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Pioneer in Process Control Instruments for over 5 decades





## Gauges Bourdon (I) Pvt. Ltd.

PRESSURE · TEMPERATURE · LEVEL

## Minco (India) Pvt. Ltd.

FLOW

Pioneer in Instrumentation, General Instruments Consortium (GIC) is the largest and the oldest manufacturer and engineering solution provider for Pressure, Temperature, Level and Flow instrumentation, since 1966. In over 5 decades of our operations, GIC has emerged as engineering solution providers, capable in designing and re-designing the products to meet critical process applications in onshore as well as offshore industries worldwide.

GIC was established by Capt. M. M. Kulkarni in the year 1966 with first manufacturing plant at New Mumbai, Panvel, India for manufacturing Bimetal Dial Thermometer. In 1991, Mr. Amarendra Kulkarni joined GIC family and with his unique vision, he redefined the manufacturing plants and processes by revamping the manufacturing facilities and adopting latest European technologies by entering into technical collaboration with M/s. Gauges Bourdon Ltd. - U.K. / France for pressure and temperature instruments which resulted into high quality products, meeting international standards.

Today, headquartered in Mumbai and sales & marketing offices in 7 metro cities in India, GIC has grown to be Industry leader with 4 state-of-the-art manufacturing plants with latest infrastructure and technology in India and France. Having 700+ people working within our group, our greatest asset is the highly expertise, dedicated workforce and overwhelming customer support through-out our journey towards success. GIC is represented in more than 40 countries and operates through its wide client network in more than 60 countries worldwide.

All manufacturing plants are quality certified as ISO 9001:2015 as well as ISO 140001: 2015 certified for health and safety and OHSAS 18001: 2007 certified for environmental safety as well as our high quality products are complimented by international certifications such CE, ATEX, NABL etc. and approved by international agencies like BV, TUV, Lloyds, GL, SGS, ABS, DNV, etc.

Our business model is tailored to supply high quality standardized products as well as customized products uniquely engineered to offer engineering solutions for various critical applications in onshore and offshore Oil and Gas industry, Petrochemicals, Refineries as well as Fertilizers, Chemicals, Pharmaceuticals, Cement, Paper, Power and Energy, Defense and other process industries. GIC has vast experience working with prestigious engineering consultants & EPCs in India and worldwide like EIL, Toyo, UHDE, Aker Solutions, Mott McDermott, Technimount ICB, Technip, SAIPEM, Jacobs, Petrofac, NPCC, Mott McDermott, Dodsall, Essar, Worley Parson, L & T, Samsung, Daewoo, Bumi Armada, Tecnicas Reunidas, Flour, Sime Derby, etc. and the list goes on.

We are also proud to be on approved vendor list of renowned companies like ONGC, BPCL, HPCL, MRPL, RELIANCE and many others in India as well as Petronas - Malaysia, KNPC & KOC - Kuwait, PDO - Oman, Qatar Petroleum - Qatar, NIGC & NIOEC - Iran, ADCO, ADMA-OPCO, ZADCO, ADGAS, Borouge, Fertil, ADNOC, Takreer and other ADNOC group of companies in UAE, Tatweer & EWA - Bahrain, EGAS & EGPC - Egypt, Air Liquid - France, Praxair & Fluor - USA, Linde - Germany and many more.

GIC is member of various government bodies such as Indian Merchant Chambers, Confederation of Indian Industry, Export Engineering Promotion Council in India and exporting almost 45-48 % of total production worldwide which is increasing rapidly. We are proud winner of EEPC "Highest Exporter" award given by Ministry of Commerce, Govt. of India for past 13 consecutive years. At GIC, we continue to reinvest in the growth and vitality of our business by providing secure and challenging careers for our employees, long-term relationships with our suppliers, synergistic partnerships with business partners and our continuous efforts for high quality engineering solutions for our clients worldwide.

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# PRESSURE GAUGES

CLASS 1%  
SS316  
Kg/cm<sup>2</sup>  
General  
Technical Collaboration with Gauges Bourdon France

# Bourdon Sensing Pressure Gauges



**MODEL : BSPG (Dry Case)**

**LFBSPG (Liquid Filled Case)**

## Features

- Compliance to latest EN-837 standard
  - Range : (-)1 to 1600 kg/cm<sup>2</sup>
  - Bourdon in SS316 Ti as standard providing better mechanical properties guaranteeing repeatability and accuracy
  - Accuracy ±1% FSD (Standard), ± 0.5% FSD on request
  - Unit of measurement - kg/cm<sup>2</sup>, bar, psi, kPa, MPa
- 
- Pressure Gauges intended for Process Industries such as Chemicals, Petro-chemicals, Energy or Gas industry, Food processing, Nuclear etc.
  - These pressure gauges have been designed to satisfy requirements to operate in aggressive environment.



## Specifications

<b>Ref. Standard</b>	EN-837
<b>Dial</b>	100 mm / 150 mm in Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel Phenol with screwed bezel
<b>Protection</b>	IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Bourdon</b>	SS316, SS316 Ti, SS316L, Monel
<b>Socket</b>	22mm Square in SS316, SS316 Ti, SS316L, Monel
<b>Movement</b>	SS304, SS316
<b>Range</b>	As per EN 837 (refer table) minimum span 0.6 kg/cm <sup>2</sup> , maximum 1600 kg/cm <sup>2</sup>
<b>Connection</b>	1/2" NPT (M) as standard* (other optional**)
<b>Accuracy</b>	±1% FSD (0.5% on request)
<b>Over range</b>	As per EN 837
<b>Zero adjustment</b>	Micrometer Pointer
<b>Blow out disc</b>	Provided (on top)
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 200°C
<b>Temperature Effect</b>	Within ±0.4% FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	IBR certification Maxima pointer NACE compliance External Knob for zero setting Built in Snubber Built in Gauge Saver Liquid filled Case (SS case only) Vacuum Protection CE Atex

\* For ranges above 1000 bar, connection shall be 1/2"BSP(M) with Bottom Entry only

\*\* Autoclave connection available on request

## Ranges

Gauge	bar, kg/cm <sup>2</sup>	Least count
Vacuum	(-)1 to 0	0.02
	-760 to 0mmHg	20
Compound	(-)1 to 0.6	0.05
	(-)1 to 1.5	0.05
	(-)1 to 3	0.10
	(-) 1 to 5	0.10
	(-)1 to 9	0.20
	(-)1 to 15	0.50
	(-)1 to 24	0.50
Pressure Gauge ('C' shaped Bourdon)	(-)1 to 39	1.0
	0 to 0.6	0.01
	0 to 1	0.02
	0 to 1.6	0.05
	0 to 2.5	0.05
	0 to 4	0.10
	0 to 6	0.10
	0 to 10	0.20
	0 to 16	0.50
	0 to 25	0.50
	0 to 40	1.0
	0 to 60	1.0
	0 to 100	2.0
	0 to 160	5.0
	0 to 250	5.0
Bourdon	0 to 400	10.0
	0 to 600	10.0
	0 to 800	20.0
	0 to 1000	20.0
	0 to 1600	50.0
	0 to 2000	50.0
	0 to 2500	50.0

For range other than above please contact our design dept.

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide suitable cooling arrangement (Syphon, Cooling Tower, Impulse Tubing, Diaphragm Seal etc.)

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



### BASIC MODEL CODE

**BSPG** Dry Case  
**LFBSPG** Liquid Filled Case

### MOUNTING

**V** Bottom Entry, Local Mounting  
**S** Bottom Entry, Surface Mounting  
**Y** Bottom Entry, 2" Pipe Mounting  
**C** Back Entry, Local Mounting  
**P** Back Entry, Flush Panel Mounting (with front Flange having 3 holes)  
**B** Back Entry, Flush Panel Mounting (with Bracket from back side)

### DIAL SIZE

**100** - 100 mm    **150** - 150 mm

### CASE

**S4S** SS 304  
**S6S** SS 316  
**PHN** Phenolic

### BOURDON

**S6S** SS 316  
**S6L** SS 316L  
**S6T** SS 316Ti  
**MN4** Monel

### SOCKET

**S6S** SS 316  
**S6L** SS 316L  
**S6T** SS 316Ti  
**MN4** Monel

### MOVEMENT

**S4S** SS 304  
**S6S** SS 316

### OPTION

**A05** Accuracy  $\pm 0.5\%$ FSD  
**ATX** Atex  
**BGS** Built In Gauge Saver  
**BOB** Blow out disc at back  
**BSN** Built In Snubber  
**CLB** Colour Band  
**CEM** CE marking  
**DC2** Silicone Oil Filled Case  
**DUS** Dual Scale  
**EXZ** External Knob for Zero Adjustment  
**FLG** Flanged Process Conn  
**GLY** Glycerine filled Case  
**IBR** IBR  
**MXP** Maxima pointer with Acrylic Window  
**NAC** NACE  
**OXY** O2 Cleaning  
**OR5** 150% FSD Over range  
**PHD** Phenolic / Plastic Dial  
**S4D** SS DIAL (SS304)  
**S6D** SS DIAL (SS316)  
**VCP** Vacuum Protection  
**L** Nil  
**CSU** Chemical Seal  
**ACC** Accessory  
**XXX** Other

### UNIT

**KSC** kg/cm<sup>2</sup>(g)  
**BAR** bar(g)  
**PSI** psi(g)  
**KPA** kPa(g)  
**MPA** MPa(g)  
**MBR** mbar(g)  
**MMW** mm WC(g)  
**CMW** cm WC(g)  
**MWC** m WC(g)  
**INW** inch WC(g)  
**MMH** mm Hg(g)  
**CMH** cm Hg(g)  
**INH** inch Hg(g)  
**XXX** Other (Please specify)

### RANGE

Please select from Table

### CONNECTION\*

Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	<b>06</b>	NPS	<b>NS</b>	Male	<b>M</b>
		3/8"	<b>10</b>	NPT	<b>NT</b>	Female	<b>F</b>
		1/2"	<b>15</b>	BSP	<b>BP</b>		
		3/4"	<b>20</b>	BSPT	<b>BT</b>		
		1"	<b>25</b>	JIS-PF	<b>PF</b>		
		M20	<b>M20</b>	JIS-PT	<b>PT</b>		
				Gas	<b>GS</b>		
				R	<b>RR</b>		
		Rp	<b>RP</b>				
		Pitch 1.5	<b>C</b>				

e.g. For 1/2"NPT(M), Code: **T15NTM**  
For M20x1.5 (F), Code: **TM20CF**

\* For Autoclave connection, please contact our design department

### FLG - FLANGE

Conn	Code	Size	Code	Rating#	Code	Facing	Code
Flange	<b>F</b>	1/2"	<b>15</b>	150	<b>A</b>	RF	<b>RF</b>
		3/4"	<b>20</b>	300	<b>B</b>	FF	<b>FF</b>
		1"	<b>25</b>	600	<b>C</b>	RTJ	<b>RJ</b>
		1-1/2"	<b>40</b>	900	<b>D</b>	LT	<b>LT</b>
		2"	<b>50</b>	1500	<b>E</b>	LG	<b>LG</b>
		3"	<b>80</b>	2500	<b>F</b>		

**Sample Model Code: BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-10)-BAR-BOB**

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

## Gauges with External Zero Adjustment (Pressure Gauges and Diff. Pressure Gauges)

**MODEL :** Applicable for all Models, where code “EXZ” is specified in Option column

### Features

Generally Pressure Gauges and Differential Pressure Gauges are provided with Micrometer type Pointer, by which zero can be adjusted after opening the Bezel & Glass. However for Gauges with Liquid (Glycerine/ Silicone Oil) filled Case, this arrangement is practically not suitable, since the filling liquid has to be drained before opening the Bezel & Glass. After doing the zero adjustment, the Bezel & Glass has to be re-assembled and again the Case has to be filled with Liquid.

In order to overcome this difficulty, General Instruments Consortium has developed a unique design of External Zero Adjustment. By this arrangement, zero can be adjusted without draining the Glycerine, without opening the Bezel, without Removing the Glass & without touching the Pointer, just by rotating a knob provided out side the Gauge. This arrangement is highly recommended from the maintenance view, especially for Liquid filled Gauges.

Please refer the photograph of Pressure Gauge and DP Gauge shown below, which shows the External Knob for zero adjustment



### Ordering Information

Ordering Information (Model Code) shall be same as the respective Model Codes, except additional code “EXZ” for External knob for zero re-setting



# Solid Front - Bourdon Sensing Pr. Gauges



**MODEL : SFBSPG (Dry Case)**  
**LSBSPG (Liquid Filled Case)**

## Features

- Safety pattern
- All SS construction
- These Pressure Gauges are well suited for the Process Industries such as Chemicals, Petro-chemicals, Energy or Gas industry, Food processing, Nuclear etc.
- These Gauges have been provided with a solid baffle wall and blow out back which immediately releases the pressure in the enclosure in the event of an accidental rupture of the sensing element.



## Specifications

<b>Ref. standard</b>	EN 837
<b>Dial</b>	100 mm /150 mm, Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	Weatherproof to IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Bourdon</b>	SS316, SS316 Ti, SS316L, Monel
<b>Socket</b>	22 mm Square in SS 316, SS316L, SS316 Ti, Monel
<b>Movement</b>	SS304, SS316
<b>Range</b>	As per EN 837 (refer table) minimum span 0.6 kg/cm <sup>2</sup> , maximum 1600 kg/cm <sup>2</sup> g
<b>Connection</b>	1/2" NPT (M) as standard* (other optional**)
<b>Accuracy</b>	±1% FSD (0.5% on request)
<b>Over range</b>	As per EN 837
<b>Zero adjustment</b>	Micrometer Pointer
<b>Blow out disc</b>	Provided at back of Case
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 200°C
<b>Temperature Effect</b>	Within ±0.4% FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	NACE compliance Liquid filled case External Knob for zero setting IBR Certification Vacuum Protection CE Atex

\* For ranges above 1000 bar, connection shall be 1/2"BSP(M) with Bottom Entry only

\*\* Autoclave connection available on request

## Ranges

Gauge	bar, kg/cm <sup>2</sup>	Least count	
Vacuum	(-)1 to 0	0.02	
	-760 to 0mmHg	20	
Compound (‘C’ shaped Bourdon)	(-)1 to 0.6	0.05	
	(-)1 to 1.5	0.05	
	(-)1 to 3	0.10	
	(-) 1 to 5	0.10	
	(-)1 to 9	0.20	
	(-)1 to 15	0.50	
	(-)1 to 24	0.50	
	(-)1 to 39	1.0	
	Pressure Gauge (‘C’ shaped Bourdon)	0 to 0.6	0.01
		0 to 1	0.02
0 to 1.6		0.05	
0 to 2.5		0.05	
0 to 4		0.10	
0 to 6		0.10	
0 to 10		0.20	
0 to 16		0.50	
0 to 25		0.50	
0 to 40		1.0	
Pressure Gauge Coil type Bourdon	0 to 60	1.0	
	0 to 100	2.0	
	0 to 160	5.0	
	0 to 250	5.0	
	0 to 400	10.0	
	0 to 600	10.0	
	0 to 800	20.0	
	0 to 1000	20.0	
	0 to 1600	50.0	
	0 to 2000	50.0	
0 to 2500	50.0		

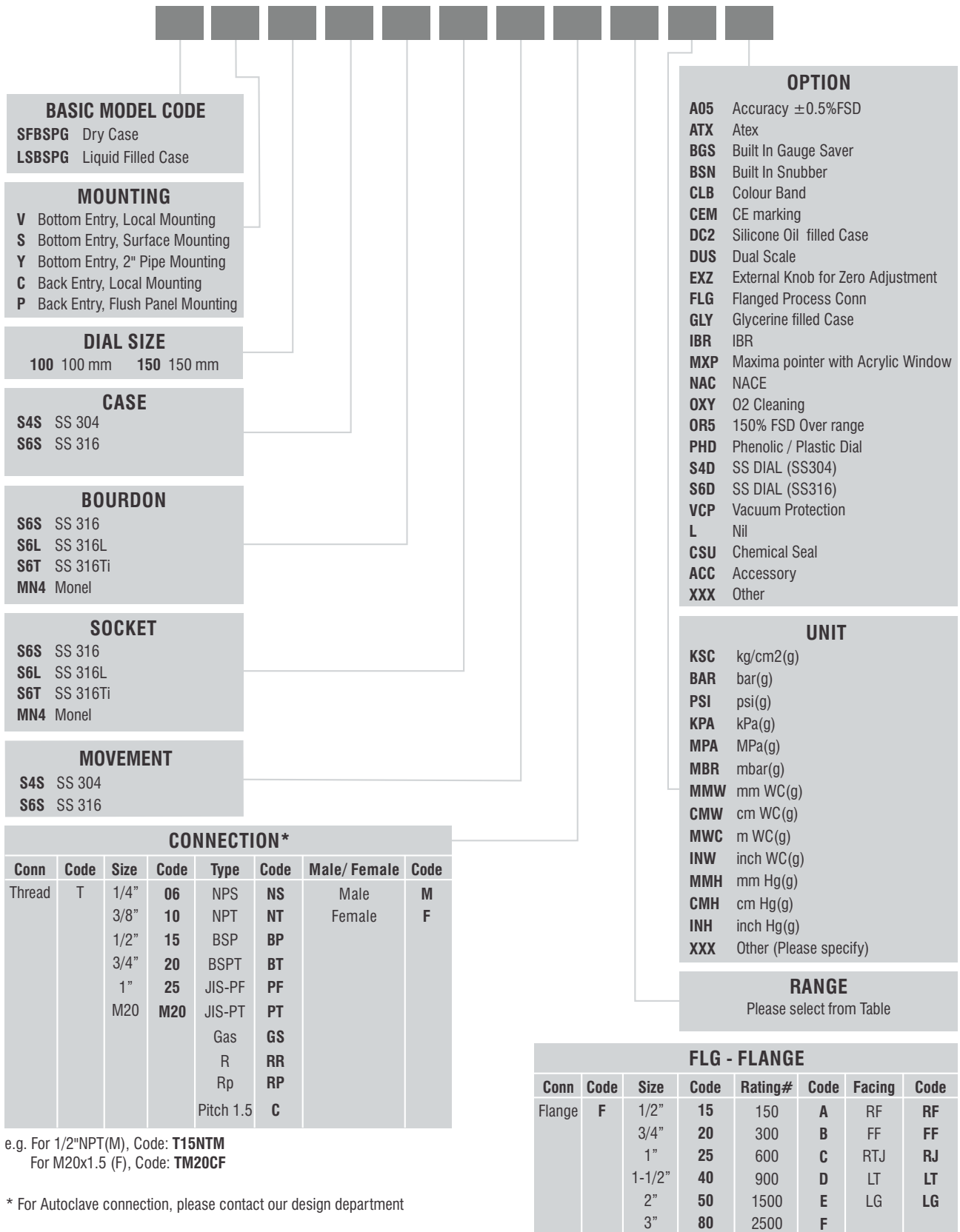
For range other than above please contact our design dept.

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide suitable cooling arrangement (Syphon, Cooling Tower, Impulse Tubing, Diaphragm Seal etc.)

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



**BASIC MODEL CODE**  
**SFBSPG** Dry Case  
**LSBSPG** Liquid Filled Case

**MOUNTING**  
**V** Bottom Entry, Local Mounting  
**S** Bottom Entry, Surface Mounting  
**Y** Bottom Entry, 2" Pipe Mounting  
**C** Back Entry, Local Mounting  
**P** Back Entry, Flush Panel Mounting

**DIAL SIZE**  
**100** 100 mm    **150** 150 mm

**CASE**  
**S4S** SS 304  
**S6S** SS 316

**BOURDON**  
**S6S** SS 316  
**S6L** SS 316L  
**S6T** SS 316Ti  
**MN4** Monel

**SOCKET**  
**S6S** SS 316  
**S6L** SS 316L  
**S6T** SS 316Ti  
**MN4** Monel

**MOVEMENT**  
**S4S** SS 304  
**S6S** SS 316

CONNECTION*							
Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
	M20	1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
			M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
		Rp	RP				
		Pitch 1.5	C				

e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

\* For Autoclave connection, please contact our design department

**OPTION**

- A05** Accuracy  $\pm 0.5\%$ FSD
- ATX** Atex
- BGS** Built In Gauge Saver
- BSN** Built In Snubber
- CLB** Colour Band
- CEM** CE marking
- DC2** Silicone Oil filled Case
- DUS** Dual Scale
- EXZ** External Knob for Zero Adjustment
- FLG** Flanged Process Conn
- GLY** Glycerine filled Case
- IBR** IBR
- MXP** Maxima pointer with Acrylic Window
- NAC** NACE
- OXY** O2 Cleaning
- OR5** 150% FSD Over range
- PHD** Phenolic / Plastic Dial
- S4D** SS DIAL (SS304)
- S6D** SS DIAL (SS316)
- VCP** Vacuum Protection
- L** Nil
- CSU** Chemical Seal
- ACC** Accessory
- XXX** Other

**UNIT**

- KSC** kg/cm2(g)
- BAR** bar(g)
- PSI** psi(g)
- KPA** kPa(g)
- MPA** MPa(g)
- MBR** mbar(g)
- MMW** mm WC(g)
- CMW** cm WC(g)
- MWC** m WC(g)
- INW** inch WC(g)
- MMH** mm Hg(g)
- CMH** cm Hg(g)
- INH** inch Hg(g)
- XXX** Other (Please specify)

**RANGE**  
 Please select from Table

FLG - FLANGE							
Conn	Code	Size	Code	Rating#	Code	Facing	Code
Flange	F	1/2"	15	150	A	RF	RF
		3/4"	20	300	B	FF	FF
		1"	25	600	C	RTJ	RJ
		1-1/2"	40	900	D	LT	LT
		2"	50	1500	E	LG	LG
		3"	80	2500	F		

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

**Sample Model Code: SFBSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-10)-BAR-OXY**

## Solid Front Phenolic Case Pr. Gauges

*General*

**MODEL : SFPHPG (Dry Case)**

**LSPHPG (Liquid Filled Case)**

### Features

- Safety pattern
- Corrosion resistant Phenolic Case makes it suitable for corrosive environment
- Available with Stainless Steel & Monel internals
- These Gauges have been provided with a solid baffle wall and blow out back which immediately releases the pressure in the enclosure in the event of an accidental rupture of the sensing element.



### Specifications

<b>Ref. standard</b>	EN 837
<b>Dial</b>	4½", Aluminium, white background, black markings
<b>Case</b>	Phenolic with screwed bezel
<b>Protection</b>	Weatherproof to IP-65 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Bourdon</b>	SS316, SS316 Ti, SS316L, Monel
<b>Socket</b>	22 mm Square in SS316, SS316L, SS316 Ti, Monel
<b>Movement</b>	SS304, SS316
<b>Range</b>	As per EN 837 (refer table) minimum span 1kg/cm2, maximum 1000 kg/cm2g
<b>Connection</b>	1/2" NPT (M) as standard (other optional)
<b>Accuracy</b>	±1% FSD (0.5% on request)
<b>Over range</b>	As per EN 837
<b>Zero adjustment</b>	Micrometer Pointer
<b>Blow out protection</b>	Provided at back of Case
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 100°C
<b>Temperature Effect</b>	Within ±0.4% FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	NACE compliance Liquid filled case Vacuum Protection CE Atex

### Ranges

Gauge	bar, kg/cm2	Least count	
Vacuum	(-)1 to 0	0.02	
	-760 to 0mmHg	20	
Compound	(-)1 to 0.6	0.05	
	(-)1 to 1.5	0.05	
	(-)1 to 3	0.10	
	(-) 1 to 5	0.10	
	(-)1 to 9	0.20	
	(-)1 to 15	0.50	
	(-)1 to 24	0.50	
	(-)1 to 39	1.0	
	Pressure Gauge ('C' shaped Bourdon)	0 to 1	0.02
		0 to 1.6	0.05
0 to 2.5		0.05	
0 to 4		0.10	
0 to 6		0.10	
0 to 10		0.20	
0 to 16		0.50	
0 to 25		0.50	
0 to 40		1.0	
0 to 60		1.0	
Pressure Gauge (Coil type Bourdon)	0 to 100	2.0	
	0 to 160	5.0	
	0 to 250	5.0	
	0 to 400	10.0	
	0 to 600	10.0	
	0 to 800	20.0	
	0 to 1000	20.0	

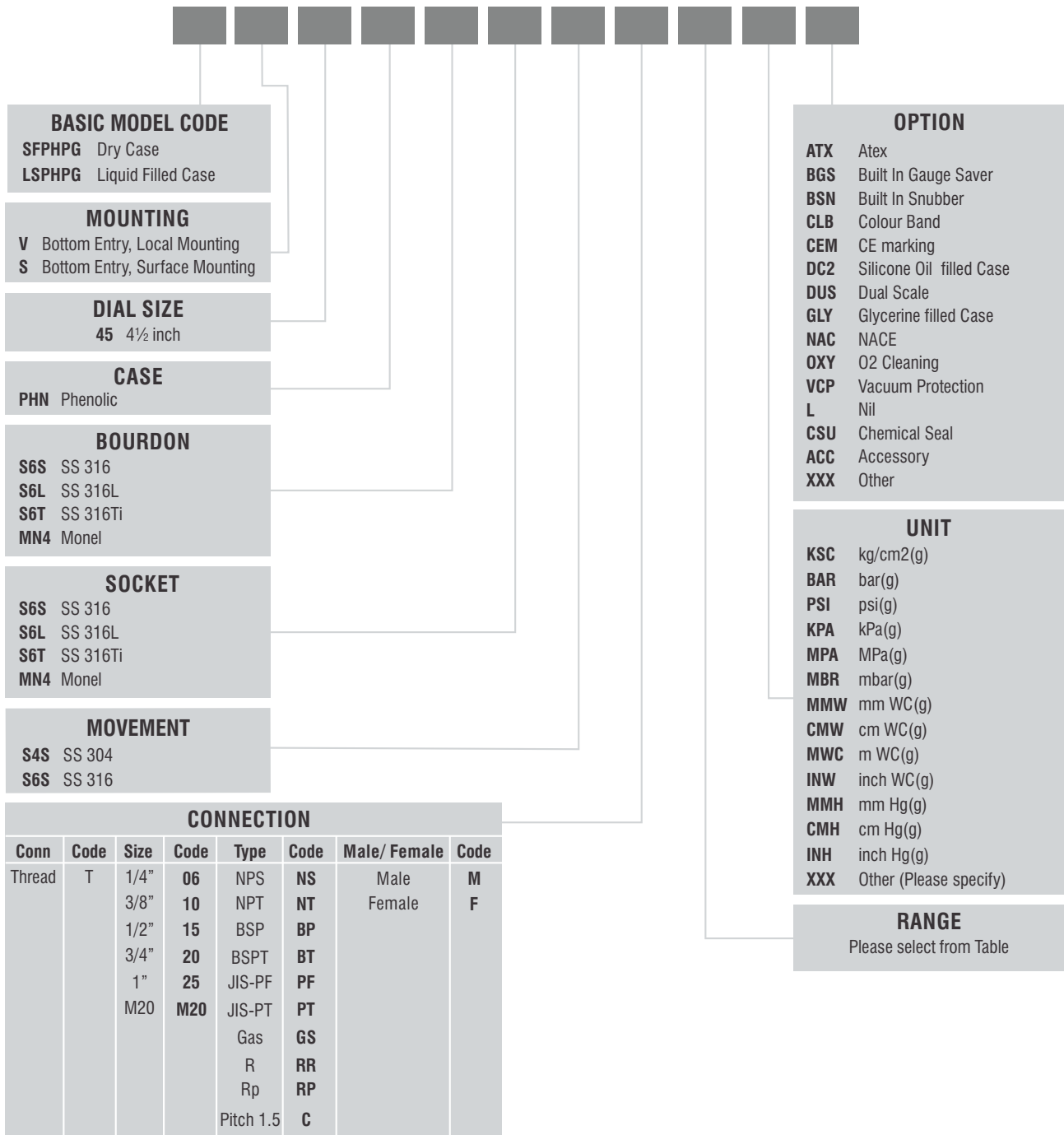
For range other than above please contact our design dept.

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide suitable cooling arrangement (Syphon, Cooling Tower, Impulse Tubing, Diaphragm Seal etc.)

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

Sample Model Code: **SFPHPG-V-45-PHN-S6S-S6S-S4S-T15NTM-(0-10)-BAR-L**

# Bourdon Sensing Pressure Gauges



(with High Over Pressure Safety)

- MODEL : HOPG** (Dry Case)
- LFHOPG** (Liquid Filled Case)
- SFHOPG** (Solid Front Dry Case)
- LSHOPG** (Liquid Filled Solid Front Case)

## Features

- Recommended for occasional short duration over pressure (up to 4 times the Measuring Range)
  - Compliance to latest EN-837 standard
  - Accuracy  $\pm 1\%$  FSD (Standard)
  - Safety Pattern available with Solid Front Case
  - Liquid filled case available for operation in vibrating process condition
  - Unit of Measurement - kg/cm<sup>2</sup>, bar, psi, kPa, MPa
- 
- Pressure Gauges intended for Process Industries such as Chemicals, Petro-chemicals, Energy or Gas industry, Power Plant etc.
  - These pressure gauges have been designed to satisfy requirements to operate in aggressive environment.



## Specifications

<b>Ref. Standard</b>	EN-837
<b>Dial</b>	100 mm / 150 mm in Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Bourdon</b>	SS316, SS316 Ti, SS316L, Monel
<b>Socket</b>	22mm Square in SS316, SS316 Ti, SS316L, Monel
<b>Movement</b>	SS304, SS316
<b>Connection</b>	1/2" NPT (M) as standard (other optional)
<b>Accuracy</b>	$\pm 1\%$ FSD
<b>Over range</b>	As shown against each range
<b>Zero adjustment</b>	Micrometer Pointer
<b>Blow out disc</b>	Provided (on top)
<b>Temperature suitability</b>	Ambient (-20°C to 60°C, Media 200°C)
<b>Temperature Effect</b>	Within $\pm 0.4\%$ FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	NACE compliance Built in Snubber Liquid filled Case Vacuum Protection CE Atex

## Ranges

Measuring Range	Over Pressure Range
kg/cm <sup>2</sup> or bar	kg/cm <sup>2</sup> or bar
0 to 1	4
0 to 1.6	6
0 to 2.5	10
0 to 4	16
0 to 6	25
0 to 10	40
0 to 16	60
0 to 25	80
0 to 40	100

For range other than above please contact our design dept.

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide suitable cooling arrangement (Syphon, Cooling Tower, Impulse Tubing, Diaphragm Seal etc.)

Under Technical Collaboration with M/s. Gauges Bourdon, France



# Ordering Information

## MODEL



### BASIC MODEL CODE

- HOPG** Dry Case
- LFHOPG** Liquid Filled Case
- SFHOPG** Solid Front Dry Case
- LSHOPG** Liquid Filled Solid Front Case

### MOUNTING

- V** Bottom Entry, Local Mounting
- S** Bottom Entry, Surface Mounting
- Y** Bottom Entry, 2" Pipe Mounting
- C** Back Entry, Local Mounting
- P** Back Entry, Flush Panel Mounting

### DIAL SIZE

100 - 100 mm 150 - 150 mm

### CASE

- S4S** SS 304
- S6S** SS 316

### BOURDON

- S6S** SS 316
- S6L** SS 316L
- S6T** SS 316Ti
- MN4** Monel

### SOCKET

- S6S** SS 316
- S6L** SS 316L
- S6T** SS 316Ti
- MN4** Monel

### MOVEMENT

- S4S** SS 304
- S6S** SS 316

### CONNECTION

Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	<b>06</b>	NPS	<b>NS</b>	Male Female	<b>M</b> <b>F</b>
		3/8"	<b>10</b>	NPT	<b>NT</b>		
		1/2"	<b>15</b>	BSP	<b>BP</b>		
		3/4"	<b>20</b>	BSPT	<b>BT</b>		
		1"	<b>25</b>	JIS-PF	<b>PF</b>		
		M20	<b>M20</b>	JIS-PT	<b>PT</b>		
				Gas	<b>GS</b>		
				R	<b>RR</b>		
				Rp	<b>RP</b>		
				Pitch 1.5	<b>C</b>		

### OPTION

- ATX** Atex
- BOB** Blow out disc at back
- BSN** Built In Snubber
- CLB** Colour Band
- CEM** CE marking
- DC2** Silicone Oil Filled Case
- DUS** Dual Scale
- GLY** Glycerine filled Case
- NAC** NACE
- OXY** O2 Cleaning
- PHD** Phenolic / Plastic Dial
- S4D** SS DIAL (SS304)
- S6D** SS DIAL (SS316)
- VCP** Vacuum Protection
- L** Nil
- CSU** Chemical Seal
- ACC** Accessory
- XXX** Other

### UNIT

- KSC** kg/cm2(g)
- BAR** bar(g)
- PSI** psi(g)
- KPA** kPa(g)
- MPA** MPa(g)
- MBR** mbar(g)
- MMW** mm WC(g)
- CMW** cm WC(g)
- MWC** m WC(g)
- INW** inch WC(g)
- MMH** mm Hg(g)
- CMH** cm Hg(g)
- INH** inch Hg(g)
- XXX** Other (Please specify)

### RANGE

Please select from Table

e.g. For 1/2"NPT(M), Code: **T15NTM**  
For M20x1.5 (F), Code: **TM20CF**

**Sample Model Code: HOPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-10)-BAR-L**

# Bourdon Sensing Pr. Gauges - 250mm



**MODEL : BS25** (Dry Case)

**LFBS25** (Liquid Filled Case)

**SFBS25** (Solid Front, Dry Case)

**LSBS25** (Liquid filled, Solid Front Case)

## Features

- Compliance to latest EN-837 standard
- Range : (-)1 to 1600 kg/cm<sup>2</sup>
- Bourdon in SS316 Ti as standard providing better mechanical properties guaranteeing repeatability and accuracy
- Accuracy  $\pm 1\%$  FSD (Standard),  $\pm 0.5\%$  FSD on request
- Unit of measurement - kg/cm<sup>2</sup>, bar, psi, kPa, MPa



## Specifications

<b>Ref. Standard</b>	EN-837
<b>Dial</b>	250 mm in Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Bourdon</b>	SS316, SS316 Ti, SS316L, Monel
<b>Socket</b>	22mm Square in SS316, SS316 Ti, SS316L, Monel
<b>Movement</b>	SS304, SS316
<b>Range</b>	As per EN 837 (refer table) minimum span 0.6 kg/cm <sup>2</sup> , maximum 1600 kg/cm <sup>2</sup>
<b>Connection</b>	1/2" NPT (M) as standard* (other optional)
<b>Accuracy</b>	$\pm 1.0\%$ FSD standard ( $\pm 0.5\%$ FSD on request)
<b>Over range</b>	As per EN 837
<b>Zero adjustment</b>	Micrometer Pointer
<b>Blow out disc</b>	Provided (on top)
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 200°C
<b>Temperature Effect</b>	Within $\pm 0.4\%$ FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	IBR certification NACE compliance Liquid Filled Case External Knob for zero setting Vacuum Protection CE Atex

\* For ranges above 1000 bar, connection shall be 1/2"BSP(M) with Bottom Entry only

## Ranges

Gauge	bar, kg/cm <sup>2</sup>	Least count
Vacuum	(-)1 to 0	0.02
	-760 to 0mmHg	20
Compound	(-)1 to 0.6	0.05
	(-)1 to 1.5	0.05
	(-)1 to 3	0.10
	(-)1 to 5	0.10
	(-)1 to 9	0.20
Pressure Gauge ('C' shaped Bourdon)	(-)1 to 15	0.50
	(-)1 to 24	0.50
	(-)1 to 39	1.0
	0 to 0.6	0.01
	0 to 1	0.02
Pressure Gauge ('C' shaped Bourdon)	0 to 1.6	0.05
	0 to 2.5	0.05
	0 to 4	0.10
	0 to 6	0.10
	0 to 10	0.20
	0 to 16	0.50
	0 to 25	0.50
	0 to 40	1.0
	0 to 60	1.0
	0 to 100	2.0
Pressure Gauge ('C' shaped Bourdon)	0 to 160	5.0
	0 to 250	5.0
	0 to 400	10.0
	0 to 600	10.0
	0 to 800	20.0
	0 to 1000	20.0
	0 to 1600	50.0

For range other than above please contact our design dept.

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide suitable cooling arrangement (Syphon, Cooling Tower, Impulse Tubing, Diaphragm Seal etc.)

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



### BASIC MODEL CODE

- BS25** Dry Case
- LFBS25** Liquid Filled Case
- SFBS25** Solid Front, Dry Case
- LSBS25** Liquid filled, Solid Front Case

### MOUNTING

- V** Bottom Entry, Local Mounting
- S** Bottom Entry, Surface Mounting
- Y** Bottom Entry, 2" Pipe Mounting
- C** Back Entry, Local Mounting
- P** Back Entry, Flush Panel Mounting

### DIAL SIZE

**250** 250 mm

### CASE

- S4S** SS 304
- S6S** SS 316

### BOURDON

- S6S** SS 316
- S6L** SS 316L
- S6T** SS 316Ti
- MN4** Monel

### SOCKET

- S6S** SS 316
- S6L** SS 316L
- S6T** SS 316Ti
- MN4** Monel

### MOVEMENT

- S4S** SS 304
- S6S** SS 316

### CONNECTION

Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	<b>06</b>	NPS	<b>NS</b>	Male	<b>M</b>
		3/8"	<b>10</b>	NPT	<b>NT</b>	Female	<b>F</b>
		1/2"	<b>15</b>	BSP	<b>BP</b>		
		3/4"	<b>20</b>	BSPT	<b>BT</b>		
		1"	<b>25</b>	JIS-PF	<b>PF</b>		
		M20	<b>M20</b>	JIS-PT	<b>PT</b>		
				Gas	<b>GS</b>		
				R	<b>RR</b>		
		Rp	<b>RP</b>				
		Pitch 1.5	<b>C</b>				

e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

### OPTION

- A05** Accuracy  $\pm 0.5\%$ FSD
- ATX** Atex
- BGS** Built In Gauge Saver
- BOB** Blow out disc at back
- BSN** Built In Snubber
- CLB** Colour Band
- CEM** CE marking
- DC2** Silicone Oil filled Case
- DUS** Dual Scale
- EXZ** External Knob for Zero Adjustment
- FLG** Flanged Process Conn
- GLY** Glycerine filled Case
- IBR** IBR
- NAC** NACE
- OXY** O2 Cleaning
- OR5** 150% FSD Over range
- VCP** Vac protection
- L** Nil
- CSU** Chemical Seal
- ACC** Accessory
- XXX** Other

### UNIT

- KSC** kg/cm2(g)
- BAR** bar(g)
- PSI** psi(g)
- KPA** kPa(g)
- MPA** MPa(g)
- MBR** mbar(g)
- MMW** mm WC(g)
- CMW** cm WC(g)
- MWC** m WC(g)
- INW** inch WC(g)
- MMH** mm Hg(g)
- CMH** cm Hg(g)
- INH** inch Hg(g)
- XXX** Other (Please specify)

### RANGE

Please select from Table

### FLG - FLANGE

Conn	Code	Size	Code	Rating#	Code	Facing	Code
Flange	<b>F</b>	1/2"	<b>15</b>	150	<b>A</b>	RF	<b>RF</b>
		3/4"	<b>20</b>	300	<b>B</b>	FF	<b>FF</b>
		1"	<b>25</b>	600	<b>C</b>	RTJ	<b>RJ</b>
		1-1/2"	<b>40</b>	900	<b>D</b>	LT	<b>LT</b>
		2"	<b>50</b>	1500	<b>E</b>	LG	<b>LG</b>
		3"	<b>80</b>	2500	<b>F</b>		

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

Sample Model Code: **BS25-V-250-S4S-S6S-S6S-S4S-T15NTM-(0-10)-KSC-L**

# Receiver Gauges

# General

## MODEL : RCPG

### Features

- Suitable for receiving pneumatic signals of level and flow transmitters
- Compliance to latest EN-837 standard
- Input Range : 0.2 to 1 kg/cm<sup>2</sup> or 3 to 15 psi
- Accuracy  $\pm 1\%$  FSD (Standard),  $\pm 0.5\%$  FSD on request



### Specifications

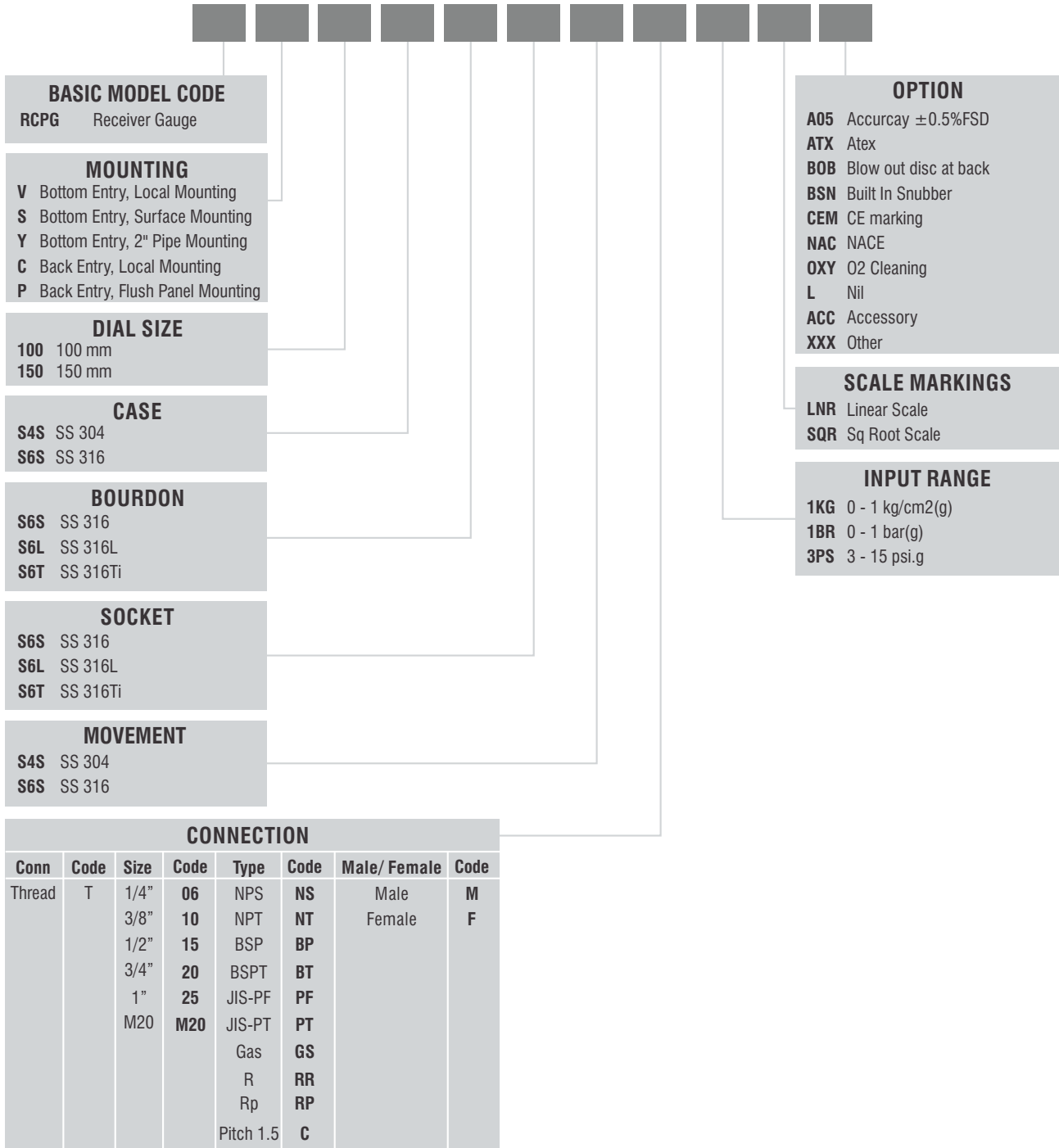
<b>Ref. Standard</b>	EN-837
<b>Dial</b>	100 mm / 150 mm in Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Bourdon</b>	SS316, SS316 Ti, SS316L
<b>Socket</b>	22mm Square in SS316, SS316 Ti, SS316L
<b>Movement</b>	SS304, SS316
<b>Input Range</b>	0.2 to 1 kg/cm <sup>2</sup> or 3 to 15 psi
<b>Scale</b>	0 - 100% Linear or 0 - 10 Sq. root
<b>Connection</b>	1/2" NPT (M) as standard (other optional)
<b>Accuracy</b>	$\pm 1.0\%$ FSD standard ( $\pm 0.5\%$ FSD on request)
<b>Over range</b>	As per EN 837
<b>Zero adjustment</b>	Micrometer Pointer
<b>Blow out disc</b>	Provided (on top)
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 100°C
<b>Temperature Effect</b>	Within $\pm 0.4\%$ FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	NACE Compliance CE Atex

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide suitable cooling arrangement (Syphon, Cooling Tower, Impulse Tubing, Diaphragm Seal etc.)

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



e.g. For 1/2"NPT(M), Code: **T15NTM**  
For M20x1.5 (F), Code: **TM20CF**

Sample Model Code: **RCPG-V-100-S4S-S6S-S6S-S4S-T06NTM-1KG-SQR-L**



# Master Pressure Gauges

**MODEL : MAPG**

## Features

- Accuracy class  $\pm 0.25\%$  FSD
- Rugged construction
- 1.2 fold over range capability for short duration
- Traceability to National / International Standard / Laboratory
- Special carrying case (Wooden Box) with each Gauge



## Specifications

<b>Ref. Standard</b>	EN 837
<b>Normal size</b>	150 mm / 250 mm
<b>Case &amp; Bezel</b>	SS304 / SS316, Weather proof to IP-68
<b>Dial</b>	Anti parallax mirror type, white, with black markings.
<b>Window</b>	Instrument glass
<b>Pointer</b>	Balanced knife edge
<b>Measuring element</b>	Bourdon in SS316 Ti
<b>Movement</b>	Precision brass, jewel bearings
<b>Connection</b>	1/2" NPT (M), bottom or back eccentric in SS316
<b>Range</b>	Refer table
<b>Scale</b>	bar(g), kg/cm <sup>2</sup> (g), psi(g)
<b>Accuracy</b>	$\pm 0.25\%$ FSD
<b>Over range</b>	1.2 times maximum rating for short duration
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 60°C
<b>Temperature Effect</b>	Within $\pm 0.25\%$ FSD/10°C, when temperature changes from reference temperature of 20°C
<b>Option</b>	CE Atex
	<b>Pressure Comparator</b>
	Pressure Comparator consists of a hand operated Screw Pump, Reservoir for filling the System, Shut- off / Relieve Valves. Fluid Pressure is generated by operating the Screw Pump; and the pressure is made available at two test ports - one for Master Gauge and the other for the Gauge under Test. After testing the pressure is released using Relief Valve. It is easy to operate and provides maintenance free operation.
	<b>Pointer Puller Fixer kit</b>

## Ranges

Range	least Count	
	bar, kg/cm <sup>2</sup>	150 mm 250 mm
(-)1 to 0	0.005	0.005
(-)760 to 0mmHg	5	5
(-)1 to 0.6	0.01	0.005
(-)1 to 1.5	0.02	0.01
(-)1 to 3	0.02	0.02
(-) 1 to 5	0.05	0.02
(-)1 to 9	0.05	0.05
(-)1 to 15	0.1	0.05
(-)1 to 24	0.2	0.1
(-)1 to 39	0.2	0.2
0 to 1	0.005	0.005
0 to 1.6	0.01	0.005
0 to 2.5	0.02	0.01
0 to 4	0.02	0.02
0 to 6	0.05	0.02
0 to 10	0.05	0.05
0 to 16	0.1	0.05
0 to 25	0.2	0.1
0 to 40	0.2	0.2
0 to 60	0.5	0.2
0 to 100	0.5	0.5
0 to 160	1.0	0.5
0 to 250	2.0	1.0
0 to 400	2.0	2.0
0 to 600	5.0	2.0

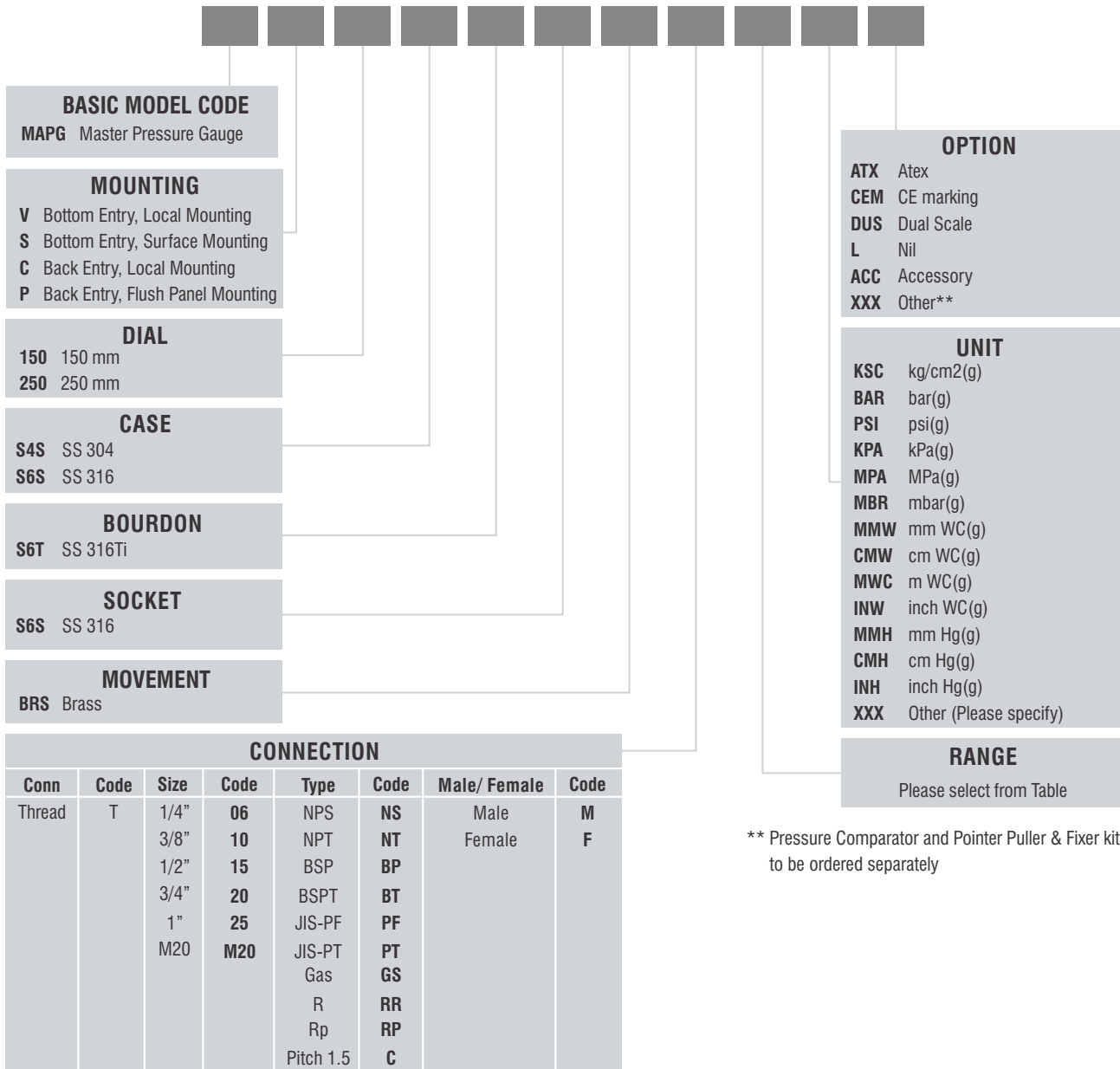
For range other than above please contact our design dept.

The parameters mentioned here are the standard specifications / values generally used for most of the Calibration Lab requirements. Any other specification not appearing here also can be provided as per customer requirement.

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



\*\* Pressure Comparator and Pointer Puller & Fixer kit to be ordered separately

e.g. For 1/2"NPT(M), Code: **T15NTM**  
For M20x1.5 (F), Code: **TM20CF**

Sample Model Code: **MAPG-V-150-S4S-S6T-S6S-BRS-T15BPM-(0-25)-BAR-L**

# Diaphragm Sensing Pressure Gauges

- MODEL : DSPG** (Dry Case)
- LFDSPG** (Liquid Filled Case)
- SF DSPG** (Solid Front, Dry Case)
- LSDSPG** (Liquid filled, Solid Front Case)

## Features

- Compliance to latest EN-837 standard
- Range : (-)10000 to (+)10000 mmWC
- All SS internals
- Special design with built in Gauges saver also available



## Specifications

## Ranges

<b>Ref. Standard</b>	EN-837
<b>Dial</b>	100 mm / 150 mm / 250 mm in Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Movement</b>	SS304 / SS316
<b>Top Chamber</b>	SS304 / SS316
<b>Diaphragm</b>	SS316, PTFE lined SS316 (other material optional)
<b>Bottom flange</b>	SS304 / SS316 / SS316 + PTFE Block / PTFE lined SS316 (other material optional)
<b>Connection</b>	1/2" NPT (M) or flanged (specify size & rating)
<b>Range</b>	Refer table
<b>Accuracy</b>	±2% FSD (1.6% FSD on request)
<b>Over range</b>	As per EN 837
<b>Zero adjustment</b>	Micrometer pointer
<b>Blow out disc</b>	Provided
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 100°C
<b>Temperature Effect</b>	Within ±0.8% FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	<ul style="list-style-type: none"> <li>• Flushing connection on the bottom chamber to facilitate cleaning</li> <li>• Liquid Filled Case (Minium Span of Range 400mmWC)</li> <li>• Solid Front Case</li> <li>• Special Construction to withstand high design pressure (Built in Gauge Saver)</li> <li>• Built in Snubber</li> <li>• External Knob for zero setting</li> <li>• CE</li> <li>• Atex</li> </ul>

0-250 mm WC	(-)250 to 0 mm WC
0-400 mm WC	(-)400 to 0 mm WC
0-600 mm WC	(-)600 to 0 mm WC
0-1000 mm WC	(-)1000 to 0 mm WC
0-1600 mm WC	(-)1600 to 0 mm WC
0-2500 mm WC	(-)2500 to 0 mm WC
0-4000 mm WC	(-)4000 to 0 mm WC
0-6000 mm WC	(-)6000 to 0 mm WC
0-1.0 bar or 0-10000 mm WC	(-)10000 to 0 mmWC

Special combination for compound ranges available, within the above span



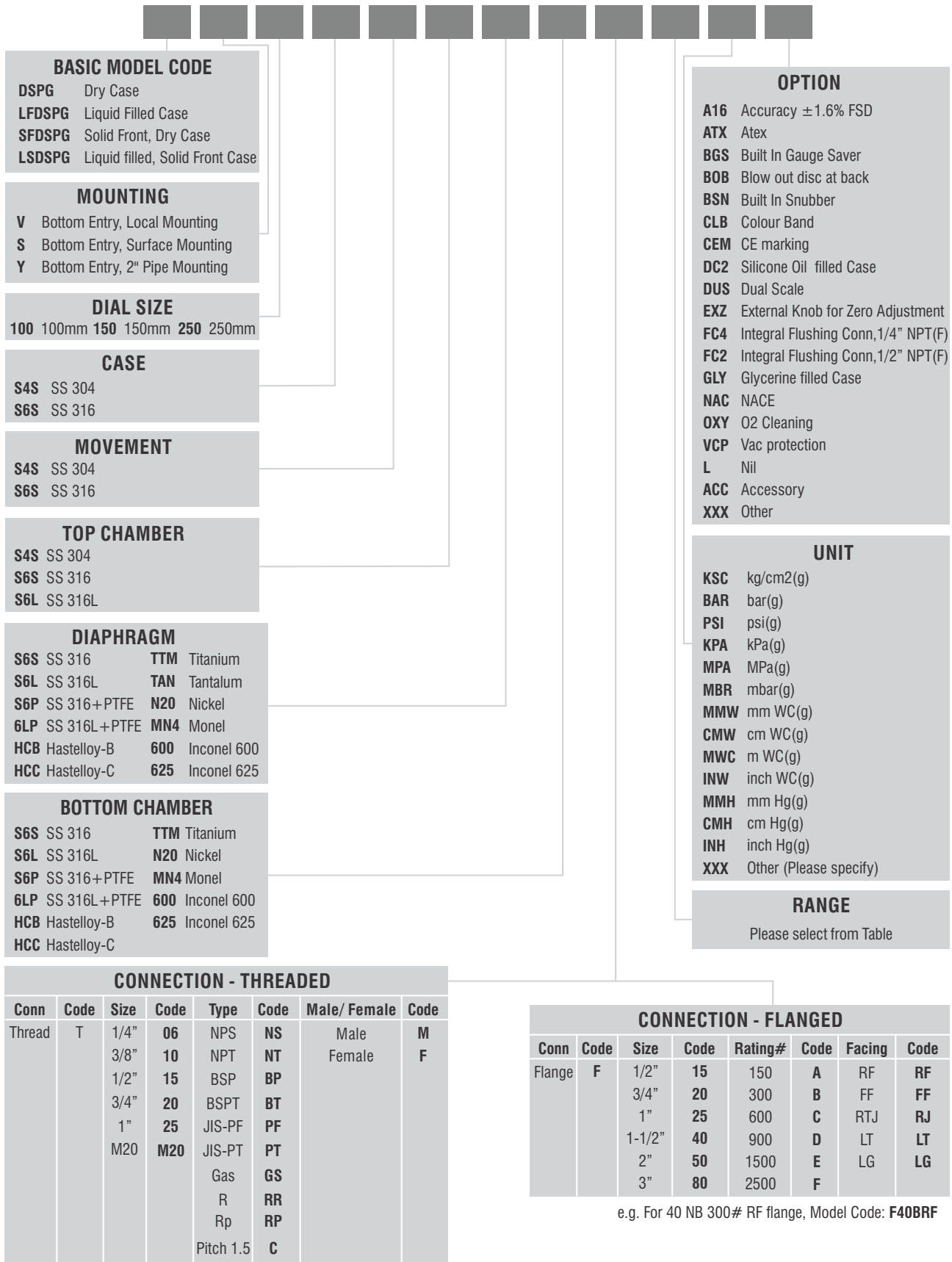
**Note:** PTFE block / moulded construction available in flanged connection only.

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100 °C, we recommend to provide suitable cooling arrangement (Syphon, Cooling Tower, Impulse Tubing etc.)

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



### BASIC MODEL CODE

- DSPG** Dry Case
- LFDSPG** Liquid Filled Case
- SF DSPG** Solid Front, Dry Case
- LS DSPG** Liquid filled, Solid Front Case

### MOUNTING

- V** Bottom Entry, Local Mounting
- S** Bottom Entry, Surface Mounting
- Y** Bottom Entry, 2" Pipe Mounting

### DIAL SIZE

- 100** 100mm **150** 150mm **250** 250mm

### CASE

- S4S** SS 304
- S6S** SS 316

### MOVEMENT

- S4S** SS 304
- S6S** SS 316

### TOP CHAMBER

- S4S** SS 304
- S6S** SS 316
- S6L** SS 316L

### DIAPHRAGM

- S6S** SS 316     **TTM** Titanium
- S6L** SS 316L   **TAN** Tantalum
- S6P** SS 316+PTFE   **N20** Nickel
- 6LP** SS 316L+PTFE   **MN4** Monel
- HCB** Hastelloy-B     **600** Inconel 600
- HCC** Hastelloy-C     **625** Inconel 625

### BOTTOM CHAMBER

- S6S** SS 316     **TTM** Titanium
- S6L** SS 316L   **N20** Nickel
- S6P** SS 316+PTFE   **MN4** Monel
- 6LP** SS 316L+PTFE   **600** Inconel 600
- HCB** Hastelloy-B     **625** Inconel 625
- HCC** Hastelloy-C

### OPTION

- A16** Accuracy  $\pm 1.6\%$  FSD
- ATX** Atex
- BGS** Built In Gauge Saver
- BOB** Blow out disc at back
- BSN** Built In Snubber
- CLB** Colour Band
- CEM** CE marking
- DC2** Silicone Oil filled Case
- DUS** Dual Scale
- EXZ** External Knob for Zero Adjustment
- FC4** Integral Flushing Conn, 1/4" NPT(F)
- FC2** Integral Flushing Conn, 1/2" NPT(F)
- GLY** Glycerine filled Case
- NAC** NACE
- OXY** O2 Cleaning
- VCP** Vac protection
- L** Nil
- ACC** Accessory
- XXX** Other

### UNIT

- KSC** kg/cm2(g)
- BAR** bar(g)
- PSI** psi(g)
- KPA** kPa(g)
- MPA** MPa(g)
- MMB** mbar(g)
- MMW** mm WC(g)
- CMW** cm WC(g)
- MWC** m WC(g)
- INW** inch WC(g)
- MMH** mm Hg(g)
- CMH** cm Hg(g)
- INH** inch Hg(g)
- XXX** Other (Please specify)

### RANGE

Please select from Table

### CONNECTION - THREADED

Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	<b>06</b>	NPS	<b>NS</b>	Male	<b>M</b>
		3/8"	<b>10</b>	NPT	<b>NT</b>	Female	<b>F</b>
	M20	1/2"	<b>15</b>	BSP	<b>BP</b>		
		3/4"	<b>20</b>	BSPT	<b>BT</b>		
		1"	<b>25</b>	JIS-PF	<b>PF</b>		
		M20	<b>M20</b>	JIS-PT	<b>PT</b>		
				Gas	<b>GS</b>		
				R	<b>RR</b>		
Rp	<b>RP</b>						
		Pitch 1.5	<b>C</b>				

### CONNECTION - FLANGED

Conn	Code	Size	Code	Rating#	Code	Facing	Code
Flange	<b>F</b>	1/2"	<b>15</b>	150	<b>A</b>	RF	<b>RF</b>
		3/4"	<b>20</b>	300	<b>B</b>	FF	<b>FF</b>
		1"	<b>25</b>	600	<b>C</b>	RTJ	<b>RJ</b>
		1-1/2"	<b>40</b>	900	<b>D</b>	LT	<b>LT</b>
		2"	<b>50</b>	1500	<b>E</b>	LG	<b>LG</b>
		3"	<b>80</b>	2500	<b>F</b>		

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

e.g. For 1/2"NPT(M), Code: **T15NTM**  
For M20x1.5 (F), Code: **TM20CF**

**Sample Model Code: LFDSPG-V-150-S4S-S4S-S4S-S6L-S6L-T15NTM-(0-2500)-MMW-GLY**

## Compact Capsule Sensing Pr. Gauges

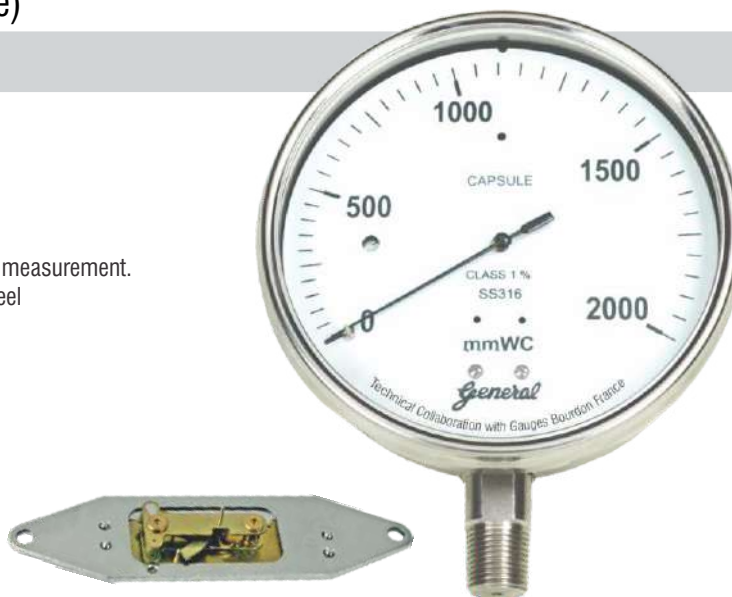
*General*

**MODEL : CCPG** (Normal Case)

**SFCCPG** (Solid Front Case)

### Features

- Low range with high accuracy
- All SS internals
- Accuracy  $\pm 1\%$  FSD
- Compact design avoids use of bulky manometers
- Ingress protection class IP-68
- These Pressure Gauges are well suited for low pressure measurement.
- The sensing Element Capsule, is made of 2 Stainless Steel Laser-welded Diaphragms.



### Specifications

<b>Ref. standard</b>	EN 837
<b>Dial</b>	100 mm /150 mm, Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Pointer</b>	Light weight, balanced, aluminium
<b>Capsule</b>	SS316 / SS316L (made of two diaphragms laser-welded )
<b>Socket</b>	SS316 / SS316L
<b>Movement</b>	SS304 / SS316
<b>Connection</b>	1/2" NPT (M) as standard (other optional )
<b>Range</b>	Refer table
<b>Accuracy</b>	$\pm 1\%$ FSD
<b>Over range</b>	110% FSD Standard, Other on request
<b>Zero reset</b>	Provided
<b>Blow out disc</b>	Provided (on top)
<b>Temperature suitability</b>	Ambient (-) 20°C to 60°C, Media 100°C
<b>Temperature Effect</b>	Within $\pm 0.6\%$ FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	NACE Compliance CE Atex

### Ranges

Range in mm WC	
0-50	(-)50-0
0-60	(-)60-0
0-100	(-)100-0
0-160	(-)160-0
0-250	(-)250-0
0-400	(-)400-0
0-500	(-)500-0
0-600	(-)600-0
0-750	(-)750-0
0-1000	(-)1000-0
0-1600	(-)1600-0
0-2000	(-)2000-0
0-2500	(-)2500-0
0-4000	(-)4000-0
0-6000	(-)6000-0

Special combination for compound ranges available, within the above span

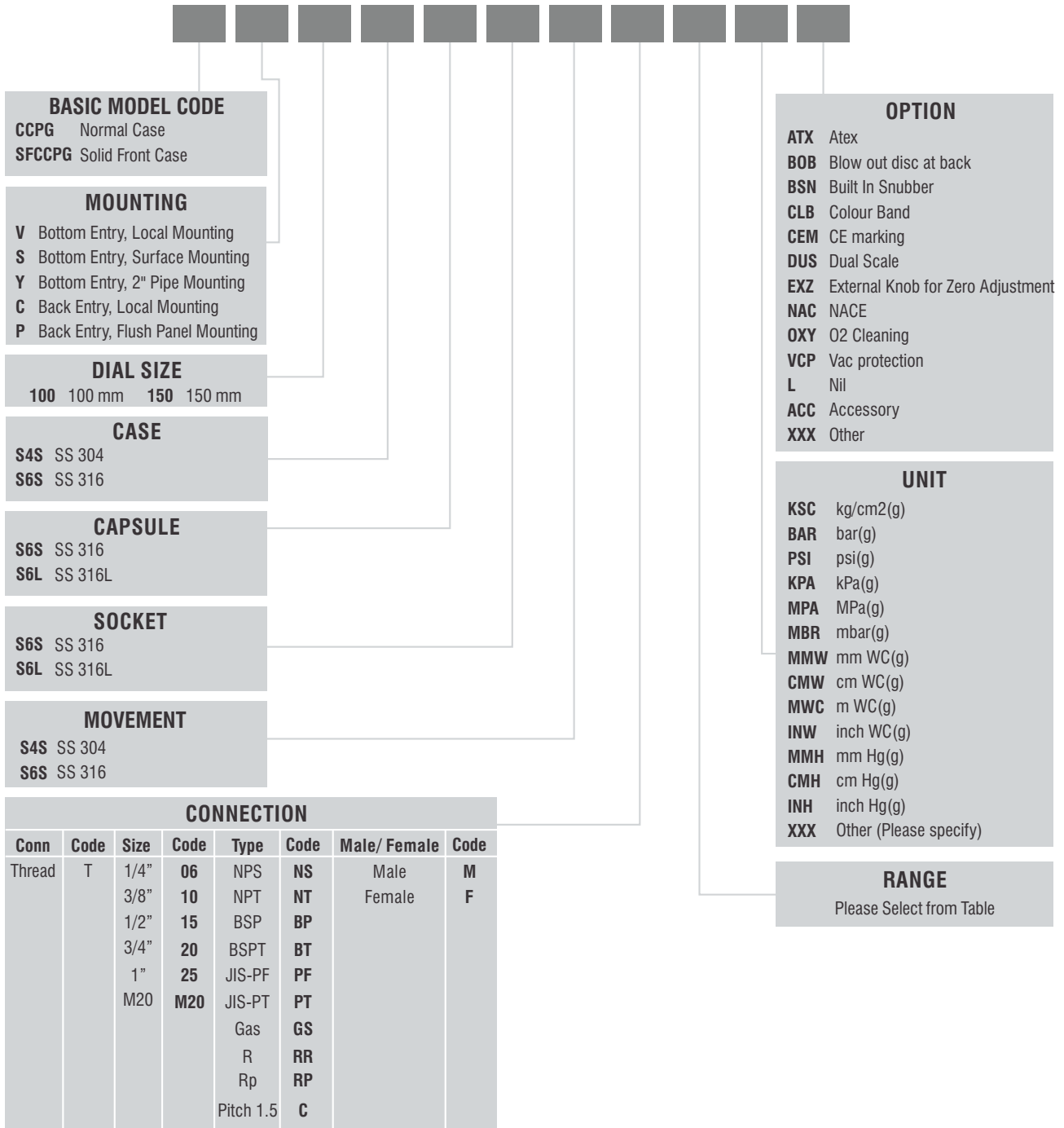
The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide suitable cooling arrangement (Syphon, Cooling Tower, Impulse Tubing etc.)

Under Technical Collaboration with M/s. Gauges Bourdon, France



# Ordering Information

## MODEL



**BASIC MODEL CODE**  
**CCPG** Normal Case  
**SFCCPG** Solid Front Case

**MOUNTING**  
**V** Bottom Entry, Local Mounting  
**S** Bottom Entry, Surface Mounting  
**Y** Bottom Entry, 2" Pipe Mounting  
**C** Back Entry, Local Mounting  
**P** Back Entry, Flush Panel Mounting

**DIAL SIZE**  
**100** 100 mm **150** 150 mm

**CASE**  
**S4S** SS 304  
**S6S** SS 316

**CAPSULE**  
**S6S** SS 316  
**S6L** SS 316L

**SOCKET**  
**S6S** SS 316  
**S6L** SS 316L

**MOVEMENT**  
**S4S** SS 304  
**S6S** SS 316

CONNECTION							
Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	<b>06</b>	NPS	<b>NS</b>	Male	<b>M</b>
		3/8"	<b>10</b>	NPT	<b>NT</b>	Female	<b>F</b>
		1/2"	<b>15</b>	BSP	<b>BP</b>		
		3/4"	<b>20</b>	BSPT	<b>BT</b>		
		1"	<b>25</b>	JIS-PF	<b>PF</b>		
	M20	<b>M20</b>		JIS-PT	<b>PT</b>		
				Gas	<b>GS</b>		
				R	<b>RR</b>		
				Rp	<b>RP</b>		
				Pitch 1.5	<b>C</b>		

**OPTION**  
**ATX** Atex  
**BOB** Blow out disc at back  
**BSN** Built In Snubber  
**CLB** Colour Band  
**CEM** CE marking  
**DUS** Dual Scale  
**EXZ** External Knob for Zero Adjustment  
**NAC** NACE  
**OXY** O2 Cleaning  
**VCP** Vac protection  
**L** Nil  
**ACC** Accessory  
**XXX** Other

**UNIT**  
**KSC** kg/cm2(g)  
**BAR** bar(g)  
**PSI** psi(g)  
**KPA** kPa(g)  
**MPA** MPa(g)  
**MBR** mbar(g)  
**MMW** mm WC(g)  
**CMW** cm WC(g)  
**MWC** m WC(g)  
**INW** inch WC(g)  
**MMH** mm Hg(g)  
**CMH** cm Hg(g)  
**INH** inch Hg(g)  
**XXX** Other (Please specify)

**RANGE**  
 Please Select from Table

e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

Sample Model Code: **CCPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-1000)-MMW-L**

# Heavy Duty Capsule Sensing Pr. Gauges

**MODEL : HCPG (Normal Case)**

**SFHCPG (Solid Front Case)**

## Features

- Compliance to latest EN-837 standard
- Range : As show in the table
- All SS internals
- Special design with built in Gauges saver also available



## Specifications

<b>Ref. Standard</b>	EN-837
<b>Dial</b>	100 mm / 150 mm in Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Movement</b>	SS304 / SS316
<b>Capsule</b>	SS316 / SS316L
<b>Pressure Chamber</b>	SS316 / SS316L
<b>Connection</b>	½" NPT (M) as standard (other on request)
<b>Range</b>	Refer table
<b>Accuracy</b>	± 1.6% FSD
<b>Over range</b>	As per EN 837
<b>Zero adjustment</b>	Micrometer pointer
<b>Blow out disc</b>	Provided
<b>Temperature suitability</b>	Ambient (-) 20°C to 60°C, Media 100°C
<b>Temperature Effect</b>	Within ±0.6% FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	<ul style="list-style-type: none"> <li>• Solid Front Case</li> <li>• Special Construction to withstand high design pressure (Built in Gauge Saver)</li> <li>• Built in Snubber</li> <li>• External Knob for zero setting</li> <li>• NACE compliance</li> <li>• CE</li> <li>• Atex</li> </ul>

## Ranges

0-250 mm WC	(-)250 to 0 mm WC
0-400 mm WC	(-)400 to 0 mm WC
0-600 mm WC	(-)600 to 0 mm WC
0-1000 mm WC	(-)1000 to 0 mm WC
0-1600 mm WC	(-)1600 to 0 mm WC
0-2500 mm WC	(-)2500 to 0 mm WC
0-4000 mm WC	(-)4000 to 0 mm WC
0-6000 mm WC	(-)6000 to 0 mm WC

Special combination for compound ranges available, within the above span

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide suitable cooling arrangement (Syphon, Cooling Tower, Impulse Tubing etc.)

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



**BASIC MODEL CODE**  
**HCPG** Normal Case  
**SFHCPG** Solid Front Case

**MOUNTING**  
**V** Bottom Entry, Local Mounting  
**S** Bottom Entry, Surface Mounting  
**Y** Bottom Entry, 2" Pipe Mounting

**DIAL SIZE**  
**100** 100 mm **150** 150 mm

**CASE**  
**S4S** SS 304  
**S6S** SS 316

**CAPSULE**  
**S6S** SS 316  
**S6L** SS 316L

**PRESSURE CHAMBER**  
**S6S** SS 316  
**S6L** SS 316L

**MOVEMENT**  
**S4S** SS 304  
**S6S** SS 316

CONNECTION							
Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
	M20	1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
			M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
		Rp	RP				
		Pitch 1.5	C				

**OPTION**

**ATX** Atex  
**BGS** Built In Gauge Saver  
**BOB** Blow out disc at back  
**BSN** Built In Snubber  
**CLB** Colour Band  
**CEM** CE marking  
**DUS** Dual Scale  
**EXZ** External Knob for Zero Adjustment  
**NAC** NACE  
**OXY** O2 Cleaning  
**VCP** Vac protection  
**L** Nil  
**ACC** Accessory  
**XXX** Other

**UNIT**

**KSC** kg/cm<sup>2</sup>(g)  
**BAR** bar(g)  
**PSI** psi(g)  
**KPA** kPa(g)  
**MPA** MPa(g)  
**MBR** mbar(g)  
**MMW** mm WC(g)  
**CMW** cm WC(g)  
**MWC** m WC(g)  
**INW** inch WC(g)  
**MMH** mm Hg(g)  
**CMH** cm Hg(g)  
**INH** inch Hg(g)  
**XXX** Other (Please specify)

**RANGE**  
 Please Select from Table

e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

Sample Model Code: **HCPG-V-150-S4S-S6L-S6L-S4S-T15NTM-(0-400)-MBR-BGS**

# Small Pressure Gauges- Brass Internals



**MODEL : SPGB (Dry Case)**

**LFSPGB (Liquid Filled Case)**

## Features

- Designed to fulfill most industrial as well as commercial applications
  - Range : (-)1 to 250 kg/cm<sup>2</sup>
  - Bourdon in Ph Bronze / Brass
  - Accuracy ±2% FSD
  - Unit of measurement - kg/cm<sup>2</sup>, bar, psi
- 
- Small dial Pressure Gauges are developed for OEM applications in compressed gases, Lubricating circuits, air filter Regulators, Gas cylinders etc.



## Specifications

<b>Dial</b>	40mm / 50mm / 63mm in Aluminium, white background, black markings
<b>Case</b>	Pressed steel, epoxy painted black / SS304
<b>Protection</b>	IP-68 for 50mm & 63mm, SS Case only (Not Applicable for 40mm SS Case & all Pressed Steel Cases)
<b>Bourdon</b>	Ph Bronze / Brass
<b>Socket</b>	Brass
<b>Movement</b>	Brass
<b>Range</b>	Rrefer table
<b>Accuracy</b>	±2% FSD
<b>Blow out disc</b>	Provided (on top) for 50mm & 63mm dials Not Applicable for 40mm Dial
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 60°C
<b>Temperature Effect</b>	Within ±0.4% FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	Glycerine filled case (in SS case of 50mm & 63mm only) Built in snubber CE

**Note:** For availability ranges in different dial sizes, please refer table



## Range vs Dial Size

Range bar(g), kg/cm2(g)	Dial Size		
	1-1/2" Dial	2" Dial	2-1/2" Dial
(-)1 to 0 Vacuum	x	Yes	Yes
(-) 1 to (+)1.5	x	Yes	Yes
(-) 1 to (+)3	x	Yes	Yes
(-) 1 to (+)5	x	Yes	Yes
(-) 1 to (+)9	x	Yes	Yes
(-) 1 to (+)15	x	Yes	Yes
(-) 1 to (+)24	x	Yes	Yes
(-) 1 to (+)39	x	Yes	Yes
0 to 1	x	Yes	Yes
0 to 1.6	x	Yes	Yes
0 to 2	Yes	Yes	Yes
0 to 2.5	Yes	Yes	Yes
0 to 4	Yes	Yes	Yes
0 to 6	Yes	Yes	Yes
0 to 10	Yes	Yes	Yes
0 to 16	Yes	Yes	Yes
0 to 25	Yes	Yes	Yes
0 to 40	x	Yes	Yes
0 to 60	x	Yes	Yes
0 to 100	x	Yes	Yes
0 to 160	x	Yes	Yes
0 to 250	x	Yes	Yes

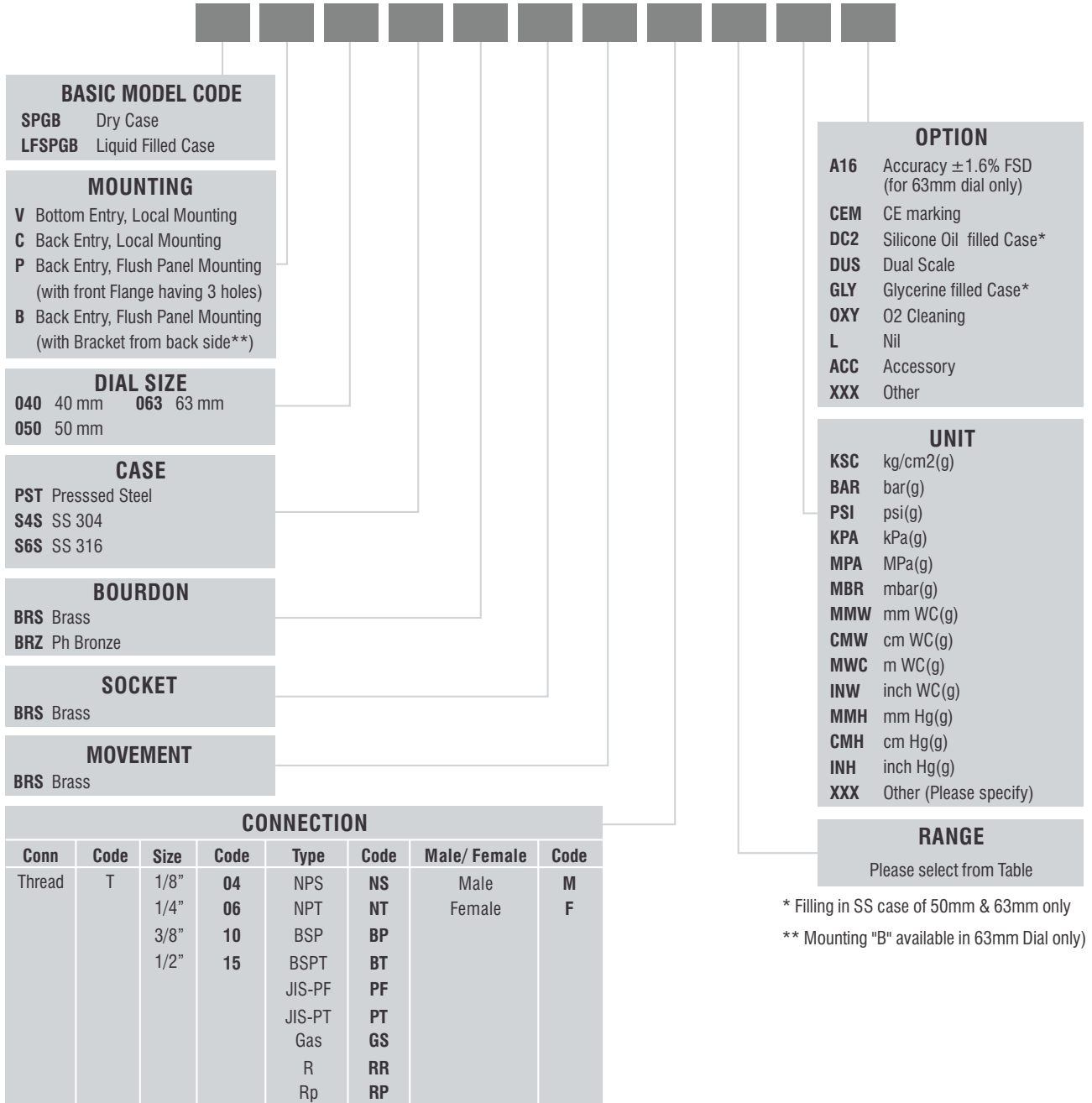
Yes = Range Available X = Range not available

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



e.g. For 1/4"NPT(M), Code: **T06NTM**

**Note:** 40mm Dial, Standard Connection 1/8" Male threads only  
50 / 63mm Dial, Standard Connection 1/8" or 1/4" Male threads only  
Any other Connection shall be provided through Adaptors

**Sample Model Code: LFSPGB-P-63-S4S-BRS-BRS-BRS-T06NTM-(0-250)-PSI-GLY**

# Small Pressure. Gauges - SS Internals



**MODEL : SPGS (Dry Case)**

**LFSPGS (Liquid Filled Case)**

## Features

- Designed to fulfill most industrial as well as commercial applications
  - Range : (-)1 to 400 kg/cm<sup>2</sup>
  - Bourdon in SS316
  - Accuracy ±2% FSD
  - Unit of measurement - kg/cm<sup>2</sup>, bar, psi
- 
- Small dial Pressure Gauges are developed for OEM applications in compressed gases, Lubricating circuits, air filter Regulators, Gas cylinders etc.



## Specifications

<b>Dial</b>	40mm / 50mm / 63mm in Aluminium, white background, black markings
<b>Case</b>	Pressed steel epoxy painted black / SS304
<b>Protection</b>	IP-68 for 50mm & 63mm, SS Case only (Not Applicable for 40mm SS Case & all Pressed Steel Cases)
<b>Bourdon</b>	SS316
<b>Socket</b>	SS316
<b>Movement</b>	SS304
<b>Range</b>	Refer table
<b>Accuracy</b>	±2% FSD
<b>Blow out disc</b>	Provided (on top) for 50mm & 63mm dials Not Applicable for 40mm Dial
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 100°C
<b>Temperature Effect</b>	Within ±0.4% FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	Glycerine filled case (in SS case of 50mm & 63mm only) Built in snubber CE

**Note:** For availability ranges in different dial sizes, please refer table



## Range vs Dial Size

Range bar(g), kg/cm <sup>2</sup> (g)	System - SS		
	1-1/2"	2"	2-1/2"
	Dial	Dial	Dial
(-) 1 to 0 Vacuum	x	Yes	Yes
(-) 1 to (+)1.5	x	Yes	Yes
(-) 1 to (+)3	x	Yes	Yes
(-) 1 to (+)5	x	Yes	Yes
(-) 1 to (+)9	x	Yes	Yes
(-) 1 to (+)15	x	Yes	Yes
(-) 1 to (+)24	x	Yes	Yes
(-) 1 to (+)39	x	Yes	Yes
0 to 1	x	Yes	Yes
0 to 1.6	x	Yes	Yes
0 to 2	Yes	Yes	Yes
0 to 2.5	Yes	Yes	Yes
0 to 4	Yes	Yes	Yes
0 to 6	Yes	Yes	Yes
0 to 10	Yes	Yes	Yes
0 to 16	Yes	Yes	Yes
0 to 25	Yes	Yes	Yes
0 to 40	x	Yes	Yes
0 to 60	x	Yes	Yes
0 to 100	x	Yes	Yes
0 to 160	x	Yes	Yes
0 to 250	x	Yes	Yes
0 to 400	x	Yes	Yes

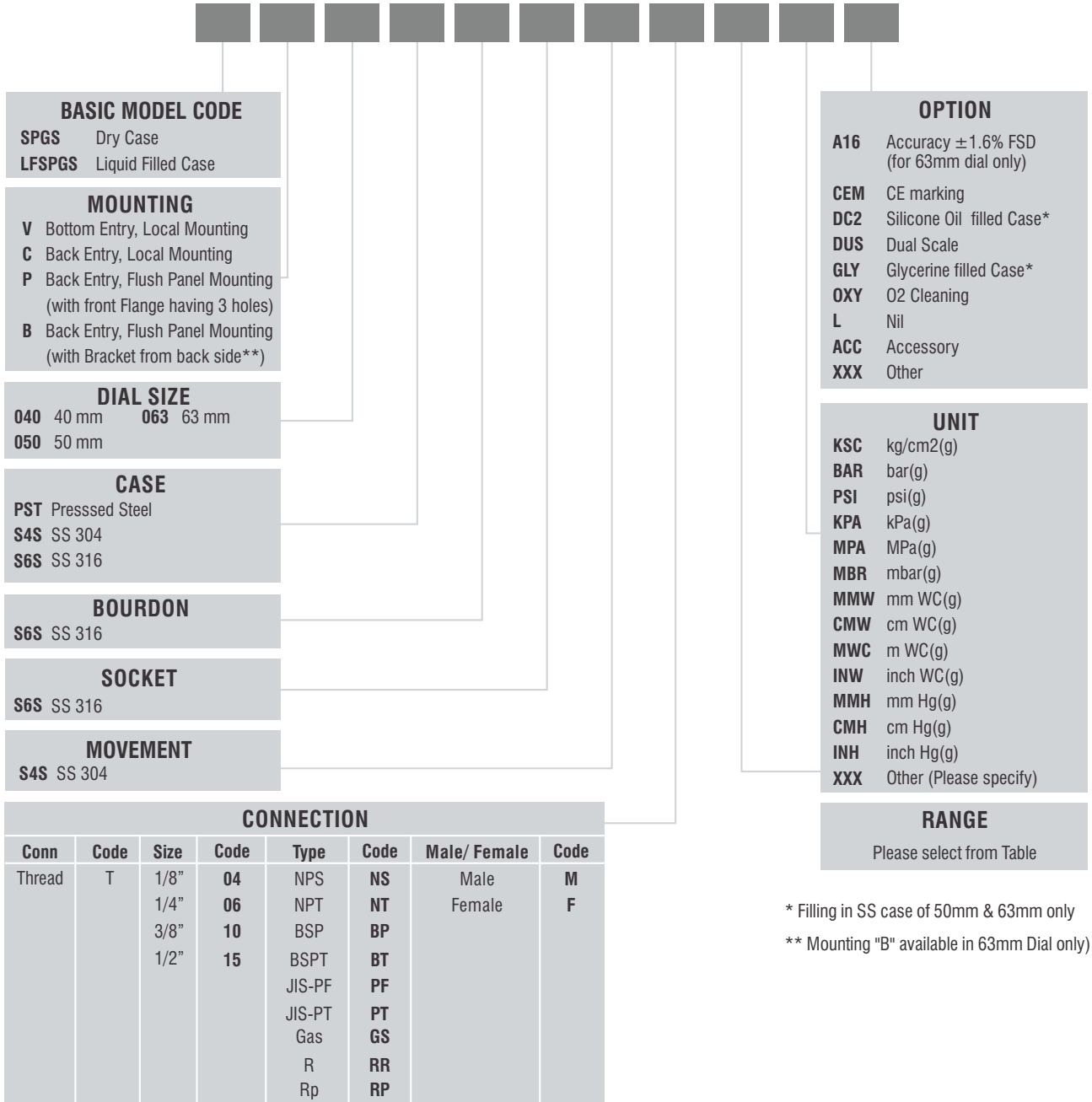
Yes = Range Available X = Range not available

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



\* Filling in SS case of 50mm & 63mm only  
 \*\* Mounting "B" available in 63mm Dial only

e.g. For 1/4"NPT(M), Code: **T06NTM**

**Note:** 40mm Dial, Standard Connection 1/8" Male threads only  
 50 / 63mm Dial, Standard Connection 1/8" or 1/4" Male threads only  
 Any other Connection shall be provided through Adaptors

Sample Model Code: **SPGS-V-050-S4S-S6S-S6S-S4S-T06NTM-(0-250)-PSI-L**



# Hygiene Gauges -100mm & 150mm Dial

- MODEL : HY10** (100mm Dial, Dry Case)
- LFHY10** (100mm Dial, Liquid Filled Case)
- HY15** (150mm Dial, Dry Case)
- LFHY15** (150mm Dial, Liquid Filled Case)

## Features

- Designed for pressure measurement in Sanitary application
- Designed compliance to International Dairy Federation
- Compliance to latest EN-837 standard
- Range : Refer table
- Accuracy  $\pm 1\%$  FSD (Standard),  $\pm 0.5\%$  FSD (on request)
- Unit of measurement - kg/cm<sup>2</sup>, bar, psi, kPa
- Micrometer pointer

Hygiene Gauges designed for pressure measurement in Sanitary application in accordance with International Dairy Federation (IDF) requirements in pharmaceutical, dairy, biotechnology, food & beverages industries.



## Specifications

<b>Ref. Standard</b>	EN-837
<b>Dial</b>	100 mm / 150 mm in Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Diaphragm</b>	SS316L welded
<b>Wetted Parts</b>	SS316L
<b>Movement</b>	SS304 / SS316
<b>Range</b>	Refer table
<b>Connection</b>	Triclover / SMS union / IDF fitting
<b>Filling Fluid</b>	Silicon oil / Glycerine / Food grade oil
<b>Accuracy</b>	$\pm 1\%$ FSD (0.5% FSD on request)
<b>Over range</b>	As per EN 837
<b>Zero adjustment</b>	Micrometer Pointer
<b>Blow out disc</b>	Provided (on top)
<b>Temperature suitability</b>	Ambient (-)4°C to 60°C, Media 150°C
<b>Temperature Effect</b>	Within $\pm 0.4\%$ FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	NACE compliance External Knob for zero setting Glycerine filled case Triclover Clamp with Gasket SMS Male Coupling with Gasket IDF Male Coupling with Gasket CE Atex

## Ranges

Gauge	bar, kg/cm <sup>2</sup>	Least count
Compound	(-)1 to 3*	0.10
	(-)1 to 5	0.10
	(-)1 to 9	0.20
	(-)1 to 15	0.50
	(-)1 to 24	0.50
Pressure	(-)1 to 39	1.0
	0 to 4*	0.10
	0 to 6	0.10
	0 to 10	0.20
	0 to 16	0.50
	0 to 25	0.50
	0 to 40	1.0

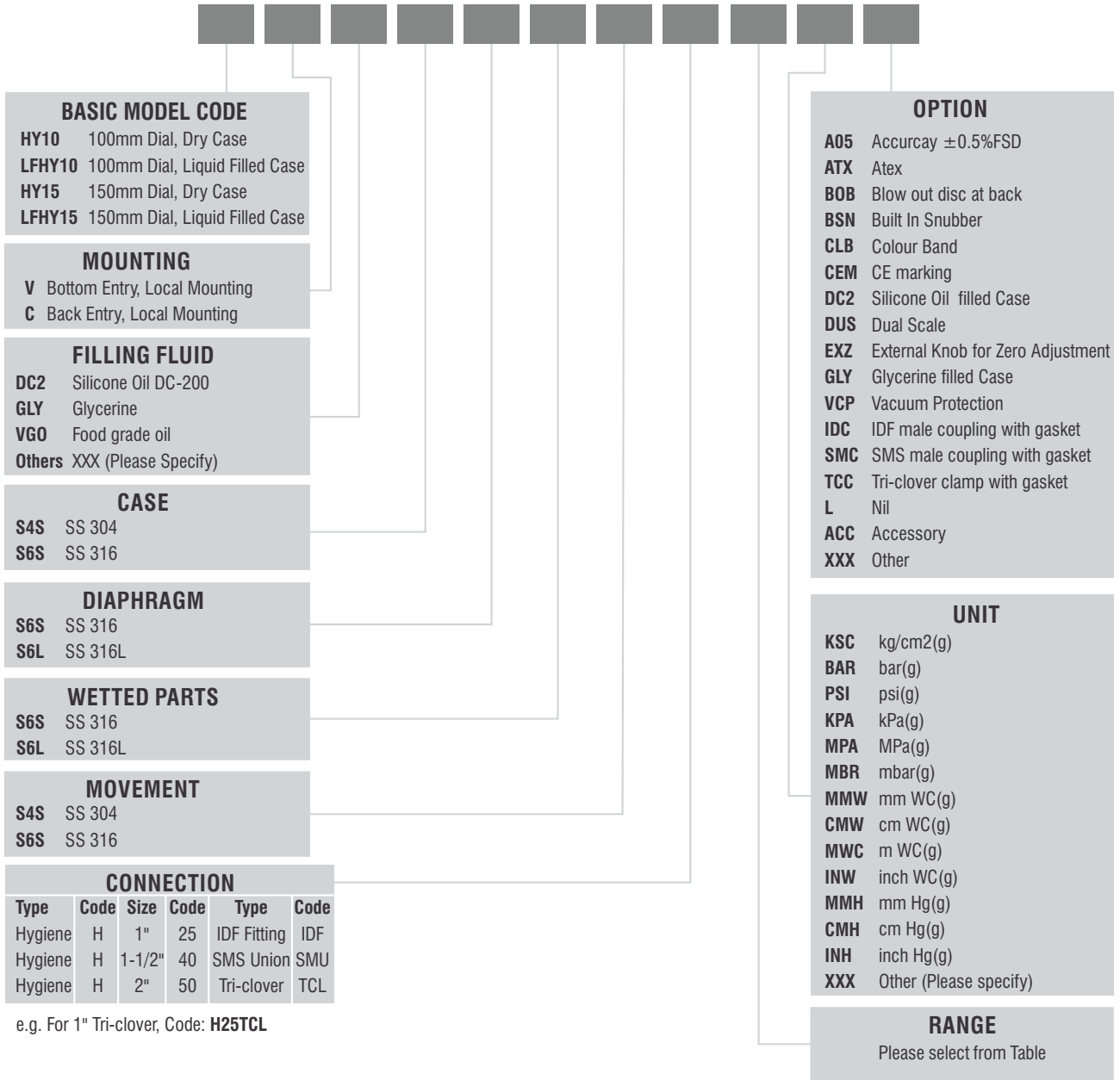
\* Range 0 to 4 and (-)1 to 3 are available in 2" connection only

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



Sample Model Code: **LFHY10-V-VGO-S4S-S6S-S6S-S4S-H40TCL-(0-10)-BAR-GLY**

# Hygiene Gauges - 63mm Dial



**MODEL : HY63 (Dry Case)**

**LFHY63 (Liquid Filled Case)**

## Features

- Designed for pressure measurement in Sanitary application
- Designed compliance to International Dairy Federation
- Compliance to latest EN-837 standard
- Range : Refer table
- Accuracy  $\pm 2\%$  FSD
- Unit of measurement - kg/cm<sup>2</sup>, bar, psi, kPa

Hygiene Gauges designed for pressure measurement in Sanitary application in accordance with International Dairy Federation (IDF) requirements in pharmaceutical, dairy, biotechnology, food & beverages industries.



## Specifications

<b>Ref. Standard</b>	EN-837
<b>Dial</b>	63 mm in Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316
<b>Protection</b>	IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Glass
<b>Diaphragm</b>	SS316L welded
<b>Wetted Parts</b>	SS316L
<b>Movement</b>	SS304 / SS316
<b>Range</b>	Refer table
<b>Connection</b>	Triclover / SMS union / IDF fitting
<b>Filling Fluid</b>	Silicon oil / Glycerine / Food grade oil
<b>Accuracy</b>	$\pm 2\%$ FSD
<b>Over range</b>	As per EN 837
<b>Blow out disc</b>	Provided (on top)
<b>Temperature suitability</b>	Ambient (-)4°C to 60°C, Media 150°C
<b>Temperature Effect</b>	Within $\pm 0.4\%$ FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	Glycerine filled case NACE Compliance Triclover clamp with Gasket SMS male coupling with Gasket IDF male coupling with Gasket CE

## Ranges

Gauge	bar, kg/cm <sup>2</sup>	Least count
	0 to 6	0.10
	0 to 10	0.20
	0 to 16	0.50
	0 to 25	0.50
	0 to 40	1.0

**Note:** Equivalent reading in other pressure Units also can be provided on request

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

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# Ordering Information

## MODEL



### BASIC MODEL CODE

**HY63** 63mm Dial, Dry Case  
**LFHY63** 63mm Dial, Liquid Filled Case

### MOUNTING

**V** Bottom Entry, Local Mounting  
**C** Back Entry, Local Mounting

### FILLING FLUID

**DC2** Silicone Oil DC-200  
**GLY** Glycerine  
**VGO** Food grade oil  
**Others** XXX (Please Specify)

### CASE

**S4S** SS 304  
**S6S** SS 316

### DIAPHRAGM

**S6S** SS 316  
**S6L** SS 316L

### WETTED PARTS

**S6S** SS 316  
**S6L** SS 316L

### MOVEMENT

**S4S** SS 304  
**S6S** SS 316

### CONNECTION

Type	Code	Size	Code	Type	Code
Hygiene	H	1"	25	IDF Fitting	IDF
Hygiene	H	1-1/2"	40	SMS Union	SMU
Hygiene	H	2"	50	Tri-clover	TCL

e.g. For 1" Tri-clover, Code: **H25TCL**

### OPTION

**BSN** Built In Snubber  
**CLB** Colour Band  
**CEM** CE marking  
**DC2** Silicone Oil filled Case  
**DUS** Dual Scale  
**GLY** Glycerine filled Case  
**VCP** Vac protection  
**IDC** IDF male coupling with gasket  
**SMC** SMS male coupling with gasket  
**TCC** Tri-clover clamp with gasket  
**L** Nil  
**ACC** Accessory  
**XXX** Other

### UNIT

**KSC** kg/cm<sup>2</sup>(g)  
**BAR** bar(g)  
**PSI** psi(g)  
**KPA** kPa(g)  
**MPA** MPa(g)  
**MBR** mbar(g)  
**MMW** mm WC(g)  
**CMW** cm WC(g)  
**MWC** m WC(g)  
**INW** inch WC(g)  
**MMH** mm Hg(g)  
**CMH** cm Hg(g)  
**INH** inch Hg(g)  
**XXX** Other (Please specify)

### RANGE

Please select from Table

**Sample Model Code: LFHY63-V-VGO-S4S-S6S-S6S-S4S-H40TCL-(0-10)-BAR-GLY**

# MUD Gauges



## MODEL : MUDG

### Features

- Designed for Oil industries / Coal industries.
- This Gauge is specially designed to measure the pressure of pulsating fluids including solid particles in suspension of stand pipe of mud pumps.
- It can also be used for any other fluids.
- Its sturdy construction can undergo severe working conditions.
- The pressure ranges meet every requirement of the oil industry.
- Pressure too high indicates a plugged drill bit or an increase in mud density or viscosity. Early indication of mud pump pressure provides an early warning of circulation problems enabling driller to make suitable corrections and helps to avoid major problems.



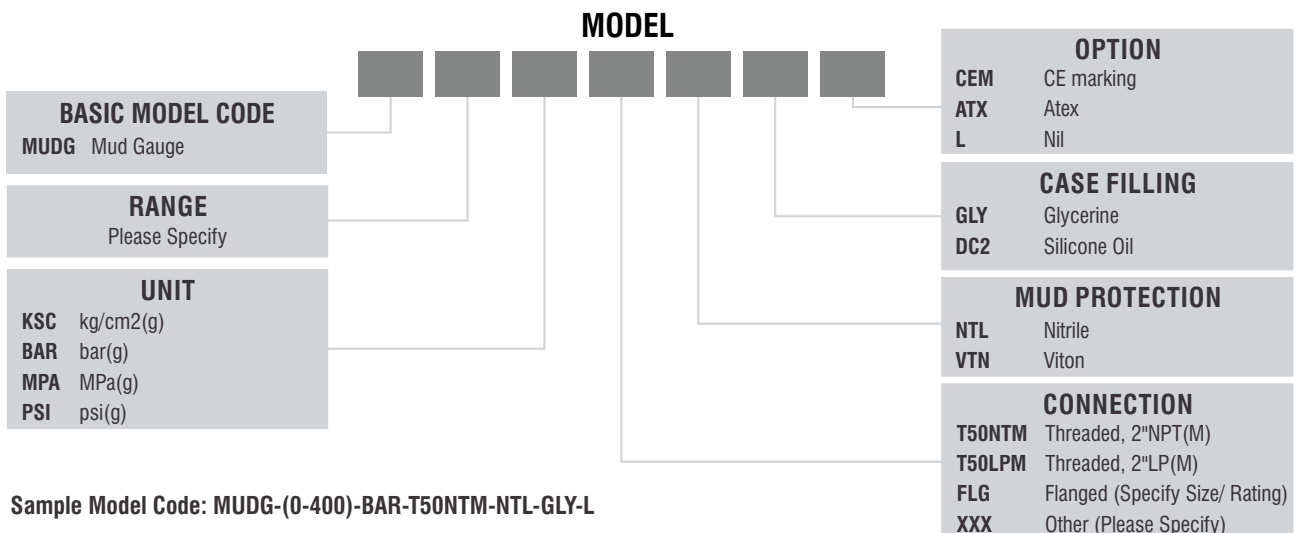
### Operating Principle

- The pressure is transmitted by a stainless steel diaphragm (1.4404/AISI 316L) to a liquid (silicon oil) which totally fills the Bourdon tube, the capillary tube and the pressure chamber.
- A rubber plug isolator protects the stainless steel diaphragm from the circuit.
- The sudden pressure variations are dampened in the capillary tube (connection pipe)
- The whole pressure element is mounted in an oil-filled case which absorbs all the displacements of the movable parts as well as the external vibrations.
- The oil also ensures the lubrication of the linkages, eliminates corrosion and avoids condensation on the window of the pressure gauge.

### Specifications

<b>Dial</b>	Nominal gauge size - 4" (100 mm)	<b>Accuracy</b>	± 1% FSD
<b>Dial type</b>	Moving (Rotating), Aluminium, white background, black markings	<b>Over range</b>	130% FSD
<b>Window</b>	Perspex Safety Glass	<b>Sensing Element</b>	SS 316L, Diaphragm
<b>Bourdon Tube</b>	SS 316	<b>Seal Chamber</b>	SS 316, Hexagonal
<b>Movement</b>	SS 304	<b>Sealing Fluid</b>	Silicone Oil
<b>Range</b>	0 to 100 Bar Min to 0 to 420 Bar Max	<b>Mud Protection</b>	Nitrile / Viton Rubber Pad
<b>Case</b>	Die Cast Al weatherproof to IP-68	<b>Process Connection</b>	2" LP(M) / 2" NPT(M) / Flanged
		<b>Case Filling</b>	Glycerine / Silicone Oil
		<b>Option</b>	CE, Atex

### Ordering Information



The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

# Absolute Pressure Gauges: Bellow Type

*General*

MODEL : APBL

## Why Absolute Pressure Gauge?

The atmospheric pressure varies from place to place depending up on the altitude of the location and prevailing weather conditions. In such variable conditions, precise pressure measurement can be arrived only if a fixed (un-changing) reference point is established.

For this purpose we have developed element of Twin Bellows, one of the same is totally evacuated and sealed, which shall be the reference point for calibration i.e. Absolute Zero. These twin bellows are connected through a special type of movement. Any pressure applied in the second bellow is compared to the reference bellow (sealed bellow) to get an accurate measurement of absolute pressure, through a precision Movement mechanism.



## Features

- Compliance to latest EN-837 standard
- Range : As shown in the table
- Bellow in SS316 as standard providing better mechanical properties guaranteeing repeatability and accuracy
- Accuracy  $\pm 1\%$  FSD

## Specifications

<b>Ref. Standard</b>	EN-837
<b>Dial</b>	150 mm in Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Sensor</b>	Bellow in SS316 / SS316L
<b>Socket</b>	22mm Square in SS316 / SS316L
<b>Movement</b>	SS304, SS316
<b>Connection</b>	1/2" NPT (M) as standard (other optional)
<b>Accuracy</b>	$\pm 1\%$ FSD
<b>Over range</b>	As per EN 837
<b>Zero adjustment</b>	Micrometer Pointer
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 100°C
<b>Temperature Effect</b>	Within $\pm 0.4\%$ FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	NACE compliance CE Atex

## Ranges

0 to 0.6 Kg/cm<sup>2</sup>(a)  
0 to 1 kg/cm<sup>2</sup>(a)  
0 to 1.6 kg/cm<sup>2</sup>(a)  
Other on request

**Note:** Equivalent Reading in other pressure Units also can be provided on request

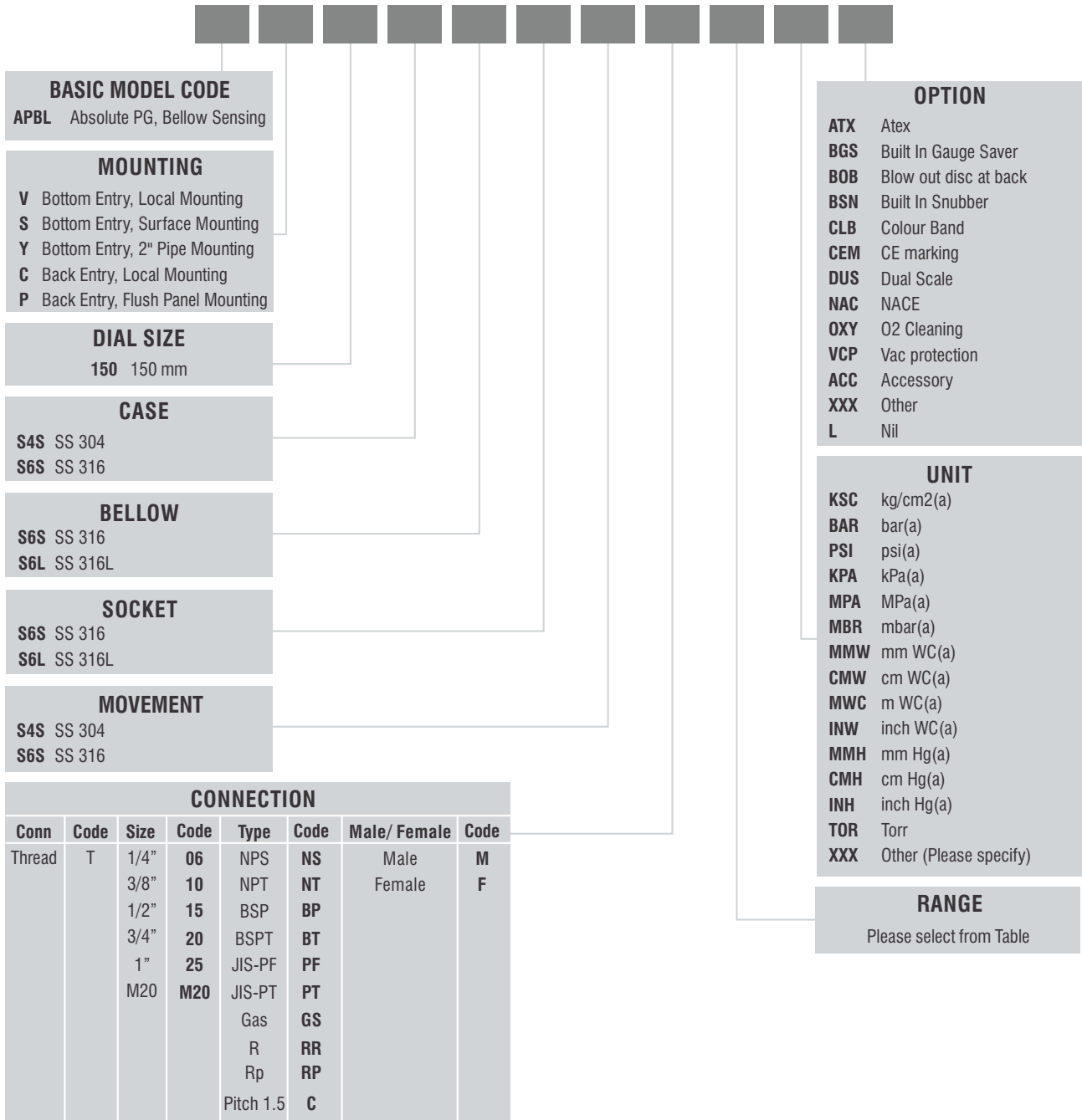
The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

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# Ordering Information

## MODEL



e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

Sample Model Code: **APBL-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-1)-BAR-L**

# Absolute Pressure Gauges - Bourdon Type

# General

**MODEL : APBR**

## Why Absolute Pressure Gauge?

The atmospheric pressure varies from place to place depending up on the altitude of the location and prevailing weather conditions. In such variable conditions, precise pressure measurement can be arrived only if a fixed (un-changing) reference point is established.

This is achieved by totally evacuating and sealing the Bourdon tube, which will act as the reference point for calibration i.e. Absolute Zero. The process pressure is applied inside the enclosure surrounding the Bourdon tube. Any pressure applied is compared to the sealed reference (Bourdon tube) to get an accurate measurement of absolute pressure, through a precision Movement mechanism.



## Features

- Compliance to latest EN-837 standard
- Range : As shown in the table
- Bourdon in SS316 as standard providing better mechanical properties guaranteeing repeatability and accuracy
- Accuracy  $\pm 1\%$  FSD

Note: Bourdon type Absolute Pressure Gauges are recommended for non-corrosive, clean, clear (colourless) & dry Gases / Air only

## Specifications

<b>Ref. Standard</b>	EN-837
<b>Dial</b>	100 mm/150 in Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Sensor</b>	Bourdon in SS316 / SS316L
<b>Socket</b>	22mm Square in SS316 / SS316L
<b>Movement</b>	SS304, SS316
<b>Connection</b>	1/2" NPT (M) as standard (other optional)
<b>Accuracy</b>	$\pm 1\%$ FSD
<b>Over range</b>	As per EN 837
<b>Zero adjustment</b>	Micrometer Pointer
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 100°C
<b>Temperature Effect</b>	Within $\pm 0.4\%$ FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	NACE compliance CE Atex

## Ranges

0 to 1 kg/cm<sup>2</sup>(a)  
0 to 1.6 kg/cm<sup>2</sup>(a)  
0 to 2.5 kg/cm<sup>2</sup>(a)  
0 to 4 kg/cm<sup>2</sup>(a)  
Other on request

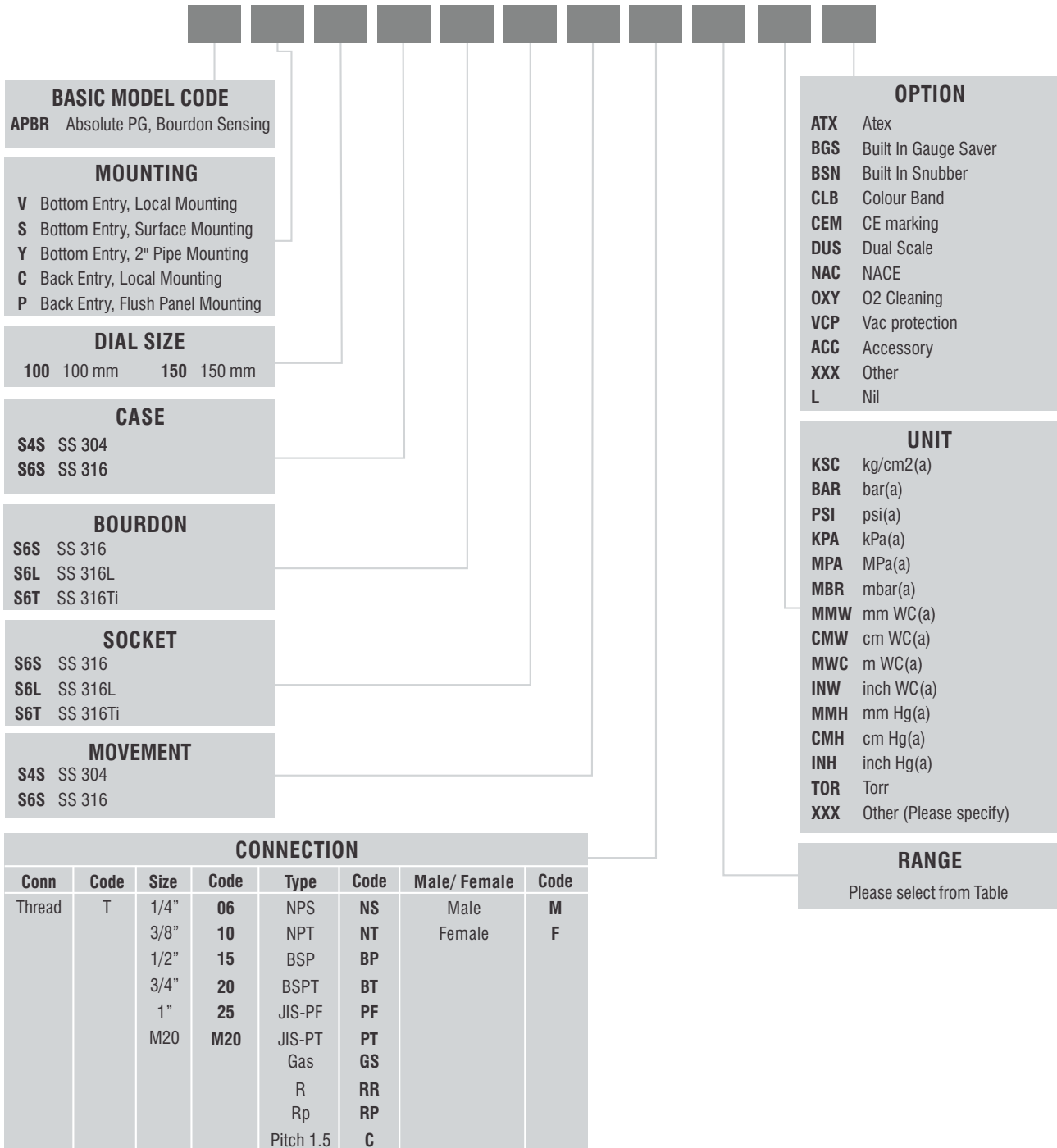
**Note:** Equivalent Reading in other pressure Units also can be provided on request

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



e.g. For 1/2"NPT(M), Code: **T15NTM**  
For M20x1.5 (F), Code: **TM20CF**

Sample Model Code: **APBR-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-1)-KSC-L**

# Absolute Pr. Gauges - Diaphragm Type



## MODEL : APDS

### Why Absolute Pressure Gauge?

The atmospheric pressure varies from place to place depending up on the altitude of the location and prevailing weather conditions. In such variable conditions, precise pressure measurement can be arrived only if a fixed (un-changing) reference point is established.

For this purpose, the Gauge is provided with 2 Chambers separated by a Diaphragm. One chamber is totally evacuated and sealed, which acts as the reference point for calibration i.e. Absolute Zero. The process pressure is applied to the pressure chamber at the other side of the Diaphragm. Any pressure applied inside the pressure chamber is compared to the sealed chamber to get an accurate measurement of absolute pressure, through a precision Movement mechanism



### Features

- Compliance to latest EN-837 standard
- Range : As shown in the table
- Diaphragm in SS316 as standard providing better mechanical properties guaranteeing repeatability and accuracy
- Accuracy  $\pm 1.6\%$  FSD

### Specifications

<b>Ref. Standard</b>	EN-837
<b>Dial</b>	100 mm/150 in Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Sensor</b>	Diaphragm in SS316 / SS316L
<b>Wetted Parts</b>	SS316 / SS316L
<b>Movement</b>	SS304, SS316
<b>Connection</b>	1/2" NPT (M) as standard (other optional)
<b>Accuracy</b>	$\pm 1.6\%$ FSD
<b>Over range</b>	As per EN 837
<b>Zero adjustment</b>	Micrometer Pointer
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 100°C
<b>Temperature Effect</b>	Within $\pm 0.8\%$ FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	NACE compliance CE Atex

### Ranges

0 to 500 mmWC(a)
0 to 600 mmWC(a)
0 to 1000 mmWC(a)
0 to 1600 mmWC(a)
0 to 2500 mmWC(a)
0 to 4000 mmWC(a)
0 to 6000 mmWC(a)
Other on request

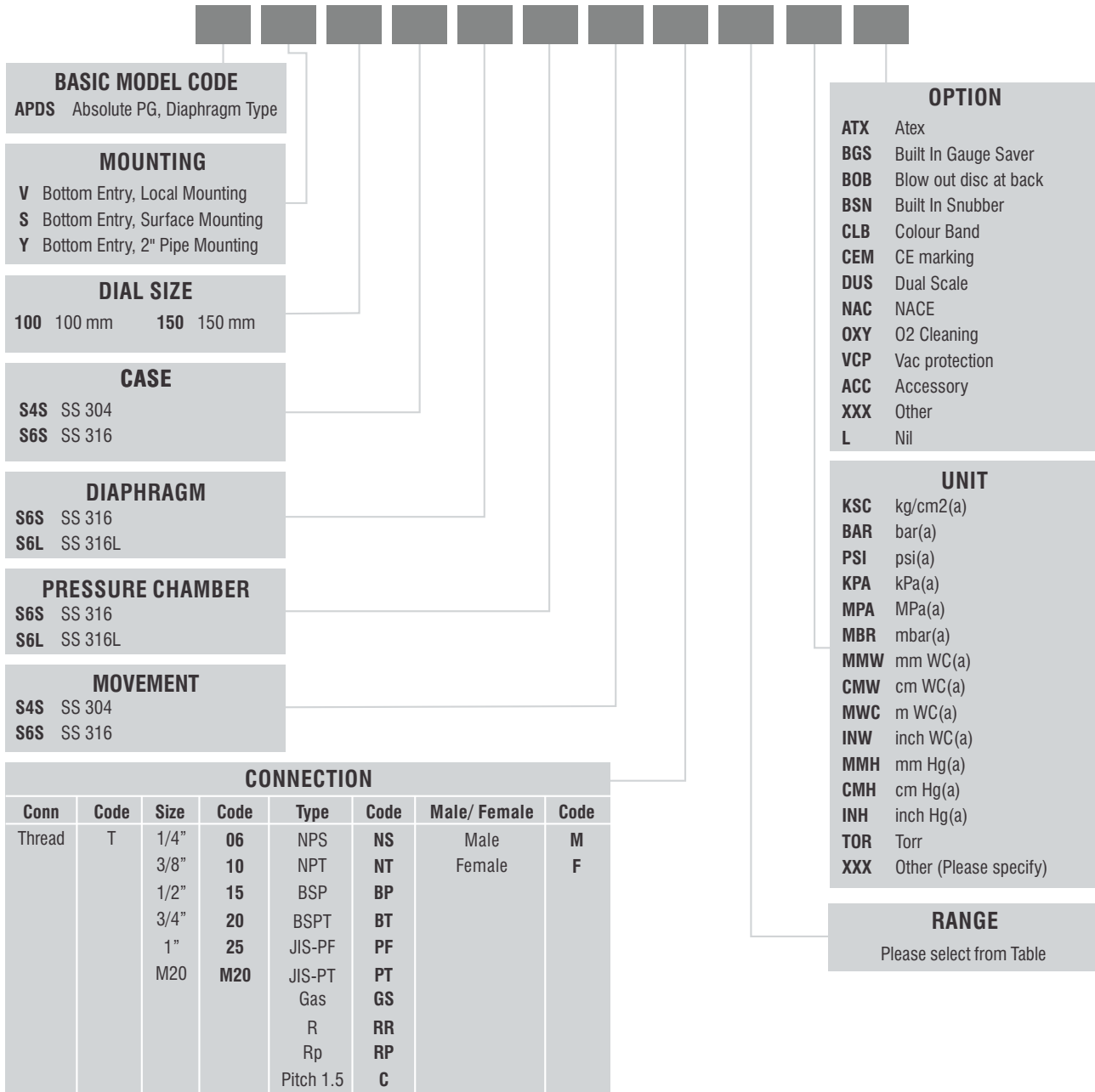
**Note:** Equivalent Reading in other pressure Units also can be provided on request

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



e.g. For 1/2"NPT(M), Code: **T15NTM**  
For M20x1.5 (F), Code: **TM20CF**

**Sample Model Code: APDS-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-1000)-MMW-L**

The recommendations made in this catalogue are to be used as intended guide. No guarantee of material can be undertaken since other factors may affect the performance. We reserve the right to change the specifications mentioned in this catalogue without any notice as improvements & development is a continuous process at General. Responsibility of typographical errors is specifically disclaimed.

# Indicating Pressure Switches



**MODEL : IPSH (Dry Case)**  
**LFIPSH (Liquid Filled Case)**

## Features

- Combination of indication and switching
- Choice of electrical contacts and microswitch
- One or two contacts available
- Switch setting throughout the range externally
- High repeatability and low hysteresis
- Weatherproof or Flameproof housing
- Mil connector provided optionally.



## Specifications

<b>Dial</b>	100mm / 150mm, aluminium, white background, black markings
<b>Case</b>	SS 304 / SS 316 with bayonet bezel (Weatherproof) Die Cast Aluminium (Flameproof)
<b>Protection</b>	Weatherproof to IP - 68 (IS:13947 part I / IEC:60529) Flameproof to IIA, IIB (equivalent to NEC Cl. 1, Div. 2, Gr. C & D)
<b>Window</b>	Safety glass
<b>Bourdon</b>	SS316, SS316 Ti, SS316L, Monel
<b>Socket</b>	22 mm Square in SS316, SS316L, SS316 Ti, Monel
<b>Movement</b>	Brass / SS304 / SS316
<b>Connection</b>	1/2" NPT (M) as standard (other optional)
<b>Range</b>	Upto 1600 kg /cm2 with minimum span of 4 kg/cm2 as shown in the Table
<b>Accuracy</b>	±1% FSD for indication ±2% FSD for switching
<b>Over range</b>	As per EN 837
<b>Blow out disc</b>	Provided
<b>Zero reset</b>	Provided (Micrometer Pointer)
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 100°C
<b>Temperature Effect</b>	Within ±0.4% FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Contacts</b>	1SPST, single, normally open, closing on rise in pressure or vice versa, rated 30VA @ 230V AC 2 SPST, two contacts, independently adjustable, one normally open, other normally closed or both normally open or both normally closed, rated 30VA @ 230V AC 1SPDT, single microswitch, adjustable over entire range, rated 5 amp @ 230V AC (3A @ 28 VDC) 2SPDT, double microswitch, independently adjustable over entire range, rated 5 amp @ 230V AC (3A @ 28 VDC)
<b>Optional</b>	Relay for the contact assembly to suit 5 amp @ 230V AC, separately mounted.

## Ranges

Gauge	bar, kg/cm <sup>2</sup>	Least count
Compound	(-)1 to 3	0.10
	(-) 1 to 5	0.10
	(-)1 to 9	0.20
	(-)1 to 15	0.50
	(-)1 to 24	0.50
Pressure Gauge ('C' shaped Bourdon)	(-)1 to 39	1.0
	0 to 4	0.10
	0 to 6	0.10
	0 to 10	0.20
	0 to 16	0.50
	0 to 25	0.50
Pressure Gauge (Coil type Bourdon)	0 to 40	1.0
	0 to 60	1.0
	0 to 100	2.0
	0 to 160	5.0
	0 to 250	5.0
	0 to 400	10.0
Pressure Gauge (Coil type Bourdon)	0 to 600	10.0
	0 to 800	20.0
	0 to 1000	20.0
	0 to 1600	50.0

For range other than above please contact our design dept.

### Benefits of Microswitch type over Electrical Contact assembly

- Microswitch is rated 5 amp @ 230 VAC (3A @ 28 VDC). Hence use of relay is not required
- Microswitch offered as a combination of movement and switch is procured from Internationally reputed vendor.
- Microswitch assembly provides better switching accuracy and repeatability
- Compact design.

### Notes

- 1) Electrical contact assembly is not offered in flameproof version.
- 2) Flameproof version available only in Die cast aluminium case.
- 3) Flameproof version available with bottom entry surface mounting only
- 4) Pressure switch can also be offered with chemical seal in weatherproof and flameproof cases.
- 5) Surface mounted flameproof housing with chemical seal pressure gauge is available with capillary.
- 6) Blow out disc not applicable for flameproof case

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide suitable cooling arrangement (Syphon, Cooling Tower, Impulse Tubing, Diaphragm Seal etc.)

Under Technical Collaboration with M/s. Gauges Bourdon, France



# Ordering Information

## MODEL



### BASIC MODEL CODE

**IPSH** Dry Case  
**LFIPSH** Liquid Filled Case

### MOUNTING

**V** Bottom Entry, Local Mounting  
**S** Bottom Entry, Surface Mounting  
**Y** Bottom Entry, 2" Pipe Mounting  
**C** Back Entry, Local Mounting  
**P** Back Entry, Flush Panel Mounting

### DIAL SIZE

**100** 100 mm    **150** 150 mm

### CASE

**S4S** SS 304  
**S6S** SS 316  
**ALM** Die Cast Aluminium

### BOURDON

**S6S** SS 316  
**S6L** SS 316L  
**S6T** SS 316Ti  
**MN4** Monel

### SOCKET

**S6S** SS 316  
**S6L** SS 316L  
**S6T** SS 316Ti  
**MN4** Monel

### MOVEMENT

**S4S** SS 304  
**S6S** SS 316  
**BRS** Brass

### OPTION

**1DT** 1SPDT Micro Switch  
**2DT** 2SPDT Micro Switch  
**1ST** 1SPST Electric Contact  
**2ST** 2SPST Electric Contact  
**FAB** Flame Proof Case - IIA/IIB  
**F2C** Flame Proof Case - IIC  
**FAT** Flame Proof Case - IIC (ATEX)  
**BGS** Built In Gauge Saver  
**BOB** Blow out disc at back  
**BSN** Built In Snubber  
**CLB** Colour Band  
**CEM** CE marking  
**TRO** Transformer Oil filled Case\*  
**DUS** Dual Scale  
**FLG** Flanged Process Conn  
**NAC** NACE  
**OXY** O2 Cleaning  
**OR5** 150% FSD Over range  
**VCP** Vacuum Protection  
**CSU** Chemical Seal  
**ACC** Accessory  
**XXX** Other (Specify)

### UNIT

**KSC** kg/cm<sup>2</sup>(g)  
**BAR** bar(g)  
**PSI** psi(g)  
**KPA** kPa(g)  
**MPA** Mpa(g)  
**MBR** mbar(g)  
**MMW** mm WC(g)  
**CMW** cm WC(g)  
**MWC** m WC(g)  
**INW** inch WC(g)  
**MMH** mm Hg(g)  
**CMH** cm Hg(g)  
**INH** inch Hg(g)  
**XXX** Other (Please specify)

### RANGE

Please select from Table

### CONNECTION

Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	<b>06</b>	NPS	<b>NS</b>	Male	<b>M</b>
		3/8"	<b>10</b>	NPT	<b>NT</b>	Female	<b>F</b>
		1/2"	<b>15</b>	BSP	<b>BP</b>		
		3/4"	<b>20</b>	BSPT	<b>BT</b>		
		1"	<b>25</b>	JIS-PF	<b>PF</b>		
		M20	<b>M20</b>	JIS-PT	<b>PT</b>		
				Gas	<b>GS</b>		
				R	<b>RR</b>		
		Rp	<b>RP</b>				
		Pitch 1.5	<b>C</b>				

e.g. For 1/2"NPT(M), Code: **T15NTM**  
For M20x1.5 (F), Code: **TM20CF**

### FLG - FLANGE

Conn	Code	Size	Code	Rating#	Code	Facing	Code
Flange	F	1/2"	<b>15</b>	150	<b>A</b>	RF	<b>RF</b>
		3/4"	<b>20</b>	300	<b>B</b>	FF	<b>FF</b>
		1"	<b>25</b>	600	<b>C</b>	RTJ	<b>RJ</b>
		1-1/2"	<b>40</b>	900	<b>D</b>	LT	<b>LT</b>
		2"	<b>50</b>	1500	<b>E</b>	LG	<b>LG</b>
		3"	<b>80</b>	2500	<b>F</b>		

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

**Sample model Code: IPSH-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-10)-BAR-2DT**

\*Case filling in Weatherproof SS Case only

# Indicating Pressure Switches

Inductive / Proximity / NAMUR Contacts

## MODEL : IPSN

Inductive contacts may be used for almost all industrial applications, due to their proximity type of switching, their switching accuracy and their long service life. Inductive contacts are given special preference for oil filled measuring instruments and in areas chemical, petrochemical Industries, power plants, mining, Ships and nuclear plants.

## Features

- Combination of indication and switching
- Completely fail-safe switching, even in explosion hazardous areas
- Switch setting between 10% & 90% of the range externally
- Weatherproof or Flameproof Versions
- Available with Diaphragm Seals of various Materials & Designs



## Operating Principle

Inductive contacts work in a “non-contact” way. They are equipped with electrical distance sensors (proximity sensors) in accordance with EN 60947-5-2. The proximity sensor (NAMUR) is having slot design. An electromagnetic field is concentrated between two axially opposed coils. The switch operates when the aluminium control vane (flag) moved by the actual value pointer (main pointer which indicates the Gauges reading on Dial) enters into the slot between the two coils of the control head. The control head is supplied with a DC voltage. When the flag enters the slot in the control head, it increases its internal resistance, which subsequently cause change in the current which acts as the input signal for the switching amplifier of the control unit.

The default settings of contacts shall be as follows:

**Case-1:** NO (Normally Open) - Contact makes when the Gauge Pointer approaches the set point in clockwise direction.

(i.e., Flag leaves control head)

**Case-2:** NC (Normally Closed) - Contact breaks when the Gauge Pointer approaches the set point in a clockwise direction.

(i.e., Flag enters control head)

## Specifications

## Ranges

<b>Ref Standards</b>	EN-837 / EN 60947-5-2 (NAMUR)	<b>Gauge</b>	<b>bar, kg/cm<sup>2</sup></b>	<b>Least count</b>
<b>Dial</b>	100 mm/150 mm, Aluminium, white background, black markings	Compound	(-)1 to 1.5	0.05
<b>Case</b>	SS304 / SS316 with bayonet bezel (Weatherproof)		(-)1 to 3	0.10
<b>Protection</b>	Weatherproof to IP-68 as per IS / IEC:60529		(-) 1 to 5	0.10
	Flameproof to Gas Groups IIA/ IIB & IIC as per IEC:60079-1		(-)1 to 9	0.20
	Exd IIC T6, Atex Certified & Weather proof to IP-66 as per IS/ IEC: 60529		(-)1 to 15	0.50
<b>Electrical Connection</b>	Weatherproof / Flame proof Junction Box in Die Cast Aluminium		(-)1 to 24	0.50
<b>Window</b>	Safety glass with adjusting Knob		(-)1 to 39	1.0
<b>Bourdon</b>	SS316, SS316 Ti, SS316L, Monel	Pressure	0 to 1	0.02
<b>Socket</b>	22 mm Square in SS316, SS316L, SS316 Ti, Monel	Gauge	0 to 1.6	0.05
<b>Movement</b>	SS304 / Ss316	('C' shaped Bourdon)	0 to 2.5	0.05
<b>Connection</b>	1/2" NPT (M) as standard (other optional)		0 to 4	0.10
<b>Range</b>	Refer Table		0 to 6	0.10
<b>Accuracy</b>	±1% FSD for indication & switching		0 to 10	0.20
<b>Over range</b>	As per EN 837		0 to 16	0.50
<b>Blow out disc</b>	Provided		0 to 25	0.50
<b>Zero reset</b>	Provided (Micrometer Pointer)		0 to 40	1.0
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 100°C		0 to 60	1.0
<b>Temperature Effect</b>	Within ±0.4% FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)		0 to 100	2.0
<b>Contact</b>	Inductive Contacts, Single or Double, adjustable between 10% & 90% of the Range	Gauge	0 to 160	5.0
	Nominal Voltage, 8.32 V DC	Coil type	0 to 250	5.0
	Operating Voltage, 5 to 25 V DC	Bourdon	0 to 400	10.0
			0 to 600	10.0
			0 to 800	20.0
			0 to 1000	20.0
			0 to 1600	50.0

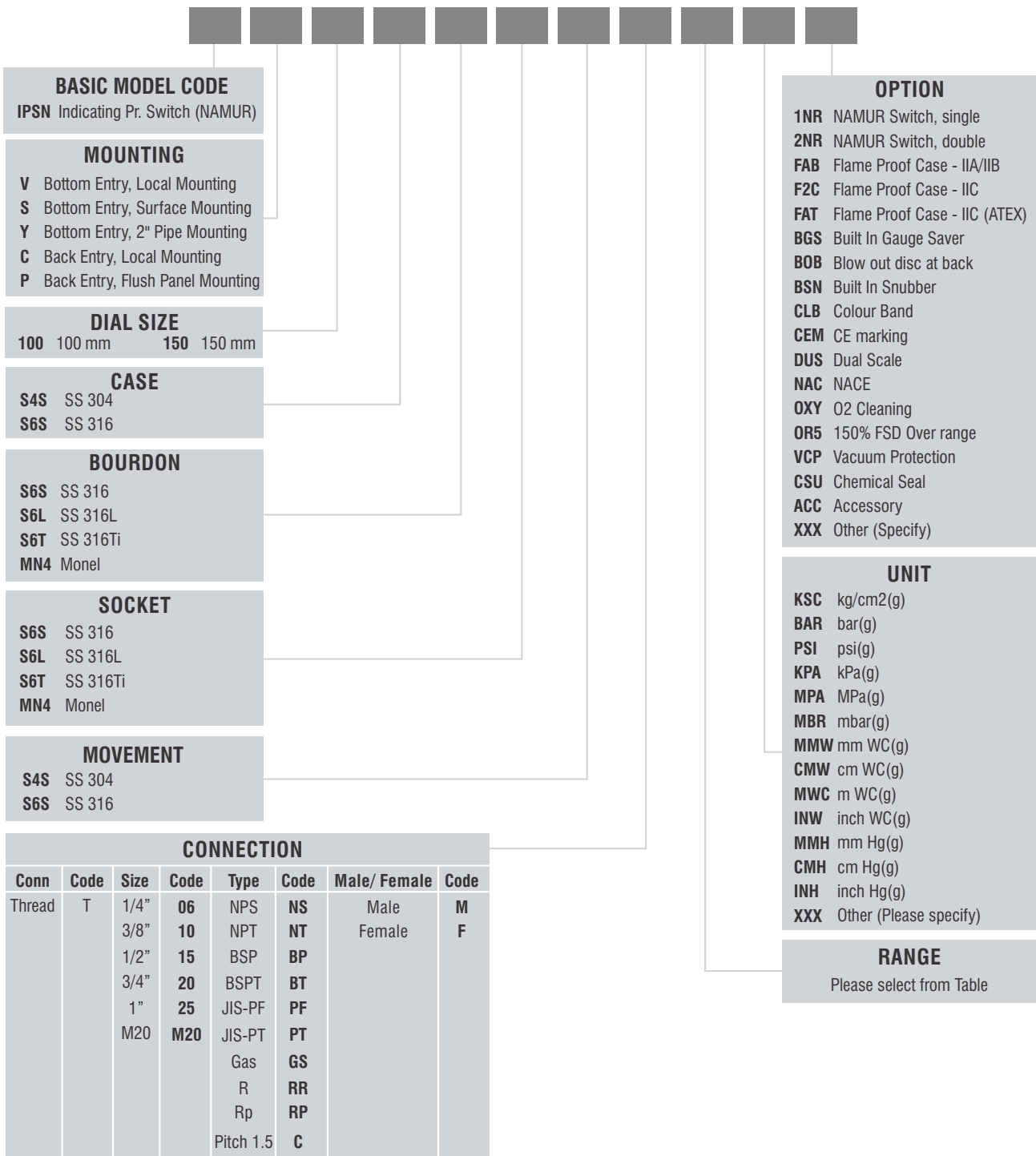
The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide suitable cooling arrangement (Syphon, Cooling Tower, Impulse Tubing, Diaphragm Seal etc.)

For range other than above please contact our design dept.

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



e.g. For 1/2"NPT(M), Code: **T15NTM**  
For M20x1.5 (F), Code: **TM20CF**

Sample model Code: **IPSN-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-10)-BAR-1NR**

# Indicating Low Range Pr. Switches

**MODEL : ILPS**

## Features

- Suitable for low pressure application
- Combination of indication and switching
- Single or double Contacts available
- Switch setting throughout the range externally



## Specifications

<b>Dial</b>	150mm, Aluminium, black marking on white background
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass
<b>Movement</b>	SS304/ SS316
<b>Top Chamber</b>	SS304/ SS316
<b>Diaphragm</b>	SS316/ SS316L/ SS316+PTFE (other material on request)
<b>Bottom flange</b>	SS316/ SS316L/ SS316+PTFE (other material on request)
<b>Connection</b>	1/2" NPT(M) as standard or flanged (specify size & rating)
<b>Range</b>	Refer table
<b>Accuracy</b>	±2% FSD for indication ±3% FSD for switching
<b>Over range</b>	As per EN-837
<b>Zero adjustment</b>	Micrometer Pointer
<b>Blow out disc</b>	Provided
<b>Contacts</b>	1SPST (single Electrical Contact) normally open, closing on rise in pressure or vice versa, rated 30VA @ 230V AC  2 SPST (two Electrical Contacts), independently adjustable, one normally open, other normally closed or both normally open or both normally closed, rated 30VA @ 230V AC

### Option

Special Construction to withstand high design pressure (Built-In Gauge Saver)  
Relay to suit current rating of 5A @ 230V AC

### Note

Indicating Low Range Pressure switches are available with Electrical Contacts & Weatherproof enclosure only

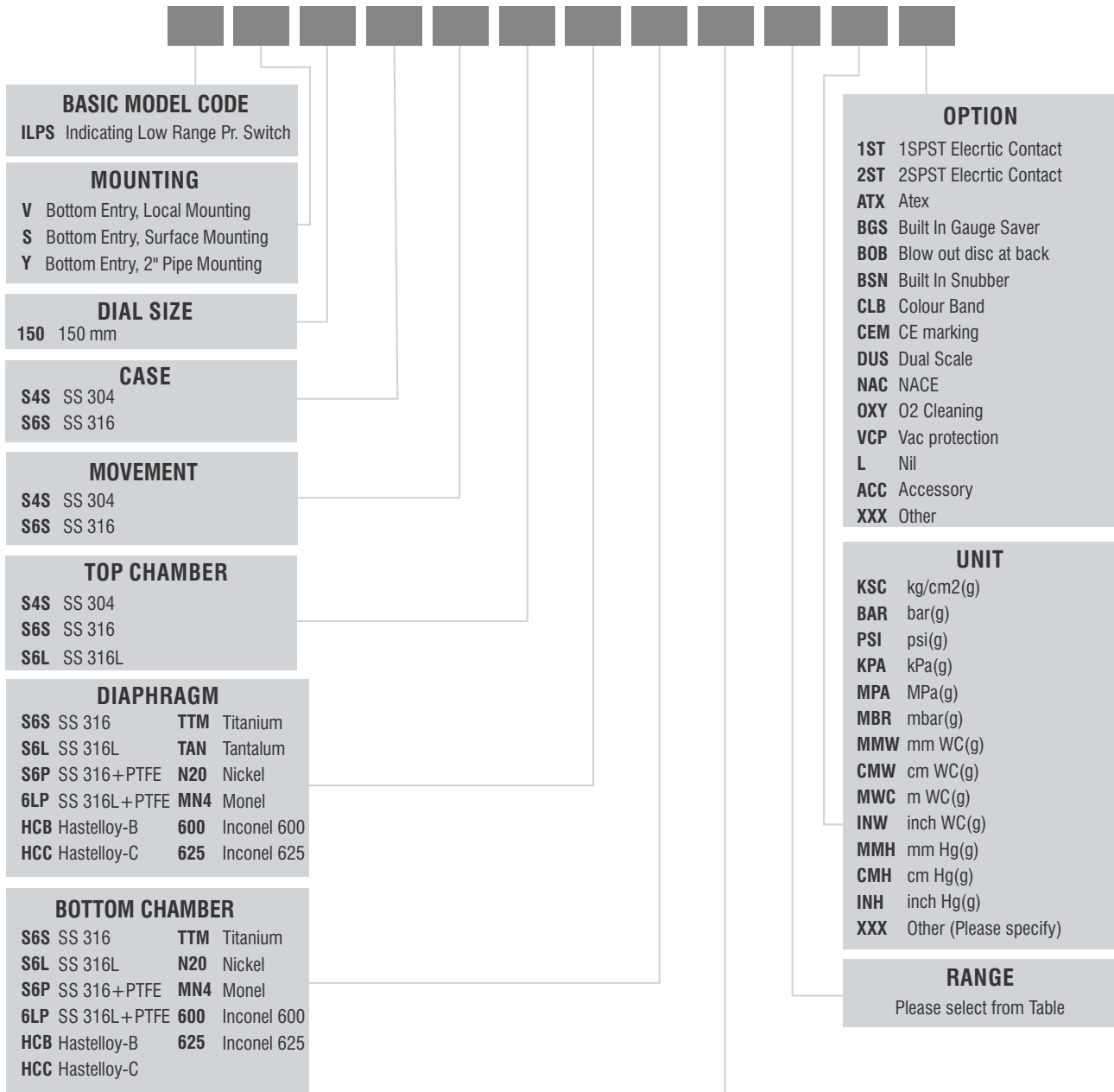
## Ranges

Range
0-250 mm WC
0-400 mm WC
0-600 mm WC
0-1000 mm WC
0-1600 mm WC
0-2500 mm WC
0-4000 mm WC
0-6000 mm WC
0-10000 mm WC / 0-1kg/cm <sup>2</sup> (g)
0-16000 mm WC / 0-1.6kg/cm <sup>2</sup> (g)

For range other than above please contact our design dept.

# Ordering Information

## MODEL



CONNECTION								
Conn	Code	Size	Code	Type	Code	Male/ Female	Code	
Thread	T	1/4"	06	NPS	NS	Male	M	
		3/8"	10	NPT	NT	Female	F	
	1/2"	15	BSP	BP				
		20	BSPT	BT				
	3/4"	25	JIS-PF	PF				
		M20	M20	JIS-PT			PT	
					Gas	GS		
					R	RR		
					Rp	RP		
					Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

FLG - FLANGE							
Conn	Code	Size	Code	Rating#	Code	Facing	Code
Flange	F	1/2"	15	150	A	RF	RF
		3/4"	20	300	B	FF	FF
		1"	25	600	C	RTJ	RJ
		1-1/2"	40	900	D	LT	LT
		2"	50	1500	E	LG	LG
		3"	80	2500	F		

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

Sample model Code: **ILPS-V-150-S4S-S4S-S4S-S6L-S6L-T15NTM-(0-2500)-MMW-2ST**

# Pressure Gauge with In-built Transmitter



**MODEL : BSPGTX (Dry Case)**

**LF BSPGTX (Liquid Filled Case)**

**SF BSPGTX (Solid Front, Dry Case)**

**LS BSPGTX (Liquid filled, Solid Front Case)**

## Features

- Gauge Design as per EN-837 standard
- Local Indication & signal transmission to the control room
- Transmission of process values 4 to 20 mA,
- Easy-to-read, analogue on-site display. No need of external power supply
- "Plug and play" with no configuration necessary
- Signal transmission as per NAMUR
- Measuring ranges (-)1-0, 0-1 to 0-1000 kg/cm<sup>2</sup>.g/ bar.g
- Nominal Dial Size of 100 or 150 mm



## Working Principle

Wherever the process pressure has to be indicated locally, and a signal is wanted to be transmitted to a central controller or remote control room at the same time, BSPGTX can be used. It is a combination of a mechanical measuring system and precise electronic signal processing. The process pressure can be read securely, even in the absence of power supply, if the supply is lost.

BSPGTX is of high-quality, stainless steel Pressure Gauge with a nominal size of 100 or 150 mm, which is manufactured in accordance with EN 837-1 standard. The Bourdon tube measuring system produces a pointer rotation that is proportional to the applied pressure. An electronic angle encoder, determines the position of the pointer shaft. It is a non-contact sensor, hence completely free from wear & tear and friction. From this, the electrical output signal proportional to the pressure, 4 to 20 mA is produced.

BSPGTX, integrated into the high-quality mechanical pressure gauge, combines the advantages of electrical signal transmission as well as local mechanical display. The measuring span (electrical output signal) is set automatically along with the mechanical display, i.e. the scale over the full display range corresponds to 4 to 20 mA. It is possible to set the electrical zero point manually.

## Ranges

Gauge	bar, kg/cm <sup>2</sup>	Least count	Gauge	bar, kg/cm <sup>2</sup>	Least count	Gauge	bar, kg/cm <sup>2</sup>	Least count
Vacuum	(-)1 to 0	0.02	Pressure Gauge ('C' shaped Bourdon)	0 to 0.6	0.01	Pressure Gauge	0 to 100	2.0
	-760 to 0mmHg	20		0 to 1	0.02		0 to 160	5.0
Compound	(-)1 to 0.6	0.05	0 to 1.6	0.05	Coil type	0 to 250	5.0	
	(-)1 to 1.5	0.05	0 to 2.5	0.05	Bourdon	0 to 400	10.0	
	(-)1 to 3	0.10	0 to 4	0.10		0 to 600	10.0	
	(-) 1 to 5	0.10	0 to 6	0.10		0 to 800	20.0	
	(-)1 to 9	0.20	0 to 10	0.20		0 to 1000	20.0	
	(-)1 to 15	0.50	0 to 16	0.50				
	(-)1 to 24	0.50	0 to 25	0.50				
	(-)1 to 39	1.0	0 to 40	1.0				
		0 to 60	1.0					

The parameters mentioned here are the standard specifications/ values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide suitable cooling arrangement (Syphon, Cooling Tower, Impulse Tubing, Diaphragm Seal etc.)

Under Technical Collaboration with M/s. Gauges Bourdon, France



# Specifications

## (A) Mechanical Data

<b>Ref. Standard</b>	EN-837
<b>Dial</b>	100 mm / 150 mm in Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	IP-66 (IS:13947 par t I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Bourdon</b>	SS316, SS316 Ti, SS316L, Monel
<b>Socket</b>	22mm Square in SS316, SS316 Ti, SS316L, Monel
<b>Movement</b>	SS304 / SS316
<b>Range</b>	As per EN 837 (refer table) minimum span 1 kg/cm <sup>2</sup> , maximum 1000 kg/cm <sup>2</sup>
<b>Connection</b>	1/2" NPT(M) as standard (other optional)
<b>Accuracy</b>	±1% FSD as standard (0.5% FSD on request)
<b>Over range</b>	As per EN 837
<b>Zero adjustment</b>	Micrometer Pointer
<b>Blow out disc</b>	Provided (on top)
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 200°C
<b>Temperature Effect</b>	Within ±0.4% FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
<b>Optional</b>	Safety design with Solid Front NACE compliance Built in Snubber Liquid filled Case (Glycerine /Silicone Oil) - only in assembly with plug connector Diaphragm seals (Refer Catalogue for Diaphragm Seal)

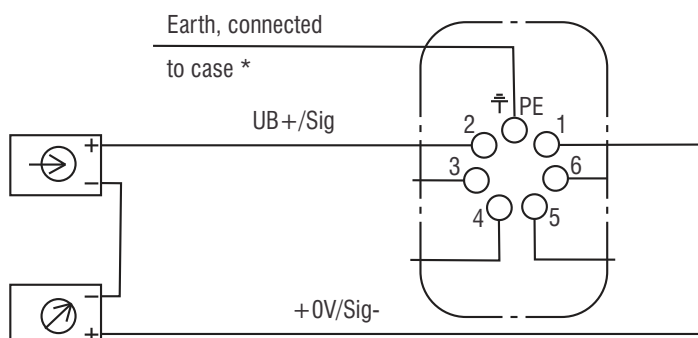


## (B) Electrical Data

Power supply U <sub>B</sub>	Between 12 & 24	DC V
Supply voltage effect	≤ 0.1	% v FS/10 V
Permissible residual ripple	≤ 10	% ss
Output signal	4 to 20 mA, 2-wire	
Permissible Max Load R <sub>A</sub>	R <sub>A</sub> ≤ (U <sub>B</sub> - 12 V)/0.02 A with R <sub>A</sub> in Ohm and U <sub>B</sub> in Volt, however max. 600 Ω	
Effect of load	≤ 0.1	%FS
Electrical zero point	Through a jumper across terminals 5 and 6	
Long-term stability of electronics	< 0.5	% FS/a
Electrical output signal	≤ 1 % of the measuring span	
Linearity	≤ 1 % (Limit point calibration)	% of span
Power supply	12 to 24	DC V
Short circuit rating	100	mA
Rating	1000	mW
Wiring	L- plug Connector, 180° rotatable, Max 1.5mm <sup>2</sup> , wire protector, Cable gland M20 x 1.5, Ext cable diameter 7 - 13 mm, incl strain relief	
Wiring protection	IP-66 as per IEC-60529	

### Wiring Details

As shown below



Terminals 3,4,5 and 6: Only for internal use

\* This connection must not be used for equipotential bonding. The instrument must be incorporated in the equipotential bonding via the process connection

# Ordering Information

## MODEL



### BASIC MODEL CODE

- BSPGTX** Dry Case
- LF BSPGTX** Liquid Filled Case
- SF BSPGTX** Solid Front Dry Case
- LS BSPGTX** Liquid Filled Solid Front Case

### MOUNTING

- V** Bottom Entry, Local Mounting
- S** Bottom Entry, Surface Mounting
- Y** Bottom Entry, 2" Pipe Mounting
- C** Back Entry, Local Mounting
- P** Back Entry, Flush Panel Mounting

### DIAL SIZE

**100** - 100 mm    **150** - 150 mm

### CASE

- S4S** SS 304
- S6S** SS 316

### BOURDON

- S6S** SS 316
- S6L** SS 316L
- S6T** SS 316Ti
- MN4** Monel

### SOCKET

- S6S** SS 316
- S6L** SS 316L
- S6T** SS 316Ti
- MN4** Monel

### MOVEMENT

- S4S** SS 304
- S6S** SS 316

### OPTION

- A05** Accuracy  $\pm 0.5\%$ FSD
- BOB** Blow out disc at back
- BSN** Built In Snubber
- CLB** Colour Band
- DC2** Silicone Oil Filled Case
- DUS** Dual Scale
- GLY** Glycerine filled Case
- NAC** NACE
- OXY** O2 Cleaning
- PHD** Phenolic / Plastic Dial
- S4D** SS DIAL (SS304)
- S6D** SS DIAL (SS316)
- VCP** Vacuum Protection
- L** Nil
- CSU** Chemical Seal
- ACC** Accessory
- XXX** Other

### UNIT

- KSC** kg/cm2(g)
- BAR** bar(g)
- PSI** psi(g)
- KPA** kPa(g)
- MPA** MPa(g)
- MBR** mbar(g)
- MMW** mm WC(g)
- CMW** cm WC(g)
- MWC** m WC(g)
- INW** inch WC(g)
- MMH** mm Hg(g)
- CMH** cm Hg(g)
- INH** inch Hg(g)
- XXX** Other (Please specify)

### RANGE

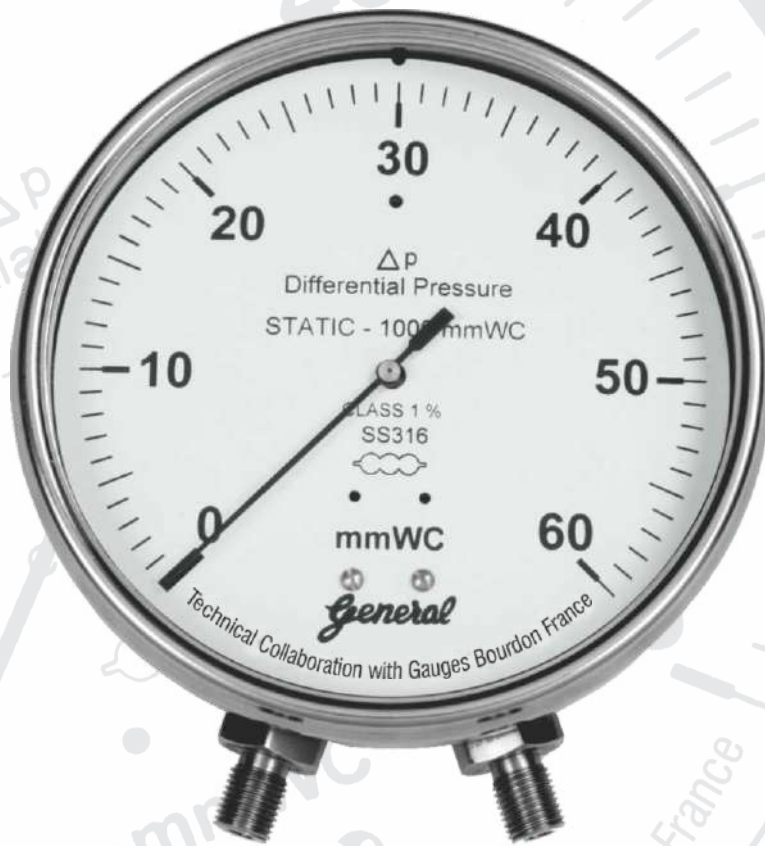
Please select from Table

### CONNECTION

Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	<b>06</b>	NPS	<b>NS</b>	Male Female	<b>M</b> <b>F</b>
		3/8"	<b>10</b>	NPT	<b>NT</b>		
		1/2"	<b>15</b>	BSP	<b>BP</b>		
		3/4"	<b>20</b>	BSPT	<b>BT</b>		
		1"	<b>25</b>	JIS-PF	<b>PF</b>		
		M20	<b>M20</b>	JIS-PT	<b>PT</b>		
				Gas	<b>GS</b>		
				R	<b>RR</b>		
				Rp	<b>RP</b>		
				Pitch 1.5	<b>C</b>		

e.g. For 1/2"NPT(M), Code: **T15NTM**  
For M20x1.5 (F), Code: **TM20CF**

**Sample Model Code: BSPGTX-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-10)-BAR-L**



# DIFFERENTIAL PRESSURE GAUGES

## Differential Pr. Gauges - Bellow Type

- MODEL : DPBL** (Dry Case)
- LFDPBL** (Liquid Filled Case)
- SFDPBL** (Solid Front, Dry Case)
- LSDPBL** (Liquid Filled, Solid Front Case)

### Features

- Bellow type construction
- Reference Standard: EN - 837
- All SS internals
- Chemical seal unit (optional) for process suitability
- Accuracy  $\pm 1\%$  FSD
- A set of two stainless steel bellows mounted on a force balance enables direct reading of the actual differential pressure.
- Each Bellow of the pressure Gauge can withstand the full static pressure without any damage or shifting being caused to the instrument.



### Specifications

<b>Dial</b>	150 mm, Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	Weatherproof to IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Pointer</b>	Light weight, micrometer adjustable
<b>Sensing element</b>	Bellow
<b>Sensor Material &amp; Wetted Parts</b>	SS316 / SS316L / Monel / Hastelloy-C
<b>Movement</b>	SS304 / SS316
<b>Connection</b>	1/2" NPT (M) as standard (other on request)
<b>Range</b>	Minimum 0 to 1000 mm WC; Higher range as per customer requirement
<b>Static Pressure</b>	Upto 60 kg/cm <sup>2</sup> g, Higher Static Pressure on request
<b>Accuracy</b>	$\pm 1\%$ FSD
<b>Blow out disc</b>	Provided (top of the case)
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 100°C
<b>Temperature Effect</b>	Within $\pm 0.4\%$ FSD/10°C, when temperature changes from reference temperature of 20°C
<b>Optional</b>	Chemical seal units with Capillary Liquid filled case External Knob for zero setting CE Atex



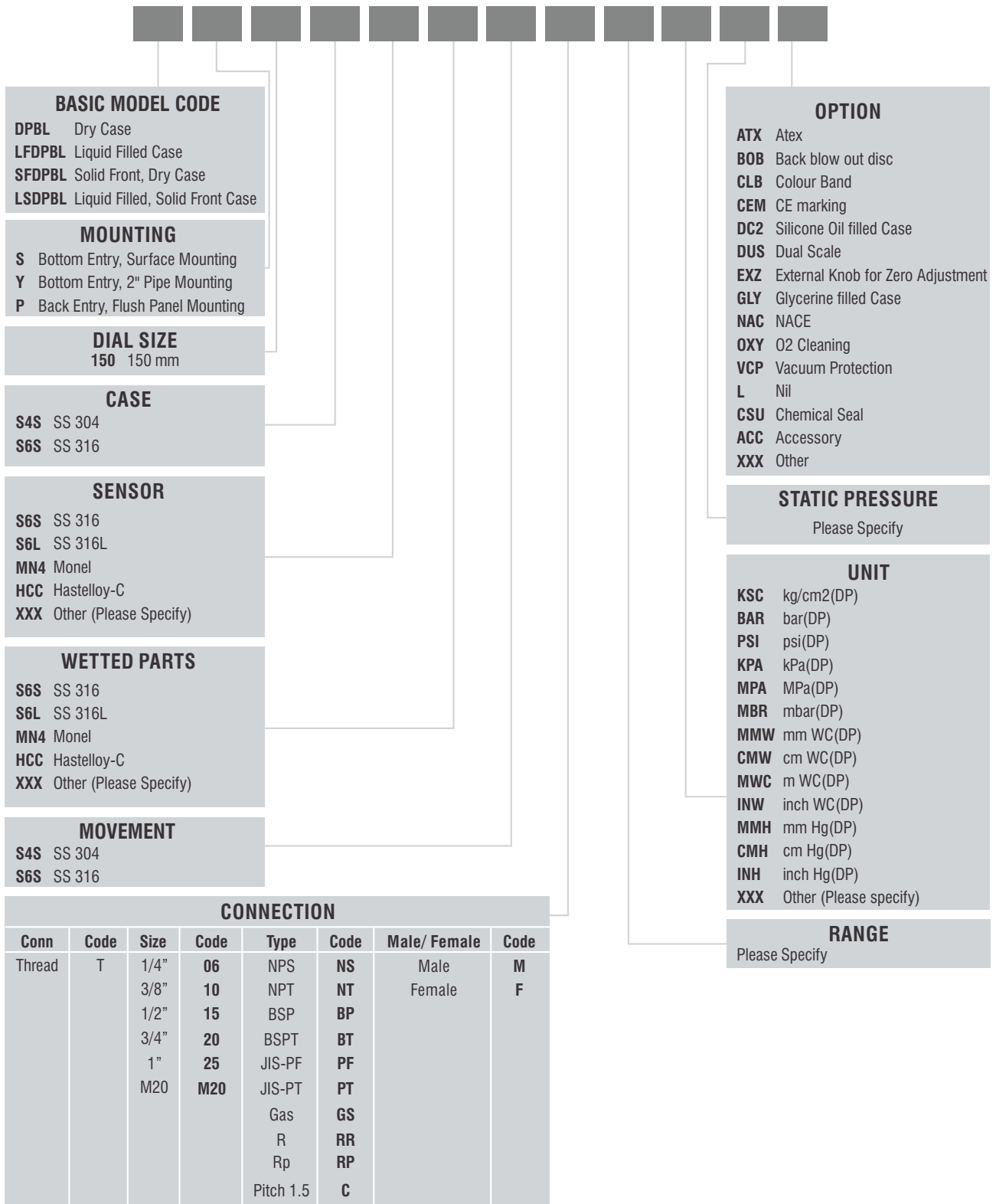
**DP Gauge with Diaphragm Seal & Capillary**

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide sufficient Impulse Tubing to bring down the fluid temperature .

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

Sample Model Code: **DPBL-Y-150-S4S-S6S-S6S-S4S-T15NTM-(0-2)-BAR-25bar.g-L**

## Differential Pr. Gauges Diaphragm type

*General*

**MODEL : DPDS (Dry Case)**

**LFPDS (Liquid Filled Case)**

**SFDPDS (Solid Front, Dry Case)**

**LSDPDS (Liquid Filled, Solid Front Case)**

### Features

- General purpose differential pressure measurement
- Sensing Element of Diaphragm
- Wetted Parts in SS316 / SS316L / Monel / Hastelloy-C (other on request)
- Non-wetted parts & Case in Stainless Steel
- Accuracy  $\pm 1.6\%$  FSD
- Span of dial marking at 270 Deg Angle, even for very low ranges



### Specifications

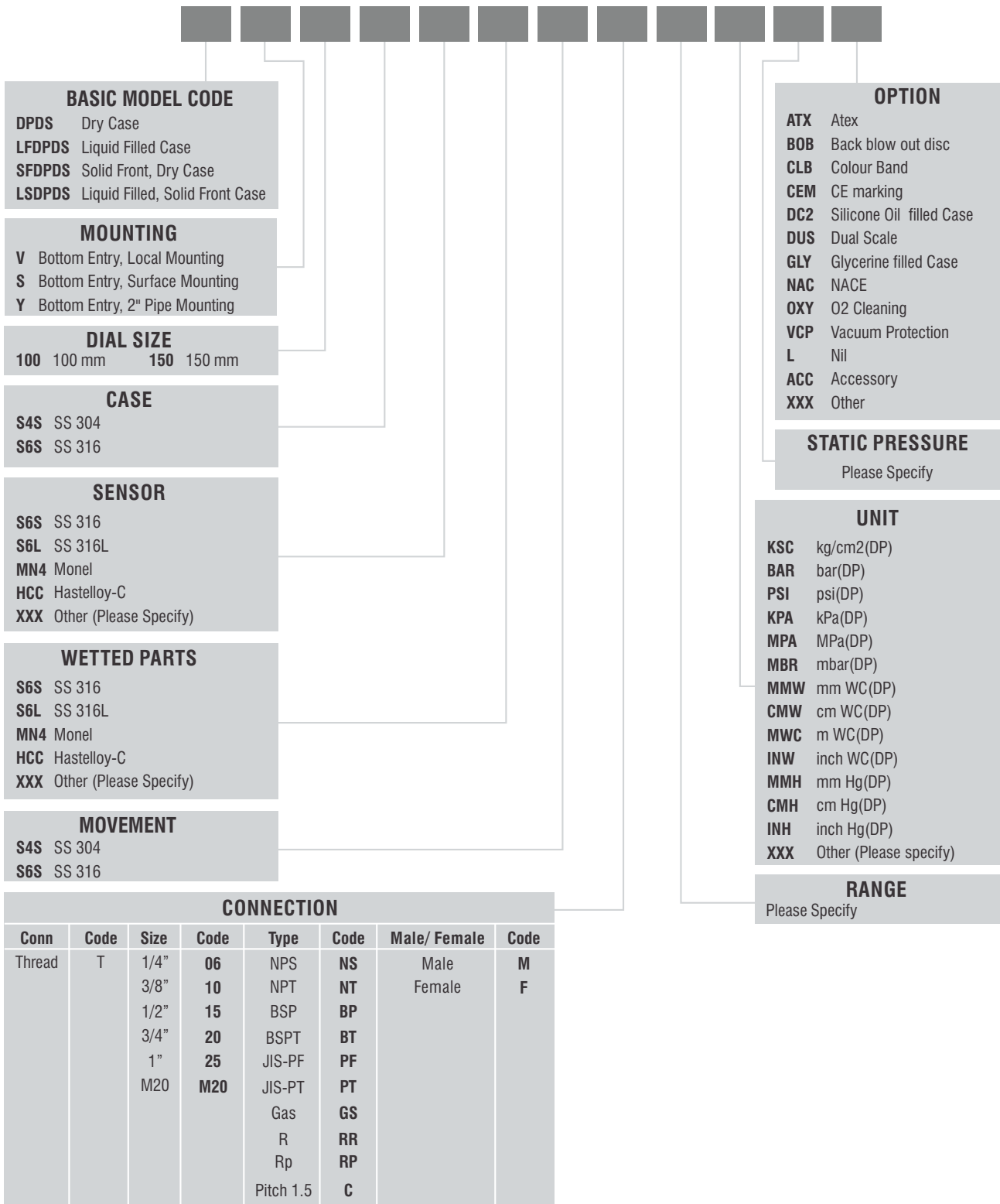
<b>Dial</b>	100mm / 150 mm, Aluminium, white background, black markings
<b>Case</b>	SS304 as standard (SS316 on request) with bayonet bezel
<b>Protection</b>	Weatherproof to IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Pointer</b>	Pointer Light weight, micrometer adjustable
<b>Sensing element</b>	Diaphragm
<b>Wetted Parts</b>	SS316 / SS316L / Monel / Hastelloy-C (other on request)
<b>Movement</b>	SS304 as standard (SS316 on request)
<b>Connection</b>	1/2" NPT (M) as standard (other on request)
<b>Range</b>	Any range between 0 to 160 mm WC & 0 to 4 kg/cm <sup>2</sup> (DP) / Higher Range on request
<b>Static Pressure</b>	Upto 60 kg/cm <sup>2</sup> g, Higher Static Pressure on request
<b>Accuracy</b>	$\pm 1.6\%$ FSD
<b>Blow out disc</b>	Provided (top of the case)
<b>Temperature suitability</b>	Ambient (-) 20°C to 60°C, Media 100°C
<b>Temperature Effect</b>	Within $\pm 0.5\%$ FSD/10°C, when temperature changes from reference temperature of 20°C
<b>Optional</b>	Liquid filled case (for Range 0 to 1000mmWC & above only) CE Atex

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide sufficient Impulse Tubing to bring down the fluid temperature .

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

Sample Model Code: **DPDS-Y-150-S4S-S6S-S6S-S4S-T15NTM-(0-1000)-MMW-4kg/cm2.g-L**



# High Static Pr. Differential Pr. Gauges

## Diaphragm type, High Static Pressure



**MODEL : DPDH (Dry Case)**  
**LFDPDH (Liquid Filled Case)**

### Features

- General purpose differential pressure measurement
- Sensing Element of Diaphragm
- Wetted Parts in SS316 / SS316L / Monel / Hastelloy-C (other on request)
- Non-wetted parts & Case in Stainless Steel
- Accuracy  $\pm 1.6\%$  FSD



### Specifications

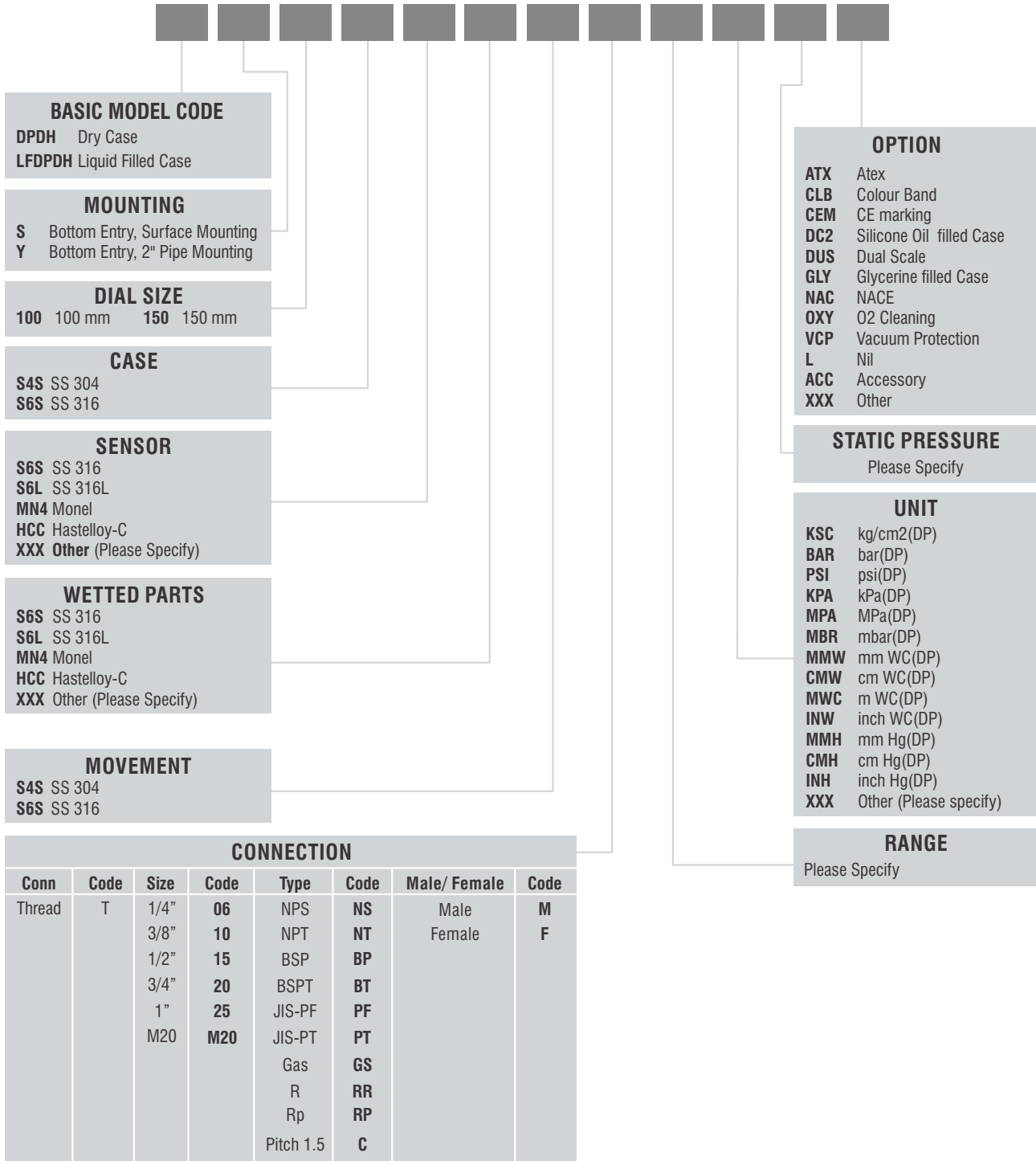
<b>Dial</b>	100mm / 150 mm, Aluminium, white background, black markings
<b>Case</b>	SS304 as standard (SS316 on request) with bayonet bezel
<b>Protection</b>	Weatherproof to IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Pointer</b>	Pointer Light weight, micrometer adjustable
<b>Sensing element</b>	Diaphragm
<b>Wetted Parts</b>	SS316 / SS316L / Monel / Hastelloy-C (other on request)
<b>Movement</b>	SS304 as standard (SS316 on request)
<b>Connection</b>	1/2" NPT (M) as standard (other on request)
<b>Range</b>	Any range between 0 to 1000 mm WC & 0 to 6 kg/cm <sup>2</sup> (DP)
<b>Static Pressure</b>	Upto 250 kg/cm <sup>2</sup> g, Higher Static Pressure on request
<b>Accuracy</b>	$\pm 1.6\%$ FSD
<b>Blow out disc</b>	Provided (top of the case)
<b>Temperature suitability</b>	Ambient (-) 20°C to 60°C, Media 100°C
<b>Temperature Effect</b>	Within $\pm 0.5\%$ FSD/10°C, when temperature changes from reference temperature of 20°C
<b>Optional</b>	Liquid filled case CE Atex

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide sufficient Impulse Tubing to bring down the fluid temperature .

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

Sample Model Code: **DPDH-Y-150-S4S-S6S-S6S-S4S-T15NTM-(0-2)-BAR-25bar.g-L**

# Differential Pr. Gauges Diaphragm type

## ±1%FSD Accuracy

*General*

### MODEL : DPDX

#### Features

- Differential pressure measurement with Accuracy of ±1% FSD
- Sensing Element of Diaphragm
- Wetted Parts in SS316 / SS316L / Monel / other on request
- Non-wetted parts & Case in Stainless Steel
- Low Range & High Static Pressure
- Span of dial marking at 270 Deg Angle



#### Specifications

<b>Dial</b>	100 mm* / 150 mm, Aluminium, white background, black markings
<b>Case</b>	SS304 as standard (SS316 on request) with bayonet bezel
<b>Protection</b>	Weatherproof to IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Pointer</b>	Pointer Light weight, micrometer adjustable
<b>Sensing element</b>	Diaphragm
<b>Wetted Parts</b>	SS316 / SS316L / Monel / other on request
<b>Movement</b>	SS304 as standard (SS316 on request)
<b>Connection</b>	½" NPT (M) as standard (other on request)
<b>Range</b>	Any range between 0 to 250 mm WC & 0 to 10,000mmWC(DP) / other on request
<b>Static Pressure</b>	Up to 100 kg/cm2.g (higher on request)
<b>Accuracy</b>	±1% FSD
<b>Blow out disc</b>	Provided (top of the case)
<b>Temperature suitability</b>	Ambient (-) 20°C to 80°C, Media 100°C
<b>Temperature Effect</b>	Within ±0.5% FSD/10°C, when temperature changes from reference temperature of 20°C
<b>Optional</b>	CE Atex

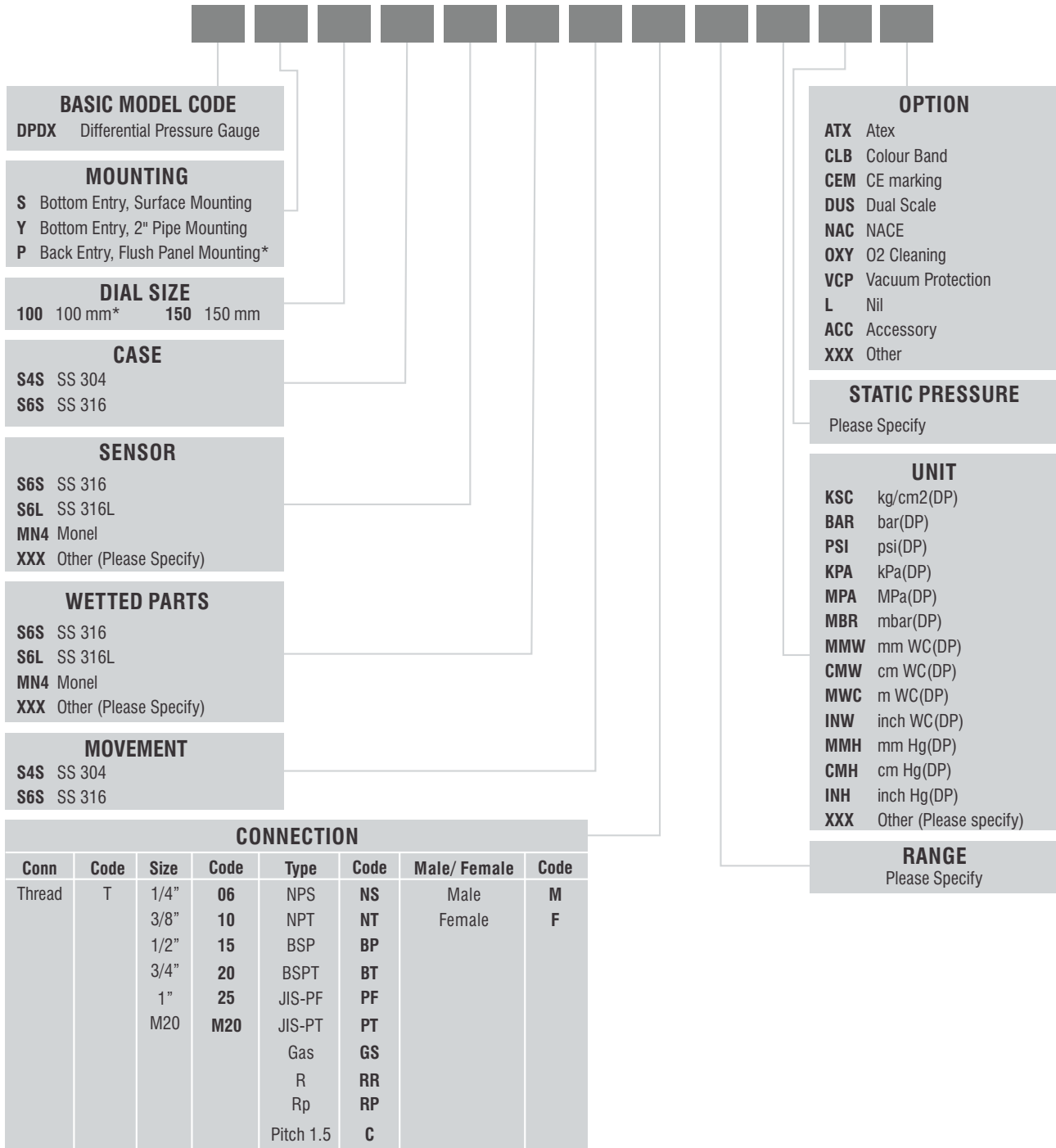
\*Note: 100 mm dial is not available in Flush Panel Mounting

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide sufficient Impulse Tubing to bring down the fluid temperature .

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



e.g. For 1/2"NPT(M), Code: **T15NTM**  
For M20x1.5 (F), Code: **TM20CF**

\*Note: 100 mm dial is not available in Flush Panel Mounting

Sample Model Code: **DPDX-P-150-S4S-S6S-S6S-S4S-T15NTM-(0-1000)-MMW-20kg/cm2.g-L**

# Differential Pr. Gauges-Capsule Type

*General*

**MODEL : DPCP**

## Features

- Low differential pressure measurement with high accuracy
- Sensing element- Capsule in SS316L
- Screwed connection
- Accuracy  $\pm 1\%$  FSD
- General stainless steel capsule differential pressure gauges are designed for measuring small differential pressures on clean & dry air or gas system



## Specifications

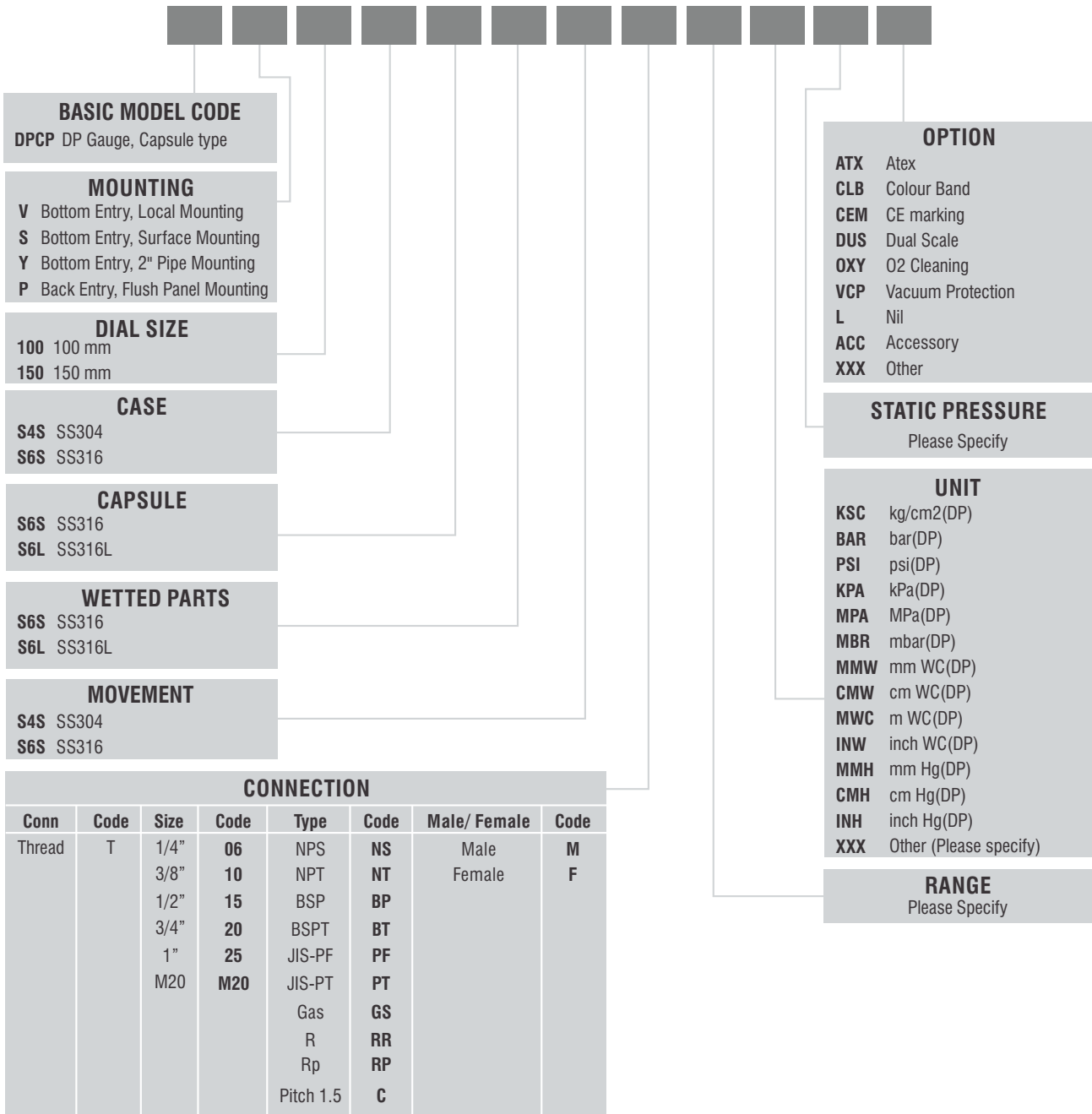
<b>Dial</b>	100 mm / 150 mm, Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	Weatherproof to IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Sensing</b>	Capsule in SS316, SS316L
<b>Connection</b>	1/2 " NPT (M) as standard (other on request)
<b>Range</b>	Any range between 0 to 60 mm WC to 0 to 1000 mmWC
<b>Static Pressure</b>	10 times the range (Maximum)
<b>Accuracy</b>	$\pm 1\%$ FSD
<b>Temperature Suitability</b>	Ambient (-)20°C to 60°C, Media 80°C
<b>Note</b>	Capsule type DP Gauges are recommended for non-corrosive, clean, clear (colourless) & dry Gases / Air only
<b>Optional</b>	CE Atex

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

Sample Model Code: **DPCP-S-150-S4S-S6S-S6S-S4S-T15NTM-(0-60)-MMW-500mmWC.g-L**

# Differential Pressure Gauges- Diaphragm/ Piston Type

**MODEL : DPMH (Dry Case)  
LFDPMH (Liquid Filled Case)**

## Features

- Magnetic Diaphragm / Piston type construction
- Static pressure 35 bar & 100 bar
- Body block - Aluminium / SS316 / SS316L
- Screwed connection
- Accuracy  $\pm 2\%$  FSD (Ascending)
- Unit of measurement - kg/cm<sup>2</sup>, bar, mmWC



## Specifications

<b>Dial</b>	100 mm / 150 mm, Aluminium, white background, black markings
<b>Case &amp; Bezel</b>	SS304 weatherproof to IP-67(Dry Case) / IP-68 (Liquid Filled Case) as per IS:13947 part I / IEC:60529
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Sensing</b>	Diaphragm in Viton / Piston in SS
<b>Body Material</b>	Aluminium / SS316 / SS316 L
<b>Magnet</b>	Ceramic
<b>Spring</b>	SS316
<b>Connection</b>	1/4" NPT (F) as standard (other on request)
<b>Range</b>	Minimum span of Range 50 mmWC (500 mmWC with Switch )
<b>Static Pressure</b>	35 bar & 100 bar
<b>Accuracy</b>	$\pm 2\%$ FSD (on Ascending Side)
<b>Blow out disc</b>	Provided (top of the case)
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 80°C
<b>Optional</b>	Liquid filled Case (minimum Range 0 to 1000mmWC) Filling not available with Switch
	Switching : <b>SPDT (Micro Switch)</b>
	Voltage : 230V AC
	Rating Switch : 1 SPDT & 2 SPDT
	Current : 5 A (max)
	CE
	Atex



**DP Gauge with Micro Switch**

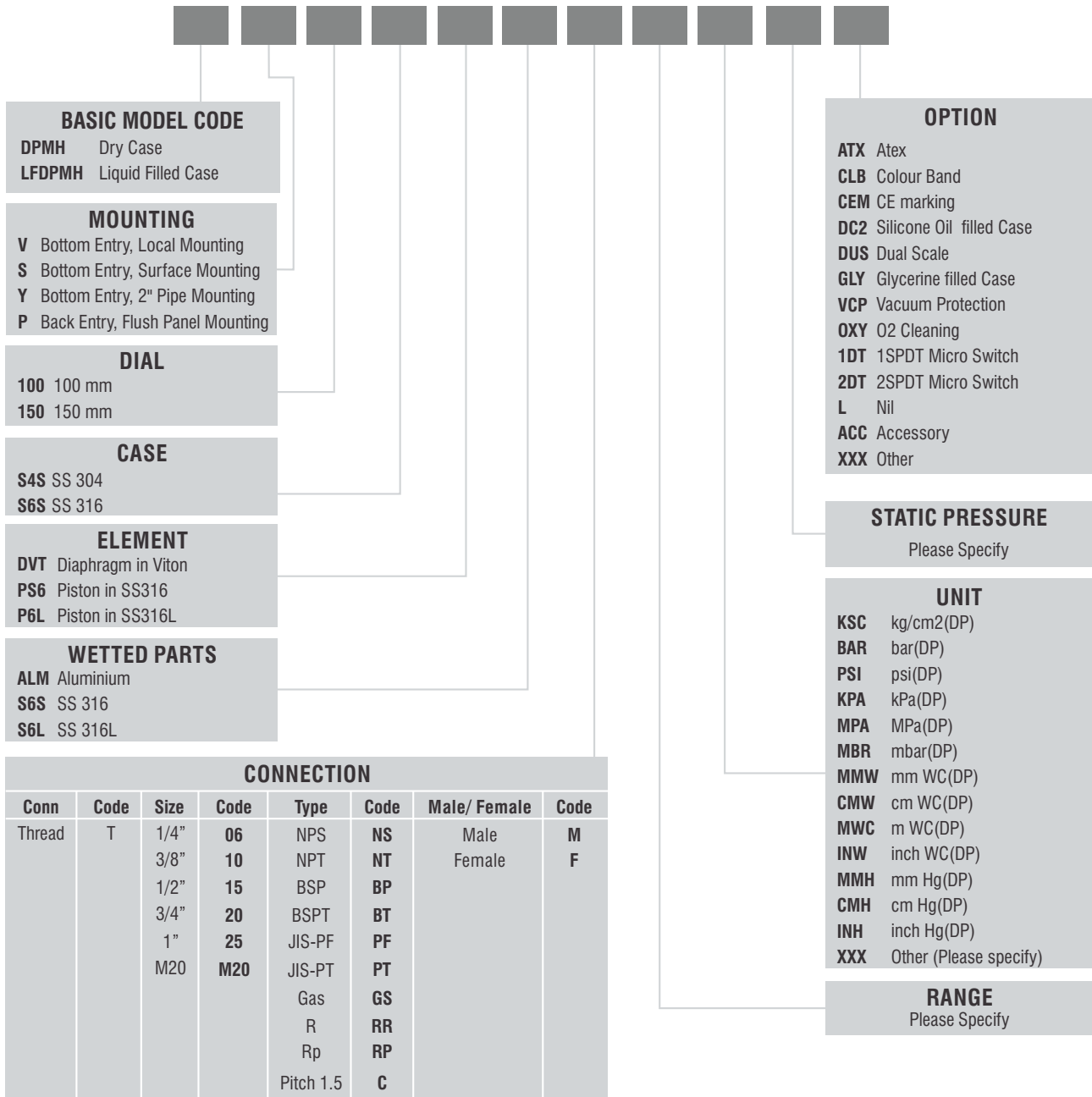
The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

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# Ordering Information

## MODEL



e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

Sample Model Code: **DPMH-P-150-S4S-DVT-S6S-T15NTM-(0-600)-MMW-25bar.g-L**

# Mag-DP - Differential Pressure Gauges



## for low Differential Pressure measurement

### MODEL: DPMG

“General” make Mag-DP Gauges are designed for measuring very low differential pressures. Minimum measuring Range offered is as low as 0 to 6 mmWC(DP). The Mag-DP Gauges are suitable for measuring fan & blower pressures, filter resistance, furnace draft, and pressure drop across orifice plates, etc. Mag-DP Gauges are designed to suit Flush Panel Mounting or Surface (Projection) Mounting or Yoke (2” Pipe) Mounting as per requirement. For maximum accuracy, it is recommended to mount the Gauge in Vertical position. Suitable mounting accessories are provided with each Gauge.

### Features

- Diaphragm operated, with magnetic helical Movement
- Suitable for measuring very low differential pressure
- Minimum measuring Range as low as 0 to 6 mmWC(DP)
- Silicone Rubber diaphragm (Buna-N for Hydrogen Service)
- Body material – Aluminium



### Working Principle

The Mag-DP Gauge consists of a Silicone Diaphragm with integrally moulded O-Ring. The Diaphragm is locked and sealed in its position with a sealing plate & retaining ring. There is a Range Spring to which Diaphragm is connected. Depending upon the applied pressure, the displacement of the Diaphragm is transferred to the Range spring. This causes the motion of the magnet provided at one end of the Range spring. The change in magnetic field rotates the Helical movement which also is made with magnetic material and mounted on frictionless jewelled beading. The pointer is fixed on the helical movement. Thus the rotation of the helical movement is directly indicated by the Pointer above the Dial.

### Specifications

<b>Mounting Orientation</b>	Diaphragm in vertical position (Consult factory for other position orientations).
<b>Size</b>	Nominal Size 4" (100 mm) & Case OD 4-1/2" (114 mm)
<b>Dial</b>	Aluminium, white background with Black markings
<b>Housing</b>	Die cast Aluminum Case & Bezel, with Acrylic cover, Weather proof to IP-65 as per IEC-60529. Exterior finish in coated Gray, withstands 168 hour Salt spray Corrosion Test.
<b>Sensing Element</b>	Silicone Rubber diaphragm with integrally molded O-ring For Hydrogen Service Diaphragm shall be Buna-N.
<b>Process Connections</b>	1/8" NPT(F) duplicate HP & LP Connections - One Pair at side & the other at back/rear. (1/8"NPT Plugs shall be provided for the unused connections)
<b>Accuracy</b>	±2% of FSD for Range 0 to 25 mmWC & above at 24 DegC ±3% of FSD for Range 0 to 10mmWC to 15 mmWC at 24 DegC ±4% of FSD for Range 0 to 6, -3 to 3, -5 to 5 mmWC at 24 DegC
<b>Pressure Limits</b>	(-)500 mm Hg Vacuum to 1 bar.g Pressure
<b>Over pressure</b>	Relief plug opens at approximately 25 psig (1.72 bar)
<b>Temperature Limits</b>	20 to 140°F (-6.67 to 60°C).
<b>Weight</b>	Approx 500 gm
<b>Standard Accessories</b>	Two 1/8" NPT Male plugs for duplicate process connections Two 1/8" pipe thread to rubber tubing adaptors Three flush mounting adapters & suitable screws.

### Ordering Information

MODEL : DPMG- [ ] [ ] [ ] [ ]

<b>Mounting</b>	<b>RANGE</b>	<b>UNIT</b>	<b>CONNECTION</b>
<b>S</b> Surface <b>Y</b> 2" Pipe <b>P</b> Flush Panel	Please Specify	<b>MMW</b> mmWC <b>MBR</b> mbar <b>CMW</b> cmWC <b>PAS</b> Pascal <b>INW</b> inchWC	<b>BUN</b> Buna-N Diaphragm instead of Silicone Diaphragm <b>ATX</b> Atex <b>CEM</b> CE <b>L</b> Nil

Any special requirement on request

**Sample Model Code: DPMG-P-(0-10)-MMW-L**

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Indicating Differential Pressure Switch

**MODEL : IDMSB (Micro switch in Bellow type)**  
**IDNSB (NAMUR switch in Bellow type)**  
**IDNSD (NAMUR switch in Diaphragm type)**

GENERAL has been designing and manufacturing high quality Differential pressure indicating switches to suit to most of the industrial application for accurate control of the process equipments. Rigorous and continuous tests are conducted for design and quality conformance.

- Indicating Differential Pressure Switches are design to use in Pumps, Compressors, Lubrication Systems, Turbines, Generators, Boilers, Furnaces etc. in industries such as Chemical, Fertilizer, Ferrous & Non-ferrous metal, Pulp & Paper, Power, Waste Water Treatment, Refinery & Petrochemical, Synthetic Fibre, etc.



**Bellow type, with Micro switch & Weather proof Case**

## Specifications

<b>Dial</b>	100/ 150 mm (for diaphragm) & 150mm (for Bellow), Aluminium dial, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel (for WP enclosure - NAMUR & Micro switch / FP enclosure - NAMUR switch only) Die Cast Aluminium (for Micro switch with FP enclosure only)
<b>Protection</b>	Weatherproof to IP - 68 (IS:13947 part I / IEC:60529) Flameproof to IIA, IIB (equivalent to NEC Cl. 1, Div. 2, Gr. C & D)
<b>Window</b>	Safety glass
<b>Cable Entry</b>	1/2" NPT (F)
<b>Switch</b>	1 SPDT / 2 SPDT, Snap acting micro-switch Rated 5A @ 230 VAC / 3A @ 28 VDC Inductive Contacts (NAMUR), Single or Double, adjustable between 10% & 90% of the Range, Nominal Voltage, 8.32 V DC, Operating Voltage, 5 to 25 V DC
<b>Sensing element</b>	Bellow/ Diaphragm
<b>Sensor Material &amp; Wetted Parts</b>	SS316 / SS316L / Monel / Hastelloy-C / other on request
<b>Movement</b>	Brass / SS304 / SS316
<b>Set Point</b>	Adjustable throughout the range
<b>Mounting</b>	Surface Mounting / 2" Pipe Mounting
<b>Process Connection</b>	1/2" NPT (M) as standard. Other connections optionally
<b>Range</b>	Minimum 0 to 250 mm WC(DP) for NAMUR switch in Diaphragm type Minimum 0 to 2500 mm WC(DP) for NAMUR switch in Bellow type Minimum 0 to 1kg/cm <sup>2</sup> (DP) for Micro switch in Bellow type Higher ranges as per customer requirement
<b>Static Pressure</b>	Upto 60 kg/cm <sup>2</sup> g, Higher on request
<b>Accuracy</b>	Bellow type with Micro switch: ±1% FSD (for indication) & ±2% FSD (for Switching) Bellow type with NAMUR switch: ±1% FSD (indication & switching) Diaphragm type with NAMUR switch: ±1.6% FSD (indication & switching)
<b>Temperature suitability</b>	Ambient (-)20°C to 60°C, Media 100°C
<b>Temperature Effect</b>	Within ±0.5% FSD/10°C, when temperature changes from reference temperature of 20°C
<b>Blow out disc</b>	Provided at top of the Case (not applicable for FP Die Cast Aluminium Case)
<b>Optional</b>	Diaphragm seal with Capillary CE, Atex



**Diaphragm type, with NAMUR switch & Weather proof Case**



**Bellow type, with Micro switch, Flame proof Case & Diaphragm Seal**

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL



### BASIC MODEL CODE

- IDMSB** Micro switch in Bellow type
- IDNSB** NAMUR switch in Bellow type
- IDNSD** NAMUR switch in Diaphragm type

### MOUNTING

- V** Bottom Entry, Local Mounting
- S** Bottom Entry, Surface Mounting
- Y** Bottom Entry, 2" Pipe Mounting
- P** Back Entry, Flush Panel Mounting (for Bellow type only)

### DIAL SIZE

- 150** 150 mm

### CASE

- S4S** SS 304
- S6S** SS 316
- ALM** Die Cast Aluminium\*

### SENSOR

- S6S** SS 316
- S6L** SS 316L
- MN4** Monel
- HCC** Hastelloy-C
- XXX** Other (Please Specify)

### WETTED PARTS

- S6S** SS 316
- S6L** SS 316L
- MN4** Monel
- HCC** Hastelloy-C
- XXX** Other (Please Specify)

### MOVEMENT

- S4S** SS 304
- S6S** SS 316
- BRS** Brass

### OPTION

- 1DT** 1SPDT Micro Switch
- 2DT** 2SPDT Micro Switch
- 1NR** NAMUR Switch, single
- 2NR** NAMUR Switch, double
- FAB** Flame Proof Case - IIA/IIB
- F2C** Flame Proof Case - IIC
- FAT** Flame Proof Case - IIC (ATEX)
- CLB** Colour Band
- CEM** CE marking
- DUS** Dual Scale
- NAC** NACE
- OXY** O2 Cleaning
- VCP** Vacuum Protection
- CSU** Chemical Seal
- ACC** Accessory
- XXX** Other

### STATIC PRESSURE

Please Specify

### UNIT

- KSC** kg/cm<sup>2</sup>(DP)
- BAR** bar(DP)
- PSI** psi(DP)
- KPA** kPa(DP)
- MPA** MPa(DP)
- MBR** mbar(DP)
- MMW** mm WC(DP)
- CMW** cm WC(DP)
- MWC** m WC(DP)
- INW** inch WC(DP)
- MMH** mm Hg(DP)
- CMH** cm Hg(DP)
- INH** inch Hg(DP)
- XXX** Other (Please specify)

### RANGE

Please Specify

### CONNECTION

Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	<b>06</b>	NPS	<b>NS</b>	Male	<b>M</b>
		3/8"	<b>10</b>	NPT	<b>NT</b>	Female	<b>F</b>
		1/2"	<b>15</b>	BSP	<b>BP</b>		
		3/4"	<b>20</b>	BSPT	<b>BT</b>		
		1"	<b>25</b>	JIS-PF	<b>PF</b>		
		M20	<b>M20</b>	JIS-PT	<b>PT</b>		
				Gas	<b>GS</b>		
				R	<b>RR</b>		
		Rp	<b>RP</b>				
		Pitch 1.5	<b>C</b>				

e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

\*Die Cast Aluminium Case applicable for Micro switch with Flame proof version only. Blow out disc shall not be applicable.

Sample Model Code: **IDMSB-Y-150-S4S-S6S-S6S-S4S-T15NTM-(0-2)-BAR-25bar.g-2DT**

# Flow Indicator

# General

## MODEL : DPFI

### Features

- Differential Pressure across Orifice Plate Assembly
- Weld Neck Flange connection
- Unit of measurement direct in terms of flow unit
- Weatherproof to IP – 68

### Specifications

#### Orifice Plate Assembly

<b>Design</b>	Conforms to ISA RP 3.2, DIN 1952, BS 1042, ISO-5167
<b>Types</b>	Square edge concentric, Quadrant edged, Conical entrance, Eccentric, Segmental
<b>Plate material</b>	SS304, SS316, SS316L as standard. Hastelloy-C, Monel, PP, PVC, PTFE coated, etc. can be given on request.
<b>Orifice Bore</b>	In accordance with ISO-5167, BS-1042, ASME MFC 3M, R.W.Miller, L.K.Spink, AGA-3
<b>Tag Plate</b>	In the same material as plate & is welded to orifice plate. Tag plate integral to the Orifice plate (i.e. without welding) can also be offered as a special case.
<b>Vent / Drain</b>	Vent or Drain holes are provided as per customer's requirement. Not drilled for orifice bores smaller than 25.4 mm
<b>Flange Union</b>	Weld neck, Slip on, Threaded, Socket welded with RF or RTJ facing Orifice flanges are in accordance with ANSI B16.36 with minimum flange rating of 300# for sizes up to 8" or male - female flanges in accordance with ANSI B16.5.
<b>Pressure Tappings</b>	Corner tappings are recommended for sizes upto 1 1/2"; Flange taps from 2" to 16"; D – D/2 taps for higher sizes.
<b>Gasket</b>	SS spiral wound + CAF, SS spiral wound + Grafoil, SS spiral wound + PTFE are normally supplied as per process requirement. Other materials available on request. For RTJ flanges, the plate is fixed on the plate holder. The plate holder is in Soft Iron material & acts as a gasket.
<b>Studs / Nuts</b>	ASTM A193 Gr.B7/A-194 Gr.2H as standard, Other material on request.
<b>Jack Screw</b>	Carbon Steel ( C1038 heat treated )



#### Flow Indicator

<b>Dial</b>	100 / 150 mm (depending upon type of DPG), Aluminium, white background, black markings
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	Weatherproof to IP-68 (IS:13947 part I / IEC:60529)
<b>Window</b>	Safety glass (Shatter proof / Toughened glass)
<b>Pointer</b>	Light weight, micrometer adjustable
<b>Sensing</b>	Bellow, Diaphragm or Piston (depending upon type of DPG)
<b>Other wetted parts</b>	SS316 / SS316L / Monel / Hastelloy-C (other on request)
<b>Movement</b>	SS304 / SS316
<b>Connection</b>	1/2" NPT (M) as standard (other on request)
<b>Range</b>	Minimum 0 to 1000 mm WC
<b>Static Pressure</b>	Upto 60 kg/cm <sup>2</sup> g, Higher Static Pressure on request
<b>Accuracy</b>	±1% FSD / ±1.6% FSD / ±2% FSD ascending (depending upon type of DPG)
<b>Blow out disc</b>	Provided (top of the case)
<b>Optional</b>	Flow Indicator with NAMUR / Micro switch also available Three Valve Manifold in SS316, suitable SS tubing and associated instrument fittings

The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Ordering Information

## MODEL CODE FOR FLOW INDICATOR ASSEMBLY \*



**BASIC MODEL CODE**  
DPFI DP type Flow Indicator

**TYPE OF ORIFICE PLATE**  
**OCC** Conical Entrance  
**OEC** Eccentric  
**OQC** Quadrant Edge Concentric  
**OSC** Square Edge Concentric  
**OSE** Segmental

**PLATE MATERIAL**  
**S4S** SS304      **MN4** Monel 400  
**S4L** SS304L    **HCB** Hastelloy-B  
**S6S** SS316      **HCC** Hastelloy-C  
**S6L** SS316L    **TTM** Titanium  
**S6T** SS316Ti   **TAN** Tantalum  
**321** SS321     **PTF** PTFE  
**S6P** SS316+PTFE **PPN** Polypropylene  
**6LP** SS316L+PTFE **XXX** Other (Please Specify)

**PLATE THICKNESS**  
**OP1** 3.18 mm  
**OP2** 6.35 mm  
**OP3** 9.52 mm  
**OP4** 12.70 mm  
**XXX** Other (Please Specify)

**TYPE OF FLANGE**  
**FSO** Slip On  
**FSW** Socket Welded  
**FTH** Threaded  
**FWN** WN Welding Neck

**LINE SIZE / SCHEDULE**

Size	Code	Schedule	Code
1/2"	<b>15</b>	Sch 40	<b>S40</b>
3/4"	<b>20</b>	Sch 80	<b>S80</b>
1"	<b>25</b>	Sch 160	<b>S16</b>
1-1/2"	<b>40</b>	Sch XXS	<b>XXS</b>
2"	<b>50</b>	Other (Please Specify)	<b>XXX</b>
3"	<b>80</b>		

e.g. For 2" (50 NB), Sch 80 Pipe, Model Code: **50S80**

**FLOW RANGE & UNIT**  
Please Specify

**STATIC PRESSURE**  
Please Specify

**UNIT**  
**KSC** kg/cm<sup>2</sup>(DP)  
**BAR** bar(DP)  
**PSI** psi(DP)  
**KPA** kPa(DP)  
**MPA** MPa(DP)  
**MBR** mbar(DP)  
**MMW** mm WC(DP)  
**CMW** cm WC(DP)  
**MWC** m WC(DP)  
**INW** inch WC(DP)  
**MMH** mm Hg(DP)  
**CMH** cm Hg(DP)  
**INH** inch Hg(DP)  
**XXX** Other (Please specify)

**DP RANGE**  
Please Specify

**FLANGE MATERIAL**  
**S4S** SS304      **6LP** SS316L+PTFE  
**S4L** SS304L    **MN4** Monel 400  
**S6S** SS316      **HCB** Hastelloy-B  
**S6L** SS316L    **HCC** Hastelloy-C  
**S6T** SS316Ti   **TTM** Titanium  
**321** SS321     **XXX** Other (Please Specify)  
**S6P** SS316+PTFE

**FLANGE RATING / FACING**

Conn	Code	Rating	Code	Rating	Code	Facing	Code
Flange	F	1/2"	<b>15</b>	150	<b>A</b>	RF	<b>RF</b>
		3/4"	<b>20</b>	300	<b>B</b>	FF	<b>FF</b>
		1"	<b>25</b>	600	<b>C</b>	RTJ	<b>RJ</b>
		1-1/2"	<b>40</b>	900	<b>D</b>	LT	<b>LT</b>
		2"	<b>50</b>	1500	<b>E</b>	LG	<b>LG</b>
		3"	<b>80</b>	2500	<b>F</b>		

e.g. For 40 NB 300# RF flange, Model Code: **40BRF**

\* Model Code for DPG to be specified separately, as per the type of DPG selected (Refer DPG Catalogues)

Sample Model Code: **DPFI-OCC-S6S-OP1-FWN-50S80-F50BRF-S6S-(0-2500)-MMW-25bar.g-(0-100m3/Hr)**



## In-House testing facilities for Pressure & Differential Pressure Gauges

Pressure Gauges and Differential Pressure Gauges are manufactured in technical collaboration with M/s Gauges Bourdon, France. The same are manufactured and tested in accordance with EN : 837 standard. According to the said international standard, following tests are carried out to ensure the quality of Pressure Gauges. We can carry out following tests In-House at our manufacturing plant.

1. Visual Inspection
2. Dimensional Verification
3. Accuracy Test
4. Hysteresis Test
5. Leak Test
6. Influence of Mounting Position
7. Degree of Protection
8. Effects of Mechanical Vibration
9. Effects of Mechanical Shock
10. Endurance test with Steady Pressure
11. Endurance test with Over Pressure
12. Endurance test with Cyclic Pressure
13. Safety Blow-out Test
14. Thermal stability test at rated temperature
15. Temperature effect test
16. Energy release test



# NABL



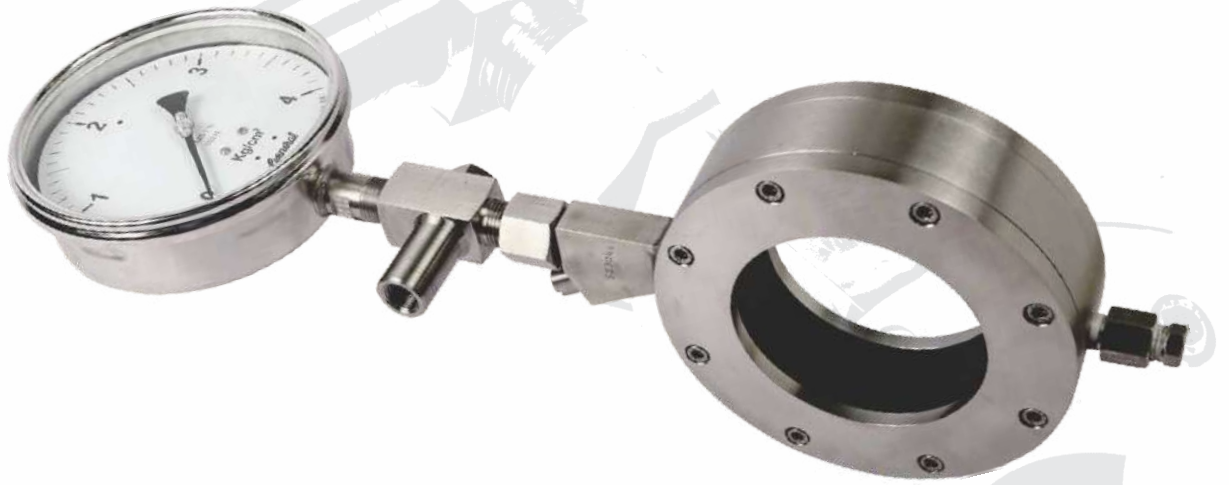
# Pressure Conversion Chart



To convert pressure from one unit to another:

1. Start at column heading with units to convert from.
2. Move down the same column to number "1".
3. Move across this row to the column with units heading you are converting to.
4. Multiply the number in this cell with the value you are converting from to get the new value in converted units.

psi	atms.	inch WC	mm WC	cm WC	oz/in <sup>2</sup>	Kg/cm <sup>2</sup>	inch Hg	mm Hg	cm Hg	mbar	bar	Pa (N/m <sup>2</sup> )	KPa	MPa
1	0.0681	27.71	703.8	70.38	16	0.0704	2.036	51.715	5.17	68.95	0.0689	6,895	6.895	0.0069
14.7	1	407.2	10,343	1,034.30	235.1	1.033	29.92	760	76	1013	1.013	101,325	101.3	0.1013
0.0361	0.00246	1	25.4	2.54	0.5775	0.00254	0.0735	1.866	0.187	2.488	0.00249	248.8	0.249	0.00025
0.001421	0.000097	0.0394	1	0.1	0.0227	0.0001	0.00289	0.0735	0.00735	0.098	0.000098	9.8	0.0098	0.00001
0.01421	0.000967	0.3937	10	1	0.227	0.001	0.0289	0.735	0.0735	0.98	0.00098	98	0.098	0.0001
0.0625	0.00425	1.732	43.986	4.4	1	0.0044	0.1273	3.232	0.3232	4.31	0.00431	431	0.431	0.00043
14.22	0.968	394.1	10001	1000.1	227.6	1	28.96	735.6	73.56	980.7	0.981	98,067	98.07	0.0981
0.4912	0.03342	13.61	345.7	34.57	7.858	0.0345	1	25.4	2.54	33.86	0.0339	3,386	3.386	0.00339
0.01934	0.001316	0.536	13.61	1.361	0.31	0.00136	0.0394	1	0.1	1.333	0.001333	133.3	0.1333	0.000133
0.1934	0.01316	5.358	136.1	13.61	3.1	0.0136	0.394	10	1	13.33	0.01333	1,333	1.333	0.00133
0.0145	0.000987	0.4012	10.21	1.021	0.2321	0.00102	0.0295	0.75	0.075	1	0.001	100	0.1	0.0001
14.504	0.987	401.9	10,210	1021	232.1	1.02	29.53	750	75	1,000	1	100,000	100	0.1
0.000145	0.00001	0.00402	0.102	0.0102	0.00232	0.00001	0.000295	0.0075	0.00075	0.01	0.00001	1	0.001	0.000001
0.14504	0.00987	4.019	102.07	10.207	2.321	0.0102	0.295	7.5	0.75	10	0.01	1,000	1	0.001
145.04	9.869	4019	102,074	10,207	2321	10.2	295.3	7500	750	10,000	10	1,000,000	1,000	1



# DIAPHRAGM SEALS (CHEMICAL SEALS)

## Features

### What is a Diaphragm Seal?

A diaphragm seal is a device in which a flexible membrane (diaphragm) seals and isolates the measuring instrument from the process medium. The instrument side of the diaphragm is filled with appropriate fluid. The pressure exerted by the process fluid on the Diaphragm is hydraulically transmitted through the seal fluid to the pressure sensing element. Diaphragm seal protects the pressure sensor from the harmful and hazardous effect the process fluid.

### Where Diaphragm Seal is essential?

- Corrosive process fluid
- Highly viscous process fluid
- Process fluid having sediments or solid particles
- Process fluid having tendency to solidify, freeze or crystallize at lower temperatures which may block the sensing element.
- Hazardous process fluid



## Specifications

### The generally offered MOC is as follows :

**Non wetted parts:** CS, SS304, SS316

**Diaphragm** : SS316, SS316L, PTFE, SS PTFE coated, Titanium, Hastelloy B, Hastelloy C, Nickel, Monel, Tantalum

**Wetted Parts** : SS316, SS304L, SS316L, SS PTFE coated / lined/ block, Hastelloy B, C.

**Filling Fluids** : Silicone Oil, DC-200 (-45°C to 205°C)  
 DC-704 (0 to 315°C)  
 DC-705 (20 to 350°C, Short term exposure up to 400°C)  
 DC-710 (5 to 345°C)  
 Fluorolube Oil (-40°C to 150°C)  
 Glycerine (5 to 80°C)  
 Halocarbon Oil (-40°C to 235°C)  
 Food Grade Vegetable Oil (5 to 182°C)

### Optional Feature:

- Cooling Tower
- Capillary for Remote mounting of the Pressure Instrument
- Flushing Ring (Spacer Ring) for purging / cleaning the area below the diaphragm without removing the Seal from the process line.
- Stud / Nut & Gasket, for assembling the Diaphragm Seal with Process Flange.

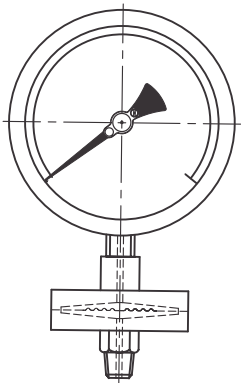
### Different types of Diaphragm Seal offered:

- 1) Sandwich Type (Threaded Connection)
- 2) Sandwich Type (Flanged Connection)
- 3) Threaded Flush Diaphragm Seal (Small / Mini Diaphragm Seal)
- 4) Flush Diaphragm Seal (Flanged Connection)
- 5) Pan Cake type Diaphragm Seal (Flanged Connection only)
- 6) Extended Diaphragm Seal (Flanged Connection only)
- 7) In line flow through type (Flanged or Weld in connection)
- 8) In line flow through Jacketed type (Flanged or Weld in connection)
- 9) In line flow through type with Cylindrical Diaphragm
- 10) In line Isolating Ring type

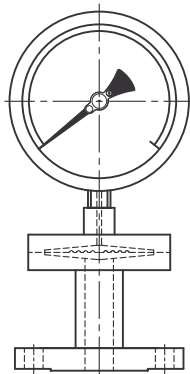
**Note :** Proper selection of diaphragm seal (Type & Material) is important after reviewing the application. Purchaser must confirm the suitability of the MOC suggested.



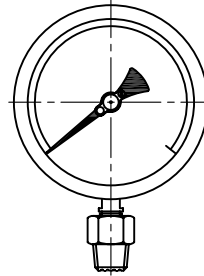
## Sketches of Different types of Diaphragm Seals



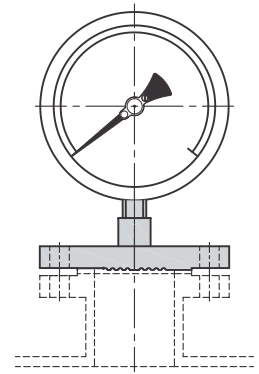
**1) Sandwich Type  
Threaded Connection  
(Welded design shown,  
Bolted design also available)**



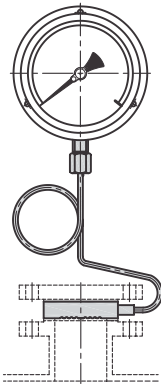
**2) Sandwich Type  
(Flanged Conn. with "I" section)  
(Welded design shown,  
Bolted design also available)**



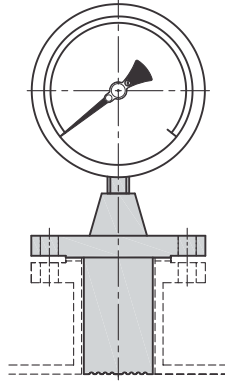
**3) Threaded Flush type  
(Small / Mini Diaphragm Seal)**



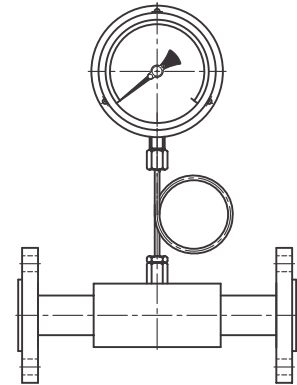
**4) Flush Diaphragm Seal  
(Flanged Connection)**



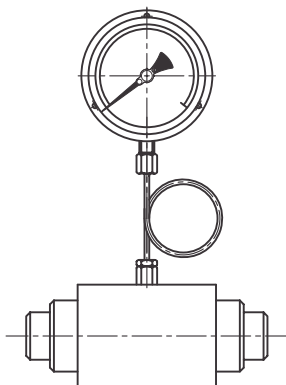
**5) Pan Cake type  
(Flanged Connection only)**



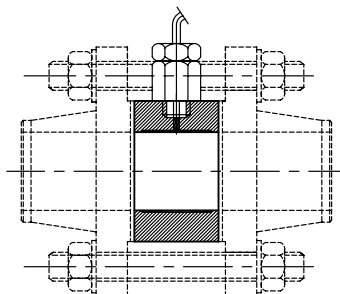
**6) Extended Diaphragm Seal  
(Flanged Connection only)**



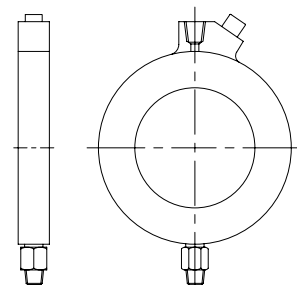
**7) In line flow through type  
(Flanged Conn. shown,  
Weld in conn. also available)**



**8) Jacketed In-Line type  
(Weld in Conn. shown,  
Flange conn. also available)**



**9) In line flow through type  
with Cylindrical Diaphragm**



**10) In line Isolating Ring type**



# Sandwich Type Diaphragm Seal

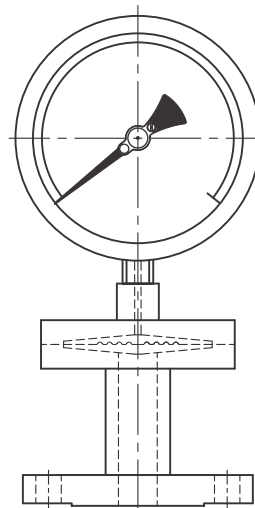
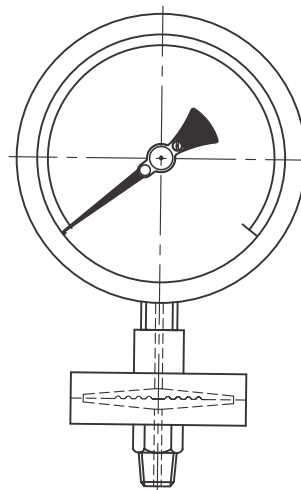
*General*

**MODEL : CSU-SDT / CSU-SDF**

## Features

Sandwich type Diaphragm Seals are the most commonly used Diaphragm Seals. The Diaphragm is sandwiched between Top Chamber & Bottom Chamber / Flange. These are available Threaded as well as Flanged process Connection. For low Pressure Range & Smaller Flange Sizes, "1" section type Diaphragm Seals are used.

Optionally, Flushing connection of 1/4" NPT(F) or 1/2" NPT(F) can be provided which enables the user to flush out / clean the area below the diaphragm without removing the Seal from the process line. For Threaded Process Connection and Flange Connection with "1" section, Flushing connection shall be directly provided on the Bottom Chamber. For bigger Flange sizes, separate Flushing Rings (Spacer Rings) are usually provided.



## Optional Feature

- **Cooling Tower**
- **Capillary** for Remote mounting of the Pressure Instrument
- **Integral Flushing Connection or Flushing Ring (Spacer Ring)** for purging / cleaning the area below the diaphragm without removing the Seal from the process line.
- **Stud / Nut & Gasket** (for Flanged Connection only), for assembling the Diaphragm Seal with Process Flange.

**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Under Technical Collaboration with M/s. Gauges Bourdon, France



# Ordering Information

## SANDWICH DIAPHRAGM SEAL (Threaded or Flanged)

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ] [ ]

### CONNECTION TYPE

**SDT** Sandwich type, Threaded Conn.  
**SDF** Sandwich type, Flanged Conn.

### TOP CHAMBER

**CST** CS  
**S4S** SS304  
**S6S** SS316  
**S6L** SS316L  
**XXX** Other (Please Specify)

### DIAPHRAGM

<b>S4S</b> SS 304	<b>HCC</b> Hastelloy C
<b>S4L</b> SS 304L	<b>TTM</b> Titanium
<b>S6S</b> SS 316	<b>TAN</b> Tantalum
<b>S6L</b> SS 316L	<b>N20</b> Nickel 200
<b>321</b> SS 321	<b>MN4</b> Monel 400
<b>S6P</b> SS 316+PTFE	<b>800</b> Incoloy 800
<b>6LP</b> SS 316L+PTFE	<b>SIL</b> Silver
<b>S6G</b> SS 316+Gold Plated	<b>GLD</b> Gold
<b>6LG</b> SS 316L+Gold Plated	<b>PTF</b> PTFE
<b>HCB</b> Hastelloy B	<b>XXX</b> Other (Please Specify)

### BOTTOM CHAMBER / FLANGE

<b>S4S</b> SS 304	<b>HCC</b> Hastelloy C
<b>S4L</b> SS 304L	<b>TTM</b> Titanium
<b>S6S</b> SS 316	<b>N20</b> Nickel 200
<b>S6L</b> SS 316L	<b>MN4</b> Monel 400
<b>321</b> SS 321	<b>800</b> Incoloy 800
<b>S6P</b> SS 316+PTFE	<b>XXX</b> Other (Please Specify)
<b>6LP</b> SS 316L+PTFE	
<b>PTF</b> PTFE*	
<b>HCB</b> Hastelloy B	

### OPTION

**4AR(\*)** SS316 Capillary, SS304 Armoured  
**4PV(\*)** SS316 Capillary, SS304 Armoured+PVC Covered  
**6AR(\*)** SS316 Capillary, SS316 Armoured  
**6PV(\*)** SS316 Capillary, SS316 Armoured+PVC Covered  
**CLT** Cooling Tower  
**FC4** Integral Flushing Connection, 1/4" NPT(F)  
**FC2** Integral Flushing Connection, 1/2" NPT(F)  
**FR4(\*\*)** Flushing Ring, 1/4" NPT(F)  
**FR2(\*\*)** Flushing Ring, 1/2" NPT(F)  
**GSK** Gasket  
**STN** Stud & Nuts  
**L** Nil  
**XXX** Other (Please specify)

\* Specify the length of Capillary in Meters.

\*\* Specify Ring material (Refer Bottom Chamber / Flange table)

### FILLING FLUID

**DC1** DC-710  
**DC2** Silicone Oil (DC-200)  
**DC4** DC-704  
**DC5** DC-705  
**FLU** Fluorolube  
**GLY** Glycerine  
**HLC** Halocarbon  
**VGO** Food grade oil  
**XXX** Other (Please specify)

### PROCESS CONNECTION

#### THREADED

Conn	Code	Size	Code	Type	Code	MALE / FEMALE	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
		1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
				Rp	RP		
				Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: **T15NTM** For M20x1.5 (F), Code: **TM20CF**

### PROCESS CONNECTION

#### FLANGED

Conn	Code	Size	Code	Rating#	Code	Facing	Code
Flange	F	1/2"	15	150	A	RF	RF
		3/4"	20	300	B	FF	FF
		1"	25	600	C	RTJ	RJ
		1-1/2"	40	900	D	ST	ST
		2"	50	1500	E	SG	SG
		3"	80	2500	F	LT	LT
						LG	LG
						SMF	SM
						SFF	SF
						LMF	LM
				LFF	LF		

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

### \*PTFE Chamber / Flange:

Max Range 0 to 16 kg/cm2.g for Flanged connection

Max Range 0 to 6 kg/cm2.g for Threaded connection (1/2" BSPM / NPTM only)

Sample model Code: **CSU-SDF-S4S-S6S-S6S-F20ARF-DC2-4AR(3)**

## Threaded Flush Diaphragm Seal

### (Small / Mini Diaphragm Seal)

**Model: CSU-FDT**

### Features

Flush Diaphragm Seal with Threaded process connection (also called as Mini Seal or Small Seal, because of its small size) are recommended for highly viscous or crystallizing process fluids. All welded construction provides compact design and light weight. This is most suitable for locations with limited space. With flush Diaphragm, it eliminates any cavities or pockets where the process medium can enter and clog the system.



**SEAL ONLY**



**SEAL WITH PG**

### Optional Feature

- **Cooling Tower**
- **Capillary** for Remote mounting of the Pressure Instrument

**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

# Ordering Information

## FLUSH DIAPHRAGM SEAL (Threaded Connection)

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ]

### CONNECTION TYPE

FDT Flush Diaphragm Threaded Conn.

### DIAPHRAGM

<b>S4S</b> SS 304	<b>HCB</b>	Hastelloy B
<b>S4L</b> SS 304L	<b>HCC</b>	Hastelloy C
<b>S6S</b> SS 316	<b>N20</b>	Nickel 200
<b>S6L</b> SS 316L	<b>MN4</b>	Monel 400
<b>S6T</b> SS 316Ti	<b>XXX</b>	Other (Please Specify)
<b>321</b> SS 321		

### CHAMBER / CONNECTION MOC

<b>S4S</b> SS 304	<b>HCB</b>	Hastelloy B
<b>S4L</b> SS 304L	<b>HCC</b>	Hastelloy C
<b>S6S</b> SS 316	<b>N20</b>	Nickel 200
<b>S6L</b> SS 316L	<b>MN4</b>	Monel 400
<b>S6T</b> SS 316Ti	<b>XXX</b>	Other (Please Specify)
<b>321</b> SS 321		

### OPTION

<b>4AR(*)</b>	SS316 Capillary, SS304 Armoured
<b>4PV(*)</b>	SS316 Capillary, SS304 Armoured + PVC Covered
<b>6AR(*)</b>	SS316 Capillary, SS316 Armoured
<b>6PV(*)</b>	SS316 Capillary, SS316 Armoured + PVC Covered
<b>CLT</b>	Cooling Tower
<b>L</b>	Nil
<b>XXX</b>	Other (Please specify)

### FILLING FLUID

<b>DC1</b>	DC-710
<b>DC2</b>	Silicone Oil (DC-200)
<b>DC4</b>	DC-704
<b>DC5</b>	DC-705
<b>FLU</b>	Fluorolube
<b>GLY</b>	Glycerine
<b>HLC</b>	Halocarbon
<b>VGO</b>	Food grade oil
<b>XXX</b>	Other (Please specify)

### CONNECTION

Conn	Code	SIZE	Code	Type	Code	Male/ Female	Code
Thread	T	3/4"	<b>20</b>	NPS	<b>NS</b>	Male only	<b>M</b>
		1"	<b>25</b>	NPT	<b>NT</b>		
		1-1/2"	<b>40</b>	BSP	<b>BP</b>		
		2"	<b>50</b>	BSPT	<b>BT</b>		
				JIS-PF	<b>PF</b>		
				JIS-PT	<b>PT</b>		
				Gas	<b>GS</b>		

e.g. For 1"NPT(M), Code: **T25NTM**

Sample model Code: **CSU-FDT-S6L-S6L-T50NTM-DC2-L**

# Flush Diaphragm Seal

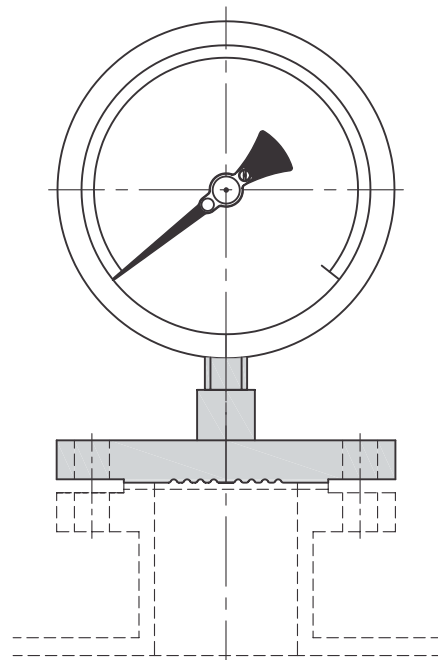
*General*

**MODEL : CSU-FDF**

## Features

Process fluids which are highly viscous or containing solid particles could plug or clog the Diaphragm Seal cavity on the process side of the diaphragm. In order to overcome this difficulty, Flush Diaphragm Seal are used. In this design, since the Diaphragm is directly welded on the Flange Face, there are no cavities or hidden ports where the process fluid can enter and clog the system.

Optionally, Flushing Ring (Spacer Ring) with 1/4" NPT(F) or 1/2" NPT(F) connection can be provided as per the requirement. Flushing Connection enables the user to purge / flush out / clean the area below the diaphragm without removing the Seal from the process line.



## Optional Feature

- **Cooling Tower**
- **Capillary** for Remote mounting of the Pressure Instrument
- **Flushing Ring (Spacer Ring)** for purging / cleaning the area below the diaphragm without removing the Seal from the process line.
- **Stud / Nut & Gasket**, for assembling the Diaphragm Seal with Process Flange.

**Note:** This catalogue indicates the general specifications used for most of the process applications.  
Any other specification not appearing here also can be provided as per customer requirement.

# Ordering Information

## FLUSH DIAPHRAGM SEAL (Flange)

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ]

### CONNECTION TYPE

**FD** Flush Diaphragm, Flanged Conn.

### FLANGE (Non-wetted part)

**CST** CS  
**S4S** SS 304  
**S4L** SS 304L  
**S6S** SS 316  
**S6L** SS 316L  
**321** SS 321  
**TTM** Titanium  
**XXX** Other (Please Specify)

### DIAPHRAGM (wetted part)

**S4S** SS 304    **HCB** Hastelloy B  
**S4L** SS 304L    **HCC** Hastelloy C  
**S6S** SS 316    **TAN** Tantalum  
**S6L** SS 316L    **N20** Nickel 200  
**S6T** SS 316Ti    **MN4** Monel 400  
**321** SS 321    **XXX** Other (Please Specify)  
**TTM** Titanium#

### PROCESS CONNECTION

#### FLANGED

CONN	CODE	SIZE	CODE	RATING	CODE	FACING	CODE
Flange	F	1"	25	150	A	RF	RF
		1-1/2"	40	300	B	RTJ	RJ
		2"	50	600	C		
		3"	80	900	D		
		4"	10	1500	E		
				2500	F		

e.g. For 100 NB 150# RF flange, Model Code: **F10ARF**

# For Titanium Diaphragm, Flange also shall be Titanium only

### OPTION

**4AR(\*)** SS 316 Capillary, SS 304 Armoured  
**4PV(\*)** SS 316 Capillary, SS 304 Armoured + PVC Covered  
**6AR(\*)** SS 316 Capillary, SS 316 Armoured  
**6PV(\*)** SS 316 Capillary, SS 316 Armoured + PVC Covered  
**CLT** Cooling Tower  
**FR4(\*\*)** Flushing Ring, 1/4" NPT(F)  
**FR2(\*\*)** Flushing Ring, 1/2" NPT(F)  
**GSK** Gasket  
**STN** Stud & Nuts  
**L** Nil  
**XXX** Other (Please specify)

\* Specify the length of Capillary in Meters.

\*\* Specify Ring material (Refer Diaphragm table)

### FILLING FLUID

**DC1** DC-710  
**DC2** Silicone Oil (DC-200)  
**DC4** DC-704  
**DC5** DC-705  
**FLU** Fluorolube  
**GLY** Glycerine  
**HLC** Halocarbon  
**VGO** Food grade oil  
**XXX** Other (Please specify)

### Minimum Span of Range

Flange Size	Min Span of Range (RF flange)	Min Span of Range (RTJ flange)
1" NB	6 kg/cm2.g	N.A.
1-1/2" NB	2.5 kg/cm2.g	60 kg/cm2.g
2" NB	1 kg/cm2.g	2.5 kg/cm2.g
3" NB	1 kg/cm2.g	2.5 kg/cm2.g

Sample model Code: **CSU-FDF-CST-S6L-F40BRF-DC4-FR2(S6L)**

# Pan Cake Diaphragm Seal (Flanged Connection)

*General*

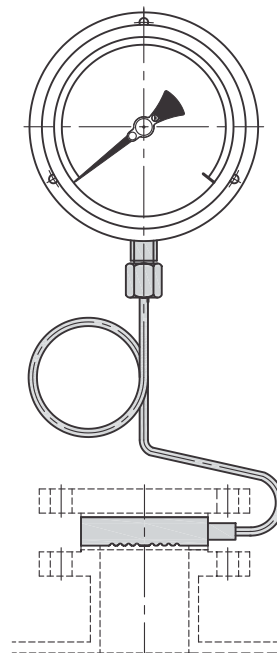
**MODEL : CSU-PCS**

## Features

Pan Cake type Diaphragm Seal is sandwiched between the Instrument Flange (loose back-up flange) and Process (Nozzle) Flange. It is always provided with Capillary for the remote mounting of the Pressure Instrument.

Pan Cake type Diaphragm Seals are ideal for fluids which are viscous or containing solid particles. The Diaphragm is directly welded to the Pan Cake unit and there are no cavities or hidden ports where the process fluid can enter and clog the system.

Optionally, Flushing Ring (Spacer Ring) with 1/4" NPT(F) or 1/2" NPT(F) connection can be provided as per the requirement. Flushing Connection enables the user to purge / flush out / clean the area below the diaphragm without removing the Seal from the process line.



## Optional Feature

- **Flushing Ring (Spacer Ring)** for purging / cleaning the area below the diaphragm without removing the Seal from the process line.
- **Stud / Nut & Gasket** for assembling the Diaphragm Seal with Process Flange.

**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

# Ordering Information

## PAN CAKE DIAPHRAGM SEAL (Flange)

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ] [ ]

### CONNECTION TYPE

**PCS** Pan Cake Diaphragm Seal

### MOUNTING FLANGE (Non-wetted part)

**CST** CS  
**S4S** SS 304  
**S4L** SS 304L  
**S6S** SS 316  
**S6L** SS 316L  
**321** SS 321  
**XXX** Other (Please Specify)

### PAN CAKE UNIT (wetted part)

**S4S** SS 304    **HCB** Hastelloy B  
**S4L** SS 304L    **HCC** Hastelloy C  
**S6S** SS 316    **N20** Nickel 200  
**S6L** SS 316L    **MN4** Monel 400  
**321** SS 321    **XXX** Other (Please Specify)  
**TTM** Titanium

### DIAPHRAGM (wetted part)

**S4S** SS 304    **HCB** Hastelloy B  
**S4L** SS 304L    **HCC** Hastelloy C  
**S6S** SS 316    **N20** Nickel 200  
**S6L** SS 316L    **MN4** Monel 400  
**321** SS 321    **XXX** Other (Please Specify)  
**TTM** Titanium

### PROCESS CONNECTION

#### FLANGED

CONN	CODE	SIZE	CODE	RATING	CODE	FACING	CODE
Flange	F	1-1/2"	40	150	A	RF	RF
		2"	50	300	B		
		3"	80	600	C		
				900	D		
				1500	E		
				2500	F		

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

### OPTION

**4AR(\*)** SS 316 Capillary, SS 304 Armoured  
**4PV(\*)** SS 316 Capillary, SS 304 Armoured+PVC Covered  
**6AR(\*)** SS 316 Capillary, SS 316 Armoured  
**6PV(\*)** SS 316 Capillary, SS 316 Armoured+PVC Covered  
**FR4(\*\*)** Flushing Ring, 1/4" NPT(F)  
**FR2(\*\*)** Flushing Ring, 1/2" NPT(F)  
**GSK** Gasket  
**STN** Stud & Nuts  
**XXX** Other (Please specify)

\* Specify the length of Capillary in Meters.  
 \*\* Specify Ring material (Refer Diaphragm table)

### FILLING FLUID

**DC1** DC-710  
**DC2** Silicone Oil (DC-200)  
**DC4** DC-704  
**DC5** DC-705  
**FLU** Fluorolube  
**GLY** Glycerine  
**HLC** Halocarbon  
**VGO** Food grade oil  
**XXX** Other (Please specify)

### Minimum Span of Range

Flange Size	Min Span of Range (RF flange)
1-1/2" NB	2.5 kg/cm2.g
2" NB	1 kg/cm2.g
3" NB	1 kg/cm2.g

Sample model Code: **CSU-PCS-CST-S6L-S6L-F40BRF-DC4-4AR(5)-FR2(S6L)**



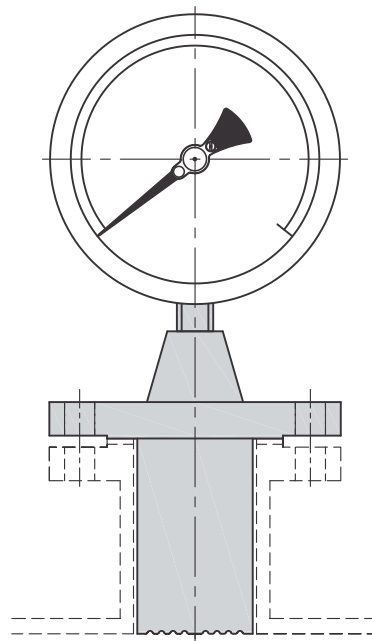
## Extended Diaphragm Seal

*General*

**MODEL : CSU-EDS**

### Features

Extended Diaphragm Seal is mounted on the Nozzle Flange of the Process Pipe line. The diaphragm is extended to the process media through the Nozzle. The length and diameter of the extension is decided as per the process requirement and nozzle diameter. The diaphragm is directly extended through the Nozzle and preventing clogging or other obstructions in the connection nozzle. Extended Diaphragm Seals are Suitable for corrosive, highly viscous, crystallizing or hot pressure media.



### Optional Feature

- **Cooling Tower**
- **Capillary** for Remote mounting of the Pressure Instrument
- **Stud / Nut & Gasket** for assembling the Diaphragm Seal with Process Flange.

**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

# Ordering Information

## EXTENDED DIAPHRAGM SEAL (Flanged Connection)

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ] [ ]

**CONNECTION TYPE**  
EDS Extended Diaphragm Seal

**FLANGE**  
**S6S** SS 316    **HCB** Hastelloy B  
**S6L** SS 316L    **HCC** Hastelloy C  
**321** SS 321    **N20** Nickel 200  
**TTM** Titanium    **MN4** Monel 400  
**N20** Nickel 200    **XXX** Other (Please Specify)

**DIAPHRAGM**  
**S6S** SS 316    **HCB** Hastelloy B  
**S6L** SS 316L    **HCC** Hastelloy C  
**321** SS 321    **N20** Nickel 200  
**TTM** Titanium    **MN4** Monel 400  
**N20** Nickel 200    **XXX** Other (Please Specify)

**EXTENSION UNIT**  
**S6S** SS 316    **HCB** Hastelloy B  
**S6L** SS 316L    **HCC** Hastelloy C  
**321** SS 321    **N20** Nickel 200  
**TTM** Titanium    **MN4** Monel 400  
**N20** Nickel 200    **XXX** Other (Please Specify)

**OPTION**  
**4AR(\*)** SS 316 Capillary, SS 304 Armoured  
**4PV(\*)** SS 316 Capillary, SS 304 Armoured+PVC Covered  
**6AR(\*)** SS 316 Capillary, SS 316 Armoured  
**6PV(\*)** SS 316 Capillary, SS 316 Armoured+PVC Covered  
**CLT** Cooling Tower  
**GSK** Gasket  
**STN** Stud & Nuts  
**L** Nil  
**XXX** Other (Please specify)

\* Specify the length of Capillary in Meters.

**FILLING FLUID**  
**DC1** DC-710  
**DC2** Silicone Oil (DC-200)  
**DC4** DC-704  
**DC5** DC-705  
**FLU** Fluorolube  
**GLY** Glycerine  
**HLC** Halocarbon  
**VGO** Food grade oil  
**XXX** Other (Please specify)

PROCESS CONNECTION							
FLANGED							
CONN	CODE	SIZE	CODE	RATING	CODE	FACING	CODE
Flange	F	1-1/2"	40	150	A	RF	RF
		2"	50	300	B	FF	FF
		3"	80	600	C	RTJ	RJ
		4"	10	900	D		
				1500	E		
				2500	F		

e.g. For 100 NB 150# RF flange, Model Code: **F10ARF**

Sample model Code: **CSU-EDS-S6S-S6S-S6S-F80ARF-DC2-L**

# In-Line Flow Through Type Diaph. Seal

*General*

MODEL : CSU-IFW / IFF / IJW / IJF

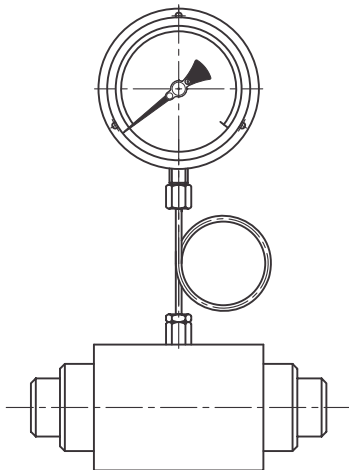
## Features

### In-Line Diaphragm Seal:

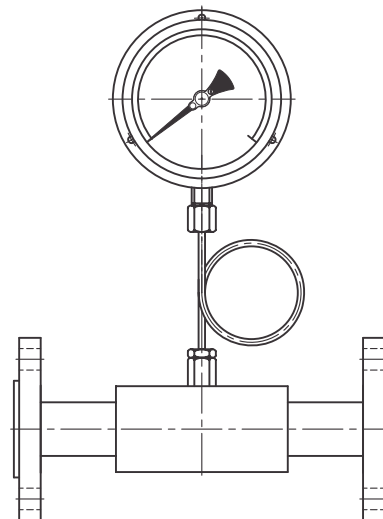
In line Diaphragm Seals are installed directly in the process flow line. These are referred to as "In-line" or "Flow-through" types. This diaphragm seal is so designed that the diaphragm is essentially flush with the flow stream and thus continually washed by the process media. In-line Diaphragm Seals are recommended when the process media is Slurry or a liquid that contains a solid component or viscous.

### Jacketed In-Line Diaphragm Seal:

Jacketed In line Diaphragm Seals are used when the process fluid has a freezing point at normal ambient temperatures. Jacket helps the Diaphragm Seal to externally heat the process fluid by means of Steam or Thermic Fluid. Thus it prevents the process fluid from solidifying and keeps the same at elevated temperature as per the requirement.



Jacketed In-Line Diaphragm Seal (Weld in)



In-Line Diaphragm Seal (Flanged)

## Optional Feature

- **Capillary** for Remote mounting of the Pressure Instrument
- **Stud / Nut & Gasket** for assembling the Diaphragm Seal with Process Flange.

**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

# Ordering Information

## IN LINE DIAPHRAGM SEAL (Flange or Weld in Connection)

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ]

### CONNECTION TYPE

- IFW** In line flow through type, Weld in connection
- IFF** In line flow through type, Flanged connection
- IJW** In line flow through type, Jacketed, Weld in connection
- IJF** In line flow through type, Jacketed Flanged connection

### DIAPHRAGM

- S6S** SS 316
- S6L** SS 316L
- 321** SS 321
- XXX** Other (Please Specify)

### WETTED PARTS

- S6S** SS 316
- S6L** SS 316L
- 321** SS 321
- XXX** Other (Please Specify)

### OPTION

- 4AR(\*)** SS 316 Capillary, SS 304 Armoured
- 4PV(\*)** SS 316 Capillary, SS 304 Armoured+PVC Covered
- 6AR(\*)** SS 316 Capillary, SS 316 Armoured
- 6PV(\*)** SS 316 Capillary, SS 316 Armoured+PVC Covered
- CLT** Cooling Tower
- GSK** Gasket
- STN** Stud & Nuts
- L** Nil
- XXX** Other (Please specify)

\* Specify the length of Capillary in Meters.

### FILLING FLUID

- DC1** DC-710
- DC2** Silicone Oil (DC-200)
- DC4** DC-704
- DC5** DC-705
- FLU** Fluorolube
- GLY** Glycerine
- HLC** Halocarbon
- VGO** Food grade oil
- XXX** Other (Please specify)

### PROCESS CONNECTION

#### WELD IN PIPE SIZE

CONN	CODE	SIZE	CODE	RATING	CODE
Weld in	W	1/2"	15	Sch 40	S40
		3/4"	20	Sch 80	S80
		1"	25	Sch 160	S16
		1-1/2"	40	Sch XXS	XXS
		2"	50	Other (Please Specify)	XXX
		3"	80		

e.g. For 2" (50 NB), Sch 80 Pipe, Model Code: **W50S80**

### PROCESS CONNECTION

#### FLANGED

CONN	CODE	SIZE	CODE	RATING#	CODE	FACING	CODE	
Flange	F	1/2"	15	150	A	RF	RF	
		3/4"	20	300	B	FF	FF	
		1"	25	600	C	RTJ	RJ	
		1-1/2"	40	900	D	ST	ST	
		2"	50	1500	E	SG	SG	
		3"	80	2500	F	LT	LT	
							LG	LG
							SMF	SM
							SFF	SF
							LMF	LM
					LFF	LF		

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

Sample model Code: CSU-IFW-S6S-S6S-W40S80-DC2-4AR(5)

## In-Line Flow Through Type Diaph. Seal

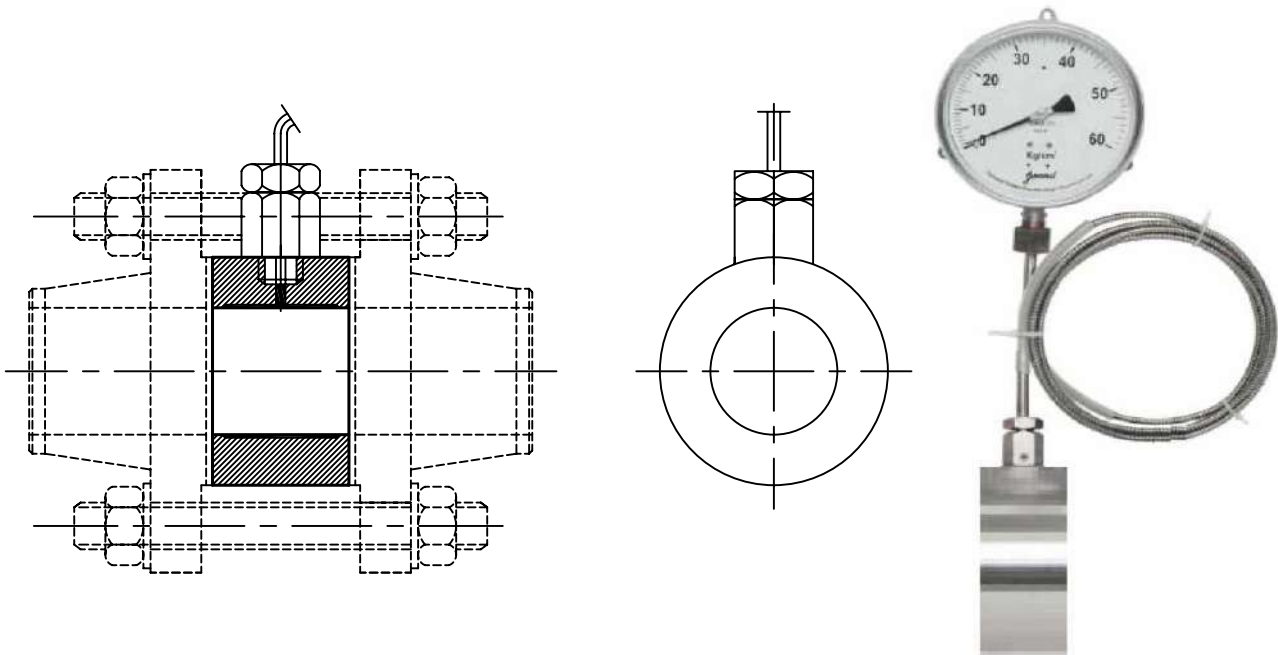
*General*

### Cylindrical Diaphragm seal to be mounted between 2 Flanges MODEL: CSU-IFC

#### Features

Cylindrical type In-Line Diaphragm Seals are installed directly in the process flow line between two flanges. These are also called as Cell type Diaphragm seal. Cylindrical type in-line Diaphragm seal recommended when the process media is Slurry or a liquid that contains a solid component or viscous.

The area behind the diaphragm is sealed with suitable filling fluid. As the process fluid flows through the pipe, it exerts pressure on the cylindrical diaphragm, which is transmitted to the pressure instrument through the filling fluid. The inner diameter of the seal unit is same as that of the process pipe. Thus it is continuously washed / cleaned by the flowing process media, thereby avoid any clogging, which results in accurate reading of the pressure instrument.



#### Optional Features

- Capillary tubing for Remote mounting of the Pressure Instrument
- Cooling Tower



**Note:** This catalogue indicates the general specifications used for most of the process applications.  
Any other specification not appearing here also can be provided as per customer requirement.

# Ordering Information

## In-Line Diaphragm Seal (Cylindrical Diaphragm) to be mounted between 2 Flanges

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ]

### CONNECTION TYPE

**IFC** In line flow through type  
Cylindrical Diaphragm Seal

### BODY MATERIAL

**S6S** SS 316  
**S6L** SS 316L  
**321** SS 321  
**HCC** Hastelloy C  
**MN4** Monel 400  
**XXX** Other (Please Specify)

### CYLINDRICAL DIAPHRAGM

**S6S** SS 316  
**S6L** SS 316L  
**321** SS 321  
**HCC** Hastelloy C  
**MN4** Monel 400  
**XXX** Other (Please Specify)

### OPTION

**4AR(\*)** SS 316 Capillary, SS 304 Armoured  
**4PV(\*)** SS 316 Capillary, SS 304 Armoured+PVC Covered  
**6AR(\*)** SS 316 Capillary, SS 316 Armoured  
**6PV(\*)** SS 316 Capillary, SS 316 Armoured+PVC Covered  
**CLT** Cooling Tower  
**L** Nil  
**XXX** Other (Please specify)

\* Specify the length of Capillary in Meters.

### FILLING FLUID

**DC1** DC-710  
**DC2** Silicone Oil (DC-200)  
**DC4** DC-704  
**DC5** DC-705  
**FLU** Fluorolube  
**GLY** Glycerine  
**HLC** Halocarbon  
**VGO** Food grade oil  
**XXX** Other (Please specify)

### MOUNTING FLANGE DETAILS (Not part of the Diaphragm Seal)

Conn	Code	Size	Code	Rating#	Code	Facing	Code
Flange	F	1"	25	150	A	RF	RF
		1-1/2"	40	300	B	FF	FF
		2"	50	600	C	XXX	Other (Please specify)
		2-1/2"	65	900	D		
		3"	80	1500	E		
		4"	10	2500	F		
		5"	55				
6"	66						

e.g. For 40 NB 300# RF flange, Model Code: F40BRF

Sample model Code: CSU-IFC-S6S-S6S-F40BRF-DC4-4AR(3)

# In-Line Flow Through Type Diaph. Seal



## Isolating Ring - Wafer Type to be mounted between 2 Flanges

**MODEL : CSU-IRW**

### Features

Ring type In-Line Diaphragm Seals are installed directly in the process flow line. These are also referred to as Isolating Rings. Isolating Rings are recommended when the process media is Slurry or a liquid that contains a solid component or viscous.

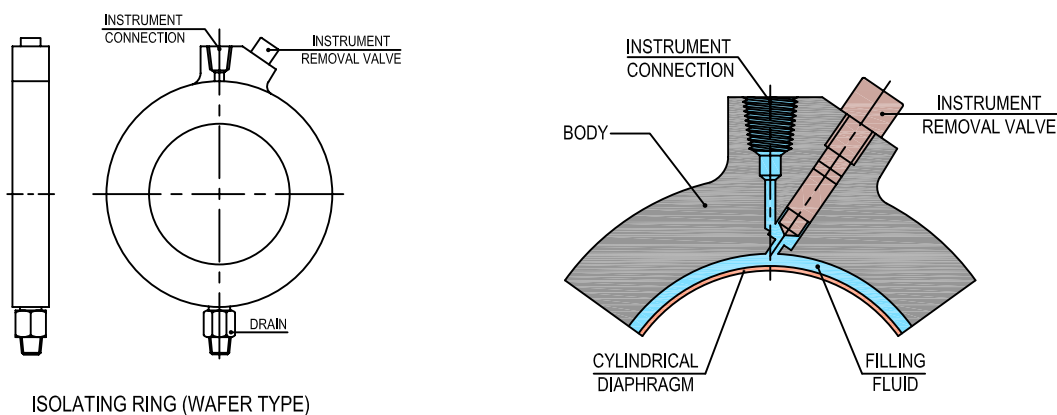
The area behind the flexible cylinder is sealed with suitable filling fluid. As the process fluid flows through the pipe, it exerts pressure on the flexible cylinder (Cylindrical Diaphragm), which is transmitted to the pressure instrument through the filling fluid. The diameter of the inner flexible cylinder is same as the inner diameter of the process pipe. Thus it is continuously washed / cleaned by the flowing process media, thereby avoid any clogging, which results in accurate reading of the pressure instrument.

#### Instrument Removal Valve:

One additional feature offered by us is the Instrument Removal Valve, which facilitates the removal of the Pressure instrument for Calibration or repair without interrupting the flow in processes line.

#### Optional Feature:

Cooling Tower  
Capillary tubing for Remote mounting of the Pressure Instrument



**Note:** This catalogue indicates the general specifications used for most of the process applications.  
Any other specification not appearing here also can be provided as per customer requirement.



# Ordering Information

## Ring type In-Line Diaphragm Seal (Isolating Ring - Wafer type) to be mounted between 2 Flanges

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ] [ ]

### TYPE

**IRW** Isolating Ring Diaphragm Seal, Wafer Type

### SIZE

Code	Size	Code	Size
R050	2"	R250	10"
R080	3"	R300	12"
R100	4"	R350	14"
R125	5"	R400	16"
R150	6"	R450	18"
R200	8"	R500	20"

### BODY MATERIAL

**CST** CS  
**S4S** SS 304  
**S4L** SS 304L  
**S6S** SS 316  
**S6L** SS 316L  
**321** SS 321  
**XXX** Other (Please Specify)

### CYLINDRICAL DIAPHRAGM

**BUN** Buna-N  
**EPD** EPDM  
**FCN** Fluorocarbon  
**NTR** Natural Rubber  
**PTF** PTFE  
**NPR** Neoprene  
**VTN** Viton  
**XXX** Other (Please Specify)

### OPTION

**CLT** Cooling Tower  
**4AR(\*)** SS 316 Capillary, SS 304 Armoured  
**4PV(\*)** SS 316 Capillary, SS 304 Armoured +PVC Covered  
**6AR(\*)** SS 316 Capillary, SS 316 Armoured  
**6PV(\*)** SS 316 Capillary, SS 316 Armoured +PVC Covered  
**L** Nil  
**XXX** Other (Please specify)

### FILLING FLUID

**DC1** DC-710  
**DC2** Silicone Oil (DC-200)  
**DC4** DC-704  
**DC5** DC-705  
**FLU** Fluorolube  
**GLY** Glycerine  
**HLC** Halocarbon  
**VGO** Food grade oil  
**XXX** Other (Please specify)

### SEALING FLANGES

**CST** CS  
**S4S** SS 304  
**S4L** SS 304L  
**S6S** SS 316  
**S6L** SS 316L  
**321** SS 321  
**XXX** Other (Please Specify)

Sample model Code: CSU-IRW-R080-S6S-BUN-S6S-DC2-CLT

# Hygiene Diaphragm Seal



**MODEL : CSU-HYG**

## Features

Hygiene Diaphragm Seals are designed for pressure Instruments in Sanitary application in accordance with International Dairy Federation (IDF) requirements in pharmaceutical, dairy, biotechnology, food & beverages industries.



## Ordering Information

### HYGIENE DIAPHRAGM SEAL

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ]

**BASIC MODEL CODE**  
HYG Hygiene Connection

**DIAPHRAGM**  
S6L SS 316L

**CHAMBER / WETTED PARTS**  
S6L SS 316L

CONNECTION					
Type	Code	Size	Code	Type	Code
Hygiene	H	1"	25	IDF Fitting	IDF
Hygiene	H	1-1/2"	40	SMS Union	SMU
Hygiene	H	2"	50	Tri-clover	TCL

**OPTION**  
**IDC** IDF male coupling with gasket  
**SMC** SMS male coupling with gasket  
**TCC** Tri-clover clamp with gasket  
**L** Nil  
**XXX** Other

**FILLING FLUID**  
**DC2** Silicone Oil DC-200  
**GLY** Glycerine  
**VGO** Food grade oil  
**Others** XXX (Please Specify)


Sample Model Code: CSU-HYG-S6L-S6L-H25TCL-GLY-TCC

e.g. For 1" Tri-clover, Code: **H25TCL**

**Note:** For Pressure Gauges with Hygiene Diaphragm Seal, please refer Pressure Gauge Catalogue, page no 31 to 34

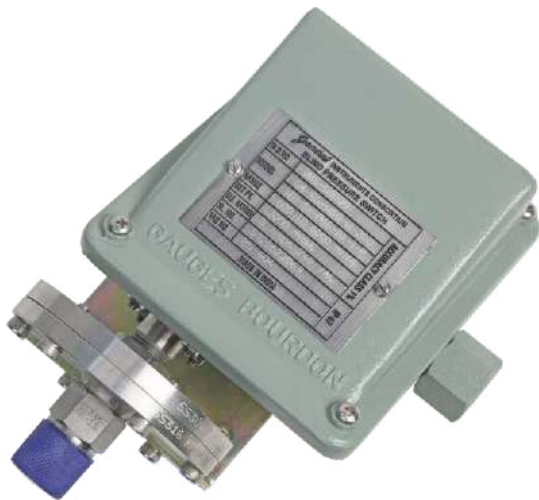
This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Under Technical Collaboration with M/s. Gauges Bourdon, France



**BLIND PRESSURE AND  
DIFFERENTIAL  
PRESSURE SWITCHES**

**GENERAL** has been designing and manufacturing reliable, high quality Pressure Switches and Differential Pressure Switches for accurate control of the process equipments to suit to most of the industrial applications in various process industries including Oil, Gas, Power, Steel, Chemical, Petrochemical, Soap, Cement, Paper, Sugar, pharmaceutical etc. Generally Pressure Switches are available with sensing element of Bellow, Diaphragm & Piston and Differential Pressure Switches with sensing element of Diaphragm. Rigorous and continuous tests are conducted for design and quality conformance.



## Blind Pressure Switches

### Application Area:

#### Safety, Alarming & Tripping of following systems

- Compressors, Pumps
- Turbines, Generators
- Boilers
- Fluid Power/ Hydraulics
- High/ Low Limit level staging functions.

## Blind Differential Pressure Switches

### Application Area:

#### Loss of pressure due to choking

- Across Filters
- Across Blowers
- Across Orifice Plates, Nozzle & Venturi
- Across water steam interface in boilers etc...



The parameters mentioned here are the standard specifications / values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Under Technical Collaboration with M/s. Gauges Bourdon, France



## Salient Features

**Complete Product Range**

Standard and customized special models covering pressure ranges from 1kg/cm<sup>2</sup> (Vacuum) to high pressure 400kg/cm<sup>2</sup>(g)

**Robust Construction**

Robust Construction, Rugged, long life, non critical to vibration, high over range & and proof pressures, excellent resistance to corrosive process media / hostile environments.

**Instrument Quality**

High resolution of Set Points, high repeatability, fixed/adjustable dead band, negligible temperature effect

**Wetted Parts & Process Connection**

Wide selection of Materials depending upon the nature of process fluids. For highly corrosive / viscous fluids, Diaphragm Seals with suitable material & process connection can be provided

**Snap Action Electrical Switching**

Wide selection of UL listed and CSA Certified switching elements for AC and DC service. Optionally Gold Plated Contacts and Environmentally Sealed Switches available. Hermetically Sealed Microswitches can be provided for hazardous and hostile environments

**Field Adjustment**

All Switches are calibrated and set point pre-set at factory. The set point is field adjustable, without any special tools. Tamper proof locking arrangement is provided. For Switches with adjustable dead band, dead band also shall be field adjustable.

**Additional Feature  
Cost Effectiveness**

External Pressure Setting with externally visible Reference Scale (Optional)  
Simple and fast installation without special tools, provides longer service life, periodic service or spare parts not required

**Quality Control  
Testing**

Rigid quality standards are maintained from raw material to finished product. "General" Pressure & Differential Pressure Switches have been tested as per BS-6134: 1991 Standard for all Routine as well as Type tests, certified by Third Party Inspection Agency

## Blind Pressure Switches

### Technical Specifications

<b>Standard</b>	BS-6134:1991
<b>Enclosure</b>	Weatherproof / Weatherproof with CE/ Flameproof IIA, IIB & IIC / Flameproof with ATEX (Refer Table-IV)
<b>Cable Entry</b>	Different types of Cable entries with or without Cable Glands (Refer Table – VI)
<b>Type of Sensor</b>	Bellow / Diaphragm / Piston (Refer Table – II)
<b>Sensor &amp; Wetted Parts Material</b>	SS304 / SS316 / SS316L / Monel / Hastelloy-C (Refer Table – VII)
<b>Process Connection</b>	Threaded Connection as per Table-VIII Flanged Connection through Diaphragm Seal (Refer Page 20 & 22 )
<b>Mounting</b>	Field (Direct) / Surface / Yoke (2" Pipe)
<b>Type of Micro-switch</b>	1SPDT/ 2SPDT Snap Action Microswitch / Gold Plated Contacts/ Environmentally Sealed Microswitches / Hermetically Sealed Microswitches (Refer Table – V). All switches are of potential free contacts.
<b>Switching Differential</b>	Fixed/ Adjustable (Refer Table-I) (For Switching Differential Values refer Table – XI to XVI)
<b>Set Point</b>	To be specified by Customer (Adjustable from 10 to 90% of the Maximum Range, with tamperproof locking arrangement)
<b>Ranges</b>	For different Ranges, Refer Table – III
<b>Over Range</b>	130% FSD as standard / higher on request
<b>Repeatability</b>	+/- 0.5% FSR
<b>Switching Accuracy</b>	+/- 0.5% FSR
<b>Scale Accuracy</b>	+/- 3% FSR
<b>Ambient Temperature</b>	(-)20°C to 70°C
<b>Process Temperature</b>	(-)20°C to 170°C (for SS wetted parts with Teflon Seal)
<b>High Voltage Strength</b>	Withstands 0.5 KV between open contact for 1 Sec & 2 KV between terminals and earth for one minute.
<b>Insulation Resistance</b>	Insulation Resistance > 10 M Ohms at 500VDC
<b>Intrinsic Safety</b>	Switches are classified as Simple Electrical Apparatus as per BS-5345 as they neither generate nor store energy. Hence Pressure switches are suitable to be used in intrinsically safe systems without certification, provided the power source is certified intrinsically Safe.
<b>Accessories</b>	For different Accessories, Refer Table – X



## Blind Differential Pressure Switches

### Technical Specifications

<b>Standard</b>	BS-6134:1991
<b>Enclosure</b>	Weatherproof / Weatherproof with CE/ Flameproof IIA, IIB & IIC / Flameproof with Atex (Refer Table-IV)
<b>Cable Entry</b>	Different types of Cable entries with or without Cable Glands (Refer Table – VI)
<b>Type of Sensor</b>	Diaphragm
<b>Sensor &amp; Wetted Parts Material</b>	SS304 / SS316 / SS316L / Monel / Hastelloy-C (Refer Table – VII)
<b>Process Connection</b>	Threaded Connection as per Table-VIII Flanged Connection through Diaphragm Seal (Refer Page 20 & 22)
<b>Mounting</b>	Field (Direct) / Surface / Yoke (2" Pipe)
<b>Type of Micro-switch</b>	1SPDT/ 2SPDT Snap Action Microswitch / Gold Plated Contacts / Environmentally Sealed Microswitches / Hermetically Sealed Microswitches (Refer Table – V). All switches are of potential free contacts.
<b>Switching Differential</b>	Fixed / Adjustable (Refer Table-I) (For Switching Differential Values refer Table - XVII & XVIII)
<b>Set Point</b>	To be specified by Customer (Adjustable from 10 to 90% of the Maximum Range, with tamperproof locking arrangement)
<b>Ranges</b>	For different Ranges, Refer Table – III
<b>Over Range</b>	130% FSD as standard/ higher on request
<b>Static pressure</b>	Static Standard Pressure values as shown below
<b>Repeatability</b>	+/- 0.5% FSR
<b>Switching Accuracy</b>	+/- 0.5% FSR
<b>Scale Accuracy</b>	+/- 3% FSR
<b>Ambient Temperature</b>	(-)20°C to 70°C
<b>Process Temperature</b>	(-)20°C to 170°C (for SS wetted parts with Teflon Seal)
<b>High Voltage Strength</b>	Withstands 0.5 KV between open contact for 1 Sec & 2 KV between terminals and earth for one minute.
<b>Insulation Resistance</b>	Insulation Resistance > 10 M Ohms at 500VDC
<b>Intrinsic Safety</b>	Switches are classified as Simple Electrical Apparatus as per BS-5345 as they neither generate nor store energy. Hence Pressure switches are suitable to be used in intrinsically safe systems without certification, provided the power source is certified intrinsically Safe.
<b>Accessories</b>	For different Accessories, Refer Table – X

### Static Pressure Values


DP Range	Static Pressure
DP Range up to 1000 mmWC	1 kg/cm <sup>2</sup>
Above 1000 mm WC upto 6000 mm WC	10 kg/cm <sup>2</sup>
Above 6000 mm WC upto 2 kg/cm <sup>2</sup>	20 kg/cm <sup>2</sup>
Above 2 kg/cm <sup>2</sup> upto 10 kg/cm <sup>2</sup>	40 kg/cm <sup>2</sup>

Above shown are the standard values available. Higher Static Pressure on request.

Under Technical Collaboration with M/s. Gauges Bourdon, France



## Common Notes for Blind Pressure & Differential Pressure Switches

1. Weatherproof Enclosure, IP-68 as per IS/IEC-60529:2001
2. Weatherproof Enclosure, IP-68 as per IS/IEC-60529:2001, approved by CE
3. Flameproof Enclosure, Gr. IIA, IIB & IIC T6 as per IS/IEC-60079.1/2007 & Weatherproof to IP 66 as per IS-12063:1987 (IEC-60529), approved by CIMFR/CCOE/PESO
4. Flameproof Enclosure, ATEX approved,  II 2 GD Ex d IIC T6 Gb  $-20^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$   
Ex tb IIIC T72°C Db  $-20^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$
5. Weatherproof enclosure is effective only if all entries and joint faces are properly sealed.
6. Flameproof enclosure is weatherproof only if cover 'O' ring is retained in position; and flameproof only if suitable Flameproof Cable Gland is provided. It is highly recommended to procure Cable Glands along with flameproof instruments to avoid negligence of the same during installation.
7. Switch Accuracy & Repeatability are one and the same for all blind Pressure / Differential pressure switches. A shift of  $\pm 2\%$  may be observed in set point when pressure falls from full static pressure. Settings may also shift with varying temperature.
8. The instrument is calibrated in vertical mounting position. Hence mounting in any other position may cause a minor range shift, especially in low and compound ranges.
9. A pressure switch is a switching device and not a measuring instrument, even though it is provided with a scale to assist setting. Therefore Test Certificates will not specify individual On-Off switching values at different scale readings. Maximum differential obtained alone will be declared, in addition to other specifications.
10. Switching differential (dead band) values furnished are nominal maximum values under test conditions at mid-scale, which may vary with range settings and operating conditions.
11. On-Off setting should not exceed the upper or lower range of the span.
12. Ambient temperature range: All models are suitable for operating within a range of ambient temperature from (-)  $20^{\circ}\text{C}$  to (+)  $70^{\circ}\text{C}$  provided the process fluid does not freeze within this range. Below  $0^{\circ}\text{C}$ , precautions should be taken in humid atmospheres to prevent frost formation inside the instrument from jamming the mechanism. Occasional excursions beyond this range are possible but accuracy might be impaired. The microswitch is the limiting factor which should never exceed the limits (-)  $25^{\circ}\text{C}$  to (+)  $80^{\circ}\text{C}$ .
13. Fluid Temperature: A pressure switch connected to the main pipe is not subjected to the flow and therefore is not fully exposed to the fluid temperature. Use of sufficient length of impulse tubing will greatly reduce excessive heating of the sensing element. For Steam / condensable vapours, a Syphon is recommended between the Process Line & Pressure Switch to reduce excess temperature.
14. Ensure that impulse pipe work applies no stress on sensing element housing and use spanners to hold pressure port / housing when connections are made.
15. It is recommended to select the range of the instrument such that the set value falls between 35% to 65% of the FSR.
16. Scale Markings are for guidance only. Set the correct set value against precision Master Gauge.
17. Pressure & Differential Pressure Switches with dual set points (2 distinct set points) also available on request

## Model Code / Ordering Information

### A) Example for Model Selection:

<b>GF</b>	<b>SS</b>	<b>010K</b>	<b>WA</b>	<b>103</b>	<b>W1E</b>	<b>SX</b>	<b>15NTM</b>	<b>IK</b>	<b>P</b>
Type	Sensor	Range	Type of Enclosure	Type of Microswitch	Cable Entry	Wetted Parts	Process Connection	Mode of Calibration	Accessories

Code	Select from	Description
GF	Table-I	BPS with fixed switching differential
SS	Table-II	BPS with Sensor of Diaphragm
010K	Table-III	Range 1-10 kg/cm <sup>2</sup>
WA	Table-IV	Weather proof, Aluminium Enclosure
103	Table-V	1 SPDT, 15A @230VAC, General purpose snap acting switch
W1E	Table-VI	1/2" NPT Brass Nickel plated DCCG
SX	Table-VII	SS316L Diaphragm with SS316 wetted parts & Teflon seal
15NTM	Table-VIII	1/2" NPT(M) Process Connection
IK	Table-IX	Calibration for increasing pressure in kg/cm <sup>2</sup>
P	Table-X	2" Pipe mounting Bracket

### B) How to select Model Code?

Please select one code from each of the following Tables (I to X), as shown in the above Example.

**Table - I : Type of Instrument & Type of Switching Differential**

DESCRIPTION	CODE
Blind Pressure Switch with Fixed Switching Differential	GF
Blind Pressure Switch with Adjustable Switching Differential	GA
Blind Differential Pressure Switch with Fixed Switching Differential	DF
Blind Differential Pressure Switch with Adjustable Switching Differential	DA

**Table - II : Type of Sensor**

DESCRIPTION	CODE
Pressure Switch Sensor of Bellow	SB
Pressure Switch Sensor of Piston	SP
Pressure Switch Sensor of Diaphragm	SS
Differential Pressure Switch Sensor of Diaphragm	DS



**Pressure Switch with  
Sensor of Diaphragm**



**Pressure Switch  
with Sensor of Bellow**



**Pressure Switch with  
Sensor of Piston**



**Differential Pressure Switch  
with Sensor of Diaphragm**

**Table III : Ranges**

Range	Unit	Code	Range	Unit	Code	Availability in Series
-600 to 0	mmWC	VW06	-60 to 0	mBar	VM06	SS
-1000 to 0	mmWC	VW10	-100 to 0	mBar	VM10	SS
-1600 to 0	mmWC	VW16	-160 to 0	mBar	VM16	SB, SS
-2500 to 0	mmWC	VW25	-250 to 0	mBar	VM25	SB, SS
-4000 to 0	mmWC	VW40	-400 to 0	mBar	VM40	SB, SS
-6000 to 0	mmWC	VW60	-600 to 0	mBar	VM60	SB, SS
-1 to 0	kg/cm <sup>2</sup>	VP1K	-1 to 0	Bar	VP1B	SB, SS
-0.5 to 0.5	kg/cm <sup>2</sup>	C50K	-0.5 to 0.5	Bar	C50B	SB, SS
-1 to 1.5	kg/cm <sup>2</sup>	C15K	-1 to 1.5	Bar	C15B	SB, SS
-1 to 3	kg/cm <sup>2</sup>	C30K	-1 to 3	Bar	C30B	SB, SS
-200 to 200	mmWC	CW02	-20 to 20	mBar	CM02	SS
-400 to 400	mmWC	CW04	-40 to 40	mBar	CM04	SS
-500 to 500	mmWC	CW05	-50 to 50	mBar	CM05	SS
20 to 200	mmWC	PW02	2 to 20	mBar	PM02	DS, SS
30 to 300	mmWC	PW03	3 to 30	mBar	PM03	DS, SS
40 to 400	mmWC	PW04	4 to 40	mBar	PM04	DS, SS
60 to 600	mmWC	PW06	6 to 60	mBar	PM06	DS, SS
100 to 1000	mmWC	PW10	10 to 100	mBar	PM10	DS, SB, SS
160 to 1600	mmWC	PW16	16 to 160	mBar	PM16	DS, SB, SS
200 to 2000	mmWC	PW20	20 to 200	mBar	PM20	DS, SB, SS
250 to 2500	mmWC	PW25	25 to 250	mBar	PM25	DS, SB, SS
400 to 4000	mmWC	PW40	40 to 400	mBar	PM40	DS, SB, SS
600 to 6000	mmWC	PW60	60 to 600	mBar	PM60	DS, SB, SS
0.1 to 1	kg/cm <sup>2</sup>	001K	0.1 to 1	Bar	001B	DS, SB, SS
0.2 to 2	kg/cm <sup>2</sup>	002K	0.2 to 2	Bar	002B	DS, SB, SS
0.3 to 3	kg/cm <sup>2</sup>	003K	0.3 to 3	Bar	003B	DS, SB, SS
0.4 to 4	kg/cm <sup>2</sup>	004K	0.4 to 4	Bar	004B	DS, SB, SS
0.5 to 5	kg/cm <sup>2</sup>	005K	0.5 to 5	Bar	005B	DS, SB, SS
0.6 to 6	kg/cm <sup>2</sup>	006K	0.6 to 6	Bar	006B	DS, SB, SS
0.7 to 7	kg/cm <sup>2</sup>	007K	0.7 to 7	Bar	007B	DS, SB, SS
1 to 10	kg/cm <sup>2</sup>	010K	1 to 10	Bar	010B	DS, SB, SS
1.6 to 16	kg/cm <sup>2</sup>	016K	1.6 to 16	Bar	016B	SB, SS
2 to 20	kg/cm <sup>2</sup>	020K	2 to 20	Bar	020B	SB, SS
2.5 to 25	kg/cm <sup>2</sup>	025K	2.5 to 25	Bar	025B	SB, SS
4 to 40	kg/cm <sup>2</sup>	040K	4 to 40	Bar	040B	SS
6 to 60	kg/cm <sup>2</sup>	060K	6 to 60	Bar	060B	SS
10 to 100	kg/cm <sup>2</sup>	100K	10 to 100	Bar	100B	SP
16 to 160	kg/cm <sup>2</sup>	160K	16 to 160	Bar	160B	SP
20 to 200	kg/cm <sup>2</sup>	200K	20 to 200	Bar	200B	SP
25 to 250	kg/cm <sup>2</sup>	250K	25 to 250	Bar	250B	SP
35 to 350	kg/cm <sup>2</sup>	350K	35 to 350	Bar	350B	SP
40 to 400	kg/cm <sup>2</sup>	400K	40 to 400	Bar	400B	SP

**Table IV : Type of Enclosure**

DESCRIPTION	CODE
Weather proof, Die-Cast Aluminium enclosure, epoxy powder coated, conforming to IP-68 protection, in accordance with IS/IEC-60529:2001	<b>WA</b>
Weather proof, SS304 enclosure, conforming to IP-68 protection, in accordance with IS/IEC-60529:2001	<b>W4</b>
Weather proof, SS316 enclosure, conforming to IP-68 protection, in accordance with IS/IEC-60529:2001	<b>W6</b>
Weather proof, Die-Cast Aluminium enclosure, epoxy powder coated, conforming to IP-68 protection, in accordance with IS/IEC-60529:2001, CE approved	<b>CA</b>
Weather proof, SS304 enclosure, conforming to IP-68 protection, in accordance with IS/IEC-60529:2001, CE approved	<b>C4</b>
Weather proof, SS316 enclosure, conforming to IP-68 protection, in accordance with IS/IEC-60529:2001, CE approved	<b>C6</b>
Flameproof Die Cast Aluminum Enclosure, epoxy powder coated, conforming to Gr. IIA, IIB & IIC T6 in accordance with IS/IEC-60079.1/2007) & Weatherproof to IP 66 in accordance with IS-12063:1987 (IEC-60529), approved by CIMFR/CCOE/PESO	<b>FA</b>
Flameproof Die Cast Aluminum epoxy powder coated Enclosure, Atex approved, $\text{Ex}$ II 2 GD Ex d IIC T6 Gb - $-20^{\circ}\text{C} \leq \text{Ta} \leq +60^{\circ}\text{C}$ , Ex tb IIIC T72°C Db $-20^{\circ}\text{C} \leq \text{Ta} \leq +60^{\circ}\text{C}$	<b>AA</b>



**Pressure Switch with Weather proof Aluminium Enclosure**



**Pressure Switch with Weather proof SS Enclosure**



**Pressure Switch with Flame proof Aluminium Enclosure**



**Differential Pressure Switch with Flame proof Aluminium Enclosure**

**Table V : Type of Micro Switch**

DESCRIPTION	CODE	AVAILABILITY IN TYPE	A.C.RATING		D.C.RATING	
			Current Voltage	Volt -	Current Resistive	Current Inductive
1-SPDT General Purpose	100	GF *	5A-250VAC	220	0.25A	0.03A
2-SPDT General Purpose	200	GF *		110	0.50A	0.07A
1-SPDT General Purpose				24	5.0A	3.00A
1-SPDT Low switching differential	101	GF/GA	15A-250 VAC	220	0.2 A	0.03 A
2-SPDT Low switching differential	201	GF		110	0.4 A	0.03 A
				24	2 A	1 A
1-SPDT-General Purpose	102	GF/DF/GA/DA	5A-250VAC	220	0.25 A	0.1 A
2-SPDT-General Purpose	202	GF/DF/GA/DA		110	0.5 A	0.2 A
				24	8 A	7 A
1-SPDT-General Purpose	103	GF/DF/GA/DA	15A-250VAC	220	0.25 A	0.1 A
2-SPDT-General Purpose	203	GF/DF/GA/DA		110	0.5 A	0.2 A
				24	8 A	7 A
1-SPDT- Very low switching differential	104	GF/DF/GA/DA	10A-250 VAC	220	0.2 A	0.03 A
2-SPDT- Very low switching differential	204	GF/DF		110	0.4 A	0.03 A
				24	2 A	1 A
1-SPDT, Gold Contact	105	GF/ DF/ GA/ DA	1A - 250 VAC	---	---	---
2-SPDT, Gold Contact	205	GF/ DF/ GA/ DA				
1-SPDT-General Purpose	106	GF/ DF/ GA/ DA	10A - 250 VAC	30	6A	6A
2-SPDT-General Purpose	206	GF/ DF/ GA/ DA				
1-SPDT, Environmentally Sealed	108	GF/ DF/ GA/ DA	5A - 250 VAC	30	3	---
2-SPDT, Environmentally Sealed	208	GF/ DF/ GA/ DA				
1-SPDT, Hermetically Sealed, Silver Contacts	109	GF/ DF/ GA/ DA	5A - 250 VAC	30	3	---
2-SPDT, Hermetically Sealed, Silver Contacts	209	GF/ DF/ GA/ DA				
1-SPDT, Hermetically Sealed, Gold Contacts	110	GF/ DF/ GA/ DA	1A - 250 VAC	---	---	---
2-SPDT, Hermetically Sealed, Gold Contacts	210	GF/ DF/ GA/ DA				
Any special requirement	XXX	---	---	---	---	---

NOTE : \* Microswitch Codes 100 & 200 are not available in Piston type Pressure Switches



**Table VI: Type of Cable Entry**

Cable Entry	Single Cable Entry				Double Cable Entries				Double Cable Entries, one plugged			
	W/P	FLP (IIA/ IIB IIC)	W/P CE	FLP Atex	W/P	FLP (IIA/ IIB) IIC)	W/P CE	FLP Atex	W/P	FLP (IIA/ IIB) IIC)	W/P CE	FLP Atex
3/4" ET(F)	W10	F10	C10	-	W20	F20	C20	-	WP0	FP0	CP0	-
3/8" BSP(F)	W11	F11	C11	-	W21	F21	C21	-	WP1	FP1	CP1	-
1/2" BSP(F)	W12	F12	C12	-	W22	F22	C22	-	WP2	FP2	CP2	-
1/2" NPT(F)	W13	F13	C13	A13	W23	F23	C23	A23	WP3	FP3	CP3	AP3
3/4" BSP(F)	W14	F14	C14	-	W24	F24	C24	-	WP4	FP4	CP4	-
3/4" NTP(F)	W15	F15	C15	A15	W25	F25	C25	A25	WP5	FP5	CP5	AP5
3/4"ET, DCCG - SS	W1B	F1B	C1B	-	W2B	F2B	C2B	-	WPB	FPB	CPB	-
1/2"BSP, DCCG - Brass	W1C	F1C	C1C	-	W2C	F2C	C2C	-	WPC	FPC	CPC	-
1/2"BSP, DCCG - SS	W1D	F1D	C1D	-	W2D	F2D	C2D	-	WPD	FPD	CPD	-
1/2"NPT, DCCG - Brass	W1E	F1E	C1E	A1E	W2E	F2E	C2E	A2E	WPE	FPE	CPE	APE
1/2"NPT, DCCG - SS	W1F	F1F	C1F	A1F	W2F	F2F	C2F	A2F	WPF	FPF	CPF	APF
3/4"NPT, DCCG - Brass	W1G	F1G	C1G	A1G	W2G	F2G	C2G	A2G	WPG	FPG	CPG	APG
3/4"NPT, DCCG - SS	W1H	F1H	C1H	A1H	W2H	F2H	C2H	A2H	WPH	FPH	CPH	APH
3/4"BSP, DCCG - Brass	W1J	F1J	C1J	-	W2J	F2J	C2J	-	WPJ	FPJ	CPJ	-
3/4"BSP, DCCG - SS	W1K	F1K	C1K	-	W2K	F2K	C2K	-	WPK	FPK	CPK	-
3/4" ET, SCCG - PVC	PVC	-	-	-	-	-	-	-	-	-	-	-
4 Pin Connector	4PC	-	-	-	-	-	-	-	-	-	-	-
7 Pin Connector	7PC	-	-	-	-	-	-	-	-	-	-	-

**NOTE :**

- a) SCCG: Single Compression Cable Gland
- b) DCCG: Double Compression Cable Gland
- c) Specify "99X" for any special requirement.

**Table VII : Sensor System (Sensor & Wetted Parts)**

DESCRIPTION	CODE
SS316L Sensor with SS304 wetted parts & Teflon seal	SS
SS316L Sensor with SS316 wetted parts & Teflon seal	SX
SS316L Sensor with SS316L wetted parts & Teflon seal	SL
Monel Sensor with Monel wetted parts & Teflon seal	MM
Hastelloy-C Sensor with Hastelloy-C wetted parts & Teflon seal	HC
Any other Material (Please specify the details separately)	XX

**NOTE :**

- a) Materials shown in the above Table are meant for Threaded Process Connection. Any other material shall be provided through Diaphragm Seal (Refer Page No: 18-22 for details of Diaphragm Seal)
- b) Flanged process connection of any material shall be provided through Diaphragm Seal (Refer Page No: 18-22 for details of Diaphragm Seal)
- c) Diaphragm Seals for Differential Pressure Switches shall be provided along with Capillary (suitable for Remote Mounting)
- d) Optionally, Wetted Parts with NACE conformance can be provided (Specify Code "N" in Accessory Column, Refer Table-X)

**Table VIII : Type of Process Connection**

Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	<b>06</b>	NPS	<b>NS</b>	Male	<b>M</b>
		3/8"	<b>10</b>	NPT	<b>NT</b>	Female	<b>F</b>
		1/2"	<b>15</b>	BSP	<b>BP</b>		
		3/4"	<b>20</b>	BSPT	<b>BT</b>		
		1"	<b>25</b>	JIS-PF	<b>PF</b>		
		M20	<b>M20</b>	JIS-PT	<b>PT</b>		
				Gas	<b>GS</b>		
				R	<b>RR</b>		
		Rp	<b>RP</b>				
		Pitch 1.5	<b>C</b>				

e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**  
 For any other connection, mention code -XX

**Table IX : Mode of Calibration / Units**

DESCRIPTION	CODE
Calibration in Increasing Pressure in kg/cm2	IK
Calibration in Decreasing Pressure in kg/cm2	DK
Calibration in Increasing Pressure in Bar	IB
Calibration in Decreasing Pressure in Bar	DB
Calibration in Increasing Pressure in mmWC	IW
Calibration in Decreasing Pressure in mmWC	DW
Calibration in Increasing Pressure in mBar	IM
Calibration in Decreasing Pressure in mBar	DM
Calibration in Increasing Pressure in any other Unit	IX
Calibration in Decreasing Pressure in any other Unit	DX



**Pressure Switch with External Setting**

**Table X : Options**

DESCRIPTION	CODE
Surface Mounting bracket	S
2" Pipe mounting bracket	Y
External Pressure Setting, with Reference Scale	EXT
NACE compliance for Wetted Parts	NAC
Diaphragm Seal (Chemical seal) *	CSU*
Accessories**	ACC**
No accessory	L

\* Model Code for Diaphragm Seal to be mentioned separately (Refer Page 109 to 113)  
 \*\* Model Code for Accessories to be mentioned separately (Refer Catalogue for Accessories)



**Differential Pressure Switch with External Setting**

**Table XI :**  
**Pressure Switch With Diaphragm Sensor - Fixed Differential**

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
VW06	-600 to 0	mmWC	75	65	65	55	---	---
VW10	-1000 to 0	mmWC	75	65	65	55	---	---
VW16	-1600 to 0	mmWC	110	100	110	70	250	350
VW25	-2500 to 0	mmWC	160	140	160	120	300	400
VW40	-4000 to 0	mmWC	270	240	270	200	400	500
VW60	-6000 to 0	mmWC	430	400	430	300	500	600
VP1K/B	-1 to 0	kg/cm <sup>2</sup> / Bar	0.20	0.10	0.20	0.06	0.20	0.30
C50K/B	-0.5 to 0.5	kg/cm <sup>2</sup> / Bar	0.20	0.10	0.20	0.06	0.20	0.30
C15K/B	-1 to 1.5	kg/cm <sup>2</sup> / Bar	0.35	0.20	0.30	0.16	0.30	0.35
C30K/B	-1 to 3	kg/cm <sup>2</sup> / Bar	0.50	0.40	0.40	0.20	0.40	0.50
CW02	-200 to 200	mmWC	30	30	30	30	---	---
CW04	-400 to 400	mmWC	60	60	60	50	---	---
CW05	-500 to 500	mmWC	80	80	80	60	---	---
PW02	20 to 200	mmWC	30	30	30	30	---	---
PW03	30 to 300	mmWC	30	30	30	30	---	---
PW04	40 to 400	mmWC	40	40	40	40	---	---
PW06	60 to 600	mmWC	60	55	60	50	---	---
PW10	100 to 1000	mmWC	70	60	70	50	---	---
PW16	160 to 1600	mmWC	100	90	100	70	250	350
PW20	200 to 2000	mmWC	130	120	130	100	250	350
PW25	250 to 2500	mmWC	150	140	150	120	300	400
PW40	400 to 4000	mmWC	250	220	250	200	400	500
PW60	600 to 6000	mmWC	400	375	400	300	500	600
001K/B	0.1 to 1	kg/cm <sup>2</sup> / Bar	0.15	0.10	0.20	0.08	0.20	0.20
002K/B	0.2 to 2	kg/cm <sup>2</sup> / Bar	0.20	0.15	0.25	0.12	0.25	0.30
003K/B	0.3 to 3	kg/cm <sup>2</sup> / Bar	0.30	0.22	0.35	0.20	0.35	0.40
004K/B	0.4 to 4	kg/cm <sup>2</sup> / Bar	0.40	0.30	0.45	0.25	0.45	0.50
005K/B	0.5 to 5	kg/cm <sup>2</sup> / Bar	0.45	0.40	0.50	0.30	0.50	0.60
006K/B	0.6 to 6	kg/cm <sup>2</sup> / Bar	0.50	0.40	0.55	0.40	0.55	0.80
007K/B	0.7 to 7	kg/cm <sup>2</sup> / Bar	0.60	0.50	0.65	0.40	0.65	0.90
010K/B	1 to 10	kg/cm <sup>2</sup> / Bar	0.70	0.60	0.75	0.50	0.75	1.10
016K/B	1.6 to 16	kg/cm <sup>2</sup> / Bar	1.00	0.90	1.20	0.70	1.20	2.00
020K/B	2 to 20	kg/cm <sup>2</sup> / Bar	2.00	1.80	2.40	1.60	2.40	2.50
025K/B	2.5 to 25	kg/cm <sup>2</sup> / Bar	2.50	2.20	3.00	2.00	3.00	3.00
040K/B	4 to 40	kg/cm <sup>2</sup> / Bar	3.00	2.70	3.50	2.20	3.50	4.50
060K/B	6 to 60	kg/cm <sup>2</sup> / Bar	5.00	4.50	5.50	3.00	5.50	7.50

**NOTE :**

- Above values are applicable for 1SPDT Microswitch. For Switching differential of 2SPDT, multiply above values with 1.5
- Switching differentials are nominal maximum values at mid-point and change along the set points
- For switching Differential Value in mBar, please consider equivalent Range in mmWC, which will be 10 times the Range in mBar (e.g, for Range of 16 to 160 mBar consider the Range of 160 to 1600 mmWC). Take the Switching Differential value in mmWC and divide the same by 10, to get switching differential value in mBar (e.g. If the Switching differential value in the above Table is 150 mmWC, equivalent value in mBar shall be 15)

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**Table XII :**  
**Pressure Switch With Bellow Sensor - Fixed Differential**

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
PW10	100 to 1000	mmWC	56	48	56	40	-	-
PW16	160 to 1600	mmWC	80	72	80	56	200	280
PW20	200 to 2000	mmWC	104	96	104	80	200	280
PW25	250 to 2500	mmWC	120	112	120	96	240	320
PW40	400 to 4000	mmWC	200	176	200	160	320	400
PW60	600 to 6000	mmWC	320	300	320	240	400	480
001K/B	0.1 to 1	kg/cm <sup>2</sup> / Bar	0.12	0.08	0.16	0.06	0.16	0.16
002K/B	0.2 to 2	kg/cm <sup>2</sup> / Bar	0.16	0.12	0.20	0.10	0.20	0.24
003K/B	0.3 to 3	kg/cm <sup>2</sup> / Bar	0.24	0.18	0.28	0.16	0.28	0.32
004K/B	0.4 to 4	kg/cm <sup>2</sup> / Bar	0.32	0.24	0.36	0.20	0.36	0.40
005K/B	0.5 to 5	kg/cm <sup>2</sup> / Bar	0.36	0.32	0.40	0.24	0.40	0.48
006K/B	0.6 to 6	kg/cm <sup>2</sup> / Bar	0.40	0.32	0.44	0.32	0.44	0.64
007K/B	0.7 to 7	kg/cm <sup>2</sup> / Bar	0.48	0.40	0.52	0.32	0.52	0.72
010K/B	1 to 10	kg/cm <sup>2</sup> / Bar	0.56	0.48	0.60	0.40	0.60	0.88
016K/B	1.6 to 16	kg/cm <sup>2</sup> / Bar	0.80	0.72	0.96	0.56	0.96	1.60
020K/B	2 to 20	kg/cm <sup>2</sup> / Bar	1.60	1.44	1.92	1.28	1.92	2.00
025K/B	2.5 to 25	kg/cm <sup>2</sup> / Bar	2.00	1.76	2.40	1.60	2.40	2.40

**Table XIII :**  
**Pressure Switch with Piston sensor - Fixed Differential**

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
100K/B	10 to 100	kg/cm <sup>2</sup> / Bar	---	7	8	6	8	10
160K/B	16 to 160	kg/cm <sup>2</sup> / Bar	---	8	9	7	9	16
200K/B	20 to 200	kg/cm <sup>2</sup> / Bar	---	9	11	8	12	20
250K/B	25 to 250	kg/cm <sup>2</sup> / Bar	---	10	12	9	14	25
350K/B	35 to 350	kg/cm <sup>2</sup> / Bar	---	16	20	12	22	35
400K/B	40 to 400	kg/cm <sup>2</sup> / Bar	---	20	25	16	27	40

**NOTE :**

- Above values are applicable for 1SPDT Microswitch. For Switching differential of 2SPDT, multiply above values with 1.5
- Switching differentials are nominal maximum values at mid-point and change along the set points
- For switching Differential Value in mBar, please consider equivalent Range in mmWC, which will be 10 times the Range in mBar (e.g, for Range of 16 to 160 mBar consider the Range of 160 to 1600 mmWC). Take the Switching Differential value in mmWC and divide the same by 10, to get switching differential value in mBar (e.g. If the Switching differential value in the above Table is 150 mmWC, equivalent value in mBar shall be 15)

**Table XIV :**  
**Pressure Switch With Diaphragm Sensor - Adjustable Differential**

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
C15K/B	-1 to 1.5	kg/cm <sup>2</sup> / Bar	---	0.20 to 0.75	0.30 to 0.75	0.16 to 0.50	0.30 to 0.75	0.35 to 0.75
C30K/B	-1 to 3	kg/cm <sup>2</sup> / Bar	---	0.40 to 1.20	0.40 to 1.20	0.20 to 0.80	0.40 to 1.20	0.50 to 1.20
PW10	100 to 1000	mmWC	---	60 to 250	70 to 300	---	---	---
PW16	160 to 1600	mmWC	---	90 to 400	100 to 480	70 to 320	250 to 480	350 to 480
PW20	200 to 2000	mmWC	---	120 to 500	130 to 600	100 to 400	250 to 600	350 to 600
PW25	250 to 2500	mmWC	---	140 to 625	150 to 750	120 to 500	300 to 750	400 to 750
PW40	400 to 4000	mmWC	---	220 to 1000	250 to 1200	200 to 800	400 to 1200	500 to 1200
PW60	600 to 6000	mmWC	---	375 to 1500	400 to 1800	300 to 1200	500 to 1800	600 to 1800
001K/B	0.1 to 1	kg/cm <sup>2</sup> / Bar	---	0.10 to 0.25	0.20 to 0.30	0.08 to 0.20	0.20 to 0.35	0.20 to 0.35
002K/B	0.2 to 2	kg/cm <sup>2</sup> / Bar	---	0.15 to 0.50	0.25 to 0.60	0.12 to 0.40	0.25 to 0.60	0.30 to 0.60
003K/B	0.3 to 3	kg/cm <sup>2</sup> / Bar	---	0.22 to 0.75	0.35 to 0.90	0.20 to 0.60	0.35 to 0.90	0.40 to 0.90
004K/B	0.4 to 4	kg/cm <sup>2</sup> / Bar	---	0.30 to 1.00	0.45 to 1.20	0.25 to 0.80	0.45 to 1.20	0.50 to 1.20
005K/B	0.5 to 5	kg/cm <sup>2</sup> / Bar	---	0.40 to 1.25	0.50 to 1.50	0.30 to 1.00	0.50 to 1.50	0.60 to 1.50
006K/B	0.6 to 6	kg/cm <sup>2</sup> / Bar	---	0.40 to 1.50	0.55 to 1.80	0.40 to 1.20	0.55 to 1.80	0.80 to 1.80
007K/B	0.7 to 7	kg/cm <sup>2</sup> / Bar	---	0.50 to 1.75	0.65 to 2.10	0.40 to 1.40	0.65 to 2.10	0.90 to 2.10
010K/B	1 to 10	kg/cm <sup>2</sup> / Bar	---	0.60 to 2.50	0.75 to 3.00	0.50 to 2.00	0.75 to 3.00	1.10 to 3.00
016K/B	1.6 to 16	kg/cm <sup>2</sup> / Bar	---	0.9 to 4.0	1.2 to 4.8	0.7 to 3.2	1.2 to 4.8	2.0 to 4.8
020K/B	2 to 20	kg/cm <sup>2</sup> / Bar	---	1.8 to 5.0	2.4 to 6.0	1.6 to 4.0	2.4 to 6.0	2.5 to 6.0
025K/B	2.5 to 25	kg/cm <sup>2</sup> / Bar	---	2.2 to 6.0	3.0 to 7.5	2.0 to 5.0	3.0 to 7.5	3.0 to 7.5
040K/B	4 to 40	kg/cm <sup>2</sup> / Bar	---	2.7 to 10.0	3.5 to 12.0	2.2 to 8.0	3.5 to 12.0	4.5 to 12.0
060K/B	6 to 60	kg/cm <sup>2</sup> / Bar	---	4.5 to 15.0	5.5 to 18.0	3.0 to 12.0	5.5 to 18.0	7.5 to 18.0

**NOTE :**

1. Above values are applicable for 1SPDT Microswitch. For Switching differential of 2SPDT, multiply above values with 1.5
2. Switching differentials are nominal maximum values at mid-point and change along the set points
3. Microswitch Codes 201 & 204 are not available with Adjustable Differential
4. For Compound Ranges, Switching differential adjustment shall be applicable in pressure side only (not in vacuum side)
5. For switching Differential Value in mBar, please consider equivalent Range in mmWC, which will be 10 times the Range in mBar (e.g. for Range of 16 to 160 mBar consider the Range of 160 to 1600 mmWC). Take the Switching Differential value in mmWC and divide the same by 10, to get switching differential value in mBar (e.g. If the Switching differential value in the above Table is 150 mmWC, equivalent value in mBar shall be 15)

**Table XV :**  
**Pressure Switch With Bellow Sensor - Adjustable Differential**

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
PW10	100 to 1000	mmWC	---	48 to 250	56 to 300	---	---	---
PW16	160 to 1600	mmWC	---	72 to 400	80 to 480	56 to 320	200 to 480	280 to 480
PW20	200 to 2000	mmWC	---	96 to 500	104 to 600	80 to 400	200 to 600	280 to 600
PW25	250 to 2500	mmWC	---	112 to 625	120 to 750	96 to 500	240 to 750	320 to 750
PW40	400 to 4000	mmWC	---	176 to 1000	200 to 1200	160 to 800	320 to 1200	400 to 1200
PW60	600 to 6000	mmWC	---	300 to 1500	320 to 1800	240 to 1200	400 to 1800	480 to 1800
001K/B	0.1 to 1	kg/cm <sup>2</sup> / Bar	---	0.08 to 0.25	0.16 to 0.30	0.06 to 0.20	0.16 to 0.35	0.16 to 0.35
002K/B	0.2 to 2	kg/cm <sup>2</sup> / Bar	---	0.12 to 0.50	0.20 to 0.60	0.10 to 0.40	0.20 to 0.60	0.24 to 0.60
003K/B	0.3 to 3	kg/cm <sup>2</sup> / Bar	---	0.18 to 0.75	0.28 to 0.90	0.16 to 0.60	0.28 to 0.90	0.32 to 0.90
004K/B	0.4 to 4	kg/cm <sup>2</sup> / Bar	---	0.24 to 1.00	0.36 to 1.20	0.20 to 0.80	0.36 to 1.20	0.40 to 1.20
005K/B	0.5 to 5	kg/cm <sup>2</sup> / Bar	---	0.32 to 1.25	0.40 to 1.50	0.24 to 1.00	0.40 to 1.50	0.48 to 1.50
006K/B	0.6 to 6	kg/cm <sup>2</sup> / Bar	---	0.32 to 1.50	0.44 to 1.80	0.32 to 1.20	0.44 to 1.80	0.64 to 1.80
007K/B	0.7 to 7	kg/cm <sup>2</sup> / Bar	---	0.40 to 1.75	0.52 to 2.10	0.32 to 1.40	0.52 to 2.10	0.72 to 2.10
010K/B	1 to 10	kg/cm <sup>2</sup> / Bar	---	0.48 to 2.50	0.60 to 3.00	0.40 to 2.00	0.60 to 3.00	0.88 to 3.00
016K/B	1.6 to 16	kg/cm <sup>2</sup> / Bar	---	0.72 to 4.00	0.96 to 4.80	0.56 to 3.20	0.96 to 4.80	1.60 to 4.80
020K/B	2 to 20	kg/cm <sup>2</sup> / Bar	---	1.44 to 5.00	1.44 to 6.00	1.28 to 4.00	1.92 to 6.00	2.50 to 6.00
025K/B	2.5 to 25	kg/cm <sup>2</sup> / Bar	---	1.76 to 6.00	1.76 to 7.50	1.60 to 5.00	2.40 to 7.50	3.00 to 7.50

**Table XVI :**  
**Pressure Switch with Piston sensor - Adjustable Differential**

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
100K/B	10 to 100	kg/cm <sup>2</sup> / Bar	---	7 to 25	8 to 30	6 to 20	8 to 30	10 to 30
160K/B	16 to 160	kg/cm <sup>2</sup> / Bar	---	8 to 40	9 to 50	7 to 32	9 to 50	16 to 50
200K/B	20 to 200	kg/cm <sup>2</sup> / Bar	---	9 to 50	11 to 60	8 to 40	12 to 60	20 to 60
250K/B	25 to 250	kg/cm <sup>2</sup> / Bar	---	10 to 65	12 to 75	9 to 50	14 to 75	25 to 75
350K/B	35 to 350	kg/cm <sup>2</sup> / Bar	---	16 to 85	20 to 105	12 to 70	22 to 105	35 to 105
400K/B	40 to 400	kg/cm <sup>2</sup> / Bar	---	20 to 100	25 to 120	16 to 80	27 to 120	40 to 120

**NOTE :**

1. Above values are applicable for 1SPDT Microswitch. For Switching differential of 2SPDT, multiply above values with 1.5
2. Switching differentials are nominal maximum values at mid-point and change along the set points
3. Microswitch Codes 201 & 204 are not available with Adjustable Differential
4. For switching Differential Value in mBar, please consider equivalent Range in mmWC, which will be 10 times the Range in mBar (e.g. for Range of 16 to 160 mBar consider the Range of 160 to 1600 mmWC). Take the Switching Differential value in mmWC and divide the same by 10, to get switching differential value in mBar (e.g. If the Switching differential value in the above Table is 150 mmWC, equivalent value in mBar shall be 15)



**Table XVII :**  
**Differential Pressure Switch With Diaphragm Sensor - Fixed Differential**

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
PW02	20 to 200	mmWC	---	---	40	40	---	---
PW03	30 to 300	mmWC	---	---	60	60	---	---
PW04	40 to 400	mmWC	---	---	80	80	---	---
PW06	60 to 600	mmWC	---	---	100	100	---	---
PW10	100 to 1000	mmWC	---	---	150	150	---	---
PW16	160 to 1600	mmWC	---	---	250	230	250	320
PW20	200 to 2000	mmWC	---	---	350	330	350	350
PW25	250 to 2500	mmWC	---	---	400	375	400	400
PW40	400 to 4000	mmWC	---	---	450	425	450	500
PW60	600 to 6000	mmWC	---	---	500	470	500	600
001K/B	0.1 to 1	kg/cm <sup>2</sup> / Bar	---	---	0.12	0.10	0.12	0.20
002K/B	0.2 to 2	kg/cm <sup>2</sup> / Bar	---	---	0.25	0.20	0.25	0.30
003K/B	0.3 to 3	kg/cm <sup>2</sup> / Bar	---	---	0.35	0.30	0.35	0.40
004K/B	0.4 to 4	kg/cm <sup>2</sup> / Bar	---	---	0.50	0.40	0.50	0.60
005K/B	0.5 to 5	kg/cm <sup>2</sup> / Bar	---	---	0.60	0.50	0.60	0.70
006K/B	0.6 to 6	kg/cm <sup>2</sup> / Bar	---	---	0.70	0.60	0.70	0.80
007K/B	0.7 to 7	kg/cm <sup>2</sup> / Bar	---	---	0.80	0.70	0.80	1.00
010K/B	1 to 10	kg/cm <sup>2</sup> / Bar	---	---	1.35	1.00	1.35	1.50

**Table XVIII :**  
**Differential Pressure Switch with Diaphragm sensor - Adjustable Differential**

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
PW16	160 to 1600	mmWC	---	---	250 to 480	230 to 400	250 to 480	320 to 500
PW20	200 to 2000	mmWC	---	---	350 to 600	330 to 500	350 to 600	350 to 650
PW25	250 to 2500	mmWC	---	---	400 to 750	375 to 625	400 to 750	400 to 800
PW40	400 to 4000	mmWC	---	---	450 to 1200	425 to 1000	450 to 1200	500 to 1250
PW60	600 to 6000	mmWC	---	---	500 to 1800	470 to 1500	500 to 1800	600 to 1900
001K/B	0.1 to 1	kg/cm <sup>2</sup> / Bar	---	---	0.12 to 0.30	0.10 to 0.25	0.12 to 0.30	0.20 to 0.32
002K/B	0.2 to 2	kg/cm <sup>2</sup> / Bar	---	---	0.25 to 0.60	0.20 to 0.60	0.25 to 0.60	0.30 to 0.65
003K/B	0.3 to 3	kg/cm <sup>2</sup> / Bar	---	---	0.35 to 0.90	0.30 to 0.75	0.35 to 0.90	0.40 to 1.00
004K/B	0.4 to 4	kg/cm <sup>2</sup> / Bar	---	---	0.50 to 1.20	0.40 to 1.00	0.50 to 1.20	0.60 to 1.25
005K/B	0.5 to 5	kg/cm <sup>2</sup> / Bar	---	---	0.60 to 1.50	0.50 to 1.25	0.60 to 1.50	0.70 to 1.60
006K/B	0.6 to 6	kg/cm <sup>2</sup> / Bar	---	---	0.70 to 1.80	0.60 to 1.50	0.70 to 1.80	0.80 to 1.90
007K/B	0.7 to 7	kg/cm <sup>2</sup> / Bar	---	---	0.80 to 2.10	0.70 to 1.75	0.80 to 2.10	1.00 to 2.25
010K/B	1 to 10	kg/cm <sup>2</sup> / Bar	---	---	1.35 to 3.00	1.00 to 2.50	1.35 to 3.00	1.50 to 3.25

**NOTE :**

- Above values are applicable for 1SPDT Microswitch. For Switching differential of 2SPDT, multiply above values with 1.5
- Switching differentials are nominal maximum values at mid-point and change along the set points
- Microswitch Code 204 is not available with Adjustable Differential
- For switching Differential Value in mBar, please consider equivalent Range in mmWC, which will be 10 times the Range in mBar (e.g, for Range of 16 to 160 mBar consider the Range of 160 to 1600 mmWC). Take the Switching Differential value in mmWC and divide the same by 10, to get switching differential value in mBar (e.g. If the Switching differential value in the above Table is 150 mmWC, equivalent value in mBar shall be 15)

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# Chemical / Diaphragm Seal Unit

*General*

**Model : CSU**

## Features

### What is a Diaphragm Seal?

A diaphragm seal is a device in which a flexible membrane (diaphragm) seals and isolates the measuring instrument from the process medium. The instrument side of the diaphragm is filled with appropriate fluid. The pressure exerted by the process fluid on the Diaphragm is hydraulically transmitted through the seal fluid to the pressure sensing element. Diaphragm seal protects the pressure sensor from the harmful and hazardous effect the process fluid.

### Where Diaphragm Seal is essential?

- Corrosive process fluid
- Highly viscous process fluid
- Process fluid having sediments or solid particles
- Process fluid having tendency to solidify, freeze or crystallize at lower temperatures which may block the sensing element.
- Hazardous process fluid



## Specifications

### The generally offered MOC is as follows :

- Non wetted parts:** CS, SS304, SS316  
**Diaphragm** : SS316, SS316L, PTFE, SS PTFE coated, Titanium, Hastelloy B, Hastelloy C, Nickel, Monel, Tantalum  
**Wetted Parts** : SS316, SS304L, SS316L, SS PTFE coated / lined/ block, Hastelloy B, C.  
**Filling Fluids** : Silicone Oil, DC-200 (-45°C to 205°C)  
DC-704 (0 to 315°C)  
DC-705 (20 to 350°C, Short term exposure up to 400°C)  
DC-710 (5 to 345°C)  
Fluorolube Oil (-40°C to 150°C)  
Glycerine (5 to 80°C)  
Halocarbon Oil (-40°C to 235°C)  
Food Grade Vegetable Oil (5 to 182°C)

### Optional Feature:

- Capillary for Remote mounting of the Pressure Instrument
- Flushing Ring (Spacer Ring) for purging / cleaning the area below the diaphragm without removing the Seal from the process line.
- Stud / Nut & Gasket, for assembling the Diaphragm Seal with Process Flange.

### Different types of Diaphragm Seal offered:

- 1) Sandwich Type with Threaded Process Connection
- 2) Sandwich Type with Flanged Process Connection
- 3) Flush Type with Flanged Process Connection

Above are the most commonly used Diaphragm Seals. Special designs like Pan Cake, In-line (Flow through type) with Flanged / Weld-In Connection, Extended Diaphragm Seal etc can be provided as per customer requirement

### Note :

Proper selection of diaphragm seal (Type & Material) is important after reviewing the application. Purchaser must confirm the suitability of the MOC suggested.



The recommendations made in this catalogue are to be used as intended guide. No guarantee of material can be undertaken since other factors may affect the performance. We reserve the right to change the specifications mentioned in this catalogue without any notice as improvements & development is a continuous process at "General". Responsibility of typographical errors is specifically disclaimed.

# Sandwich Type Diaphragm Seal

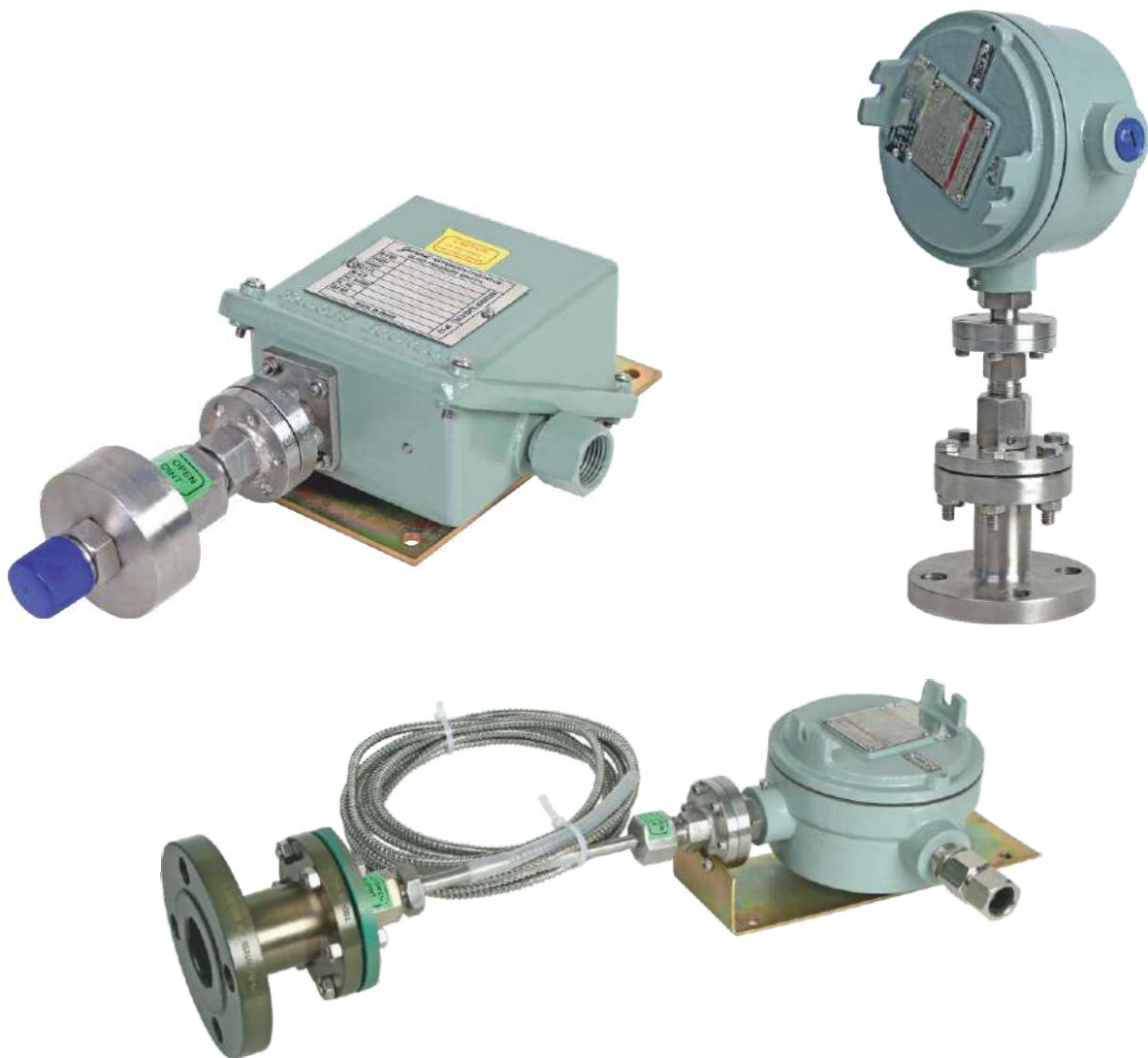
*General*

**Model : CSU**

## Features

Sandwich type Diaphragm Seals are the most commonly used Diaphragm Seals. The Diaphragm is sandwiched between Top Chamber & Bottom Chamber / Flange. These are available Threaded as well as Flanged process Connection. For low Pressure Range & Smaller Flange Sizes, "I" section type Diaphragm Seals are used.

Optionally, Flushing connection of 1/4" NPT(F) or 1/2" NPT(F) can be provided which enables the user to flush out / clean the area below the diaphragm without removing the Seal from the process line. For Threaded Process Connection and Flange Connection with "I" section, Flushing connection shall be directly provided on the Bottom Chamber. For bigger Flange sizes, separate Flushing Rings (Spacer Rings) are usually provided.



## Optional Feature

- **Capillary** for Remote mounting of the Pressure Instrument
- **Integral Flushing Connection or Flushing Ring (Spacer Ring)** for purging / cleaning the area below the diaphragm without removing the Seal from the process line.
- **Stud / Nut & Gasket** (for Flanged Connection only), for assembling the Diaphragm Seal with Process Flange.

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# Ordering Information

## SANDWICH DIAPHRAGM SEAL (Threaded or Flanged)

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ] [ ]

### CONNECTION TYPE

**SDT** Sandwich type, Threaded Conn.  
**SDF** Sandwich type, Flanged Conn.

### TOP CHAMBER

**CST** CS  
**S4S** SS304  
**S6S** SS316  
**S6L** SS316L  
**XXX** Other (Please Specify)

### DIAPHRAGM

<b>S4S</b> SS 304	<b>HCC</b> Hastelloy C
<b>S4L</b> SS 304L	<b>TTM</b> Titanium
<b>S6S</b> SS 316	<b>TAN</b> Tantalum
<b>S6L</b> SS 316L	<b>N20</b> Nickel 200
<b>321</b> SS 321	<b>MN4</b> Monel 400
<b>S6P</b> SS 316+PTFE	<b>800</b> Incoloy 800
<b>6LP</b> SS 316L+PTFE	<b>SIL</b> Silver
<b>S6G</b> SS 316+Gold Plated	<b>GLD</b> Gold
<b>6LG</b> SS 316L+Gold Plated	<b>XXX</b> Other (Please Specify)
<b>HCB</b> Hastelloy B	

### BOTTOM CHAMBER / FLANGE

<b>S4S</b> SS 304	<b>HCC</b> Hastelloy C
<b>S4L</b> SS 304L	<b>TTM</b> Titanium
<b>S6S</b> SS 316	<b>N20</b> Nickel 200
<b>S6L</b> SS 316L	<b>MN4</b> Monel 400
<b>321</b> SS 321	<b>800</b> Incoloy 800
<b>S6P</b> SS 316+PTFE	<b>XXX</b> Other (Please Specify)
<b>6LP</b> SS 316L+PTFE	
<b>HCB</b> Hastelloy B	

### OPTION

**4AR(\*)** SS316 Capillary, SS304 Armoured  
**4PV(\*)** SS316 Capillary, SS304 Armoured+PVC Covered  
**6AR(\*)** SS316 Capillary, SS316 Armoured  
**6PV(\*)** SS316 Capillary, SS316 Armoured+PVC Covered  
**CLT** Cooling Tower  
**FC4** Integral Flushing Connection, 1/4" NPT(F)  
**FC2** Integral Flushing Connection, 1/2" NPT(F)  
**FR4(\*\*)** Flushing Ring, 1/4" NPT(F)  
**FR2(\*\*)** Flushing Ring, 1/2" NPT(F)  
**GSK** Gasket  
**STN** Stud & Nuts  
**L** Nil  
**XXX** Other (Please specify)

\* Specify the length of Capillary in Meters.

\*\* Specify Ring material (Refer Bottom Chamber / Flange table)

### FILLING FLUID

**DC1** DC-710  
**DC2** Silicone Oil (DC-200)  
**DC4** DC-704  
**DC5** DC-705  
**FLU** Fluorolube  
**GLY** Glycerine  
**HLC** Halocarbon  
**VGO** Food grade oil  
**XXX** Other (Please specify)

### PROCESS CONNECTION

#### THREADED

Conn	Code	Size	Code	Type	Code	MALE / FEMALE	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
		1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
				Rp	RP		
				Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: **T15NTM**

For M20x1.5 (F), Code: **TM20CF**

### PROCESS CONNECTION

#### FLANGED

Conn	Code	Size	Code	Rating#	Code	Facing	Code
Flange	F	1/2"	15	150	A	RF	RF
		3/4"	20	300	B	FF	FF
		1"	25	600	C	RTJ	RJ
		1-1/2"	40	900	D	ST	ST
		2"	50	1500	E	SG	SG
		3"	80	2500	F	LT	LT
						LG	LG
						SMF	SM
						SFF	SF
						LMF	LM
				LFF	LF		

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

Sample model Code: **CSU-SDF-S4S-S6S-S6S-F20ARF-DC2-4AR(3)**

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Flush Diaphragm Seal

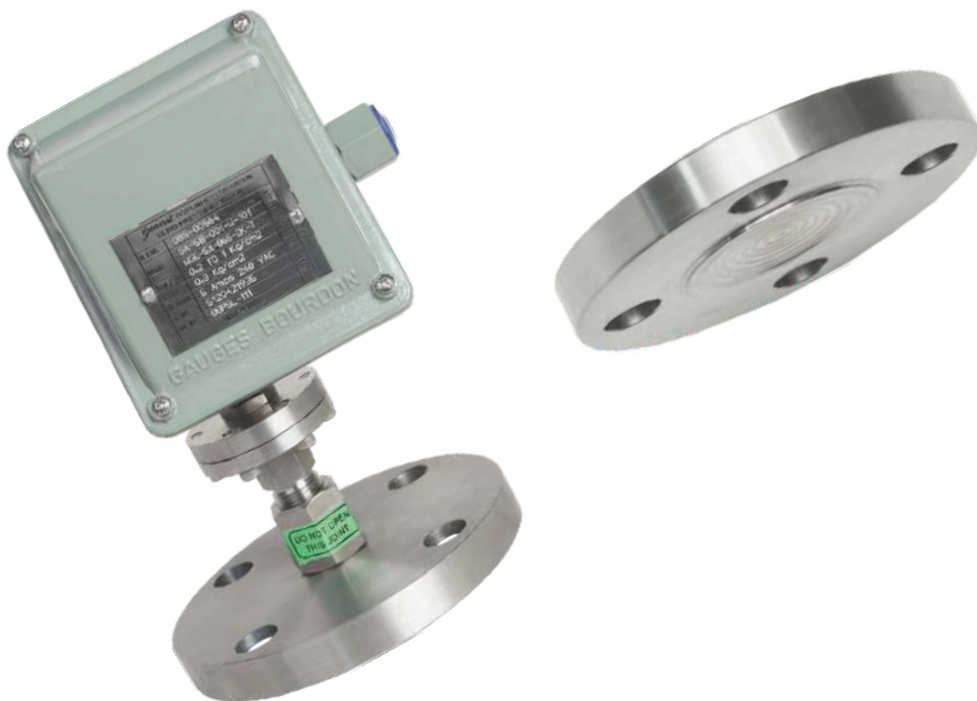
*General*

**Model : CSU**

## Features

Process fluids which are highly viscous or containing solid particles could plug or clog the Diaphragm Seal cavity on the process side of the diaphragm. In order to overcome this difficulty, Flush Diaphragm Seal are used. In this design, since the Diaphragm is directly welded on the Flange Face, there are no cavities or hidden ports where the process fluid can enter and clog the system.

Optionally, Flushing Ring (Spacer Ring) with 1/4" NPT(F) or 1/2" NPT(F) connection can be provided as per the requirement. Flushing Connection enables the user to purge / flush out / clean the area below the diaphragm without removing the Seal from the process line.



## Optional Feature

- **Capillary** for Remote mounting of the Pressure Instrument
- **Flushing Ring (Spacer Ring)** for purging / cleaning the area below the diaphragm without removing the Seal from the process line.
- **Stud / Nut & Gasket** (for Flanged Connection only), for assembling the Diaphragm Seal with Process Flange.

# Ordering Information

## FLUSH DIAPHRAGM SEAL (Flange)

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ]

### CONNECTION TYPE

**FD** Flush Diaphragm, Flanged Conn.

### FLANGE (Non-wetted part)

**CST** CS  
**S4S** SS 304  
**S4L** SS 304L  
**S6S** SS 316  
**S6L** SS 316L  
**321** SS 321  
**TTM** Titanium  
**XXX** Other (Please Specify)

### DIAPHRAGM (wetted part)

**S4S** SS 304     **HCB** Hastelloy B  
**S4L** SS 304L   **HCC** Hastelloy C  
**S6S** SS 316     **TAN** Tantalum  
**S6L** SS 316L   **N20** Nickel 200  
**S6T** SS 316Ti   **MN4** Monel 400  
**321** SS 321     **XXX** Other (Please Specify)  
**TTM** Titanium#

### OPTION

**4AR(\*)** SS 316 Capillary, SS 304 Armoured  
**4PV(\*)** SS 316 Capillary, SS 304 Armoured + PVC Covered  
**6AR(\*)** SS 316 Capillary, SS 316 Armoured  
**6PV(\*)** SS 316 Capillary, SS 316 Armoured + PVC Covered  
**CLT** Cooling Tower  
**FR4(\*\*)** Flushing Ring, 1/4" NPT(F)  
**FR2(\*\*)** Flushing Ring, 1/2" NPT(F)  
**GSK** Gasket  
**STN** Stud & Nuts  
**L** Nil  
**XXX** Other (Please specify)

\* Specify the length of Capillary in Meters.  
 \*\* Specify Ring material (Refer Diaphragm table)

### FILLING FLUID

**DC1** DC-710  
**DC2** Silicone Oil (DC-200)  
**DC4** DC-704  
**DC5** DC-705  
**FLU** Fluorolube  
**GLY** Glycerine  
**HLC** Halocarbon  
**VGO** Food grade oil  
**XXX** Other (Please specify)

### PROCESS CONNECTION

#### FLANGED

CONN	CODE	SIZE	CODE	RATING	CODE	FACING	CODE
Flange	F	1"	25	150	A	RF	RF
		1-1/2"	40	300	B	RTJ	RJ
		2"	50	600	C		
		3"	80	900	D		
		4"	10	1500	E		
				2500	F		

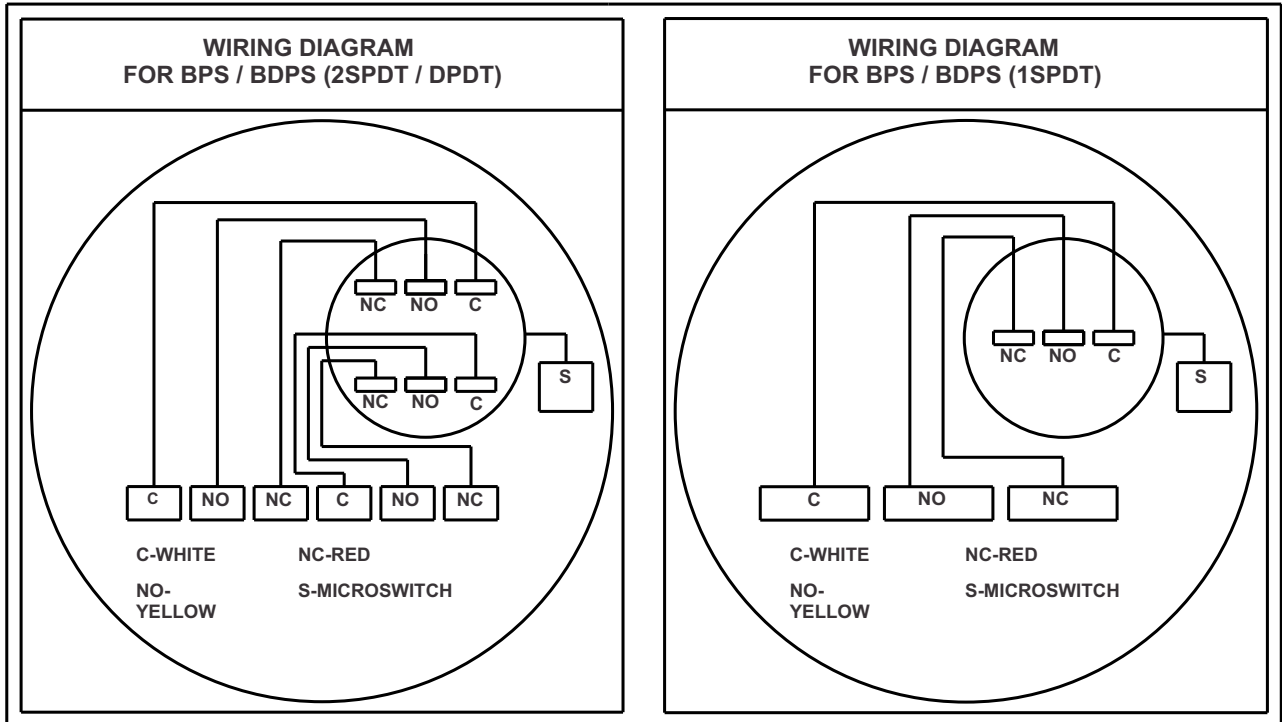
e.g. For 100 NB 150# RF flange, Model Code: **F10ARF**

# For Titanium Diaphragm, Flange also shall be Titanium only

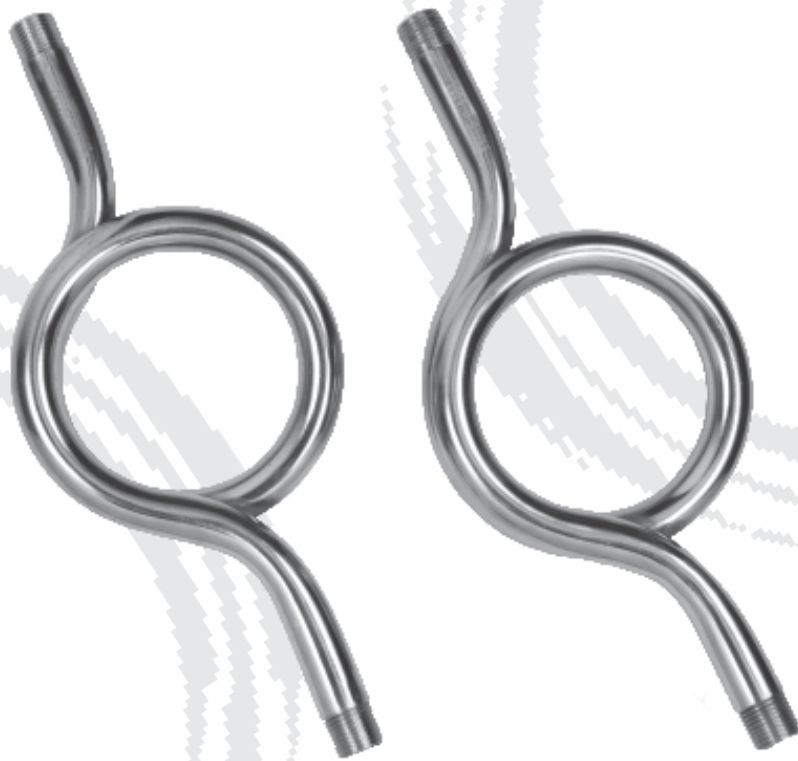
### Minimum Span of Range

Flange Size	Min Span of Range (RF flange)	Min Span of Range (RTJ flange)
1" NB	6 kg/cm2.g	N.A.
1-1/2" NB	2.5 kg/cm2.g	60 kg/cm2.g
2" NB	1 kg/cm2.g	2.5 kg/cm2.g
3" NB	1 kg/cm2.g	2.5 kg/cm2.g

Sample model Code: **CSU-FDF-CST-S6L-F40BRF-DC4-FR2(S6L)**







# ACCESSORIES



## MODEL : ACC

### Snubber



Snubber (Pulsation Dampener) protects the pressure instruments from pressure pulsations / rapid pressure fluctuation. Ideal for instruments which undergo severe pressure pulsations like those located at pump discharge. Available in materials like CS, SS304, SS316, Monel etc.

Standard connection is 1/2" NPT(F) x 1/2" NPT(M) (other connection can be offered as per customer requirement)

### Pig tail Syphon



Syphons are used to protect pressure instruments from high temperature of the process fluid. It helps to reduce the service temperature so that the pressure instrument is exposed to lower temperature. Generally offered in 1/2" sch, 40 or 80 size (other sizes also can be offered on request). Standard connection is 1/2" NPT(F) x 1/2" NPT(M). Plain end suitable for Butt welding can also be offered. Available in material like CS (A106), SS304, SS316, P11 etc. IBR Certification can be offered as per customer requirement.

### U Syphon



### Gauge saver



Gauge Saver (Pressure Limit Valve) is used where the process pressure exceeds the over range limit of the pressure instrument. When the process pressure exceeds the pre-set pressure, Gauge Saver shuts off the pressure to the instrument and thereby prevents damage of the sensing element and protects the calibration. Generally minimum setting offered is 1 kg/cm<sup>2</sup>g (lower setting on request). Normally offered in SS316 & Monel with standard connection of 1/2" NPT(F) x 1/2" NPT(M) (other material / connection on request)

### Gauge Adaptor



Gauge Adaptors are used for connecting instruments and accessories having different type of threads. Conversion from male to female threads and vice versa is possible by selecting suitable adaptors. Generally offered in material like SS304, SS316, Monel etc. (Other material on request).

### Universal Adaptor or Gauge union



Universal Adaptor (Swivel Adaptor) facilitates the positioning of the Instrument during installation. Generally offered in material like SS304, SS316, Monel etc. (Other material on request). Standard connection is 1/2" NPT(F) x 1/2" NPT(M) (other connection on request)

# Ordering Information

## MODEL

ACC- [ ] [ ] [ ] [ ] [ ]

### ITEM DESCRIPTION

**SNB** Snubber  
**SYP** Pig Tail Syphon  
**SYU** "U" Syphon  
**GSV** Gauge Saver  
**GAD** Gauge Adaptor  
**SWA** Swivel Adaptor

### MATERIAL

**CST** Carbon Steel  
**S4S** SS 304  
**S4L** SS 304L  
**S6S** SS 316  
**S6L** SS 316L  
**321** SS 321  
**MN4** Monel  
**HCC** Hastelloy-C  
**XXX** Other (Please specify)

### OPTION

**IBR** IBR\*  
**NAC** NACE  
**OXY** O2 Cleaning  
**L** Nil  
**XXX** Other (Please specify)

### PROCESS CONNECTION

Conn	Code	Size	Code	Type	Code	MALE / FEMALE	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
		1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
				Rp	RP		
				Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: **T15NTM** For M20x1.5 (F), Code: **TM20CF**

\* IBR certification shall be applicable for Syphon only

### INSTRUMENT CONNECTION

Conn	Code	Size	Code	Type	Code	MALE / FEMALE	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
		1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
				Rp	RP		
				Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: **T15NTM** For M20x1.5 (F), Code: **TM20CF**

**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Sample model Code (for Gauge Saver): **ACC-GSV-S6L-T15NTF-T15NTM-NAC**

# Accessories



## MODEL : ACC-2WC

### 2 Way Gauge Cocks

Using Gauge cock is an economical method for isolating the pressure instrument from the process fluid. Generally used for low pressure Application below 25 kg/cm2(g).

Normally available in CS, SS304 & SS316. Standard connection is 1/2" NPT(M) threads at process side and 1/2" NPT(F) at instrument side (other connections available on request)



Two Way Gauge Cock

### Ordering Information

#### MODEL

ACC- [ ] [ ] [ ] [ ] [ ]

**ITEM DESCRIPTION**  
2WC 2 Way Gauge Cock

**MATERIAL**  
CST Carbon Steel  
S4S SS 304  
S6S SS 316  
XXX Other (Please specify)

INSTRUMENT CONNECTION							
Conn	Code	Size	Code	Type	Code	MALE / FEMALE	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
		1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
				Rp	RP		
				Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: T15NTM For M20x1.5 (F), Code: TM20CF

**OPTION**  
NAC NACE  
OXY O2 Cleaning  
L Nil  
XXX Other (Please specify)

PROCESS CONNECTION							
Conn	Code	Size	Code	Type	Code	MALE / FEMALE	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
		1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
				Rp	RP		
				Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: T15NTM For M20x1.5 (F), Code: TM20CF

**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Sample Model Code: ACC-2WC-S6S-T15NTF-T15NTM-L

# Accessories



## MODEL : ACC-3WC

### 3 Way Gauge Cocks

Using Gauge cock is an economical method for isolating the pressure instrument from the process fluid. Generally used for low pressure Application below 25 kg/cm2(g).

3 Way Gauge Cock provides isolation of the instrument as well as vent (drain).

Normally available in CS, SS304 & SS316. Standard connection is 1/2" NPT(M) threads at process side and 1/2" NPT(F) at instrument & drain sides (other connections available on request)



Three Way Gauge Cock

### Ordering Information

#### MODEL

ACC- [ ] [ ] [ ] [ ] [ ] [ ]

**ITEM DESCRIPTION**  
3WC 3 Way Gauge Cock

**MATERIAL**  
CST Carbon Steel  
S4S SS 304  
S6S SS 316  
XXX Other (Please specify)

**INSTRUMENT CONNECTION**  
Please Select from following table

**PROCESS CONNECTION**  
Please Select from following table

**OPTION**  
NAC NACE  
OXY O2 Cleaning  
L Nil  
XXX Other (Please specify)

**DRAIN CONNECTION**  
Please Select from following table

CONNECTION							
Conn Thread	Code T	Size	Code	Type	Code	MALE / FEMALE	Code
		1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
		1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
				Rp	RP		
				Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: **T15NTM** For M20x1.5 (F), Code: **TM20CF**

**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Sample Model Code: ACC-3WC-S6S-T15NTF-T15NTM-T15NTF-L

# Accessories



## MODEL : ACC-2NV

### Needle Valves

#### Screwed Bonnet Design

Needle Valves are designed for use in applications for throttling purpose and straight shut off of liquids, gas or vapour service. These needle valves are available with a variety of end connections and stem packing.

### Specifications

<b>Test Pressure</b>	@25°C Room Temperature Hydrostatic: Body - 620 bar Seat - 415 bar
<b>Gland Packing</b>	Pneumatic : Seat - 40 bar PTFE : Standard
<b>Material</b>	Craphoil : Temperatures above 180°C CS, SS304, SS316, SS316L
<b>Finish</b>	Monel, Hastelloy CS zinc plated, SS Natural



Female x Female End



Male x Female End

### Ordering Information

#### MODEL

ACC- [ ] [ ] [ ] [ ] [ ]

ITEM DESCRIPTION	
2NV	Needle Valve
MATERIAL	
CST	Carbon Steel
S4S	SS 304
S4L	SS 304L
S6S	SS 316
S6L	SS 316L
321	SS 321
MN4	Monel
HCC	Hastelloy-C
XXX	Other (Please specify)

OPTION	
NAC	NACE
OXY	O2 Cleaning
L	Nil
XXX	Other (Please specify)

**PROCESS CONNECTION**  
Please Select from following table

**INSTRUMENT CONNECTION**  
Please Select from following table

CONNECTION							
Conn	Code	Size	Code	Type	Code	MALE / FEMALE	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
		1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
				Rp	RP		
				Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: **T15NTM**      For M20x1.5 (F), Code: **TM20CF**

**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

**Sample Model Code: ACC-2NV-S6S-T15NTF-T15NTM-L**

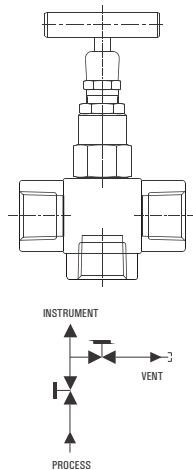
# Accessories



**MODEL : ACC-G2VM1**

## 2 Valve Manifold

Two valve manifold is designed in a single block with male or female screwed inlet and outlet ports combining isolation valve and calibration / vent valve. Generally used on static pressure Transmitters, Switches and Gauges.



## Ordering Information

### MODEL

ACC- [ ] [ ] [ ] [ ] [ ] [ ]

#### ITEM DESCRIPTION

**G2VM1** 2 Valve Manifold

#### MATERIAL

- CST** Carbon Steel
- S4S** SS 304
- S4L** SS 304L
- S6S** SS 316
- S6L** SS 316L
- 321** SS 321
- MN4** Monel
- HCC** Hastelloy-C
- XXX** Other (Please specify)

#### OPTION

- NAC** NACE
- OXY** O2 Cleaning
- L** Nil
- XXX** Other (Please specify)

#### DRAIN CONNECTION

Please Select from following table

#### INSTRUMENT CONNECTION

Please Select from following table

#### PROCESS CONNECTION

Please Select from following table

#### CONNECTION

Conn	Code	SIZE	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	<b>06</b>	NPS	<b>NS</b>	Male	<b>M</b>
		3/8"	<b>10</b>	NPT	<b>NT</b>	Female	<b>F</b>
	1/2"	<b>15</b>	BSP	<b>BP</b>			
	3/4"	<b>20</b>	BSPT	<b>BT</b>			
	1"	<b>25</b>	JIS-PF	<b>PF</b>			
	M20	<b>M20</b>	JIS-PT	<b>PT</b>			
			Gas	<b>GS</b>			
			R	<b>RR</b>			
		Rp	<b>RP</b>				
		Pitch 1.5	<b>C</b>				

**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

**Sample Model Code: ACC-G2VM1-S6S-T15NTF-T15NTF-T15NTF-L**

# Accessories

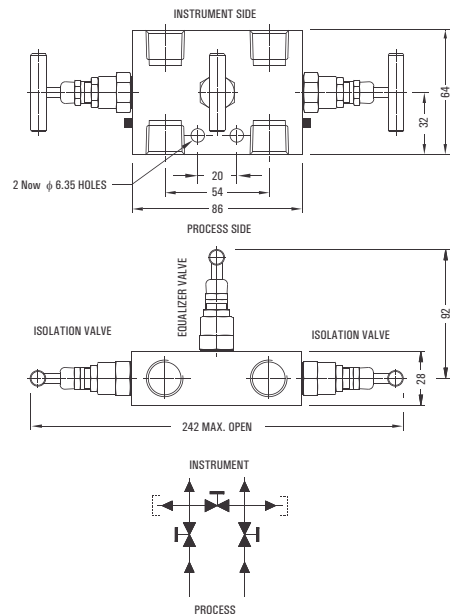


## MODEL : ACC-3VMPP1

### 3 Valve Manifold (for DP Instruments)

#### (Seperately Mounted)

Three Valve Manifold incorporates two process isolation valves and one equalizer valve with separate connections in a compact manifold block. Model 3VMPP1 is designed for remote mounting away from the differential pressure instrument and joined by tube or pipe impulse lines. They have threaded connections. Dimensions shown below are for the standard 54 mm or 2-1/8 inch centre distance, found in majority of instruments.



## Specifications

<b>Connections</b>	Process : 1/2" NPT (F) Instrument : 1/2" NPT (F)	<b>Gland Packing</b>	PTFE : Standard GRAPHOIL: Temperatures above 180°C
<b>Test Pressure</b>	@25°C Room Temperature Hydrostatic: Body - 620 bar Seat - 415 bar Pneumatic : Seat - 40 bar	<b>Material</b>	A105, A182GRF304, A182GRF316, Monel, Hastelloy
		<b>Finish</b>	CS zinc plated, SS Natural

## Ordering Information

MODEL : ACC [ ] [ ] [ ]

<b>ITEM DESCRIPTION</b> 3VMPP1 Three Valve Manifold	<b>OPTION</b> <b>NAC</b> NACE <b>OXY</b> O2 Cleaning <b>L</b> Nil <b>XXX</b> Other (Please specify)
<b>MATERIAL</b> <b>CST</b> Carbon Steel <b>S4S</b> SS 304 <b>S4L</b> SS 304L <b>S6S</b> SS 316 <b>S6L</b> SS 316L <b>321</b> SS 321 <b>MN4</b> Monel <b>HCC</b> Hastelloy-C <b>XXX</b> Other (Please specify)	<p><b>Note:</b> This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.</p> <p style="text-align: right;"><b>Sample Model Code: ACC-3VMPP1-S6L-NAC</b></p>



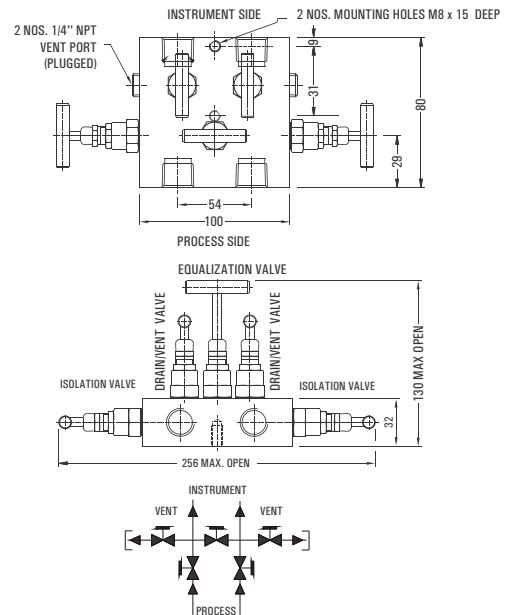
# Accessories



## MODEL : ACC-5VMPP1

### 5 Valve Manifold (for DP Instruments)

Five Valve Manifold incorporates two process isolation valves, one equalizer valve and two drain/vent valves with separate connections in a compact manifold block. Model 5VMPP1 is designed for remote mounting away from the differential pressure instrument and joined by tube or pipe impulse lines. They have threaded connections. Dimensions shown below are for the standard 54 mm or 2-1/8 inch centre distance, found in majority of instruments.



### Specifications

<b>Connections</b>	Process : 1/2" NPT (F) Instrument : 1/2" NPT (F) Drain/Vent : 1/4" NPT (F)	<b>Gland Packing</b>	PTFE : Standard GRAPHOIL: Temperatures above 180°C
<b>Test Pressure</b>	@25°C Room Temperature Hydrostatic: Body - 620 bar Seat - 415 bar Pneumatic : Seat - 40 bar	<b>Material</b>	A105, A182GRF304, A182GRF316, Monel, Hastelloy
		<b>Finish</b>	CS zinc plated, SS Natural

### Ordering Information

MODEL : ACC [ ] [ ] [ ]

ITEM DESCRIPTION	
5VMPP1	Five Valve Manifold
MATERIAL	
CST	Carbon Steel
S4S	SS 304
S4L	SS 304L
S6S	SS 316
S6L	SS 316L
321	SS 321
MN4	Monel
HCC	Hastelloy-C
XXX	Other (Please specify)

OPTION	
NAC	NACE
OXY	O2 Cleaning
L	Nil
XXX	Other (Please specify)

**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Sample Model Code: ACC-5VMPP1-S6L-NAC

# Accessories



## MODEL : ACC-FRG

### Flushing Rings

During installation, the Flushing Ring (Spacer Ring) is sandwiched between the process flange and the diaphragm seal. The purpose of Flushing Ring is to avoid the formation of solid deposits below the Diaphragm and thus avoid the clogging. 2 holes with internal threads provided on the ring facilitate the purging / cleaning of the area below the diaphragm, without removing the Seal from the process line. At normal conditions the female ports of the ring shall be plugged.

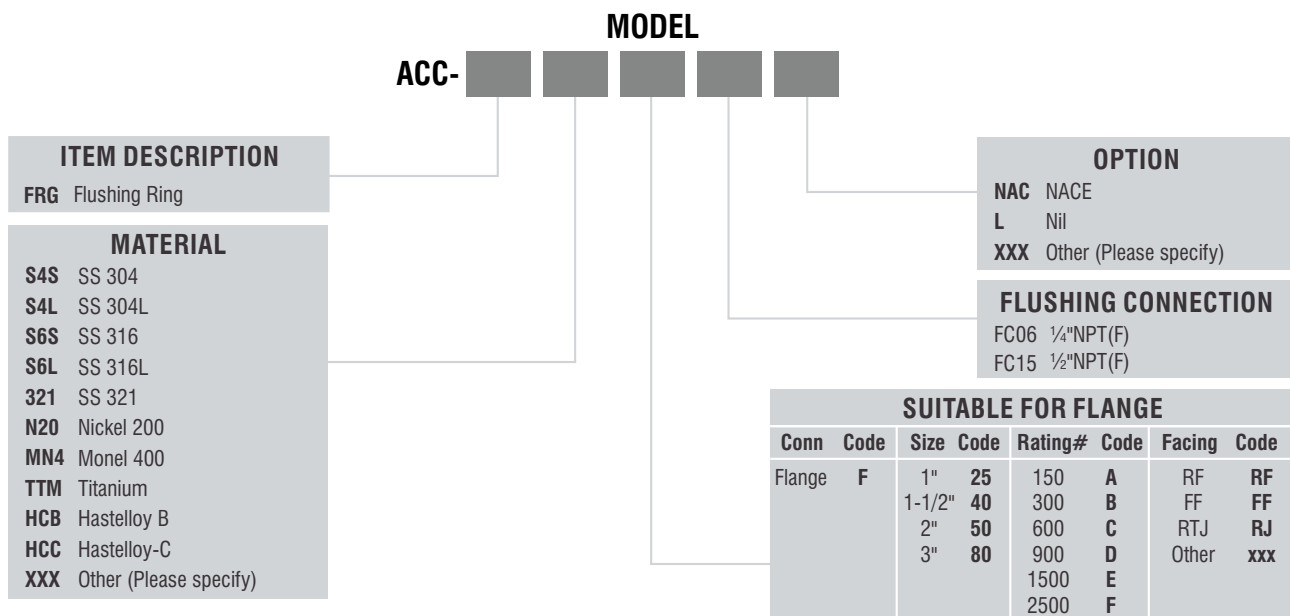
Generally available materials are SS304, SS316, SS316L, Nickel, Monel, Hastelloy-C, Titanium etc (other material on request)



### Ordering Information

When ordered with Diaphragm Seal Gauges, the ordering information is already covered in Option Column of Model Codes for Diaphragm Seal.

When ordered at a separate Item, the ordering Information shall be as follows:



**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Sample Model Code: ACC-FRG-S6S-F50BRF-FC15-L

## Accessories

**MODEL : ACC-CLT**

## Cooling Tower

For Diaphragm Seal without Capillary, when the process temperature is high, a Cooling Tower can be installed between the Diaphragm Seal and Pressure Instrument, to reduce the temperature effect. Cooling Tower is provided with cooling fins which increases the area of surface contact with the atmosphere. The increased area of contact increases the heat transfer to the atmosphere by convection.



## Ordering Information

Cooling Tower is generally supplied as an integral part of Diaphragm Seal type Pressure Gauges. For ordering, please add Code "CLT" as an option in Model Code of Diaphragm Seal.

## Pointer Puller & Fixer Kit

Requirement of International Quantity Standard ISO-9001:2008, calls for proper maintenance and periodic calibration of the measuring instruments. For Dial type Gauges, this may require removal of the Glass, unscrewing of the dial and removal & re-fixing of the Pointer. Use of hand is not advisable for removing and fixing the pointer. Pointer Puller (Extractor) and Pointer Fixer (Pneumatic Hammer) are to be used for this purpose.

The Pointer Puller & Fixer Kit contains one Pneumatic Hammer (Pointer Fixer) and 3 Pointer Pullers having central pin of different diameters (i.e., 0.7 mm, 1 mm & 1.2 mm)

The recommended procedure for pointer removal and fixing, which is followed internationally is given overleaf.



## Ordering Information

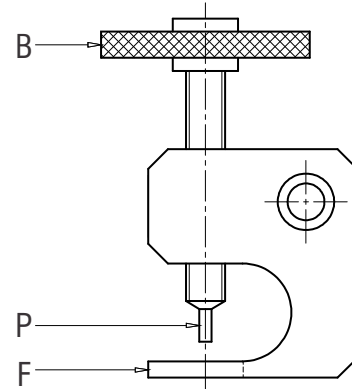
To be ordered as "POINTER PULLER & FIXER KIT"

## Pointer Puller & Fixer Kit

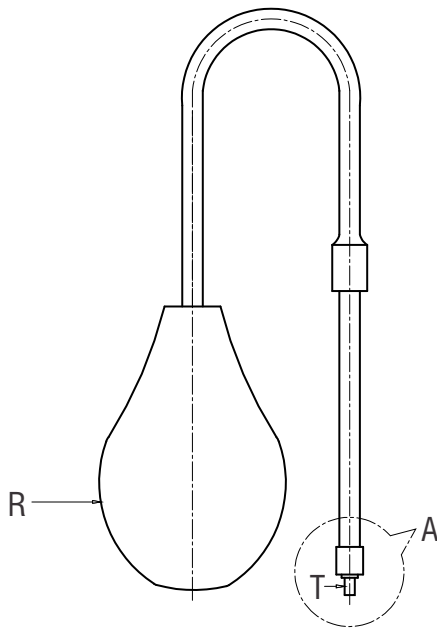
### Operating Instructions

#### HOW TO EXTRACT THE POINTER

- Turn the Barrel (B) anti-clockwise to ensure that there is sufficient clearance between the foot (F) and the central pin (P) to accommodate the thickness of the pointer.
- Place the foot of the Point Puller under the fixed pointer of the Gauge.
- Gently screw the barrel clockwise until the central pin locates the pointer shaft, through the centre of the pointer.
- Continue to turn the barrel slowly until the pointer is removed.
- There are 3 models of the pointer Puller having three different diameters of the central pin (0.7 mm, 1 mm, 1.2 mm) to match the diameter of the pointer shaft. Use of an oversized model may damage the pointer, hence this provision.



**POINTER PULLER**

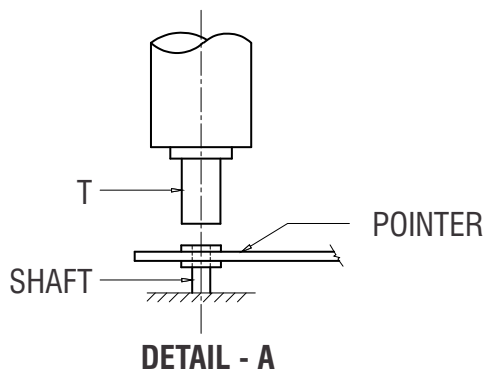


**PNEUMATIC HAMMER**

#### HOW TO FIX THE POINTER

Place the pointer in the desired position on the pointer shaft. Align the tip of the metal tube (T) of the pointer fixer with the centre of the pointer, hold it lightly and lift the rubber ball (R) and press it gently.

The resultant shock will tap the pointer back onto the Pointer shaft. The “tap” is easily controlled by operator by varying the pressure on the rubber ball.



**DETAIL - A**

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# **DIAPHRAGM SEALS FOR PRESSURE & DIFFERENTIAL PRESSURE TRANSMITTERS**

## Features

### What is a Diaphragm Seal?

A diaphragm seal is a device in which a flexible membrane (diaphragm) seals and isolates the measuring instrument from the process medium. The instrument side of the diaphragm is filled with appropriate fluid. The pressure exerted by the process fluid on the Diaphragm is hydraulically transmitted through the seal fluid to the pressure sensing element. Diaphragm seal protects the pressure sensor from the harmful and hazardous effect the process fluid.

### Where Diaphragm Seal is essential?

- Corrosive process fluid
- Highly viscous process fluid
- Process fluid having sediments or solid particles
- Process fluid having tendency to solidify, freeze or crystallize at lower temperatures which may block the sensing element.
- Hazardous process fluid



## Specifications

### The generally offered MOC is as follows :

- Diaphragm** : SS316, SS316L, PTFE, SS PTFE coated, Titanium, Hastelloy B, Hastelloy C, Nickel, Monel, Tantalum
- Wetted Parts** : SS316, SS304L, SS316L, SS PTFE coated / lined/ block, Hastelloy B/C, Nickel, Monel
- Filling Fluids** : Silicone Oil, DC-200 (-45°C to 205°C)  
DC-704 (0 to 315°C)  
DC-705 (20 to 350°C, Short term exposure up to 400°C)  
DC-710 (5 to 345°C)  
Fluorolube Oil (-40°C to 150°C)  
Glycerine (5 to 80°C)  
Halocarbon Oil (-40°C to 235°C)  
Food Grade Vegetable Oil (5 to 182°C)

### Optional Feature:

- Cooling Tower
- Capillary for Remote mounting of the Pressure Instrument
- Flushing Ring (Spacer Ring) for purging / cleaning the area below the diaphragm without removing the Seal from the process line.
- Stud / Nut & Gasket, for assembling the Diaphragm Seal with Process Flange.



**Note** : Proper selection of diaphragm seal (Type & Material) is important after reviewing the application. Purchaser must confirm the suitability of the MOC suggested.

Under Technical Collaboration with M/s. Gauges Bourdon, France



## Threaded Flush Diaphragm Seal (Small / Mini Diaphragm Seal)

**Model: CSU-FDT**

### Features

Flush Diaphragm Seal with Threaded process connection (also called as Mini Seal or Small Seal, because of its small size) are recommended for highly viscous or crystallizing process fluids. All welded construction provides compact design and light weight. This is most suitable for locations with limited space. With flush Diaphragm, it eliminates any cavities or pockets where the process medium can enter and clog the system.



**SEAL ONLY**



**SEAL WITH TRANSMITTER**

### Optional Feature

- **Cooling Tower**
- **Capillary** for Remote mounting of the Pressure Instrument

**Note:** This catalogue indicates the general specifications used for most of the process applications.  
Any other specification not appearing here also can be provided as per customer requirement.



# Ordering Information

## FLUSH DIAPHRAGM SEAL (Threaded Connection)

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ]

### CONNECTION TYPE

FDT Flush Diaphragm Threaded Conn.

### DIAPHRAGM

<b>S4S</b> SS 304	<b>HCB</b>	Hastelloy B
<b>S4L</b> SS 304L	<b>HCC</b>	Hastelloy C
<b>S6S</b> SS 316	<b>N20</b>	Nickel 200
<b>S6L</b> SS 316L	<b>MN4</b>	Monel 400
<b>S6T</b> SS 316Ti	<b>XXX</b>	Other (Please Specify)
<b>321</b> SS 321		

### CHAMBER / CONNECTION MOC

<b>S4S</b> SS 304	<b>HCB</b>	Hastelloy B
<b>S4L</b> SS 304L	<b>HCC</b>	Hastelloy C
<b>S6S</b> SS 316	<b>N20</b>	Nickel 200
<b>S6L</b> SS 316L	<b>MN4</b>	Monel 400
<b>S6T</b> SS 316Ti	<b>XXX</b>	Other (Please Specify)
<b>321</b> SS 321		

### OPTION

<b>4AR(*)</b>	SS316 Capillary, SS304 Armoured
<b>4PV(*)</b>	SS316 Capillary, SS304 Armoured + PVC Covered
<b>6AR(*)</b>	SS316 Capillary, SS316 Armoured
<b>6PV(*)</b>	SS316 Capillary, SS316 Armoured + PVC Covered
<b>CLT</b>	Cooling Tower
<b>L</b>	Nil
<b>XXX</b>	Other (Please specify)

\* Specify the length of Capillary in Meters.

### FILLING FLUID

<b>DC1</b>	DC-710
<b>DC2</b>	Silicone Oil (DC-200)
<b>DC4</b>	DC-704
<b>DC5</b>	DC-705
<b>FLU</b>	Fluorolube
<b>GLY</b>	Glycerine
<b>HLC</b>	Halocarbon
<b>VGO</b>	Food grade oil
<b>XXX</b>	Other (Please specify)

### CONNECTION

Conn	Code	SIZE	Code	Type	Code	Male/ Female	Code
Thread	T	3/4"	<b>20</b>	NPS	<b>NS</b>	Male only	<b>M</b>
		1"	<b>25</b>	BSP	<b>BP</b>		
		1-1/2"	<b>40</b>	JIS-PF	<b>PF</b>		
		2"	<b>50</b>	Gas	<b>GS</b>		

e.g. For 1"BSP(M), Code: **T25BPM**

Sample model Code: **CSU-FDT-S6L-S6L-T50BPM-DC2-L**

# Flush Diaphragm Seal (Flanged)

*General*

**MODEL : CSU-FDF**

## Features

Process fluids which are highly viscous or containing solid particles could plug or clog the Diaphragm Seal cavity on the process side of the diaphragm. In order to overcome this difficulty, Flush Diaphragm Seal are used. In this design, since the Diaphragm is directly welded on the Flange Face, there are no cavities or hidden ports where the process fluid can enter and clog the system.

Optionally, Flushing Ring (Spacer Ring) with 1/4" NPT(F) or 1/2" NPT(F) connection can be provided as per the requirement. Flushing Connection enables the user to purge / flush out / clean the area below the diaphragm without removing the Seal from the process line.



## Optional Feature

- **Cooling Tower**
- **Capillary** for Remote mounting of the Pressure Instrument
- **Flushing Ring (Spacer Ring)** for purging / cleaning the area below the diaphragm without removing the Seal from the process line.
- **Stud / Nut & Gasket**, for assembling the Diaphragm Seal with Process Flange.

**Note:** This catalogue indicates the general specifications used for most of the process applications.  
Any other specification not appearing here also can be provided as per customer requirement.

# Ordering Information

## FLUSH DIAPHRAGM SEAL (Flange)

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ]

### CONNECTION TYPE

**FD** Flush Diaphragm, Flanged Conn.

### FLANGE (Non-wetted part)

**CST** CS  
**S4S** SS 304  
**S4L** SS 304L  
**S6S** SS 316  
**S6L** SS 316L  
**321** SS 321  
**TTM** Titanium  
**XXX** Other (Please Specify)

### DIAPHRAGM (wetted part)

**S4S** SS 304     **HCB** Hastelloy B  
**S4L** SS 304L   **HCC** Hastelloy C  
**S6S** SS 316     **TAN** Tantalum  
**S6L** SS 316L   **N20** Nickel 200  
**S6T** SS 316Ti   **MN4** Monel 400  
**321** SS 321     **XXX** Other (Please Specify)  
**TTM** Titanium#

### OPTION

**4AR(\*)** SS 316 Capillary, SS 304 Armoured  
**4PV(\*)** SS 316 Capillary, SS 304 Armoured +PVC Covered  
**6AR(\*)** SS 316 Capillary, SS 316 Armoured  
**6PV(\*)** SS 316 Capillary, SS 316 Armoured +PVC Covered  
**CLT** Cooling Tower  
**FRG** Flushing Ring  
**GSK** Gasket  
**STN** Stud & Nuts  
**L** Nil  
**XXX** Other (Please specify)

\* Specify the length of Capillary in Meters.

\*\* Refer Catalogue for Flushing Ring and specify detailed model code

### FILLING FLUID

**DC1** DC-710  
**DC2** Silicone Oil (DC-200)  
**DC4** DC-704  
**DC5** DC-705  
**FLU** Fluorolube  
**GLY** Glycerine  
**HLC** Halocarbon  
**VGO** Food grade oil  
**XXX** Other (Please specify)

### PROCESS CONNECTION

#### FLANGED

CONN	CODE	SIZE	CODE	RATING	CODE	FACING	CODE
Flange	F	1"	25	150	A	RF	RF
		1-1/2"	40	300	B	RTJ	RJ
		2"	50	600	C		
		3"	80	900	D		
		4"	10	1500	E		
						2500	F

e.g. For 100 NB 150# RF flange, Model Code: **F10ARF**

# For Titanium Diaphragm, Flange also shall be Titanium only

Sample model Code: **CSU-FDF-CST-S6L-F40BRF-DC4-FRG**

# Pan Cake Diaphragm Seal (Flanged Connection)

*General*

**MODEL : CSU-PCS**

## Features

Pan Cake type Diaphragm Seal is sandwiched between the Instrument Flange (loose back-up flange) and Process (Nozzle) Flange. It is always provided with Capillary for the remote mounting of the Pressure Instrument.

Pan Cake type Diaphragm Seals are ideal for fluids which are viscous or containing solid particles. The Diaphragm is directly welded to the Pan Cake unit and there are no cavities or hidden ports where the process fluid can enter and clog the system.

Optionally, Flushing Ring (Spacer Ring) with 1/4" NPT(F) or 1/2" NPT(F) connection can be provided as per the requirement. Flushing Connection enables the user to purge / flush out / clean the area below the diaphragm without removing the Seal from the process line.



## Optional Feature

- **Flushing Ring (Spacer Ring)** for purging / cleaning the area below the diaphragm without removing the Seal from the process line.
- **Stud / Nut & Gasket** for assembling the Diaphragm Seal with Process Flange.

**Note:** This catalogue indicates the general specifications used for most of the process applications.  
Any other specification not appearing here also can be provided as per customer requirement.

# Ordering Information

## PAN CAKE DIAPHRAGM SEAL (Flange)

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ] [ ]

### CONNECTION TYPE

**PCS** Pan Cake Diaphragm Seal

### MOUNTING FLANGE (Non-wetted part)

**CST** CS  
**S4S** SS 304  
**S4L** SS 304L  
**S6S** SS 316  
**S6L** SS 316L  
**321** SS 321  
**XXX** Other (Please Specify)

### PAN CAKE UNIT (wetted part)

**S4S** SS 304    **HCB** Hastelloy B  
**S4L** SS 304L    **HCC** Hastelloy C  
**S6S** SS 316    **N20** Nickel 200  
**S6L** SS 316L    **MN4** Monel 400  
**321** SS 321    **XXX** Other (Please Specify)  
**TTM** Titanium

### DIAPHRAGM (wetted part)

**S4S** SS 304    **HCB** Hastelloy B  
**S4L** SS 304L    **HCC** Hastelloy C  
**S6S** SS 316    **N20** Nickel 200  
**S6L** SS 316L    **MN4** Monel 400  
**321** SS 321    **XXX** Other (Please Specify)  
**TTM** Titanium

### PROCESS CONNECTION

#### FLANGED

CONN	CODE	SIZE	CODE	RATING	CODE	FACING	CODE
Flange	F	1-1/2"	40	150	A	RF	RF
			50	300	B		
			80	600	C		
				900	D		
				1500	E		
				2500	F		

### OPTION

**4AR(\*)** SS 316 Capillary, SS 304 Armoured  
**4PV(\*)** SS 316 Capillary, SS 304 Armoured+PVC Covered  
**6AR(\*)** SS 316 Capillary, SS 316 Armoured  
**6PV(\*)** SS 316 Capillary, SS 316 Armoured+PVC Covered  
**CLT** Cooling Tower  
**FRG** Flushing Ring\*\*  
**GSK** Gasket  
**STN** Stud & Nuts  
**L** Nil  
**XXX** Other (Please specify)

\* Specify the length of Capillary in Meters.

\*\* Refer Catalogue for Flushing Ring and specify detailed model code

### FILLING FLUID

**DC1** DC-710  
**DC2** Silicone Oil (DC-200)  
**DC4** DC-704  
**DC5** DC-705  
**FLU** Fluorolube  
**GLY** Glycerine  
**HLC** Halocarbon  
**VGO** Food grade oil  
**XXX** Other (Please specify)

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

Sample model Code: **CSU-PCS-CST-S6L-S6L-F40BRF-DC4-4AR(5)-FRG**

# Extended Diaphragm Seal

*General*

**MODEL : CSU-EDS**

## Features

Extended Diaphragm Seal is mounted on the Nozzle Flange of the Process Pipe line. The diaphragm is extended to the process media through the Nozzle. The length and diameter of the extension is decided as per the process requirement and nozzle diameter. The diaphragm is directly extended through the Nozzle and preventing clogging or other obstructions in the connection nozzle. Extended Diaphragm Seals are suitable for corrosive, highly viscous, crystallizing or hot pressure media.



## Optional Feature

- **Cooling Tower**
- **Capillary** for Remote mounting of the Pressure Instrument
- **Stud / Nut & Gasket** for assembling the Diaphragm Seal with Process Flange.

**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

# Ordering Information

## EXTENDED DIAPHRAGM SEAL (Flanged Connection)

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ] [ ]

### CONNECTION TYPE

**EDS** Extended Diaphragm Seal

### FLANGE

**S6S** SS 316    **HCB** Hastelloy B  
**S6L** SS 316L    **HCC** Hastelloy C  
**321** SS 321    **N20** Nickel 200  
**TTM** Titanium    **MN4** Monel 400  
**N20** Nickel 200    **XXX** Other (Please Specify)

### DIAPHRAGM

**S6S** SS 316    **HCB** Hastelloy B  
**S6L** SS 316L    **HCC** Hastelloy C  
**321** SS 321    **N20** Nickel 200  
**TTM** Titanium    **MN4** Monel 400  
**N20** Nickel 200    **XXX** Other (Please Specify)

### EXTENSION UNIT

**S6S** SS 316    **HCB** Hastelloy B  
**S6L** SS 316L    **HCC** Hastelloy C  
**321** SS 321    **N20** Nickel 200  
**TTM** Titanium    **MN4** Monel 400  
**N20** Nickel 200    **XXX** Other (Please Specify)  
**TAN** Tantalum

### OPTION

**4AR(\*)** SS 316 Capillary, SS 304 Armoured  
**4PV(\*)** SS 316 Capillary, SS 304 Armoured+PVC Covered  
**6AR(\*)** SS 316 Capillary, SS 316 Armoured  
**6PV(\*)** SS 316 Capillary, SS 316 Armoured+PVC Covered  
**CLT** Cooling Tower  
**GSK** Gasket  
**STN** Stud & Nuts  
**L** Nil  
**XXX** Other (Please specify)

\* Specify the length of Capillary in Meters.

### FILLING FLUID

**DC1** DC-710  
**DC2** Silicone Oil (DC-200)  
**DC4** DC-704  
**DC5** DC-705  
**FLU** Fluorolube  
**GLY** Glycerine  
**HLC** Halocarbon  
**VGO** Food grade oil  
**XXX** Other (Please specify)

### PROCESS CONNECTION

#### FLANGED

CONN	CODE	SIZE	CODE	RATING	CODE	FACING	CODE
Flange	F	1-1/2"	40	150	A	RF	RF
		2"	50	300	B	FF	FF
		3"	80	600	C	RTJ	RJ
		4"	10	900	D		
				1500	E		
				2500	F		

e.g. For 100 NB 150# RF flange, Model Code: **F10ARF**

Sample model Code: CSU-EDS-S6S-S6S-S6S-F80ARF-DC2-L



# Sandwich Type Diaphragm Seal

*General*

**MODEL : CSU-SDT / CSU-SDF**

## Features

Sandwich type Diaphragm Seals are the most commonly used Diaphragm Seals. The Diaphragm is sandwiched between Top Chamber & Bottom Chamber / Flange. These are available Threaded as well as Flanged process Connection. For low Pressure Range & Smaller Flange Sizes, "1" section type Diaphragm Seals are used.

Optionally, Flushing connection of 1/4" NPT(F) or 1/2" NPT(F) can be provided which enables the user to flush out / clean the area below the diaphragm without removing the Seal from the process line. For Threaded Process Connection and Flange Connection with "1" section, Flushing connection shall be directly provided on the Bottom Chamber. For bigger Flange sizes, separate Flushing Rings (Spacer Rings) are usually provided.



## Optional Feature

- **Cooling Tower**
- **Capillary** for Remote mounting of the Pressure Instrument
- **Integral Flushing Connection or Flushing Ring (Spacer Ring)** for purging / cleaning the area below the diaphragm without removing the Seal from the process line.
- **Stud / Nut & Gasket** (for Flanged Connection only), for assembling the Diaphragm Seal with Process Flange.

**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

# Ordering Information

## SANDWICH DIAPHRAGM SEAL (Threaded or Flanged)

MODEL: CSU- [ ] [ ] [ ] [ ] [ ] [ ] [ ]

### CONNECTION TYPE

**SDT** Sandwich type, Threaded Conn.  
**SDF** Sandwich type, Flanged Conn.

### TOP CHAMBER

**CST** CS  
**S4S** SS304  
**S6S** SS316  
**S6L** SS316L  
**XXX** Other (Please Specify)

### DIAPHRAGM

<b>S4S</b> SS 304	<b>HCC</b> Hastelloy C
<b>S4L</b> SS 304L	<b>TTM</b> Titanium
<b>S6S</b> SS 316	<b>TAN</b> Tantalum
<b>S6L</b> SS 316L	<b>N20</b> Nickel 200
<b>321</b> SS 321	<b>MN4</b> Monel 400
<b>S6P</b> SS 316+PTFE	<b>800</b> Incoloy 800
<b>6LP</b> SS 316L+PTFE	<b>SIL</b> Silver
<b>S6G</b> SS 316+Gold Plated	<b>GLD</b> Gold
<b>6LG</b> SS 316L+Gold Plated	<b>PTF</b> PTFE
<b>HCB</b> Hastelloy B	<b>XXX</b> Other (Please Specify)

### BOTTOM CHAMBER / FLANGE

<b>S4S</b> SS 304	<b>HCC</b> Hastelloy C
<b>S4L</b> SS 304L	<b>TTM</b> Titanium
<b>S6S</b> SS 316	<b>N20</b> Nickel 200
<b>S6L</b> SS 316L	<b>MN4</b> Monel 400
<b>321</b> SS 321	<b>800</b> Incoloy 800
<b>S6P</b> SS 316+PTFE	<b>XXX</b> Other (Please Specify)
<b>6LP</b> SS 316L+PTFE	
<b>PTF</b> PTFE*	
<b>HCB</b> Hastelloy B	

### OPTION

**4AR(\*)** SS316 Capillary, SS304 Armoured  
**4PV(\*)** SS316 Capillary, SS304 Armoured+PVC Covered  
**6AR(\*)** SS316 Capillary, SS316 Armoured  
**6PV(\*)** SS316 Capillary, SS316 Armoured+PVC Covered  
**CLT** Cooling Tower  
**FC4** Integral Flushing Connection, 1/4" NPT(F)  
**FC2** Integral Flushing Connection, 1/2" NPT(F)  
**FR4(\*\*)** Flushing Ring, 1/4" NPT(F)  
**FR2(\*\*)** Flushing Ring, 1/2" NPT(F)  
**GSK** Gasket  
**STN** Stud & Nuts  
**L** Nil  
**XXX** Other (Please specify)

\* Specify the length of Capillary in Meters.

\*\* Specify Ring material (Refer Bottom Chamber / Flange table)

### FILLING FLUID

**DC1** DC-710  
**DC2** Silicone Oil (DC-200)  
**DC4** DC-704  
**DC5** DC-705  
**FLU** Fluorolube  
**GLY** Glycerine  
**HLC** Halocarbon  
**VGO** Food grade oil  
**XXX** Other (Please specify)

### PROCESS CONNECTION

#### THREADED

Conn	Code	Size	Code	Type	Code	MALE / FEMALE	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
		1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
				Rp	RP		
				Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: **T15NTM** For M20x1.5 (F), Code: **TM20CF**

### PROCESS CONNECTION

#### FLANGED

Conn	Code	Size	Code	Rating#	Code	Facing	Code
Flange	F	1/2"	15	150	A	RF	RF
		3/4"	20	300	B	FF	FF
		1"	25	600	C	RTJ	RJ
		1-1/2"	40	900	D	ST	ST
		2"	50	1500	E	SG	SG
		3"	80	2500	F	LT	LT
						LG	LG
						SMF	SM
						SFF	SF
						LMF	LM
						LFF	LF

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

### \*PTFE Chamber / Flange:

Max Range 0 to 16 kg/cm2.g for Flanged connection

Max Range 0 to 6 kg/cm2.g for Threaded connection (1/2" BSPM / NPTM only)

Sample model Code: **CSU-SDF-S4S-S6S-S6S-F20ARF-DC2-4AR(3)**

# Hygiene Diaphragm Seal



**MODEL : CSU-HYG**

## Features

Hygiene Diaphragm Seals are designed for pressure Instruments in Sanitary application in accordance with International Dairy Federation (IDF) requirements in pharmaceutical, dairy, biotechnology, food & beverages industries.



## Ordering Information

### HYGIENE DIAPHRAGM SEAL

**MODEL: CSU-** [ ] [ ] [ ] [ ] [ ] [ ]

**BASIC MODEL CODE**  
HYG Hygiene Connection

**DIAPHRAGM**  
S6L SS 316L

**CHAMBER / WETTED PARTS**  
S6L SS 316L

CONNECTION					
Type	Code	Size	Code	Type	Code
Hygiene	H	1"	25	IDF Fitting	IDF
Hygiene	H	1-1/2"	40	SMS Union	SMU
Hygiene	H	2"	50	Tri-clover	TCL

**OPTION**  
**IDC** IDF male coupling with gasket  
**SMC** SMS male coupling with gasket  
**TCC** Tri-clover clamp with gasket  
**L** Nil  
**XXX** Other

**FILLING FLUID**  
**DC2** Silicone Oil DC-200  
**GLY** Glycerine  
**VGO** Food grade oil  
**Others** XXX (Please Specify)

Sample Model Code: CSU-HYG-S6L-S6L-H25TCL-GLY-TCC

e.g. For 1" Tri-clover, Code: **H25TCL**

This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Under Technical Collaboration with M/s. Gauges Bourdon, France

# Accessories



**MODEL : ACC-FRG**

## Flushing Rings

During installation, the Flushing Ring (Spacer Ring) is sandwiched between the process flange and the diaphragm seal. The purpose of Flushing Ring is to avoid the formation of solid deposits below the Diaphragm and thus avoid the clogging. 2 holes with internal threads provided on the ring facilitate the purging / cleaning of the area below the diaphragm, without removing the Seal from the process line. At normal conditions the female ports of the ring shall be plugged.

Generally available materials are SS304, SS316, SS316L, Nickel, Monel, Hastelloy-C, Titanium etc (other material on request)



## Ordering Information

**MODEL**

**ACC-** [ ] [ ] [ ] [ ] [ ]

**ITEM DESCRIPTION**

FRG Flushing Ring

**MATERIAL**

S4S SS 304  
 S4L SS 304L  
 S6S SS 316  
 S6L SS 316L  
 321 SS 321  
 N20 Nickel 200  
 MN4 Monel 400  
 TTM Titanium  
 HCB Hastelloy B  
 HCC Hastelloy-C  
 XXX Other (Please specify)

**OPTION**

NAC NACE  
 L Nil  
 XXX Other (Please specify)

**FLUSHING CONNECTION**

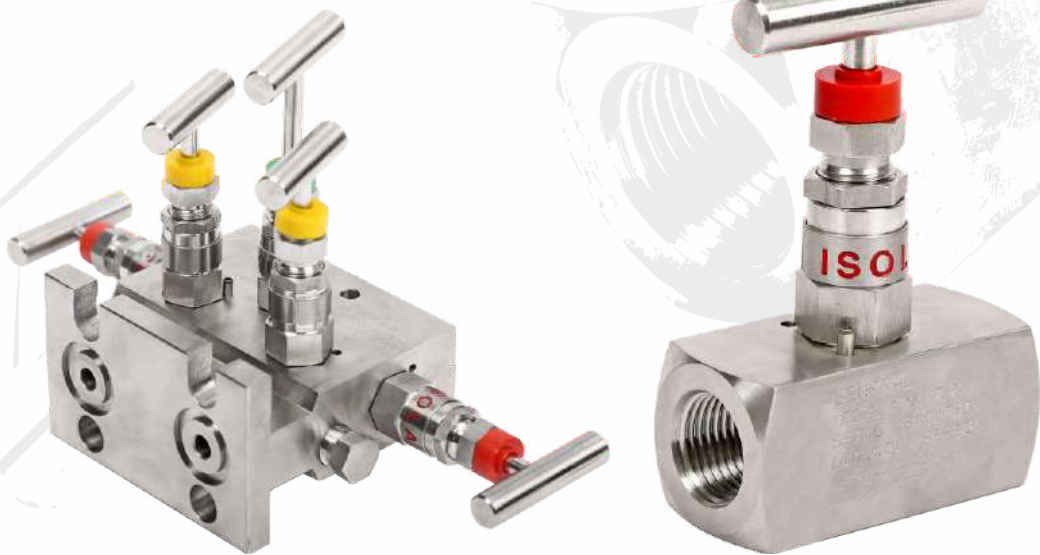
FC06 1/4 "NPT(F)  
 FC15 1/2 "NPT(F)  
 FC20 3/4 "NPT(F)

**SUITABLE FOR FLANGE**

Conn Code	Size	Code	Rating#	Code	Facing	Code
Flange F	1"	25	150	A	RF	RF
	1-1/2"	40	300	B	FF	FF
	2"	50	600	C	RTJ	RJ
	3"	80	900	D	Other	XXX
	4"	10	1500	E		
			2500	F		

**Note:** This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

**Sample Model Code: ACC-FRG-S6S-F50BRF-FC15-L**



# VALVES AND VALVE MANIFOLDS

Established in 1967, *General* INSTRUMENTS CONSORTIUM is an ISO 9001 certified company, involved in the manufacture of Valves, Valve Manifolds, Compression Tube Fittings & Special accessories for use in instrumentation, hydraulics, pneumatic, which cater to Oil and gum industries, Petrochemicals, Power generation, Agro genic and Vacuum applications.

## Design and Materials

Engineered to the specific designs for low, medium and high pressure usage, The Valves & Manifold manufactured by *General* available in a wide range of materials. These materials are custom selected for the body, trim and seals to suit the pressure, temperatures and fluids in the process systems.

The materials used for manufacturing are based on ASTM / DIN / BS and other relevant standards depending upon the requirements of our clients. Most of the products manufactured are in stainless steel (ASTM 182 F 316, ASTM A 479 & ASTM A 276), Carbon Steel (ASTM A 105). Both the materials confirm to NACE MR01-75 for specified corrosive applications & requirements.

Special Valves are available in materials such as Monel, Hastelloy C, Titanium depending upon the specifications of the application for all the valves specified in the Catalogue, the full range of materials for both body and trim are available.

The gland seal material for the Valves & Manifolds are directly related to application service and the temperature. As a standard PTFE is used. For high Temperature above 200°C and up to 550°C graphite asbestos and graphoil are used.

*General* products are manufactured using latest art of technology. The products are machined for tolerance and compliance with International standards.

*General* is committed to ensure the highest quality of their products. Consequently all products undergo quality check at every stage. This is achieved by the full fledged Quality Assurance Dept. equipped with all standard gauges and test jigs. We have a Quality assurance programme which is in line with the international standards.

Certificate - All valves & Manifolds are supplied with certificate of conformance for material, performance & type tests specified by our customers.

*General* offers a series of Manifolds Compact Piping and Control in lines involving pressure and differential pressure instruments. Manifold eliminates several parts used in the conventional method of piping with individual valves and adaptors resulting in costs saving. Their compact design reduces space requirements for operation and installation. Internal porting arrangements within the Manifold eliminates leakage points.

*General* Manifolds are available in 2, 3 and 5 Valve construction.

Two Valve Manifolds are used in pressure instruments such as pressure gauges, pressure transmitters, pressure switches, differential pressure gauges etc.

Three Valve and Five Valve Manifolds are used in differential pressure instruments such as differential pressure transmitters, differential pressure switches, differential pressure gauges etc. as well as level/flow transmitters.

Three Valve Manifolds are the most commonly used manifolds. They may be provided with test ports on the process sides and drain ports on the instrument side for drawing of the process and instrument lines respectively.

Five Valve Manifolds are normally used with differential pressure instruments where drain valves are required on the instrument sides. They are also used for flushing of the system and prevention of loss of expensive process fluid in the impulses.

Mono flange Valves typically used with differential pressure instruments applications to minimize the size and weight of the pipe-valve assemblies used primary and for secondary isolation, vent and calibration.

**GENERAL** Manifolds are available in Five different types of designs.

**SEPARATELY MOUNTED MANIFOLDS (PIPE TO PIPE)** meant for installation from the instrument and are usually connected by means of pipes or tubes, pipes and pipe fittings / tubes and tube fittings.

**DIRECT MOUNTING 'T' TYPE MANIFOLDS(PIPE TO FLANGE)** for the direct mounting on the instrument and screwed process connections.

**DIRECT MOUNTING "H" TYPE (FLANGE TO FLANGE)** Manifold for stacked assembly between the instrument and flanged process connection.

**CO-PLANAR MANIFOLDS** mounted directly on the instrument eliminating the adapter plate.

**MONO FLANGE VALVE** for the direct mounting on the instrument and flange process connection

At the heart of the *General* Manifold is the design of the pressure sealing system for each of the valve which has the following advantages :

- The stem threads are rolled to reduce friction
- Stem threads are coated with silver teflon mixture to allow for smooth operation.
- The stem plug has swivelling design and is uniquely hardened to provide for wear resistance and long life.
- The pipe sealing system to prevent blowout of the stem and reduce gland leakage.

*General* Manifolds are available in variety of materials depending on the usage. The most common materials of construction are

- Carbon Steel ASTM A105
- Stainless Steel ASTM 479/A182 F 304, F316, F304L, F316L and F321
- Cupro Nickel : Monel
- Inconel
- Hastelloy 'C'
- Titanium
- Duplex

Manifolds in Stainless Steel and Monel are also available with conformity to NACE MR 0175 for corrosion resistance.

*General* Manifolds are available in three specific designs.

- The standard design is with a case hardened swivelling stem plug suitable for most applications in low, medium and high pressure range.
- Where gas at high pressure is encounterable, erodable swivelling plug with soft seat is preferred. The standard seat materials are reinforced PTFE, Delrin and PEEK.
- The thread design is for a case hardened ball plug in 316 Stainless Steel. Alternatively, Hastelloy, Monel, Inconel, Titanium and Duplex manifolds have Tungsten Carbide ball plug.
- All these designs are available in a standard thread above the seal so that stem threads are not subjected to process fluid.

The gland sealing arrangements used in *General* Manifolds vary with the temperature requirement. The most common material is PTFE for temperatures upto 200°C. Beyond 200°C and up to 550°C, graphoil is the standard use.

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.



# Ball Valve



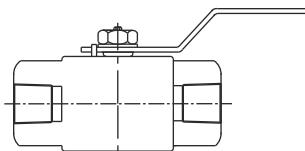
## Model No. GBV

A ball valve is a valve with a spherical disc, the part of the valve which controls the flow through it. The sphere has a hole, or port, through the middle so that when the port is in line with both ends of the valve, flow will occur. When the valve is closed the hole is perpendicular to the ends of the valve, and flow is blocked. The handle will be inline with the port position letting you “see” the valve position.

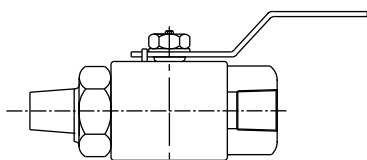
Ball valves are durable and usually work to achieve perfect shutoff even after years of disuse. They are therefore an excellent choice for shutoff applications. They do not offer the fine control that may be necessary in throttling applications.



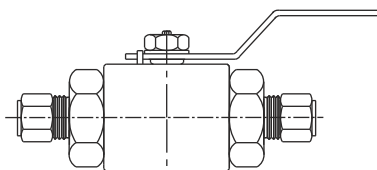
## Description



**Female Ends Connection**



**Male x Female Ends Connection**



**Double Ferrule Tube Ends Connection**

<b>Available Connection Female Ends</b>	process and instrument 1/4", 3/8", 1/2", 3/4", 1" NPT / BSP
<b>Male x Female Ends</b>	process and instrument 1/4", 3/8", 1/2", 3/4", 1" NPT / BSP
<b>Double Ferrule Tube Ends</b>	process and instrument 1/4", 3/8", 1/2", 3/4", 1" OD
<b>Test Pressure</b>	@25°C Room Temperature Hydrostatic : Body - 60 bar(g) Seat - 60 bar(g) Pneumatic : Seat - 4 bar(g)
<b>Gland Packing</b>	PTFE: Standard PEEK: Temperature above 200°C
<b>Material</b>	A105, A 479 304, A 479 316, A182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated, SS Natural

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Needle Valves Screwed Bonnet Design Double Ferrule Tube Ends

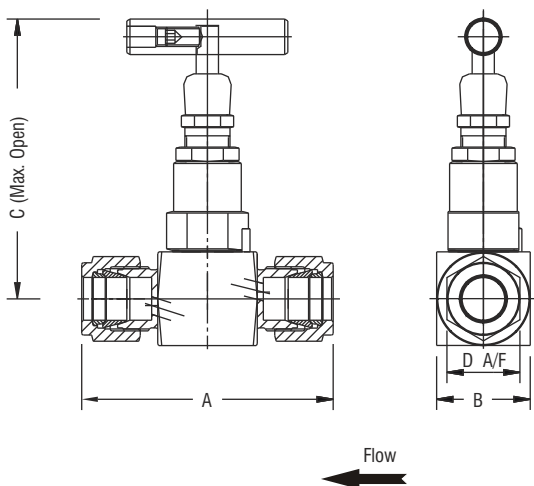


## Model No. NVT

Designed for use with tubes through built in Double ferrule compression fittings for throttling purpose and straight shut off of liquids, gas or vapour service. These needle valves are available with a variety of end connections and stem packing.



## Description



<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar Seat - 415 bar Pneumatic : Seat - 7 bar
<b>Gland Packing</b>	PTFE : Standard Graphoil : Temperatures above 200°C
<b>Material</b>	A105, A 479 304, A 479 316, A182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated, SS Natural

### Connections

TUBE OD	A	B	C	D A/F	PART No.
1/4" / 6mm	65	25	90	14	G4 NV-T/NV-T-6
5/16" / 8mm	65	25	90	16	G5 NV-T/NV-T-8
3/8" / 10mm	65	25	90	17	G6 NV-T/NV-T-10
1/2" / 12mm	70	28	92	22	G8 NV-T/NV-T-12
3/4" / 20 mm	80	30	92	28.5	G12 NV-T/NV-T-20

**Note:** Bigger tube connections up to 1 1/2" 25 mm OD size available on request.

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Needle Valves Integral Bonnet Double Ferrule Ends

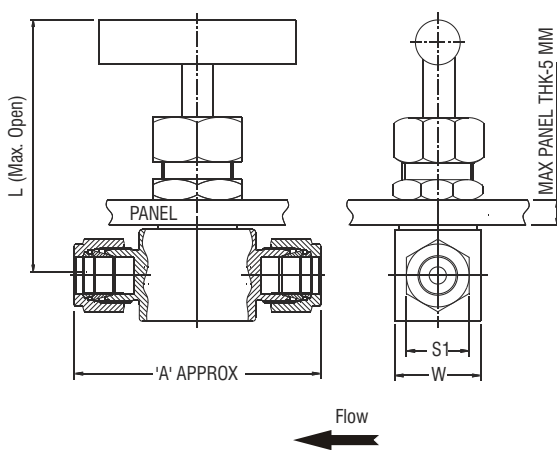


## Model No. NV-T-IB

A compact needle valve especially designed for direct use with tubes through built-in double ferrule compression fittings for panel mounting. Ideal for stainless steel, copper monel tubes. These needle valves are available with a variety of end connections and stem packing.



## Description



<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard Graphoil : Temperatures above 200°C
<b>Material</b>	A105, A 479 304, A 479 316, A182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural

### Connections

SIZE	A	W	S1	L	PART No.
1/8" O.D.	59	22	11	68	G2 NV - T - IB-P
1/4" O.D.	59	22	14	68	G4 NV - T - IB-P
3/8" O.D.	65	24	17	72	G6 NV - T - IB-P
1/2" O.D.	65	28	22	75	G8 NV - T - IB-P
3/4" O.D.	123	32	28.5	120	G12 NV - T - IB-P
1" O.D.	128	38	38.1	120	G16 NV - T - IB-P

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Needle Valves Screwed Bonnet Design Female Ends

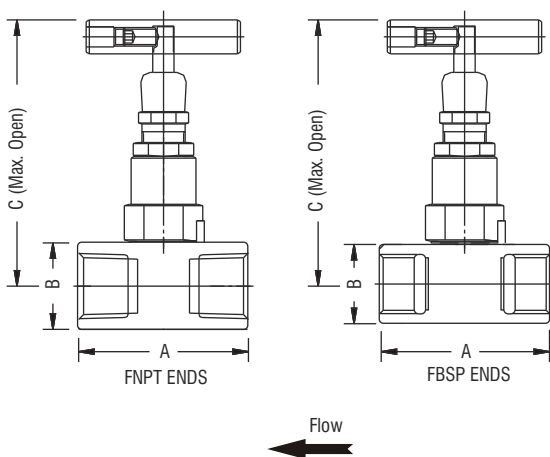


## Model No. NV M/F

Designed for use in purpose applications for throttling and straight shut off of liquids, gas or vapour service. These needle valves are available with a variety of end connections and stem packing.



## Description



<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard Graphoil : Temperatures above 200°C
<b>Material</b>	A105, A 479 304, A 479 316, A182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural

### Connections

SIZE	A	B	C	Part No.	Size	A	B	C	PART No.
1/4" FNPT	55	25	89	G4 FNVN	1/4" BSP	55	25	90	G4 FNVR
3/8" FNPT	55	25	89	G6 FNVN	3/8" BSP	55	25	90	G6 FNVR
1/2" FNPT	65	28	90	G8 FNVN	1/2" BSP	65	28	92	G8 FNVR
3/4" FNPT	65	36	110	G12 FNVN	3/4" BSP	65	36	92	G12 FNVR
1" FNPT	80	42	113	G16 FNVN	1" BSP	80	42	100	G16 FNVR

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Needle Valves Screwed Bonnet Design Male x Female Ends

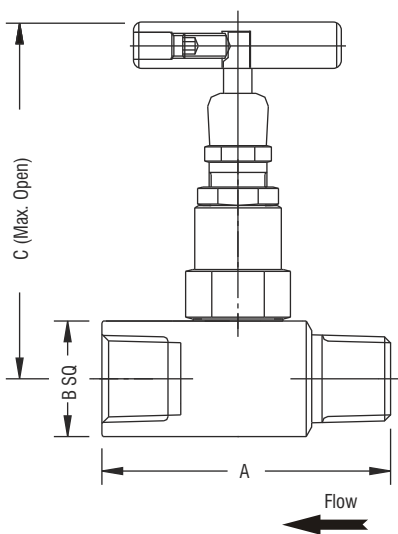
*General*

## Model No. M/F NV

Designed for use in applications for throttling purpose and straight shut off of liquids, gas or vapour service. These needle valves are available with a variety of end connections and stem packing.



## Description



<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard Graphoil : Temperatures above 200°C
<b>Material</b>	A105, A 479 304, A 479 316, A182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural

### Connections

(INLET x OUTLET)	A	B	C	PART No.
1/4" MNPT x 1/4" FNPT	55	25	90	G4 M/FNVN
1/4" MBSP x 1/4" FBSP	55	25	90	G4 M/FNVR
1/2" MNPT x 1/4" FNPT	63	28	92	G8-4 M/FNVN
1/2" MNPT x 1/2" FNPT	65	28	92	G8 M/FNVN
1/2" MBSP x 1/2" FBSP	65	28	92	G8 M/FNVR
3/4" MNPT x 1/2" FNPT	65	36	110	G12-8 M/FNVN
3/4" MBSP x 1/2" FBSP	65	36	110	G12-8 M/FNVR
3/4" MNPT x 3/4" FNPT	65	36	95	G12 M/FNVN
3/4" MBSP x 3/4" FBSP	65	36	95	G12 M/FNVR
1" MNPT x 1" FNPT	80	42	100	G16 M/FNVN
1" MBSP x 1" FBSP	80	42	100	G16 M/FNVR

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Needle Valves Integral Bonnet Screwed Ends

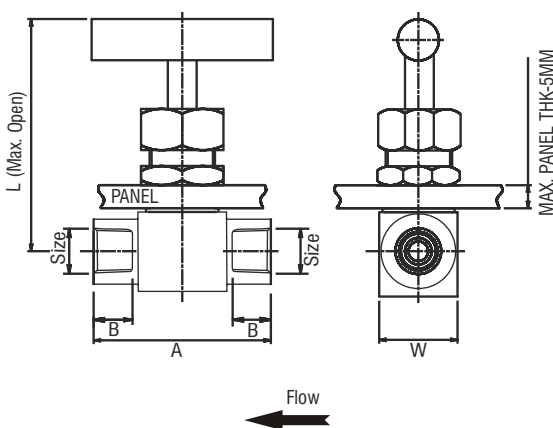


## Model No. FNVN-IB

A compact needle type valve for isolation of lines, sampling, throttling & similar applications. The valve has screwed ends to be used with pipes & tubes for panel mounting. These needle valves are available with a variety of end connections and stem packing.



## Description



<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard Graphoil : Temperatures above 200°C
<b>Material</b>	A105, A 479 304, A 479 316, A182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural

### Connections

SIZE	A	B	W	L	PART No.
1/8" FNPT	50	11	22	65	G2 FNVN-IB-P
1/4" FNPT	50	14	22	65	G4 FNVN-IB-P
3/8" FNPT	50	14	24	53	G6 FNVN-IB-P
1/2" FNPT	65	19	28	88	G8 FNVN-IB-P
3/4" FNPT	65	19	36	88	G12 FNVN-IB-P
1" FNPT	84	25	45	102	G16 FNVN-IB-P

**Note:** Also available with BSP and BSP taper threads.

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

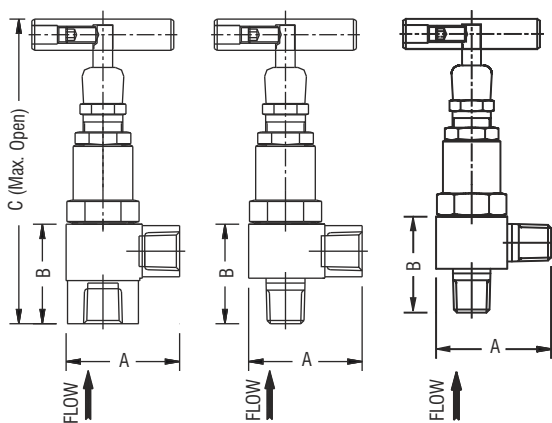
# Angle Needle Valves Screwed Bonnet Design

## Model No. ANVN

Designed for use in applications for throttling purpose and straight shut off of liquids, gas or vapour service. These needle valves are available with a variety of end connections and stem packing.



## Description



<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard Graphoil : Temperatures above 200°C
<b>Material</b>	A105, A 479 304, A 479 316, A182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural

### Connections

(INLET x OUTLET)	A	B	C	PART No.
1/4" MNPT x 1/4" MNPT	45	39	116	G4 AMNVN
1/4" FNPT x 1/4" FNPT	45	39	115	G4 AFNVN
1/4" MNPT x 1/4" FNPT	45	39	115	G4 AM/FNVN
3/8" MNPT x 3/8" MNPT	45	39	116	G6 AMNVN
3/8" FNPT x 3/8" FNPT	45	39	115	G6 AFNVN
3/8" MNPT x 3/8" FNPT	45	39	115	G6 M/FNVN
1/2" MNPT x 1/2" MNPT	50	50	126	G8 AMNVN
1/2" FNPT x 1/2" FNPT	50	50	128	G8 AFNVN
1/2" MNPT x 1/2" FNPT	50	50	128	G8 AM/FNVN

**Note:** Also available with BSP and BSP taper thread connections bigger pipe connections on request.

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.



# Multi - Port Gauge Valves

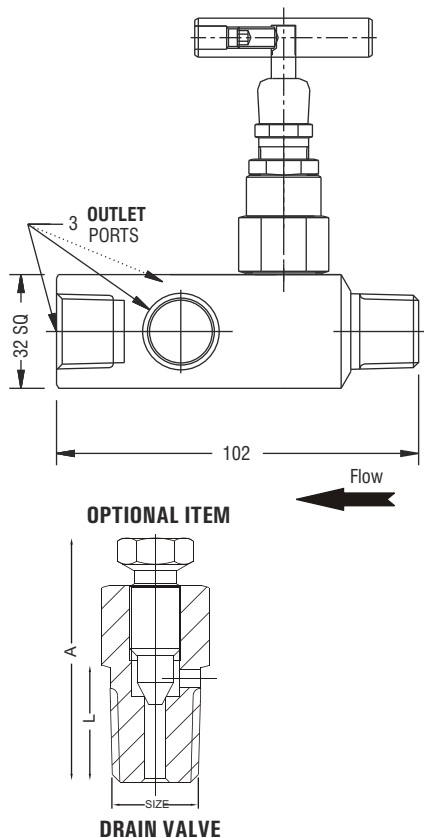


## Model No. MPV

Multiport gauge valve is designed for giving the user flexibility in positioning of gauges or pressure switches. These valve can be supplied with vent valve and blanking plug separately.



## Description



<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard Graphoil : Temperatures above 200°C
<b>Material</b>	A105, A 479 304, A 479 316, A182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural

### Connections

(INLET x OUTLET)	PART No.
1/2"MNPT x 1/2"FNPT	G8 MPV M/FN
1/2"FNPT x 1/2"FNPT	G8 MPV FN
3/4"MNPT x 1/2"FNPT	G12-8 MPV M/FN

**Note:** Also available with BSP and BSP taper threads.

### DRAIN VALVE

A compact miniature drain valve to be used with multiport valves and transmitters for draining or venting of instruments.

SIZE	A	L	PART No.
1/4"NPT	37.3	14.3	G4DVN
3/8"NPT	37.3	14.3	G6DVN
1/2"NPT	42.1	19.1	G8DVN
3/4"NPT	42.1	19.1	G12DVN

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

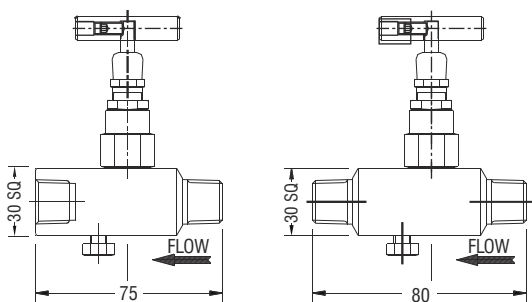
# Single Block & Bleed Gauge Valves

## Model No. GIV

Needle Valve with down stream vent for usage with Static Pressure Gauge and instrument installation for isolation and venting.



## Description



<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard Graphoil : Temperatures above 200°C
<b>Material</b>	A105, A 479 304, A 479 316, A182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural

### Connections

(INLET x OUTLET) x DRAIN	PART No.
1/2" MNPT x 1/2" MNPT x 1/4" NPT PLUG	G8 GIV.M.N.D
1/2" MNPT x 1/2" FNPT x 1/4" NPT PLUG	G8 GIV.M/F.N.D
1/2" FNPT x 1/2" FNPT x 1/4" NPT PLUG	G8 GIV.F.N.D
3/4" MNPT x 1/2" FNPT x 1/4" NPT PLUG	G12-8 GIV.M/F.N.D

**Note:** Also available with BSP and BSP Taper Pipe Threads bigger pipe connections on request.



# Two Valve (Three-way) Manifold for Pressure Instruments

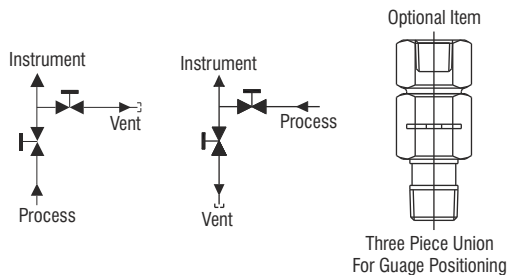
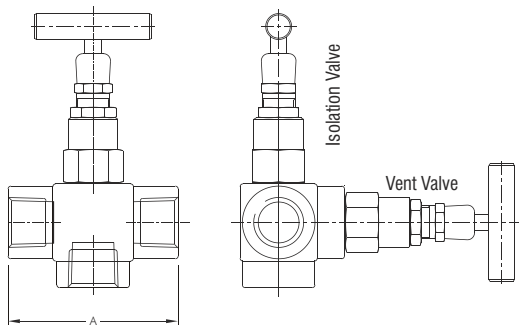


## Model No. G2 VM1

Two valve manifold is designed in a single block with female screwed inlet and outlet ports combining isolation valve and calibration / vent valve. Generally used on static pressure transmitters, switches and gauges.



## Description



<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard Graphoil : Temperatures above 200°C
<b>Material</b>	A105, A 479 304, A 479 316, A182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish Option</b>	CS zinc plated. SS Natural Drain Plug. Three piece union for gauge positioning

PROCESS PORT	GAUGE PORT	DRAIN PORT	A
1/2" NPT(F)	1/2" NPT(F)	1/4" NPT(F)	65
1/2" NPT(F)	1/2" NPT(F)	1/2" NPT(F)	65
3/4" NPT(F)	3/4" NPT(F)	3/4" NPT(F)	65
1/2" BSP(F)	1/2" BSP(F)	1/2" BSP(F)	65
1/2" NBSW	1/2" NPT(F)	1/2" NPT(F)	65
3/4" NBSW	1/2" NPT(F)	1/2" NPT(F)	65

### Angle Type II

GAUGE INLINE WITH DRAIN/VENT AND PROCESS AT RIGHT ANGLE			
1/2" BSP(F)	1/2" NPT(F)	1/2" NPT(F)	65
3/4" NPT(F)	3/4" NPT(F)	3/4" NPT(F)	65
1/2" NBSW	1/2" NPT(F)	1/2" NPT(F)	65
3/4" NBSW	1/2" NPT(F)	1/2" NPT(F)	65

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Two Valve Manifold

*General*

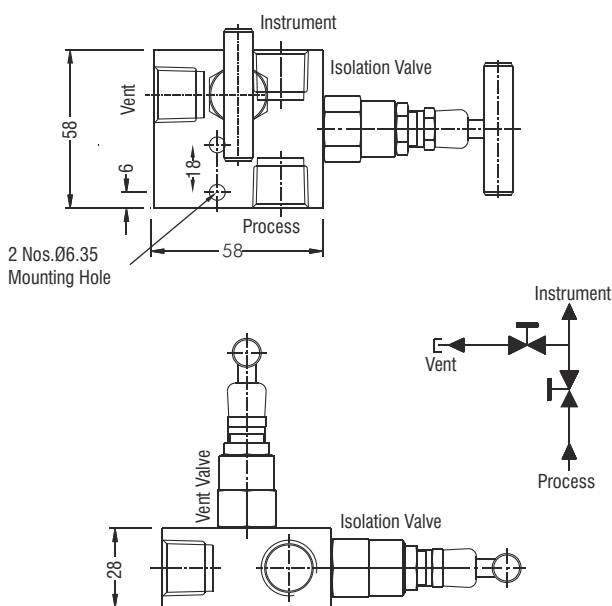
## Model No. G2 VM2

Two valve manifold is designed in a single block with female screwed inlet and outlet port combining isolation valve and calibration / vent valve. Generally used on static pressure transmitters, switches or gauges.



Vent valve on top and isolation valve on side

## Description



<b>Connections</b>	Process : 1/2" NPT (F) Instrument : 1/2" NPT (F) Drain/Vent : 1/4" NPT (F), (1/2" NPT (F) optional)
<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard GRAPHOIL : Temperatures above 200°C
<b>Material</b>	A 105, A 182 / A 479 GR F 304, A 182 / A 479 GR F316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural
<b>Option</b>	Drain Plug. Three piece union for gauge positioning
<b>Accessory</b>	Mounting Bolts - IS : 1364 - 1960 - 2 Nos

**Note:** Also available with BSP and BSP taper threads.

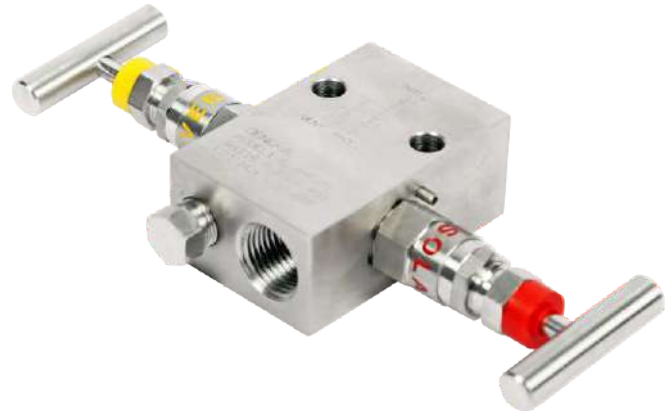
**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Two Valve Manifold

*General*

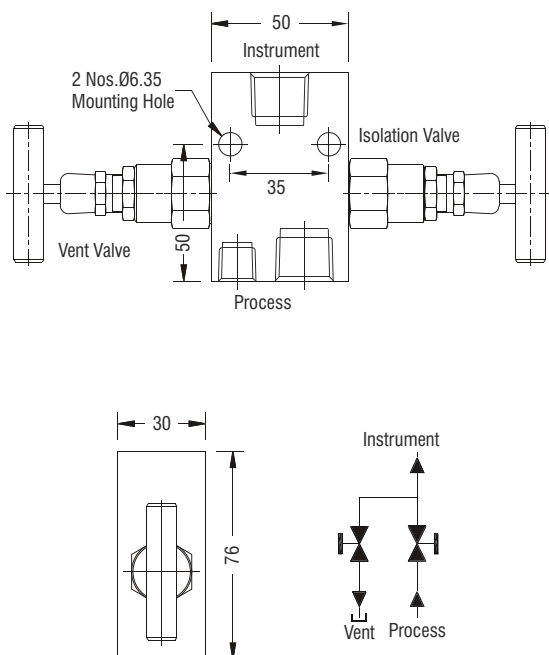
## Model No. G2 VMPTM1

Two valve manifold is designed in a single block with female screwed inlet and outlet port combining isolation valve and vent / calibration valve. Generally used on static pressure transmitters, switches or gauges.



Isolation & vent valve opposed and drain on process side

## Description



<b>Connections</b>	Process : 1/2" NPT (F) Instrument : 1/2" NPT (F) Drain/Vent : 1/4" NPT (F)
<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard GRAPHOIL : Temperatures above 200°C
<b>Material</b>	A 105, A 182 / A 479 GR F 304, A 182 / A 479 GR F316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural
<b>Option</b>	Drain Plug. Three piece union for gauge positioning
<b>Accessory</b>	Mounting Bolts - IS : 1364 - 1960

**Note:** Also available with BSP and BSP taper threads.

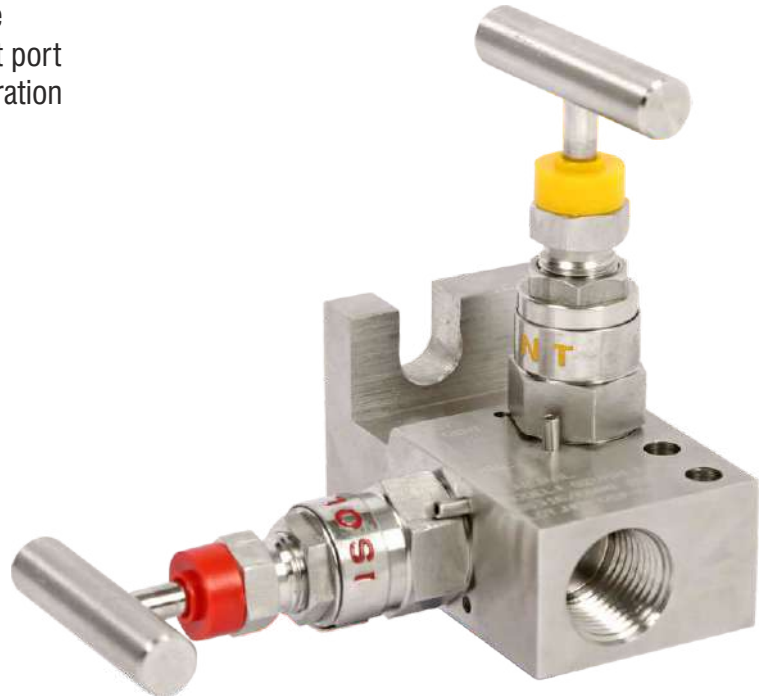
**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Two Valve "T" Type Manifold for Pressure Instruments

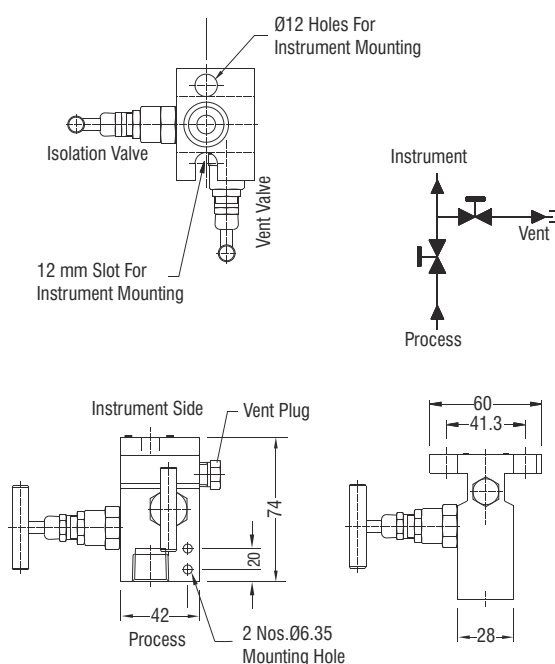
*General*

## Model No. G2 VMPF1

Two valve manifold is designed in a single block with female screwed inlet and outlet port combining isolation valve and vent / calibration valve. Generally used on static pressure transmitters, switches or gauges.



## Description



<b>Connections</b>	Process : 1/2" NPT (F) Instrument : Flanged Drain/Vent : 1/4" NPT (F)
<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard GRAPHOIL : Temperatures above 200°C
<b>Material</b>	A 105, A 182 GR F 304, A 182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural
<b>Option</b>	Drain Plug
<b>Accessory</b>	Mounting Bolts - IS : 1364 - 1960 - 2 Nos Interface seal - PTFE / VITON - 1 Nos

**Note:** Also available with BSP and BSP taper threads.

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.



# Three Valve Manifold, Separately Mounted



## Model No. G3 VMPP1

Designed for applications to facilitate remote mounting of differential pressure instruments. Dimensions shown above are for the standard 54 mm or 2 1/8 inch instrument connection. Centre distance found in majority of instruments.

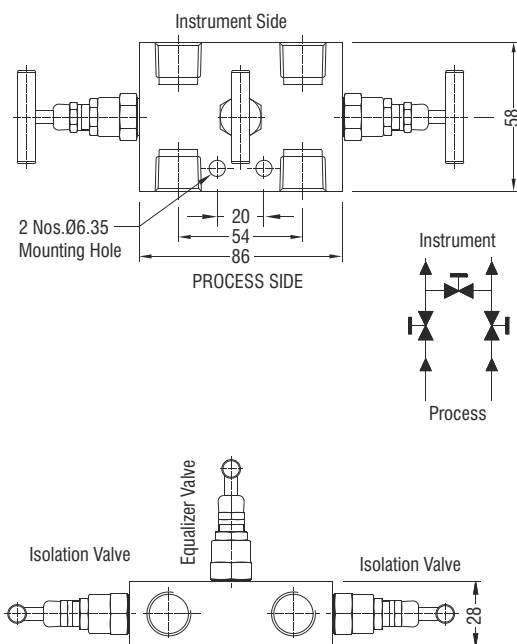
The manifold is also available for instruments with other centre distances for instrument connections (as 55 mm, 56 mm and 57 mm) but dimensions shown will vary.

Please consult us for these dimensions. Useful for installations in remote fields eliminating conventional method of piping.



**Valve on three sides with screwed connections**

## Description



<b>Connections</b>	Process : 1/2" NPT (F) Instrument : 1/2" NPT (F) Drain/Vent : 1/4" NPT (F) (Optional)
<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard GRAPHOIL : Temperatures above 200°C
<b>Material</b>	A 105, A 182 GR F 304, A 182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural
<b>Option</b>	Drain Port on instrument side with drain plug (Dimension 58 becomes 76) Test Port on process side with plug
<b>Accessory</b>	Mounting Bolts - IS : 1364 - 1960 - 2 Nos

**Note:** Also available with BSP and BSP taper threads.

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Three Valve Manifold, Direct Mounting



## Model No. G3 VMPF2

Designed for direct mounting on to standard differential pressure transmitters. This manifold block incorporates three valves, two main process isolation valves and one equalising valve.

This design is suitable where the straight valve may foul with the instrument and to provide ease of operation.

Dimensions shown are for the standard 54 mm or 2 1/8 inch instrument connection Centre distance found in majority of instruments.

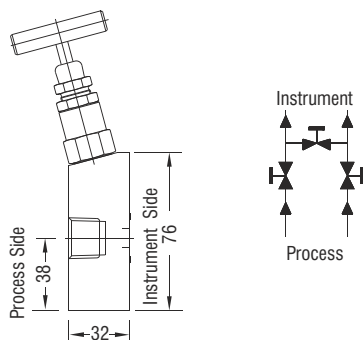
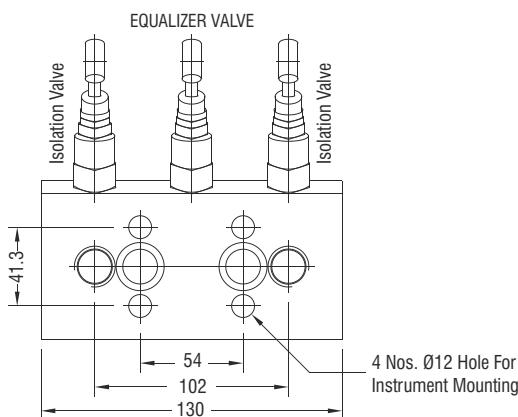
The manifold is also available for instruments with other centre distances for instrument connections (as 55 mm, 56 mm and 57 mm) but dimensions shown will vary.

Please consult factory for these dimensions.



All valves on top, screwed process connections

## Description



<b>Connections</b>	Process : 1/2" NPT (F) Instrument : Flanged Drain/Vent : 1/4" NPT (F) (Optional)
<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard GRAPHOIL : Temperatures above 200°C
<b>Material</b>	A 105, A 182 / A 479 GR F 304, A 182 / A 479 GR F316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural
<b>Option</b>	Drain Port on instrument side with drain plug Test Port on process side with plug.
<b>Accessory</b>	Mounting Bolts - IS : 1364 - 1960 - 4 Nos Interface seal - PTFE / VITON - 2 Nos

**Note:** Also available with BSP and BSP taper threads.

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continued research and development.

# Three Valve Manifold, Direct Mounting - T Type

## Model No. G3 VMPF1

Designed for direct mounting on to standard differential pressure transmitters. This manifold block incorporates three valves, two main process isolation valves and one equalising valve.

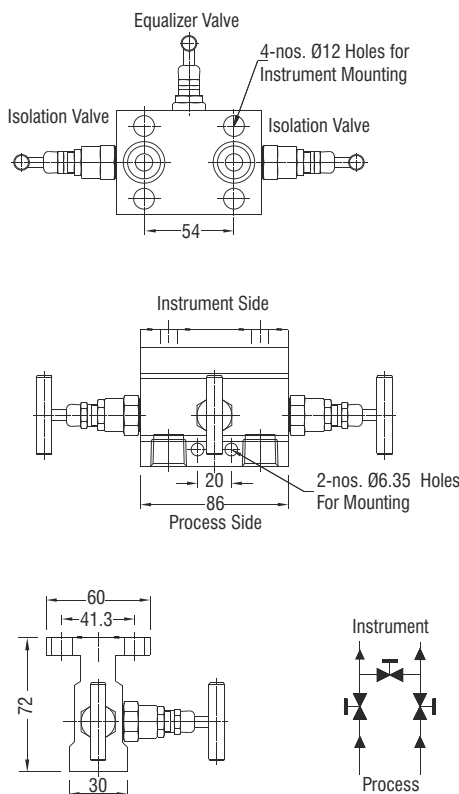
Dimensions shown are for the standard 54 mm or 2 1/8 inch instrument connection Centre distance found in majority of instruments. The manifold is also available for instruments with other centre distances for instrument connections (as 55 mm, 56 mm and 57 mm) but dimensions shown will vary.

Please consult us for these dimensions.



**Screwed process and flanged instrument connection**

## Description



<b>Connections</b>	Process : 1/2" NPT (F) Instrument : Flanged Drain/Vent : 1/4" NPT (F) (Optional)
<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard GRAPHOIL : Temperatures above 200°C
<b>Material</b>	A 105, A 182 GR F 304, A 182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural
<b>Accessories</b>	Two PTFE seal ring and four 7/16" UNF HI Steel mounting bolts available on request
<b>Mounting Kit</b>	Mounting bracket with U bolts and necessary kits for fitting on 2" NB stanchion pipe stand or wall mount. (to be ordered separately)
<b>Option</b>	Drain Port on instrument side with drain plug Test Port on process side with plug
<b>Accessory</b>	Mounting Bolts - IS : 1364 - 1960 - 4 Nos Interface seal - PTFE / VITON - 2 Nos

**Note:** Also available with BSP and BSP taper threads.

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Three Valve Manifold, Direct Mounting - H Type

## Model No. G3 VMFF1

Designed for direct or remote mounting of differential pressure transmitters. For remote mounting two oval / kidney flanges are used for connecting process pipe to manifold block. The manifold block incorporate two main valves for process isolation and one valve for equalizing.

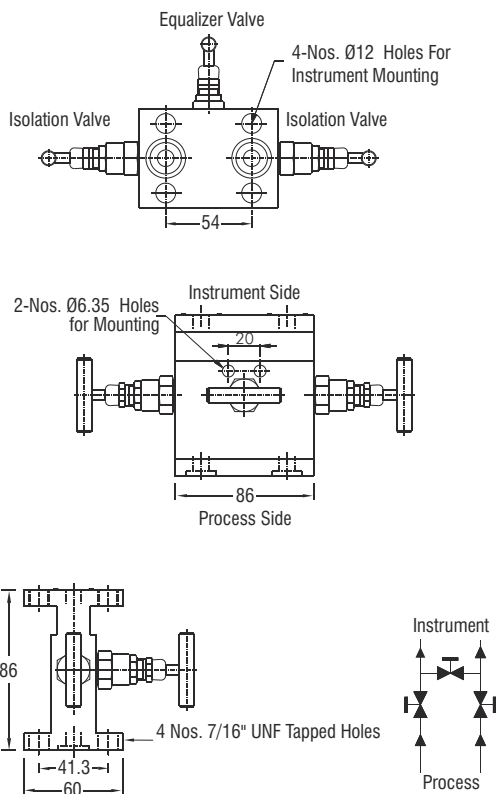
Dimensions shown are for the standard 54 mm or 2 1/8 inch instrument connection Centre distance found in majority of instruments. The manifold is also available for instruments with other centre distances for instrument connections (as 55 mm, 56 mm and 57 mm) but dimensions shown will vary.

Please consult us for these dimensions.



**Flanged instrument  
and process connection**

## Description



<b>Connections</b>	Process : Flanged Instrument : Flanged Drain/Vent : 1/4" NPT (F) (Optional)
<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard GRAPHOIL : Temperatures above 200°C
<b>Material</b>	A 105, A 182 GR F 304, A 182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural
<b>Accessories</b>	Two PTFE seal ring and four 7/16" UNF HI Steel mounting bolts available on request
<b>Mounting Kit</b>	Mounting bracket with U bolts and necessary kits for fitting on 2" NB stanchion pipe stand or wall mount. (to be ordered separately)
<b>Option</b>	Drain Port on instrument side with drain plug Test Port on process side with plug
<b>Accessory</b>	Mounting Bolts - IS : 1364 - 1960 - 4 Nos Interface seal - PTFE / VITON - 2 Nos

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Three Valve Manifold Coplanar Mounting



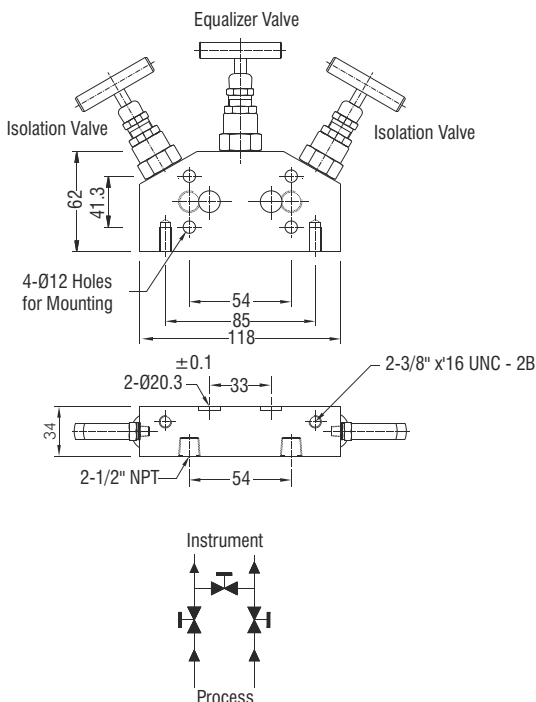
## Model No. G3 VMC 1

Designed as a new series of process instrument manifold for particular transmitter models. The coplanar manifold when assembled to transmitter has the advantage of compact size with ease for operation in minimum space, thereby eliminating several components in integrating the manifold to the transmitter. The coplanar manifold has two isolating valves, one equalizer valve.

The manifold dimensions illustrated are for standard 33 mm instrument centres but available for other centres. The direct mounting facility to the base of the differential pressure transmitter results in less leakage points and more accurate measurements.



## Description



<b>Connections</b>	Process : 1/2" NPT (F) Instrument : Flanged Drain/Vent : 1/4" NPT (F) (Optional)
<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard GRAPHOIL : Temperatures above 200°C
<b>Material</b>	A 105, A 182 / A 479 GR F 304, A 182 / A 479 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural
<b>Option</b>	Test Port on process side with plug
<b>Accessory</b>	Mounting Bolts - IS : 1364 - 1960 - 4 Nos

**Note:** Also available with BSP and BSP taper threads.

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.





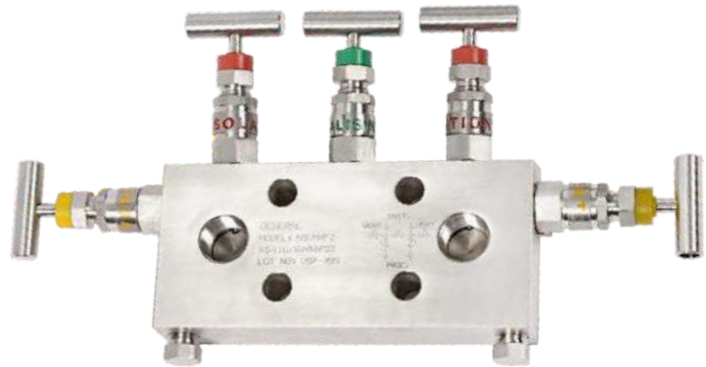
# Five Valve Manifold, Direct Mounting



## Model No. G5 VMPF2

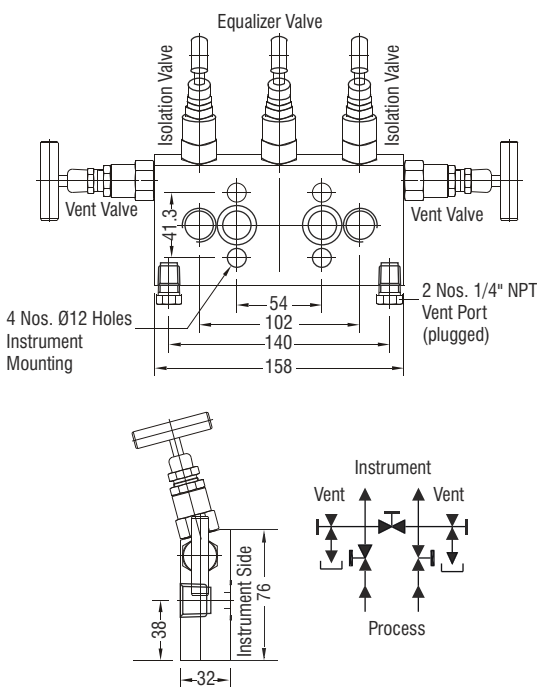
Five Valve Manifold Model G5VMPF2 is designed for direct mounting on differential pressure instruments. The manifold incorporates two process isolation valves, one equalizer valve and two drain/vent valves with separate connections. The process connection is through threaded connections for tube or pipe assembly. The valves are suitably angled to prevent fouling with the instrument.

Dimensions shown are for the standard 54 mm or 2 1/8 inch instrument connection centres but also available for other centres on request.



Vent valves on side and rest on top, screwed process connection

## Description



<b>Connections</b>	Process : 1/2" NPT (F) Instrument : Flanged Drain/Vent : 1/4" NPT (F)
<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard GRAPHOIL : Temperatures above 200°C
<b>Material</b>	A 105, A 182 / A 479 GR F 304, A 182 / A 479 GR F316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural
<b>Option</b>	Test Port on precess side with plug
<b>Accessory</b>	Mounting Bolts - IS : 1364 - 1960 - 4 Nos Interface seal - PTFE / VITON - 2 Nos

**Note:** Also available with BSP and BSP taper threads.

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continued research and development.



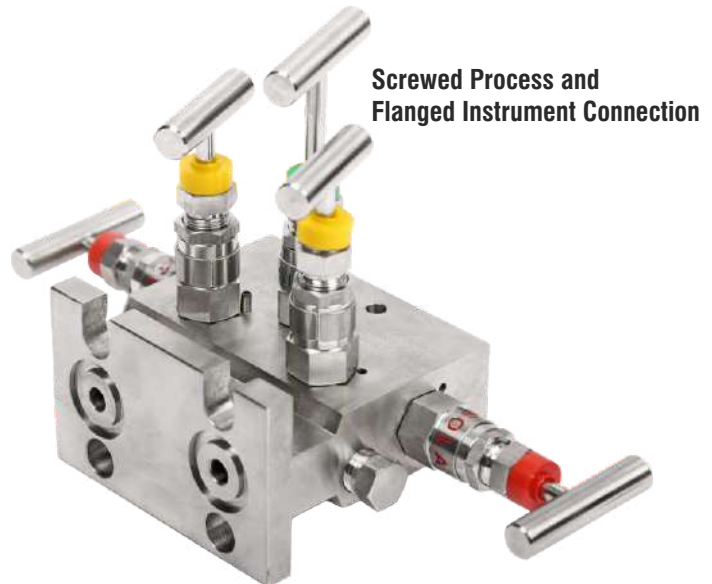
# Five - Valve Manifold, Direct Mounting - T Type

*General*

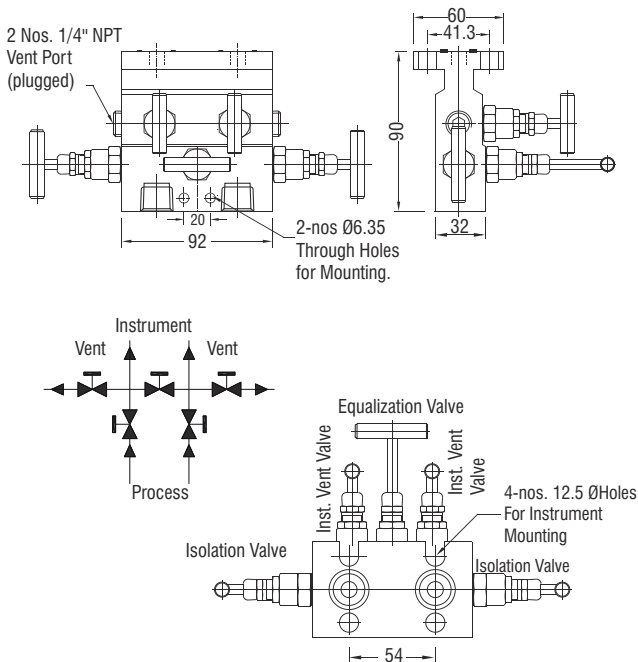
## Model No. G5 VMPF1

Five Valve Manifold Model “T” type Model G5VMPF1 is designed for direct mounting on differential pressure instruments. The manifold incorporates two process isolation valves, one equalizer valve and two drain/vent valves in a compact block. The process connection is threaded for connections by tube or pipe fittings.

Dimensions shown are for the standard 54 mm or 2 1/8 inch centres for instrument and process connections but are available for other centres on request. Thread details shown are for standard popular sizes and available to suit other thread standards.



## Description



<b>Connections</b>	Process : 1/2" NPT (F) Instrument : Flanged Drain/Vent : 1/4" NPT (F)
<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard GRAPHOIL : Temperatures above 200°C
<b>Material</b>	A 105, A 182 GR F 304, A 182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural
<b>Mounting Kit</b>	Mounting bracket with U bolts and necessary kits for fitting on 2" NB stanchion pipe stand or wall mount. (to be ordered separately)
<b>Option</b>	Test Port on process side with plug
<b>Accessory</b>	Mounting Bolts - IS : 1364 - 1960 - 4 Nos Interface seal - PTFE / VITON - 2 Nos

**Note:** Also available with BSP and BSP taper threads.

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

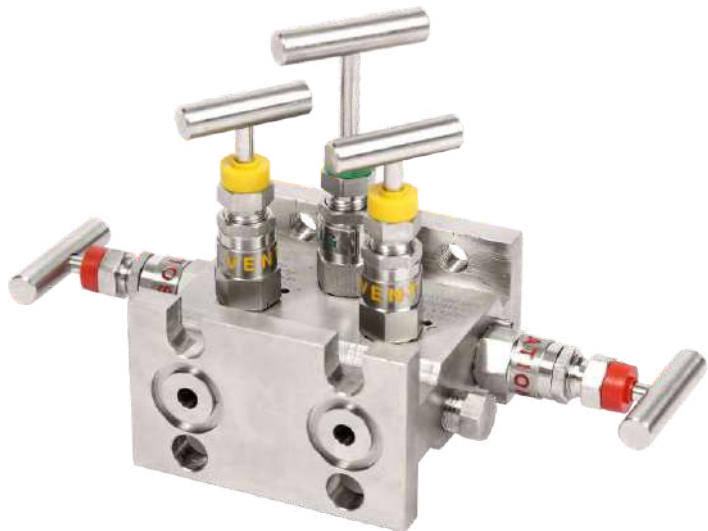
# Five Valve Manifold, Direct Mounting - H Type

*General*

## Model No. G5 VMFF 1

Five Valve Manifold Model G5 VMFF 1 is designed for direct or remote mounting of differential pressure transmitters. For remote mounting two oval / kidney flanges are used for connecting process pipe to manifold block. These manifold block incorporate five valves, two main valve for process isolation valve for vent one valves for equalizing.

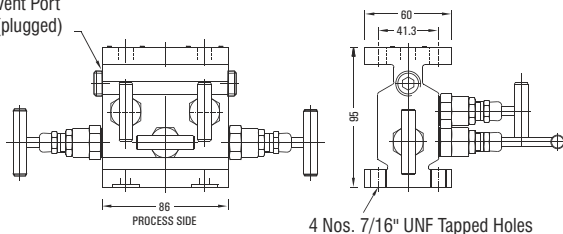
Dimensions shown above are for the standard 54 mm or 2 1/8 inch instrument connection Centre distance found in majority of instruments. The manifold is also available for instruments with other centre distances for instrument connections (as 55 mm, 56 mm and 57 mm) but dimensions shown will vary. Please consult us for these dimensions.



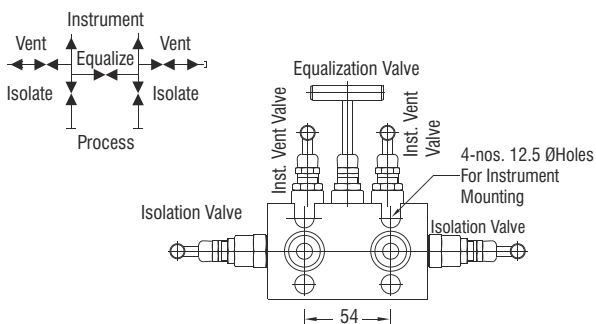
**Flanged instrument and process connection**

## Description

2 Nos. 1/4" NPT  
Vent Port  
(plugged)



4 Nos. 7/16" UNF Tapped Holes



### Connections

Process : Flanged  
Instrument : Flanged  
Drain/Vent : 1/4" NPT (F)

### Test Pressure

@ 25°C Room Temperature  
Hydrostatic : Body - 415 bar(g)  
Seat - 415 bar(g)  
Pneumatic : Seat - 7 bar(g)

### Gland Packing

PTFE : Standard  
GRAPHOIL : Temperatures above 200°C

### Material

A 105, A 182 GR F 304,  
A 182 GR F 316, Monel, Hastelloy

### Finish

CS zinc plated. SS Natural

### Mounting Kit

Mounting bracket with U bolts and necessary kits for fitting on 2" NB stanchion pipe stand or wall mount. (to be ordered separately)

### Option

Test Port on process side with plug.

### Accessory

Mounting Bolts - IS : 1364 - 1960 - 4 Nos  
Interface seal - PTFE / VITON - 2 Nos

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Monoflange Single Block & Bleed Valve



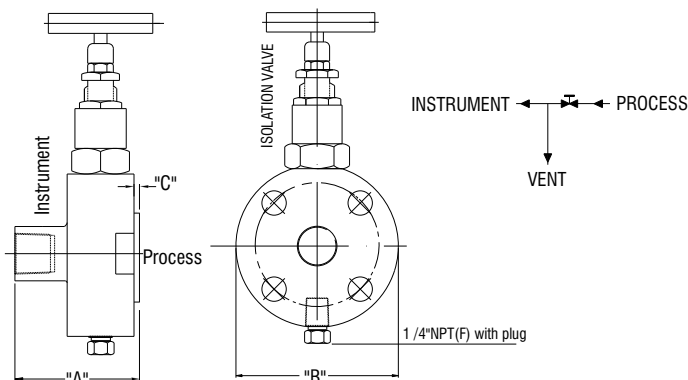
## Model No. GMFSBV

Isolation valve for primary take offs, where the valve is directly mounted to the vessel or Process pipe. Instruments may be directly mounted to the valve outlet or alternatively remotely mounted with gauge line / impulse pipe work.



<b>Connections</b>	Process : Flange as per ANSI B16.5 Instrument : 1/2"NPT (F) Drain/Vent : 1/4"NPT (F)
<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard GRAPHOIL : Temperatures above 200°C
<b>Material</b>	A 105, A 182 GR F 304, A 182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural

**Note:** Also available with BSP and BSP taper threads.



SIZE (inch)	RATING (#)	A (mm)	ØB (mm)	ØC (mm)
1/2"	150	57	90	2
3/4"	150	57	100	2
1"	150	57	110	2
1 1/2"	150	60	125	2
2"	150	63	150	2
1/2"	300	57	95	2
3/4"	300	60	115	2
1"	300	60	125	2
1 1/2"	300	63	155	2
2"	300	63	165	2
1/2"	600	61	95	7
3/4"	600	64	115	7
1"	600	64	125	7
1 1/2"	600	67	155	7
2"	600	67	165	7
1/2"	900	64	120	7
3/4"	900	64	130	7
1"	900	67	150	7
1 1/2"	900	67	180	7
2"	900	72	215	7
1/2"	1500	60	120	7
3/4"	1500	60	130	7
1"	1500	60	150	7
1 1/2"	1500	60	180	7
2"	1500	72	215	7
1/2"	2500	60	135	7
3/4"	2500	60	140	7
1"	2500	60	160	7
1 1/2"	2500	72	205	7
2"	2500	72	235	7

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Monoflange Double Block & Bleed Valve

*General*

## Model No. GMFDBV

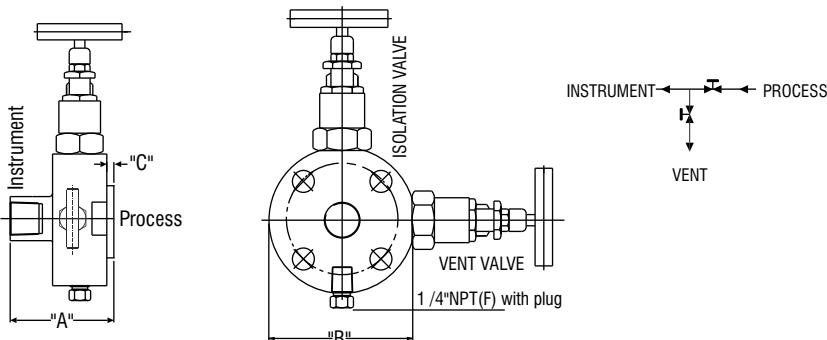
Block & bleed assemblies for primary isolation of pressure take-offs, where the valve is directly mounted to the vessel or process pipe. Instruments may be directly mounted to the valve outlet or alternatively remotely mounted with gauge line / impulse pipe line.



<b>Connections</b>	Process : Flange as per ANSI B16.5 Instrument : 1/2"NPT (F) Drain/Vent : 1/4"NPT (F)
<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard GRAPHOIL : Temperatures above 200°C
<b>Material</b>	A 105, A 182 GR F 304, A 182 GR F 316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural

**Note:** Also available with BSP and BSP taper threads.

SIZE (inch)	RATING (#)	A (mm)	ØB (mm)	ØC (mm)
1/2"	150	57	90	2
3/4"	150	57	100	2
1"	150	57	110	2
1 1/2"	150	60	125	2
2"	150	63	150	2
1/2"	300	57	95	2
3/4"	300	60	115	2
1"	300	60	125	2
1 1/2"	300	63	155	2
2"	300	63	165	2
1/2"	600	61	95	7
3/4"	600	64	115	7
1"	600	64	125	7
1 1/2"	600	67	155	7
2"	600	67	165	7
1/2"	900	64	120	7
3/4"	900	64	130	7
1"	900	67	150	7
1 1/2"	900	67	180	7
2"	900	72	215	7
1/2"	1500	60	120	7
3/4"	1500	60	130	7
1"	1500	60	150	7
1 1/2"	1500	60	180	7
2"	1500	72	215	7
1/2"	2500	60	135	7
3/4"	2500	60	140	7
1"	2500	60	160	7
1 1/2"	2500	72	205	7
2"	2500	72	235	7



**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Five Valve Manifold Coplanar Mounting

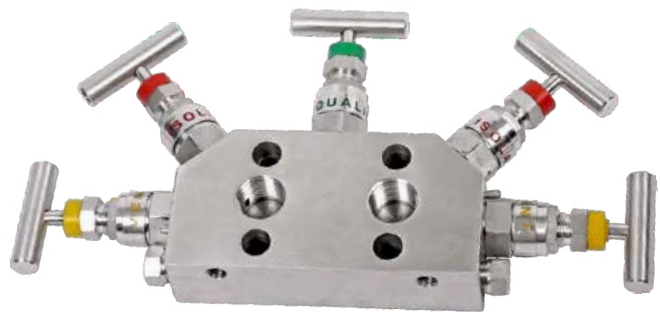


## Model No. G5 VMC1

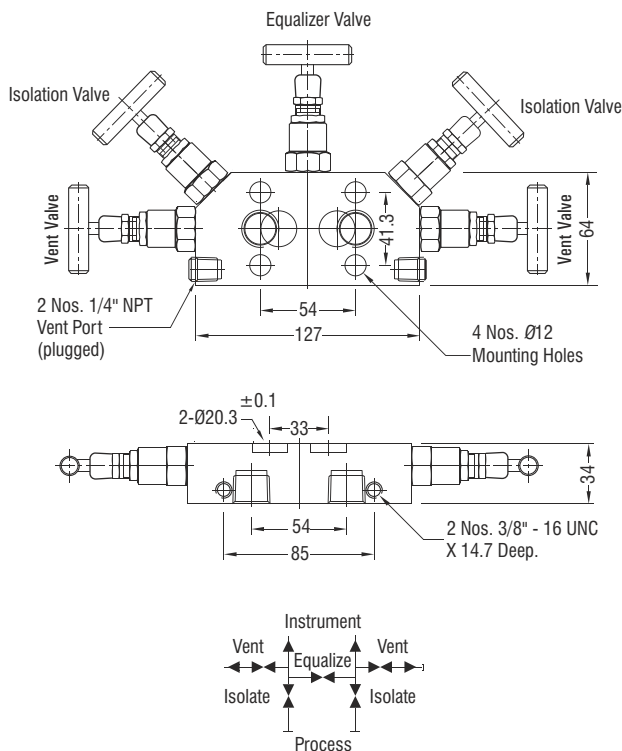
Five Valve Manifold Model G5VMC1 is designed as a new series of process instrument manifold for particular transmitter models.

The coplanar manifold when assembled to transmitter has the advantage of compact size with ease for operation in minimum space, thereby eliminating several components in integrating the manifold to the transmitter. The coplanar manifold has two isolating valves, one equalizer valve and two vent valves and two bottom test ports duly plugged.

The manifold dimensions illustrated are for standard 33 mm instrument centres but available for other centres. The direct mounting facility to the base of the differential pressure transmitter results in lesser leakage points and more accurate measurements.



## Description



<b>Connections</b>	Process : 1/2" NPT (F) Instrument : Flanged Drain/Vent : 1/4" NPT (F)
<b>Test Pressure</b>	@ 25°C Room Temperature Hydrostatic : Body - 415 bar(g) Seat - 415 bar(g) Pneumatic : Seat - 7 bar(g)
<b>Gland Packing</b>	PTFE : Standard GRAPHOIL : Temperatures above 200°C
<b>Material</b>	A 105, A 182 / A 479 GR F 304, A 182 / A 479 GR F316, Monel, Hastelloy, Duplex
<b>Finish</b>	CS zinc plated. SS Natural
<b>Optional</b>	Test Port on precess side with plug
<b>Accessory</b>	Mounting Bolts - IS : 1364 - 1960 - 4 Nos

**Note:** Also available with BSP and BSP taper threads.

**Note:** Drawings, Dimensions and other information are subject to change without notice, as a part of our continues research and development.

# Five Valve Manifold Coplanar Mounting



## Model No. G5 VMC2

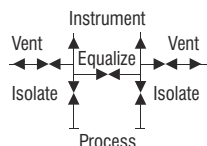
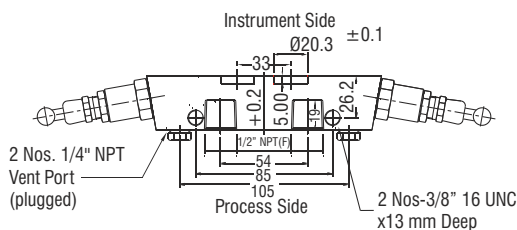
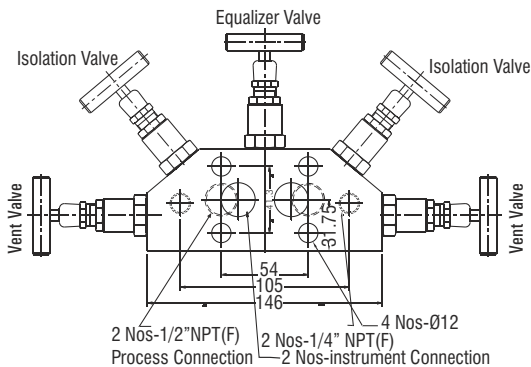
Five Valve Manifold Model G5 VMC 2 is designed as a new series of process instrument manifold for particular transmitter models.

The coplanar manifold when assembled to transmitter has the advantage of compact size with ease for operation in minimum space, thereby eliminating several components in integrating the manifold to the transmitter. The coplanar manifold has two isolating valves, one equalizer valve and two vent valves and two bottom test ports duly plugged.

The manifold dimensions illustrated are for standard 33 mm instrument centres but available for other centres. The direct mounting facility to the base of the differential pressure transmitter results in lesser leakage points and more accurate measurements.



## Description



### Connections

Process : 1/2" NPT (F)  
Instrument : Flanged  
Drain/Vent : 1/4" NPT (F)

### Test Pressure

@ 25°C Room Temperature  
Hydrostatic : Body - 415 bar(g)  
                  Seat - 415 bar(g)  
Pneumatic : Seat - 7 bar(g)

### Gland Packing

PTFE : Standard  
GRAPHOIL : Temperatures above 200°C

### Material

A 105, A 182 / A 479 GR F 304,  
A 182 / A 479 GR F316, Monel, Hastelloy, Duplex

### Finish

CS zinc plated. SS Natural

### Optional

Test Port on process side with plug

### Accessory

Mounting Bolts - IS : 1364 - 1960 - 4 Nos

**Note:** Also available with BSP and BSP taper threads.





# INSTRUMENT FITTINGS



## TUBING SPECIFICATION

We give below the specifications to be followed for the various tubings for use with GENERAL INSTRUMENTS CONSORTIUM Double Ferrule Compression Fittings.

### CARBON STEEL TUBING

Soft, annealed carbon steel hydraulic tubing to ASTM A 179, Din 2391 or equivalent based on ultimate tensile strength of 47000 psi and for metal temperatures not to exceed 20 deg C to 100 deg C. For higher temperature service, reducing factors for elevated temperature operation as specified in table 302.3 1A and 304.1.2 of the code for pressure piping in ANSI B31.3 should be applied.

The hardness of the tube is recommended to RB 72 or less.

The tubes should be suitable for bending and flaring and free of all surface defects and imperfections.

### STAINLESS STEEL TUBING

Annealed 304 or 316 Stainless Steel tubing to ASTM A 269 or A 213 or equivalent based on ultimate tensile strength of 75,000 psi and suitable for temperatures 20 deg C to 100 deg C.

The hardness of these tubes is not to exceed RB 80 and is preferred in the range RB 70-74.

Tubes to be suitable for bending and flaring and should be free of surface defects and imperfections.

### COPPER TUBING

Annealed, soft, seamless copper tubing to ASTM B 75 or ASTM B 88 based on an ultimate tensile strength of 30,000 psi and for a temperature in the range of 20 deg C to 80 deg C. Maximum hardness of the tube not to exceed RB 50. Tubes preferred in the range RB 40-45.

### MONEL 400 TUBING

Fully annealed Monel 400 seamless tubing conforming ASTM B165 or equivalent and based on ultimate tensile strength of 70,000 psi. and for use with temperatures 20 deg C to 90 deg C.

Hardness of the tube must be RB 75 maximum and is preferred in the range RB 68-72.

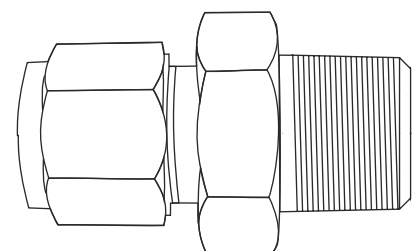
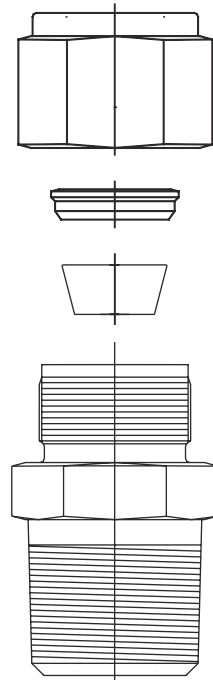
These tubes should be suitable for blending and flaring and free from all surface defects and imperfections.

## THREAD SPECIFICATIONS

GENERAL INSTRUMENTS CONSORTIUM connectors have one or more tubing end connections and the others with male or female pipe threads. There are a variety of pipe threads for which GENERAL INSTRUMENTS CONSORTIUM Double Ferrule Fittings are available. The most popular thread connections are the American National Pipe thread (NPT) British Standard Pipe threads (BSP) and metric threads. These threads belong to standards of individual countries as well as ISO where they have been codified. All

GENERAL INSTRUMENTS CONSORTIUM Fittings with pipe threads or stud end threads conforming to the specifications as detailed below.

- American National Pipe Thread (NPT) :  
Reference specification ANSI B1.20.1 : 1983
- ISO Parallel Pipe Thread (British Standard Pipe Thread ) :  
Reference specifications BS 2779, ISO 228/1, DIN 259, JIS B 0202, IS 2643
- ISO Taper Pipe Thread (British Standard Pipe Taper Thread)  
Reference specification BS 21, ISO 7/1, DIN 2999, JIS B0203, IS 554
- Unified National Pipe Threads:  
Reference specifications ANCI B1.1 : 1964



## TECHNICAL SPECIFICATIONS TO WHICH FITTINGS PERFORM

There are no standards available for Double Ferrule Compression fittings. The working pressure is restricted by the maximum working pressure of the tubes to be used with the fitting design is such that the tubes will burst before the breakage of the joint. Accordingly, the working pressure outlined in the section entitled 'Allowable Pressure Ratings for Tubing will prevail as the working pressure for these fittings.

The maximum working pressure of these fittings is also restricted by the pressure ratings for the pipe end connections adopted (see section entitled 'Pressure Ratings for Pipe Ends'). The lower of the two will be the maximum working pressure for the fittings.

There are no standard specifications available for type test requirement of Double Ferrule Compression Fittings. The attempt has been made by British Standards Institute to formulate a Standard BS 4368: Part IV 1984. A similar Standard has been formulated by the Indian Standards Institute vide IS 10103 : 1982. Both these Standards refer to Single Ferrule Fittings. They can however be adopted for Double Ferrule Fittings as well. The Standards cover the basic type test requirements for fittings assembled in a standard test assembly as outlined in the above Standards. The tests specified by these Standards are as follows :

### PROOF PRESSURE TEST

Test assemblies to be subjected to a pressure of 1.5 times the maximum working pressure of the fittings applied at the rate of 200 kg/cm<sup>2</sup> per minute and maintained at final pressure for five minutes with out leak.

### MINIMUM HYDRAULIC BURST PRESSURE

Apply hydraulic pressure to the test assembly upto a maximum of four times the working pressure at the rate not exceeding 200 kg/cm<sup>2</sup> per minute and maintain for five minutes without leak.

### DISMANTLING & REASSEMBLE TEST

Assemblies successfully completing Proof test are to be obeyed & assembled 25 times after which they must pass proof test.

### MINIMUM STATIC VACUUM TEST

Test assemblies satisfactorily proof pressure tested are subjected to negative pressure upto 700 mbar and then isolated from the vacuum pump. The assembly must maintain the vacuum for fifteen minutes. The assemblies are suitably decreased before the test and total exhausted volume should not exceed 20% of the total assembly volume. This test can also be given at two temperature for cryogenic applications.

### HYDRAULIC IMPULSE VIBRATION TEST

Test assemblies suitably proof pressure tested are connected to a hydraulic impulse and vibration test bench and subjected simultaneously to Pressure Impulses at 30 to 100 cycles per minute and vibration in two mutually perpendicular planes at 1,300 to 2,820 cycles per minute for a minimum of  $5 \times 10^6$  pressure impulses and  $20 \times 10^5$  vibration cycles. The method of choosing the displacement and the cycle is outlined in the Standards mentioned. The only permissible retightening is allowed after the first 1,000 pressure impulses to allow for bedding-in. When subjected to the test described this coupling should not leak in the assembly. Couplings that fail shall be examined for signs of cracking due to fatigue stress.

The above tests have been specified in the Standards BS 4369 Part IV : 1984. Some customers working with high temperature cycling test which requires test assemblies to be subjected to suitable temperature cycles and then subjected to the Proof Pressure Test without leakage. Other customers working with gases have specified a helium leak test with leak rates not exceeding  $2 \times 10^{-6}$  STD. CC/SEC. Fluid Controls undertakes all these tests at their recognized laboratories to satisfy all customers technical requirements.

### HIGH PRESSURE APPLICATIONS, HIGH SAFETY FACTOR SYSTEMS

Due to the variation of tubing diameters, a common starting point is desirable. Therefore, use a wrench to snug up the nut until the tubing will not turn (by hand) in the fitting. Now tighten the nut one-and-onequarter turns and the fitting is ready to hold pressure well above the working pressure of the tubing.

### RE-TIGHTENING INSTRUCTIONS

Connections can be disconnected and re-tightened many, many times and the same reliable, leak-proof seal obtained every time the reconnection is made.

### PRE-SWAGING

When GENERAL INSTRUMENTS CONSORTIUM fittings are to be installed in cramped quarters or overhead where ladders must be used is sometimes found advantageous to use a pre-swaging tool on the tubing in an open ground area, thus pre-swaging the ferrules onto the tubing. The tubing is then removed from the pre-swaging tool and the tubing (with nut and pre-swaging ferrules) can now be attached to the fitting merely by following the re-tightening instructions.

1. Assemble GENERAL INSTRUMENTS CONSORTIUM nut and ferrules to pre-swaging tool. Insert tubing until it bottoms in the fitting body, and tighten nut one-and-onequarter turns.
2. The nut is loosened and the tubing with pre-swaged ferrules is removed from the pre-swaging tool.
3. The connection can now be made by merely snugging up the nut as described in the re-tightening instructions.

GENERAL INSTRUMENTS CONSORTIUM Hydraulic swaging units are now available in 1/2", 5/8", 3/4" & 1" sizes for further information consult GENERAL INSTRUMENTS CONSORTIUM

### NOTE:

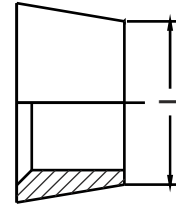
GENERAL INSTRUMENTS CONSORTIUM has a continuous and dynamic research and development program for the development of fittings in different materials, higher pressures and temperatures. The dimensions and information given in the catalog are subject to change without notice as a result of the findings in these programs.

## FRONT FERRULE INCH OD Tubes

T Tube OD	Part No.
1/16	1 GFF
1/8	2 GFF
1/4	4 GFF
5/16	5 GFF
3/8	6 GFF
1/2	8 GFF
5/8	10 GFF
3/4	12 GFF
7/8	14 GFF
1	16 GFF
1.1/4	20 GFF
1.1/2	24 GFF
2	32 GFF

## METRIC OD Tubes

T Tube OD	Part No.
4	GFF-4
6	GFF-6
8	GFF-8
10	GFF-10
12	GFF-12
14	GFF-14
15	GFF-15
16	GFF-16
18	GFF-18
20	GFF-20
22	GFF-22
25	GFF-25
28	GFF-28
30	GFF-30
32	GFF-32
38	GFF-38

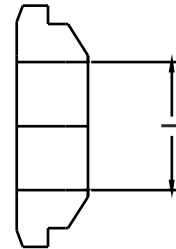


## BACK FERRULE INCH OD Tubes

T Tube OD	Part No.
1/16	1 GBF
1/8	2 GBF
1/4	4 GBF
5/16	5 GBF
3/8	6 GBF
1/2	8 GBF
5/8	10 GBF
3/4	12 GBF
7/8	14 GBF
1	16 GBF
1.1/4	20 GBF
1.1/2	24 GBF
2	32 GBF

## METRIC OD Tubes

T Tube OD	Part No.
3	GBF-3
6	GBF-6
8	GBF-8
10	GBF-10
12	GBF-12
14	GBF-14
15	GBF-15
16	GBF-16
18	GBF-18
20	GBF-20
22	GBF-22
25	GBF-25
28	GBF-28
30	GBF-30
32	GBF-32
38	GBF-38

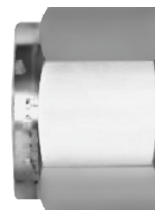
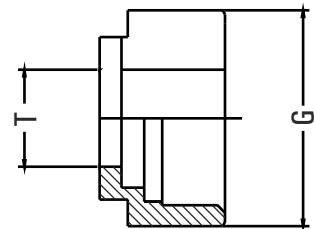


## COUPLING CAP (NUTS) INCH OD Tubes

T Tube OD	L	G A/FPart No.
1/16	8.0	8 1 GN
1/8	12.0	11 2 GN
1/4	12.7	14 4 GN
5/16	14.0	16 5 GN
3/8	14.5	17 6 GN
1/2	17.5	22 8 GN
5/8	17.5	25 10 GN
3/4	17.5	28.5 12 GN
7/8	17.5	32 14 GN
1	20.6	38 16 GN
1.1/4	31.8	50 20 GN
1.1/2	38.0	57 24 GN
2	52.5	76 32 GN

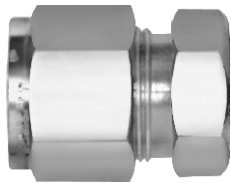
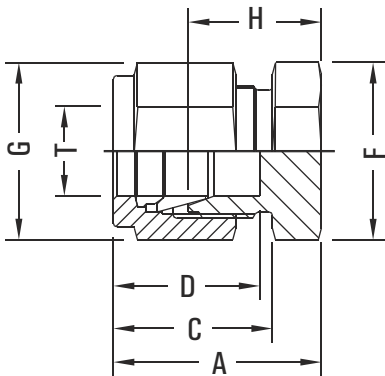
## METRIC OD Tubes

T Tube OD	L	G A/FPart No.
3	12.0	11 GN-3
6	12.7	14 GN-6
8	13.5	16 GN-8
10	15.1	22 GN-10
12	17.5	22 GN-12
14	17.5	25 GN-12
15	17.5	25 GN-15
16	17.5	25 GN-16
18	17.5	30 GN-18
20	17.5	32 GN-20
22	17.5	32 GN-22
25	20.6	38 GN-25
28	30.6	46 GN-28
30	32.7	50 GN-30
32	31.8	50 GN-32
38	38.1	57 GN-38



## TUBE END CLOSURE

INCH OD Tubes



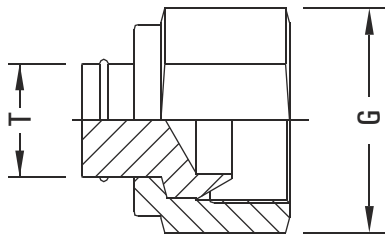
T Tube OD	A	C	D	F A/F	G A/F	H	Part No.
1/16	13.0	11.0	8.6	11	8	11.2	1GTC
1/8	20.0	15.3	12.7	11	11	13.5	2GTC
1/4	23.4	17.8	15.3	14	14	16.0	4GTC
5/16	24.4	18.5	16.3	16	16	17.0	5GTC
3/8	25.7	19.3	16.8	17	17	18.3	6GTC
1/2	29.2	21.8	22.9	22	22	19.0	8GTC
5/8	30.0	21.8	24.4	24	25	19.8	10GTC
3/4	31.5	21.8	24.4	27	28.5	21.4	12GTC
7/8	34.0	21.8	25.9	35	32	23.9	14GTC
1	38.4	26.4	31.2	35	38	26.2	16GTC
1.1/4	53.3	38.9	41.2	46	50	31.2	20GTC
1.1/2	64.5	45.2	50.0	55	57	37.4	24GTC
2	8	62.7	67.6	70.0	76.0	49.3	32GTC

METRIC OD Tubes

T Tube OD	A	C	D	F A/F	G A/F	H	Part No.
3	20.1	15.3	12.9	11	11	13.5	GTC-3
6	23.1	17.7	15.3	14	14	15.7	GTC-6
8	24.5	18.6	16.2	16	16	17.0	GTC-8
10	26.6	19.5	17.2	17	19	19.0	GTC-10
12	29.1	22.0	22.8	22	22	19.0	GTC-12
14	29.9	22.0	24.4	24	25	19.8	GTC-14
15	29.9	22.0	24.4	24	25	19.8	GTC-15
16	29.9	22.0	24.4	24	25	19.8	GTC-16
18	31.4	22.0	24.4	27	30	21.3	GTC-18
20	34.0	22.0	26.0	32	32	23.9	GTC-20
22	34.0	22.0	26.0	32	32	23.9	GTC-22
25	38.5	26.5	31.3	35	38	26.2	GTC-25
28	48.5	36.6	36.6	41	46	27.7	GTC-28
30	53.4	39.2	39.6	46	50	31.8	GTC-30
32	55.8	41.6	42.0	46	50	32.8	GTC-32
38	65.4	47.9	49.4	55	57	37.8	GTC-38

## FITTING END CLOSURE

INCH OD Tubes



T Tube OD	G A/F	Part No.
1/16	8	1GTP
1/8	11	2GTP
1/4	14	4GTP
5/16	16	5GTP
3/8	17	6GTP
1/2	22	8GTP
5/8	25	10GTP
3/4	28.5	12GTP
7/8	32	14GTP
1	38	16GTP
1.1/4	50	20GTP
1.1/2	57	24GTP
2	76	32GTP

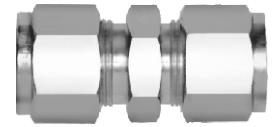
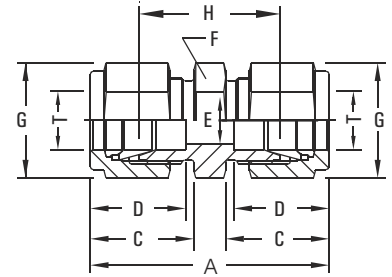
METRIC OD Tubes

T Tube OD	G A/F	Part No.
3	11	GTP-3
6	14	GTP-6
8	16	GTP-8
10	19	GTP-10
12	22	GTP-12
14	25	GTP-14
15	25	GTP-15
16	25	GTP-16
18	30	GTP-18
20	32	GTP-20
22	32	GTP-22
25	38	GTP-25
28	46	GTP-28
30	50	GTP-30
32	50	GTP-32
38	57	GTP-38

## UNION

### INCH OD Tubes

T Tube OD	A	C	D	E min.	F A/F	G A/F	H	Part No.
1/16	25.1	11.0	8.6	1.3	8	8	17.5	1 GU
1/8	35.6	15.3	12.7	2.4	11	11	22.4	2 GU
1/4	40.9	17.8	15.3	4.8	14	14	26.2	4 GU
5/16	42.9	18.5	16.3	6.3	14	16	28.2	5 GU
3/8	45.0	19.3	16.8	7.1	16	17	30.2	6 GU
1/2	51.3	21.8	22.9	10.4	22	22	31.0	8 GU
5/8	52.0	21.8	24.4	12.7	24	25	31.8	10 GU
3/4	53.6	21.8	24.4	15.8	27	28.5	33.3	12 GU
7/8	55.2	21.8	25.9	18.2	30	32	34.8	14 GU
1	64.8	26.4	31.2	22.3	35	38	40.4	16 GU
1.1/4	92.2	38.9	41.2	27.6	46	50	48.0	20 GU
1.1/2	108.0	45.2	50.0	34.0	55	57	53.6	24 GU
2	149.4	62.7	67.6	46.0	70	76	74.7	32 GU

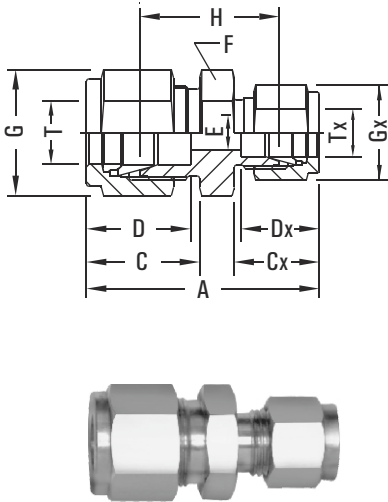


### METRIC OD Tubes

T Tube OD	A	C	D	E min.	F A/F	G A/F	H	Part No.
3	35.3	15.3	12.9	2.4	11	11	22.1	GU-3
6	41.0	17.7	15.3	4.8	14	14	26.2	GU-6
8	43.2	18.6	16.2	6.3	16	16	28.2	GU-8
10	46.2	19.5	17.2	7.9	17	19	31.0	GU-10
12	51.2	22.0	22.8	9.5	22	22	31.0	GU-12
14	52.0	22.0	24.4	11.1	24	25	31.0	GU-14
15	52.0	22.0	24.4	11.9	24	25	31.8	GU-15
16	52.0	22.0	24.4	12.7	24	25	31.8	GU-16
18	53.5	22.0	24.4	15.1	27	30	33.3	GU-18
20	55.0	22.0	26.0	15.9	30	32	34.8	GU-20
22	55.0	22.0	26.0	18.3	30	32	34.8	GU-22
25	65.0	26.5	31.3	21.8	35	38	40.4	GU-25
28	85.0	36.6	36.6	21.8	41	46	43.4	GU-28
30	92.7	39.2	39.6	26.2	46	50	49.5	GU-30
32	97.3	41.6	42.0	28.6	46	50	51.3	GU-32
38	113.6	47.9	49.4	33.7	55	57	58.4	GU-38

## REDUCING UNION

INCH OD Tubes



T Tube OD	Tx Tube OD	A	C	Cx	D	Dx	E min.	F A/F	G A/F	Gx A/F	H	Part No.
1/4	1/8	38.6	17.8	15.3	15.3	12.7	2.4	14	14	11	24.6	4-2 GRU
5/16	1/8	39.6	18.6	15.3	16.3	12.7	2.4	14	16	11	25.7	5-2 GRU
5/16	1/4	42.2	18.6	17.8	16.3	15.3	4.8	14	16	14	27.5	5-4 GRU
3/8	1/8	40.9	19.3	15.3	16.8	12.7	2.4	16	17	11	26.9	6-2 GRU
3/8	1/4	43.2	19.3	17.8	16.8	15.3	4.8	16	17	14	28.5	6-4 GRU
1/2	1/8	45.2	21.8	15.3	22.9	12.7	2.4	22	22	11	28.5	8-2 GRU
1/2	1/4	47.0	21.8	17.8	22.9	15.3	4.8	22	22	14	29.5	8-4 GRU
1/2	3/8	48.5	21.8	19.3	22.9	16.8	7.1	22	22	17	31.0	8-6 GRU
5/8	3/8	49.3	21.8	19.3	24.4	16.8	7.1	24	25	17	31.8	10-6 GRU
5/8	1/2	52.0	21.8	21.8	24.4	22.9	10.4	24	25	22	31.8	10-8 GRU
3/4	1/4	49.3	21.8	17.8	24.4	15.3	4.8	27	28.5	14	31.8	12-4 GRU
3/4	3/8	50.8	21.8	19.3	24.4	16.8	7.1	27	28.5	17	33.3	12-6 GRU
3/4	1/2	53.6	21.8	21.8	24.4	22.9	10.4	27	28.5	22	33.3	12-8 GRU
1	1/2	60.5	26.5	21.8	31.2	22.9	10.4	35	38	22	38.1	16-8 GRU
1	3/4	60.5	26.5	21.8	31.2	24.4	15.8	35	38	28.5	38.1	16-12 GRU
1.1/4	1	92.2	38.9	26.4	41.2	31.2	22.3	45	50	38	48.0	20-16 GRU
1.1/2	1.1/4	60.5	26.5	21.8	31.2	24.4	15.8	55	57	50	53.6	24-20 GRU

METRIC OD Tubes

T Tube OD	Tx Tube OD	A	C	Cx	D	Dx	E min.	F A/F	G A/F	Gx A/F	H	Part No.
6	3	38.6	17.7	15.3	15.3	12.9	2.4	14	14	11	24.6	GRU 6-3
8	6	42.3	18.6	17.7	16.2	15.3	4.8	14	16	14	27.4	GRU 8-6
10	6	44.5	19.5	17.7	17.2	15.3	4.8	17	19	14	29.5	GRU 10-6
10	8	45.1	19.5	18.6	17.2	16.2	6.3	17	19	16	30.0	GRU 10-8
12	6	47.0	22.0	17.7	22.8	15.3	4.8	22	22	14	29.5	GRU 12-6
12	8	47.8	22.0	18.6	22.8	16.2	6.4	22	22	16	30.2	GRU 12-8
12	10	48.7	22.0	19.5	22.8	17.2	7.9	22	22	19	31.0	GRU 12-10
16	10	49.5	22.0	19.5	24.4	17.2	7.9	24	25	19	31.8	GRU 16-10
16	12	52.0	22.0	22.0	24.4	22.8	9.5	24	25	22	31.8	GRU 16-12
22	18	55.0	22.0	22.0	26.0	24.4	15.1	30	32	30	34.8	GRU 22-18
22	20	55.0	22.0	22.0	26.0	26.6	15.9	30	32	32	34.8	GRU 22-20
25	12	65.0	26.5	22.0	31.3	22.8	9.5	35	38	22	40.4	GRU 25-12
25	20	65.0	26.5	22.0	31.3	26.0	15.9	35	38	32	40.4	GRU 25-20
30	20	75.4	39.2	22.0	39.6	26.0	15.9	45	50	32	43.7	GRU 30-20
30	25	80.1	39.2	26.5	39.6	31.3	21.8	45	50	38	46.2	GRU 30-25
32	20	77.8	41.6	22.0	42.0	26.0	15.9	45	50	32	44.7	GRU 32-20
32	25	82.3	41.6	26.5	42.0	31.3	21.8	45	50	38	47.0	GRU 32-25
38	20	92.0	47.9	26.5	49.4	31.3	21.8	55	57	38	52.1	GRU 38-20
38	25	104.6	47.9	39.2	49.4	39.6	26.2	55	57	50	55.4	SCR 38-25

NOTE :The combinations shown above are representative of various possibilities. Other combinations not shown are also available. Please consult us.

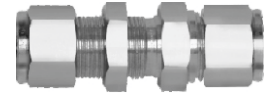
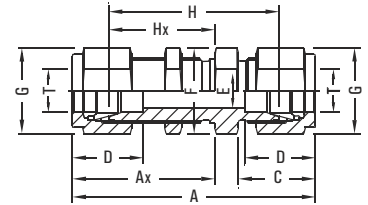
# Bulkhead / Reducing Union



## BULKHEAD UNION

INCH OD Tubes

T Tube OD	A	Ax	C	D	E min.	F A/F	G A/F	H	Hx	Panel Hole Drill Size	Max. Panel Thick- ness	Part No.
1/16	31.5	17.3	11.0	8.6	1.3	11	8	23.8	13.5	5.2	3.0	1 GBU
1/8	51.3	31.2	15.3	12.7	2.4	11	11	38.1	24.6	8.3	12.7	2 GBU
1/4	57.6	33.6	17.8	15.3	4.8	16	14	43.0	26.2	11.5	10.1	4 GBU
5/16	60.7	35.8	18.5	16.3	6.3	17	16	46.0	28.5	13.0	11.1	5 GBU
3/8	62.2	36.8	19.3	7.1	7.1	22	17	47.5	29.5	14.6	11.1	6 GBU
1/2	71.1	41.9	21.8	22.9	10.4	24	22	50.8	31.8	19.5	12.7	8 GBU
5/8	72.6	42.7	21.8	24.4	12.7	27	25	52.3	32.5	22.6	12.7	10 GBU
3/4	79.0	47.5	21.8	24.4	16.0	30	28.5	58.6	37.4	25.8	16.8	12 GBU
1	95.6	57.4	26.4	31.2	22.3	35	38	71.3	45.2	33.7	19.0	16 GBU
1.1/4	123.2	69.9	38.9	41.2	27.6	50	50	79.0	47.7	41.6	19.0	20 GBU
1.1/2	139.2	76.4	45.2	50.0	34.0	60	57	84.8	49.3	49.6	19.0	24 GBU
2	180.4	93.7	62.7	67.6	46.0	70	76	105.6	56.4	67.0	19.0	32 GBU



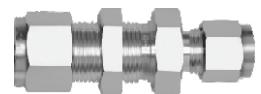
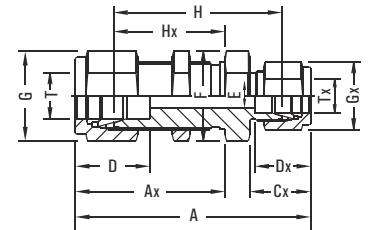
METRIC OD Tubes

T Tube OD	A	Ax	C	D	E min.	F A/F	G A/F	H	Hx	Panel Hole Drill Size	Max. Panel Thick- ness	Part No.
3	51.3	31.2	15.3	12.9	2.4	14	11	38.1	24.6	8.3	12.7	GBU-3
6	57.7	33.6	17.7	15.3	4.8	16	14	42.9	26.2	11.5	10.2	GBU-6
8	61.0	36.1	18.6	16.2	6.3	17	16	46.0	28.6	13.1	11.2	GBU-8
10	63.7	37.0	19.5	17.2	7.9	22	19	48.5	29.4	16.3	11.2	GBU-10
12	71.0	41.9	22.0	22.8	9.5	24	22	50.8	31.8	19.5	12.7	GBU-12
14	72.5	42.6	22.0	24.4	11.1	27	25	52.3	32.5	22.5	12.7	GBU-14
15	72.5	42.6	22.0	24.4	11.9	27	25	52.3	32.5	22.8	12.7	GBU-15
16	72.5	42.6	22.0	24.4	12.7	27	25	52.3	32.5	22.8	12.7	GBU-16
18	78.9	47.4	22.0	24.4	15.1	30	30	58.7	37.3	26.0	16.8	GBU-18
20	84.5	53.0	22.0	26.0	15.8	35	32	64.3	42.9	29.0	19.0	GBU-20
25	95.6	57.4	26.4	31.2	22.3	35	38	71.3	45.2	33.7	19.0	GBU-25
30	123.7	70.2	39.2	39.6	26.2	50	46	80.5	48.6	40.5	19.0	GBU-30
32	128.3	72.5	41.6	42.0	27.6	50	50	82.3	49.5	42.5	19.0	GBU-32
38	144.6	79.1	47.9	49.4	33.7	60	57	89.4	51.5	50.5	19.0	GBU-38

## BULKHEAD REDUCING UNION

INCH OD Tubes

T Tube OD	T Tube OD	A	Ax	Cx	D	Dx	E min.	F A/F	G A/F	Gx A/F	H	Hx	Panel Hole Drill Size	Max. Panel Thick- ness	Part No.
1/4	1/8	55.2	33.5	15.3	15.3	12.7	2.4	16	14	11	41.2	26.2	11.5	10.2	4-2 GBRU
3/8	1/4	60.7	36.6	17.8	16.8	15.3	4.8	22	17	14	46.0	29.5	14.6	11.2	6-4 GBRU
1/2	1/4	66.8	41.9	17.8	22.4	15.3	4.8	24	22	14	49.2	31.8	19.5	12.7	8-4 GBRU
1/2	3/8	66.8	41.9	17.8	22.4	16.8	7.1	24	22	17	49.2	31.8	19.5	12.7	8-6 GBRU



METRIC OD Tubes

T Tube OD	T Tube OD	A	Ax	Cx	D	Dx	E min.	F A/F	G A/F	Gx A/F	H	Hx	Panel Hole Drill Size	Max. Panel Thick- ness	Part No.
6	3	56.0	33.6	17.7	15.3	12.9	2.4	16	14	11	41.2	26.2	11.5	10.2	GBRU-6-3
8	6	61.0	36.1	18.6	16.2	15.3	4.8	17	16	14	48.0	28.6	13.1	11.2	GBRU-8-6
10	6	63.7	37.0	19.5	17.2	15.3	4.8	22	19	14	48.5	29.4	16.3	11.2	GBRU-10-6
12	6	71.0	41.9	22.0	22.8	15.3	4.8	24	22	14	50.8	31.8	19.5	12.7	GBRU-12-6
12	10	71.0	41.9	22.0	22.8	17.2	7.9	24	22	17	50.8	31.8	19.5	12.7	GBRU-12-10

NOTE: The combinations shown above are representative of various possibilities. Other combinations not shown are also available. Please consult us.

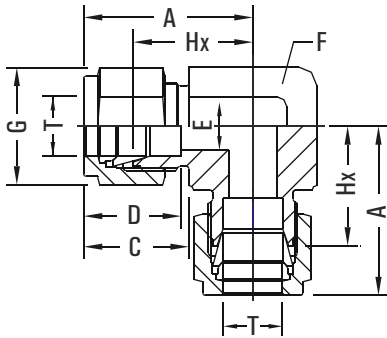


# Union / Bulkhead Elbow



## UNION ELBOW

INCH OD Tubes



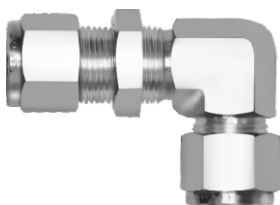
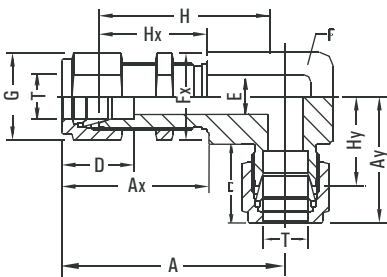
T Tube OD	A	C	D	E min.	F A/F	G	Hx	Part No.
1/16	17.8	11.0	8.6	1.3	11	8	14.0	GUE 1
1/8	22.4	15.3	12.7	2.4	11	11	15.8	GUE 2
1/4	26.9	17.8	15.3	4.8	14	14	19.6	GUE 4
5/16	28.7	18.5	16.3	6.3	16	16	21.3	GUE 5
3/8	30.5	19.3	16.8	7.1	17	17	23.2	GUE 6
1/2	36.0	21.8	22.9	10.4	22	22	25.9	GUE 8
5/8	38.1	21.8	24.4	12.7	24	25	27.9	GUE 10
3/4	39.9	21.8	24.4	15.8	27	28.5	29.7	GUE 12
7/8	44.7	21.8	25.9	18.2	35	32	34.6	GUE 14
1	49.0	26.4	31.2	22.3	35	38	36.8	GUE 16
1.1/4	66.6	38.9	41.2	27.6	46	50	44.5	GUE 20
1.1/2	78.0	45.2	50.0	34.0	55	57	50.8	GUE 24
2	107.2	62.7	67.6	46.0	70	76	69.9	GUE 32

METRIC OD Tubes

T Tube OD	A	C	D	E min.	F A/F	G	Hx	Part No.
3	22.3	15.3	12.9	2.4	11	11	15.7	GUE-3
6	27.0	17.7	15.3	4.8	14	14	19.6	GUE-6
8	28.8	18.6	16.2	6.3	16	16	21.3	GUE-8
10	31.5	19.5	17.2	7.9	17	19	23.9	GUE-10
12	36.0	22.0	22.8	9.5	22	22	25.9	GUE-12
14	38.0	22.0	24.4	11.1	24	25	27.9	GUE-14
15	38.0	22.0	24.4	11.9	24	25	27.9	GUE-15
16	38.0	22.0	24.4	12.7	24	25	27.9	GUE-16
18	39.8	22.0	24.4	15.1	27	30	29.7	GUE-18
20	44.6	22.0	26.0	15.9	32	32	34.5	GUE-20
22	44.6	22.0	26.0	18.3	32	32	34.5	GUE-22
25	49.1	26.5	31.3	21.8	35	38	36.8	GUE-25
28	64.0	36.6	36.6	21.8	41	46	43.5	GUE-28
30	69.9	39.2	39.6	26.2	46	50	48.3	GUE-30
32	72.3	41.6	42.0	28.6	46	50	49.3	GUE-32
38	84.0	47.9	49.4	33.7	55	57	56.4	GUE-38

## BULKHEAD ELBOW

INCH OD Tubes



T Tube OD	A	Ax	Ay	C	D	E min.	F A/F	G A/F	H	Hx	Hy	Panel Hole Drill Size	Max. Panel Thick- ness	Part No.
1/8	43.1	31.2	22.4	15.3	12.7	2.4	11	11	36.5	24.6	15.8	8.3	12.7	2GBE
1/4	48.9	33.6	26.9	17.8	15.3	4.8	16	14	41.5	26.2	19.6	11.5	10.1	4GBE
3/8	54.1	36.8	30.5	19.3	16.8	7.1	22	17	46.8	29.5	23.2	14.6	11.1	6GBE
1/2	63.5	41.9	36.0	21.8	22.9	10.4	24	22	53.4	31.8	25.9	19.5	12.7	8GBE
3/4	75.3	47.5	39.9	21.8	24.4	16.0	30	29	65.2	37.4	29.7	25.8	16.8	12GBE
1	91.8	57.4	49.0	26.4	31.2	22.3	35	38	79.6	45.2	36.8	33.7	19.0	16GBE

METRIC OD Tubes

T Tube OD	A	Ax	Ay	C	D	E min.	F A/F	G A/F	H	Hx	Hy	Panel Hole Drill Size	Max. Panel Thick- ness	Part No.
3	43.0	31.2	22.3	15.3	12.9	2.4	14	11	36.4	24.6	15.7	8.3	12.7	GBE-3
6	49.3	33.6	27.0	17.7	15.3	4.8	16	14	41.9	26.2	19.6	11.5	10.2	GBE-6
8	52.6	36.1	28.8	18.6	16.2	6.3	17	16	45.1	28.6	21.3	13.1	11.2	GBE-8
10	56.2	37.0	31.5	19.5	17.2	7.9	22	19	48.6	29.4	23.9	16.3	11.2	GBE-10
12	63.0	41.9	36.0	22.0	22.8	9.5	24	22	52.9	31.8	25.9	19.5	12.7	GBE-12
16	66.5	42.6	38.0	22.0	24.4	12.7	27	25	56.4	32.5	27.9	22.8	12.7	GBE-16
22	85.1	53.0	44.6	22.0	26.0	18.3	35	32	75.0	42.9	34.5	29.0	19.0	GBE-20
25	91.8	57.4	49.1	26.4	31.2	22.3	35	38	79.6	45.2	36.8	33.7	19.0	GBE-25

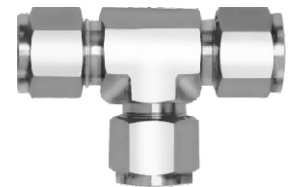
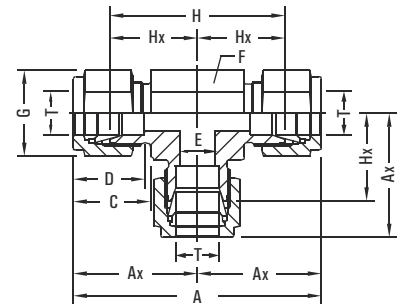
# Union Tee



## UNION TEE

INCH OD Tubes

T Tube OD	A	Ax	C	D	E min.	F A/F	G A/F	H	Hx	Part No.
1/16	35.6	17.8	11.0	8.6	1.3	11	8	28.0	14.0	1GUT
1/8	44.8	22.4	15.3	12.7	2.4	11	11	31.6	15.8	2GUT
1/4	53.8	26.9	17.8	15.3	4.8	14	14	39.2	19.6	4GUT
5/16	57.4	28.7	18.5	16.3	6.3	16	16	42.6	21.3	5GUT
3/8	61.0	30.5	19.3	16.8	7.1	17	17	46.4	23.2	6GUT
1/2	72.0	36.0	21.8	22.9	10.4	22	22	51.8	25.9	8GUT
5/8	76.2	38.1	21.8	24.4	12.7	24	25	55.8	27.9	10GUT
3/4	79.8	39.9	21.8	24.4	15.8	27	28.5	59.4	29.7	12GUT
7/8	89.4	44.7	21.8	25.9	18.2	35	32	69.2	34.6	14GUT
1	98.0	49.0	26.4	31.2	22.3	35	38	73.6	36.8	16GUT
1.1/4	133.2	66.6	38.9	41.2	27.6	46	50	89.0	44.5	20GUT
1.1/2	156.0	78.0	45.2	50.0	34.0	55	57	101.6	50.8	24GUT
2	214.4	107.4	62.7	67.9	46.0	70	76	139.8	69.9	32GUT



METRIC OD Tubes

T Tube OD	A	Ax	C	D	E min.	F A/F	G A/F	H	Hx	Part No.
3	44.6	22.3	15.3	12.9	2.4	11	11	31.4	15.7	GUT-3
6	54.0	27.0	17.7	15.3	4.8	14	14	39.2	19.6	GUT-6
8	57.6	28.8	18.6	16.2	6.3	16	16	42.6	21.3	GUT-8
10	63.0	31.5	19.5	17.2	7.9	17	19	47.8	23.9	GUT-10
12	72.0	36.0	22.0	22.8	9.5	22	22	51.8	25.9	GUT-12
14	76.0	38.0	22.0	24.4	11.1	24	25	55.8	27.9	GUT-14
15	76.0	38.0	22.0	24.4	11.9	24	25	55.8	27.9	GUT-15
16	76.0	38.0	22.0	24.4	12.7	24	25	55.8	27.9	GUT-16
18	79.6	39.8	22.0	24.4	15.1	27	30	59.4	29.7	GUT-18
20	89.2	44.6	22.0	26.0	15.9	32	32	69.0	34.5	GUT-20
22	89.2	44.6	22.0	26.0	18.3	32	32	69.0	34.5	GUT-22
25	98.2	49.1	26.5	31.3	21.8	35	38	73.6	36.8	GUT-25
28	128.0	64.0	36.6	36.6	21.8	41	46	87.0	43.5	GUT-28
30	139.8	69.9	39.2	39.6	26.2	46	50	96.6	48.3	GUT-30
32	144.6	72.3	41.6	42.0	28.6	46	50	98.6	49.3	GUT-32
38	168.0	84.0	47.9	49.4	33.7	55	57	112.8	56.4	GUT-38

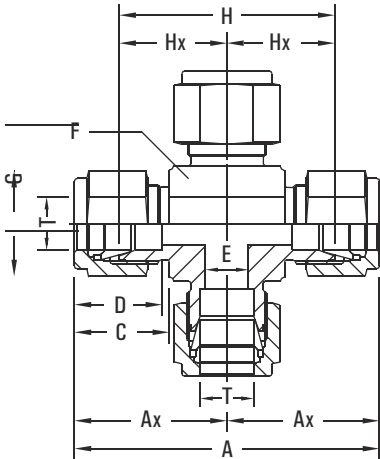
## UNION CROSS

INCH OD Tubes

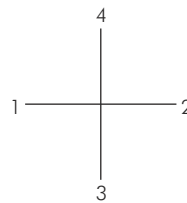
T Tube OD	A	Ax	C	D	E min.	F A/F	G A/F	H	Hx	Part No.
1/8	44.8	22.4	15.3	12.7	2.4	11	11	31.6	15.8	2 GUC
1/4	53.8	26.9	17.8	15.3	4.8	14	14	39.2	19.6	4 GUC
3/8	61.0	30.5	19.3	16.8	7.1	17	17	46.4	23.2	6 GUC
1/2	72.0	36.0	21.8	22.9	10.4	22	22	51.8	25.9	8 GUC
3/4	79.8	39.9	21.8	24.4	15.8	27	28.5	59.4	29.7	12 GUC
1	98.0	49.0	26.4	31.2	22.3	35	38	73.6	36.8	16 GUC

METRIC OD Tubes

T Tube OD	A	Ax	C	D	E min.	F A/F	G A/F	H	Hx	Part No.
3	44.6	22.3	15.3	12.9	2.4	11	11	31.4	15.7	GUC-3
6	54.0	27.0	17.7	15.3	4.8	14	14	39.2	19.6	GUC-6
8	57.6	28.8	18.6	16.2	6.3	16	16	42.6	21.3	GUC-8
10	63.0	31.5	19.5	17.2	7.9	17	19	47.8	23.9	GUC-10
12	72.0	36.0	22.0	22.8	9.5	22	22	51.8	25.9	GUC-12
16	76.0	38.0	22.0	24.4	12.7	24	25	55.8	27.9	GUC-16
22	89.2	44.6	22.0	26.0	18.3	32	32	69.0	34.5	GUC-22
25	98.2	49.1	26.5	31.3	21.8	35	38	73.6	36.8	GUC-25



NOTE: Reducing Cross with variation in the tube sizes are available. The tube sizes are designated in the order given below.



The tube sizes are indicated in the part number in the same order above.

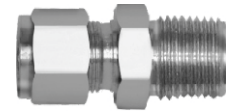
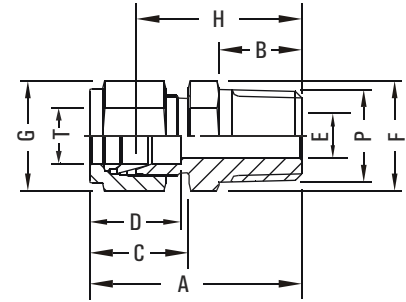
# Male Connector



## MALE CONNECTOR

INCH OD Tubes X Male NPT Threads

T Tube OD	P NPT Male	A	B	C	D	E min.	F A/F	G A/F	H	Part No.
1/16	1/16	23.9	9.6	11.0	8.6	1.3	8	8	20.0	1 GMC-N
1/16	1/8	26.2	9.6	11.0	8.6	1.3	11	8	22.4	1-2 GMCH-N
1/8	1/8	30.5	9.6	15.3	12.7	2.4	11	11	23.9	2 GMC-N
1/8	1/4	35.6	14.3	15.3	12.7	2.4	14	11	29.0	2-4 GMCH-N
1/4	1/8	32.8	9.6	17.8	15.3	4.8	14	14	25.4	4-2 GMC-N
1/4	1/4	37.8	14.3	17.8	15.3	4.8	14	14	30.5	4 GMC-N
1/4	3/8	38.4	14.3	17.8	15.3	4.8	19	14	31.0	4-6 GMC-N
1/4	1/2	44.7	19.1	17.8	15.3	4.8	22	14	37.4	4-8 GMC-N
5/16	1/4	38.6	14.3	18.5	16.3	6.3	14	16	31.2	5-4 GMC-N
3/8	1/8	35.3	9.6	19.3	16.8	4.8	16	17	27.9	6-2 GMC-N
3/8	1/4	39.8	14.3	19.3	16.8	7.1	16	17	32.5	6-4 GMC-N
3/8	3/8	39.8	14.3	19.3	16.8	7.1	19	17	32.5	6 GMC-N
3/8	1/2	41.2	19.1	19.3	16.8	7.1	22	17	38.9	6-8 GMC-N
1/2	1/4	43.4	14.3	21.8	22.9	7.1	22	22	33.3	8-4 GMC-N
1/2	3/8	43.4	14.3	21.8	22.9	9.6	22	22	33.3	8-6 GMC-N
1/2	1/2	49.0	19.1	21.8	22.9	10.4	22	22	38.9	8 GMC-N
1/2	3/4	50.5	19.1	21.8	22.9	10.4	27	22	40.4	8-12 GMC-N
1/2	1	57.1	23.8	21.8	22.9	10.4	35	22	47.0	8-16 GMC-N
5/8	3/8	44.2	14.3	21.8	24.4	9.6	24	25	34.0	10-6 GMC-N
5/8	1/2	49.0	19.1	21.8	24.4	10.4	24	25	38.9	10-8 GMC-N
3/4	1/2	50.5	19.1	21.8	24.4	10.4	27	28.5	40.4	12-8 GMC-N
3/4	3/4	50.5	19.1	21.8	24.4	15.8	27	28.5	40.4	12 GMC-N
3/4	1	57.1	23.8	21.8	24.4	15.8	35	28.5	47.0	12-16 GMC-N
7/8	3/4	50.5	19.1	21.8	26.0	15.8	30	32	40.4	14-12 GMC-N
1	1/2	57.4	19.1	26.4	31.2	10.4	35	38	45.2	16-8 GMC-N
1	3/4	57.4	19.1	26.4	31.2	15.8	35	38	45.2	16-12 GMC-N
1	1	62.2	23.8	26.4	31.2	22.3	35	38	50.0	16 GMC-N
1.1/4	1	77.2	23.8	38.9	41.2	22.3	46	50	55.2	20-16 GMC-N
1.1/4	1.1/4	77.2	23.8	38.9	41.2	27.6	46	50	55.2	20 GMC-N
1.1/2	1.1/2	88.9	26.2	45.2	50.0	34.0	55	57	61.7	24 GMC-N
2	2	113.5	26.9	62.7	67.6	46.0	70	76	76.2	32 GMC-N



INCH OD Tubes X Male ISO \* Tapered Pipe Threads

T Tube OD	P ISO Male	A	B	C	D	E min.	F A/F	G A/F	H	Part No.
1/8	1/8	30.5	9.6	15.3	12.7	2.4	11	11	23.9	2 GMC-Rx
1/8	1/4	35.6	14.3	15.3	12.7	2.4	14	11	29.0	2-4 GMCH-Rx
1/4	1/8	32.8	9.6	17.8	15.3	4.8	14	14	25.4	4-2 GMC-Rx
1/4	1/4	37.8	14.3	17.8	15.3	4.8	14	14	30.1	4 GMC-Rx
1/4	3/8	38.4	14.3	17.8	15.3	4.8	19	14	31.0	4-6 GMC-Rx
1/4	1/2	44.7	19.1	17.8	15.3	4.8	22	14	37.4	4-8 GMC-Rx
3/8	1/8	35.3	9.6	19.3	16.8	4.8	16	17	27.9	6-2 GMC-Rx
3/8	1/4	39.8	14.3	19.3	16.8	7.1	16	17	32.5	6-4 GMC-Rx
3/8	3/8	39.8	14.3	19.3	16.8	7.1	19	17	32.5	6 GMC-Rx
3/8	1/2	41.2	19.1	19.3	16.8	7.1	22	17	38.9	6-8 GMC-Rx
1/2	1/4	43.4	14.3	21.8	22.9	7.1	22	22	33.3	8-4 GMC-Rx
1/2	3/8	43.4	14.3	21.8	22.9	9.6	22	22	33.3	8-6 GMC-Rx
1/2	1/2	49.0	19.1	21.8	22.9	10.4	22	22	38.9	8 GMC-Rx
3/4	3/4	50.5	19.1	21.8	24.4	15.8	27	28.5	40.4	12 GMC-Rx
1	1	62.2	23.8	26.4	31.2	22.3	35	38	50.0	16 GMC-Rx
1.1/4	1	77.2	23.8	38.9	41.2	22.3	46	50	55.2	20-16 GMC-Rx
1.1/4	1.1/4	77.2	23.8	38.9	41.2	27.6	46	50	55.2	20 GMC-Rx
1.1/2	1.1/2	88.9	26.2	45.2	50.0	34.0	55	57	61.7	24 GMC-Rx

**NOTE** :The combination of tube OD and male threads are indicative of popular sizes. Other combinations, not shown, are available . Please Consult us.

**BORED-THROUGH CONNECTORS** available in all these sizes. Add suffix "BT" to the above part numbers to designate bored - trough male connector.

10/17 REV.:00

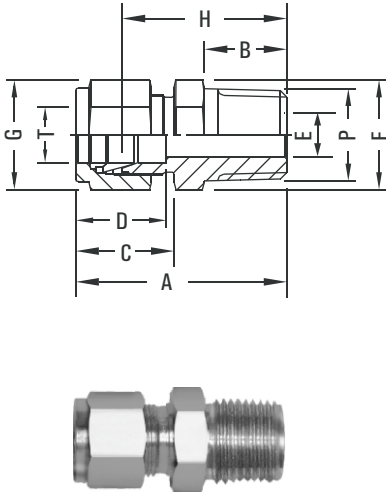
\* Reference Specifications: BS 21 : ISO 7/1 : JIS B 0203 : DIN 2999 : IS 554

# Male Connector



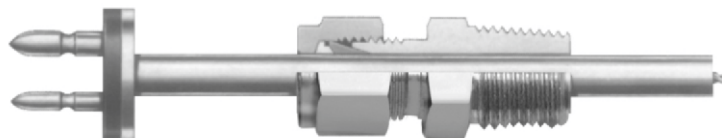
## MALE CONNECTOR

METRIC OD Tubes x Male NPT Threads



T Tube OD	P NPT Male	A	B	C	D	E min.	F A/F	G A/F	H	Part No.
3	1/8	30.5	9.6	15.3	12.9	2.4	11	11	23.9	GMC 3-2N
3	1/4	35.6	14.3	15.3	12.9	2.4	14	11	29.0	GMC 3-4N
6	1/8	32.8	9.6	17.7	15.3	4.8	14	14	25.4	GMC 6-2N
6	1/4	37.9	14.3	17.7	15.3	4.8	14	14	30.5	GMC 6-4N
6	3/8	38.4	14.3	17.7	15.3	4.8	19	14	31.0	GMC 6-N
6	1/2	44.7	19.1	17.7	15.3	4.8	22	14	37.3	GMC 6-8N
8	1/8	34.2	9.6	18.6	16.2	4.8	14	16	26.7	GMC 8-2N
8	1/4	38.7	14.3	18.6	16.2	6.3	14	16	31.2	GMC 8-4N
8	3/8	39.3	14.3	18.6	16.2	6.3	19	16	31.8	GMC 8-6N
8	1/2	45.6	19.1	18.6	16.2	6.3	22	16	38.1	GMC 8-N
10	1/8	36.3	9.6	19.5	17.2	4.8	17	19	28.7	GMC 10-2N
10	1/4	40.9	14.3	19.5	17.2	7.9	19	19	33.3	GMC 10-4N
10	3/8	40.9	14.3	19.5	17.2	7.9	19	19	33.3	GMC 10-6N
10	1/2	46.5	19.1	19.5	17.2	7.9	22	19	38.9	GMC 10-8N
12	1/4	43.4	14.3	22.0	22.8	7.1	22	22	33.3	GMC 12-4N
12	3/8	43.4	14.3	22.0	22.8	9.5	22	22	33.3	GMC 12-6N
12	1/2	49.0	19.1	22.0	22.8	9.5	22	22	38.9	GMC 12-8N
12	3/4	50.5	19.1	22.0	22.8	9.5	27	22	40.4	GMC 12-N
12	1	57.1	23.8	22.0	22.8	9.5	35	22	47.0	GMC 12-16N
14	1/4	44.1	14.3	22.0	24.4	7.1	24	25	34.0	GMC 14-4N
14	3/8	44.1	14.3	22.0	24.4	9.5	24	25	34.0	GMC 14-6N
14	1/2	49.0	19.1	22.0	24.4	11.1	24	25	38.9	GMC 14-8N
15	1/2	49.0	19.1	22.0	24.4	11.9	24	25	38.9	GMC 15 8N
16	3/8	44.1	14.3	22.0	24.4	9.5	24	25	34.0	GMC 16-6N
16	1/2	49.0	19.1	22.0	24.4	11.9	24	25	38.9	GMC 16-8N
16	3/4	50.5	19.1	22.0	24.4	12.7	27	25	40.4	GMC 16-12N
18	1/2	50.5	19.1	22.0	24.4	11.9	27	30	40.4	GMC 18-8N
18	3/4	50.5	19.1	22.0	24.4	15.1	27	30	40.4	GMC 18-12N
20	1/2	52.3	19.1	22.0	26.0	11.9	30	32	42.2	GMC 20-8N
20	3/4	52.3	19.1	22.0	26.0	15.9	30	32	42.2	GMC 20-12N
22	3/4	52.3	19.1	22.0	26.0	15.9	30	32	42.2	GMC 22-12N
22	1	57.1	23.8	22.0	26.0	18.3	35	32	47.0	GMC 22 16N
25	1/2	57.5	19.1	26.5	31.3	11.9	35	38	45.2	GMC 25- 8N
25	3/4	57.5	19.1	26.5	31.3	15.8	35	38	45.2	GMC 25-12N
25	1	62.3	23.8	26.5	31.3	21.8	35	38	50.0	GMC 25-16N
28	1	72.4	23.8	36.6	36.6	21.8	41	46	51.6	GMC 28-16N
28	1.1/4	73.1	23.8	36.6	36.6	21.8	46	46	52.3	GMC 28-20N
30	1.1/4	77.2	23.8	39.2	39.6	26.2	46	50	55.6	GMC 30-20N
32	1.1/4	79.6	23.8	41.6	42.0	28.6	46	50	56.6	GMC 32-20N
38	1.1/2	96.6	26.2	47.9	49.4	33.7	55	57	64.0	GMC 38-24N

## Bored-Through Fittings for Thermocouples



To order, add BT to the desired Fluid Controls Male Connector Part Number : 8 SCM - N. BT  
 Example : Bored Through Connection 1/2" OD x 1/2" NPT (M) with 1/2" OD through bore has part number

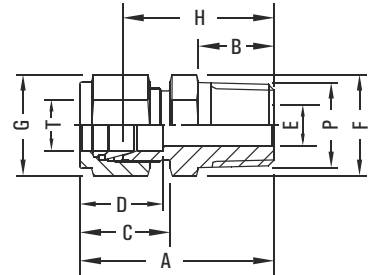
# Male Connector



## MALE CONNECTOR

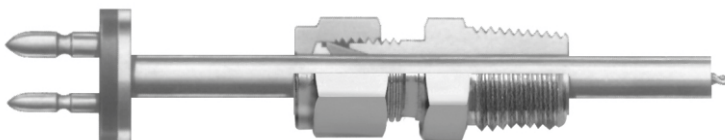
METRIC OD Tubes x Male ISO\* Tapered Pipe Thread

T Tube OD	P ISO Male	A	B	C	D	E min.	F A/F	G A/F	H	Part No.
3	1/8	30.5	9.6	15.3	12.9	2.4	11	11	23.9	GMC 3-2 Rx
3	1/4	35.6	14.3	15.3	12.9	2.4	14	11	29.0	GMC 3-4 Rx
6	1/8	32.8	9.6	17.7	15.3	4.8	14	14	25.4	GMC 6-2 Rx
6	1/4	37.9	14.3	17.7	15.3	4.8	14	14	30.5	GMC 6-4 Rx
6	3/8	38.4	14.3	17.7	15.3	4.8	19	14	31.0	GMC 6 Rx
6	1/2	44.7	19.1	17.7	15.3	4.8	22	14	37.3	GMC 6-8 Rx
8	1/8	34.2	9.6	18.6	16.2	4.8	14	16	26.7	GMC 8-2 Rx
8	1/4	38.7	14.3	18.6	16.2	6.3	14	16	31.2	GMC 8-4 Rx
8	3/8	39.3	14.3	18.6	16.2	6.3	19	16	31.8	GMC 8-6 Rx
8	1/2	45.6	19.1	18.6	16.2	6.3	22	16	38.1	GMC 8 Rx
10	1/8	36.3	9.6	19.5	17.2	4.8	17	19	28.7	GMC 10-2 Rx
10	1/4	40.9	14.3	19.5	17.2	7.9	19	19	33.3	GMC 10-4 Rx
10	3/8	40.9	14.3	19.5	17.2	7.9	19	19	33.3	GMC 10-6 Rx
10	1/2	46.5	19.1	19.5	17.2	7.9	22	19	38.9	GMC 10-8 Rx
12	1/4	43.4	14.3	22.0	22.8	7.1	22	22	33.3	GMC 12-4 Rx
12	3/8	43.4	14.3	22.0	22.8	9.5	22	22	33.3	GMC 12-6 Rx
12	1/2	49.0	19.1	22.0	22.8	9.5	22	22	38.9	GMC 12-8 Rx
12	3/4	50.5	19.1	22.0	22.8	9.5	27	22	40.4	GMC 12 Rx
12	1	57.1	23.8	22.0	22.8	9.5	35	22	47.0	GMC 12-16 Rx
14	3/8	44.1	14.3	22.0	24.4	9.5	24	25	34.0	GMC 14-6 Rx
14	1/2	49.0	19.1	22.0	24.4	11.1	24	25	38.9	GMC 14-8 Rx
15	1/2	49.0	19.1	22.0	24.4	11.9	24	25	38.9	GMC 15 8 Rx
16	3/8	44.1	14.3	22.0	24.4	9.5	24	25	34.0	GMC 16-6 Rx
16	1/2	49.0	19.1	22.0	24.4	11.9	24	25	38.9	GMC 16-8 Rx
16	3/4	50.5	19.1	22.0	24.4	12.7	27	25	40.4	GMC 16-12 Rx
18	1/2	50.5	19.1	22.0	24.4	11.9	27	30	40.4	GMC 18-8 Rx
18	3/4	50.5	19.1	22.0	24.4	15.1	27	30	40.4	GMC 18-12 Rx
20	1/2	52.3	19.1	22.0	26.0	11.9	30	32	42.2	GMC 20-8 Rx
20	3/4	52.3	19.1	22.0	26.0	15.9	30	32	42.2	GMC 20-12 Rx
22	3/4	52.3	19.1	22.0	26.0	15.9	30	32	42.2	GMC 22-12 Rx
22	1	57.1	23.8	22.0	26.0	18.3	35	32	47.0	GMC 22 16 Rx
25	1/2	57.5	19.1	26.5	31.3	11.9	35	38	45.2	GMC 25- 8 Rx
25	3/4	57.5	19.1	26.5	31.3	15.8	35	38	45.2	GMC 25-12 Rx
25	1	62.3	23.8	26.5	31.3	21.8	35	38	50.0	GMC 25-16 Rx
28	1	72.4	23.8	36.6	36.6	21.8	41	46	51.6	GMC 28-16 Rx
28	1.1/4	73.1	23.8	36.6	36.6	21.8	46	46	52.3	GMC 28-20 Rx
30	1.1/4	77.2	23.8	39.2	39.6	26.2	46	50	55.6	GMC30-20 RX
32	1.1/4	79.6	23.8	41.6	42.0	28.6	46	50	56.6	GMC32-20 Rx
38	1.1/2	96.6	26.2	47.9	49.4	33.7	55	57	64.0	GMC 38-24 Rx



\* Reference Specifications BS 21: ISO 7/1 : JIS B 0203 : DIN 2999 : IS 554

## Bored-Through Fittings for Thermocouples



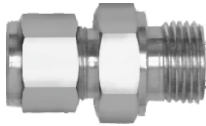
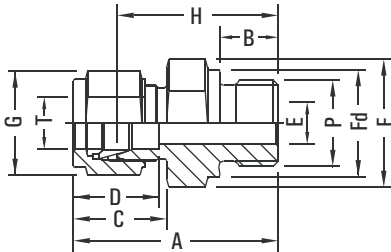
To order, add BT to the desired Fluid Controls Male Connector Part Number : 8 SCM - Rx. BT  
 Example : Bored Through Connection 1/2" OD x 1/2" ISO Tapered Male Pipe Thread 1/2" OD through bore has part number.

# Male Connector



## MALE CONNECTOR

INCH OD Tubes x Male ISO\* Parallel Threads - RP



T Tube OD	P ISO Male	A	B	C	D	E min.	F A/F	Fd	G A/F	H	Part No.
1/8	1/8	30.0	7.1	15.3	12.7	2.4	14	13.7	11	23.4	2 GMC-Rp
1/8	1/4	35.3	11.2	15.3	12.7	2.4	19	18.0	11	28.7	2-4 GMCH-Rp
1/4	1/8	32.3	7.1	17.8	15.3	4.8	14	13.7	14	24.9	4-2 GMC-Rp
1/4	1/4	37.6	11.2	17.8	15.3	4.8	19	18.0	14	30.2	4 GMC-Rp
1/4	3/8	38.9	11.2	17.8	15.3	4.8	22	21.8	14	31.5	4-6 GMC-Rp
1/4	1/2	44.7	14.2	17.8	15.3	4.8	27	26.0	14	37.4	4-8 GMC-Rp
3/8	1/4	39.2	11.2	19.3	16.8	5.8	19	18.0	17	31.8	6-4 GMC-Rp
3/8	3/8	40.4	11.2	19.3	16.8	7.1	22	21.8	17	33.0	6 GMC-Rp
3/8	1/2	46.3	14.2	19.3	16.8	7.1	27	26.0	17	38.9	6-8 GMC-Rp
1/2	1/4	42.7	11.2	21.8	22.9	5.8	22	18.0	22	32.5	8-4 GMC-Rp
1/2	3/8	43.2	11.2	21.8	22.9	7.9	22	21.8	22	33.0	8-6 GMC-Rp
1/2	1/2	49.0	14.2	21.8	22.9	10.4	27	26.0	22	38.9	8 GMC-Rp
1/2	3/4	52.8	15.7	21.8	22.9	10.4	35	32.0	22	42.7	8-12 GMC-Rp
3/4	1/2	49.0	14.2	21.8	24.4	11.9	27	26.0	28.5	38.9	12-8 GMC-Rp
3/4	3/4	52.8	15.7	21.8	24.4	15.8	35	32.0	28.5	42.7	12 GMC-Rp
3/4	1	55.4	18.3	21.8	24.4	15.8	41	39.0	28.5	45.6	12-16 GMC-Rp
1	1/2	55.9	14.2	26.4	31.2	11.9	35	26.0	38	43.7	16-8 GMC-Rp
1	3/4	57.5	15.7	26.4	31.2	15.8	35	32.0	38	45.2	16-12 GMC-Rp
1	1	60.0	18.3	26.4	31.2	19.8	41	39.0	38	47.8	16 GMC-Rp
1.1/4	1.1/4	78.9	19.8	38.9	41.2	25.0	50	49.0	50	55.9	20 GMC-Rp
1.1/2	1.1/2	90.8	22.1	45.2	50.0	31.8	60	54.7	57	63.2	24 GMC-Rp

METRIC OD Tubes x Male ISO\* Parallel Threads - RP

T Tube OD	P ISO Male	A	B	C	D	E min.	F A/F	Fd	G	H	Part No.
3	1/8	30.0	7.1	15.3	12.9	2.4	14	13.8	11	23.4	GMC 3-2Rp
3	1/4	35.3	11.2	15.3	12.9	2.4	19	18.0	11	28.7	GMC 3-4Rp
6	1/8	32.3	7.1	17.7	15.3	4.8	14	13.8	14	24.9	GMC 6-2Rp
6	1/4	37.6	11.2	17.7	15.3	4.8	19	18.0	14	30.2	GMC 6-4Rp
6	3/8	38.9	11.2	17.7	15.3	4.8	22	21.8	14	31.5	GMC 6-Rp
6	1/2	44.7	14.2	17.7	15.3	4.8	27	26.0	14	37.3	GMC 6-8Rp
8	1/8	33.2	7.1	18.6	16.2	4.0	14	13.8	16	25.7	GMC 8-2Rp
8	1/4	38.5	11.2	18.6	16.2	6.4	19	18.0	16	31.0	GMC 8-4Rp
8	3/8	39.8	11.2	18.6	16.2	6.4	22	21.8	16	32.3	GMC 8-6Rp
8	1/2	45.6	14.2	18.6	16.2	6.4	27	26.0	16	38.1	GMC 8-Rp
10	1/4	39.4	11.2	19.5	17.2	5.9	19	18.0	19	31.8	GMC 10-4Rp
10	3/8	40.6	11.2	19.5	17.2	7.6	22	21.8	19	33.0	GMC 10-6Rp
10	1/2	46.5	14.2	19.5	17.2	7.9	27	26.0	19	38.9	GMC 10-8Rp
12	1/4	42.6	11.2	22.0	22.8	5.9	22	18.0	22	32.5	GMC 12-4Rp
12	3/8	43.1	11.2	22.0	22.8	7.9	22	21.8	22	33.0	GMC 12-6Rp
12	1/2	49.0	14.2	22.0	22.8	9.5	27	26.0	22	38.9	GMC 12-8Rp
12	3/4	52.8	15.7	22.0	22.8	9.5	35	32.0	22	42.7	GMC 12Rp
16	3/8	43.9	11.2	22.0	24.4	7.9	24	21.8	25	33.8	GMC 16-6Rp
16	1/2	49.0	14.2	22.0	24.4	11.9	27	26.0	25	38.9	GMC 16-8Rp
20	1/2	50.5	14.2	22.0	26.0	11.9	30	26.0	28.5	40.4	GMC 20-8Rp
20	3/4	52.3	15.7	22.0	26.0	15.9	35	32.0	28.5	42.7	GMC 22-12Rp
22	3/4	52.3	15.7	22.0	26.0	15.9	35	32.0	32	42.7	GMC 20-16Rp
22	1	55.3	18.3	22.0	26.0	18.3	41	39.0	32	45.2	GMC 25-12Rp
25	3/4	57.5	15.7	26.5	31.3	15.9	35	32.0	38	45.2	GMC 20-16Rp
25	1	60.1	18.3	26.5	31.3	19.8	41	39.0	38	47.8	GMC 20-12Rp
28	1	70.1	18.3	36.6	36.6	19.8	41	39.0	46	49.3	GMC 28-16Rp
30	1.1/4	76.5	19.8	39.2	39.6	25.0	50	49.0	50	54.9	GMC 30-20Rp
32	1.1/4	78.9	19.8	41.6	42.0	25.0	50	49.0	50	55.9	GMC 32-20Rp
38	1.1/2	90.8	22.1	47.9	49.4	31.8	55	54.7	57	63.2	GMC 38-24Rp

NOTE: The ISO parallel Thread System RP shown on this page does not create pressure tight seal against the threads. The seal is made by metal to metal contact against the female part. A soft metal (usually annealed copper) gasket between the fitting and the part face.

BORED - THROUGH FITTINGS FOR THERMOCOUPLE ARE AVAILABLE WITH ISO P ARALLEL MALE THREADS. Add suffix "BT" to the above part numbers above.

\* Reference Specifications : BS 2779 : ISO 228/1 : JIS B 0202 : DIN-ISO 228/1



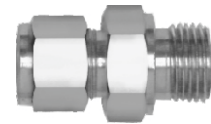
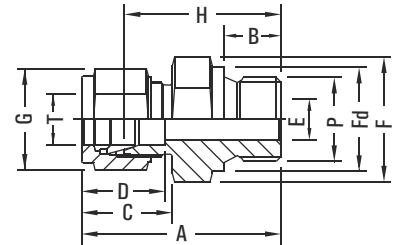
# Male Connector



## MALE CONNECTOR

INCH OD Tubes x Male ISO\* Parallel Threads - RS

T Tube OD	P ISO Male	A	B	C	D	E min.	F A/F	Fd	G A/F	H	Part No..
1/8	1/8	30.0	7.1	15.3	12.7	2.4	14	13.7	11	23.4	2 GMC-Rs
1/8	1/4	35.3	11.2	15.3	12.7	2.4	19	18.0	11	28.7	2-4 GMCH-Rs
1/4	1/8	32.3	7.1	17.8	15.3	4.8	14	13.7	14	24.9	4-2 GMC-Rs
1/4	1/4	37.6	11.2	17.8	15.3	4.8	19	18.0	14	30.2	4 GMC-Rs
1/4	3/8	38.9	11.2	17.8	15.3	4.8	22	21.8	14	31.5	4-6 GMC-Rs
1/4	1/2	44.7	14.2	17.8	15.3	4.8	27	26.0	14	37.4	4-8 GMC-Rs
3/8	1/4	39.2	11.2	19.3	16.8	5.8	19	18.0	17	31.8	6-4 GMC-Rs
3/8	3/8	40.4	11.2	19.3	16.8	7.1	22	21.8	17	33.0	6 GMC-Rs
3/8	1/2	46.3	14.2	19.3	16.8	7.1	27	26.0	17	38.9	6-8 GMC-Rs
1/2	1/4	42.7	11.2	21.8	22.9	5.8	22	18.0	22	32.5	8-4 GMC-Rs
1/2	3/8	43.2	11.2	21.8	22.9	7.9	22	21.8	22	33.0	8-6 GMC-Rs
1/2	1/2	49.0	14.2	21.8	22.9	10.4	27	26.0	22	38.9	8 GMC-Rs
1/2	3/4	52.8	15.7	21.8	22.9	10.4	35	32.0	22	42.7	8-12 GMC-Rs
3/4	1/2	49.0	14.2	21.8	24.4	11.9	27	26.0	28.5	38.9	12-8 GMC-Rs
3/4	3/4	52.8	15.7	21.8	24.4	15.8	35	32.0	28.5	42.7	12 GMC-Rs
3/4	1	55.4	18.3	21.8	24.4	15.8	41	39.0	28.5	45.6	12-16 GMC-Rs
1	1/2	55.9	14.2	26.4	31.2	11.9	35	26.0	38	43.7	16-8 GMC-Rs
1	3/4	57.5	15.7	26.4	31.2	15.8	35	32.0	38	45.2	16-12 GMC-Rs
1	1	60.0	18.3	26.4	31.2	19.8	41	39.0	38	47.8	16 GMC-Rs
1.1/4	1.1/4	78.9	19.8	38.9	41.2	25.0	50	49.0	50	55.9	20 GMC-Rs
1.1/2	1.1/2	90.8	22.1	45.2	50.0	31.8	60	54.7	57	63.2	24 GMC-Rs



METRIC OD Tube x Male ISO\* Parallel Threads - RS

T Tube OD	P ISO Male	A	B	C	D	E min.	F A/F	Fd	G A/F	H	Part No.
3	1/8	30.0	7.1	15.3	12.9	2.4	14	13.8	11	23.4	GMC 3-2 Rs
3	1/4	35.3	11.2	15.3	12.9	2.4	19	18.0	11	28.7	GMC 3-4 Rs
6	1/8	32.3	7.1	17.7	15.3	4.8	14	13.8	14	24.9	GMC 6-2 Rs
6	1/4	37.6	11.2	17.7	15.3	4.8	19	18.0	14	30.2	GMC 6-4 Rs
6	3/8	38.9	11.2	17.7	15.3	4.8	22	21.8	14	31.5	GMC 6- Rs
6	1/2	44.7	14.2	17.7	15.3	4.8	27	26.0	14	37.3	GMC 6-8 Rs
8	1/8	33.2	7.1	18.6	16.2	4.0	14	13.8	16	25.7	GMC 8-2 Rs
8	1/4	38.5	11.2	18.6	16.2	6.4	19	18.0	16	31.0	GMC 8-4 Rs
8	3/8	39.8	11.2	18.6	16.2	6.4	22	21.8	16	32.3	GMC 8-6 Rs
8	1/2	45.6	14.2	18.6	16.2	6.4	27	26.0	16	38.1	GMC 8 Rs
10	1/4	39.4	11.2	19.5	17.2	5.9	19	18.0	19	31.8	GMC 10-4 Rs
10	3/8	40.6	11.2	19.5	17.2	7.6	22	21.8	19	33.0	GMC 10-6 Rs
10	1/2	46.5	14.2	19.5	17.2	7.9	27	26.0	19	38.9	GMC 10-8 Rs
12	1/4	42.6	11.2	22.0	22.8	5.9	22	18.0	22	32.5	GMC 12-4 Rs
12	3/8	43.1	11.2	22.0	22.8	7.9	22	21.8	22	33.0	GMC 12-6 Rs
12	1/2	49.0	14.2	22.0	22.8	9.5	27	26.0	22	38.9	GMC 12-8 Rs
12	3/4	52.8	15.7	22.0	22.8	9.5	35	32.0	22	42.7	GMC 12 Rs
16	3/8	43.9	11.2	22.0	24.4	7.9	24	21.8	25	33.8	GMC 16-6 Rs
16	1/2	49.0	14.2	22.0	24.4	11.9	27	26.0	25	38.9	GMC 16-8 Rs
20	1/2	50.5	14.2	22.0	26.0	11.9	30	26.0	28.5	40.4	GMC 20-8 Rs
20	3/4	52.3	15.7	22.0	26.0	15.9	35	32.0	28.5	42.7	GMC 22-12 Rs
22	3/4	52.3	15.7	22.0	26.0	15.9	35	32.0	32	42.7	GMC 20-16 Rs
22	1	55.3	18.3	22.0	26.0	18.3	41	39.0	32	45.2	GMC 25-12 Rs
25	3/4	57.5	15.7	26.5	31.3	15.9	35	32.0	38	45.2	GMC 20-16 Rs
25	1	60.1	18.3	26.5	31.3	19.8	41	39.0	38	47.8	GMC 20-12 Rs
28	1	70.1	18.3	36.6	36.6	19.8	41	39.0	46	49.3	GMC 28-16 Rs
30	1.1/4	76.5	19.8	39.2	39.6	25.0	50	49.0	50	54.9	GMC 30-20 Rs
32	1.1/4	78.9	19.8	41.6	42.0	25.0	50	49.0	50	55.9	GMC 32-20 Rs
38	1.1/2	90.8	22.1	47.9	49.4	31.8	55	54.7	57	63.2	GMC 38-24 Rs

\* Reference Specifications : BS 2779 : ISO 228/1 : JIS B0202 : DIN-ISO 228/1

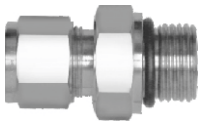
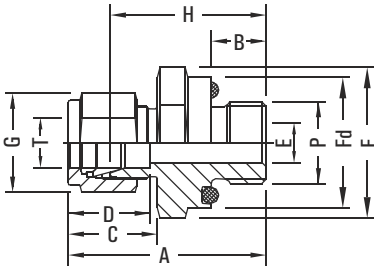
NOTThe ISO Parallel Thread system shown on this page does not create pressure tight seal against the threads. The seal is made by a bounded washer seal between the fitting and female part face. A soft metal (Copper) Gasket may also be used.

# O Seal Male Connector



## O SEAL MALE CONNECTOR

INCH OD Tubes x Male ISO\* Parallel Threads

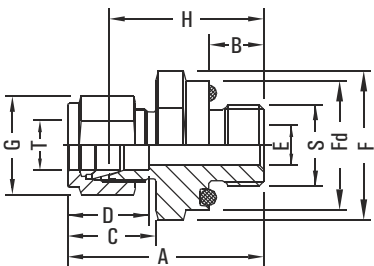


T Tube OD	P ISO Male	A	B	C	D	E min.	F A/F	Fd	G A/F	H	O Ring Part No.	Part No.
1/8	1/8	32.8	7.1	15.3	12.7	2.4	19	18.8	11	26.2	2 OPN	2 GOMC-R
1/4	1/8	35.0	7.1	17.8	15.3	4.8	19	18.8	14	27.7	2 OPN	4-2 GOMC-R
1/4	1/4	40.0	11.2	17.8	15.3	7.1	24	23.6	14	32.6	4 OPN	4 GOMC-R
3/8	1/4	41.5	11.2	19.3	16.8	7.1	24	23.6	17	34.1	4 OPN	6-4 GOMC-R
3/8	3/8	42.2	11.2	19.3	16.8	7.1	30	29.8	17	34.8	6 OPN	6 GOMC-R
3/8	1/2	47.7	14.2	19.3	16.8	9.6	32	31.8	17	40.3	8 OPN	6-8 GOMC-R
1/2	3/8	44.5	10.4	21.8	22.9	10.4	30	29.8	22	34.4	6 OPN	8-6 GOMC-R
1/2	1/2	50.4	14.2	21.8	22.9	11.9	32	31.8	22	40.3	8 OPN	8 GOMC-R
5/8	1/2	50.4	14.2	21.8	24.4	11.9	32	31.8	22	40.3	8 OPN	10-8 GOMC-R
3/4	1/2	50.4	14.2	21.8	24.4	15.8	32	31.8	28.5	40.3	8 OPN	12-8 GOMC-R
3/4	3/4	53.5	15.7	21.8	24.4	15.8	38	37.8	28.5	43.4	12 OPN	12 GOMC-R
1	3/4	58.2	15.7	26.4	31.2	22.3	38	37.8	38	46.0	12 OPN	16-12 GOMC-R
1	1	62.2	18.3	26.4	31.2	27.6	45	44.0	38	50.0	16 OPN	16 GOMC-R
1.1/4	1.1/4	77.6	12.0	38.9	41.4	27.6	55	54.0	50	55.6	20 OPN	20 GOMC-R
1.1/2	1.1/2	88.9	12.0	45.2	50.0	34.0	60	58.0	57	61.7	24 OPN	24 GOMC-R

METRIC OD Tubes x Male ISO\* Parallel Threads

T Tube OD	P ISO Male	A	B	C	D	E min.	F A/F	Fd	G A/F	H	O Ring Part No.	Part No.
3	1/8	32.8	7.1	15.3	12.9	2.4	19	18.8	11	26.2	2 OPN	GOMC 3-2 R
3	1/4	37.6	11.2	15.3	12.9	2.4	24	23.8	11	31.0	4 OPN	GOMC 3-4 R
6	1/4	40.1	11.2	17.7	15.3	4.8	24	23.8	14	32.7	4 OPN	GOMC 6-4 R
6	3/8	40.8	11.2	17.7	15.3	4.8	30	29.8	14	33.4	6 OPN	GOMC 6 R
8	1/4	40.9	11.2	18.6	16.2	6.3	24	23.8	16	33.4	4 OPN	GOMC 8-4 R
10	1/4	41.0	11.2	19.5	17.2	7.1	24	23.8	17	33.4	4 OPN	GOMC 10-4 R
10	3/8	42.6	11.2	19.5	17.2	7.1	30	29.8	17	35.0	6 OPN	GOMC 10-6 R
10	1/2	48.0	14.2	19.5	17.2	7.9	32	31.8	17	40.4	8 OPN	GOMC 10-8 R
12	1/4	44.3	11.2	22.0	22.8	7.1	24	21.8	22	34.2	4 OPN	GOMC 12-4 R
12	3/8	45.1	11.2	22.0	22.8	7.9	30	29.8	22	34.0	6 OPN	GOMC 12-6 R
12	1/2	50.5	14.3	22.0	22.8	9.5	32	31.8	22	40.4	8 OPN	GOMC 12-8 R
16	1/2	50.5	14.3	22.0	24.4	11.9	32	31.8	25	40.4	8 OPN	GOMC 16-8 R
20	3/4	55.1	15.7	22.0	26.0	15.8	38	37.0	32	45.0	12 OPN	GOMC 20-2 R
25	3/4	58.1	15.7	26.5	31.3	15.8	38	37.0	38	45.8	12 OPN	GOMC 25-2 R
25	1	62.3	18.3	26.5	31.3	19.8	45	44.0	38	50.0	16 OPN	GOMC 25-16 R

\* Reference Specifications : BS 2779 : ISO 228/1 : JIS B0202 : DIN-ISO 228/1



INCH OD Tube x Male Straight Threads - UNF

T Tube OD	S Thread Male	A	B	C	D	E min.	F A/F	Fd	G A/F	H	O Ring Part No.	Part No.
1/8	5/16 -24	32.8	8.6	15.3	12.7	2.4	14	13.8	11	26.2	1 OPU	2 GOMC-U
1/4	7/16 -20	38.4	10.4	17.8	15.3	4.8	19	18.8	14	31.0	2 OPU	4 GOMC-U
5/16	1/2 -20	40.6	11.2	18.5	16.3	6.3	22	21.8	16	33.3	3 OPU	5 GOMC-U
3/8	9/16 -18	42.4	12.0	19.3	16.8	7.1	24	23.6	17	35.0	4 OPU	6 GOMC-U
1/2	3/4 -16	46.0	12.0	21.8	22.9	10.4	28.5	28.0	22	35.8	6 OPU	8 GOMC-U
3/4	11/16 -12	52.4	14.3	21.8	24.4	15.8	38	37.8	28.5	42.2	12 OPU	12 GOMC-U
1	15/16 -12	58.2	14.3	26.4	31.2	22.3	45	44.0	38	46.0	16 OPU	16 GOMC-U
1.1/4	15/8 -12	76.2	18.3	38.9	41.4	27.6	55	54.0	50	54.1	20 OPU	20 GOMC-U
1.1/2	17/8 -12	86.6	19.8	45.2	50.0	34.0	60	58.0	57	59.4	24 OPU	24 GOMC-U

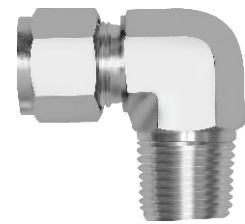
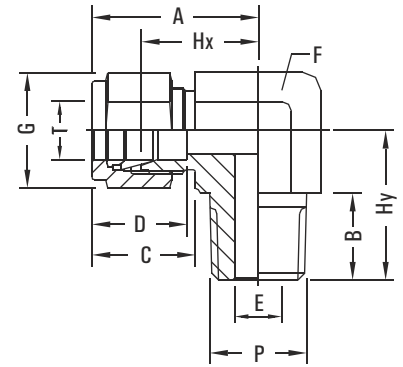
# Male Elbow



## MALE ELBOW

INCH OD Tubes x Male NPT Thread

T Tube OD	P NPT Male	A	B	C	D	E min.	F A/F	G A/F	Hx	Hy	Part No.
1/16	1/16	19.0	9.6	10.9	8.6	1.3	11	11	15.3	17.8	1 GME-N
1/16	1/8	19.0	9.6	10.9	8.6	1.3	11	11	15.3	17.8	1-2 GME-N
1/8	1/8	23.6	9.6	15.3	12.7	2.4	11	11	17.0	17.8	2 GME-N
1/8	1/4	24.6	14.3	15.3	12.7	2.4	14	11	18.0	23.4	2-4 GME-N
1/4	1/8	26.9	9.6	17.8	5.3	4.8	14	14	19.6	18.8	4-2 GME-N
1/4	1/4	26.9	14.3	17.8	15.3	4.8	14	14	19.6	23.4	4 GME-N
1/4	3/8	29.7	14.3	17.8	15.3	4.8	19	14	22.4	26.2	4-6 GME-N
1/4	1/2	31.8	19.1	17.8	15.3	4.8	22	14	24.4	33.0	4-8 GME-N
5/16	1/4	28.7	9.6	18.5	16.3	6.3	14	16	21.3	24.4	5-4 GME-N
3/8	1/8	30.5	9.6	19.3	16.8	4.8	14	17	23.1	20.9	6-2 GME-N
3/8	1/4	30.5	14.3	19.3	16.8	7.1	17	17	23.1	25.4	6-4 GME-N
3/8	3/8	31.2	14.3	19.3	16.8	7.1	19	17	23.9	26.2	6 GME-N
3/8	1/2	33.3	19.1	19.3	16.8	7.1	22	17	25.9	33.0	6-8 GME-N
1/2	1/4	36.0	14.3	21.8	22.9	4.8	22	22	25.9	28.2	8-4 GME-N
1/2	3/8	36.0	14.3	21.8	22.9	9.6	22	22	25.9	28.2	8-6 GME-N
1/2	1/2	36.0	19.1	21.8	22.9	10.4	22	22	25.9	33.0	8 GME-N
1/2	3/4	39.9	19.1	21.8	22.9	10.4	27	22	29.7	36.8	8-12 GME-N
5/8	1/2	38.1	19.1	21.8	24.4	11.9	24	25	27.9	35.0	10-8 GME-N
3/4	1/2	39.9	19.1	21.8	24.4	11.9	27	28.5	29.7	36.8	12-8 GME-N
3/4	3/4	39.9	19.1	21.8	24.4	15.8	27	28.5	29.7	36.8	12 GME-N
7/8	3/4	44.7	19.1	21.8	25.9	15.8	35	32	34.5	41.6	14-12 GME-N
1	3/4	49.0	19.1	26.4	31.2	15.8	35	38	36.8	41.6	16-12 GME-N
1	1	49.0	23.8	26.4	31.2	22.3	35	38	36.8	46.5	16 GME-N
1.1/4	1.1/4	66.5	23.8	38.8	41.1	27.6	46	50	44.5	47.8	20 GME-N
1.1/2	1.1/2	78.0	26.2	45.2	50.0	34.0	55	57	50.8	60.4	24 GME-N
2	2	107.2	26.9	62.7	67.6	46.0	70	76	69.9	70.6	32 GME-N



INCH OD Tubes x Male ISO\* Tapered Pipe Threads

T Tube OD	P ISO Male	A	B	C	D	E min.	F A/F	G A/F	Hx	Hy	Part No.
1/8	1/8	23.6	9.6	15.3	12.7	2.4	11	11	17.0	17.8	2 GME-Rx
1/8	1/4	24.6	14.3	15.3	12.7	2.4	14	11	18.0	23.4	2-4 GME-Rx
1/4	1/8	26.9	9.6	17.8	5.3	4.8	14	14	19.6	18.8	4-2 GME-Rx
1/4	1/4	26.9	14.3	17.8	15.3	4.8	14	14	19.6	23.4	4 GME-Rx
1/4	3/8	29.7	14.3	17.8	15.3	4.8	19	14	22.4	26.2	4-6 GME-Rx
1/4	1/2	31.8	19.1	17.8	15.3	4.8	22	14	24.4	33.0	4-8 GME-Rx
3/8	1/8	30.5	9.6	19.3	16.8	4.8	14	17	23.1	20.9	6-2 GME-Rx
3/8	1/4	30.5	14.3	19.3	16.8	7.1	17	17	23.1	25.4	6-4 GME-Rx
3/8	3/8	31.2	14.3	19.3	16.8	7.1	19	17	23.9	26.2	6 GME-Rx
3/8	1/2	33.3	19.1	19.3	16.8	7.1	22	17	25.9	33.0	6-8 GME-Rx
1/2	1/4	36.0	14.3	21.8	22.9	4.8	22	22	25.9	28.2	8-4 GME-Rx
1/2	3/8	36.0	14.3	21.8	22.9	9.6	22	22	25.9	28.2	8-6 GME-Rx
1/2	1/2	36.0	19.1	21.8	22.9	10.4	22	22	25.9	33.0	8 GME-Rx
1/2	3/4	39.9	19.1	21.8	22.9	10.4	27	22	29.7	36.8	8-12 GME-Rx
3/4	1/2	39.9	19.1	21.8	24.4	11.9	27	28.5	29.7	36.8	12-8 GME-Rx
3/4	3/4	39.9	19.1	21.8	24.4	15.8	27	28.5	29.7	36.8	12 GME-Rx
1	3/4	49.0	19.1	26.4	31.2	15.8	35	38	36.8	41.6	16-12 GME-Rx
1	1	49.0	23.8	26.4	31.2	22.3	35	38	36.8	46.5	16 GME-Rx
1.1/4	1.1/4	66.5	23.8	38.8	41.1	27.6	46	50	44.5	47.8	20 GME-Rx
1.1/2	1.1/2	78.0	26.2	45.2	50.0	34.0	55	57	50.8	60.4	24 GME-Rx

\* Reference Specifications BS 21 : ISO 7/1 : JIS B 0203 : DIN 2999 : IS 554

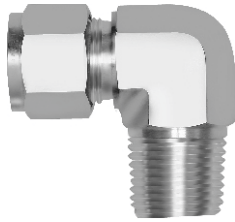
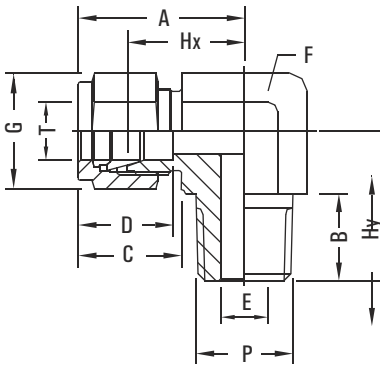
NOTE : The combination of tube OD and male threads are indicative of popular sizes. Other combinations, not shown, are available . Please Consult us.

# Male Elbow



## MALE ELBOW

METRIC OD Tubes x Male NPT Threads



T Tube OD	P NPT Male	A	B	C	D	E min.	F A/F	G A/F	Hx	Hy	Part No.
3	1/8	23.6	9.6	15.3	12.9	2.4	11	11	17.0	17.8	GME-3-2N
3	1/4	24.6	14.3	15.3	12.9	2.4	14	11	18.0	23.4	GME-3-4N
6	1/8	27.0	9.6	17.7	15.3	4.8	14	14	19.6	18.8	GME-6-2N
6	1/4	27.0	14.3	17.7	15.3	4.8	14	14	19.6	23.4	GME-6-4N
6	3/8	29.8	14.3	17.7	15.3	4.8	19	14	22.4	26.2	GME-6N
6	1/2	31.8	19.1	17.7	15.3	4.8	22	14	24.4	33.0	GME-6-8N
8	1/8	28.8	9.6	18.6	16.2	4.8	14	16	21.3	19.8	GME-8-2N
8	1/4	28.8	14.3	18.6	16.2	6.3	14	16	21.3	24.4	GME-8-4N
8	3/8	30.6	14.3	18.6	16.2	6.3	19	16	23.1	26.2	GME-8-6N
8	1/2	32.6	19.1	18.6	16.2	6.3	22	16	25.1	33.0	GME-8N
10	1/8	31.5	9.6	19.5	17.2	4.8	17	19	23.9	21.6	GME-10-2N
10	1/4	31.5	14.3	19.5	17.2	7.1	17	19	23.9	26.2	GME-10-4N
10	3/8	31.5	14.3	19.5	17.2	7.9	19	19	23.9	26.2	GME-10-6N
10	1/2	33	19.1	19.5	17.2	7.9	22	19	25.9	33.0	GME-10-8N
12	1/4	36.0	14.3	22.0	22.8	7.1	22	22	25.9	26.2	GME-12-4N
12	3/8	36.0	14.3	22.0	22.8	9.5	22	22	25.9	38.2	GME-12-6N
12	1/2	36.0	19.1	22.0	22.8	9.5	22	22	25.9	33.0	GME-12-8N
12	3/4	39.8	19.1	22.0	22.8	9.5	27	22	29.7	36.8	GME-12N
15	1/2	38.0	19.1	22.0	24.4	11.9	24	25	27.9	35.1	GME-15-8N
16	1/2	38.0	19.1	22.0	24.4	11.9	24	25	27.9	35.1	GME-16-8N
16	3/4	39.8	19.1	22.0	24.4	27.7	27	25	29.7	36.8	GME-16-12N
18	1/2	39.8	19.1	22.0	24.4	11.9	27	30	29.7	36.8	GME-18-8N
18	3/4	39.8	19.1	22.0	24.4	15.1	27	30	29.7	36.8	GME-18-12N
20	1/2	44.6	19.1	22.0	26.0	11.9	35	32	34.5	41.7	GME-20-8N
20	3/4	44.6	19.1	22.0	26.0	15.9	35	32	34.5	41.7	GME-20-12N
22	3/4	44.6	19.1	22.0	26.0	15.9	35	32	34.5	41.7	GME-22-12N
22	1	44.6	23.9	22.0	26.0	18.3	35	32	34.5	46.5	GME-22-16N
25	3/4	49.1	19.1	26.5	31.3	59.9	35	38	36.8	41.7	GME-25-12N
25	1	41.1	23.9	26.5	31.3	21.8	35	38	36.8	46.5	GME-25-16N
30	1.1/4	69.9	23.9	39.2	39.6	26.2	45	50	48.3	53.1	GME-30-20N
32	1.1/4	72.3	23.9	41.6	42.0	27.6	45	50	49.3	53.1	GME-32-20N
38	1.1/2	84.0	26.2	47.9	49.4	33.7	55	57	56.4	60.4	GME-38-24N

METRIC OD Tubes x Male ISO\* Tapered Pipe Threads

T Tube OD	P ISO Male	A	B	C	D	E min.	F A/F	G A/F	Hx	Hy	Part No.
3	1/8	23.6	9.6	15.3	12.9	2.4	11	11	17.0	17.8	GME-3-2Rx
3	1/4	24.6	14.3	15.3	12.9	2.4	14	11	18.0	23.4	GME-3-4Rx
6	1/8	27.0	9.6	17.7	15.3	4.8	14	14	19.6	18.8	GME-6-2Rx
6	1/4	27.0	14.3	17.7	15.3	4.8	14	14	19.6	23.4	GME-6-4Rx
6	3/8	29.8	14.3	17.7	15.3	4.8	19	14	22.4	26.2	GME-6Rx
6	1/2	31.8	19.1	17.7	15.3	4.8	22	14	24.4	33.0	GME-6-8Rx
8	1/4	28.8	14.3	18.6	16.2	6.3	14	16	21.3	24.4	GME-8-4Rx
8	3/8	30.6	14.3	18.6	16.2	6.3	19	16	23.1	26.2	GME-8-6Rx
8	1/2	32.6	19.1	18.6	16.2	6.3	22	16	25.1	33.0	GME-8Rx
10	1/4	31.5	14.3	19.5	17.2	7.1	17	19	23.9	26.2	GME-10-4Rx
10	3/8	31.5	14.3	19.5	17.2	7.9	19	19	23.9	26.2	GME-10-6Rx
10	1/2	33	19.1	19.5	17.2	7.9	22	19	25.9	33.0	GME-10-8Rx
12	1/4	36.0	14.3	22.0	22.8	7.1	22	22	25.9	26.2	GME-12-4Rx
12	3/8	36.0	14.3	22.0	22.8	9.5	22	22	25.9	38.2	GME-12-6Rx
12	1/2	36.0	19.1	22.0	22.8	9.5	22	22	25.9	33.0	GME-12-8Rx
15	1/2	38.0	19.1	22.0	24.4	11.9	24	25	27.9	35.1	GME-15-8Rx
16	1/2	38.0	19.1	22.0	24.4	11.9	24	25	27.9	35.1	GME-16-8Rx
16	3/4	39.8	19.1	22.0	24.4	27.7	27	25	29.7	36.8	GME-16-12Rx
22	3/4	44.6	19.1	22.0	26.0	15.9	35	32	34.5	41.7	GME-22-12Rx
22	1	44.6	23.9	22.0	26.0	18.3	35	32	34.5	46.5	GME-22-16Rx
25	3/4	49.1	19.1	26.5	31.3	59.9	35	38	36.8	41.7	GME-25-12Rx
25	1	41.1	23.9	26.5	31.3	21.8	35	38	36.8	46.5	GME-25-16Rx
30	1.1/4	69.9	23.9	39.2	39.6	26.2	45	50	48.3	53.1	GME-30-20Rx
32	1.1/4	72.3	23.9	41.6	42.0	27.6	45	50	49.3	53.1	GME-32-20Rx
38	1.1/2	84.0	26.2	47.9	49.4	33.7	55	57	56.4	60.4	GME-38-24Rx

\* Reference Specifications: BS 21 : ISO 7/1 : JIS B 0203 : DIN 2999 : IS 554

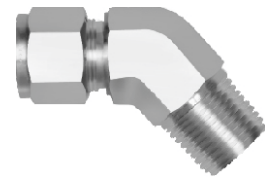
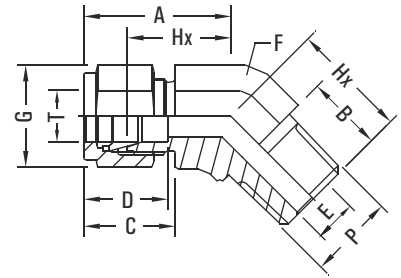
# 45 Deg. / Positionable Male Elbow



## 45 DEG. MALE ELBOW

INCH OD Tubes x Male NPT Threads

T Tube OD	P NPT Male	A	B	C	D	E min.	F A/F	G A/F	Hx	Hy	Part No.
1/4	1/8	24.6	9.6	17.8	15.3	4.8	14	14	17.3	16.5	4-2 GDME-N
1/4	1/4	24.6	14.3	17.8	15.3	4.8	14	14	17.3	21.0	4 GDME-N
3/8	1/8	27.9	9.6	19.3	16.8	4.8	14	17	20.6	18.3	6-2 GDME-N
3/8	1/4	27.9	14.3	19.3	16.8	7.1	17	17	20.6	22.9	6-4 GDME-N
3/8	3/8	29.2	14.3	19.3	16.8	7.1	19	17	21.8	24.1	6 GDME-N
1/2	3/8	32.0	14.3	21.8	22.9	9.6	22	22	21.8	24.1	8-6 GDME-N
1/2	1/2	32.0	19.1	21.8	22.9	10.4	22	22	21.8	29.0	8 GDME-N
3/4	3/4	34.0	19.1	21.8	24.4	15.8	27	28.5	23.9	31.8	12 GDME-N
1	1	40.4	23.8	26.4	31.2	22.3	35	38	26.2	37.8	16 GDME-N

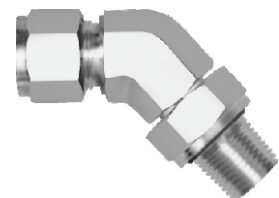
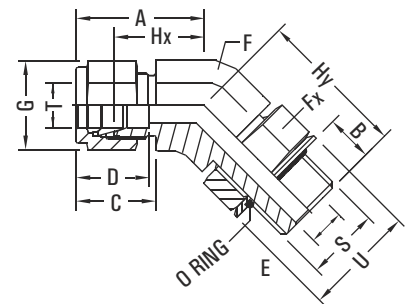


## 45 DEG. POSITIONABLE MALE ELBOW

INCH OD Tube x SAE/MS Straight Threads

T Tube OD	P SAE/MS Male	A	B	C	D	E min.	F	Fx A/F	G A/F	Hx A/F	Hy	U	O Ring Part No.	Part No.
1/4	7/16-20	25.7	9.9	17.8	15.3	4.8	14	14	14	18.3	25.6	16.5	4 OPU	4 GDPME-U
3/8	9/16-18	27.9	11.2	19.3	16.8	7.1	16	17	17	20.6	28.2	20.0	6 OPU	6 GDPME-U
1/2	3/4-16	32.0	12.7	21.8	22.9	10.4	22	22	22	21.8	32.3	25.7	8 OPU	8 GDPME-U
3/4	11/16-12	39.9	16.8	21.8	24.4	15.8	27	32	28.5	29.7	47.3	36.6	12 OPU	12 GDPME-U
1	15/16-12	47.5	16.8	26.4	31.2	19.8	35	38	38	35.3	50.6	44.0	16 OPU	16 GDPME-U

\* Reference Specifications SAE Screw Thread standard conforms to American standard B1.1. Unified screw threads.



INCH OD Tube x Male ISO\* Parallel Threads

T Tube OD	P ISO Male	A	B	C	D	E min.	F	Fx A/F	G A/F	Hx A/F	Hy	U	O Ring Part No.	Part No.
1/4	1/4	25.7	9.9	17.8	15.3	4.8	14	14	14	18.3	25.6	16.5	4 OPU	4 GDPME-U
3/8	3/8	27.9	11.2	19.3	16.8	7.1	16	17	17	20.6	28.2	20.0	6 OPU	6 GDPME-U
1/2	1/2	32.0	12.7	21.8	22.9	10.4	22	22	22	21.8	32.3	25.7	8 OPU	8 GDPME-U
3/4	3/4	39.9	16.8	21.8	24.4	15.8	27	32	28.5	29.7	47.3	36.6	12 OPU	12 GDPME-U
1	1	47.5	16.8	26.4	31.2	19.8	35	38	38	35.3	50.6	44.0	16 OPU	16 GDPME-U

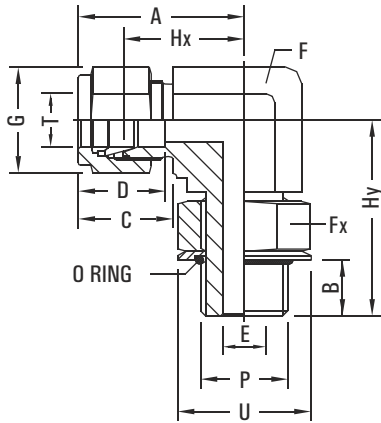
\* Reference Specifications BS 2779 : ISO 228/1 : JIS B0202 : DIN-ISO 228/1

# Positionable Male Elbow



## POSITIONABLE MALE ELBOW

INCH OD Tubes X Male ISO\* Parallel Threads



T Tube OD	P ISO Male	Ax	B	C	D	E min.	F	Fx A/F	G A/F	Hx A/F	Hy	U	O Ring Part No.	Part No.
1/4	1/8	27.0	8.2	17.8	15.3	4.0	14	14	14	19.6	26.4	17.3	2 Opn	4-2 GPME-R
1/4	1/4	29.0	9.2	17.8	15.3	4.8	16	19	14	21.6	32.3	22.9	4 Opn	4 GPME-R
3/8	1/4	30.5	9.2	19.3	16.8	5.8	16	19	17	23.2	32.3	22.9	4 Opn	6-4 GPME-R
3/8	3/8	33.0	9.2	19.3	16.8	7.1	22	22	17	25.9	37.0	26.4	6 Opn	6 GPME-R
1/2	1/4	36.0	9.2	21.8	22.9	5.8	22	19	22	25.9	35.0	22.9	4 Opn	8-4 GPME-R
1/2	3/8	36.0	9.4	21.8	22.9	7.8	22	22	22	25.9	37.0	26.4	6 Opn	8-6 GPME-R
1/2	1/2	38.1	13.0	21.8	24.4	10.4	24	27	22	27.9	43.4	32.0	8 Opn	8 GPME-R
5/8	1/2	38.1	13.0	21.8	24.4	10.4	24	27	25	27.9	43.4	32.0	8 Opn	10-8 GPME-R
3/4	1/2	39.9	13.0	21.8	24.4	10.4	27	27	28.5	29.7	45.2	32.0	8 Opn	12-8 GPME-R
3/4	3/4	39.9	13.0	21.8	24.4	15.8	27	35	28.5	29.7	48.8	41.2	12 Opn	12 GPME-R
1	3/4	49.0	13.0	26.4	31.2	15.8	35	35	38	36.8	53.3	41.2	12 Opn	16-12 GPME-R
1	1	49.0	14.0	26.4	31.2	19.8	35	41	38	36.8	53.6	48.5	16 Opn	16 GPME-R

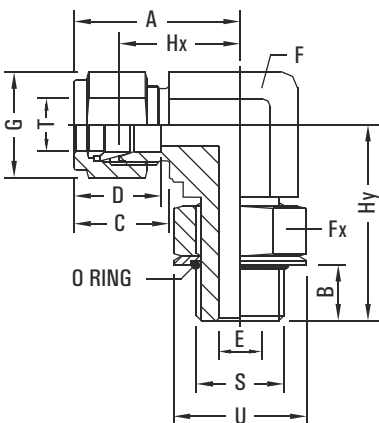


METRIC OD Tubes X Male ISO\* Parallel Threads

T Tube OD	P ISO Male	Ax	B	C	D	E min.	F	Fx A/F	G A/F	Hx A/F	Hy	U	O Ring Part No.	Part No.
6	1/8	27.0	8.1	17.7	15.3	4.0	14	14	14	19.6	26.4	17.3	2 Opn	GPME 6-2R
6	1/4	29.0	9.1	17.7	15.3	4.8	16	19	14	21.6	32.3	22.9	4 Opn	GPME 6-4R
8	1/8	28.8	8.1	18.6	16.2	4.0	14	14	16	21.3	27.4	17.3	2 Opn	GPME 8-2R
8	1/4	29.9	9.1	18.6	16.2	5.9	16	19	16	22.4	32.2	22.9	4 Opn	GPME 8-4R
10	1/4	33.5	9.1	19.5	17.2	5.9	19	19	19	25.9	35.0	22.9	4 Opn	GPME 10-4R
10	3/8	33.5	9.4	19.5	17.2	7.9	19	22	19	25.9	37.1	26.4	6 Opn	GPME 10-6R
12	3/8	36.0	9.4	22.0	22.8	7.9	22	22	22	25.9	37.1	26.4	6 Opn	GPME 12-6R
12	1/2	38.0	13.0	22.0	22.8	9.5	24	27	22	27.9	43.4	32.0	8 Opn	GPME 12-8R
12	3/4	39.8	13.0	22.0	22.8	9.5	27	35	22	29.7	48.8	41.1	12 Opn	GPME 12R
16	1/2	38.1	13.0	22.0	24.4	11.9	27	27	28.5	29.7	45.2	32.0	8 Opn	GPME 16-8R
22	3/4	44.6	13.0	22.0	26.0	15.8	27	35	28.5	34.5	48.8	41.2	12 Opn	GPME 22-12R
25	3/4	49.0	13.0	26.5	31.3	15.8	35	35	38	36.8	53.3	41.2	12 Opn	GPME 25-12R
25	1	49.0	14.0	26.5	31.3	21.8	35	41	38	36.8	53.6	48.5	16 Opn	GPME 25-16R

\* Reference Specification BS 2779 : ISO 228/1 : JIS B0202 : DIN-ISO 228/1

INCH OD Tube x SAE/MS Straight Threads



T Tube OD	P ISO Male	Ax	B	C	D	E min.	F	Fx A/F	G A/F	Hx A/F	Hy	U	O Ring Part No.	Part No.
1/4	7/16-20	28.5	9.9	17.8	15.3	4.8	14	14	14	21.0	28.5	16.5	4 OPU	4 GPME-U
1/4	9/16-18	30.5	11.2	17.8	15.3	4.8	16	17	14	23.1	32.3	20.0	6 OPU	4-6 GPME-U
3/8	9/16-18	32.0	11.2	19.3	16.8	7.1	16	17	17	24.6	32.3	20.0	6 OPU	6 GPME-U
3/8	3/4-16	34.8	12.7	19.3	16.8	7.1	22	22	17	27.4	37.8	25.6	8 OPU	6-8 GPME-U
1/2	3/4-16	37.6	12.7	21.8	22.9	10.4	22	22	22	27.4	37.8	25.6	8 OPU	8 GPME-U
5/8	7/16-14	39.6	14.3	21.8	24.4	12.7	24	25	25	29.5	43.4	29.5	10 OPU	10 GPME-U
3/4	11/16-12	41.4	16.8	21.8	24.4	15.8	27	32	28.5	31.2	48.8	36.6	12 OPU	12 GPME-U
7/8	11/16-12	43.2	16.8	21.8	25.9	18.3	30	32	32	33	50.5	40.4	14 OPU	14 GPME-U
1	15/16-12	50.5	16.8	26.4	31.2	22.3	35	35	38	38.4	53.6	44.0	16 OPU	16 GPME-U
1.1/4	15/8-12	67.8	16.8	38.9	41.2	27.6	46	50	50	45.7	58.2	54.9	20 OPU	20 GPME-U
1.1/2	17/8-12	78.0	16.8	45.2	50.0	34.0	50	55	60	50.8	60.4	62.5	24 OPU	24 GPME-U

\* Reference Specifications SAE Screw Thread standard conforms to American standard B1.1. Unified screw threads.



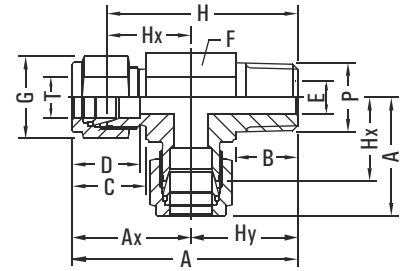
# Male Run Tee



## MALE RUN TEE

INCH OD Tubes X Male NPT Threads

T Tube OD	P NPT Male	A	Ax	B	C	D	E min.	F	G A/F	H A/F	Hx	Hy	Part No.
1/8	1/8	41.4	23.6	9.6	15.3	12.7	2.4	11	11	34.8	17.0	17.8	2 GMRT-N
1/8	1/4	48.0	24.6	14.3	15.3	12.7	2.4	14	11	41.4	18.0	23.4	2-4 GMRT-N
1/4	1/8	45.7	26.9	9.6	17.8	15.3	4.8	14	14	38.4	19.6	18.8	4-2 GMRT-N
1/4	1/4	50.3	26.9	14.3	17.8	15.3	4.8	14	14	43	19.6	23.4	4 GMRT-N
1/4	3/8	55.9	29.7	14.3	17.8	15.3	4.8	19	14	48.8	22.4	26.2	4-6 GMRT-N
1/4	1/2	64.8	31.8	19.1	17.8	15.3	4.8	22	14	57.4	24.4	33.0	4-8 GMRT-N
3/8	1/4	55.9	30.5	14.3	19.3	16.8	7.1	17	17	48.5	23.1	25.4	6-4 GMRT-N
3/8	3/8	57.4	31.2	14.3	19.3	16.8	7.1	19	17	50.1	23.9	26.2	6 GMRT-N
3/8	1/2	66.0	33.0	19.1	19.3	16.8	7.1	22	17	58.9	25.9	33.0	6-8 GMRT-N
1/2	1/4	64.2	36.0	14.3	21.8	22.9	4.8	22	22	54.1	25.9	28.2	8-4 GMRT-N
1/2	3/8	64.2	36.0	14.3	21.8	22.9	9.6	22	22	54.1	25.9	28.2	8-6 GMRT-N
1/2	1/2	69.0	36.0	19.1	21.8	22.9	10.4	22	22	58.9	25.9	33.0	8 GMRT-N
5/8	1/2	73.1	38.1	19.1	21.8	24.4	11.9	22	25	62.9	27.9	35.0	10-8 GMRT-N
3/4	1/2	76.7	39.9	19.1	21.8	24.4	11.9	27	29	66.5	29.7	36.8	12-8 GMRT-N
3/4	3/4	76.7	39.9	19.1	21.8	24.4	15.8	27	29	66.5	29.7	36.8	12 GMRT-N
1	3/4	90.6	49.0	19.1	26.4	31.2	15.8	35	38	78.4	36.8	41.6	16-12 GMRT N
1	1	95.5	49.0	23.8	26.4	31.2	22.3	35	38	83.3	36.8	46.5	16 GMRT-N
1.1/4	1.1/4	114.1	66.5	23.8	38.8	41.1	27.6	46	50	92.1	44.5	47.6	20 GMRT-N
1.1/2	1.1/2	138.4	78.0	26.2	45.2	50.0	34.0	55	57	111.2	50.8	60.4	24 GMRT-N



METRIC OD Tubes X Male NPT Threads

T Tube OD	P NPT Male	A	Ax	B	C	D	E min.	F	G A/F	H A/F	Hx	Hy	Part No.
3	1/8	41.4	23.6	9.6	15.3	12.9	2.4	11	11	34.8	17.0	17.8	GMRT 3-2N
3	1/4	48.0	24.6	14.3	15.3	12.9	2.4	14	11	41.4	18.0	23.4	GMRT 3-4N
6	1/8	45.8	27.0	9.6	17.7	15.3	4.8	14	14	38.9	19.6	18.8	GMRT 6-2N
6	1/4	50.4	27.0	14.3	17.7	15.3	4.8	14	14	43.0	19.6	23.4	GMRT 6-4N
6	3/8	56.0	29.8	14.3	17.7	15.3	4.8	19	14	48.6	22.4	26.2	GMRT 6-N
8	1/4	53.2	28.8	14.3	18.6	16.2	6.3	14	16	45.7	21.3	24.4	GMRT 8-4N
8	3/8	56.8	30.6	14.3	18.6	16.2	6.3	19	16	49.3	23.1	26.2	GMRT 8-6N
8	1/2	65.6	32.6	19.1	18.6	16.2	6.3	22	16	58.1	25.1	33.0	GMRT 8-N
10	1/4	57.7	31.5	14.3	19.5	17.2	7.1	17	19	50.1	23.9	26.2	GMRT 10-4N
10	3/8	57.7	31.5	14.3	19.5	17.2	7.9	19	19	50.1	23.9	26.2	GMRT 10-6N
10	1/2	66.5	33.5	19.1	19.5	17.2	7.9	22	19	58.9	25.9	33.0	GMRT 10-8N
12	1/4	62.2	36.0	14.3	22.0	22.8	7.1	22	22	52.1	25.9	26.2	GMRT 12-4N
12	3/8	62.2	36.0	14.3	22.0	22.8	9.5	22	22	52.1	25.9	28.2	GMRT 12-6N
12	1/2	69.0	36.0	19.1	22.0	22.8	9.5	22	22	58.9	25.9	33.0	GMRT 12-8N
16	1/2	73.1	38.0	19.1	22.0	24	11.9	24	25	64.0	27.9	35.1	GMRT 16-8N
25	3/4	90.8	49.1	19.1	26.5	31.3	15.8	35	38	78.5	36.8	41.7	GMRT 25-12N
25	1	95.6	49.1	23.8	26.5	31.3	21.8	35	38	83.3	36.8	46.5	GMRT 25-16N
30	1.1/4	120.0	66.9	23.8	39.2	39.6	26.2	45	50	101.4	48.3	53.1	GMRT 30-20N
32	1.1/4	125.4	72.3	23.8	41.6	42.0	27.6	45	50	102.4	49.3	53.1	GMRT 32-20N
38	1.1/2	144.4	84.0	26.2	47.9	50.0	33.7	55	57	116.8	56.4	60.4	GMRT 38-24N

NOTE :The combination of tube OD and male threads are indicative of popular sizes. Other combinations, not shown, are available . Please Consult us.

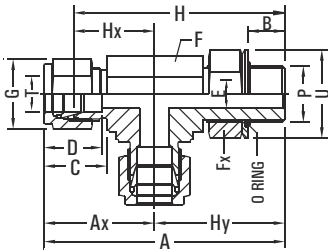


# Positionable Male Run / Branch Tee



## POSITIONABLE MALE RUN TEE

INCH OD Tubes X Male ISO\* Parallel Threads



T	P	A	Ax	B	C	D	E	F	Fx	G	H	Hx	Hy	U	O Ring	Part No.	Part No.
Tube ISO	OD Male						min.	A/F	A/F	A/F							
1/4	1/8	53.4	27.0	8.2	17.8	15.3	4.0	14	14	14	46.0	19.6	26.4	17.3	2 Opn	4-2	GPMRT-R
1/4	1/4	61.3	29.0	9.2	17.8	15.3	4.8	16	19	14	53.9	21.6	32.3	22.9	4 Opn	4	GPMRT-R
3/8	1/4	62.8	30.5	9.2	19.3	16.8	5.8	16	19	17	55.5	23.2	32.3	22.9	4 Opn	6-4	GPMRT-R
1/2	3/8	73.0	36.0	9.4	21.8	22.9	7.8	22	22	22	62.9	25.9	37.0	26.4	6 Opn	8-6	GPMRT-R
1/2	1/2	81.5	38.1	13.0	21.8	24.4	10.4	24	27	22	71.3	27.9	43.4	32.0	8 Opn	8	GPMRT-R
5/8	1/2	81.5	38.1	13.0	21.8	24.4	10.4	24	27	25	71.3	27.9	43.4	32.0	8 Opn	10-8	GPMRT-R
3/4	1/2	85.1	39.9	13.0	21.8	24.4	10.4	27	27	28.5	74.9	29.7	45.2	32.0	8 Opn	12-8	GPMRT-R
3/4	3/4	88.7	39.9	13.0	21.8	24.4	15.8	27	35	28.5	78.5	29.7	48.8	41.2	12 Opn	12	GPMRT-R
1	1	102.6	49.0	14.0	26.4	31.2	19.8	35	41	38	90.4	36.8	53.6	48.5	16 Opn	16	GPMRT-R



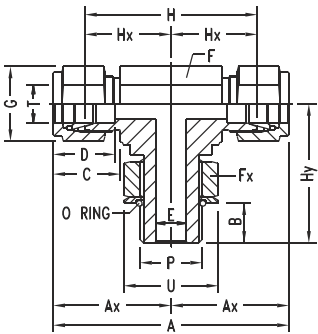
METRIC OD Tubes X Male ISO\* Parallel Threads

T	P	A	Ax	B	C	D	E	F	Fx	G	H	Hx	Hy	U	O Ring	Part No.	Part No.
Tube ISO	OD Male						min.	A/F	A/F	A/F							
6	1/8	53.4	27.0	8.1	17.7	15.3	4.0	14	14	14	46.0	19.6	26.4	17.3	2 Opn		GPMRT 6-2R
6	1/4	61.3	29.0	9.1	17.7	15.3	4.8	16	19	14	53.9	21.6	32.3	22.9	4 Opn		GPMRT 6-4R
8	1/8	56.2	28.8	8.1	18.6	16.2	4.0	14	14	16	48.7	21.3	27.4	17.3	2 Opn		GPMRT 8-2R
8	1/4	62.1	29.9	9.1	18.6	16.2	5.9	16	19	16	54.6	22.4	32.2	22.9	4 Opn		GPMRT 8-4R
10	1/4	68.5	33.5	9.1	19.5	17.2	5.9	19	19	19	61.9	25.9	35.0	22.9	4 Opn		GPMRT 10-4R
12	3/8	73.1	36.0	9.4	22.0	22.8	7.9	22	22	22	63.0	25.9	37.1	26.4	6 Opn		GPMRT 12-6R
12	1/2	81.4	38.0	13.0	22.0	23	9.5	24	27	22	71.3	27.9	43.4	32.0	8 Opn		GPMRT 12-8R
16	1/2	83.3	38.1	13.0	22.0	24.4	11.9	27	27	28.5	74.9	29.7	45.2	32.0	8 Opn		GPMRT 16-8R
22	3/4	93.4	44.6	13.0	22.0	26.0	15.8	27	35	28.5	83.3	34.5	48.8	41.2	12 Opn		GPMRT 22-12R
25	3/4	102.3	49.0	13.0	26.5	31.3	15.8	35	35	38	90.1	36.8	53.3	41.2	12 Opn		GPMRT 25-12R
25	1	102.6	49.0	14.0	26.5	31.3	21.8	35	41	38	90.4	36.8	53.6	48.5	16 Opn		GPMRT 25-16R

\* Reference Specifications : BS 2779 : ISO 228/1 : JIS B0202 : DIN-ISO 228/1

## POSITIONABLE BRANCH TEE

Inch OD Tubes X Male ISO\* Parallel Thread



T	P	A	Ax	B	C	D	E	F	Fx	G	H	Hx	Hy	U	O Ring	Part No.	Part No.
Tube ISO	OD Male						min.	A/F	A/F	A/F							
1/4	1/8	53.4	27.0	8.2	17.8	15.3	4.0	14	14	14	46.0	19.6	26.4	17.3	2 OPN	4-2	GPMBT-R
1/4	1/4	61.3	29.0	9.2	17.8	15.3	4.8	16	19	14	53.9	21.6	32.3	22.9	4 OPN	4	GPMBT-R
3/8	1/4	62.8	30.5	9.2	19.3	16.8	5.8	16	19	17	55.5	23.2	32.3	22.9	4 OPN	6-4	GPMBT-R
1/2	3/8	73.0	36.0	9.4	21.8	22.9	7.8	22	22	22	62.9	25.9	37.0	26.4	6 OPN	8-6	GPMBT-R
1/2	1/2	81.5	38.1	13.0	21.8	24.4	10.4	24	27	22	71.3	27.9	43.4	32.0	8 OPN	8	GPMBT-R
5/8	1/2	81.5	38.1	13.0	21.8	24.4	10.4	24	27	25	71.3	27.9	43.4	32.0	8 OPN	10-8	GPMBT-R
3/4	1/2	85.1	39.9	13.0	21.8	24.4	10.4	27	27	28.5	74.9	29.7	45.2	32.0	8 OPN	12-8	GPMBT-R
3/4	3/4	88.7	39.9	13.0	21.8	24.4	15.8	27	35	28.5	78.5	29.7	48.8	41.2	12 OPN	12	GPMBT-R
1	1	102.6	49.0	14.0	26.4	31.2	19.8	35	41	38	90.4	36.8	53.6	48.5	16 OPN	16	GPMBT-R

Metric OD Tubes X Male ISO\* Parallel Threads



T	P	A	AX	B	C	D	E	F	FX	G	H	HX	HY	U	O Ring	Part No.	Part No.
Tube ISO	OD MALE						min.		A/F	A/F	A/F						
6	1/8	53.4	27.0	8.1	17.7	15.3	4.0	14	14	14	46.0	19.6	26.4	17.3	2 OPN		GPMBT 6-2R
6	1/4	61.3	29.0	9.1	17.7	15.3	4.8	16	19	14	53.9	21.6	32.3	22.9	4 OPN		GPMBT 6-4R
8	1/8	56.2	28.8	8.1	18.6	16.2	4.0	14	14	16	48.7	21.3	27.4	17.3	2 OPN		GPMBT 8-2R
8	1/4	62.1	29.9	9.1	18.6	16.2	5.9	16	19	16	54.6	22.4	32.2	22.9	4 OPN		GPMBT 8-4R
10	1/4	68.5	33.5	9.1	19.5	17.2	5.9	19	19	19	61.9	25.9	35.0	22.9	4 OPN		GPMBT 10-4R
12	3/8	73.1	36.0	9.4	22.0	22.8	7.9	22	22	22	63.0	25.9	37.1	26.4	6 OPN		GPMBT 12-6R
12	1/2	81.4	38.0	13.0	22.0	23	9.5	24	27	22	71.3	27.9	43.4	32.0	8 OPN		GPMBT 12-8R
16	1/2	83.3	38.1	13.0	22.0	24.4	11.9	27	27	28.5	74.9	29.7	45.2	32.0	8 OPN		GPMBT 16-8R
22	3/4	93.4	44.6	13.0	22.0	26.0	15.8	27	35	28.5	83.3	34.5	48.8	41.2	12 OPN		OPNGPMBT 22-12R
25	3/4	102.3	49.0	13.0	26.5	31.3	15.8	35	35	38	90.1	36.8	53.3	41.2	12 OPN		OPNGPMBT 25-12R
25	1	102.6	49.0	14.0	26.5	31.3	21.8	35	41	38	90.4	36.8	53.6	48.5	16 OPN		OPNGPMBT 25-16R

\* Reference Specifications : BS 2779 : ISO 228/1 : JIS B0202 : DIN-ISO 228/1

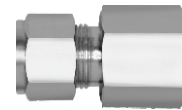
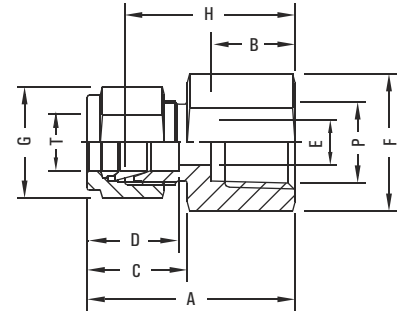
# Female Connector



## FEMALE CONNECTOR

INCH OD Tubes x Female NPT Threads

T Tube OD	P NPT Female	A	B	C	D	E min.	F A/F	G A/F	H	Part No.
1/16	1/16	23.6	9.9	11.0	8.6	1.3	11	8	19.8	1 GFC-N
1/16	1/8	24.4	10.4	11.0	8.6	1.3	14	8	20.6	1-2 GFC-N
1/8	1/8	28.7	10.4	15.3	12.7	2.4	14	11	22.1	2 GFC-N
1/8	1/4	33.6	15.0	15.3	12.7	2.4	19	11	26.9	2-4 GFC-N
1/4	1/8	31.2	9.9	17.8	15.3	4.8	14	14	23.9	4-2 GFC-N
1/4	1/4	35.8	15.0	17.8	15.3	4.8	19	14	28.5	4 GFC-N
1/4	3/8	37.6	15.0	17.8	15.3	4.8	22	14	30.2	4-6 GFC-N
1/4	1/2	42.4	19.8	17.8	15.3	4.8	27	14	35.0	4-8 GFC-N
5/16	1/8	32.0	10.4	18.5	16.3	6.3	14	16	24.6	5-2 GFC-N
5/16	1/4	36.8	15.0	18.5	16.3	6.3	19	16	29.5	5-4 GFC-N
3/8	1/8	32.8	10.4	19.3	16.8	7.1	16	17	25.4	6-2 GFC-N
3/8	1/4	37.6	15.0	19.3	16.8	7.1	19	17	30.2	6-4 GFC-N
3/8	3/8	39.1	15.0	19.3	16.8	7.1	22	17	31.8	6 GFC-N
3/8	1/2	43.9	19.8	19.3	16.8	7.1	27	17	36.6	6-8 GFC-N
1/2	1/4	40.4	15.0	21.8	22.9	10.4	22	22	30.2	8-4 GFC-N
1/2	3/8	41.9	15.0	21.8	22.9	10.4	22	22	30.2	8-6 GFC-N
1/2	1/2	46.7	19.8	21.8	22.9	10.4	27	22	36.6	8 GFC-N
1/2	3/4	48.3	20.6	21.8	22.9	10.4	32	22	38.1	8-12 GFC-N
5/8	3/8	41.9	15.0	21.8	24.4	12.7	24	25	31.8	10-6 GFC-N
5/8	1/2	46.7	19.8	21.8	24.4	12.7	27	25	36.6	10-8 GFC-N
3/4	1/2	46.7	19.8	21.8	24.4	15.8	27	28.5	36.6	12-8 GFC-N
3/4	3/4	48.3	20.6	21.8	24.4	15.8	35	28.5	38.1	12 GFC-N
7/8	3/4	49.8	20.6	21.8	25.9	18.3	35	32	39.6	14-12 GFC-N
1	3/4	53.4	20.6	26.4	31.2	22.3	35	38	41.2	16-12 GFC-N
1	1	62.3	25.4	26.4	31.2	22.3	41	38	50.0	16 GFC-N
1.1/4	1.1/4	74.6	25.4	38.9	41.2	27.6	55	50	52.6	20 GFC-N
1.1/2	1.1/2	83.3	27.6	45.2	50.0	34.0	60	60	56.2	24 GFC-N



INCH OD Tubes x Female ISO\* Tapered Pipe Threads

T Tube OD	P ISO Female	A	B	C	D	E min.	F A/F	G A/F	H	Part No.
1/16	1/16	23.6	9.9	11.0	8.6	1.3	11	8	19.8	1 GFC-Rx
1/8	1/8	28.7	10.4	15.3	12.7	2.4	14	11	22.1	2 GFC-Rx
1/8	1/4	33.6	15.0	15.3	12.7	2.4	19	11	26.9	2-4 GFC-Rx
1/4	1/8	31.2	9.9	17.8	15.3	4.8	14	14	23.9	4-2 GFC-Rx
1/4	1/4	35.8	15.0	17.8	15.3	4.8	19	14	28.5	4 GFC-Rx
1/4	3/8	37.6	15.0	17.8	15.3	4.8	22	14	30.2	4-6 GFC-Rx
1/4	1/2	42.4	19.8	17.8	15.3	4.8	27	14	35.0	4-8 GFC-Rx
3/8	1/4	37.6	15.0	19.3	16.8	7.1	19	17	30.2	6-4 GFC-Rx
3/8	3/8	39.1	15.0	19.3	16.8	7.1	22	17	31.8	6 GFC-Rx
3/8	1/2	43.9	19.8	19.3	16.8	7.1	27	17	36.6	6-8 GFC-Rx
1/2	1/4	40.4	15.0	21.8	22.9	10.4	22	22	40.4	8-4 GFC-Rx
1/2	3/8	41.9	15.0	21.8	22.9	10.4	22	22	30.2	8-6 GFC-Rx
1/2	1/2	46.7	19.8	21.8	22.9	10.4	27	22	31.8	8 GFC-Rx
3/4	1/2	46.7	19.8	21.8	24.4	15.8	27	28.5	36.6	12-8 GFC-Rx
3/4	3/4	48.3	20.6	21.8	24.4	15.8	35	28.5	38.1	12 GFC-Rx
1	3/4	53.4	20.6	26.4	31.2	22.3	35	38	41.2	16-12 GFC-Rx
1	1	62.3	25.4	26.4	31.2	22.3	41	38	50.0	16 GFC-Rx
1.1/4	1.1/4	74.6	25.4	38.9	41.2	27.6	55	50	52.6	20 GFC-Rx
1.1/2	1.1/2	83.3	27.6	45.2	50.0	34.0	60	60	56.2	24 GFC-Rx

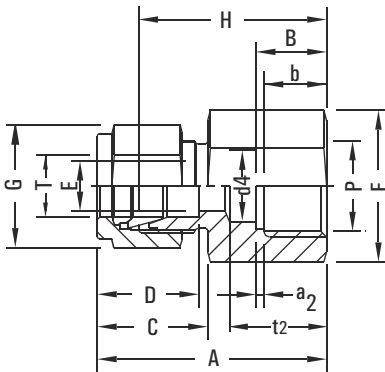
\* Reference Specifications: BS 21: ISO 7/1 : JIS B 0203 : DIN 2999 : IS 554

\* Female connectors with Parallel ISO Female Threads to BS:2779; ISO 228/1; JIS B6202; DIN 259 are also Available. Their Dimensions are as same as ISO. Tapered Pipe Threads above. Please consult us.

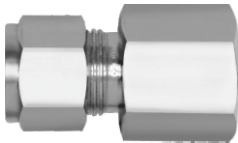
NOTE : The combinations shown above are representative of various possibilities. Other combinations not shown are also available. Please consult us.

## FEMALE MANOMETER CONNECTOR

Inch OD Tubes X Female Iso\* Parallel Threads (gage)



T Tube OD	P ISO Female	A	B	C	D	E min.	F A/F	G A/F	H	a2 MinmMinm.	d4	b	t2	Part No.
1/4	1/4	37.6	13.0	17.8	15.3	4.8	19	14	30.2	1.6	5.6	9.4	17.0	4 GFC-MAN
1/4	3/8	37.6	14.2	17.8	15.3	4.8	24	14	30.2	1.6	6.6	9.9	20.3	4-6 GFC-MAN
1/4	1/2	43.4	18.8	17.8	15.3	4.8	27	14	36.0	1.6	6.6	14.5	24.9	4-8 GFC-MAN
5/16	1/4	38.4	13.0	18.5	16.3	6.0	19	16	31.0	1.6	-	9.4	-	5-4 GFC-MAN
5/16	1/2	40.9	18.8	18.5	16.3	7.1	27	16	33.6	1.6	-	14.5	-	5-8 GFC-MAN
3/8	1/4	39.2	13.0	19.3	16.8	6.0	19	17	31.8	1.6	-	9.4	-	6-4 GFC-MAN
3/8	3/8	38.6	14.2	19.3	16.8	6.6	24	17	31.2	1.6	-	9.9	-	6 GFC-MAN
3/8	1/2	41.9	18.8	19.3	16.8	7.1	27	17	34.5	1.6	-	14.5	-	6-8 GFC-MAN
1/2	3/8	44.5	14.2	21.8	22.9	6.6	24	22	34.3	1.6	-	9.9	-	8-6 GFC-MAN
1/2	1/2	48.3	18.8	21.8	22.9	7.1	27	22	38.1	1.6	-	14.5	-	8 GFC-MAN



Metric OD Tubes X Female ISO\* Parallel Thread (gage)

T Tube OD	P ISO Female	A	B	C	D	E min.	F A/F	G A/F	H	a2 min	b min	d4	t2	Part No.
3	1/4	35.3	12.9	15.3	12.9	2.4	19	11	28.7	1.6	9.5	5.5	17.0	GFC 3-4MAN
6	1/4	37.6	12.9	17.7	15.3	4.8	19	14	30.2	1.6	9.5	5.5	17.0	GFC 6-4MAN
6	3/8	37.6	14.1	17.7	15.3	4.8	24	14	30.2	1.6	10.0	6.5	20.3	GFC 6MAN
6	1/2	43.5	18.9	17.7	15.3	4.8	27	14	36.1	1.6	14.5	7.0	24.9	GFC 6-8MAN
8	1/4	38.5	12.9	18.6	16.2	5.5	19	16	31.0	1.6	9.5	5.5	-	GFC 8-4MAN
8	3/8	36.2	14.1	18.6	16.2	6.5	24	16	28.7	1.6	10.0	6.5	-	GFC 8-6MAN
8	1/2	41.0	18.9	18.6	16.2	7.1	27	16	33.5	1.6	14.5	7.0	-	GFC 8MAN
10	1/4	39.4	19.5	19.5	17.2	5.5	19	19	31.8	1.6	9.5	5.5	-	GFC 10-4MAN
10	3/8	38.8	19.5	19.5	17.2	6.5	24	19	31.2	1.6	10.0	6.5	-	GFC 10-6MAN
10	1/2	42.1	19.5	19.5	17.2	7.1	27	19	34.5	1.6	14.5	7.0	-	GFC 10-8MAN
12	1/4	41.9	12.9	22.0	22.8	5.5	22	22	31.8	1.6	9.5	5.5	-	GFC 12-4MAN
12	3/8	44.4	14.1	22.0	22.8	6.5	24	22	34.3	1.6	10.0	6.5	-	GFC12-6MAN
12	1/2	48.2	18.9	22.0	22.8	7.1	27	22	38.1	1.6	14.5	7.0	-	GFC 12-8MAN

No seal is made around the male thread. instead, a gasket is dropped into the flat bottom in the female thread, and the end of the male threaded end exerts a load on the gasket to seal. Details of gasket given below.

\* Reference Specifications : BS 2779 : ISO 228/1 : JIS B0202 : DIN-259

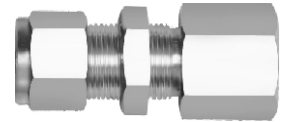
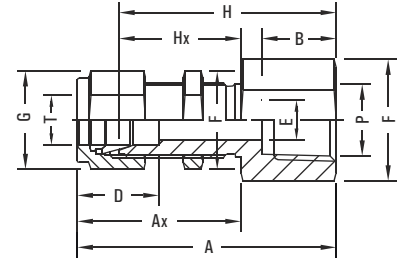
# Bulkhead Female Connector



## BULKHEAD FEMALE CONNECTOR

INCH OD Tubes x Female NPT Threads

T Tube OD	P NPT Male	A	Ax	B	D	E min.	F A/F	G A/F	H	Hx	Panel Hole Drill Size	Max. Panel Thick- ness	Part No.
1/8	1/8	44.7	31.2	10.4	12.7	2.4	14	11	38.1	24.6	8.3	12.7	2 GBFC-N
1/4	1/8	47.0	33.5	10.4	15.3	4.8	16	14	39.7	26.2	11.5	10.2	4-2 GBFC-N
1/4	1/4	51.5	33.5	15.0	15.3	4.8	19	14	44.2	26.2	11.5	10.2	4 GBFC-N
3/8	1/4	54.8	36.8	15.0	16.8	7.1	19	17	47.5	29.5	14.7	11.2	6-4 GBFC-N
1/2	3/8	61.7	41.9	15.0	22.9	10.4	22	22	51.6	31.0	19.5	12.7	8-6 GBFC-N
1/2	1/2	66.7	41.9	19.8	22.9	10.4	27	22	56.6	31.0	19.5	12.7	8 GBFC-N
5/8	1/2	67.6	42.7	19.8	22.9	12.7	27	25	57.4	32.5	22.6	12.7	10-8 GBFC-N
3/4	1/2	72.4	47.5	19.8	24.4	16.0	35	28.5	62.3	37.4	25.8	16.8	12-8 GBFC-N
3/4	3/4	74.7	47.5	20.6	24.4	16.0	35	28.5	64.3	37.4	25.8	16.8	12 GBFC-N
1	3/4	84.3	57.4	20.6	31.2	16.0	35	38	72.1	45.2	33.7	19.0	16-12 GBFC-N
1	1	93.2	57.4	25.4	31.2	22.2	35	38	81.0	45.2	33.7	19.0	16 GBFC-N
1.1/4	1.1/4	105.7	69.9	25.4	41.2	27.6	50	50	83.5	47.7	41.6	19.0	20 GBFC-N
1.1/2	1.1/2	144.5	76.4	27.6	50.0	34.0	60	57	87.4	49.3	49.6	19.0	24 GBFC-N

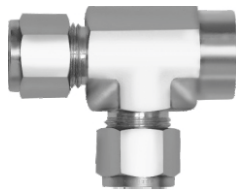
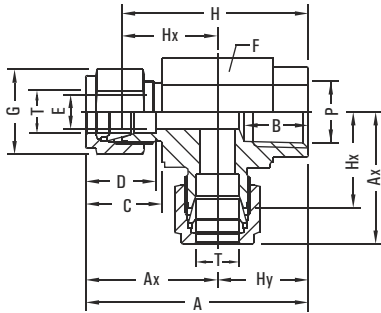


Metric OD Tubes x Female NPT Threads

T Tube OD	P NPT Male	A	Ax	B	D	E min.	F A/F	G A/F	H	Hx	Panel Hole Drill Size	Max. Panel Thick- ness	Part No.
3	1/8	44.7	31.2	10.4	12.9	2.4	14	11	38.1	24.6	8.3	12.7	GBFC 3-2N
6	1/4	51.6	33.6	15.0	15.3	4.8	19	14	44.2	26.2	11.5	10.2	GBFC 6-4N
10	3/8	56.8	37.0	15.0	17.2	7.9	22	19	49.2	29.4	16.3	11.2	GBFC10-4N
12	3/8	61.8	41.9	15.0	22.8	9.5	24	22	51.7	31.8	19.5	12.7	GBFC12-6N
12	1/2	66.7	41.9	19.8	22.8	9.5	27	22	56.6	31.8	19.5	12.7	GBFC12-8N
16	1/2	67.5	42.6	20.6	24.4	12.7	27	25	57.4	32.5	22.8	12.7	GBFC16-8N
22	3/4	79.9	53.0	20.6	26.0	15.8	35	35	69.8	42.9	29.0	19.0	GBFC22-12N
25	3/4	84.3	57.4	20.6	31.2	15.8	35	38	72.1	45.2	33.7	19.0	GBFC25-12N
25	1	93.2	57.4	25.4	31.2	22.3	35	38	81.0	45.2	33.7	19.0	GBFC25-16N
32	1.1/4	105.7	69.9	25.4	42.0	27.6	50	50	83.5	44.7	41.6	19.0	GBFC32-20N
38	1.1/2	114.5	76.4	27.6	49.4	33.7	60	57	87.4	49.3	49.6	19.0	GBFC38-24N

NOTE : Bulkhead Female Connectors are also available with ISO Taper Female Threads, ISO Parallel Female Threads and ISO Female Marcometer connection. Please consult us.

# Female Run / Branch Tee



## FEMALE RUN TEE

INCH OD Tubes X Female NPT Threads

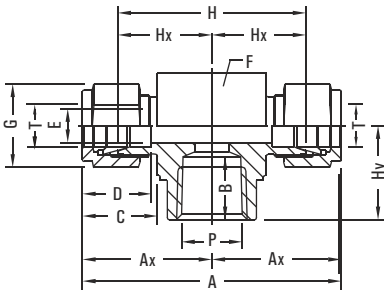
T Tube OD	P NPT Female	A	Ax	B	C	D	E min.	F A/F	G A/F	H	Hx	Hy	Part No.
1/8	1/8	43.6	24.6	10.4	15.3	12.7	2.4	14	11	37.0	18.0	19.0	2 GFRT-N
1/4	1/8	45.9	26.9	10.4	17.8	15.3	4.8	14	14	38.6	19.6	19.0	4-2 GFRT-N
1/4	1/4	52.1	29.7	15.0	17.8	15.3	4.8	19	14	44.8	22.4	22.4	4 GFRT-N
3/8	1/4	53.6	31.2	15.0	19.3	16.8	7.1	19	17	46.3	23.9	22.4	6-4 GFRT-N
3/8	3/8	55.7	33.3	15.0	19.3	16.8	7.1	22	17	48.3	25.9	22.4	6 GFRT-N
1/2	3/8	58.4	36.0	15.0	21.8	22.9	10.4	22	22	48.3	25.9	22.4	8-6 GFRT-N
1/2	1/2	67.4	38.9	19.8	21.8	22.9	10.4	27	22	57.2	28.7	28.5	8 GFRT-N
3/4	3/4	76.5	44.7	20.6	21.8	24.4	15.8	35	29	66.4	34.6	31.8	12 GFRT-N
1	3/4	80.8	49.0	20.6	26.4	31	22.3	35	38	68.6	36.8	31.8	16-12 GFRT-N
1	1	91.7	53.6	25.4	26.4	31	22.3	41	38	79.5	41.4	38.1	16 GFRT-N

METRIC OD Tubes X Female NPT Threads

T Tube OD	P NPT Female	A	Ax	B	C	D	E min.	F A/F	G A/F	H	Hx	Hy	Part No.
3	1/8	43.6	24.6	10.4	15.3	12.9	2.4	14	11	37.0	18.0	19.0	GFRT 3-2N
6	1/8	46.0	27.0	10.4	17.7	15.3	4.8	14	14	38.6	19.6	19.0	GFRT 6-2N
6	1/4	52.2	29.8	15.0	17.7	15.3	4.8	19	14	44.8	22.4	22.4	GFRT 6-4N
8	1/8	48.9	29.9	10.4	18.6	16.2	6.3	16	16	41.4	22.4	19.0	GFRT 8-2N
8	1/4	53.0	30.6	15.0	18.6	16.2	6.3	19	16	45.5	23.1	22.4	GFRT 8-4N
10	1/4	55.9	33.5	15.0	19.5	17.2	7.9	19	19	48.3	25.9	22.4	GFRT 10-4N
12	3/8	58.4	36.0	15.0	22.0	22.8	9.5	22	22	48.3	25.9	22.4	GFRT 12-6N
12	1/2	67.3	38.8	19.8	22.0	22.8	9.5	27	22	57.2	28.7	28.5	GFRT 12-8N
16	1/2	68.0	39.5	19.8	22.0	24	12.7	27	25	58.2	29.7	28.5	GFRT 16-8N
25	1	91.7	53.6	25.4	26.5	31.3	22.3	41	38	79.5	41.4	38.1	GFRT 25-16N

## FEMALE BRANCH TEE

INCH OD Tubes X Female NPT Threads



T Tube OD	P NPT Female	A	Ax	B	C	D	E min.	F A/F	G A/F	H	Hx	Hy	Part No.
1/8	1/8	49.2	24.6	10.4	15.3	12.7	2.4	14	11	36.0	18.0	19.0	2 GFBT-N
1/4	1/8	53.8	26.9	10.4	17.8	15.3	4.8	14	14	39.2	19.6	19.0	4-2 GFBT-N
1/4	1/4	59.4	27.9	15.0	17.8	15.3	4.8	19	14	44.8	22.4	22.4	4 GFBT-N
3/8	1/4	62.4	31.2	15.0	19.3	16.8	7.1	16	16	47.8	23.9	22.4	6-4 GFBT-N
3/8	3/8	66.6	33.3	15.0	19.3	16.8	7.1	19	16	51.8	25.9	22.4	6 GFBT-N
1/2	3/8	72.0	36.0	15.0	21.8	22.9	10.4	19	19	51.8	25.9	22.4	8-6 GFBT-N
1/2	1/2	77.8	38.9	19.8	21.8	22.9	10.4	22	22	57.4	28.7	28.5	8 GFBT-N
3/4	3/4	89.4	44.7	20.6	21.8	24.4	15.8	35	22	69.2	34.6	31.8	12 GFBT-N
1	3/4	98.0	49.0	20.6	26.4	31.2	22.3	35	25	73.6	36.8	31.8	16-12 GFBT-N
1	1	107.2	53.6	25.4	26.4	31.2	22.3	41	38	82.8	41.4	38.1	16 GFBT-6N

METRIC Tubes X Female NPT Threads

T Tube OD	P NPT Female	A	Ax	B	C	D	E min.	F A/F	G A/F	H	Hx	Hy	Part No.
3	1/8	49.2	24.6	10.4	15.3	12.9	2.4	14	11	36.0	18.0	19.0	GFBT 3-2N
6	1/8	54.0	27.0	10.4	17.7	15.3	4.8	14	14	39.2	19.6	19.0	GFBT 6-2N
6	1/4	59.6	29.8	15.0	17.7	15.3	4.8	19	14	44.8	22.4	22.4	GFBT 6-4N
8	1/8	59.8	29.9	10.4	18.6	16.2	6.3	16	16	44.8	22.4	19.0	GFBT 8-2N
8	1/4	61.2	30.6	15.0	18.6	16.2	6.3	19	16	46.2	23.1	22.4	GFBT 8-4N
10	1/4	67.0	33.5	15.0	19.5	17.2	7.9	19	19	51.8	25.9	22.4	GFBT 10-4N
12	3/8	72.0	36.0	15.0	22.0	22.8	9.5	22	22	51.8	25.9	22.4	GFBT 12-6N
12	1/2	77.6	38.8	19.8	22.0	22.8	9.5	27	22	57.4	28.7	28.5	GFBT 12-8N
16	1/2	79.0	39.5	19.8	22.0	24.4	12.7	27	25	59.4	29.7	28.5	GFBT 16-8N
25	1	107.2	53.6	25.4	26.5	31.3	22.3	41	38	82.8	41.4	38.1	GFBT 25-16N

NOTE :The combinations shown above are representative of various possibilities. Other combinations not shown are also available. Please consult us.

NOTE Bulkhead Female Connectors are also available with ISO Taper Female Threads, ISO Parallel Female Threads and ISO Female Marcometer connection. Please consult us.

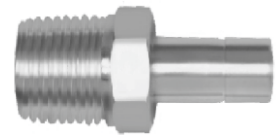
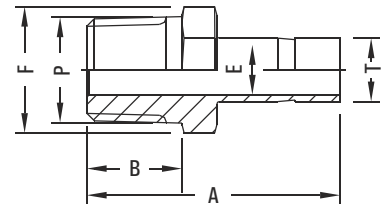
# Male Adapter



## MALE ADAPTER

INCH OD Tubes x Male NPT Threads

T Tube OD	P NPT Male	A	B	E min.	F A/F	Part No.
1/8	1/8	29.5	9.6	4.8	11	2 GMA-N
1/8	1/4	34.8	14.4	7.1	14	2-4 GMA-N
1/4	1/8	31.8	9.6	4.8	11	4-2 GMA-N
1/4	1/4	37.0	14.3	4.8	14	4 GMA-N
1/4	3/8	37.8	14.3	4.8	19	4-6 GMA-N
1/4	1/2	43.4	19.1	4.8	22	4-8 GMA-N
5/16	1/4	38.1	14.3	6.3	14	5-4 GMA-N
3/8	1/4	38.9	14.3	7.1	14	6-4 GMA-N
3/8	3/8	39.6	14.3	7.1	19	6 GMA-N
3/8	1/2	45.2	19.1	7.1	22	6-8 GMA-N
1/2	1/4	44.5	14.3	7.1	14	8-4 GMA-N
1/2	3/8	45.2	14.3	9.9	19	8-6 GMA-N
1/2	1/2	50.8	19.1	9.9	22	8 GMA-N
5/8	1/2	52.3	19.1	11.9	22	10-8 GMA-N
3/4	1/2	52.3	19.1	11.9	22	12-8 GMA-N
3/4	3/4	52.3	19.1	15.0	27	12 GMA-N
1	3/4	58.7	19.1	15.7	27	16 GMA-N
1	1	66.0	23.8	20.3	35	16-12 GMA-N
1.1/4	1.1/4	80.3	23.8	27.6	45	20 GMA-N
1.1/2	1.1/2	94.5	26.2	33.2	55	24 GMA-N



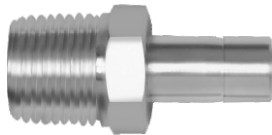
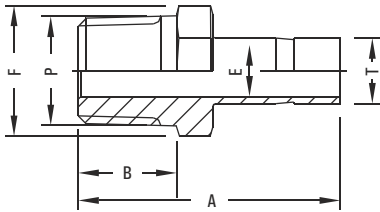
INCH OD Tubes x Male ISO\* Tapered Pipe Threads

T Tube OD	P ISO Male	A	B	E min.	F A/F	Part No.
1/8	1/8	29.5	9.6	4.8	11	2 GMA-Rx
1/8	1/4	34.8	14.4	7.1	14	2-4 GMA-Rx
1/4	1/8	31.8	9.6	4.8	11	4-2 GMA-Rx
1/4	1/4	37.0	14.3	4.8	14	4 GMA-Rx
1/4	3/8	37.8	14.3	4.8	19	4-6 GMA-Rx
1/4	1/2	43.4	19.1	4.8	22	4-8 GMA-Rx
3/8	1/4	38.9	14.3	7.1	14	6-4 GMA-Rx
3/8	3/8	39.6	14.3	7.1	19	6 GMA-Rx
3/8	1/2	45.2	19.1	7.1	22	6-8 GMA-Rx
1/2	1/4	44.5	14.3	7.1	14	8-4 GMA-Rx
1/2	3/8	45.2	14.3	9.9	19	8-6 GMA-Rx
1/2	1/2	50.8	19.1	9.9	22	8 GMA-Rx
3/4	3/4	52.3	19.1	15.0	27	12 GMA-Rx
1	1	66.0	23.8	20.3	35	16-12 GMA-Rx
1.1/4	1.1/4	80.3	23.8	27.6	45	20 GMA-Rx
1.1/2	1.1/2	94.5	26.2	33.2	55	24 GMA-Rx

\* Reference Specifications : BS 21 : ISO 7/1 : JIS B 0203 : DIN 2999 : IS 554

## MALE ADAPTER

METRIC OD Tubes x Male NPT Threads



T Tube OD	P NPT Male	A	B	E min.	F A/F	Part No.
3	1/4	34.8	9.6	7.1	14	GMA 3-2N
6	1/8	32.8	14.3	4.6	14	GMA 6-2N
6	1/4	38.1	14.3	4.6	14	GMA 6-4N
8	1/4	39.1	14.3	6.2	14	GMA 8-4N
10	1/4	39.9	14.3	7.7	14	GMA 10-4N
10	3/8	40.6	14.3	7.7	19	GMA 10-6N
12	1/4	46.5	14.3	7.1	14	GMA 12-4N
12	3/8	46.5	14.3	9.1	19	GMA 12-6N
12	1/2	52.0	14.3	9.1	22	GMA 12-8N
25	3/4	62.0	19.1	15.7	27	GMA 25-12N
25	1	66.8	23.8	15.7	35	GMA 25-16N
30	1	79.2	23.8	22.2	41	GMA 30-16N
30	1.1/4	80.0	23.8	24.6	45	GMA 30-20N
32	1.1/4	81.0	23.8	27.4	46	GMA32-20N
38	1.1/2	92.2	26.2	33.3	55	GMA 38-24N

METRIC OD Tubes x Male ISO\* Tapered Pipe Threads

T Tube OD	P ISO Male	A	B	E min.	F A/F	Part No.
3	1/4	34.8	9.6	7.1	14	GMA 3-2Rx
6	1/8	32.8	14.3	4.6	14	GMA 6-2Rx
6	1/4	38.1	14.3	4.6	14	GMA 6-4Rx
8	1/4	39.1	14.3	6.2	14	GMA 8-4Rx
10	1/4	39.9	14.3	7.7	14	GMA 10-4Rx
10	3/8	40.6	14.3	7.7	19	GMA 10-6Rx
12	1/4	46.5	14.3	7.1	14	GMA 12-4Rx
12	3/8	46.5	14.3	9.1	19	GMA 12-6Rx
12	1/2	52.0	14.3	9.1	22	GMA 12-8Rx
25	3/4	62.0	19.1	15.7	27	GMA 25-12Rx
25	1	66.8	23.8	15.7	35	GMA 25-16Rx
30	1	79.2	23.8	22.2	41	GMA 30-16Rx
30	1.1/4	80.0	23.8	24.6	45	GMA 30-20Rx
32	1.1/4	81.0	23.8	27.4	46	GMA32-20Rx
38	1.1/2	92.2	26.2	33.3	55	GMA 38-24Rx

\* Reference Specifications: BS 21: ISO 7/1 : JIS B 0203 : DIN 2999 : IS 554



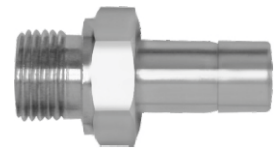
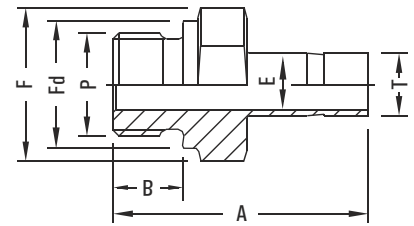
# Male Adapter / O Seal Male Adapter



## MALE ADAPTER

INCH OD Tubes x Male ISO\* Parallel Threads - RS

T Tube OD	P ISO Male	A	B	E min.	F A/F	Fd	Part No.
1/8	1/8	31.0	7.1	2.4	14	13.7	2 GMA-Rs
1/8	1/4	35.8	11.2	2.4	19	17.8	2-4 GMA-Rs
1/4	1/8	33.3	7.1	4.0	14	13.7	4-2 GMA-Rs
1/4	1/4	38.1	11.2	4.8	19	17.8	4 GMA-Rs
3/8	1/4	39.9	11.2	5.8	19	17.8	6-4 GMA-Rs
3/8	3/8	40.6	11.2	7.1	22	21.6	6 GMA-Rs
1/2	1/4	45.5	11.2	5.8	19	17.8	8-4 GMA-Rs
1/2	3/8	46.3	11.2	7.9	22	21.6	8-6 GMA-Rs
1/2	1/2	49.3	14.2	9.9	27	26.0	8 GMA-Rs
3/4	3/4	54.9	15.7	15.0	32	31.8	12 GMA-Rs
1	1	64.5	18.2	19.8	41	38.8	16-12 GMA-Rs
1.1/4	1.1/4	79.5	19.8	27.4	50	49.0	20 GMA-Rs
1.1/2	1.1/2	93.7	22.1	33.3	55	54.7	24 GMA-Rs



METRIC OD Tubes x Male ISO\* Parallel Threads - RS

T Tube OD	P ISO Male	A	B	E min.	F A/F	Fd	Part No.
3	1/8	31.0	7.1	2.4	14	13.7	GMA 3-2Rs
3	1/4	35.8	11.2	2.4	19	17.8	GMA 3-4Rs
6	1/8	34.3	7.1	4.0	14	13.7	GMA 6-2Rs
6	1/4	39.1	11.2	4.6	19	17.8	GMA 6-4Rs
8	1/4	40.1	11.2	5.8	19	17.8	GMA 8-4Rs
10	1/4	40.9	11.2	5.8	19	17.8	GMA 10-4Rs
10	3/8	41.7	11.2	7.7	22	21.7	GMA 10-6Rs
10	1/2	44.7	14.2	7.7	27	25.9	GMA 10-8Rs
12	1/4	46.7	11.2	5.8	19	17.8	GMA 12-4Rs
12	3/8	47.2	11.2	7.9	22	21.7	GMA 12-6Rs
12	1/2	50.5	14.2	9.1	27	25.9	GMA 12-8Rs
16	1/2	50.5	14.2	12.7	27	25.9	GMA 16-8Rs
22	3/4	55.2	15.7	15.8	35	32.0	GMA 22-12Rs
22	1	64.5	18.3	19.8	41	39.0	GMA 22-16Rs
25	1.1/4	79.5	19.8	27.4	50	49.0	GMA 25-20Rs
25	1.1/2	93.7	22.1	33.3	55	54.7	GMA 25-24Rs

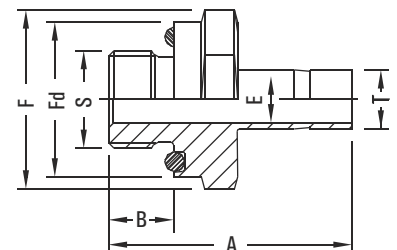
\* Reference Specifications BS 2779 : ISO 228/1 : JIS B0202 : DIN-ISO 228/1

- NOTE : 1. For use with soft metal gasket (usually copper) between fitting and female part face  
 2. Also available in ISO Parallel Threads - RP series for beaded metal gaskets. See page 22/23 for explanation.

## O SEAL MALE ADAPTER

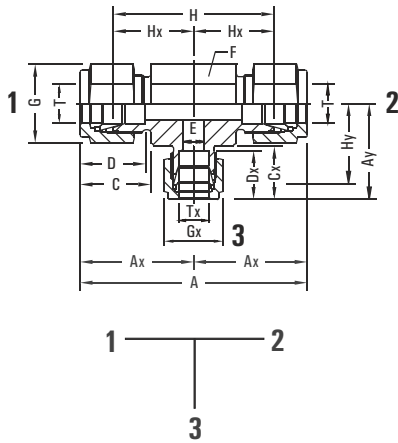
INCH OD Tubes x Male Straight Threads - UNF

T Tube OD	S UNF Male	A	B	E min.	F	Fd A/F	O Ring Part No.	Part No.
1/8	5/16 - 24	32.5	8.6	2.4	14	13.8	1 OPU	2 GOMA-U
1/4	7/16 - 24	39.2	10.4	4.8	19	18.8	2 OPU	4 GOMA-U
5/16	1/2 - 24	41.7	11.2	6.3	22	21.8	3 OPU	5 GOMA-U
5/16	9/16 - 24	43.2	12.0	7.1	24	23.6	4 OPU	6 GOMA-U
1/2	3/4 - 24	49.5	12.0	9.9	27	26.8	6 OPU	8 GOMA-U
3/4	11/16 - 12	55.0	14.3	15.0	38	37.8	12 OPU	12 GOMA-U
1	15/16 - 12	62.5	14.3	19.8	45	44.0	16 OPU	16 GOMA-U
1.1/4	15/8 - 12	79.5	18.3	27.4	55	54.0	20 OPU	20 GOMA-U
1.1/2	17/8 - 12	92.2	19.8	33.3	60	58.0	24 OPU	24 GOMA-U



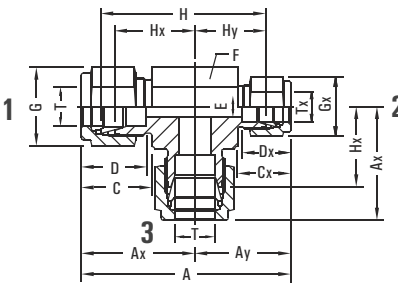
## REDUCING UNION TEE

### INCH OD Tubes



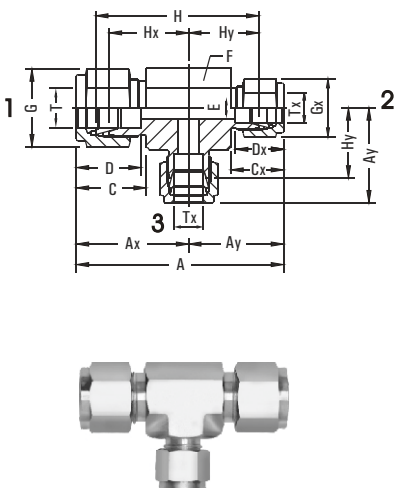
T Tube OD	Tx Tube OD	A	Ax	Ay	C	Cx	D	Dx	E min.	F A/F	G A/F	Gx A/F	H	Hx	Hy	Part No.
3/8	1/4	61.0	30.5	29.0	19.3	17.8	16.8	15.3	4.8	16	17	14	46.2	23.1	21.6	6/6/4 GRUT
1/2	1/4	72.2	36.0	31.8	21.8	17.8	22.9	15.3	4.8	22	22	14	51.8	25.9	24.4	8/8/4 GRUT
1/2	3/8	72.2	36.0	33.3	21.8	19.3	22.9	16.8	7.1	22	22	17	51.8	25.9	25.9	8/8/6 GRUT
3/4	3/8	79.8	39.9	37.0	21.8	19.3	24.4	16.8	7.1	27	28.5	17	59.4	29.7	29.7	12/12/6 GRUT
3/4	1/2	79.8	39.9	39.9	21.8	21.8	24.4	22.9	10.4	27	28.5	22	59.4	29.7	29.7	12/12/8 GRUT
1	3/8	98.0	49.0	41.9	26.4	19.3	31.2	16.8	7.1	35	38	17	73.6	36.8	34.5	16/16/A6 GRUT
1	1/2	98.0	49.0	44.7	26.4	22.9	31.2	21.8	10.4	35	38	22	73.6	36.8	34.5	16/16/8 GRUT
1	3/4	98.0	49.0	44.7	26.4	24.4	31.2	24.4	15.8	35	38	28.5	73.6	36.8	34.5	16/16/12 GRUT
1.1/4	1	135.6	67.8	55.1	38.9	26.4	41.2	31.2	22.3	46	50	38	91.4	45.7	42.9	20/20/16 GRUT
1.1/2	1	157.5	78.7	60.0	44.7	26.4	50.0	31.2	22.3	55	57	38	103.2	51.6	47.8	24/24/16 GRUT

### INCH OD Tubes



T Tube OD	Tx Tube OD	A	Ax	Ay	C	Cx	D	Dx	E min.	F A/F	G A/F	Gx A/F	H	Hx	Hy	Part No.
3/8	1/4	59.4	30.5	29.0	19.3	17.8	16.8	15.3	4.8	16	17	14	44.7	23.1	21.6	6/4/6 GRUT
1/2	1/4	67.7	36.0	31.7	21.8	17.8	22.9	15.3	4.8	22	22	14	50.2	25.9	24.3	8/4/8 GRUT
1/2	3/8	69.3	36.0	33.3	21.8	19.3	22.9	16.8	7.1	22	22	17	51.8	25.9	25.9	8/6/8 GRUT
3/4	3/8	77.0	39.9	37.1	21.8	19.3	24.4	16.8	7.1	27	28.5	17	59.4	29.7	29.7	12/6/12 GRUT
3/4	1/2	79.8	39.9	39.9	21.8	21.8	24.4	22.9	10.4	27	28.5	22	59.4	29.7	29.7	12/8/12 GRUT
1	3/8	98.9	49.0	41.9	26.4	19.3	31.2	16.8	7.1	35	38	17	71.3	36.8	34.5	16/6/16 GRUT
1	1/2	93.7	49.0	44.7	26.4	21.8	31.2	21.8	10.4	35	38	22	71.3	36.8	34.5	16/8/16 GRUT
1	3/4	93.7	49.0	44.7	26.4	21.8	31.2	24.4	15.8	35	38	28.5	71.3	36.8	34.5	16/12/16 GRUT
1.1/4	1	119.6	67.8	53.0	38.9	26.4	41.2	31.2	18.2	46	50	38	85.3	45.7	40.8	20/16/20 GRUT
1.1/2	1	150.9	78.7	72.9	45.2	38.9	50.0	41.3	27.6	55	57	38	101.6	50.8	50.8	24/20/24 GRUT

### INCH OD Tubes



T Tube OD	Tx Tube OD	A	Ax	Ay	C	Cx	D	Dx	E min.	F A/F	G A/F	Gx A/F	H	Hx	Hy	Part No.
3/8	1/4	59.6	30.6	29.0	19.3	17.8	16.8	15.3	4.8	16	17	14	44.8	23.2	21.6	6/4/4 GRUT
1/2	1/4	67.7	36.0	31.7	21.8	17.8	22.9	15.3	4.8	22	22	14	50.2	25.9	24.3	8/4/4 GRUT
1/2	3/8	69.3	36.0	33.2	21.8	19.3	22.9	16.8	7.1	22	22	17	51.8	25.9	25.9	8/6/6 GRUT
3/4	3/8	77.0	38.9	37.0	21.8	19.3	24.4	16.8	7.1	27	28.5	17	59.4	29.7	29.7	12/6/6 GRUT
3/4	1/2	79.8	39.9	39.9	21.8	21.8	24.4	22.9	10.4	27	28.5	22	59.4	29.7	29.7	12/8/8 GRUT
1	3/8	99.9	39.9	41.9	26.4	19.3	31.2	16.8	7.1	35	38	17	71.3	36.8	34.5	16/6/6 GRUT
1	1/2	93.7	49.0	44.7	26.4	22.9	31.2	21.8	10.4	35	38	22	71.3	36.8	34.5	16/8/8 GRUT
1	3/4	93.7	49.0	44.7	26.4	24.4	31.2	24.4	15.8	35	38	28.5	71.3	36.8	34.5	16/12/12 GRUT
1.1/4	1	122.9	67.8	55.1	38.9	26.4	41.2	31.2	22.3	46	50	38	88.6	45.7	42.9	20/16/16 GRUT
1.1/2	1	138.7	78.7	60.0	44.7	26.4	50.0	31.2	22.3	50	57	38	99.4	51.6	47.8	24/16/16 GRUT

NOTE: 1. The order of the sizes is as per the designation (1-2-3) in figure shown above.

NOTE: The combinations shown above are representative of various possibilities. Other combinations not shown are also available. Please consult us.

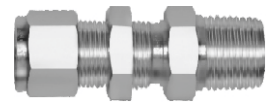
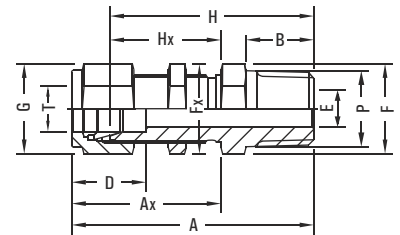
# Bulkhead Male Connector



## BULKHEAD MALE CONNECTOR

INCH OD Tubes x Male NPT Threads

T Tube OD	P NPT Male	A	Ax	B	D	E min.	F A/F	G A/F	H	Hx	Panel Hole Drill Size	Max. Panel Thick- ness	Part No.
1/8	1/8	46.4	31.2	9.6	12.7	2.4	14	11	39.8	24.6	8.3	12.7	2 GBMC-N
1/4	1/8	49.5	33.5	9.6	15.3	4.8	16	14	42.2	26.2	11.5	10.2	4-2 GBMC-N
1/4	1/4	54.1	33.5	14.3	15.3	4.8	16	14	46.7	26.2	11.5	10.2	4 GBMC-N
3/8	1/4	57.4	36.8	14.3	16.8	7.1	19	17	50.0	29.5	14.7	11.2	6-4 GBMC-N
3/8	3/8	57.4	36.8	14.3	16.8	7.1	19	17	50.0	29.5	14.7	11.2	6 GBMC-N
3/8	1/2	63.7	36.8	19.1	16.8	7.1	22	17	56.5	29.5	14.7	11.2	6-8 GBMC-N
1/2	3/8	63.3	41.9	14.3	22.9	9.6	24	22	53.0	31.8	19.5	12.7	8-6 GBMC-N
1/2	1/2	68.8	41.9	19.1	22.9	10.4	24	22	58.8	31.8	19.5	12.7	8 GBMC-N
3/4	3/4	76.2	47.5	19.1	24.4	15.8	30	28.5	66.9	37.4	25.8	16.8	12 GBMC-N
1	1	93.2	57.4	23.9	31.2	22.3	41	38	81.0	45.2	33.7	19.0	16 GBMC-N
1.1/4	1.1/4	110.5	72.5	23.9	41.2	27.6	50	50	87.5	49.5	42.5	19.0	20 GBMC-N
1.1/2	1.1/2	122.8	79.1	26.2	50.0	34.0	60	57	95.5	51.5	50.5	19.0	24 GBMC-N



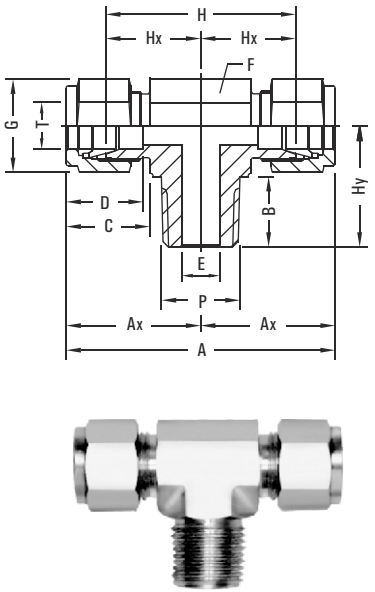
METRIC OD Tubes x Male NPT Threads

T Tube OD	P NPT Male	A	Ax	B	D	E min.	F A/F	G A/F	H	Hx	Panel Hole Drill Size	Max. Panel Thick- ness	Part No.
3	1/8	46.4	31.2	9.6	12.9	2.4	11	11	39.8	24.6	8.3	12.7	GBMC 3-2N
6	1/8	49.5	33.5	9.6	15.3	4.8	16	14	42.2	26.2	11.5	10.2	GBMC 6-2N
10	1/4	57.4	36.8	14.3	17.2	7.1	19	17	50.0	29.5	14.7	11.2	GBMC10-4N
10	3/8	57.4	36.8	14.3	17.2	7.1	19	17	50.0	29.5	14.7	11.2	GBMC10-4N
12	3/8	63.3	41.9	14.3	22.0	9.6	24	22	53.0	31.8	19.5	12.7	GBMC12-6N
12	1/2	68.8	41.9	19.1	22.0	10.4	24	22	58.8	31.8	19.5	12.7	GBMC12-8N
16	1/2	69.6	42.6	19.1	24.4	11.9	27	25	59.5	32.5	22.8	12.7	GBMC16-8N
22	3/4	83.3	53.0	19.1	26.0	15.8	35	25	73.2	42.9	29.0	19.0	GBMØ2-12N
25	1	93.2	57.4	23.9	31.3	22.3	41	38	81.0	45.2	33.7	19.0	GBMØ5-16N
32	1.1/4	110.5	72.5	23.9	42.0	28.6	50	50	87.5	49.5	42.5	19.0	GBMØ3-20N
38	1.1/2	122.8	79.1	26.2	49.4	33.7	60	57	95.5	51.5	50.5	19.0	GBMØ8-24N

NOTE : Bulkhead Male Connectors are also available with ISO Taper Male Threads, ISO Parallel Male Threads, ISO Parallel Male Therads - RP and RS and UNEF Threads. Please consult us for details.

## MALE BRANCH TEE

INCH OD Tubes x Male NPT Threads



T Tube OD	P NPT Male	A	Ax	B	C	D	E min.	F	G A/F	H A/F	Hx	Hy	Part No.
1/8	1/8	47.2	23.6	9.6	15.3	12.7	2.4	11	11	34.0	17.0	17.8	2 GMBT-N
1/8	1/4	49.2	24.6	14.3	15.3	12.7	2.4	14	11	36.0	18.0	23.4	2-4 GMBT-N
1/4	1/8	53.8	26.9	9.6	17.8	5.3	4.8	14	14	39.2	19.6	18.8	4-2 GMBT-N
1/4	1/4	53.8	26.9	14.3	17.8	15.3	4.8	14	14	39.2	19.6	23.4	4 GMBT-N
1/4	3/8	59.4	29.7	14.3	17.8	15.3	4.8	19	14	44.8	22.4	26.2	4-6 GMBT-N
1/4	1/2	63.6	31.8	19.1	17.8	15.3	4.8	22	14	44.8	24.4	33.0	4-8 GMBT-N
3/8	1/4	61.0	30.5	14.3	19.3	16.8	7.1	17	17	46.2	23.1	25.4	6-4 GMBT-N
3/8	3/8	62.4	31.2	14.3	19.3	16.8	7.1	19	17	47.8	23.9	26.2	6 GMBT-N
3/8	1/2	66.0	33.0	19.1	19.3	16.8	7.1	22	17	51.8	25.9	33.0	6-8 GMBT-N
1/2	1/4	72.0	36.0	14.3	21.8	22.9	4.8	22	22	51.8	25.9	28.2	8-4 GMBT-N
1/2	3/8	72.0	36.0	14.3	21.8	22.9	9.6	22	22	51.8	25.9	28.2	8-6 GMBT-N
1/2	1/2	72.0	36.0	19.1	21.8	22.9	10.4	22	22	51.8	25.9	33.0	8 GMBT-N
5/8	1/2	76.2	38.1	19.1	21.8	24.4	11.9	22	25	55.8	27.9	35.0	10-8 GMBT-N
3/4	1/2	79.8	39.9	19.1	21.8	24.4	11.9	27	29	59.4	29.7	36.8	12-8 GMBT-N
3/4	3/4	79.8	39.9	19.1	21.8	24.4	15.8	27	29	59.4	29.7	36.8	12 GMBT-N
1	3/4	98.0	49.0	19.1	26.4	31	15.8	35	38	73.6	36.8	41.6	16-12 GMBT-N
1	1	98.0	49.0	23.8	26.4	31	22.3	35	38	73.6	36.8	46.5	16 GMBT-N
1.1/4	1.1/4	133.0	66.5	23.8	38.8	41.1	27.6	46	50	89.0	44.5	47.6	20 GMBT-N
1.1/2	1.1/2	156.0	78.0	26.2	45.2	50.0	34.0	55	57	101.6	50.8	60.4	24 GMBT-N

METRIC OD Tubes x Male NPT Threads

T Tube OD	P NPT Male	A	Ax	B	C	D	E min.	F	G A/F	H A/F	Hx	Hy	Part No.
3	1/8	47.2	23.6	9.6	15.3	12.9	2.4	11	11	34.0	17.0	17.8	GMBT 3-2N
3	1/4	49.2	24.6	14.3	15.3	12.9	2.4	14	11	36.0	18.0	23.4	GMBT 3-4N
6	1/8	54.0	27.0	9.6	17.7	15.3	4.8	14	14	39.2	19.6	18.8	GMBT 6-2N
6	1/4	54.0	27.0	14.3	17.7	15.3	4.8	14	14	39.2	19.6	23.4	GMBT 6-4N
6	3/8	59.6	29.8	14.3	17.7	15.3	4.8	19	14	44.8	22.4	26.2	GMBT 6-N
8	1/4	57.6	28.8	14.3	18.6	16.2	6.3	14	16	42.6	21.3	24.4	GMBT 8-4N
8	3/8	61.2	30.6	14.3	18.6	16.2	6.3	19	16	46.2	23.1	26.2	GMBT 8-6N
8	1/2	65.2	32.6	19.1	18.6	16.2	6.3	22	16	50.2	25.1	33.0	GMBT 8-N
10	1/4	63.0	31.5	14.3	19.5	17.2	7.1	17	19	47.8	23.9	26.2	GMBT 10-4N
10	3/8	63.0	31.5	14.3	19.5	17.2	7.9	19	19	47.8	23.9	26.2	GMBT 10-6N
10	1/2	67.0	33.5	19.1	19.5	17.2	7.9	22	19	51.8	25.9	33.0	GMBT 10-8N
12	1/4	72.0	36.0	14.3	22.0	22.8	7.1	22	22	51.8	25.9	26.2	GMBT 12-4N
12	3/8	72.0	36.0	14.3	22.0	22.8	9.5	22	22	51.8	25.9	28.2	GMBT 12-6N
12	1/2	72.0	36.0	19.1	22.0	22.8	9.5	22	22	51.8	25.9	33.0	GMBT 12-8N
16	1/2	76.0	38.0	19.1	22.0	24	11.9	24	25	55.8	27.9	35.1	GMBT 16-8N
25	3/4	98.2	49.1	19.1	26.5	31.3	15.8	35	38	73.6	36.8	41.7	GMBT 25-12N
25	1	98.2	49.1	23.8	26.5	31.3	21.8	35	38	73.6	36.8	46.5	GMBT 25-16N
30	1.1/4	139.8	66.9	23.8	39.2	39.6	26.2	45	50	96.6	48.3	53.1	GMBT 30-20N
32	1.1/4	144.6	72.3	23.8	41.6	42.0	27.6	45	50	98.6	49.3	53.1	GMBT 32-20N
38	1.1/2	168.0	84.0	26.2	47.9	50.0	33.7	55	57	112.8	56.4	60.4	GMBT 38-24N

NOTE : The combination of tube OD and male threads are indicative of popular sizes. Other combinations, not shown, are available. Please Consult us.

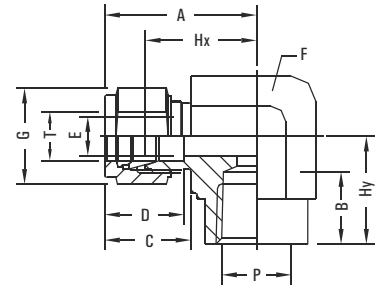
# Female Elbow



## FEMALE ELBOW

INCH OD Tubes X Female NPT Threads

T Tube OD	P NPT Female	A	B	C	D	E min.	F A/F	G A/F	Hx	Hy	Part No.
1/8	1/8	24.6	10.4	15.3	12.7	2.4	14	11	18.0	19.0	2 GFE-N
1/8	1/4	27.4	15.0	15.3	12.7	2.4	19	11	20.8	22.4	2-4 GFE-N
1/4	1/8	26.9	10.4	17.8	15.3	4.8	14	14	19.6	19.0	4-2 GFE-N
1/4	1/4	29.7	15.0	17.8	15.3	4.8	19	14	22.4	22.4	4 GFE-N
1/4	3/8	31.8	15.0	17.8	15.3	4.8	22	14	24.4	22.4	4-6 GFE-N
1/4	1/2	34.6	19.8	17.8	15.3	4.8	27	14	27.2	28.5	4-8 GFE-N
5/16	1/8	28.7	10.4	17.8	15.3	6.3	19	14	21.4	19.1	5-2 GFE-N
5/16	1/4	30.5	15.0	18.5	16.3	6.3	22	16	23.2	22.4	5-4 GFE-N
3/8	1/8	30.5	10.4	19.3	16.8	7.1	17	17	23.2	19.1	6-2 GFE-N
3/8	1/4	31.2	15.0	19.3	16.8	7.1	19	17	23.9	22.4	6-4 GFE-N
3/8	3/8	33.3	15.0	19.3	16.8	7.1	22	17	25.9	22.4	6 GFE-N
3/8	1/2	36.0	19.8	19.3	16.8	7.1	27	17	28.7	28.5	6-8 GFE-N
1/2	1/4	36.0	15.0	21.8	22.9	7.1	22	22	25.9	22.4	8-4 GFE-N
1/2	3/8	36.0	15.0	21.8	22.9	10.4	22	22	25.9	22.4	8-6 GFE-N
1/2	1/2	38.9	19.8	21.8	22.9	10.4	27	22	28.7	28.5	8 GFE-N
5/8	3/8	38.1	15.0	21.8	22.9	12.7	24	22	28.0	22.4	10-6 GFE-N
5/8	1/2	39.9	19.8	21.8	24.4	12.7	27	25	29.7	28.5	10-8 GFE-N
3/4	1/2	39.9	19.8	21.8	24.4	15.8	27	28.5	29.7	28.5	12-8 GFE-N
3/4	3/4	44.7	20.6	21.8	24.4	15.8	35	28.5	34.6	31.8	12 GFE-N
7/8	3/4	44.7	20.6	21.8	25.9	18.2	35	32	34.6	31.8	14-12 GFE-N
1	3/4	49.0	20.6	26.4	31.2	22.3	35	38	36.8	31.8	16-12 GFE-N
1	1	53.6	25.4	26.4	31.2	22.3	41	38	41.4	38.1	16 GFE-N

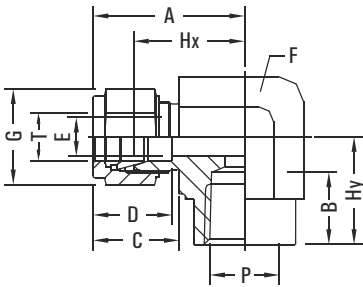


METRIC OD Tubes x Female NPT Threads

T Tube OD	P NPT Female	A	B	C	D	E min.	F A/F	G A/F	Hx	Hy	Part No.
3	1/8	24.6	10.4	15.3	12.9	2.4	14	11	18.0	19.0	GFE 3-2N
3	1/4	27.4	15.0	15.3	12.9	2.4	19	11	20.8	22.4	GFE 3-4N
6	1/8	27.0	10.4	17.7	15.3	4.8	14	14	19.6	19.0	GFE 6-2N
6	1/4	29.8	15.0	17.7	15.3	4.8	19	14	22.4	22.4	GFE 6-4N
6	1/2	34.6	19.8	17.7	15.3	4.8	27	14	27.2	28.5	GFE 6-8N
8	1/4	30.6	15.0	18.6	16.2	6.3	19	16	23.1	22.4	GFE 8-4N
8	3/8	32.6	15.0	18.6	16.2	6.3	22	16	25.1	22.4	GFE 8-6N
10	1/4	33.5	15.0	19.5	17.2	7.9	19	19	25.9	22.4	GFE 10-4N
10	3/8	33.5	15.0	19.5	17.2	7.9	22	19	25.9	22.4	GFE 10-6N
12	1/4	36.0	15.0	22.0	22.8	9.5	22	22	25.9	22.4	GFE 12-4N
12	3/8	36.0	15.0	22.0	22.8	9.5	22	22	25.9	22.4	GFE 12-6N
12	1/2	38.8	19.8	22.0	22.8	9.5	27	22	28.7	28.5	GFE 12-8N
16	1/2	39.5	19.8	22.0	24.4	12.7	27	25	29.7	28.5	GFE 16-8N
25	3/4	49.0	20.6	26.5	31.3	22.3	35	38	36.8	31.8	GFE 25-12N
25	1	53.6	25.4	26.5	31.3	22.3	41	38	41.4	38.1	GFE 25-16N

## FEMALE ELBOW

INCH OD Tubes X Female ISO\* tapered pipe threads



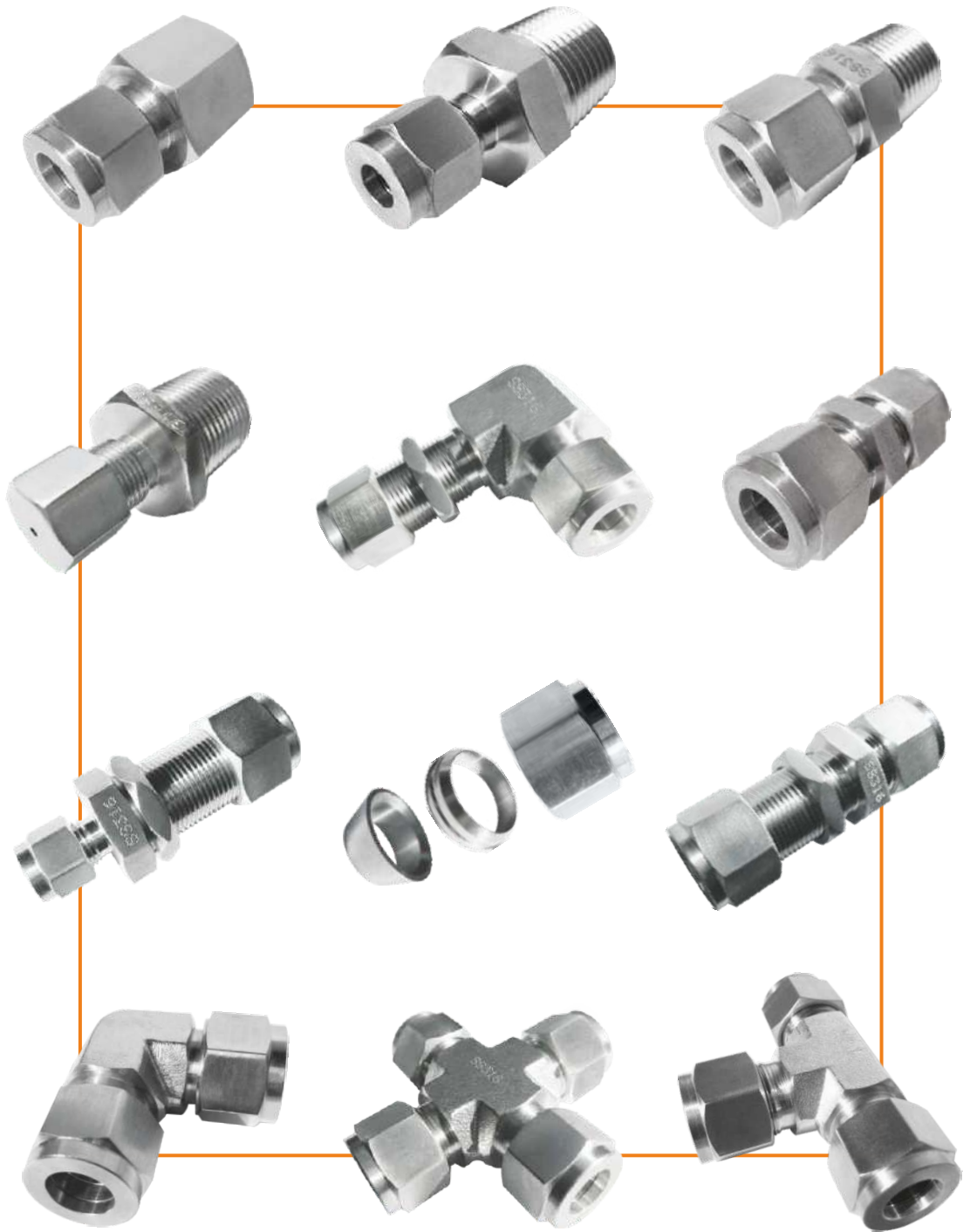
T Tube OD	P NPT Female	A	B	C	D	E min.	F A/F	G A/F	Hx	Hy	Part No.
1/8	1/8	24.6	10.4	15.3	12.7	2.4	14	11	18.0	19.0	2 GFE-Rx
1/8	1/4	27.4	15.0	15.3	12.7	2.4	19	11	20.8	22.4	2-4 GFE-Rx
1/4	1/8	26.9	10.4	17.8	15.3	4.8	14	14	19.6	19.0	4-2 GFE-Rx
1/4	1/4	29.7	15.0	17.8	15.3	4.8	19	14	22.4	22.4	4 GFE-Rx
1/4	3/8	31.8	15.0	17.8	15.3	4.8	22	14	24.4	22.4	4-6 GFE-Rx
1/4	1/2	34.6	19.8	17.8	15.3	4.8	27	14	27.2	28.5	4-8 GFE-Rx
5/16	1/8	28.7	10.4	17.8	15.3	6.3	19	14	21.4	19.1	5-2 GFE-Rx
5/16	1/4	30.5	15.0	18.5	16.3	6.3	22	16	23.2	22.4	5-4 GFE-Rx
3/8	1/8	30.5	10.4	19.3	16.8	7.1	17	17	23.2	19.1	6-2 GFE-Rx
3/8	1/4	31.2	15.0	19.3	16.8	7.1	19	17	23.9	22.4	6-4 GFE-Rx
3/8	3/8	33.3	15.0	19.3	16.8	7.1	22	17	25.9	22.4	6 GFE-Rx
3/8	1/2	36.0	19.8	19.3	16.8	7.1	27	17	28.7	28.5	6-8 GFE-Rx
1/2	1/4	36.0	15.0	21.8	22.9	7.1	22	22	25.9	22.4	8-4 GFE-Rx
1/2	3/8	36.0	15.0	21.8	22.9	10.4	22	22	25.9	22.4	8-6 GFE-Rx
1/2	1/2	38.9	19.8	21.8	22.9	10.4	27	22	28.7	28.5	8 GFE-Rx
5/8	3/8	38.1	15.0	21.8	22.9	12.7	24	22	28.0	22.4	10-6 GFE-Rx
5/8	1/2	39.9	19.8	21.8	24.4	12.7	27	25	29.7	28.5	10-8 GFE-Rx
3/4	1/2	39.9	19.8	21.8	24.4	15.8	27	28.5	29.7	28.5	12-8 GFE-Rx
3/4	3/4	44.7	20.6	21.8	24.4	15.8	35	28.5	34.6	31.8	12 GFE-Rx
7/8	3/4	44.7	20.6	21.8	25.9	18.2	35	32	34.6	31.8	14-12 GFE-Rx
1	3/4	49.0	20.6	26.4	31.2	22.3	35	38	36.8	31.8	16-12 GFE-Rx
1	1	53.6	25.4	26.4	31.2	22.3	41	38	41.4	38.1	16 GFE-Rx

METRIC OD Tubes x Female ISO\* tapered pipe threads

T Tube OD	P NPT Female	A	B	C	D	E min.	F A/F	G A/F	Hx	Hy	Part No.
3	1/8	24.6	10.4	15.3	12.9	2.4	14	11	18.0	19.0	GFE 3-2Rx
3	1/4	27.4	15.0	15.3	12.9	2.4	19	11	20.8	22.4	GFE 3-4Rx
6	1/8	27.0	10.4	17.7	15.3	4.8	14	14	19.6	19.0	GFE 6-2Rx
6	1/4	29.8	15.0	17.7	15.3	4.8	19	14	22.4	22.4	SCF 6-4Rx
6	1/2	34.6	19.8	17.7	15.3	4.8	27	14	27.2	28.5	GFE 6-8Rx
8	1/4	30.6	15.0	18.6	16.2	6.3	19	16	23.1	22.4	GFE 8-4Rx
8	3/8	32.6	15.0	18.6	16.2	6.3	22	16	25.1	22.4	GFE 8-6Rx
10	1/4	33.5	15.0	19.5	17.2	7.9	19	19	25.9	22.4	GFE 10-4Rx
10	3/8	33.5	15.0	19.5	17.2	7.9	22	19	25.9	22.4	GFE 10-6Rx
12	1/4	36.0	15.0	22.0	22.8	9.5	22	22	25.9	22.4	GFE 12-4Rx
12	3/8	36.0	15.0	22.0	22.8	9.5	22	22	25.9	22.4	GFE 12-6Rx
12	1/2	38.8	19.8	22.0	22.8	9.5	27	22	28.7	28.5	GFE 12-8Rx
16	1/2	39.5	19.8	22.0	24.4	12.7	27	25	29.7	28.5	GFE 16-8Rx
25	3/4	49.0	20.6	26.5	31.3	22.3	35	38	36.8	31.8	GFE 25-12Rx
25	1	53.6	25.4	26.5	31.3	22.3	41	38	41.4	38.1	GFE 25-16Rx

\* Reference Specifications : BS 21 : ISO 7/1 : JIS B 0203 : DIN 2999 : IS 554

\* Female connectors with Parallel ISO Female Threads to BS:2779; ISO 228/1; JIS B6202; DIN 259 are also available. Their Dimensions are as same as ISO. Tapered Pipe Threads above. Please consult us.







# TEMPERATURE GAUGES

# Bimetal Dial Thermometer

# General

The Bimetal thermometer employs a bimetal strip in the form of helix (it works on the principle of thermal expansion - two metals having different coefficient of expansions are joined to form a bimetal. The resultant expansion of bimetal is proportional to temperature). Bimetal dial thermometers are simple in construction, yet rugged. They are used for measurement of temperature in most of the industrial applications. They are offered in the range of (-) 50°C to 600°C. With rigid stem having bottom or back entry. It can also be offered in every angle rotatable construction.

## Features

- Rugged construction
- Bottom/Back entry, every angle construction
- Fast response
- Protection class IP-68
- Accuracy  $\pm 1\%$  FSD
- High repeatability, low hysteresis
- Hermetically sealed case



## Specifications

<b>Ref. Standard</b>	ASME B 40.200, EN 13190
<b>Dial</b>	100mm / 150mm / 250mm in aluminium white background, black markings
<b>Case</b>	SS304 with bayonet bezel / SS316 optional
<b>Protection</b>	Weatherproof to IP - 68 (IS/IEC : 60947 / IEC : 60529)
<b>Window</b>	Shatterproof glass
<b>Pointer</b>	Aluminium, black, micrometer adjustable
<b>Stem</b>	SS304 or SS316 in 6 mm, 8 mm, 10 mm, 12 mm dia and length from 100 mm to 1000 mm as standard
<b>Connection</b>	1/2" NPT (M) as standard in SS304 or SS316 adjustable three piece compression fitting
<b>Range</b>	(-) 50°C to 600°C with a minimum span of 60°C
<b>Accuracy</b>	$\pm 1\%$ FSD
<b>Over range</b>	125% FSD (upto max temp range of 500°C )
<b>Reset</b>	Micrometer Pointer (standard) External (optional)
<b>Optional</b>	1) Silicon Oil Filled Case (Suitable upto 339°C Max) 2) Contacts: Single SPST, normally open to close on rise / fall in temperature (specify action required) adjustable over the entire range, rating 30 VA @ 230 V AC (100 mm dial, back entry only )
<b>Note</b>	1) For minimum insertion length essential for proper sensing, contact our design department. 2) Three point calibration certificate accompanies each thermometer.



# Ordering Information

## MODEL : BDT



### MOUNTING

- V** Bottom Entry, Local Mounting
- C** Back Entry, Local Mounting
- E** Every Angle, Local Mounting

### DIAL

- 100** - 100 mm
- 150** - 150 mm
- 250** - 250 mm

### CASE

- S4S** SS304
- S6S** SS316

### STEM-OD

- S06** 6 mm      **S10** 10 mm
- S08** 8 mm      **S12** 12 mm

### STEM LENGTH

Specify in mm

### STEM MATERIAL

- S4S** - SS304
- S6S** - SS316
- 310** - SS310\*

### OPTION

- TW** Thermowell
- CLB** Colour Band
- DUS** Dual Scale
- 1ST** 1 SPST Electrical contact
- DC2** Silicon Oil Filled Case \*
- L** Nil

### UNIT

- DGC** Deg C      **DGF** Deg F

### RANGE \*\*

- |                  |          |
|------------------|----------|
| (-) 50 to (+) 30 | 0 to 200 |
| (-) 30 to (+) 50 | 0 to 250 |
| (-) 20 to (+) 60 | 0 to 300 |
| 0 to 60          | 0 to 350 |
| 0 to 80          | 0 to 400 |
| 0 to 100         | 0 to 500 |
| 0 to 120         | 0 to 600 |
| 0 to 160         |          |

\* Silicon Oil Filled Case shall be suitable up to maximum temperature of 339°C only.

\*\* Ranges mentioned are in °C. Equivalent unit in °F can be provided on request.

### CONNECTION

Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	06	NPS	NS	Male Female	M F
		3/8"	10	NPT	NT		
		1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
				Rp	RP		
				Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: **T15NTM**  
For M20x1.5 (F), Code: **TM20CF**

\*Note: Stem material of SS310 is recommended for Temperature 600 Deg. C

**Sample Model Code: BDT-E-150-S4S-S10-400-S6S-T15NTM-(0-250)-DGC-L**

The recommendations made in this catalogue are to be used as intended guide. No guarantee of material can be undertaken since other factors may affect the performance. We reserve the right to change the specifications mentioned in this catalogue without any notice as improvements & development is a continuous process at "General". Responsibility of typographical errors is specifically disclaimed.

# Gas Filled Dial Thermometer

# General

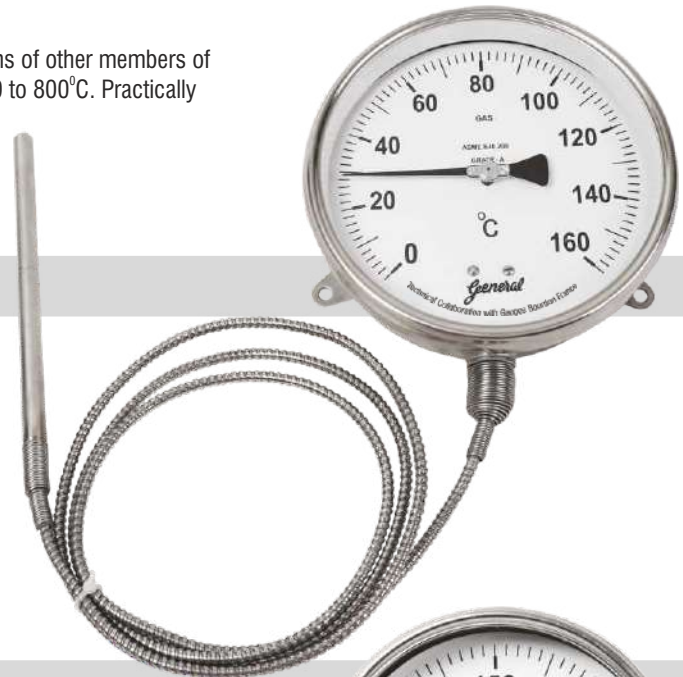
Gas filled Temperature Gauge overcomes most of the limitations of other members of family. It is offered in a very wide temperature range i.e. (-)200 to 800°C. Practically any stem length can be offered and capillary length as long as 30 mtr, without any loss of accuracy. Inert, non hazardous, non toxic nature of the filled system makes it virtually ideal choice of cross section of industries.

## Features

- Use of inert gas - N<sub>2</sub>
- Suitable for sanitary application
- All SS construction
- Rigid stem or capillary type
- Fast response
- Non-polluting, environment friendly
- Non-hazardous for the service
- High reliability
- IP-68 protection
- Accuracy  $\pm 1\%$  FSD

## Specifications

<b>Ref. Standard</b>	ASME B 40.200, EN 13190
<b>System</b>	Gas (N <sub>2</sub> ) filled, case compensated in accordance with SAMA CI. III B
<b>Dial</b>	100 mm / 150mm / 250mm in aluminium, white background, black marking
<b>Case</b>	SS304 / SS316 with bayonet bezel
<b>Protection</b>	Weatherproof to IP-68 (IS/IEC : 60947 / IEC : 60529)
<b>Window</b>	Shatterproof glass
<b>Pointer</b>	Aluminium, black with micrometer adjustment
<b>Stem</b>	SS316 in 6 mm, 8 mm, 10 mm, 12 mm dia as standard
<b>Capillary</b>	SS316 with SS304 / SS316 armouring or SS316 with SS304 / SS316 armouring, with PVC covering
<b>Connection</b>	1/2"NPT (M) adjustable three piece compression fitting in SS304 or SS316
<b>Range</b>	(-) 200°C to 800°C with minimum span of 80°C
<b>Accuracy</b>	$\pm 1\%$ FSD
<b>Overrange</b>	125% FSD
<b>Reset</b>	Micrometer Pointer
<b>Optional</b>	Silicon Oil Filled Case
<b>Note</b>	1) For minimum insertion length essential for proper sensing, contact our design department. 2) Three point calibration certificate accompanies each thermometer. 3) For operating temp > 600°C; stem of SS310 / Inconel 600 shall be recommended.



# Ordering Information

**GDT-R - Rigid Stem**  
**GDT-C - Capillary Type**

## MODEL : GDT-R / GDT-C



**MOUNTING**  
**V** Bottom Entry, Local Mounting  
**C** Back Entry, Local Mounting  
**E** Every Angle, Local Mounting  
**S** Bottom Entry, Surface Mounting  
**P** Back Entry, Panel Mounting  
**Y** Bottom Entry, 2" Pipe Mounting

**DIAL**  
**100** 100 mm  
**150** 150 mm  
**250** 250 mm

**CASE**  
**S4S** SS304  
**S6S** SS316

**STEM-OD**  
**S06** 6 mm      **S10** 10 mm  
**S08** 8 mm      **S12** 12 mm

**STEM LENGTH**  
 Specify in mm

**STEM MATERIAL**  
**S6S** SS316    **S4S** SS304  
**310** SS310\*\*   **600** Inconel 600\*\*

**CAPILLARY**  
**4AR(\*)** SS 316 Capillary, SS 304 Armoured  
**4PV(\*)** SS 316 Capillary, SS 304 Armoured+PVC Covered  
**6AR(\*)** SS 316 Capillary, SS 316 Armoured  
**6PV(\*)** SS 316 Capillary, SS 316 Armoured+PVC Covered  
**NIL** Not Applicable for GDT-R type.

**OPTION**  
**TW** Thermowell  
**CLB** Colour Band  
**DUS** Dual Scale  
**L** Nil  
**DC2** Silicone Oil Filled Case

**UNIT**  
**DGC** Deg C      **DGF** Deg F

**RANGE #**

0 to 80	0 to 600
0 to 100	0 to 800
0 to 120	(-) 30 to (+) 50
0 to 160	(-) 20 to (+) 80
0 to 200	(-) 50 to (+) 30
0 to 250	(-) 50 to (+) 50
0 to 250	(-) 80 to (+) 120
0 to 350	(-) 100 to (+) 150
0 to 400	(-) 200 to (+) 50
0 to 500	(-) 200 to (+) 100

CONNECTION							
Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	<b>T</b>	1/4"	<b>06</b>	NPS	<b>NS</b>	Male	<b>M</b>
		3/8"	<b>10</b>	NPT	<b>NT</b>		
		1/2"	<b>15</b>	BSP	<b>BP</b>		
		3/4"	<b>20</b>	BSPT	<b>BT</b>		
		1"	<b>25</b>	JIS-PF	<b>PF</b>		
		M20	<b>M20</b>	JIS-PT	<b>PT</b>		
				Gas	<b>GS</b>		
				R	<b>RR</b>		
				Rp	<b>RP</b>		
				Pitch 1.5	<b>C</b>		

e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

\* Specify the length of Capillary in Meters.

\*\*Note: Stem material of SS310 is recommended for Temperature 600 Deg. C and Inconel 600 for temperature above 600 Deg.C

#Ranges mentioned are in °C. Equivalent unit in °F can be provided on request.

**Sample Model Code: GDT-C-P-150-S4S-S10-400-S6S-4AR(5)-T15NTM-(0-250)-DGC-TW**

The recommendations made in this catalogue are to be used as intended guide. No guarantee of material can be undertaken since other factors may affect the performance. We reserve the right to change the specifications mentioned in this catalogue without any notice as improvements & development is a continuous process at "General". Responsibility of typographical errors is specifically disclaimed.

# Skin Type - Gas Filled Dial Thermometer

*General*

“General” Skin type Temperature Gauges are designed for measurement of Surface temperature of process lines. These Gauges are available 100 mm & 150 mm Dial sizes. Inert, non hazardous, non toxic nature of the filled system (Nitrogen) makes it virtually ideal choice of all type of industries. Micro-Switch can be provided as per process requirement.

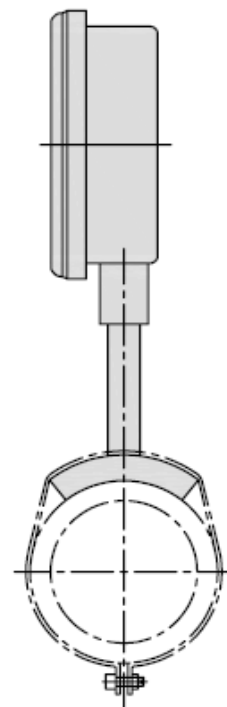
## Features

- Suitable for surface temperature measurement
- Use of inert gas - Nitrogen (N<sub>2</sub>)
- All SS construction
- Direct mounting or Remote mounting with Capillary
- Fast response
- Non-polluting, environment friendly
- Non-hazardous for the service
- High reliability
- IP-68 protection
- Accuracy  $\pm 1\%$  FSD



## Specifications

<b>Ref. Standard System</b>	ASME B 40.200, EN 13190 Gas (N <sub>2</sub> ) filled, case compensated in accordance with SAMA Cl. III B
<b>Dial</b>	100 mm / 150 mm in aluminium, white background, black marking
<b>Case</b>	SS304 as standard (SS316 on request)
<b>Protection</b>	Weatherproof to IP-68
<b>Window</b>	Shatterproof glass
<b>Pointer</b>	Aluminium, black with micrometer adjustment
<b>Sensor / Bulb</b>	SS316 to suit OD of process pipe
<b>Capillary</b>	SS316 with SS304 / SS316 armouring or SS316 with SS304 / SS316 armouring, with PVC covering.
<b>Connection</b>	1/2"NPT (M) adjustable three piece compression fitting in SS304 or SS316
<b>Range</b>	(-) 200°C to 400°C with minimum span of 80°C
<b>Accuracy</b>	$\pm 1\%$ FSD
<b>Over range</b>	125% FSD
<b>Reset</b>	Micrometer Pointer
<b>Optional</b>	Silicon Oil Filled Case (Not Applicable for Gauge with Microswitch) 1SPDT / 2SPDT Microswitch Flame proof (IIA/ IIB/ IIC) enclosure in Die Cast Aluminium (applicable for Remote mounted Gauges with Microswitch only)



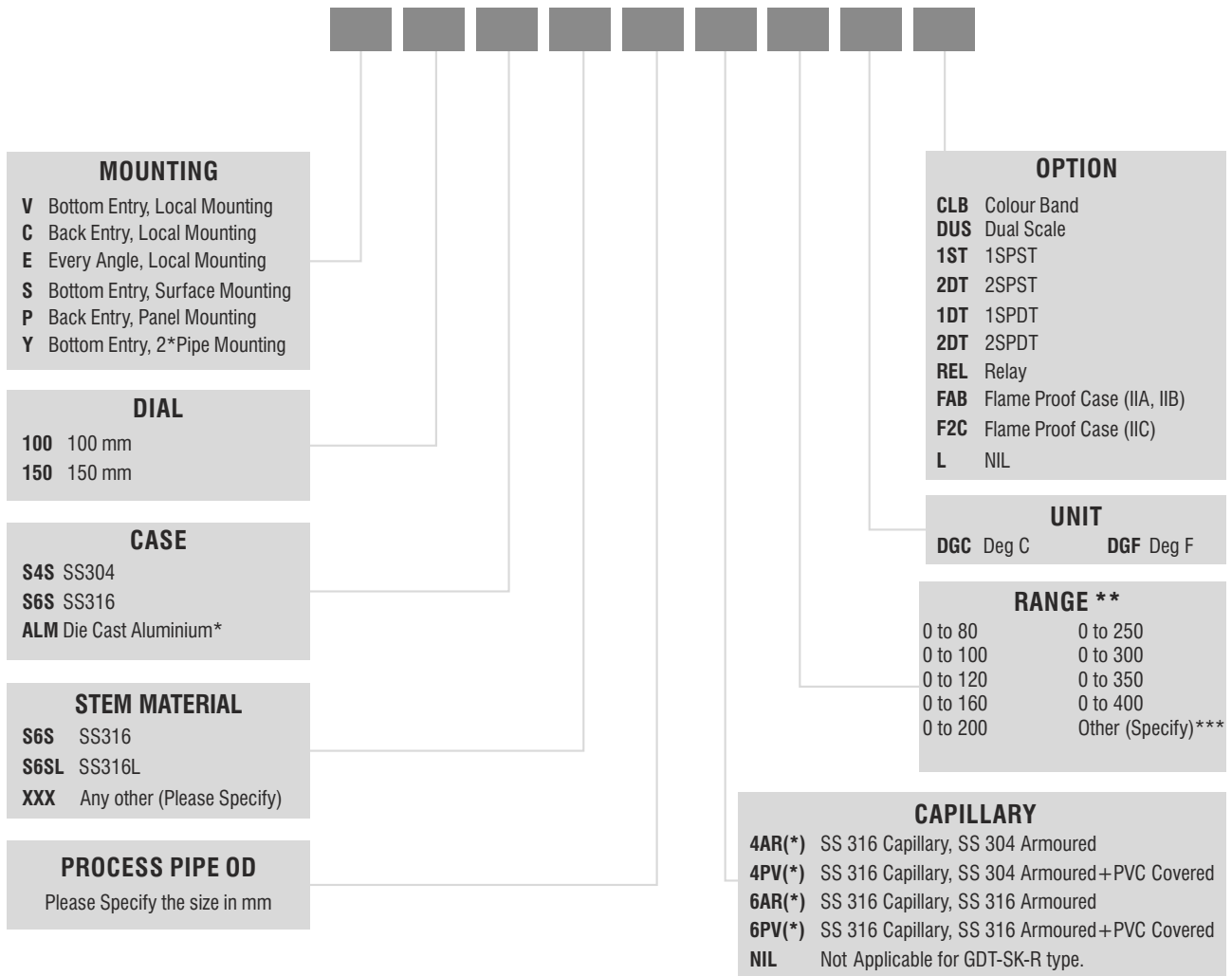


## Ordering Information

**GDT-SK-R : Rigid stem type**

**GDT-SK-C : Capillary type**

**MODEL : GDT-SK-R / GDT-SK-C**



\* Specify the Capillary length in Meter.

\* Die Cast Aluminium Case available in Flameproof version only (for Gauge with Microswitch & Remote mounting)

\*\* Ranges mentioned are in °C. Equivalent unit in °F can be provided on request.

\*\*\*Compound Ranges with negative temperature also can be provided within the above span

**Sample Model Code: GDT-SK-R-V-150-S4S-S6S-150-NIL-(0-250)-DGC-L**

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# Indicating Temperature Switch

Indicating temperature switch combines indication with switching (in order to make or break the associated electrical circuit). Can be offered with contact assembly as well as microswitch (as a combination of switch and movement)

## Features

- Combination of indication and switch
- Fast response
- Choice of contact assembly or microswitch
- Switching accuracy  $\pm 2\%$  FSD
- High repeatability and low hysteresis
- Flameproof version available
- Case compensated system



## Specifications

<b>System</b>	Gas (N <sub>2</sub> ) filled case compensated in accordance with SAMA Cl. IIIB
<b>Dial</b>	100 mm / 150 mm in aluminium, white background, black marking
<b>Case</b>	SS304 / SS316 with bayonet bezel (Flameproof case in AI only)
<b>Protection</b>	Weatherproof to IP-68 (IS/IEC : 60947 / IEC : 60529) Flameproof to IIA IIB (Equivalent to NEC Cl. I Div 2 Gr. C&D) Flameproof to IIC (Equivalent to NEC Cl. Div 1 Gr. A&B)
<b>Stem</b>	SS304 or SS316, 6 mm, 8 mm, 10 mm, 12 mm dia as standard
<b>Connection</b>	½" NPT (M) adjustable three piece compression fitting as standard
<b>Capillary</b>	SS316 with SS304 / SS316 armouring or SS316 with SS304 / SS316 armouring, with PVC covering
<b>Range</b>	(-) 200 to 800°C (minimum span 80°C )
<b>Accuracy</b>	$\pm 1\%$ FSD for indication, $\pm 2\%$ FSD for switching
<b>Over range</b>	125% FSD
<b>Contacts</b>	1) 1SPST /2SPST (Single/ Double) Electrical Contacts, independently adjustable over the entire Range, rated 30VA@230V AC 2) 1SPDT /2SPDT (Single/ Double) Microswitch, independently adjustable over entire range, rated 5A@230V AC (3A@28V DC) 3) Inductive Contacts (NAMUR), Single or Double, independently adjustable between 10% & 90% of the Range, Nominal Voltage, 8.32 V DC, Operating Voltage, 5 to 25 V DC
<b>Accessory</b>	Relay for the contact assembly to suit 5 amp @ 230 V AC, separately mounted.
<b>Note</b>	1) Flameproof version is offered with SPDT Microswitch in Die Cast Aluminium housing only. 2) Surface mounted flameproof housing is available with capillary. 3) For minimum insertion length essential for proper sensing, contact our design department. 4) Three point calibration certificate accompanies each thermometer. 5) For operating temp > 600°C; stem of SS310 / Inconel 600 shall be recommended.



**Advantages of Microswitch Type Models:** Microswitch is rated 5 amp @ 230 V AC (3A @ 28 VDC). No relay is required. Microswitch is imported from reputed international supplier as combination of movement and switch. Microswitch assembly gives better switching accuracy. Compact design.

# Ordering Information

**GDT-SW-R - Rigid Stem**  
**GDT-SW-C - Capillary Type**

## MODEL : GDT-SW-R / GDT-SW-C



### MOUNTING

- V** Bottom Entry, Local Mounting
- C** Back Entry, Local Mounting
- E** Every Angle, Local Mounting
- S** Bottom Entry, Surface Mounting
- P** Back Entry, Panel Mounting
- Y** Bottom Entry, 2" Pipe Mounting

### DIAL

- 100** 100 mm      **150** 150 mm

### CASE

- S4S** SS304      **S6S** SS316
- ALM** Die Cast Al\*\*\*

### STEM-OD

- S06** 6 mm      **S10** 10 mm
- S08** 8 mm      **S12** 12 mm

### STEM LENGTH

Specify in mm

### STEM MATERIAL

- S6S** SS316      **S4S** SS304
- 310** SS310\*\*      **600** Inconel 600\*\*

### CAPILLARY

- 4AR(\*)** SS 316 Capillary, SS 304 Armoured
- 4PV(\*)** SS 316 Capillary, SS 304 Armoured+PVC Covered
- 6AR(\*)** SS 316 Capillary, SS 316 Armoured
- 6PV(\*)** SS 316 Capillary, SS 316 Armoured+PVC Covered
- NIL** Not Applicable for GDT-SW-R type.

\* Specify the length of Capillary in Meters.

\*\*Stem material of SS310 is recommended for Temperature 600 Deg. C and Inconel 600 for temperature above 600 Deg.C

\*\*\* for Flame proof case with microswitch only

### OPTION

- TW** Thermowell
- CLB** Colour Band
- DUS** Dual Scale
- 1ST** 1SPST
- 2ST** 2SPST
- 1DT** 1SPDT
- 2DT** 2SPDT
- 1NR** NAMUR Switch, Single
- 2NR** NAMUR Switch, Double
- REL** Relay
- FAB** Flame Proof Case (IIA, IIB)
- F2C** Flame Proof Case (IIC)

### UNIT

- DGC** Deg C      **DGF** Deg F

### RANGE #

- 0 to 80      0 to 300
- 0 to 100      0 to 350
- 0 to 120      0 to 400
- 0 to 160      0 to 500
- 0 to 200      0 to 600
- 0 to 250      0 to 800

### CONNECTION

Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT		
		1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
				Rp	RP		
				Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: **T15NTM**  
 For M20x1.5 (F), Code: **TM20CF**

# Ranges mentioned are in °C. Equivalent unit in °F can be provided on request.

**Sample Model Code: GDT-SW-C-S-150-S4S-S10-400-600-4AR(3)-T15NTM-(0-800)-DGC-2DT**

The recommendations made in this catalogue are to be used as intended guide. No guarantee of material can be undertaken since other factors may affect the performance. We reserve the right to change the specifications mentioned in this catalogue without any notice as improvements & development is a continuous process at "General". Responsibility of typographical errors is specifically disclaimed.

# Blind Temperature Switch

*General* has been designing and manufacturing reliable, high quality Temperature Switches for accurate control of the process equipments to suit to most of the industrial applications in various process industries. With inert Gas Nitrogen, our Switches are most environment friendly and Safe, which makes them the ideal choice of almost all types of process industries / applications.



## Features

- Use of Inert Gas (Nitrogen)
- Non-polluting, Environment friendly
- Rugged construction
- Rigid Stem or Capillary type
- Weather proof or Flame proof enclosure
- Fast Response
- 1SPDT / 2SPDT micro-switches

## Specifications

<b>System</b>	: Inert Gas (Nitrogen) filled System
<b>Case</b>	: Weather proof, Die-Cast Aluminium enclosure, epoxy powder coated, conforming to IP-68 protection, in accordance with IS/IEC-60529:2001 Flameproof Die Cast Aluminum Enclosure, epoxy powder coated, conforming to Gr. IIA, IIB & IIC T6 in accordance with IS 2148-2004 (IEC-60079:2001) & Weatherproof to IP 66 in accordance with IS-12063:1987 (IEC-60529), approved by CMRI/CCOE/PESO
<b>Cable entry</b>	: As shown in <b>Table-III</b>
<b>Stem</b>	: SS304 or SS316, 6 mm, 8 mm, 10 mm, 12 mm
<b>Connection</b>	: ½" NPT(M) adjustable compression fitting in SS316 as standard (other connections on request)
<b>Capillary</b>	: SS316 with SS304 / SS316 armouring or SS316 with SS304 / SS316 armouring, with PVC covering
<b>Range</b>	: As shown in <b>Table-I</b>
<b>Switching Accuracy</b>	: ±1% FSD
<b>Repeatability</b>	: ±1% FSD
<b>Scale Accuracy</b>	: ±5% FSD
<b>Over Range</b>	: 125% FSD
<b>Switch Type</b>	: 1SPDT / 2SPDT Snap Action Microswitch
<b>Switch Rating</b>	: As shown in <b>Table-II</b>
<b>Set Point</b>	: To be specified by Customer (Adjustable from 10 to 90% of the Maximum Range), Internal Setting with tamperproof locking arrangement
<b>Switching Differential</b>	: Fixed or Adjustable
<b>High Voltage Strength</b>	: Withstands 0.5 KV between open contact for 1 Sec & 2 KV between terminals and earth for one minute.
<b>Insulation Resistance</b>	: Insulation Resistance >10 M Ohms at 500VDC
<b>Thermowell</b>	: Refer our Catalogue for Thermowell



# Blind Temperature Switch



**Note:**

- 1) Weatherproof enclosure is effective only if all entries and joint faces are properly sealed.
- 2) Flameproof enclosure is weatherproof only if cover 'O' ring is retained in position; and flameproof only if suitable Flameproof Cable Gland is provided. It is highly recommended to procure Cable Glands along with flameproof instruments to avoid negligence of the same during installation.
- 3) Switch Accuracy & Repeatability are one and the same for all Blind Temperature Switches (being a switching device; not an indicating/measuring device).
- 4) The instrument is calibrated in vertical mounting position. Hence mounting in any other position may cause a minor range shift.
- 5) Ambient temperature range: All models are suitable for operating within a range of ambient temperature from (-) 20°C to (+) 60°C provided the process fluid does not freeze within this range. Below 0°C, precautions should be taken in humid atmospheres to prevent frost formation inside the instrument from jamming the mechanism.
- 6) It is recommended to select the range of the instrument such that the set value falls between 35% to 65% of the FSR.
- 7) Scale Markings are for guidance only. Set the correct set value against precision Master instrument
- 8) Thermowells of different process connections & Material of Construction can be provided as per process requirement.

## Table I : Ranges (in Deg. C)

20 to 60	(-)30 to (+)30
20 to 80	(-)30 to (+)50
20 to 100	(-)30 to (+)90
20 to 120	
20 to 160	(-)40 to (+)40
20 to 200	(-)40 to (+)60
20 to 250	(-)40 to (+)80
20 to 300	
	(-)50 to (+)30
(-)20 to (+)40	(-)50 to (+)50
(-)20 to (+)60	(-)50 to (+)100
(-)20 to (+)80	
<b>Any other (Please specify)</b>	

**Note:** Ranges mentioned are in Deg.C.  
Equivalent unit in Deg.F can be provided on request.

## Table II : Type of Micro Switch

Description	Code	Availability In Type	A/C Rating Current Voltage	Volt	DC Rating Current	
					Resistive	Inductive
1-SPDT	<b>100</b>	Fixed switching Differential only	5A-250VAC	220	0.25 A	0.03 A
				110	0.50 A	0.07 A
2-SPDT				24	5.0 A	3.00 A
1-SPDT	<b>102</b>	Fixed or Adjustable Switching Differential	5A-250VAC	220	0.25A	0.1A
				110	0.5A	0.2A
2-SPDT				24	8A	7A
1-SPDT	<b>103</b>	Fixed or Adjustable Switching Differential	15A-250VAC	220	0.25A	0.1A
				110	0.5A	0.2A
2-SPDT				24	8A	7A
Any Special Requirement	<b>XXX</b>	—	—	—	—	---

## Table III : Type of Cable Entry

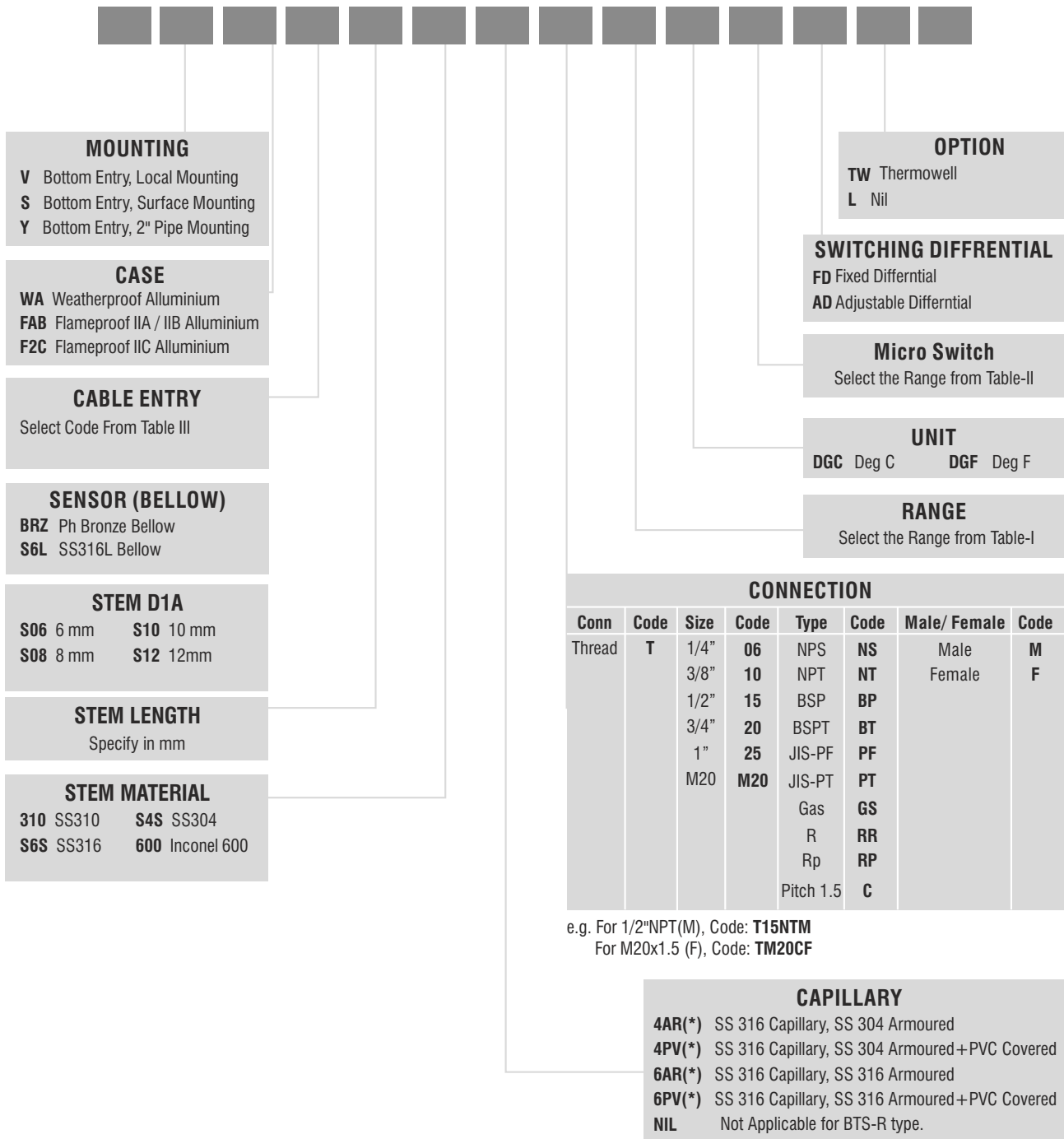
Cable Entry	Single Cable Entry		Double Cable Entries		Double Cable Entries, one plugged	
	W/P	FLP (IIA/IIIB/IIC)	W/P	FLP (IIA/IIIB/IIC)	W/P	FLP (IIA/IIIB/IIC)
3/4" ET(F)	W10	F10	W20	F20	WP0	FP0
3/8" BSP(F)	W11	F11	W21	F21	WP1	FP1
1/2" BSP(F)	W12	F12	W22	F22	WP2	FP2
1/2" NPT(F)	W13	F13	W23	F23	WP3	FP3
3/4" BSP(F)	W14	F14	W24	F24	WP4	FP4
3/4" NPT(F)	W15	F15	W25	F25	WP5	FP5
3/4"ET, DCCG - Brass	W1A	F1A	W2A	F2A	WPA	FPA
3/4"ET, DCCG - SS	W1B	F1B	W2B	F2B	WPB	FPB
1/2"BSP, DCCG - Brass	W1C	F1C	W2C	F2C	WPC	FPC
1/2"BSP, DCCG - SS	W1D	F1D	W2D	F2D	WPD	FPD
1/2"NPT, DCCG - Brass	W1E	F1E	W2E	F2E	WPE	FPE
1/2"NPT, DCCG - SS	W1F	F1F	W2F	F2F	WPF	FPF
3/4"NPT, DCCG - Brass	W1G	F1G	W2G	F2G	WPG	FPG
3/4"NPT, DCCG - SS	W1H	F1H	W2H	F2H	WPH	FPH
3/4"BSP, DCCG - Brass	W1J	F1J	W2J	F2J	WPJ	FPJ
3/4"BSP, DCCG - SS	W1K	F1K	W2K	F2K	WPK	FPK
3/4" ET, SCCG - PVC	PVC	---	---	---	---	---
4 Pin Connector	4PC	---	---	---	---	---
7 Pin Connector	7PC	---	---	---	---	---

# Ordering Information

**BTS-R : Rigid Stem type**

**BTS-C : Capillary type**

**MODEL : BTS-R / BTS-C**



\* Specify the length of Capillary in Meters.

**Sample Model Code: BTS-R-V-WA-W13-S6L-S10-300-S6S-NIL-T15NTM-(20-200)-DGC-100-FD-L**

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## In-House testing facilities for Temperature Gauges

For the manufacturing & testing of Temperature Gauges, we strictly follow EN : 13190-2001 and ASME B40.200. Following tests are carried out to ensure the quality of Temperature Gauges. We have facilities to carry out following tests in-house at our manufacturing plant.

1. Accuracy test
2. Over range test
3. Hysteresis test
4. Response time test
5. Repeatability test
6. Vibration test (rattling test)
7. Load test
8. Mounting position test
9. Ambient temperature compensation test (Case compensation test)
10. Capillary compensation test
11. Thermal stability test
12. Hermetical sealing test (for Bimetal Temperature Gauges)
13. End nipple test (for Bimetal Temperature Gauges)
14. Hose down test (water spray test)
15. Switching accuracy test (for contact assembly & microswitch type models)
16. High voltage test (for contact assembly & microswitch type models)
17. Insulation test
18. Contact resistance test
19. Altitude test
20. Cyclic test



# NABL



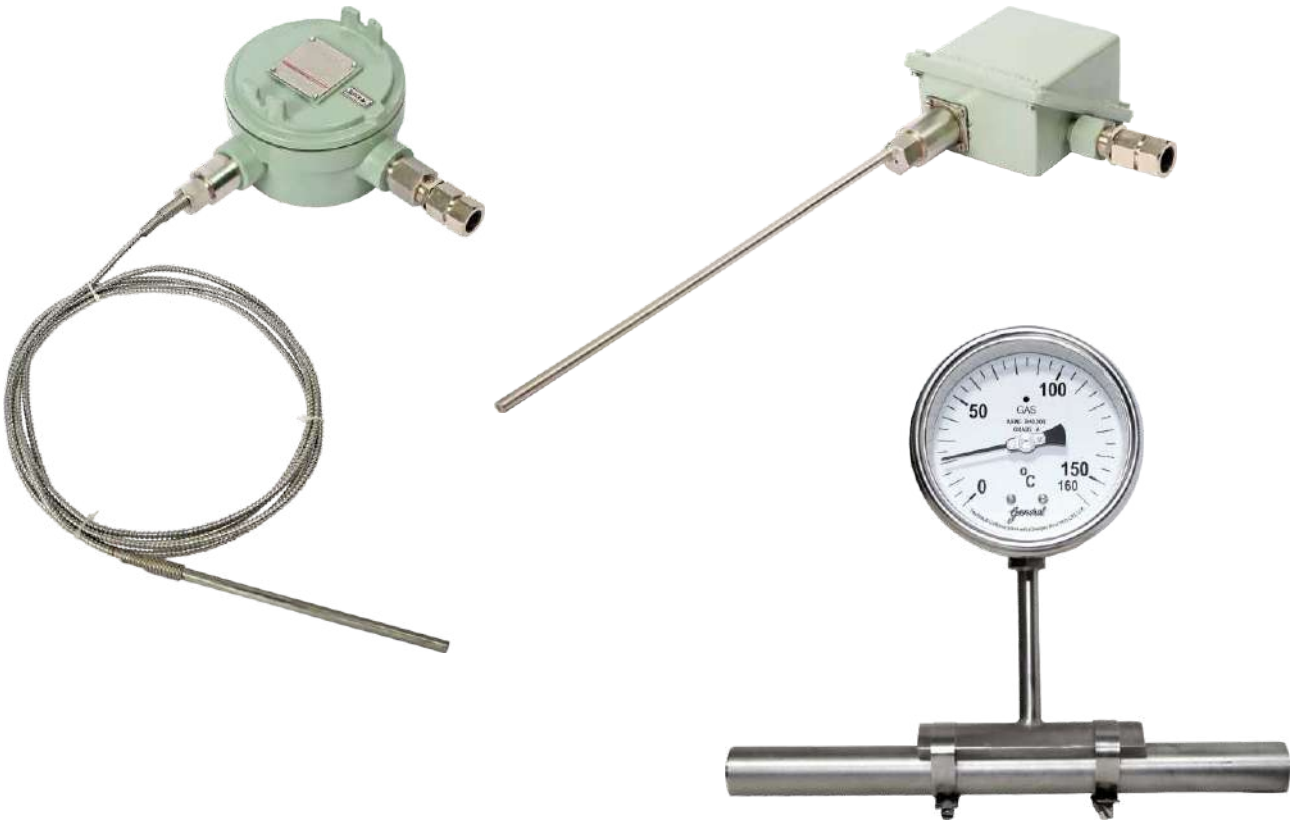


# Temperature Conversion Chart



°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
-200	-328	8	46.4	220	428	460	860	700	1292
-180	-292	9	48.2	230	446	470	878	710	1310
-160	-256	10	50	240	464	480	896	720	1328
-140	-220	20	68	250	482	490	914	730	1346
-120	-184	30	86	260	500	500	932	740	1364
-110	-166	40	104	270	518	510	950	750	1382
-100	-148	50	122	280	536	520	968	760	1400
-90	-130	50	140	290	554	530	986	770	1418
-80	-112	70	158	300	572	540	1004	780	1436
-70	-94	80	176	310	590	550	1022	790	1454
-60	-76	90	194	320	608	560	1040	800	1472
-50	-58	100	212	330	626	570	1058		
-40	-40	110	230	340	644	580	1076		
-30	-22	120	248	350	662	590	1094		
-20	-4	130	266	360	680	600	1112		
-10	14	140	284	370	698	610	1130		
0	32	150	302	380	716	620	1148		
1	33.8	160	320	390	734	630	1166		
2	35.6	170	338	400	752	640	1184		
3	37.4	180	356	410	770	650	1202		
4	39.2	190	374	420	788	660	1220		
5	41	200	392	430	806	670	1238		
6	42.8	210	410	440	824	680	1256		
7	44.6	212	413.6	450	842	690	1274		

For the conversion of temperature values other than listed above, use the formula: °F=(°Cx9/5)+32 or °C=(°F-32)x5/9  
 Further for conversion of °C into Kelvin(K), following formula can be used: K=°C+273.15





# THERMOCOUPLES

## Introduction

Thermocouples are pairs of dissimilar metal wires joined at one end, which generate a net thermoelectric voltage between the open pair according to the temperature difference between the ends.

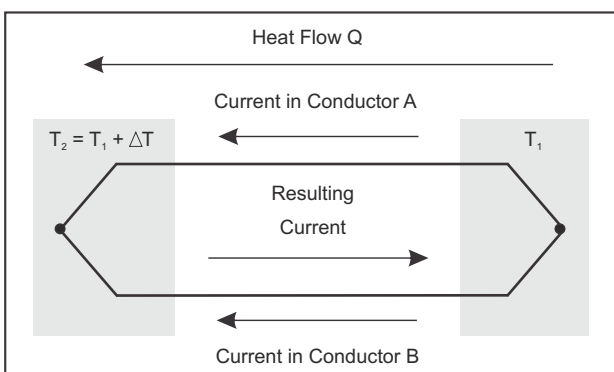
The junction that is put into the process in which temperature is being measured is called the HOT JUNCTION.

The other junction which is at the last point of thermocouple material and which is almost always at some kind of measuring instrument is called the COLD JUNCTION. Thermocouples are available either as bare wire ('bead' thermocouples) which offer low cost and fast response times, or built into probes. A wide variety of probes are available, suitable for different measuring applications (industrial, scientific, food temperature, medical research etc)

## The Seebeck Effect.

In 1821 a German physicist named Seebeck discovered the thermoelectric effect, which forms the basis of modern thermocouple technology. He observed that an electric current flows in a closed circuit of two dissimilar metals if their two junctions are at different temperatures. The thermoelectric voltage produced depends on the metals used and on the temperature relationship between the junctions. If the same temperature exists at the two junctions, the voltage produced at each junction cancel each other out and no current flows in the circuit. With different temperatures at each junction, different voltages are produced and current flows in the circuit. A Thermocouple can therefore only measure temperature differences between the two junctions.

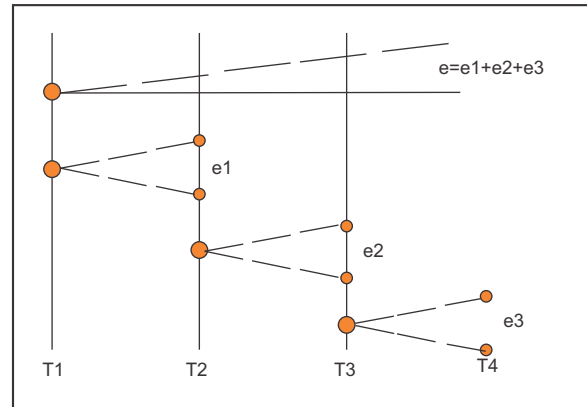
It is important to designate each of the junctions for practical purposes; the measuring junction (often referred to as the 'hot' junction) is that which is exposed to be measured temperature. The reference junction is the other junction that is kept at a known temperature; this is often referred to as the 'cold' junction. The term thermocouple refers to the complete system for producing thermal voltages and generally implies an actual assembly (i.e. a sheathed device with extension leads or terminal blocks).



The two conductors and associated measuring junction constitute a thermo element and the individual conductors are identified as the positive or negative leg.

The change in material EMF with respect to a change in temperature is called the Seebeck coefficient or thermoelectric sensitivity. This coefficient is usually a nonlinear function of temperature.

## Law of Successive Thermocouple



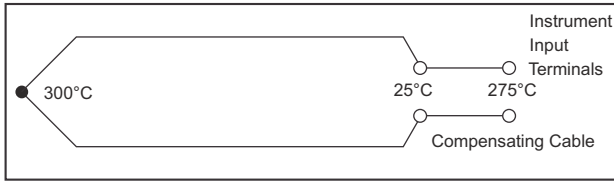
One thermocouple has its measuring point at  $T_1$  and open end at  $T_2$ . The second thermocouple has its measuring point at  $T_2$  and its open end at  $T_3$ . The third thermocouple has its measuring point at  $T_3$ . The emf level for the thermocouple that is measuring  $T_1$  is  $e_1$ ; that for the other thermocouple is  $e_2$ ; and for the last thermocouple is  $e_3$ . The sum of the three EMF's  $e_1, e_2, e_3$ , equals the EMF 'e' that would be generated by the combined thermocouple operating between  $T_1$  &  $T_4$

Hence a thermocouple is a sum of many thermocouples. For eg. An EMF produced by a thermocouple with hot junction at  $T_1$  & cold at  $T_4$ ; The EMF generated will be equal to many thermocouples joined together and produced EMF would be equals to sum of these three EMF  $e_1, e_2, e_3$ .

$$e = e_1 + e_2 + e_3$$

The characteristics of the thermocouple alloy should be uniform for the full length of thermocouple..

Note : Thermocouple is always formed when two metals are connected together. For example, when the Thermo element conductors are joined to copper cable or terminals, thermal voltages can be generated at the transition. In this case, the second junction can be taken as located at the connection point (assuming the two connections to be thermally common). The temperature of this connection point (terminal temperature) if known, allows computation of the temperature at the measuring junction. The thermal voltage resulting from the terminal temperature is added to the measured voltage and their sum corresponds to the thermal voltage against a  $0^\circ\text{C}$  reference.



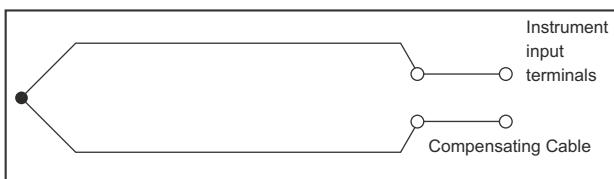
If the measuring junction is at 300°C and the terminal temperature is 25°C, the measured thermal voltage for the type K thermo element (Nickel-Chromium v Nickel-Aluminum) is 11.18 mV. This corresponds to 275°C difference temperature. Therefore a positive correction of 25°C refers the temperature to 0°C reference; 300°C is thus indicated. Important points to note at this stage are four-fold.

1. Thermocouples only generate an output in the regions where the temperature gradient exists- not beyond.
2. Accuracy and stability can only be assured if the thermoelectric characteristics of the thermocouple conductors are uniform throughout.
3. Only a circuit comprising dissimilar materials in a temperature gradient generates an output.
4. Although the thermoelectric effects are seen at junctions, they are not due to any magic property of the junction itself.

### Cold Junction Compensation

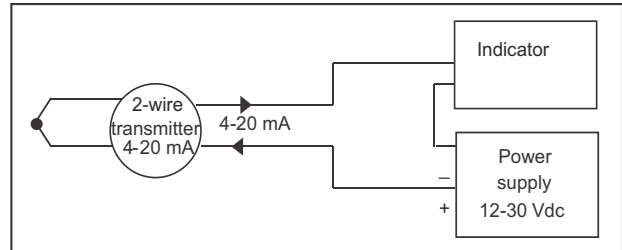
A practical industrial or laboratory Thermocouple consists of only a single (measuring) junction; the reference is always the terminal temperature. Possible measures are:-

- a) Measures the terminal temperature accurately and compensate accordingly in calculating the measured value.
- b) Locate the terminals in a thermally controlled enclosure.
- c) Terminate not in copper cable but use compensating or actual thermocouple wire to extend the sensor termination to the associated instrumentation (compensating cable uses low cost alloys, which have similar thermoelectric properties to the actual thermoelement). On this basis, there is no thermal voltage at the thermocouple termination. The transition to copper then occurs only at the instrument terminals where the ambient temperature can measure by the instrument; the reference junction can then be compensated for electronically.



**Thermoelement with compensating cable**

Note :- It is essential to use only compensating or specific extension cables (these have the correct thermoelectric properties) appropriate to the thermocouple other wise an additional thermocouple is formed at the connection point. The reference junction is formed where the compensating or extension cable is connected to a difference material. The cable used must not be extended with copper or with compensating cable of a different type.

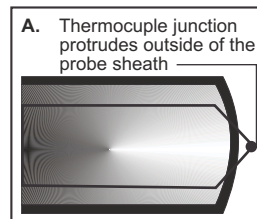


**Temperature Transmitter 2- wire**

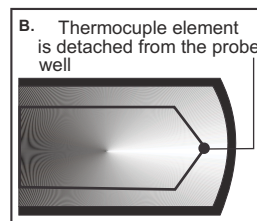
d) Use a temperature transmitter at the termination point. This is effectively bringing instrumentation close to the sensor where electronic reference junction techniques can be utilized. However, this technique is convenient and often used in plant; transmitter produces an amplified "corrected" signal, which can be sent to remote instruments via copper cable of any length.

### Measuring Junctions

Three alternative tip configurations are usually offered:

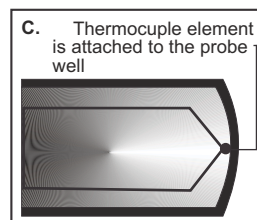


a) An exposed (measuring) junction is recommended for the measurement of flowing or static non-corrosive gas temperature when the greatest sensitivity and quickest response is required.



b) An insulated junction is more suitable for corrosive media although the thermal response is slower. In some applications where more than one thermocouple connects to the associated instrumentation, insulation may be essential to

avoid spurious signals occurring in the measuring circuits. If not specified, this is the standard.



c) An earthed (grounded) junction is also suitable for corrosive media and for high pressure applications. It provides faster response than the insulated junction and



protection not offered by the exposed junction.

## Method of Formation of Hot Junction

To form the hot junction, a suitable method has to be adopted to obtain a good electrical contact between the thermocouple wires.

For Chromal/Alumal and other combinations, for use in high temperature measurements, welding is the only method to obtain a suitable joint.

For this purpose Tig welding & Laser beam welding is mostly used.

### Tig welding

Gas tungsten arc welding (GTAW), also known as tungsten inert gas (TIG) welding, is an arc welding process that uses a nonconsumable tungsten electrode to produce the weld. The weld area is protected from atmospheric contamination by a shielding gas.

### Laser beam welding

Laser beam welding (LBW) is a welding technique used to join multiple pieces of metal through the use of a laser. The beam provides a concentrated heat source, allowing for narrow, deep welds and high welding rates. LBW is a versatile process, capable of welding carbon steels, HSLA steels, stainless steel, aluminum and titanium. The speed of welding is proportional to the amount of power supplied but also depends on the type and thickness of the workpieces.

## Thermocouple standard

ASTM E 235 : Standard Specification for Thermocouples, Sheathed, Type K and Type N for Nuclear or for other High-Reliability Applications.

ASTM E 839 : Standard Test Methods for Sheathed Thermocouples and Sheathed Thermocouple Materials.

ASTM E 220 : Test Methods for Calibration of Thermocouples by Comparison Techniques

ASTM E 230 : Specification and Temperature-EMF Tables for Standardized Thermocouples.

ASTM E 585 : Standard specification for compacted MI, MS, base metal thermocouple cables.

ASTM E 608 : Standard specification for compacted MI, MS, base metal thermocouples.

ASTM E 696 : Standard specifications for tungsten - rhenium alloy thermocouple wire.

ASTM E 1652 : Standard specification for Magnesium oxide &

Alumina oxide powder & crushable insulators used in metal sheathed PRT's, base metal thermocouples & noble metal thermocouple.

IS 12579 : Specification for Base Metal Mineral Insulated Thermocouple Cables and Thermocouples.

GB/T1598-2010 : Chinese standard for platinum thermocouples.

IEC 584 : International standard for thermocouples.

## Types of thermocouple

Many combinations of materials have been used to produce acceptable thermocouples, each with its own particular application spectrum. However, the value of interchangeability and the economics of mass production have led to standardization, with a few specific types now being easily available, and covering by far the majority of the temperature and environmental applications.

These thermocouples are made to conform to an e.m.f/temperature relationship specified in the form of tabulated values of e.m.fs resolved normally to 1mV against temperature in 1C intervals, and vice versa. Internationally, these reference tables are published as IEC 584 1, 2 & 4, which is based on the International Temperature Scale ITS-90. It is worth noting here, however, that the standards do not address the construction or insulation of the cables themselves or other performance criteria. With the diversity to be found, manufacturers' own standards must be relied upon in this respect.

The standard covers the eight specified and most commonly used thermocouples, referring to their internationally recognized alpha character type designation & providing the full reference tables for each. These thermocouple types can be subdivided in 3 groups, base metal, noble (rare) metal & Refractory metal thermocouple.

## Base Metal Thermocouples

Base metal thermocouple types are composed of common, inexpensive metals such as nickel, iron and copper. The thermocouple types E, J, K, N and T are among this group and are the most commonly used type of thermocouple.

Each leg of these different thermocouples is composed of a special alloy, which is usually referred to by their common names.

Type E – The type E thermocouple is composed of a positive leg of chromel (90%nickel/10%chromium) and a negative leg of constantan (45%nickel/55% copper).The temperature range for this thermocouple is -200 to 900°C(-330 to 1600 OF). The type E thermocouple has the highest millivolt (EMF)

output of all established thermocouple types. Type E sensors can be used in sub-zero, oxidizing or inert applications but should not be used in sulphurous, vacuum or low oxygen atmospheres.

**Type J** – Type J thermocouples have an iron positive leg and a constantan negative leg. Type J thermocouples have a useful temperature range of 0 to 750°C (32 to 1400 °F) and can be used in vacuum, oxidizing, reducing and inert atmospheres. Due to the oxidation (rusting) problems associated with the iron leg, care must be taken when choosing this type for use in oxidizing environments above 537 °C

**Type K** – The type K thermocouple has a Chromel (90% nickel/10% copper) positive leg and an Alumel (95% nickel/ 5% manganese, aluminum and silicon) negative leg. The temperature range for type K alloys is -200 to 1250°C (-328 to 2282 °F). Type K sensors are recommended for use in oxidizing or completely inert environments. Type K and type E should not be used in sulfurous environments. Because type K has better oxidation resistance than types E, J and T, its main area of usage is at temperatures above 600°C but vacuum and low oxygen conditions should be avoided.

**Type N** – Type N thermocouples are made with a Nicrosil (74.1% nickel – 14.4% chromium – 1.4 % silicon. 0.1% magnesium) positive leg and a Nisil (95.6% nickel – 4.4% silicon) negative leg. The temperature range for Type N is -270 to 1300°C (-450 to 2372°F). Type N is very similar to Type K except that it is less susceptible to selective oxidation. Type N should not be used in vacuum and or reducing environments in an unshielded design.

**Type T** – Type T thermocouples are made with a copper positive leg and a constantan negative leg. The temperature range for type T is -200 to 350°C (-328 – 662°F). Type T sensors can be used in oxidizing (below 350°C), reducing or inert applications.

## Noble Metal Thermocouples

Noble metal thermocouples are manufactured with wire that is made with precious or “noble” metals like Platinum and Rhodium. Noble metal thermocouples can be used in oxidizing or inert applications and must be used with a ceramic protection tube surrounding the thermocouple element. These sensors are usually fragile and must not be used in applications that are reducing or in applications that contain metallic vapors.

**Type R** – Type R thermocouples are made with a platinum/13% rhodium positive leg and a pure platinum negative leg. The temperature range for type R is 0 to 1450°C (32 – 2642 °F)

**Type S** – Type S thermocouples are made with a platinum/10% rhodium positive leg and a pure platinum negative leg. The temperature range for type S is 0 to 1450°C (32 – 2642 °F).

**Type B** – Type B thermocouples are made with a platinum/30% rhodium positive leg and a platinum/6% Rhodium negative leg. The temperature range for type B is 0 to 1700°C (32 – 3092°F).

## Refractory Metal Thermocouples

Refractory metal thermocouples are manufactured with wire that is made from the exotic metals tungsten and Rhenium. These metals are expensive, difficult to manufacture and wire made with these metals are very brittle. These thermocouples are intended to be used in vacuum furnaces at extremely high temperatures and must never be used in the presence of oxygen at temperatures above 300°C. There are several different combinations of alloys that have been used in the past but only one generally used at this time.

**Type C** – The type C thermocouple is made with a tungsten/5% rhenium positive leg and tungsten 26% rhenium negative leg and has a temperature range of 0 – 2320°C (32 – 4208 °F).

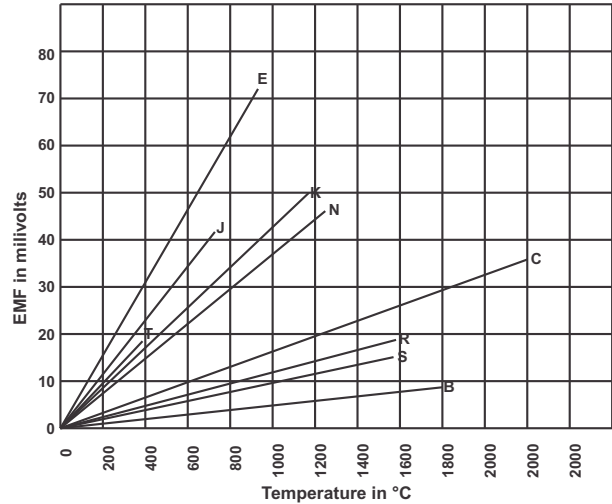
**Type G** – Type G thermocouple technically also known as WM26Re. The type G thermocouple has alloy combination of tungsten (W) as positive lead and tungsten + 26% Rhenium (W-26% Re) as negative lead. Maximum useful temperature range of this thermocouple is 0 to 2320°C.

**Type D** – Type D thermocouple technically also known as W3ReM25Re. Type D thermocouple has alloy combination of tungsten + 3% rhenium (W-3%Re) as positive lead and tungsten + 25 % Rhenium (W-56% Re) as negative lead. Maximum useful temperature range of this thermocouple is 0 to 2320°C.



*General* Mineral Insulated Thermocouple Assemblies consist of two, four or six thermocouple wires embedded in compact MgO - mineral insulation, enclosed in a metallic tube. The assembly is compact, flexible enough to route, has a high insulation resistance and high thermal conductivity. Mineral insulated thermocouple assemblies are robust in construction and offer good mechanical strength.

Beside the standard construction, complex, custom built designs are available. Our expert design team can assist you solve your temperature related problems to satisfaction.



Thermocouple Grade		T/C Type	Temp range	Sheath OD	Sheath Material*	Std limits of error	Spl limits of error	Extension Grade	
ICE 584 (+/-)	ANSI MC 96.1 (+/-)							ICE 584 (+/-)	ANSI MC 96.1 (+/-)
		J Iron Constantan	0-700°C	2 mm, 3 mm 4.5 mm, 6 mm 8 mm	SS316, SS321 Inconel 600®	±2.2°C or ±0.75%	±1.1°C or ±0.4%		
		K Chromel Alumel	(-) 200°C to 1150°C	1 mm, 1.5 mm 2 mm, 3 mm 4.5 mm, 6 mm 8 mm	SS316, SS321 Inconel 600®, SS310, SS446	±2.2°C or ±0.75%	±1.1°C or ±0.4%		
		E Chromel Constantan	(-) 200°C to 800°C	2 mm, 3 mm 4.5 mm, 6 mm 8 mm	SS316, SS321	±1.7°C or ±0.75%	±1.0°C or ±0.4%		
		T Copper Constantan	(-) 200°C to 300°C	2 mm, 3 mm 4.5 mm, 6 mm 8 mm	SS316, SS321	±1.0°C or ±0.75%	±0.5°C or ±0.4%		
		N Nicrosil Nisil	0 to 1280°C	2 mm, 3 mm 4.5 mm, 6 mm 8 mm	Inconel 600®, nicrobel/pyrosil	±2.2°C or ±0.75%	±1.1°C or ±0.4%		
	None Established	R Pt PtRh 13%	0 to 1400°C	3 mm, 4.5 mm 6 mm	Inconel® or ceramic	±1.5°C or ±0.25%	±0.6°C or ±0.1%		
	None Established	S Pt PtRh 10%	0 to 1400°C	3 mm, 4.5 mm 6 mm	Inconel® or ceramic	±1.5°C or ±0.25%	±0.6°C or ±0.1%		
	None Established	B PtRh 6% PtRh 30%	800°C to 1700°C	3 mm, 4.5 mm 6 mm	Inconel® or ceramic	±0.5%	None Established		
No Std. Use ANSI Colour Code	None Established	C (W5) Tungsten-5% Rhenium Tungsten-26% Rhenium	0-2320°C	3 mm, 4.5 mm 6 mm		±4.5% or ±1.0%	None Established	No Std. Use ANSI Colour Code	

Other sheath OD and sheath material available on request.

## Types of Thermocouple Construction

There are two types of thermocouple construction most commonly used. Mineral Insulated (M.I.) Thermocouples & Non M.I. Thermocouples.

### Mineral Insulated Thermocouples

Magnesium Oxide insulated thermocouples, commonly referred as MgO thermocouples, are used in many process and laboratory applications. They are available in all thermocouple element types, a wide variety of sheath diameters and materials, they are rugged in nature and bendable, and their fairly high temperature ratings make MgO thermocouples a popular choice for a multitude of temperature measuring applications. The many desirable characteristics make them a good choice for general and special purpose applications.



MgO sensors are constructed by placing an element or elements into a sheath of a suitable material and size, insulating the elements from themselves and the sheath with loose filled or crushable Magnesium Oxide powder or insulators, and then swaging or drawing the filled sheath down to its final reduced size. The swaging process produces an element with highly compacted MgO insulation and provides high dielectric strength insulation between the elements themselves and their sheath.

Mineral insulated Thermocouples consist of thermocouple wire embedded in a densely packed refractory oxide powder insulate all enclosed in a seamless, drawn metal sheath (usually stainless steel).

Effectively the thermoelement, insulation and sheath are combined as a flexible cable, which is available in different diameters, usually from 0.25mm to 10mm.

At one end cores and sheath are welded from a "hot" junction. At the other end, the thermocouple is connected to a "transition" of extension wires, connecting head or connector.

## Advantages of mineral insulated thermocouple are

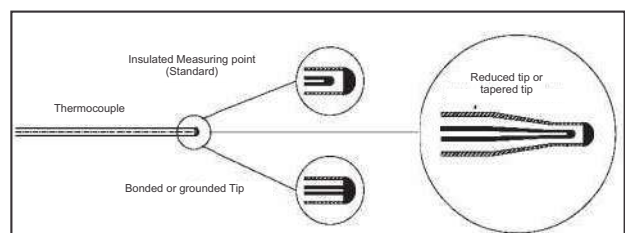
- a) Small over all dimension and high flexibility, which enable temperature measurement in location with poor accessibility.
- b) Good mechanical strength.
- c) Protection of the thermo element wires against oxidation, corrosion and contamination.
- d) Fast thermal response.

The mineral oxides used for insulation are highly hygroscopic and open-ended cables must be effectively sealed (usually with epoxy resins) to prevent moisture take-up. A carefully prepared mineral insulated thermocouple will normally have a high value of insulation resistance (many hundreds of mega ohms).

### Mineral Insulated Thermocouple Tip Style

The junction tip of Mineral insulated thermocouple can be of three types as described previously. The tip can be insulated, grounded and reduced type.

- a.) Insulated Tip: Insulated hot end junctions are suitable for most applications, especially where low EMF pickup is essential. High insulation resistance is enhanced due to extreme compaction of the high purity MgO powder insulation.
- b.) Bonded or grounded junctions offer a slightly faster temperature response than the insulated junction type. Not recommended for multi-point instrumentation.
- c.) Reduced tip junctions are ideal for applications where low mass and extremely fast response times are required, together with good mechanical strength. Reduced tip can be provided on 1.0 to 6.0 mm diameter thermocouples.



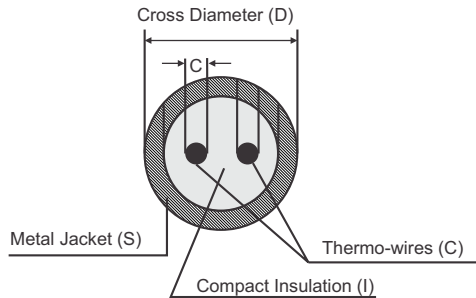
Cross section view of M.I. thermocouple

In above figure of M.I. thermocouple, S, I, C represent the terms sheath thickness, insulation, conductor respectively. These values depend upon the outer diameter (D) of M.I. thermocouple.

Sheath thickness (S) = 10% of D

Conductor (C) = 15% of D

Insulation (I) = 08% of D



**Cross Section of Shell Lines**

### Non M.I. Thermocouples

In Non-M.I. thermocouples, thermocouple wires are either insulated with ceramic beads or after insulation of ceramic, covered by a metal sheath (usually stainless steel) and some form of termination (extension lead, connecting head or

connector for example) is provided. In this type of construction thermocouple wires are protected from the measuring environment when a sheath protection is provided. The sheath material is dependent on the measuring environment usually stainless steel is used. According to the corrosive environment sheath selection is changed.

This construction does not provide flexibility & not found in small sizes. Not too good mechanical strength.

In Non M.I. construction sheath may be of ceramic or metal as per suitability.

Exposed, Grounded and Ungrounded all types of junctions are formed in both the M.I. & Non M.I. construction.

### Characteristics of thermocouple

#### Tolerances on Temperature Reading

Tolerance denotes the maximum allowable value obtained by subtracting the temperature reading or the temperature at the hot junction from the standard temperature converted from the applicable temperature EMF table.

Type of thermocouple	Tolerance Grade					
	ASTM E230-ANSI MC 96.1			IEC 584-2		
	Temperature range (°C)	Standard	Special	Temperature Range (°C)	Class 1	Class 2
B	800-1700°C	±0.5%	---	600 to 1700°C	±1°C or $\{ \pm(1 + (T - 1100) \times 0.3\%) \}$	± 1.5°C or ±0.25%
R & S	0 - 1450°C	±0.5°C or ±0.25%	±0.6°C or ±0.1%	0 to 1600°C	±1°C or $\{ \pm(1 + (T - 1100) \times 0.3\%) \}$	± 1.5°C or ±0.25%
N & K	- 200-0°C	±2.2°C or ±2%	---	-40 to 1000°C	±1.5°C or ±0.4%	± 2.5°C or ±0.75%
	0-1260°C	±2.2°C or ±0.75%	±1.1°C or ±0.4%			
E	-200 - 0°C	±1.7°C or ±1%	---	-40 to 800°C	1.5°C or ±0.4%	± 2.5°C or ± 0.75%
	0 - 870°C	±1.7°C or ±0.5%	±1.0°C or ±0.4%			
J	0 - 760°C	±2.2°C or ±0.75%	±1.1°C or ±0.4%	-40 to 750°C	±1.5°C or ±0.4%	± 2.5°C or ±0.75%
T	-200 - 0°C	±1.0°C or ±1.5%	---	-40 to 350°C	± 0.5°C or ±0.4%	±1°C or ±0.75%
	0 - 370°C	±1.0°C or ±0.75%	±0.5°C or ±0.4%			
C	0 to 2320°C	4.5°C or ±1.0%	---	---	---	---

## Maximum Operating Temperature

Operating temperature limit means the upper temperature where thermocouple can be used continuously in air. Maximum limit means the upper temperature where thermocouple can be used temporarily for short period of time owing to unavoidable circumstances. This graph is given as a guide only, and not to be guaranteed. Principal factors that affect the life of a thermocouple are:

Temperature : Thermocouple life decreases by about 50% when an increase of 50 °C occurs.

Diameter : By doubling the diameter of the wire, the life increases by 2-3 times.

Thermic cycling : When thermocouples are exposed to thermic cycling from room temperature to above 500°C, their life decreases by about 50% compared to a thermocouple used continuously at the same temperature.

Protection : When thermocouples are covered by a protective sheath and placed into ceramic insulators, their life is considerably extended.

## For bare wire thermocouple :

Type of Thermocouple	Upper temperature limit for various wire sizes				
	No. 8 AWG 3.25 mm (°C)	No. 14 AWG 1.63 mm (°C)	No. 20 AWG 0.81 mm (°C)	No. 24 AWG 0.51 mm (°C)	No. 28 AWG 0.33 mm (°C)
T	---	370	260	200	200
J	760	590	480	370	370
E	870	650	540	430	430
K	1260	1090	980	870	870
N	1260	1090	980	870	870
R, S	---	---	---	1480	---
B	---	---	---	1700	---

## For Mineral Insulated Cables :

Type of Thermocouple	Upper temperature limit for various sheath diameters							
	0.5 mm (°C)	1.0 mm (°C)	1.5 mm (°C)	2.0 mm (°C)	3.0 mm (°C)	4.5 mm (°C)	6.0 mm (°C)	8.0 mm (°C)
T	260	260	260	315	370	370	370	370
J	260	260	440	440	520	620	720	720
E	300	300	510	510	650	730	820	820
K	700	700	920	920	1070	1150	1150	1150
N	700	700	920	920	1070	1150	1150	1150

While application conditions do alter techniques, the following factors are suggested for consideration.

1. Obtain thermocouples with insulated measuring junctions.
2. Specify "same metal" for large installation, preferably close tolerance.
3. Thermocouple reference junction should be monitored in a reference unit with an accuracy of +0.1°C or better.
4. Great care to be taken in running thermocouple circuitry against "Pickup" etc. with the minimum number of joints in the wiring.
5. Heat-treat thermocouple to their most stable condition.
6. Calibrate thermocouples.

### Thermocouple Response Times

The response time for a thermocouple is usually defined as the time taken for the thermal voltage (output) to reach 63% of maximum for the step change temperature. It is dependent on several parameters including the thermocouple dimension, construction, tip configuration and the nature of the medium in which the sensor is located. If the thermocouple is plunged in to a medium with a high thermal capacity and heat transfer is rapid, the effective response time will be practically the same as for the thermocouple itself (the intrinsic response time). However, if the thermal properties of the medium are poor (e.g. still air) the response time can be 100 times greater.

For exposed measuring junctions, divide the values shown by 10. Thermocouple with grounded junction display response times some 20 to 30% faster than those with insulated junction. Very good sensitivity is provided by fine gauge unsheathed thermocouples. With conductor diameter in the range 0.025mm to 0.81mm, response times in the region of 0.05 to 0.40 seconds can be realized.

Sheath Outer Diameter (mm)	Types of Measuring Junction	Response Time in Seconds (in sec.)					
		100°C	250°C	350°C	430°C	700°C	850°C
6.00	Insulated	3.2	4.0	4.7	5.0	6.4	16.0
6.00	Earthed	1.6	2.0	2.3	2.5	3.15	8.0
3.00	Insulated	1.0	1.1	1.25	1.4	1.6	4.5
3.00	Earthed	0.4	0.46	0.5	0.56	0.65	1.8
1.5	Insulated	0.25	0.37	0.43	0.50	0.72	1.0
1.5	Earthed	0.14	0.17	0.185	0.195	0.22	0.8
1.00	Insulated	0.16	0.18	0.19	0.21	0.24	0.73
1.00	Earthed	0.07	0.09	0.11	0.12	0.16	0.6

Values shown are for a closed end sheath.

### Immersion Length

Thermocouple assemblies are "tip" sensing devices which lends them to both surface and immersion applications depending on their construction. However immersion type must be used carefully to avoid error due to stem conduction from the process which can result in a high or low reading respectively. A general rule is to immerse into the medium to a minimum of 4 times the out side diameter of them sheath; no quantitative data applies but care must be exercised in order to obtain meaningful results. The ideal immersion depth can be achieved in practice by moving the probe in to or out of the process medium incrementally; with each adjustment, not any apparent change in indicating temperature. The correct depth will result in no change in indicating temperature.

### Surface Temperature Measurement

Although thermocouple assemblies are primarily tip sensing devices, the use of protection tubes renders surface sensing impractical. Physically, the probe does not lend it self to surface presentation and stem conduction would cause reading errors. If thermocouple is to be used reliably for surface sensing, it must be either exposed, welded junction from with very small thermal mass or be housed in a construction, which permits true surface contact when attaching to the surface. Locating a thermocouple on a surface can be achieved in various ways including the use of an adhesive patch, a washer and stud, a magnet for ferrous metal and pipe clips.

## Advantage of Thermocouple

Industrial thermocouple, in comparison with other thermometers, has the following features:

1. Quick response and stable temperature measurement by direct contact with the measuring object.
2. If the selection of a quality thermocouple is properly made, wide range of temperature can be measured.
3. Temperature of specific spot or small space can be measured.
4. Since temperature is detected by means of EMF generated, measurement, adjustment, amplification, control, conversion and other data processing are easy.
5. Less expensive and better interchangeability in comparison with other temperature sensors.
6. The most versatile and safe for measuring environments, if a suitable protection tube is employed.
7. Rugged construction and easy installation.

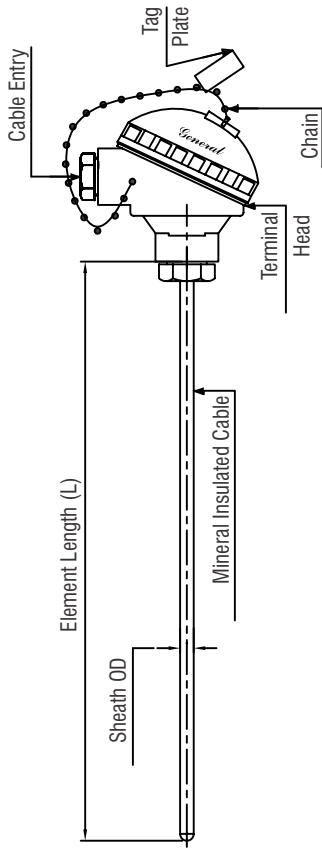
## Applications of Thermocouple

Thermocouples are suitable for measuring over a large temperature range, up to 2300 °C. They are less suitable for applications where smaller temperature differences need to be measured with high accuracy, for example the range 0–100 °C with 0.1 °C accuracy. For such applications thermistors and resistance temperature detectors are more suitable. Applications include temperature measurement for kilns, gas turbine exhaust, diesel engines, and other industrial processes.

Some other applications are as follows :

1. Steel Industry
2. Cement Industry
3. Pharmaceutical Industry
4. Petrochemical Industry
5. Nuclear Industry
6. Power Industry
7. Laboratories
8. Furnace Industry
9. Oil & Gas
10. Refinery & Petrol Chemical

# TC 0101 - Thermocouple Assembly



Other Options	
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special
8	'L' Type Mounting Bracket

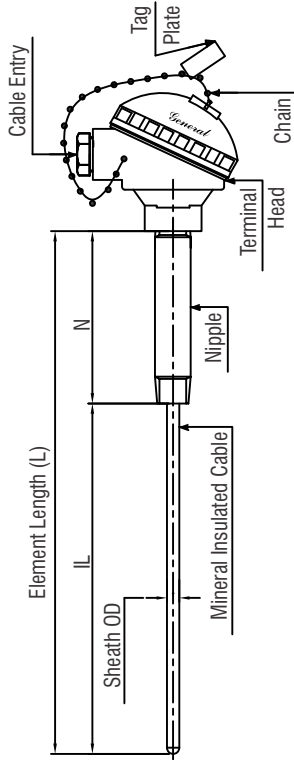
## TC - 0101

<b>Element</b>		<b>K</b>	Chromel/Alumel
		<b>J</b>	Iron/Constantan
		<b>E</b>	Chromel/Constantan
		<b>T</b>	Copper/Constantan
		<b>N</b>	Nicrosil/Nisil
		<b>R</b>	Pt PtRh 13%
		<b>S</b>	Pt PtRh 10%
		<b>B</b>	PtRh 6% PtRh 30%
<b>Element Type</b>		<b>1</b>	Simplex
		<b>2</b>	Duplex
<b>Junction Style</b>		<b>UG</b>	Ungrounded
		<b>G</b>	Grounded
<b>Calibration Standard</b>		<b>IEC</b>	IEC 584
		<b>ANSI</b>	MC 96.1
<b>Calibration Class</b>		<b>1</b>	Class 1
		<b>2</b>	Class 2
<b>Sheath 'OD'</b>		<b>3</b>	3 mm
		<b>4.5</b>	4.5 mm
		<b>6</b>	6 mm
		<b>8</b>	8 mm
		<b>10</b>	10 mm
		<b>XXX</b>	Please Specify
<b>Sheath Material</b>		<b>S6S</b>	SS316
		<b>S6L</b>	SS316L
		<b>446</b>	SS446
		<b>600</b>	Incolly 600
		<b>310</b>	SS310
		<b>800</b>	Incolly 800
		<b>XXX</b>	Please Specify
<b>Terminal Head</b>		<b>Al</b>	Die cast Aluminium
		<b>S4S</b>	SS304
		<b>S6S</b>	SS316
<b>No. of Cable Entries</b>		<b>1</b>	Single
		<b>2</b>	Double
<b>Cable Entry (F)</b>		<b>15N</b>	1/2" NPT
		<b>20E</b>	3/4" ET
		<b>15M</b>	M20 x 1.5
		<b>15B</b>	1/2" BSP
<b>Head Type</b>		<b>H1</b>	Weatherproof IP-65
		<b>H2</b>	Weatherproof IP-67
		<b>H3</b>	Flameproof, IP-67, Gr IIA,IIB
		<b>H4</b>	Explosionproof, IP-67, Gr IIC
		<b>H5</b>	ATEX
<b>Element Length of "L" (mm)</b>			Pl. Specify in mm

Ordering Example:- TC0101-K-1-UG-IEC-1-6-S6S-Al-2-15N-H1-500-1(SS316)



# TC 0102 - Thermocouple Assembly with Nipple Extension



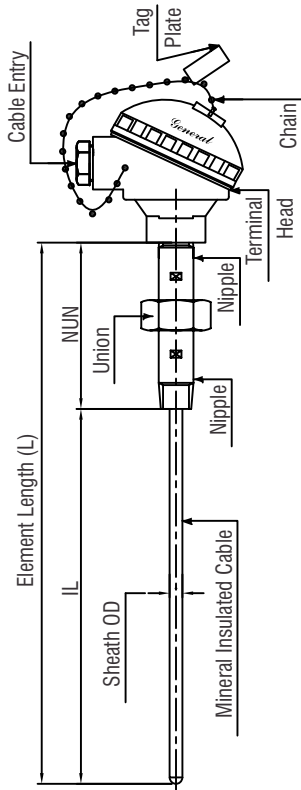
Other Options	
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special
9	Thermowell

## TC - 0102

<b>Element</b>		<b>K</b>	Chromel/Alumel
		<b>J</b>	Iron/Constantan
		<b>E</b>	Chromel/Constantan
		<b>T</b>	Copper/Constantan
		<b>N</b>	Nicrosil/Nisil
		<b>R</b>	Pt PtRh 13%
		<b>S</b>	Pt PtRh 10%
		<b>B</b>	PtRh 6% PtRh 30%
<b>Element Type</b>		<b>1</b>	Simplex
		<b>2</b>	Duplex
<b>Junction Style</b>		<b>UG</b>	Ungrounded
		<b>G</b>	Grounded
<b>Calibration Standard</b>		<b>IEC</b>	IEC 584
		<b>ANSI</b>	MC 96.1
<b>Calibration Class</b>		<b>1</b>	Class 1
		<b>2</b>	Class 2
		<b>3</b>	3 mm
		<b>4.5</b>	4.5 mm
<b>Sheath 'OD'</b>		<b>6</b>	6 mm
		<b>8</b>	8 mm
		<b>10</b>	10 mm
		<b>XXX</b>	Please Specify
<b>Sheath Material</b>		<b>S6S</b>	SS316
		<b>S6L</b>	SS316L
		<b>446</b>	SS446
		<b>600</b>	Incolly 600
		<b>310</b>	SS310
		<b>800</b>	Incolly 800
		<b>XXX</b>	Please Specify
<b>Terminal Head</b>		<b>AI</b>	Die cast Aluminium
		<b>S4S</b>	SS304
		<b>S6S</b>	SS316
<b>No. of Cable Entries</b>		<b>1</b>	Single
		<b>2</b>	Double
<b>Cable Entry (F)</b>		<b>15N</b>	1/2" NPT
		<b>20E</b>	3/4" ET
		<b>15M</b>	M20 x 1.5
		<b>15B</b>	1/2" BSP
<b>Head Type</b>		<b>H1</b>	Weatherproof IP-65
		<b>H2</b>	Weatherproof IP-67
		<b>H3</b>	Flameproof, IP-67, Gr IIA, IIB
		<b>H4</b>	Explosionproof, IP-67, Gr IIC
		<b>H5</b>	ATEX
<b>Nipple MOC</b>		<b>C</b>	Cadmium plated CS
		<b>S4</b>	SS304
		<b>S6</b>	SS316
<b>N Length</b>		<b>A</b>	75 mm
		<b>B</b>	100 mm
		<b>C</b>	150 mm
		<b>XXX</b>	Please Specify
<b>Connection Fitting</b>		<b>15N</b>	1/2" NPT
		<b>15B</b>	1/2" BSP
<b>Insertion Length of "IL" (mm)</b>		<b>XXX</b>	Please Specify
			Pl. Specify in mm

Ordering Example:- TC0102-K-1-UG-IEC-1-6-S6S-AI-2-15N-H2-C-B-15N-400-1(SS316)

# TC 0103 - Thermocouple Assembly with Nipple Union Nipple Extension



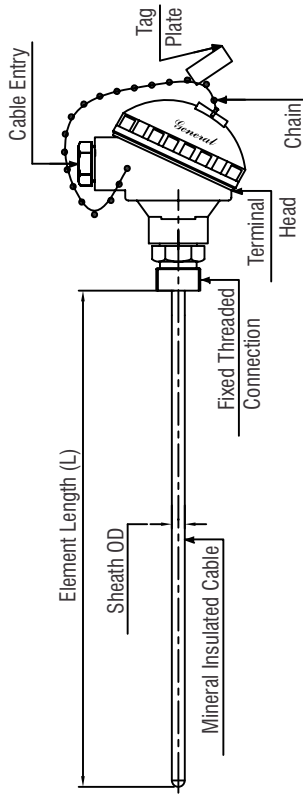
Other Options	
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special
9	Thermowell

## TC - 0103

<b>Element</b>		<b>K</b>	Chromel/Alumel
		<b>J</b>	Iron/Constantan
		<b>E</b>	Chromel/Constantan
		<b>T</b>	Copper/Constantan
		<b>N</b>	Nicrosil/Nisil
		<b>R</b>	Pt PtRh 13%
		<b>S</b>	Pt PtRh 10%
		<b>B</b>	PtRh 6% PtRh 30%
<b>Element Type</b>		<b>1</b>	Simplex
		<b>2</b>	Duplex
<b>Junction Style</b>		<b>UG</b>	Ungrounded
		<b>G</b>	Grounded
<b>Calibration Standard</b>		<b>IEC</b>	IEC 584
		<b>ANSI</b>	MC 96.1
<b>Calibration Class</b>		<b>1</b>	Class 1
		<b>2</b>	Class 2
		<b>3</b>	3 mm
		<b>4.5</b>	4.5 mm
<b>Sheath 'OD'</b>		<b>6</b>	6 mm
		<b>8</b>	8 mm
		<b>10</b>	10 mm
		<b>XXX</b>	Please Specify
<b>Sheath Material</b>		<b>S6S</b>	SS316
		<b>S6L</b>	SS316L
		<b>446</b>	SS446
		<b>600</b>	Incolly 600
		<b>310</b>	SS310
		<b>800</b>	Incolly 800
		<b>XXX</b>	Please Specify
<b>Terminal Head</b>		<b>AI</b>	Die cast Aluminium
		<b>S4S</b>	SS304
		<b>S6S</b>	SS316
<b>No. of Cable Entries</b>		<b>1</b>	Single
		<b>2</b>	Double
<b>Cable Entry (F)</b>		<b>15N</b>	1/2" NPT
		<b>20E</b>	3/4" ET
		<b>15M</b>	M20 x 1.5
		<b>15B</b>	1/2" BSP
<b>Head Type</b>		<b>H1</b>	Weatherproof IP-65
		<b>H2</b>	Weatherproof IP-67
		<b>H3</b>	Flameproof, IP-67, Gr IIA, IIB
		<b>H4</b>	Explosionproof, IP-67, Gr IIC
		<b>H5</b>	ATEX
<b>NUN MOC</b>		<b>C</b>	Cadmium plated CS
		<b>S4S</b>	SS304
		<b>S6S</b>	SS316
<b>NUN Length</b>		<b>B</b>	100 mm
		<b>C</b>	150 mm
		<b>XXX</b>	Please Specify
<b>Connection Fitting</b>		<b>15N</b>	1/2" NPT
		<b>15B</b>	1/2" BSP
<b>Insertion Length of "IL" (mm)</b>		<b>XXX</b>	Please Specify
			Pl. Specify in mm

Ordering Example:- TC0103-K-1-UG-IEC-1-6-S6S-AI-2-15N-H2-C-B-15N-400-1(SS316)

# TC 0104 - Thermocouple Assembly with Fixed Threaded Connection



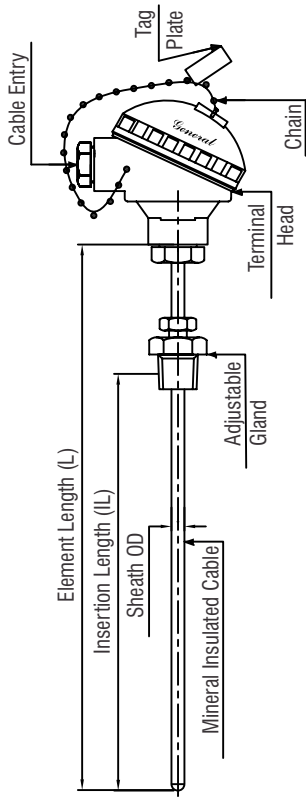
Other Options	
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special
9	Thermowell

## TC - 0104

<b>Element</b>		<b>K</b>	Chromel/Alumel
		<b>J</b>	Iron/Constantan
		<b>E</b>	Chromel/Constantan
		<b>T</b>	Copper/Constantan
		<b>N</b>	Nicrosil/Nisil
		<b>R</b>	Pt PtRh 13%
		<b>S</b>	Pt PtRh 10%
		<b>B</b>	PtRh 6% PtRh 30%
<b>Element Type</b>		<b>1</b>	Simplex
		<b>2</b>	Duplex
<b>Junction Style</b>		<b>UG</b>	Ungrounded
		<b>G</b>	Grounded
<b>Calibration Standard</b>		<b>IEC</b>	IEC 584
		<b>ANSI</b>	MC 96.1
<b>Calibration Class</b>		<b>1</b>	Class 1
		<b>2</b>	Class 2
<b>Sheath 'OD'</b>		<b>3</b>	3 mm
		<b>4.5</b>	4.5 mm
		<b>6</b>	6 mm
		<b>8</b>	8 mm
		<b>10</b>	10 mm
		<b>Other</b>	Please Specify
<b>Sheath Material</b>		<b>S6S</b>	SS316
		<b>S6L</b>	SS316L
		<b>446</b>	SS446
		<b>600</b>	Incolly 600
		<b>310</b>	SS310
		<b>800</b>	Incolly 800
		<b>XXX</b>	Please Specify
<b>Terminal Head</b>		<b>AI</b>	Die cast Aluminium
		<b>S4S</b>	SS304
		<b>S6S</b>	SS316
<b>No. of Cable Entries</b>		<b>1</b>	Single
		<b>2</b>	Double
<b>Cable Entry (F)</b>		<b>15N</b>	1/2" NPT
		<b>20E</b>	3/4" ET
		<b>15M</b>	M20 x 1.5
		<b>15B</b>	1/2" BSP
<b>Head Type</b>		<b>H1</b>	Weatherproof IP-65
		<b>H2</b>	Weatherproof IP-67
		<b>H3</b>	Flameproof, IP-67, Gr IIA,IIB
		<b>H4</b>	Explosionproof, IP-67, Gr IIC
		<b>H5</b>	ATEX
<b>Fixed Conn. MOC</b>		<b>S4S</b>	SS304
		<b>S6S</b>	SS316
<b>Connection Fitting</b>		<b>15N</b>	1/2 " NPT
		<b>15B</b>	1/2 " BSP
<b>Element Length of "L" (mm)</b>		<b>XXX</b>	Please Specify
			Pl. Specify in mm

Ordering Example:- TC0104-K-1-UG-IEC-1-6-S6S-AI-2-15N-H2-S6S-15N-400-1(S6)

# TC 0105 - Thermocouple Assembly with Adjustable Connection



Other Options	
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special
8	'L' Type Mounting Bracket
9	Thermowell

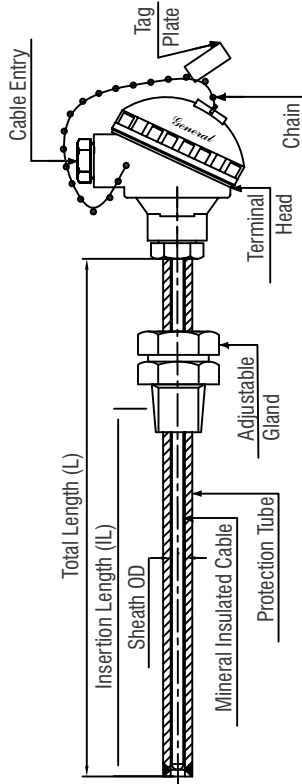
NOTE: Adjustable Gland Length - 50 mm  
L = IL + 50 mm

## TC - 0105

<b>Element</b>		<b>K</b>	Chromel/Alumel
		<b>J</b>	Iron/Constantan
		<b>E</b>	Chromel/Constantan
		<b>T</b>	Copper/Constantan
		<b>N</b>	Nicrosil/Nisil
		<b>R</b>	Pt PtRh 13%
		<b>S</b>	Pt PtRh 10%
		<b>B</b>	PtRh 6% PtRh 30%
<b>Element Type</b>		<b>1</b>	Simplex
		<b>2</b>	Duplex
<b>Junction Style</b>		<b>UG</b>	Ungrounded
		<b>G</b>	Grounded
<b>Calibration Standard</b>		<b>IEC</b>	IEC 584
		<b>ANSI</b>	MC 96.1
<b>Calibration Class</b>		<b>1</b>	Class 1
		<b>2</b>	Class 2
<b>Sheath 'OD'</b>		<b>3</b>	3 mm
		<b>4.5</b>	4.5 mm
		<b>6</b>	6 mm
		<b>8</b>	8 mm
		<b>10</b>	10 mm
		<b>XXX</b>	Please Specify
<b>Sheath Material</b>		<b>S6S</b>	SS316
		<b>S6L</b>	SS316L
		<b>446</b>	SS446
		<b>600</b>	Incolly 600
		<b>310</b>	SS310
		<b>800</b>	Incolly 800
		<b>XXX</b>	Please Specify
<b>Terminal Head</b>		<b>AI</b>	Die cast Aluminium
		<b>S4S</b>	SS304
		<b>S6S</b>	SS316
<b>No. of Cable Entries</b>		<b>1</b>	Single
		<b>2</b>	Double
<b>Cable Entry (F)</b>		<b>15N</b>	1/2" NPT
		<b>20E</b>	3/4" ET
		<b>15M</b>	M20 x 1.5
		<b>15B</b>	1/2" BSP
<b>Head Type</b>		<b>H1</b>	Weatherproof IP-65
		<b>H2</b>	Weatherproof IP-67
		<b>H3</b>	Flameproof, IP-67, Gr IIA,IIB
		<b>H4</b>	Explosionproof, IP-67, Gr IIC
		<b>H5</b>	ATEX
<b>Adj. Gland MOC</b>		<b>S4S</b>	SS304
		<b>S6S</b>	SS316
<b>Connection Fitting</b>		<b>15N</b>	1/2 " NPT
		<b>15B</b>	1/2 " BSP
<b>Insertion Length of "IL" (mm)</b>		<b>XXX</b>	Please Specify
			Pl. Specify in mm

Ordering Example:- TC0105-K-1-UG-IEC-1-6-S6S-AI-2-15N-H2-S6S-15N-400-1(SS316)

# TC 0106 - Thermocouple Assembly with Protecting Tube (Screwed Connection)



Other Options	
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special

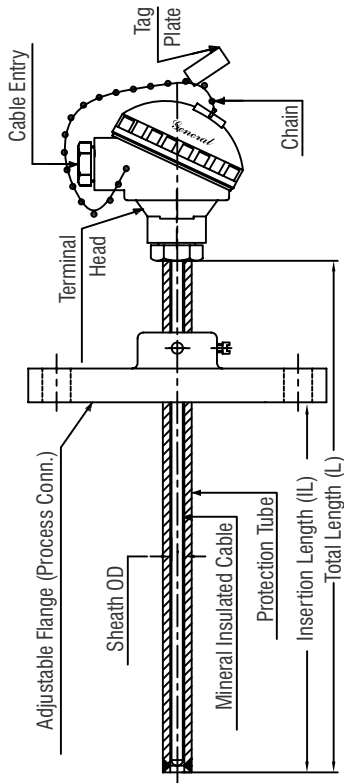
NOTE: Adjustable Gland Length - 50 mm  
L = IL + 50 mm

## TC - 0106

<b>Element</b>		<b>K</b> Chromel/Alumel	<b>J</b> Iron/Constantan
		<b>E</b> Chromel/Constantan	
		<b>T</b> Copper/Constantan	
		<b>N</b> Nicrosil/Nisil	<b>R</b> Pt PtRh 13%
		<b>S</b> Pt PtRh 10%	<b>B</b> PtRh 6% PtRh 30%
<b>Element Type</b>		<b>1</b> Simplex	<b>2</b> Duplex
<b>Junction Style</b>		<b>UG</b> Ungrounded	
		<b>G</b> Grounded	
<b>Calibration Standard</b>		<b>IEC</b> IEC 584	<b>ANSI</b> MC 96.1
<b>Calibration Class</b>		<b>1</b> Class 1	<b>2</b> Class 2
<b>Sheath 'OD'</b>		<b>3</b> 3 mm	<b>4.5</b> 4.5 mm
		<b>6</b> 6 mm	<b>8</b> 8 mm
		<b>10</b> 10 mm	
		<b>XXX</b> Please Specify	
<b>Sheath Material</b>		<b>S6S</b> SS316	<b>S6L</b> SS316L
		<b>446</b> SS446	<b>600</b> Incolloy 600
		<b>310</b> SS310	<b>800</b> Incolloy
		<b>XXX</b> Please Specify	
<b>Terminal Head</b>		<b>AI</b> Die cast Aluminium	
		<b>S4S</b> SS304	<b>S6S</b> SS316
<b>No. of Cable Entries</b>		<b>1</b> Single	<b>2</b> Double
<b>Cable Entry (F)</b>		<b>15N</b> 1/2" NPT	<b>20E</b> 3/4" ET
		<b>15M</b> M20 x 1.5	<b>15B</b> 1/2" BSP
<b>Head Type</b>		<b>H1</b> Weatherproof IP-65	
		<b>H2</b> Weatherproof IP-67	
		<b>H3</b> Flameproof, IP-67, Gr IIA,IIB	
		<b>H4</b> Explosionproof, IP-67, Gr IIC	
		<b>H5</b> ATEX	
		<b>S4S</b> SS304	<b>825</b> Incolloy® 825
		<b>S6S</b> SS316	<b>600</b> Inconel® 600
		<b>310</b> SS310	<b>800</b> Incolloy® 800
		<b>446</b> SS446	<b>321</b> SS321
		<b>S4L</b> SS304L	<b>KAN</b> Kanthal
		<b>S6L</b> SS316L	<b>HCC</b> Hastelloy® C-276
		<b>CST</b> CS	<b>HCB</b> Hastelloy® B
		<b>410</b> SS410	<b>MN4</b> Monel® 400
		<b>S7S</b> SS317	<b>MN5</b> Monel® 500
		<b>S7L</b> SS317L	<b>T</b> Ti-II
		<b>N20</b> Nickel 200	<b>XXX</b> Please Specify
		**Special material on Request	
		Protection Tube Standard Sizes	
		<b>A</b> 10x7	<b>B</b> 12x7
		<b>C</b> 14x7	<b>D</b> 14x9
<b>Protection Tube Material</b>		<b>S4S</b> SS304	<b>S6S</b> SS316
		<b>15N</b> 1/2" NPT	<b>15B</b> 1/2" BSP
		<b>XXX</b> Please Specify	
<b>Protection Tube Size</b>		Pl. Specify in mm	
<b>Adj. Gland MOC</b>		<b>S4S</b> SS304	<b>S6S</b> SS316
<b>Connection Fitting</b>		<b>15N</b> 1/2" NPT	<b>15B</b> 1/2" BSP
<b>Insertion Length of "IL" (mm)</b>		Pl. Specify in mm	

Ordering Example:- TC0106-K-1-UG-IEC-1-6-S6S-AI-2-15N-H2-S6S-A-S6S-15N-400-1(SS316)

# TC 0107 - Thermocouple with Protecting Tube (Flanged Connection)



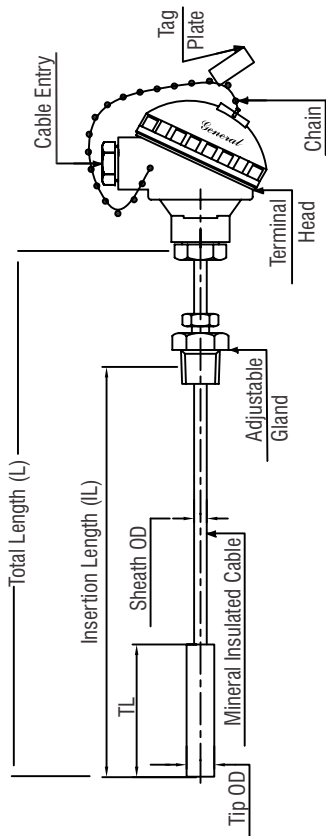
Other Options	
0	None
1	Cable Gland (Specify MOC [S4,S6,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special

## TC - 0107

<b>Element</b>	<table border="1"> <tr> <td><b>K</b></td> <td>Chromx/Alumel</td> <td><b>J</b></td> <td>Iron/Constantan</td> </tr> <tr> <td><b>E</b></td> <td>Chromel/Constantan</td> <td></td> <td></td> </tr> <tr> <td><b>T</b></td> <td>Copper/Constantan</td> <td></td> <td></td> </tr> <tr> <td><b>N</b></td> <td>Nicrosil/Nisil</td> <td><b>R</b></td> <td>Pt PtRh 13%</td> </tr> <tr> <td><b>S</b></td> <td>Pt PtRh 10%</td> <td><b>B</b></td> <td>PtRh 6% PtRh 30%</td> </tr> </table>		<b>K</b>	Chromx/Alumel	<b>J</b>	Iron/Constantan	<b>E</b>	Chromel/Constantan			<b>T</b>	Copper/Constantan			<b>N</b>	Nicrosil/Nisil	<b>R</b>	Pt PtRh 13%	<b>S</b>	Pt PtRh 10%	<b>B</b>	PtRh 6% PtRh 30%																								
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<b>Element Type</b>	<table border="1"> <tr> <td><b>1</b></td> <td>Simplex</td> <td><b>2</b></td> <td>Duplex</td> </tr> </table>		<b>1</b>	Simplex	<b>2</b>	Duplex																																								
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<b>Junction Style</b>	<table border="1"> <tr> <td><b>UG</b></td> <td>Ungrounded</td> <td><b>G</b></td> <td>Grounded</td> </tr> </table>		<b>UG</b>	Ungrounded	<b>G</b>	Grounded																																								
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<b>Calibration Standard</b>	<table border="1"> <tr> <td><b>IEC</b></td> <td>IEC 584</td> <td><b>ANSI</b></td> <td>MC 96.1</td> </tr> </table>		<b>IEC</b>	IEC 584	<b>ANSI</b>	MC 96.1																																								
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<b>Calibration Class</b>	<table border="1"> <tr> <td><b>1</b></td> <td>Class 1</td> <td><b>2</b></td> <td>Class 2</td> </tr> </table>		<b>1</b>	Class 1	<b>2</b>	Class 2																																								
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<b>Sheath 'OD'</b>	<table border="1"> <tr> <td><b>3</b></td> <td>3 mm</td> <td><b>4.5</b></td> <td>4.5 mm</td> </tr> <tr> <td><b>6</b></td> <td>6 mm</td> <td><b>8</b></td> <td>8 mm</td> </tr> <tr> <td><b>10</b></td> <td>10 mm</td> <td></td> <td></td> </tr> <tr> <td><b>XXX</b></td> <td colspan="3">Please Specify</td> </tr> </table>		<b>3</b>	3 mm	<b>4.5</b>	4.5 mm	<b>6</b>	6 mm	<b>8</b>	8 mm	<b>10</b>	10 mm			<b>XXX</b>	Please Specify																														
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<b>10</b>	10 mm																																													
<b>XXX</b>	Please Specify																																													
<b>Sheath Material</b>	<table border="1"> <tr> <td><b>S6S</b></td> <td>SS316</td> <td><b>S6L</b></td> <td>SS316L</td> </tr> <tr> <td><b>446</b></td> <td>SS446</td> <td><b>600</b></td> <td>Incolly 600</td> </tr> <tr> <td><b>310</b></td> <td>SS310</td> <td><b>800</b></td> <td>Incolly 800</td> </tr> <tr> <td><b>XXX</b></td> <td colspan="3">Please Specify</td> </tr> </table>		<b>S6S</b>	SS316	<b>S6L</b>	SS316L	<b>446</b>	SS446	<b>600</b>	Incolly 600	<b>310</b>	SS310	<b>800</b>	Incolly 800	<b>XXX</b>	Please Specify																														
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<b>Terminal Head</b>	<table border="1"> <tr> <td><b>AI</b></td> <td colspan="3">Die cast Aluminium</td> </tr> <tr> <td><b>S4S</b></td> <td>SS304</td> <td><b>S6S</b></td> <td>SS316</td> </tr> </table>		<b>AI</b>	Die cast Aluminium			<b>S4S</b>	SS304	<b>S6S</b>	SS316																																				
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<b>No. of Cable Entries</b>	<table border="1"> <tr> <td><b>1</b></td> <td>Single</td> <td><b>2</b></td> <td>Double</td> </tr> </table>		<b>1</b>	Single	<b>2</b>	Double																																								
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<b>Cable Entry (F)</b>	<table border="1"> <tr> <td><b>15N</b></td> <td>1/2" NPT</td> <td><b>20E</b></td> <td>3/4" ET</td> </tr> <tr> <td><b>15M</b></td> <td>M20 x 1.5</td> <td><b>15B</b></td> <td>1/2" BSP</td> </tr> </table>		<b>15N</b>	1/2" NPT	<b>20E</b>	3/4" ET	<b>15M</b>	M20 x 1.5	<b>15B</b>	1/2" BSP																																				
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<b>Head Type</b>	<table border="1"> <tr> <td><b>H1</b></td> <td>Weatherproof IP-65</td> <td><b>H2</b></td> <td>Weatherproof IP-67</td> </tr> <tr> <td><b>H3</b></td> <td colspan="3">Flameproof, IP-67, Gr IIA,IIB</td> </tr> <tr> <td><b>H4</b></td> <td colspan="3">Explosionproof, IP-67, Gr IIC</td> </tr> <tr> <td><b>H5</b></td> <td colspan="3">ATEX</td> </tr> </table>		<b>H1</b>	Weatherproof IP-65	<b>H2</b>	Weatherproof IP-67	<b>H3</b>	Flameproof, IP-67, Gr IIA,IIB			<b>H4</b>	Explosionproof, IP-67, Gr IIC			<b>H5</b>	ATEX																														
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<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825																																											
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<b>Protection Tube Size</b>	<table border="1"> <tr> <th colspan="4">Protection Tube Standard Sizes</th> </tr> <tr> <td><b>A</b></td> <td>10x7</td> <td><b>B</b></td> <td>12x7</td> </tr> <tr> <td><b>C</b></td> <td>14x7</td> <td><b>D</b></td> <td>14x9</td> </tr> <tr> <td><b>XXX</b></td> <td colspan="3">Please Specify</td> </tr> </table>		Protection Tube Standard Sizes				<b>A</b>	10x7	<b>B</b>	12x7	<b>C</b>	14x7	<b>D</b>	14x9	<b>XXX</b>	Please Specify																														
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<b>Process Conn. Fitting</b>	<table border="1"> <thead> <tr> <th>Size</th> <th>Code</th> <th>Rating</th> <th>Code</th> <th>Facing</th> <th>Code</th> </tr> </thead> <tbody> <tr> <td>1/2"</td> <td>15</td> <td>150#</td> <td>A</td> <td>RF</td> <td>RF</td> </tr> <tr> <td>3/4"</td> <td>20</td> <td>300#</td> <td>B</td> <td>FF</td> <td>FF</td> </tr> <tr> <td>1"</td> <td>25</td> <td>600#</td> <td>C</td> <td>RTJ</td> <td>RTJ</td> </tr> <tr> <td>1.5"</td> <td>40</td> <td>900#</td> <td>D</td> <td>LT</td> <td>LT</td> </tr> <tr> <td>2"</td> <td>50</td> <td>1500#</td> <td>E</td> <td>LG</td> <td>LG</td> </tr> <tr> <td>3"</td> <td>80</td> <td>2500#</td> <td>F</td> <td></td> <td></td> </tr> </tbody> </table>		Size	Code	Rating	Code	Facing	Code	1/2"	15	150#	A	RF	RF	3/4"	20	300#	B	FF	FF	1"	25	600#	C	RTJ	RTJ	1.5"	40	900#	D	LT	LT	2"	50	1500#	E	LG	LG	3"	80	2500#	F				
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1/2"	15	150#	A	RF	RF																																									
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<b>Flange</b>	<table border="1"> <tr> <td><b>CST</b></td> <td>CS</td> <td><b>S4S</b></td> <td>SS304</td> <td><b>S6S</b></td> <td>SS316</td> </tr> </table>		<b>CST</b>	CS	<b>S4S</b>	SS304	<b>S6S</b>	SS316																																						
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<b>Insertion Length of "IL" (mm)</b>	<table border="1"> <tr> <td><b>PI</b></td> <td colspan="3">Specify in mm</td> </tr> </table>		<b>PI</b>	Specify in mm																																										
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Ordering Example:- TC0107-K-1-UG-IEC-1-6-S6S-AI-2-15N-H2-S6S-A-15ARF-CST-400-3

# TC 0108 - Thermocouple Assembly with Adjustable Conn. & Tip Assembly



Other Options	
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special
8	'L' Type Mounting Bracket

**NOTE:** Adjustable Gland Length - 50 mm  
 $L = IL + 50$

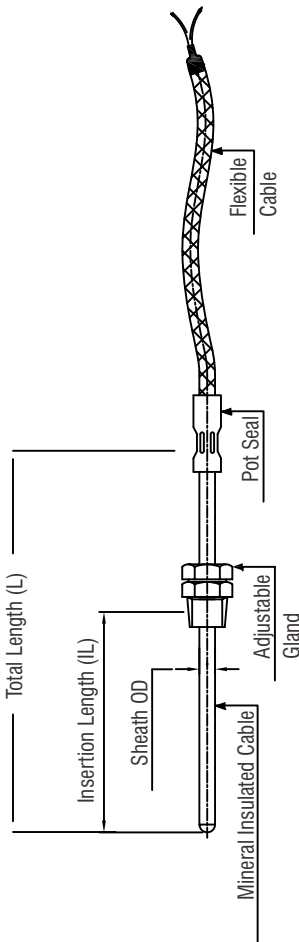
## TC - 0108

<b>Element</b>		<b>K</b>	Chromel/Alumel
		<b>J</b>	Iron/Constantan
		<b>E</b>	Chromel/Constantan
		<b>T</b>	Copper/Constantan
		<b>N</b>	Nicrosil/Nisil
		<b>R</b>	Pt PtRh 13%
		<b>S</b>	Pt PtRh 10%
		<b>B</b>	PtRh 6% PtRh 30%
<b>Element Type</b>		<b>1</b>	Simplex
		<b>2</b>	Duplex
<b>Junction Style</b>		<b>UG</b>	Ungrounded
		<b>G</b>	Grounded
<b>Calibration Standard</b>		<b>IEC</b>	IEC 584
		<b>ANSI</b>	MC 96.1
<b>Calibration Class</b>		<b>1</b>	Class 1
		<b>2</b>	Class 2
<b>Sheath 'OD' (Tip "OD")</b>		<b>3</b>	3 mm
		<b>4.5</b>	4.5 mm
		<b>6</b>	6 mm
		<b>8</b>	8 mm
		<b>10</b>	10 mm
		<b>XXX</b>	Please Specify
<b>Sheath Material</b>		<b>S6S</b>	SS316
		<b>S6L</b>	SS316L
		<b>446</b>	SS446
		<b>600</b>	Incolly 600
		<b>310</b>	SS310
		<b>800</b>	Incolly 800
		<b>XXX</b>	Please Specify
<b>Terminal Head</b>		<b>AI</b>	Die cast Aluminium
		<b>S4S</b>	SS304
		<b>S6S</b>	SS316
<b>No. of Cable Entries</b>		<b>1</b>	Single
		<b>2</b>	Double
<b>Cable Entry (F)</b>		<b>15N</b>	1/2" NPT
		<b>20E</b>	3/4" ET
		<b>15M</b>	M20 x 1.5
		<b>15B</b>	1/2" BSP
<b>Head Type</b>		<b>H1</b>	Weatherproof IP-65
		<b>H2</b>	Weatherproof IP-67
		<b>H3</b>	Flameproof, IP-67, Gr IIA,IIB
		<b>H4</b>	Explosionproof, IP-67, Gr IIC
		<b>H5</b>	ATEX
<b>Adj. Gland MOC</b>		<b>S4S</b>	SS304
		<b>S6S</b>	SS316
<b>Connection Fitting</b>		<b>15N</b>	1/2 " NPT
		<b>15B</b>	1/2 " BSP
		<b>XXX</b>	Please Specify
<b>Insertion Length of "IL" (mm)</b>			Pl. Specify in mm
<b>Tip OD &amp; Length of "TL" (mm)</b>			Pl. Specify in mm

**Ordering Example:- TC0108-K-1-UG-IEC-1-6-S6S-AI-2-15N-H2-S6S-15N-400-10-0**



# TC 0201 - Thermocouple with Transition Joint



Other Options	
0	None
1	CE Certification
2	SS Conduit ( Armour )

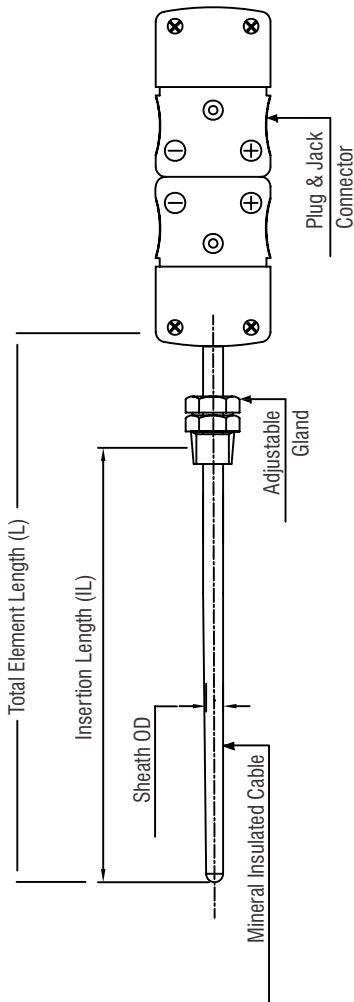
**NOTE:** Pot Seal Length (Standard) - 40 mm  
 $L = IL + 50$

## TC - 0201

<b>Element</b>	<b>K</b>	Chromel/Alumel		
	<b>J</b>	Iron/Constantan		
	<b>E</b>	Chromel/Constantan		
	<b>T</b>	Copper/Constantan		
	<b>N</b>	Nicrosil/Nisil		
	<b>R</b>	Pt PtRh 13%		
	<b>S</b>	Pt PtRh 10%		
<b>Element Type</b>	<b>1</b>	Simplex		
	<b>2</b>	Duplex		
<b>Junction Style</b>	<b>UG</b>	Ungrounded		
	<b>G</b>	Grounded		
<b>Calibration Standard</b>	<b>IEC</b>	IEC 584		
	<b>ANSI</b>	MC 96.1		
<b>Calibration Class</b>	<b>1</b>	Class 1		
	<b>2</b>	Class 2		
<b>Sheath 'OD'</b>	<b>3</b>	3 mm		
	<b>4.5</b>	4.5 mm		
	<b>6</b>	6 mm		
	<b>8</b>	8 mm		
	<b>10</b>	10 mm		
	<b>XXX</b>	Please Specify		
<b>Sheath Material</b>	<b>S6S</b>	SS316	<b>S6L</b>	SS316L
	<b>446</b>	SS446	<b>600</b>	Incolly 600
	<b>310</b>	SS310	<b>800</b>	Incolly 800
	<b>XXX</b>	Please Specify		
	<b>Adj. Gland MOC</b>	<b>S4S</b>	SS304	
<b>Connection Fitting</b>	<b>S6S</b>	SS316		
	<b>XXX</b>	Please Specify		
	<b>15N</b>	½ " NPT		
<b>Insertion Length of "IL" (mm)</b>	<b>15B</b>	½ " BSP		
	<b>XXX</b>	Please Specify		
<b>Flexible Cable Type</b>	<b>1</b>	PTFE insulated, PTFE overall cable		
	<b>2</b>	PTFE Insulated, overall PTFE & SS braided cable		
	<b>3</b>	FG/FG Insulated cable		
	<b>4</b>	FG/FG/SS Cable		
	<b>5</b>	PTFE / SS / FG		
	<b>Flexible Cable Length in (mm)</b>	Pl. Specify in mm		

**Ordering Example:- TC201-K-1-UG-IEC-1-6-S6S-S4S-15N-500-1-3000**

# TC 202 - Thermocouple Insert with Plug & Jack Connector



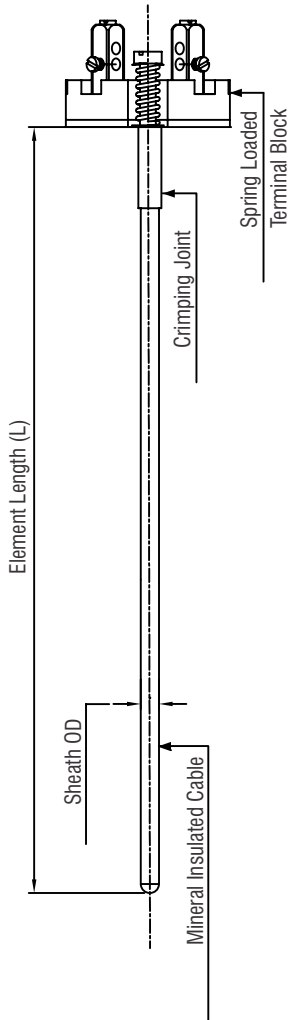
**NOTE:** Adjustable Gland Length - 50 mm  
 $L = IL + 50 \text{ mm}$

## TC - 0202

<b>Element</b>	<b>K</b>	Chromel/Alumel		
	<b>J</b>	Iron/Constantan		
	<b>E</b>	Chromel/Constantan		
	<b>T</b>	Copper/Constantan		
	<b>N</b>	Nicrosil/Nisil		
	<b>R</b>	Pt PtRh 13%		
	<b>S</b>	Pt PtRh 10%		
	<b>B</b>	PtRh 6% PtRh 30%		
<b>Element Type</b>	<b>1</b>	Simplex		
	<b>2</b>	Duplex		
<b>Junction Style</b>	<b>UG</b>	Ungrounded		
	<b>G</b>	Grounded		
<b>Calibration Standard</b>	<b>IEC</b>	IEC 584		
	<b>ANSI</b>	MC 96.1		
<b>Calibration Class</b>	<b>1</b>	Class 1		
	<b>2</b>	Class 2		
<b>Sheath 'OD'</b>	<b>3</b>	3 mm		
	<b>4.5</b>	4.5 mm		
	<b>6</b>	6 mm		
	<b>8</b>	8 mm		
	<b>10</b>	10 mm		
	<b>XXX</b>	Please Specify		
<b>Sheath Material</b>	<b>S6S</b>	SS316	<b>S6L</b>	SS316L
	<b>446</b>	SS446	<b>600</b>	Incolly 600
	<b>310</b>	SS310	<b>800</b>	Incolly 800
	<b>XXX</b>	Please Specify		
	<b>S4S</b>	SS304		
<b>Adj. Gland MOC</b>	<b>S6S</b>	SS316		
	<b>XXX</b>	Please Specify		
	<b>15N</b>	1/2" NPT		
<b>Connection Fitting</b>	<b>15B</b>	1/2" BSP		
	<b>XXX</b>	Please Specify		
<b>Insertion Length of "IL" (mm)</b>	Pl. Specify in mm			

**Ordering Example:- TC0202-K-1-UG-IEC-1-6-S6S-S4S-15N-500**

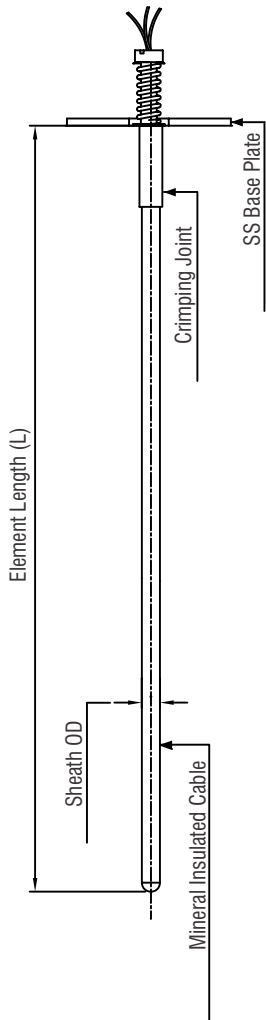
# TC 203 - Thermocouple Insert with Spring Loaded Terminal Block



## TC - 0203

<b>Element</b>		<b>K</b>	Chromel/Alumel
		<b>J</b>	Iron/Constantan
		<b>E</b>	Chromel/Constantan
		<b>T</b>	Copper/Constantan
		<b>N</b>	Nicrosil/Nisil
		<b>R</b>	Pt PtRh 13%
		<b>S</b>	Pt PtRh 10%
		<b>B</b>	PtRh 6% PtRh 30%
<b>Element Type</b>		<b>1</b>	Simplex
		<b>2</b>	Duplex
<b>Junction Style</b>		<b>UG</b>	Ungrounded
		<b>G</b>	Grounded
<b>Calibration Standard</b>		<b>IEC</b>	IEC 584
		<b>ANSI</b>	MC 96.1
<b>Calibration Class</b>		<b>1</b>	Class 1
		<b>2</b>	Class 2
<b>Sheath 'OD'</b>		<b>3</b>	3 mm
		<b>4.5</b>	4.5 mm
		<b>6</b>	6 mm
		<b>8</b>	8 mm
		<b>10</b>	10 mm
		<b>XXX</b>	Please Specify
<b>Sheath Material</b>		<b>S6S</b>	SS316
		<b>S6L</b>	SS316L
		<b>446</b>	SS446
		<b>600</b>	Incolly 600
		<b>310</b>	SS310
		<b>800</b>	Incolly 800
		<b>XXX</b>	Please Specify
<b>Element Length of "L" (mm)</b>		Pl. Specify in mm	

# TC 204 - Thermocouple Insert with SS Base Plate For Temperature Transmitter Mounting

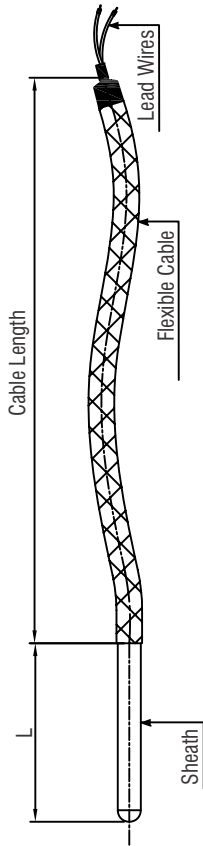


## TC - 0204

<b>Element</b>		<b>K</b>	Chromel/Alumel
		<b>J</b>	Iron/Constantan
		<b>E</b>	Chromel/Constantan
		<b>T</b>	Copper/Constantan
		<b>N</b>	Nicrosil/Nisil
		<b>R</b>	Pt PtRh 13%
		<b>S</b>	Pt PtRh 10%
		<b>B</b>	PtRh 6% PtRh 30%
<b>Element Type</b>		<b>1</b>	Simplex
		<b>2</b>	Duplex
<b>Junction Style</b>		<b>UG</b>	Ungrounded
		<b>G</b>	Grounded
<b>Calibration Standard</b>		<b>IEC</b>	IEC 584
		<b>ANSI</b>	MC 96.1
<b>Calibration Class</b>		<b>1</b>	Class 1
		<b>2</b>	Class 2
<b>Sheath 'OD'</b>		<b>3</b>	3 mm
		<b>4.5</b>	4.5 mm
		<b>6</b>	6 mm
		<b>8</b>	8 mm
		<b>10</b>	10 mm
		<b>XXX</b>	Please Specify
<b>Sheath Material</b>		<b>S6S</b>	SS316
		<b>S6L</b>	SS316L
		<b>446</b>	SS446
		<b>600</b>	Incolloy 600
		<b>310</b>	SS310
		<b>800</b>	Incolloy 800
		<b>XXX</b>	Please Specify
<b>Element Length of "L" (mm)</b>		Pl. Specify in mm	

Ordering Example:- TC0204-K-1-UG-IEC-1-6-S6S-500

# TC 0205 - Bearing Temperature Thermocouple

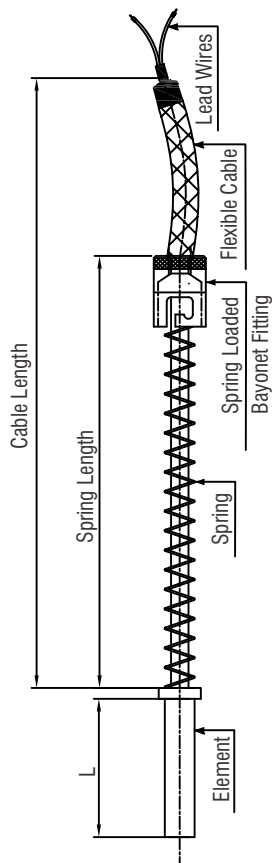


## TC - 0205

<b>Element</b>	<b>K</b>	Chromel/Alumel		
	<b>J</b>	Iron/Constantan		
	<b>E</b>	Chromel/Constantan		
	<b>T</b>	Copper/Constantan		
	<b>N</b>	Nicrosil/Nisil		
	<b>R</b>	Pt PtRh 13%		
	<b>S</b>	Pt PtRh 10%		
	<b>B</b>	PtRh 6% PtRh 30%		
<b>Element Type</b>	<b>1</b>	Simplex		
	<b>2</b>	Duplex		
<b>Junction Style</b>	<b>UG</b>	Ungrounded		
	<b>G</b>	Grounded		
<b>Calibration Standard</b>	<b>IEC</b>	IEC 584		
	<b>ANSI</b>	MC 96.1		
<b>Calibration Class</b>	<b>1</b>	Class 1		
	<b>2</b>	Class 2		
<b>Sheath 'OD'</b>	<b>3</b>	3 mm		
	<b>4.5</b>	4.5 mm		
	<b>6</b>	6 mm		
	<b>8</b>	8 mm		
	<b>10</b>	10 mm		
	<b>XXX</b>	Please Specify		
<b>Sheath Material</b>	<b>S6S</b>	SS316	<b>S6L</b>	SS316L
	<b>446</b>	SS446	<b>600</b>	Incolly 600
	<b>310</b>	SS310	<b>800</b>	Incolly 800
	<b>XXX</b>	Please Specify		
	<b>Element Length of "L" (mm)</b>			
Pl. Specify in mm				
<b>Flexible Cable Type</b>	<b>1</b>	PTFE insulated, PTFE overall cable		
	<b>2</b>	PTFE Insulated, overall PTFE & SS braided cable		
	<b>3</b>	FG/FG Insulated cable		
	<b>4</b>	FG/FG/SS Cable		
	<b>5</b>	PTFE / SS / FG		
<b>Flexible Cable Length (mm)</b>	Pl. Specify in mm			

Ordering Example:- TC0205-K-1-UG-IEC-1-6-S6S-500-1-3000

# TC 0206 - Thermocouple Insert With Spring Loaded Bayonet Fitting (Straight)

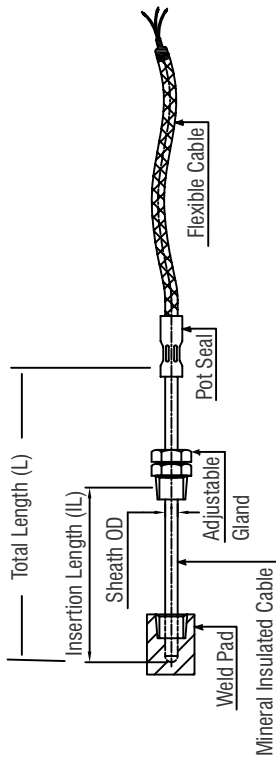


## TC - 0206

<b>Element</b>		<b>K</b>	Chromel/Alumel
		<b>J</b>	Iron/Constantan
		<b>E</b>	Chromel/Constantan
		<b>T</b>	Copper/Constantan
		<b>N</b>	Nicrosil/Nisil
		<b>R</b>	Pt PtRh 13%
		<b>S</b>	Pt PtRh 10%
		<b>B</b>	PtRh 6% PtRh 30%
<b>Element Type</b>		<b>1</b>	Simplex
		<b>2</b>	Duplex
<b>Junction Style</b>		<b>UG</b>	Ungrounded
		<b>G</b>	Grounded
<b>Calibration Standard</b>		<b>IEC</b>	IEC 584
		<b>ANSI</b>	MC 96.1
<b>Calibration Class</b>		<b>1</b>	Class 1
		<b>2</b>	Class 2
<b>Sheath 'OD'</b>		<b>3</b>	3 mm
		<b>4.5</b>	4.5 mm
		<b>6</b>	6 mm
		<b>8</b>	8 mm
		<b>10</b>	10 mm
		<b>XXX</b>	Please Specify
<b>Sheath Material</b>		<b>S6S</b>	SS316
		<b>S6L</b>	SS316L
		<b>446</b>	SS446
		<b>600</b>	Incolly 600
		<b>310</b>	SS310
		<b>800</b>	Incolly 800
		<b>XXX</b>	Please Specify
<b>Element Length of "L" (mm)</b>		Pl. Specify in mm	
<b>Flexible Cable Type</b>		<b>1</b>	PTFE insulated, PTFE overall cable
		<b>2</b>	PTFE Insulated, overall PTFE & SS braided cable
		<b>3</b>	FG/FG Insulated cable
		<b>4</b>	FG/FG/SS Cable
		<b>5</b>	PTFE / SS / FG
<b>Flexible Cable Length "TL" (mm)</b>		Pl. Specify in mm	

Ordering Example:- TC0206-K-1-UG-IEC-1-6-S6S-500-1-3000

# TC 0207 - Thermocouple with Weld Pad & Cable



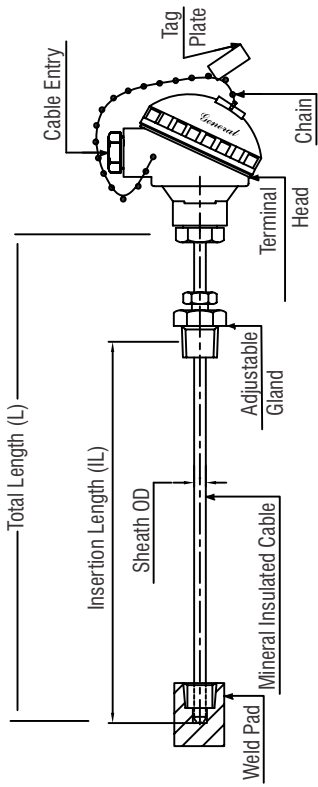
**NOTE:** Pot Seal Length(Standard) - 40 mm  
 $L = IL + 50 \text{ mm}$

## TC - 0207

<b>Element</b>		<b>K</b>	Chromel/Alumel
		<b>J</b>	Iron/Constantan
		<b>E</b>	Chromel/Constantan
		<b>T</b>	Copper/Constantan
		<b>N</b>	Nicrosil/Nisil
		<b>R</b>	Pt PtRh 13%
		<b>S</b>	Pt PtRh 10%
		<b>B</b>	PtRh 6% PtRh 30%
<b>Element Type</b>		<b>1</b>	Simplex
		<b>2</b>	Duplex
<b>Junction Style</b>		<b>UG</b>	Ungrounded
		<b>G</b>	Grounded
<b>Calibration Standard</b>		<b>IEC</b>	IEC 584
		<b>ANSI</b>	MC 96.1
<b>Calibration Class</b>		<b>1</b>	Class 1
		<b>2</b>	Class 2
<b>Sheath 'OD'</b>		<b>3</b>	3 mm
		<b>4.5</b>	4.5 mm
		<b>6</b>	6 mm
		<b>8</b>	8 mm
		<b>10</b>	10 mm
		<b>XXX</b>	Please Specify
<b>Sheath Material</b>		<b>S6S</b>	SS316
		<b>S6L</b>	SS316L
		<b>446</b>	SS446
		<b>600</b>	Incolly 600
		<b>310</b>	SS310
		<b>800</b>	Incolly 800
		<b>XXX</b>	Please Specify
<b>Adj. Gland MOC</b>		<b>S4S</b>	SS304
		<b>S6S</b>	SS316
		<b>XXX</b>	Please Specify
<b>Connection Fitting</b>		<b>15N</b>	1/2 " NPT
		<b>15B</b>	1/2 " BSP
		<b>XXX</b>	Please Specify
<b>Insertion Length of "IL" (mm)</b>		Pl. Specify in mm	
<b>Flexible Cable Type</b>		<b>1</b>	PTFE insulated, PTFE overall cable
		<b>2</b>	PTFE Insulated, overall PTFE & SS braided cable
		<b>3</b>	FG/FG Insulated cable
		<b>4</b>	FG/FG/SS Cable
		<b>5</b>	PTFE / SS / FG
<b>Flexible Cable Length in (mm)</b>		Pl. Specify in mm	
<b>Weld Pad MOC</b>		<b>S6S</b>	SS316
		<b>S6L</b>	SS316L
		<b>XXX</b>	Please Specify
<b>Weld Pad Dimensions</b>		Length (L) x Breadth (B) x Height (H)	



# TC 0301 - Thermocouple Assembly with Adjustable Connection with Weld Pad



	Other Options
0	None
1	Cable Gland (Specify MOC [S4,S6,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special
8	'L' Type Mounting Bracket

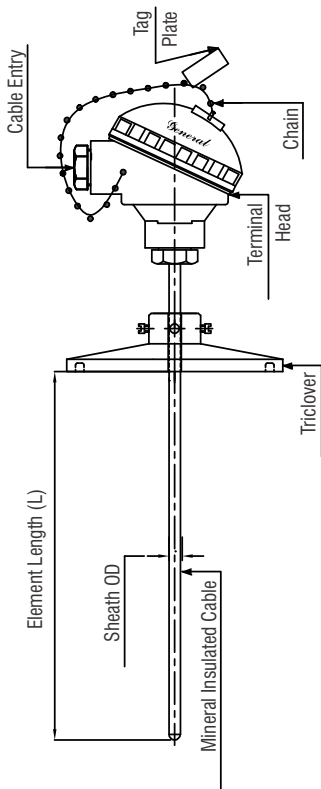
**NOTE:** Adjustable Gland Length - 50 mm  
 $L = IL + 50 \text{ mm}$

## TC - 0301

<b>Element</b>		<b>K</b>	Chromel/Alumel
		<b>J</b>	Iron/Constantan
		<b>E</b>	Chromel/Constantan
		<b>T</b>	Copper/Constantan
		<b>N</b>	Nicrosil/Nisil
		<b>R</b>	Pt PtRh 13%
		<b>S</b>	Pt PtRh 10%
		<b>B</b>	PtRh 6% PtRh 30%
<b>Element Type</b>		<b>1</b>	Simplex
		<b>2</b>	Duplex
<b>Junction Style</b>		<b>UG</b>	Ungrounded
		<b>G</b>	Grounded
<b>Calibration Standard</b>		<b>IEC</b>	IEC 584
		<b>ANSI</b>	MC 96.1
<b>Calibration Class</b>		<b>1</b>	Class 1
		<b>2</b>	Class 2
<b>Sheath 'OD'</b>		<b>3</b>	3 mm
		<b>4.5</b>	4.5 mm
		<b>6</b>	6 mm
		<b>8</b>	8 mm
		<b>10</b>	10 mm
		<b>XXX</b>	Please Specify
<b>Sheath Material</b>		<b>S6S</b>	SS316
		<b>S6L</b>	SS316L
		<b>446</b>	SS446
		<b>600</b>	Incolly 600
		<b>310</b>	SS310
		<b>800</b>	Incolly 800
		<b>XXX</b>	Please Specify
<b>Terminal Head</b>		<b>AI</b>	Die cast Aluminium
		<b>S4S</b>	SS304
		<b>S6S</b>	SS316
<b>No. of Cable Entries</b>		<b>1</b>	Single
		<b>2</b>	Double
<b>Cable Entry (F)</b>		<b>15N</b>	1/2" NPT
		<b>20E</b>	3/4" ET
		<b>15M</b>	M20 x 1.5
		<b>15B</b>	1/2" BSP
<b>Head Type</b>		<b>H1</b>	Weatherproof IP-65
		<b>H2</b>	Weatherproof IP-67
		<b>H3</b>	Flameproof, IP-67, Gr IIA,IIB
		<b>H4</b>	Explosionproof, IP-67, Gr IIC
		<b>H5</b>	ATEX
<b>Adj. Gland MOC</b>		<b>S4S</b>	SS304
		<b>S6S</b>	SS316
<b>Connection Fitting</b>		<b>15N</b>	1/2 " NPT
		<b>15B</b>	1/2 " BSP
<b>Insertion Length of "IL" (mm)</b>		<b>XXX</b>	Please Specify
			Pl. Specify in mm
<b>Weld Pad MOC</b>		<b>S6S</b>	SS316
		<b>S6L</b>	SS316L
		<b>XXX</b>	Please Specify
<b>Weld Pad Dimensions</b>			Length (L) x Breadth (B) x Height (H)

**Ordering Example:- TC0301-K-1-UG-IEC-1-6-S6S-AI-2-15N-H2-S6S-15N-400-S6S-25x25x15-0**

# TC 0302 -Thermocouple Assembly with Tri-Clamp Adjustable Connection



	Other Options
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification

## TC - 0302

<b>Element</b>		<b>K</b>	Chromel/Alumel
		<b>J</b>	Iron/Constantan
		<b>E</b>	Chromel/Constantan
		<b>T</b>	Copper/Constantan
		<b>N</b>	Nicrosil/Nisil
		<b>R</b>	Pt PtRh 13%
		<b>S</b>	Pt PtRh 10%
		<b>B</b>	PtRh 6% PtRh 30%
<b>Element Type</b>		<b>1</b>	Simplex
		<b>2</b>	Duplex
<b>Junction Style</b>		<b>UG</b>	Ungrounded
		<b>G</b>	Grounded
<b>Calibration Class</b>		<b>A</b>	Class 1
		<b>B</b>	Class 2
<b>Sheath 'OD'</b>		<b>3</b>	3 mm
		<b>4.5</b>	4.5 mm
		<b>6</b>	6 mm
		<b>8</b>	8 mm
		<b>10</b>	10 mm
		<b>XXX</b>	Please Specify
<b>Sheath Material</b>		<b>S6S</b>	SS316 <b>321</b> SS321
		<b>446</b>	SS446 <b>600</b> Incoloy 600
		<b>800</b>	Incolly 800
		<b>XXX</b>	Please Spesify
<b>Terminal Head</b>		<b>AI</b>	Die cast Aluminium
		<b>S4S</b>	SS304
		<b>S6S</b>	SS316
<b>No. of Cable Entries</b>		<b>1</b>	Single
		<b>2</b>	Double
<b>Cable Entry (F)</b>		<b>15N</b>	1/2" NPT
		<b>20E</b>	3/4" ET
		<b>15M</b>	M20 x 1.5
		<b>15B</b>	1/2" BSP
<b>Head Type</b>		<b>H1</b>	Weatherproof IP-65
		<b>H2</b>	Weatherproof IP-67
		<b>H3</b>	Flameproof, IP-67 ,Gr IIA,IIB
		<b>H4</b>	Explosionproof, IP-67, Gr IIC
		<b>H5</b>	ATEX
<b>Connection Fitting TC (Triclover/Triclamp)</b>		<b>15TC</b>	1/2" BSP
		<b>20TC</b>	3/4" NPT
		<b>25TC</b>	1"
		<b>40TC</b>	1-1/2"
		<b>XXX</b>	Please Specify
<b>Nominal Length of "L" (mm)</b>			Pl. Specify in mm

Ordering Example:- TC0302-K-2-UG-1-AI-2-15N-H1-6-40TC-S6S-500-1(S6S)

## In-House tests carried out for thermocouple assemblies

1. **Calibration**  
Thermocouple calibration in accordance with IEC 584 / ANSI MC 96.1 Class 1 & 2. Typical test is conducted at two points viz. 100°C & 600°C for J, K, E & at 100°C & 900°C or 1100°C for R, S & B type. Optionally for 3 points or more on request.
2. **Insulation Resistance Test at ambient at 500 VDC (MI type)**  
Should be more than 100 M ohms for sheath OD greater than 3 mm  
  
Should be more than 100 M ohms at 75 V DC in case of sheath OD 1 to 3 mm
3. **Insulation Resistance Test at 540°C at 500 VDC**  
IR should be more than 2 M ohms as standard.  
IR > 20 M ohms can also be offered on request.
4. **N<sub>2</sub> Leakage Test**  
For thermocouple tip sensor after cap welding the same test is conducted & no leakage should be observed at 40 kg/cm<sup>2</sup> as per IEC 1515.
5. **Response Time Test/Thermal Cycling/Thermal Inertia**  
As per IS7358 - ASTM E-839 (63.2% step change from ambient to 80° C)
6. **Flame Test**  
This test is applicable for multipoint thermocouple assembly to find out exact location of thermocouple in protecting tube and to ensure touching of thermocouple tip to tube.
7. **Continuity Test: By using continuity tester/multimeter**  
To confirm the element is proper and no open junction is observed.
8. **Grounding & Ungrounding Junction**  
By using continuity tester/multimeter.
9. **Ductility - (Bending Test) - (For MI thermocouple & MI RTD cable)**  
Minimum bending radius should be 5 times sheath OD.
10. **Sheath Integrity Test - Water Immersion test**  
To check sheath integrity of mineral insulated (MI) thermocouple/RTD cable.
11. **Dye Penetration Test**  
For skin type Dye Penetration test for weld joints of weld pad and tip of sensor.
12. **Helium Leak Test** on request.





# RESISTANCE TEMPERATURE DETECTOR

**Introduction**

The measurement of temperature using the resistance/temperature characteristics of various materials were probably first to put use by Sir Williams Siemens in 1871, largely laid the foundations of modern resistance thermometry.

The resistance of material can be obtained from the given formula:

$$R = (\rho \times L) / A$$

Where

R = Resistance (ohms)

$\rho$  = Resistivity (ohm/cm)

L = Length(cm)

A = Cross sectional area(cm<sup>2</sup>)

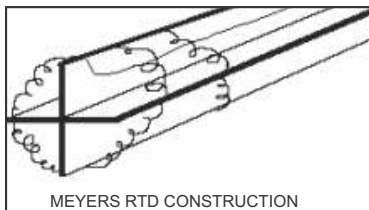
**History Related to Resistance Temperature Detector**

Sir William Siemens offered the use of platinum as the element in a resistance thermometer. His choice proved most favorable, as platinum is used to these days as the primary element in all high-accuracy resistance thermometers.

Platinum is especially suited to this purpose, as it can withstand high temperatures while maintaining excellent stability. As a noble metal, it shows limited susceptibility to contamination.

The classical resistance temperature detector (RTD) construction using platinum was proposed by C.H. Meyers in 1932. He used a helical coil of platinum on a crossed mica web and mounted the assembly inside a glass tube. This construction minimizes strain on the wire while maximizing resistance.

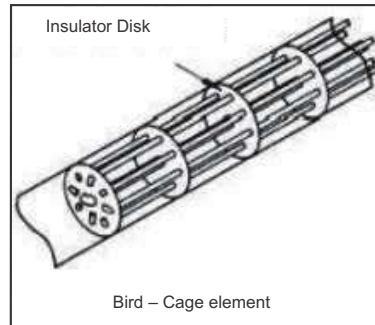
Although this construction produces a very stable element, the thermal contact between the platinum and the measured point is quite poor. This results in a slow thermal response time. The fragility of the structure limits its use today primarily to that of a laboratory standard.



MEYERS RTD CONSTRUCTION

Another laboratory standard has taken the place of Meyers design. This is the bird-cage element proposed by Evans and Burns. The platinum element

remains largely unsupported, which allows it to move freely when expanded or contracted by temperature variations.



Strain-induced resistance changes over time and temperature are thus minimized, and the bird-cage becomes the ultimate laboratory standard. Due to the unsupported structure and subsequent susceptibility to vibration, this configuration is still a bit too fragile for industrial environment.

The platinum wire is bifilar wound on a glass or ceramic bobbin. The bifilar winding reduces the effective enclosed area of the coil to minimize magnetic pickup and its related noise. Once the wire is wound on to the bobbin, the assembly is then sealed with a coating of molten glass.

The sealing process assures that the RTD will maintain its integrity under extreme vibration, but it also limits the expansion of the platinum metal at high temperatures. Unless the coefficients of expansion of the platinum and the bobbin match perfectly, stress will be placed on the wire as the temperature changes, resulting in a strain-induced resistance change. This may result in a permanent change in the resistance of the wire. There are partially supported versions of the RTD which offer a compromise between the bird-cage approach and the sealed helix. One such approach uses a platinum helix threaded through a ceramic cylinder and affixed via glass-frit. These devices will maintain excellent stability in moderately rugged vibrational applications.

**Resistance Temperature Detector (RTD)**

**Introduction**

The RTDs resistance vs temperature characteristics are stable, reproducible, and have a near linear positive temperature coefficient from 200 to 800 °C. These attributes establish RTDs as a de-facto industry standard. Temperature is determined by measuring resistance and then using the RTD's R vs T. characteristics to extrapolate temperature. The superior sensitivity and stability of these devices, in comparison to thermocouples, give them important advantages in low and intermediate temperature ranges. In addition, resistive devices often simplify control and readout electronics.

Resistance thermometers may be called RTD's (resistance temperature detectors), PRT's (platinum resistance thermometers), or SPRT's (standard platinum resistance thermometers).



The chemical stability, availability in pure form, and highly reproducible electrical properties, has made Platinum the metal of choice for RTD's which are made of either IEC/DIN-grade platinum or reference-grade platinum. The difference lies in the purity of the platinum. The IEC/DIN standard is pure platinum that is intentionally contaminated with other platinum.

**Equation of RTD**

At 0 °C, A platinum RTD has a resistance of 100 Ω & a temperature co-efficient of about 0.00385 Ω/ Ω / °C. These nonlinearities are described in Callender- Van Duesen equation. This equation consists of both a linear portion & a nonlinear portion.

Range -200 to 0°C :  $R(t) [\Omega] = R(1 + At + Bt^2 + C(t - 100^\circ C)^3)$

Range 0 to 850°C :  $R(t) [\Omega] = R(1 + At + Bt^2)$

With: R is resistance at 0 °C

$A = 3,9083 \times 10^{-3} \text{ } ^\circ C^{-1}$

$B = -5,775 \times 10^{-7} \text{ } ^\circ C^{-2}$

$C = -4,183 \times 10^{-12} \text{ } ^\circ C^{-4}$

**TEMPERATURE COEFFICIENT OF RESISTANCE (α)**

Temperature Coefficient of Resistance (TCR) has many definitions. For resistance thermometers, TCR is normally defined as the average resistance change per °C over the range 0 to 100°C, divided by R 0C. 0 TCR values for the common elements are:

$TCR(\alpha) (\Omega/^\circ C) = (R - R_0) / (R_0 \times \Delta T)$

Where,

$\alpha = \text{Temperature Coefficient } (\Omega/\Omega/^\circ C)$

$R = \text{RTD resistance at } 100^\circ C$

$R_0 = \text{RTD resistance at } 0^\circ C$

TCR values for the common elements are:

Copper =  $\{(12.897 - 9.035) / (9.035)\} / (100) = 0.00427 \text{ } \Omega/\Omega/^\circ C$

Nickel- Iron =  $\{(917.33 - 604) / 604\} / (100) = 0.00518 \text{ } \Omega/\Omega/^\circ C$

Nickel =  $\{(200.64 - 120) / 120\} / 100 = 0.00672 \text{ } \Omega/\Omega/^\circ C$

Platinum =  $\{(138.50 - 100) / 100\} / 100 = 0.003850 \text{ } \Omega/\Omega/^\circ C$

There are four primary curves specified for platinum:

1. 0.003926/°C : Standard platinum resistance thermometers are the only PRT's that can achieve this TCR. They must have high purity platinum wire (99.999% or better) wound in a strain-free configuration. The stresses introduced in manufacturing, lower the TCR of ordinary industrial models. Several manufacturers offer industrial platinum thermometers with nominal TCR of 0.00392; TCR's around 0.003923 are achieved regularly.
2. 0.003911/°C : This TCR is sometimes called the "U.S. Industrial Standard." Ceramic elements impose strain on platinum wire. It is lower than laboratory standards as the typical construction of high temperature.
3. 0.00385/°C : DIN 43760, IEC 751, and other national and international specifications mandate this TCR.
4. 0.00375/°C : Elements with 0.00375 TCR, intended for low-cost applications. There are few inherent advantages in specifying any particular TCR over another. Laboratory systems traditionally use reference standards with the highest-grade platinum, but industrial specify may aim instead for the greatest degree of standardization. In this case, 0.00385 TCR will be compatible with the length number of manufacturers.

**RTD Materials**

The criterion for selecting a material to make an RTD is:

The material must be malleable so that it can be formed into small wires

It must have a repeatable and stable slope or curve.

The material should also be resistant to corrosion.

The material should be low cost.

It is preferred that the material have a linear resistance verses temperature slope.

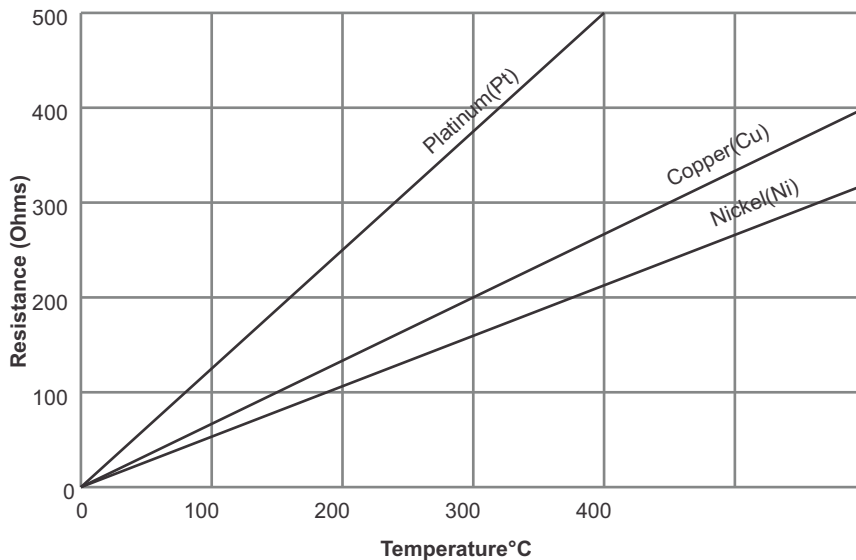
Some of the common RTD materials are platinum, copper, nickel, Balco (an alloy of 70% nickel and 30 % iron). These metals have the advantage that they can be manufactured to a very high degree of purity and are, consequently, available with highly reproducible temperature/resistance characteristics. These metals can also be drawn to a fine diameter wires required in resistance thermometry.



**Characteristics of several metals used as RTD**

Element Material	Temperature Range(°C)	Resistance Ratio( $R_{100}/R_0$ )	Resistivity $\times 10^{-8}(\Omega.m)$	Relative Cost	Linearity Deviation (0-100°C)
Platinum	-200 to 850	1.3925 to 1.385	11	1100	+0.12
Copper	-200 to 260	1.427	1.72	1	0
Nickel	-80 to 300	1.672	7.8	20	-1.61
Balco	-200 to 230	1.518	20	15	-1.17

As shown in table, although copper is cheapest, it also has the lowest resistivity and therefore requires inconveniently large sensing elements. On the other hand, even as nickel and nickel alloy have high resistivity, their resistance versus temperature coefficients are non-linear. They are also sensitive to strain and their resistivities suffer from an inflexion around the Curie point (358°C) that makes the deviation of their resistance/ temperature expressions more complicated.



This platinum which not only has a high resistivity (more than six times that of copper) but also a high degree of stability and a wide temperature range. Although platinum is expensive it can be drawn into fine wires or strips and we only require small amounts for manufacturing RTDs. As a noble metal, it has minimum susceptibility to contamination. The presence of impurities is undesirable since diffusion, segregation and evaporation may occur in service, resulting in a lack of stability. The resistivity is also sensitive to internal strains. Thus, it is essential that the platinum should remain in a fully annealed condition i.e. it should be annealed at a temperature higher than the maximum temperature of service.

**TEMPERATURE RATING**

The maximum temperature rating for RTD's is based on two different factors. First is the element material. Platinum RTD's can be used as high as 650°C (1202°F). Other materials are much lower in temperature rating and vary from material to material. The other determining factor for temperature rating is probe construction. There are construction considerations used in each of these different styles making them ideal for use in each of those ranges. No one style is good for all ranges.

**Types of RTD:**

Platinum RTDs typically are provided in two classes; Class A is considered high accuracy and has an ice point tolerance of  $\pm 0.06$  ohms.

Class B is standard accuracy and has an ice point tolerance of  $\pm 0.12$  ohms. Class B is widely used by most industries.

The accuracy will decrease with temperature. Class A will have an accuracy of  $\pm 0.43$  ohms ( $\pm 1.45^\circ\text{C}$ ) at  $600^\circ\text{C}$  and class B will be  $\pm 1.06$  ohms ( $\pm 3.3^\circ\text{C}$ ) at  $600^\circ\text{C}$ . The chart below shows the tolerance versus temperature (IEC 751).

Other accuracy classes like 1/3, 1/5, 1/10 of class B are available.

Temperature	1/10 Din ( $\pm^\circ\text{C}$ )	1/5 Din ( $\pm^\circ\text{C}$ )	1/3 Din ( $\pm^\circ\text{C}$ )	Class A ( $\pm^\circ\text{C}$ )	Class B ( $\pm^\circ\text{C}$ )
-100°C	0.080	1.160	0.267	0.350	0.800
-50°C	0.055	0.110	0.183	0.250	0.550
0°C	0.030	0.060	0.100	0.150	0.300
50°C	0.055	0.110	0.183	0.250	0.550
100°C	0.080	0.160	0.267	0.350	0.800
150°C	0.105	0.210	0.350	0.450	1.050
200°C	0.130	0.260	0.433	0.550	1.300
250°C	0.155	0.310	0.517	0.650	1.550
300°C	0.180	0.360	0.600	0.750	1.800
350°C	0.205	0.410	0.683	0.850	2.050
400°C	0.230	0.460	0.767	0.950	2.300

**Platinum resistance temperature sensors (PRT)** They offer excellent accuracy over a wide temperature range (from  $-200$  to  $+850^\circ\text{C}$ ). Other resistance value options

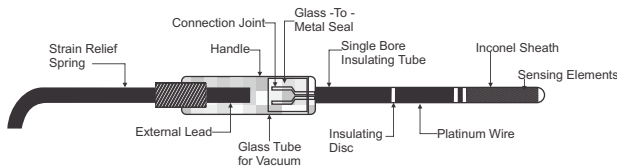
RTD elements are also available with resistances of 200, 500, and 1000  $\Omega$  at  $0^\circ\text{C}$ . Such type of RTDs is normally known as PT200, PT 500, and PT 1000 respectively. These RTDs have the same temperature coefficients as previously described, but because of their higher resistances at  $0^\circ\text{C}$ , they provide more resistance change per degree, allowing for greater resolution.

Other standards for Pt 100  $\Omega$  RTDs are shown:

Standard	$R_{100}/R_0$ Ratio
DIN 43760	1.385
U.S. Lab Spec.	1.3926
U.S. Industrial Spec.	1.3911
Canadian Spec.	1.3889
MIL - T -24388	1.3924
Japanese JIS C 1604	1.3916

**Standard Platinum RTDs (SPRTs)**

The ITS-90 (International Temperature Scale of 1990- used as a worldwide practical temperature scale in national metrology labs like NIST, NPL) is made up of a number of fixed reference points with various interpolating devices used to define the scale between points. A special set of PRTs, called SPRTs, are used to perform the interpolation in such labs over the ranges 13.8033 K (Triple point of Equilibrium Hydrogen) to the Freezing point of silver, 971.78 °C.



**RTD standards**

There are two standards for platinum RTDs: The European standard (also known as the DIN or IEC standard) and the American standard.

The European standard, also known as the DIN or IEC standard, is considered the world-wide standard for platinum RTDs. This standard, DIN/IEC 60751 (or simply IEC751), requires the RTD to have an electrical resistance of 100.00 Ω at 0°C and a temperature coefficient of resistance (TCR) of 0.00385 Ω/Ω/°C between 0 and 100°C. There are three resistance tolerances for Thin Film

RTDs specified in IEC60751:

Class AA (Formerly 1/3B) = ± (0.1+0.0017×t) °C or 100.00 ± 0.04Ω at 0°C

Class A = ± (0.15+0.002×t) °C or 100.00 ± 0.06Ω at 0°C

Class B = ± (0.3+0.005×t) °C or 100.00 ± 0.12Ω at 0°C

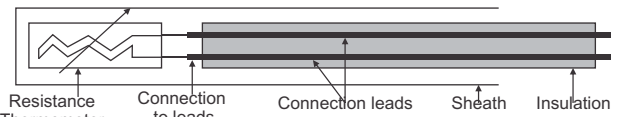
Also, one special class not included in DIN/IEC60751:

Class 1/10B = ±1/10 (0.3+0.005×t) °C or 100.00 ± 0.012Ω at 0°C

**Construction of RTD**

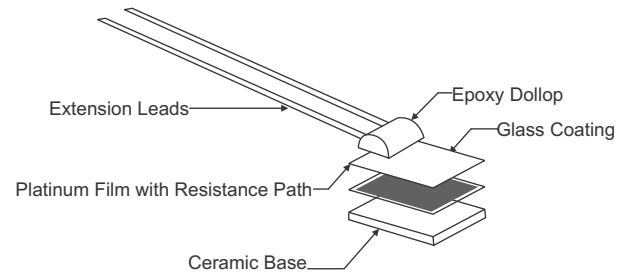
The RTD elements nearly always require insulated leads attached. At temperatures below about 250 °C PVC, silicon rubber or PTFE insulators are used. Above this, glass fiber or ceramic are used. The measuring point, and usually most of the leads, requires a housing or protective sleeve, often made of a metal alloy which is chemically inert to the process being monitored. Selecting and designing protection sheaths can require more care than the actual sensor, as the sheath must withstand chemical or physical attack and provide convenient attachment points.

RTD's are manufactured in 3 basic types of construction. Each of these different types has advantages and disadvantages.



**Platinum Thin Film RTD construction**

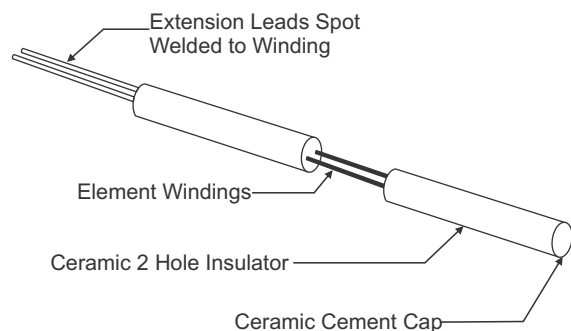
The thin film style of RTD is probably the most popular design because of their rugged design and low cost. The thin film element is manufactured by coating a small ceramic chip with a very thin (.0001") film of platinum and then laser cutting or chemical etching a resistance path in the platinum film. The element is then coated with a thin layer of glass to protect it from harmful chemicals and gases. Larger extension lead wires are spot welded to the chip and this junction is then covered with a drop of epoxy to help hold the wires to the element.



**Platinum thin film RTD**

**Inner coil wire wound RTD**

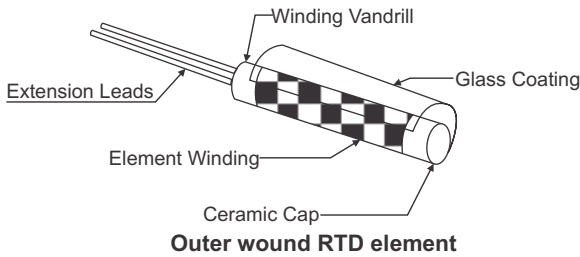
This type of element is normally manufactured using platinum wire. Very small platinum wire (0.02 mm) is coiled and then slid into a small 2 holes ceramic insulator. Larger extension leads are then spot welded to the ends of the platinum wire and cemented in place. Some manufacturers backfill the bores of the insulator with ceramic powder, once the coils have been inserted. This keeps the coils from moving and shorting against each other. The end opposite the extension leads is capped with ceramic cement also.



**Inner coil wire wound RTD**

**Outer wound RTD element**

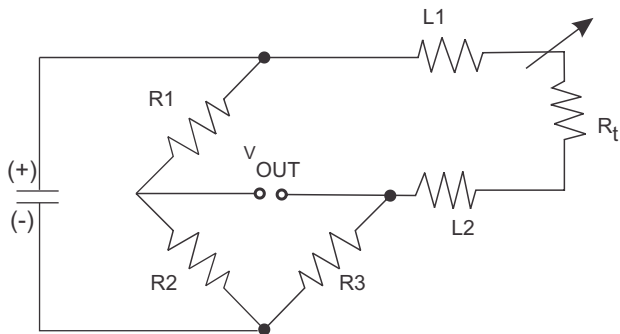
The outer wound RTD element is made by winding the sensing element wire around a center mandrill, which is usually made of ceramic. This winding is then coated with glass or some other insulating material to protect and secure the windings. The winding wires are then spot welded to extension leads and secured to the body with ceramic cement or epoxy. Each of the types has their advantages. The thin film is the least expensive to manufacture and also the most rugged. They can also be manufactured in very small sizes. The inner coil wire wound style is the most accurate. It is however, more expensive to manufacture and does not perform well in high vibration applications. The outer wound element is similar in cost to the inner coil element. It is not as accurate as the inner coil style but is more rugged.



**Outer wound RTD element**

**Lead Wire configurations**

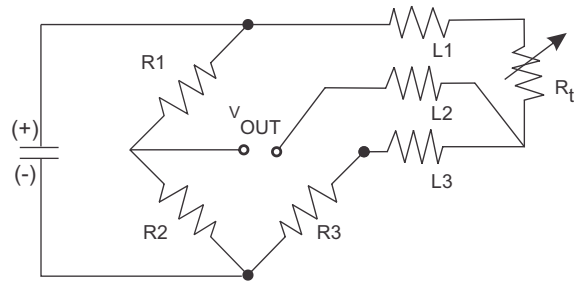
RTDs are available with three different lead wire configurations. The selection of lead wire configuration is based on desired accuracy and instrumentation to be used for the measurement. Two wire RTD The two wires RTD is the simplest wire configuration. One wire is attached to each side of the element. A measure can be taken by any device equipped to measure resistance, including basic Volt Ohm Meters (VOM). This is the least accurate way of measuring temperature, due to the fact that the lead wire resistance is in series with the sensing element. The lead wire is at a different temperature than the sensing element and also has different resistance verses temperature characteristics. The longer the lead wire greater will be the effect on the measurement.



**Two Wire RTD**

**Three Wire RTD**

The three wires RTD is the most popular configuration for use in industrial applications. In order to minimize the effects of the lead resistances, a three-wire configuration can be used. Using this method the two leads to the sensor are on adjoining arms. There is a lead resistance in each arm of the bridge so that the resistance is cancelled out, so long as the two lead resistances are accurately the same. This configuration allows up to 600 meters of cable.

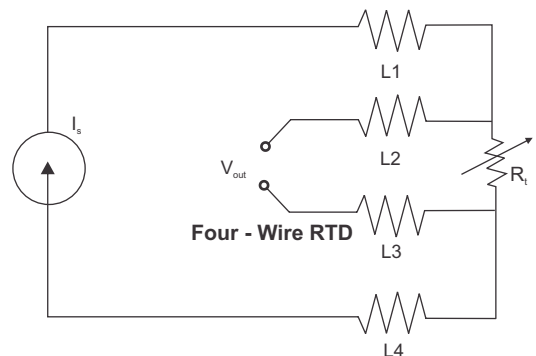


**Three Wire RTD**

When used correctly, the three wire configuration eliminates the series resistance. This permits an accurate measurement of the sensing element. Two of the leads are connected to one side of the sensing element and the single lead to the other side. The resistance in L1 and L3 should be matched as close as possible, this will cause the lead resistance to cancel themselves. The color code for a three wire RTD is two red wires and one white.

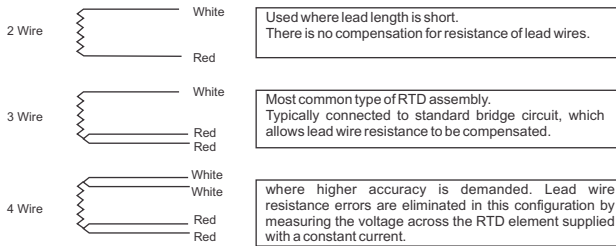
**Four Wire RTD**

A four wire RTD is the most accurate method to measure an RTD. It is primarily used in laboratories and is seldom seen in an industrial application. The four-wire resistance thermometer configuration increases the accuracy and reliability of the resistance being measured: the resistance error due to lead wire resistance is zero. A four wire RTD circuit removes the effect of mismatched resistances on the lead wires. A constant current is passed through L1 and L4, L2 and L3 measure the voltage drop across the RTD element. The color code for a four wire RTD is usually two red wires and two white wires. The following diagram illustrates a typical four wire measurement.



**Four - Wire RTD**

**LEAD CONFIGURATION & COLOUR CODE**



**Mineral Insulated RTD**

Mineral-Insulated resistance thermometers (M.I.) are equipped in general with Platinum-measuring resistors Pt100  $\Omega$  to DIN IEC 751. The inner (Cu) conductors are embedded in a closely compacted, inert mineral powder (MgO), the measuring resistor will be connected to the inner conductors, is also embedded and is surrounded by the metal sheath to form a hermetically sealed assembly. Some times inner conductor of constantan and nickel are also used. The sheath functions as a useful protective cover in many situations. They are applied in locations where fast response, reduced space and or vibration resistance is a need. They can be furnished with a fixed cable or with a special plug which allows rapid fitting or exchange. Mineral-insulated RTD temperature probes consist of a flexible, thin-walled stainless steel mineral-insulated cable, in which low ohmic conductor copper wires are embedded in pressed, heat resistant magnesium oxide. The temperature probe is connected to the wires of the internal conductors and accommodated in a stainless steel sheath. Thermo- well and mineral-insulated cable are welded to one another. The good heat transition between the sheath and the temperature probe permits short response times and high measuring accuracy. The vibration resistant (shake proof) design guarantees a long operating life. Temperature measurements at measuring points difficult to access are possible thanks to the flexible mineral-insulated cable. The smallest bending radius is 5 times the outer diameter.

**Metal sheathed RTD**

- 1) It comprises of a thin-walled and flexible mineral insulated sheath cable made up of stainless steel.
- 2) The cable contains low resistance inner wires made of copper embedded in pressed fireproof magnesium oxide.
- 3) The temperature sensor is connected to the inner wires and fitted in a protective tube.
- 4) Protective tube and sheathed cable are welded together hermetically.
- 5) Good heat transfer between protective tube and temperature sensor allows fast response time and high

measuring accuracies.

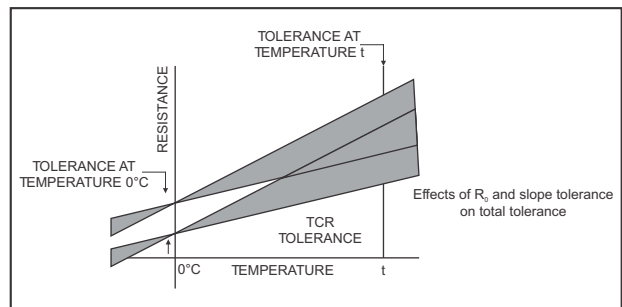
- 6) The flexible probe tube allows temperature measurement at locations that are not easily accessible.
- 7) They are used in difficult measurement application with strong vibrations as well as at all measuring positions where flexibility and ease of replacement are needed.
- 8) Areas of application are to be found in chemical plants, power stations, motors, as well as in machine construction and building installation and in general industrial applications.

**Potential Sources of Error with Resistance Thermometers**

Resistance thermometer systems are susceptible to three types of errors: The inherent tolerances built into the thermometers, gradients between the thermometer and the medium to be sensed, and errors introduced along the path between the sensor and readout or control instrument. Some sources of error are electrical; others result from the mechanical construction of the thermometer.

**Interchangeability/Conformity:**

Conformity specifies the amount of resistance a thermometer is allowed to deviate from a standard curve (such as the curve produced by the Callendar-Van Dusen equation). A tolerance at the reference temperature, usually 0°C, and a tolerance on the slope or TCR. Below shown figure states that a resistance thermometer conforms most closely to its curve at the reference temperature, while the resistance fans out above and below this reference. For example, IEC 751, Class B, requires calibration within 0.12 (0.3°C) at 0°C, but allows TCR to deviate from nominal 0.00385 by  $\pm 0.000012$  /°C. Thus, tolerance spreads to 0.8°C at 100°C, 1.3°C at 200°C, and on up to 3.8°C at 700°C. Interchangeability between two thermometers is no more than twice the value of there Conformity. Commercial platinum resistance thermometer elements are available with extremely tight tolerances, to within 0.026°C in some cases. When interchangeability is an overriding consideration, the specified may consider other means to achieve it. For example, manufacturers may alter their calibration procedures to fix the reference temperature and tightest tolerance at a point other than 0°C.





### Sensitivity

The resistance change per degree change in temperature is a function of base resistance and TCR (Temperature Coefficient of Resistance). Although a thermometer with higher sensitivity is not necessarily more accurate, a larger signal simplifies output electronics and is less susceptible to lead wire effects and electrical noise. In addition, a larger resistance produces the same voltage output with less measuring current, which helps to limit self heating of the thermometer element.

### Insulation Resistance

If the sensing element and leads are not completely insulated from the case, a shunting effect occurs in which the case becomes a parallel resistor and lowers apparent readings. In most industrial thermometers, with specified insulation Resistances in the 100-M $\Omega$  ranges, error approaches zero. The manufacturer must take care to seal water-absorbing materials. The shunting effect decreases with low-resistance elements, which accounts. The shunting effect decreases with low-resistance elements, which accounts for the use of 25.5 PRT's in laboratory measurements.

### Self-Heating

A resistance thermometer is a passive resistance sensor; it requires a measuring current to produce a useful signal. Because this measuring current heats the element wire above the true ambient temperature, errors will result unless the extra heat is dissipated. Self-heating is most often expressed in mW/ $^{\circ}$ C, which is the power in mill watts (1000 I<sup>2</sup> R) required to raise the thermometers internal temperature by 1 $^{\circ}$ C. The higher the mW/ $^{\circ}$ C figure, the lower the self-heating. As an example, assume a 5 mA measuring current is driven through 100 platinum RTD at 100 $^{\circ}$ C. Self-heating is specified as 50 mW/ $^{\circ}$ C in water moving at 3 ft/sec. The amount of heat generated is:

$$1000 \text{ mW} \times (0.005 \text{ A})^2 \times (138.5) = 3.5 \text{ mW}$$

The self-heating error is:

$$(3.5 \text{ mW}) / (50 \text{ mW}/^{\circ}\text{C}) = 0.07^{\circ}\text{C}$$

The generated heat increases with higher sensor element resistance (when a constant current measurement device is used), or with increasing measuring current.

The resulting error is inversely proportional to the ability of the thermometer to shed extra heat; which in turn depends on thermometer materials, construction, and environment.

The worst self-heating occurs when a high resistance is packed into a small body. Thin film elements, with little surface area to dissipate heat, are an example. Self-heating also depends on the medium in which the thermometer is

immersed. Error in still air may be over 100 times greater than in moving water.

### Time Constant

A time constant indicates the responsiveness of a resistance thermometer to temperature change. A common expression is the time it takes a thermometer to reflect 63.2% of a step temperature change in moving water. Response speed depends on the mass of the thermometer and the rate at which heat transfers from the outer surface to the sensing element. A rapid time constant reduces errors in a system subject to rapid temperature changes.

### Repeatability

The degree of accord between two successive readings with a thermometer is its repeatability. Loss of repeatability results from permanent or temporary changes to the resistance characteristics of the element and may be caused by exposing the thermometer to temperatures at or beyond the endpoints of its specified range. A repeatability test cycles the thermometer between low and high temperatures; any changes to R are noted. A typical repeatability rating for 0 $^{\circ}$ C industrial platinum resistance thermometers is  $\pm 0.1^{\circ}$ C.

### Stability

Stability is long-term drift in thermometer readings. A typical specification would limit drift to 0.1 $^{\circ}$ C per year for rated operation. Normal services at points well within the temperature rating typically cause much less drift. Drift is a consequence of the element material, with platinum being the most stable; encapsulating materials, which could contaminate the element; and mechanical stress placed on the element by expansion of winding bobbins or other supporting structures.

### Shock and Vibration

Mechanical shock and vibration can alter thermometer readings or cause complete failure. In fact, stability and ruggedness are somewhat exclusive. A laboratory thermometer designed for maximum stability contains an unsupported element, which is far too fragile for industrial use. The elements of most industrial resistance thermometers are fully supported by a bobbin or packing material, and therefore stand up quite well to extreme environments. More likely to suffer are lead wire transition points, which should be properly immobilized. A typical RTD will meet a specification allowing shock of 100 G's of 8 milliseconds duration and vibration of 10 to 2000 Hz at 20 G's.

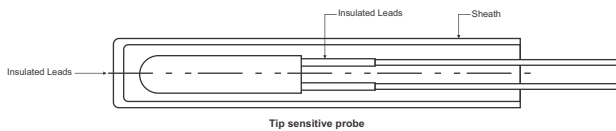
### Packaging and Thermal Transfer

Sheaths and other structures surrounding resistive elements should maximize heat transfer from the sensed medium,

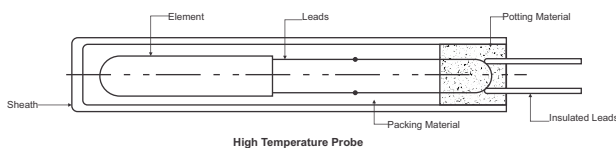
minimize heat transfer from ambient which can alter readings, and provide necessary protection of the elements. Proper materials and construction can dramatically improve reading accuracy. One strategy practicable only with wire-wound resistance thermometers versus thermistors, thermocouples, and solid-state devices are temperature averaging. An element may be wound to average temperature over lengths of up to 100feet.

**Industrial RTD Probes**

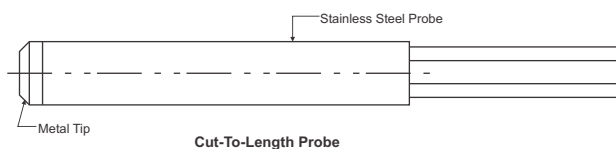
The encased probe is the standard resistance thermometer configuration for industrial process control and machinery protection. Most probe cases are stainless steel or Inconel to withstand high temperatures, although other materials offer advantages at intermediate ranges. For example, the tip-sensitive probe of Figure a copper-alloy tip which conducts heat 20 times better than stainless steel. This design improves thermal contact with sensed surfaces and reduces errors from conduction along the sheath.



Standard probe diameters range from 0.125. to 0.250. Smaller probes respond faster when directly immersed, but larger probes may fit more snugly in standard thermowells. Probe lengths range from a few inches to ten feet or more. Figure shows the construction of a high temperature probe. The element fits in the tip, surrounded by high temperature powder or cement. Extension leads, normally uninsulated, extend back from the element and are encapsulated by powder, cement, or bored ceramic spacers. External leads, often insulated with Teflon or glass braid, are potted with cement at the entry point to seal against moisture.

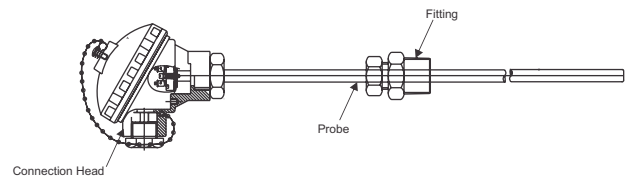


The alternative construction of figure places the element, potting, and lead transitions within a module at the tip of the probe. This design allows the user to cut the probe to required lengths. Temperature is limited to the rating of the external lead wire insulation: 260°C (500°F) for Teflon, up to 550°C (1022°F) for insulations such as woven mica/glass.



**Probe Assemblies**

A wide variety of mounting fittings and accessories aid probe installation. Selection depends on the nature of the medium being sensed and cost requirements. Direct immersion of a probe into a liquid requires a fitting with a pipe thread, which may be adjustable or welded on the probe. Figure shows a typical assembly, with one thread for mounting the probe and another for a connection head. Connection heads provide a transition between probe leads and external signal wires.



Typical Probe Assembly

Mounting in a solid material is best accomplished with a spring-loaded holder, which may be fixed or adjustable. Spring loading provides good contact of the probe tip against the bottom of the hole and dampens potentially damaging vibration. When liquids are particularly corrosive, under high pressure, or fast-flowing, a thermowell may be necessary. A thermowell is a tube, closed at one end, which protects the probe and allows its removal without breaking the liquid seal. Many materials and styles are available to match application requirements. Thermowells drilled from solid bar stock provide the highest pressure ratings, but welded models cost much less.

**Flexible Resistance Thermometers**

The encased probes described above do not adapt well to sensing flat surfaces. Unlike thermocouple junctions, which can be welded directly to metal surfaces, resistance thermometers present a certain amount of bulk; and heat losses to ambient air may affect readings. Small flat elements, such as thin films, may mount on surfaces, but fragile element and lead wire connections make installation difficult.

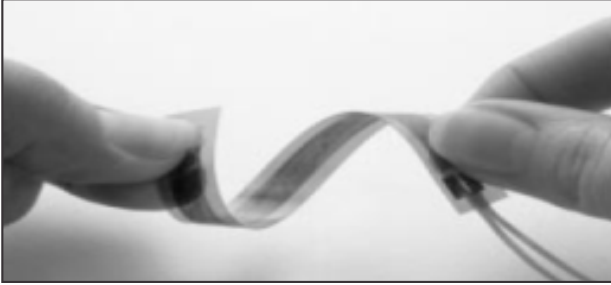
Figure shows a flexible resistance thermometer with a wire-wound sensing element sandwiched between insulating layers. It conforms closely to sensed surfaces, and has thin insulation to readily transmit heat to the sensing element. The wire element may be wound to nearly any size to average out temperature gradients, and the flexible construction can withstand extreme shock and vibration.

**Special Purpose Resistance Thermometers**

Resistance thermometers readily adapt to most process control and thermal equipment designs. The user may specify cases with axial leads for circuit board mounting, flat packages for clamping to surfaces, miniature cases for embedment into metal blocks, and any sheaths and fittings



which can be produced by a machine shop. In addition, wire windings may be configured to sense over large areas.



**Flexible resistance thermometer**

### **Where to use resistance thermometers**

In summary, resistance thermometers offer the greatest benefits relative to other thermometer types in these situations:

Accuracy and stability are the foremost goals of the Application.

Accuracy must extend over a wide temperature range

Area, rather than point, sensing improves control

A high degree of standardization is desirable

### **Advantages and limitations**

Advantages of platinum resistance thermometers

High accuracy

Low drift

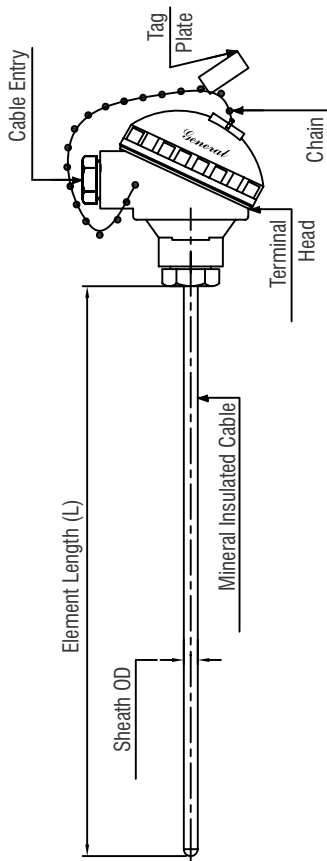
Wide operating range

Suitable for precision applications

### **Limitations**

RTDs in industrial applications are rarely used above 660 °C. At temperatures above 660 °C it becomes increasingly difficult to prevent the platinum from becoming contaminated by impurities from the metal sheath of the thermometer. This is why laboratory standard thermometers replace the metal sheath with a glass construction. At very low temperatures, say below -270 °C (or 3 K), due to the fact that there are very few photons, the resistance of an RTD is mainly determined by impurities and boundary scattering and thus basically independent of temperature. As a result, the sensitivity of the RTD is essentially zero and therefore not useful.

Compared to thermistors, platinum RTDs are less sensitive to small temperature changes and have a slower response time. However, thermistors have a smaller temperature range and stability.



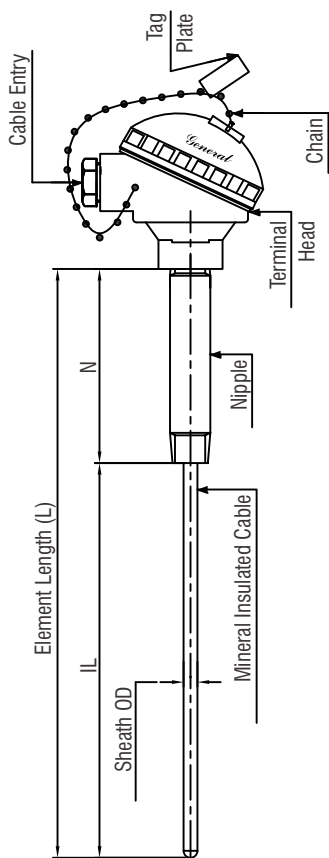
	Other Options
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special
8	'L' Type Mounting Bracket

## RTD - 101

<b>Element</b>	1	Pt. 100
	2	Pt. 1000
	XXX	Please Specify
<b>Element Type</b>	1	Simplex
	2	Duplex
<b>Wire Configuration</b>	2W	2-Wire
	3W	3-Wire
	4W	4-Wire
<b>Calibration Standard</b>	IEC	IEC 751
	DIN	DIN 43760
<b>Calibration Class</b>	A	Class A
	B	Class B
<b>Sheath 'OD'</b>	3	3 mm
	4.5	4.5 mm
	6	6 mm
	8	8 mm
	10	10 mm
	XXX	Please Specify
<b>Sheath Material</b>	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
<b>Terminal Head</b>	AI	Die cast Aluminium
	S4S	SS304
	S6S	SS316
<b>No. of Cable Entries</b>	1	Single
	2	Double
<b>Cable Entry (F)</b>	15N	1/2" NPT
	20E	3/4" ET
	15M	M20 x 1.5
	15B	1/2" BSP
<b>Head Type</b>	H1	Weatherproof IP-65
	H2	Weatherproof IP-67
	H3	Flameproof, IP-67, Gr IIA, IIB
	H4	Explosionproof, IP-67, Gr IIC
	H5	ATEX
<b>Element Length of "L" (mm)</b>		Pl. Specify in mm

Ordering Example:- RTD101-1-2-3W-IEC-A-6-S6S-AI-2-15N-H1-500-1(SS316)

# RTD 102 - RTD Assembly with Nipple Extension



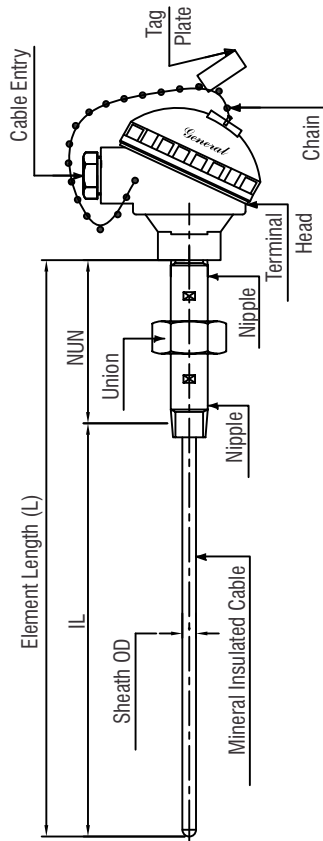
Other Options	
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special
9	Thermowell

## RTD - 102

Element	1	Pt. 100
	2	Pt. 1000
	XXX	Please Specify
Element Type	1	Simplex
	2	Duplex
Wire Configuration	2W	2-Wire
	3W	3-Wire
	4W	4-Wire
Calibration Standard	IEC	IEC 751
	DIN	DIN 43760
Calibration Class	A	Class A
	B	Class B
Sheath 'OD'	3	3 mm
	4.5	4.5 mm
	6	6 mm
	8	8 mm
	10	10 mm
	XXX	Please Specify
Sheath Material	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
Terminal Head	AI	Die cast Aluminium
	S4S	SS304
	S6S	SS316
No. of Cable Entries	1	Single
	2	Double
Cable Entry (F)	15N	1/2" NPT
	20E	3/4" ET
	15M	M20 x 1.5
	15B	1/2" BSP
Head Type	H1	Weatherproof IP-65
	H2	Weatherproof IP-67
	H3	Flameproof, IP-67, Gr IIA, IIB
	H4	Explosionproof, IP-67, Gr IIC
	H5	ATEX
Nipple MOC	C	Cadmium Plated CS
	S4S	SS304
	S6S	SS316
N Length	A	75 mm
	B	100 mm
	C	150 mm
	XXX	Please Specify
Connection Fitting	15N	1/2 " NPT
	15B	1/2 " BSP
	XXX	Please Specify
Insertion Length of "IL" (mm)	Pl. Specify in mm	

Ordering Example:- RTD102-1-1-3W-IEC-A-6-S6S-AI-2-15N-H2-C-B-15N-400-1(SS316)

# RTD 103 - RTD Assembly with Nipple Union Nipple Extension



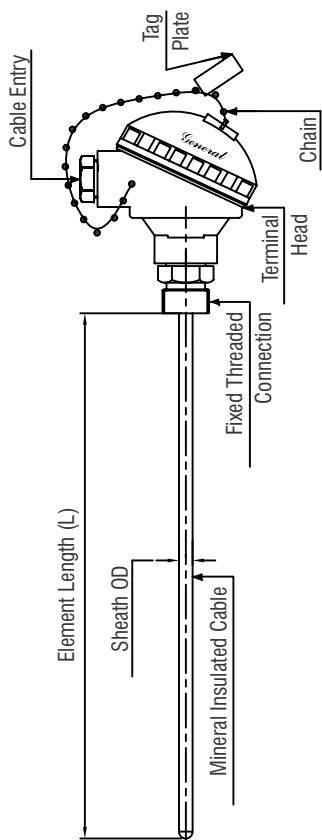
Other Options	
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special
9	Thermowell

## RTD - 103

<b>Element</b>	1	Pt. 100
	2	Pt. 1000
	XXX	Please Specify
<b>Element Type</b>	1	Simplex
	2	Duplex
<b>Wire Configuration</b>	2W	2-Wire
	3W	3-Wire
	4W	4-Wire
<b>Calibration Standard</b>	IEC	IEC 751
	DIN	DIN 43760
<b>Calibration Class</b>	A	Class A
	B	Class B
<b>Sheath 'OD'</b>	3	3 mm
	4.5	4.5 mm
	6	6 mm
	8	8 mm
	10	10 mm
XXX	Please Specify	
<b>Sheath Material</b>	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
<b>Terminal Head</b>	AI	Die cast Aluminium
	S4S	SS304
	S6S	SS316
<b>No. of Cable Entries</b>	1	Single
	2	Double
<b>Cable Entry (F)</b>	15N	1/2" NPT
	20E	3/4" ET
	15M	M20 x 1.5
	15B	1/2" BSP
<b>Head Type</b>	H1	Weatherproof IP-65
	H2	Weatherproof IP-67
	H3	Flameproof, IP-67, Gr IIA, IIB
	H4	Explosionproof, IP-67, Gr IIC
	H5	ATEX
<b>NUN MOC</b>	C	Cadmium Plated CS
	S4S	SS304
	S6S	SS316
<b>NUN Length</b>	B	100 mm
	C	150 mm
	XXX	Please Specify
<b>Connection Fitting</b>	15N	1/2" NPT
	15B	1/2" BSP
	XXX	Please Specify
<b>Insertion Length of "IL" (mm)</b>	Pl. Specify in mm	

Ordering Example:- RTD103-1-1-3W-IEC-A-6-S6S-AI-2-15N-H2-C-B-15N-400-1(SS316)

# RTD 104 - RTD Assembly with Fixed Threaded Connection



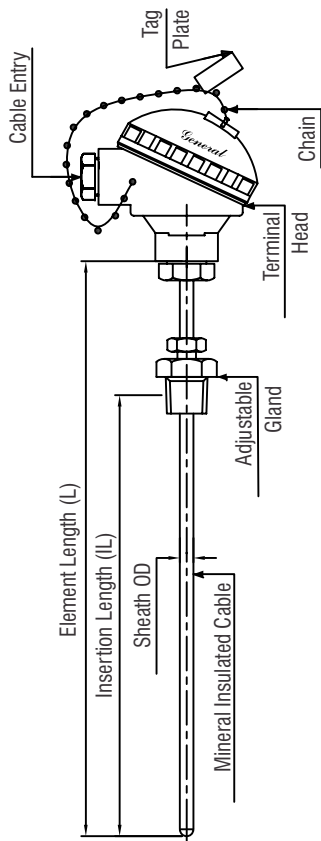
Other Options	
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special
9	Thermowell

## RTD - 104

<b>Element</b>	1	Pt. 100
	2	Pt. 1000
	XXX	Please Specify
<b>Element Type</b>	1	Simplex
	2	Duplex
<b>Wire Configuration</b>	2W	2-Wire
	3W	3-Wire
	4W	4-Wire
<b>Calibration Standard</b>	IEC	IEC 751
	DIN	DIN 43760
<b>Calibration Class</b>	A	Class A
	B	Class B
<b>Sheath 'OD'</b>	3	3 mm
	4.5	4.5 mm
	6	6 mm
	8	8 mm
	10	10 mm
	XXX	Please Specify
<b>Sheath Material</b>	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
<b>Terminal Head</b>	Al	Die cast Aluminium
	S4S	SS304
	S6S	SS316
<b>No. of Cable Entries</b>	1	Single
	2	Double
<b>Cable Entry (F)</b>	15N	1/2" NPT
	20E	3/4" ET
	15M	M20 x 1.5
	15B	1/2" BSP
<b>Head Type</b>	H1	Weatherproof IP-65
	H2	Weatherproof IP-67
	H3	Flameproof, IP-67, Gr IIA, IIB
	H4	Explosionproof, IP-67, Gr IIC
	H5	ATEX
<b>Fixed Conn. MOC</b>	S4S	SS304
	S6S	SS316
<b>Connection Fitting</b>	15N	1/2" NPT
	15B	1/2" BSP
	XXX	Please Specify
<b>Element Length of "L" (mm)</b>	Pl. Specify in mm	

Ordering Example:- RTD104-1-1-3W-IEC-A-6-S6S-Al-2-15N-H2-S6S-15N-400-1(SS316)

# RTD 105 - RTD Assembly with Adjustable Connection



	Other Options
0	None
1	Cable Gland (Specify MOC [S4,S6,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special
8	'L' Type Mounting Bracket
9	Thermowell

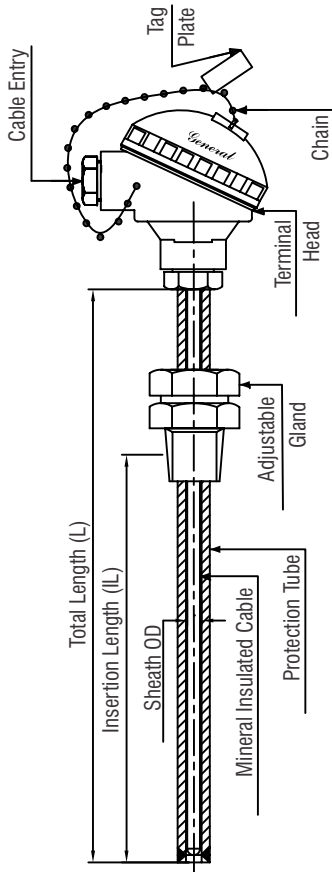
**NOTE: Adjustable Gland Length - 50 mm**  
(L=IL + 50 mm Below Head)

## RTD - 105

<b>Element</b>	1	Pt. 100
	2	Pt. 1000
	XXX	Please Specify
<b>Element Type</b>	1	Simplex
	2	Duplex
<b>Wire Configuration</b>	2W	2-Wire
	3W	3-Wire
	4W	4-Wire
<b>Calibration Standard</b>	IEC	IEC 751
	DIN	DIN 43760
<b>Calibration Class</b>	A	Class A
	B	Class B
<b>Sheath 'OD'</b>	3	3 mm
	4.5	4.5 mm
	6	6 mm
	8	8 mm
	10	10 mm
	XXX	Please Specify
<b>Sheath Material</b>	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
<b>Terminal Head</b>	Al	Die cast Aluminium
	S4S	SS304
	S6S	SS316
<b>No. of Cable Entries</b>	1	Single
	2	Double
<b>Cable Entry (F)</b>	15N	1/2" NPT
	20E	3/4" ET
	15M	M20 x 1.5
	15B	1/2" BSP
<b>Head Type</b>	H1	Weatherproof IP-65
	H2	Weatherproof IP-67
	H3	Flameproof, IP-67, Gr IIA,IIB
	H4	Explosionproof, IP-67, Gr IIC
	H5	ATEX
<b>Adj. Gland MOC</b>	S4S	SS304
	S6S	SS316
<b>Connection Fitting</b>	15N	1/2 " NPT
	15B	1/2 " BSP
	XXX	Please Specify
<b>Insertion Length of "IL" (mm)</b>		Pl. Specify in mm

**Ordering Example:- RTD105-1-1-3W-IEC-A-6-S6S-Al-2-15N-H2-S6S-15N-400-1(SS316)**

# RTD 106 - RTD with Protecting Tube (Screwed Connection)



	Other Options
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special

**NOTE: Adjustable Gland Length - 50 mm**  
(L=IL + 50 mm Below Head)

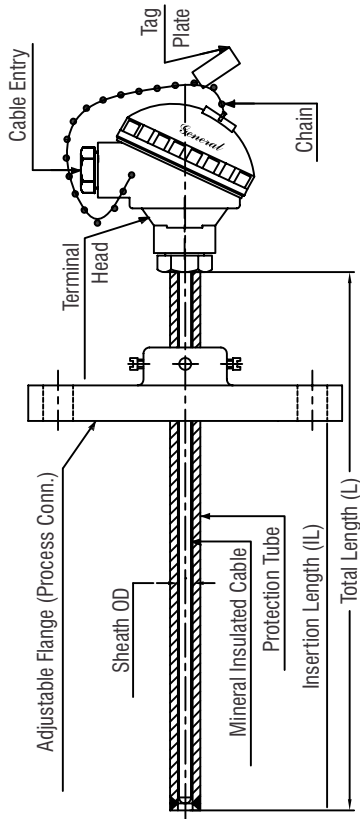
## RTD - 106

<b>Element</b>		1	Pt. 100	2	Pt. 1000	
		XXX	Please Specify			
<b>Element Type</b>		1	Simplex	2	Duplex	
<b>Wire Configuration</b>		2W	2-Wire			
		3W	3-Wire			
		4W	4-Wire			
<b>Calibration Standard</b>		IEC	IEC 751	DIN	DIN 43760	
<b>Calibration Class</b>		A	Class A	B	Class B	
<b>Sheath 'OD'</b>		3	3 mm	4.5	4.5 mm	
		6	6 mm	8	8mm	
		10	10mm			
		XXX	Please Specify			
<b>Sheath Material</b>		S6S	SS316	S6L	SS316L	
		XXX	Please Specify			
<b>Terminal Head</b>		AI	Die cast Aluminum			
		S4S	SS304	S6S	SS316	
<b>No. of Cable Entries</b>		1	Single	2	Double	
<b>Cable Entry (F)</b>		15N	1/2" NPT	20E	3/4" ET	
		15M	M20 x 1.5	15B	1/2" BSP	
<b>Head Type</b>		H1	Weatherproof IP-65			
		H2	Weatherproof IP-67			
		H3	Flameproof, IP-67, Gr IIA, IIB			
		H4	Explosionproof, IP-67, Gr IIC			
		H5	ATEX			
		S4S	SS304	825	Incoloy® 825	
		S6S	SS316	600	Inconel® 600	
		310	SS310	800	Incoloy® 800	
		446	SS446	321	SS321	
		S4L	SS304L	KAN	Kanthal	
		S6L	SS316L	HCC	Hastelloy® C-276	
		CST	CS	HCB	Hastelloy® B	
		410	SS410	MN4	Monel® 400	
		S7S	SS317	MN5	Monel® 500	
		S7L	SS317L	T	Ti-II	
		N200	Nickel 200	XXX	Please Specify	
		**Special material on Request				
		Protection Tube Standard Sizes				
		A	10x7	B	12x7	
		C	14x7	D	14x9	
		XXX	Please Specify			
<b>Protection Tube Material</b>		S4S	SS304			
		S6S	SS316			
<b>Protection Tube Size</b>		15N	1/2" NPT			
		15B	1/2" BSP			
		XXX	Please Specify			
<b>Adj. Gland MOC</b>		Pl. Specify in mm				
<b>Connection Fitting</b>		Pl. Specify in mm				
<b>Insertion Length of "IL" (mm)</b>		Pl. Specify in mm				

**Ordering Example:- RTD106-1-1-3W-IEC-A-6-S6S-AI-2-15N-H2-C-A-S6S-15N-400-1(SS316)**



# RTD 107 - RTD with Protecting Tube (Flanged Connection)



Other Options	
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special

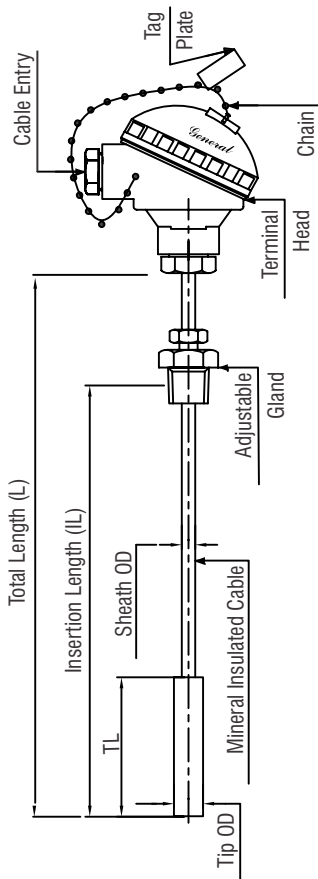
**NOTE: Adjustable Gland Length - 50 mm**  
(L=IL + 50 mm Below Head)

## RTD - 107

Element	1	Pt. 100	2	Pt. 1000		
	XXX	Please Specify				
Element Type	1	Simplex	2	Duplex		
Wire Configuration	2W	2-Wire				
	3W	3-Wire				
	4W	4-Wire				
Calibration Standard	IEC	IEC 751	DIN	DIN 43760		
Calibration Class	A	Class A	B	Class B		
Sheath 'OD'	3	3 mm	4.5	4.5 mm		
	6	6 mm	8	8mm		
	10	10mm				
	XXX	Please Specify				
Sheath Material	S6S	SS316	S6L	SS316L		
	XXX	Please Specify				
Terminal Head	AI	Die cast Aluminium				
	S4S	SS304	S6S	SS316		
No. of Cable Entries	1	Single	2	Double		
Cable Entry (F)	15N	1/2" NPT	20E	3/4" ET		
	15M	M20 x 1.5	15B	1/2" BSP		
Head Type	H1	Weatherproof IP-65				
	H2	Weatherproof IP-67				
	H3	Flameproof, IP-67, Gr IIA, IIB				
	H4	Explosionproof, IP-67, Gr IIC				
	H5	ATEX				
Protection Tube Material	S4S	SS304	825	Incoloy® 825		
	S6S	SS316	600	Inconel® 600		
	310	SS310	800	Incoloy® 800		
	446	SS446	321	SS321		
	S4L	SS304L	KAN	Kanthal		
	S6L	SS316L	HCC	Hastelloy® C-276		
	CST	CS	HCB	Hastelloy® B		
	410	SS410	MN4	Monel® 400		
	S7S	SS317	MN5	Monel® 500		
	S7L	SS317L	T	Ti-II		
N200	Nickel 200	XXX	Please Specify			
**Special material on Request						
Protection Tube Size	Protection Tube Standard Sizes					
	A	10x7	B	12x7		
	C	14x7				
	D	14x9	XXX	Please Specify		
Process Conn. Fitting	Size	Code	Rating	Code	Facing	Code
	1/2"	15	150#	A	RF	RF
	3/4"	20	300#	B	FF	FF
	1"	25	600#	C	RTJ	RTJ
	1.5"	40	900#	D	LT	LT
	2"	50	1500#	E	LG	LG
Flange	3"	80	2500#	F		
Insertion Length of "IL" (mm)	CST	CS				
	S4S	SS304	S6S	SS316		
Pl. Specify in mm						

**Ordering Example:- RTD107-1-1-3W-IEC-A-6-S6S-AI-2-15N-H2-S6S-A-15ARF-S6S-400-1(SS316)**

# RTD 108 - RTD Assembly with adjustable Conn. & Tip Assembly



	Other Options
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special
8	'L' Type Mounting Bracket

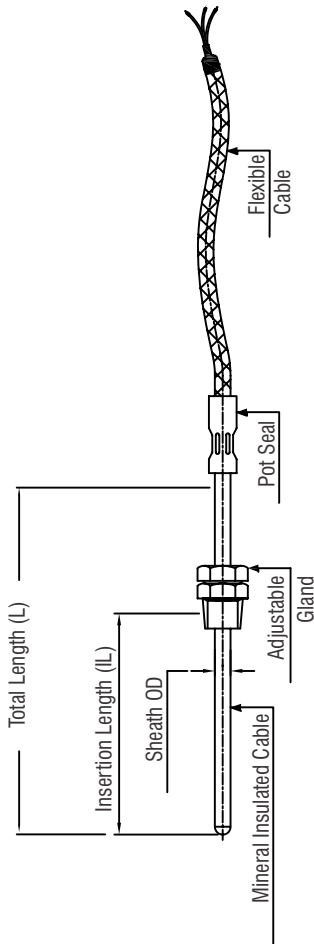
**NOTE:** Adjustable Gland Length - 50 mm  
(L=IL + 50 mm Below Head)

## RTD - 108

<b>Element</b>	1	Pt. 100
	2	Pt. 1000
	XXX	Please Specify
<b>Element Type</b>	1	Simplex
	2	Duplex
<b>Wire Configuration</b>	2W	2-Wire
	3W	3-Wire
	4W	4-Wire
<b>Calibration Standard</b>	IEC	IEC 751
	DIN	DIN 43760
<b>Calibration Class</b>	A	Class A
	B	Class B
<b>Sheath 'OD' (Tip 'OD')</b>	3	3 mm
	4.5	4.5 mm
	6	6 mm
	8	8 mm
	10	10 mm
	XXX	Please Specify
<b>Sheath Material</b>	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
<b>Terminal Head</b>	AI	Die cast Aluminium
	S4S	SS304
	S6S	SS316
<b>No. of Cable Entries</b>	1	Single
	2	Double
<b>Cable Entry (F)</b>	15N	1/2" NPT
	20E	3/4" ET
	15M	M20 x 1.5
	15B	1/2" BSP
<b>Head Type</b>	H1	Weatherproof IP-65
	H2	Weatherproof IP-67
	H3	Flameproof, IP-67, Gr IIA,IIB
	H4	Explosionproof, IP-67, Gr IIC
	H5	ATEX
<b>Adj. Gland MOC</b>	S4S	SS304
	S6S	SS316
<b>Connection Fitting</b>	15N	1/2" NPT
	15B	1/2" BSP
	XXX	Please Specify
<b>Insertion Length of "IL" (mm)</b>		Pl. Specify in mm
<b>Tip OD &amp; Length "TL" (mm)</b>		Pl. Specify in mm

**Ordering Example:-** RTD108-1-1-3W-IEC-A-6-S6S-AI-2-15N-H2-S6S-15N-400-10-0

# RTD 201 - RTD Insert with Transition Joint



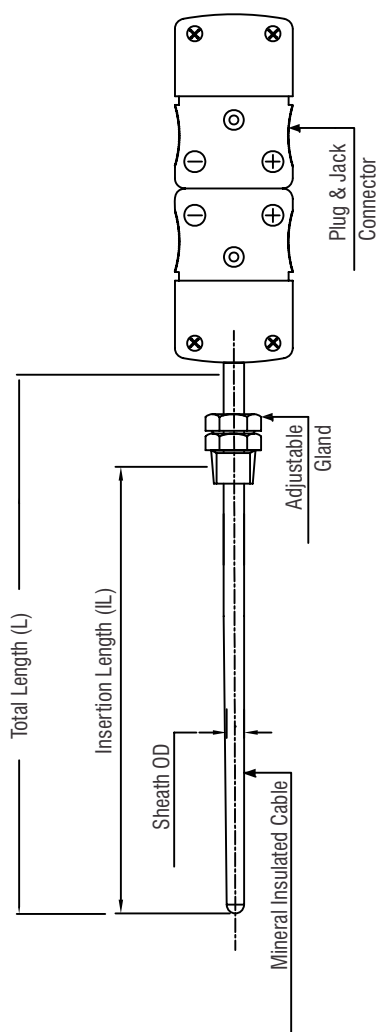
Other Options	
0	None
1	CE Certification
2	SS Conduit ( Armour )

**NOTE:** Pot Seal Length(Standard) - 40 mm  
 $L = IL + 50 \text{ mm}$

## RTD - 201

<b>Element</b>	1	Pt. 100
	2	Pt. 1000
	XXX	Please Specify
<b>Element Type</b>	1	Simplex
	2	Duplex
<b>Wire Configuration</b>	2W	2-Wire
	3W	3-Wire
	4W	4-Wire
<b>Calibration Standard</b>	IEC	IEC 751
	DIN	DIN 43760
<b>Calibration Class</b>	A	Class A
	B	Class B
<b>Sheath 'OD'</b>	3	3 mm
	4.5	4.5 mm
	6	6 mm
	8	8 mm
	10	10 mm
	XXX	Please Specify
<b>Sheath Material</b>	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
<b>Adj. Gland MOC</b>	S4S	SS304
	S6S	Ss316
	XXX	Please Specify
<b>Connection Fitting</b>	15N	1/2 " NPT
	15B	1/2 " BSP
	XXX	Please Specify
<b>Insertion Length of "IL" (mm)</b>	Pl. Specify in mm	
<b>Flexible Cable Type</b>	1	PTFE insulated, PTFE overall cable
	2	PTFE Insulated, overall PTFE & SS braided cable
	3	FG/FG Insulated cable
	4	FG/FG/SS Cable
	5	PTFE / SS / FG
<b>Flexible Cable Length (mm)</b>	Pl. Specify in mm	

# RTD 202 - RTD Insert with Plug & Jack Connector



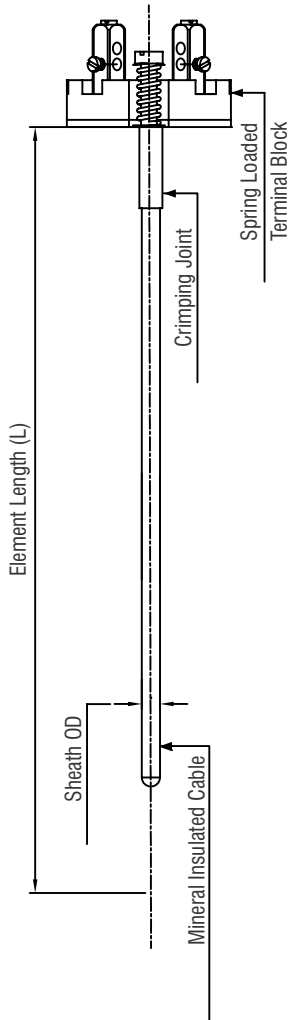
**NOTE:** Adjustable Gland Length - 50 mm  
 $L = IL + 50 \text{ mm}$

## RTD - 202

<b>Element</b>	1	Pt. 100
	2	Pt. 1000
	XXX	Please Specify
<b>Element Type</b>	1	Simplex
	2	Duplex
<b>Wire Configuration</b>	2W	2-Wire
	3W	3-Wire
	4W	4-Wire
<b>Calibration Standard</b>	IEC	IEC 751
	DIN	DIN 43760
<b>Calibration Class</b>	A	Class A
	B	Class B
<b>Sheath 'OD'</b>	3	3 mm
	4.5	4.5 mm
	6	6 mm
	8	8 mm
	10	10 mm
	XXX	Please Specify
<b>Sheath Material</b>	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
<b>Adj. Gland MOC</b>	S4S	SS304
	S6S	SS316
	XXX	Please Specify
<b>Connection Fitting</b>	15N	1/2" NPT
	15B	1/2" BSP
	XXX	Please Specify
<b>Insertion Length of "IL" (mm)</b>	Pl. Specify in mm	

**Ordering Example:-** RTD202-1-2-3W-IEC-A-6-S6S-S4S-15N-500

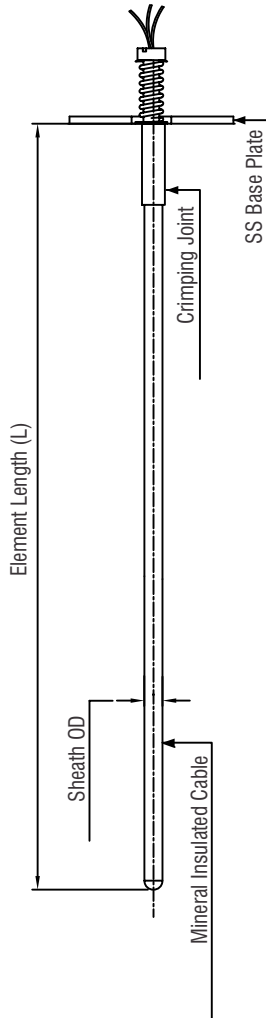
# RTD 203 - RTD Insert with Spring Loaded Terminal Block



## RTD - 203

<b>Element</b>	1	Pt. 100
	2	Pt. 1000
	XXX	Please Specify
<b>Element Type</b>	1	Simplex
	2	Duplex
<b>Wire Configuration</b>	2W	2-Wire
	3W	3-Wire
	4W	4-Wire
<b>Calibration Standard</b>	IEC	IEC 751
	DIN	DIN 43760
<b>Calibration Class</b>	A	Class A
	B	Class B
<b>Sheath 'OD'</b>	3	3 mm
	4.5	4.5 mm
	6	6 mm
	8	8 mm
	10	10 mm
	XXX	Please Specify
<b>Sheath Material</b>	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
<b>Element Length of "L" (mm)</b>	Pl. Specify in mm	

# RTD 204 - RTD Insert with SS Base Plate for Temperature Transmitter Mounting

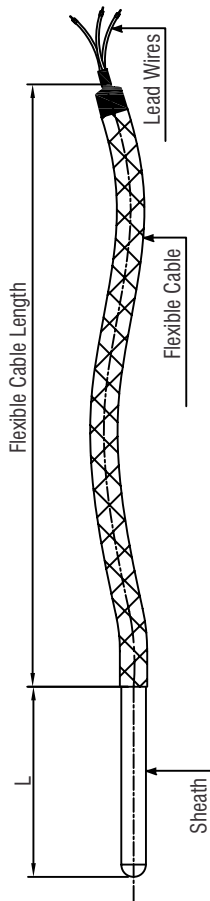


## RTD - 204

<b>Element</b>	1	Pt. 100
	2	Pt. 1000
	XXX	Please Specify
<b>Element Type</b>	1	Simplex
	2	Duplex
<b>Wire Configuration</b>	2W	2-Wire
	3W	3-Wire
	4W	4-Wire
<b>Calibration Standard</b>	IEC	IEC 751
	DIN	DIN 43760
<b>Calibration Class</b>	A	Class A
	B	Class B
<b>Sheath 'OD'</b>	3	3 mm
	4.5	4.5 mm
	6	6 mm
	8	8 mm
	10	10 mm
	XXX	Please Specify
<b>Sheath Material</b>	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
<b>Element Length of "L" (mm)</b>	Pl. Specify in mm	

Ordering Example:- RTD204-1-2-3W-IEC-A-6-S6S-500

# RTD 205 - Bearing Temperature RTD

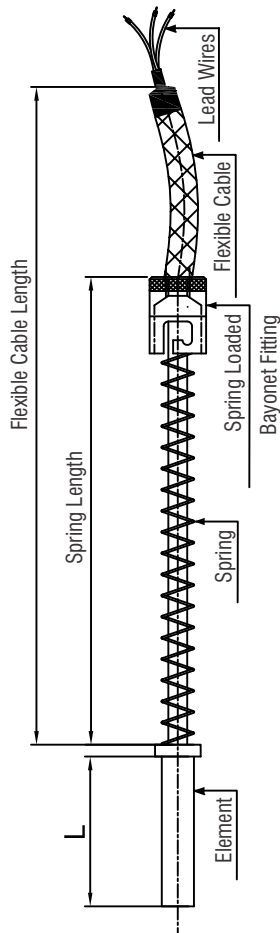


## RTD - 205

<b>Element</b>	<b>1</b>	Pt. 100
	<b>2</b>	Pt. 1000
	<b>XXX</b>	Please Specify
<b>Element Type</b>	<b>1</b>	Simplex
	<b>2</b>	Duplex
<b>Wire Configuration</b>	<b>2W</b>	2-Wire
	<b>3W</b>	3-Wire
	<b>4W</b>	4-Wire
<b>Calibration Standard</b>	<b>IEC</b>	IEC 751
	<b>DIN</b>	DIN 43760
<b>Calibration Class</b>	<b>A</b>	Class A
	<b>B</b>	Class B
<b>Sheath 'OD'</b>	<b>3</b>	3 mm
	<b>4.5</b>	4.5 mm
	<b>6</b>	6 mm
	<b>8</b>	8 mm
	<b>10</b>	10 mm
	<b>XXX</b>	Please Specify
<b>Sheath Material</b>	<b>S6S</b>	SS316
	<b>S6L</b>	SS316L
	<b>XXX</b>	Please Specify
<b>Element Length of "L" (mm)</b>	Pl. Specify in mm	
<b>Flexible Cable Type</b>	<b>1</b>	PTFE insulated, PTFE overall cable
	<b>2</b>	PTFE Insulated, overall PTFE & SS braided cable
	<b>3</b>	FG/FG Insulated cable
	<b>4</b>	FG/FG/SS Cable
	<b>5</b>	PTFE / SS / FG
<b>Flexible Cable Length (mm)</b>	Pl. Specify in mm	



# RTD 206 - RTD Inert with Spring Loaded Bayonet Fitting (Straight)

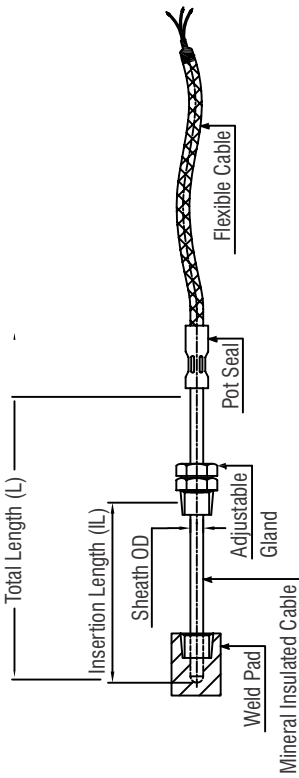


## RTD - 206

<b>Element</b>	1	Pt. 100
	2	Pt. 1000
	XXX	Please Specify
<b>Element Type</b>	1	Simplex
	2	Duplex
<b>Wire Configuration</b>	2W	2-Wire
	3W	3-Wire
	4W	4-Wire
<b>Calibration Standard</b>	IEC	IEC 751
	DIN	DIN 43760
<b>Calibration Class</b>	A	Class A
	B	Class B
<b>Sheath 'OD'</b>	3	3 mm
	4.5	4.5 mm
	6	6 mm
	8	8 mm
	10	10 mm
	XXX	Please Specify
<b>Sheath Material</b>	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
<b>Element Length of "L" (mm)</b>	Pl. Specify in mm	
<b>Flexible Cable Type</b>	1	PTFE insulated, PTFE overall cable
	2	PTFE Insulated, overall PTFE & SS braided cable
	3	FG/FG Insulated cable
	4	FG/FG/SS Cable
	5	PTFE / SS / FG
<b>Flexible Cable Length "TL" (mm)</b>	Pl. Specify in mm	

Ordering Example:- RTD206-1-2-3W-IEC-A-6-S6S-500-1-3000

# RTD 207 - RTD with Weld Pad & Cable

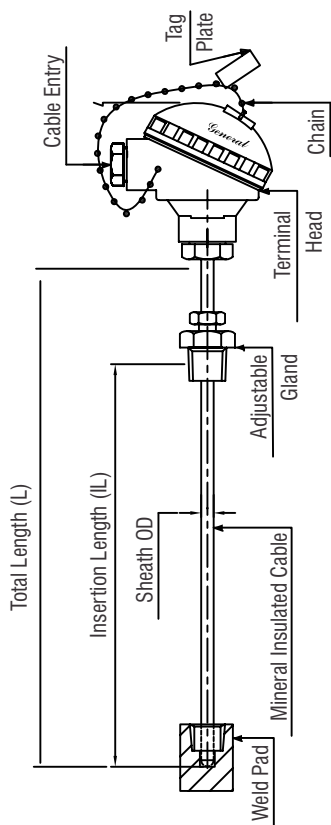


**NOTE:** Pot Seal Length(Standard) - 40 mm  
 $L = IL + 50 \text{ mm}$

## RTD - 207

<b>Element</b>	1	Pt. 100
	2	Pt. 1000
	XXX	Please Specify
<b>Element Type</b>	1	Simplex
	2	Duplex
<b>Wire Configuration</b>	2W	2-Wire
	3W	3-Wire
	4W	4-Wire
<b>Calibration Standard</b>	IEC	IEC 751
	DIN	DIN 43760
<b>Calibration Class</b>	A	Class A
	B	Class B
<b>Sheath 'OD'</b>	3	3 mm
	4.5	4.5 mm
	6	6 mm
	8	8 mm
	10	10 mm
	XXX	Please Specify
<b>Sheath Material</b>	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
<b>Adj. Gland MOC</b>	S4S	SS304
	S6S	Ss316
	XXX	Please Specify
<b>Connection Fitting</b>	15N	1/2 " NTP
	15B	1/2 " BSP
	XXX	Please Specify
<b>Insertion Length of "IL" (mm)</b>	Pl. Specify in mm	
<b>Flexible Cable Type</b>	1	PTFE insulated, PTFE overall cable
	2	PTFE Insulated, overall PTFE & SS braided cable
	3	FG/FG Insulated cable
	4	FG/FG/SS Cable
	5	PTFE / SS / FG
<b>Flexible Cable Length in (mm)</b>	Pl. Specify in mm	
<b>Weld Pad MOC</b>	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
<b>Weld Pad Dimensions</b>	Length (L) x Breadth (B) x Height (H)	

# RTD 301 - RTD Assembly with adjustable Connection With Weld Pad



Other Options	
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification
5	Only Base Plate Suitable for TT
6	6 Pin / 10 Pin Connector
7	Special
8	'L' Type Mounting Bracket

NOTE: Adjustable Gland Length - 50 mm

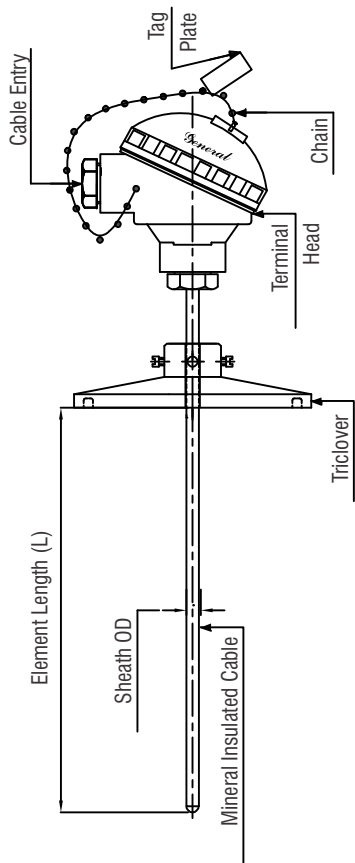
$$L = IL + 50 \text{ mm}$$

## RTD - 301

Element	1	Pt. 100
	2	Pt. 1000
	XXX	Please Specify
Element Type	1	Simplex
	2	Duplex
Wire Configuration	2W	2-Wire
	3W	3-Wire
	4W	4-Wire
Calibration Standard	IEC	IEC 751
	DIN	DIN 43760
Calibration Class	A	Class A
	B	Class B
Sheath 'OD' (Tip 'OD')	3	3 mm
	4.5	4.5 mm
	6	6 mm
	8	8 mm
	10	10 mm
	XXX	Please Specify
Sheath Material	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
Terminal Head	AI	Die cast Aluminium
	S4S	SS304
	S6S	SS316
No. of Cable Entries	1	Single
	2	Double
Cable Entry (F)	15N	1/2" NPT
	20E	3/4" ET
	15M	M20 x 1.5
	15B	1/2" BSP
Head Type	H1	Weatherproof IP-65
	H2	Weatherproof IP-67
	H3	Flameproof, IP-67, Gr IIA, IIB
	H4	Explosionproof, IP-67, Gr IIC
	H5	ATEX
Adj. Gland MOC	S4S	SS304
	S6S	SS316
Connection Fitting	15N	1/2" NPT
	15B	1/2" BSP
	XXX	Please Specify
Insertion Length of "IL" (mm)	Pl. Specify in mm	
Weld Pad MOC	S6S	SS316
	S6L	SS316L
	XXX	Please Specify
Weld Pad Dimensions	Length (L) x Breadth (B) x Height (H)	

Ordering Example:- RTD301-1-1-3W-IEC-A-6-S6S-AI-2-15N-H2-S6S-15N-400-S6S-25x25x15-0

# RTD 302 - RTD Assembly with Tri-clamp Connection



	Other Options
0	None
1	Cable Gland (Specify MOC [SS304,SS316,Brass])
2	Plug (Specify MOC [Al,SS304,SS316])
3	Head Mounted transmitter
4	CE Certification

## RTD - 302

<b>Element</b>	1	Pt. 100
	2	Pt. 1000
	XXX	Please Specify
<b>Element Type</b>	1	Simplex
	2	Duplex
<b>Wire Configuration</b>	2W	2-Wire
	3W	3-Wire
	4W	4-Wire
<b>Calibration Standard</b>	IEC	IEC 751
	DIN	DIN 43760
<b>Calibration Class</b>	A	Class A
	B	Class B
<b>Sheath 'OD' (Tip 'OD')</b>	3	3 mm
	4.5	4.5 mm
	6	6 mm
	8	8 mm
	10	10 mm
	XXX	Please Specify
<b>Sheath Material</b>	S6S	SS316
	321	SS321
	446	SS446
	600	Incoloy 600
	800	Incoloy 800
	XXX	Please Specify
<b>Terminal Head</b>	AI	Die cast Aluminium
	S4S	SS304
	S6S	SS316
<b>No. of Cable Entries</b>	1	Single
	2	Double
<b>Cable Entry (F)</b>	15N	1/2" NPT
	20E	3/4" ET
	15M	M20 x 1.5
	15B	1/2" BSP
<b>Head Type</b>	H1	Weatherproof IP-65
	H2	Weatherproof IP-67
	H3	Flameproof, IP-67, Gr IIA, IIB
	H4	Explosionproof, IP-67, Gr IIC
	H5	ATEX
<b>Connection Fitting TC (Triclover/Triclamp)</b>	15TC	1/2 " NPT
	20TC	3/4 " BSP
	25TC	1"
	40TC	1.1/2"
	XXX	Please Specify
<b>Nominal Length of "L" (mm)</b>	Pl. Specify in mm	

Ordering Example:- RTD302-1-1-3W-IEC-A-6-S6S-AI-1-15N-H1-25TC-200-0

## In-House tests carried out for RTD assemblies

- 1. Calibration:** RTD calibration can be done as per IEC 751/DIN 43760 Class A & B. Normally test is conducted for two points (i.e. 0°C & 100°C) 3 point calibration or more on request.
- 2. Insulation Resistance Test** at ambient (room temperature) at 500 VDC - should be more than 100 M ohms. Higher value of request.
- 3. Insulation Resistance Test** at 320° C at 100 V DC - IR should be more than 2 M ohms. More than 20 M ohms also can be offered.
- 4. N<sub>2</sub> leakage Test:** For RTD sensor, after cap welding the N<sub>2</sub> leakage test should be carried out no leakage should be observed at 40 kg/cm<sup>2</sup>.
- 5. Response Time Test:** Response time test as per IEC 751 - (63.2% step change from ambient to 80°C) for RTD without transmitter - 6 to 9 sec up to 6 mm OD of sheath. For RTD with thermowell the response time will be 35 to 45 sec.
- 6. Special Test: Autoclave Test:** RTD kept in steam @ 125°C & at 1.2 kg/cm<sup>2</sup> for about 1 hour. IR should be more than 5 M Ohms.
- 7. Continuity Test:** By using continuity tester / multimeter - This test is used to confirm the element is connected properly to the RTD transducer cable.
- 8. Sheath Integrity Test: Water Immersion Test:** To check sheath integrity of thermocouple/ MI RTD cable.
- 9. Response Time Test:** For RTD with RTD connected to pipe on its outside surface to which water is flowing @ 20 ltrs. per second and @ 80°C. Acceptance norm is less than 20 seconds.
- 10. Self Heating Error Test:** Done in accordance with IEC 751
- 11. Cryogenic Temperature Calibration:** At (-)196°C

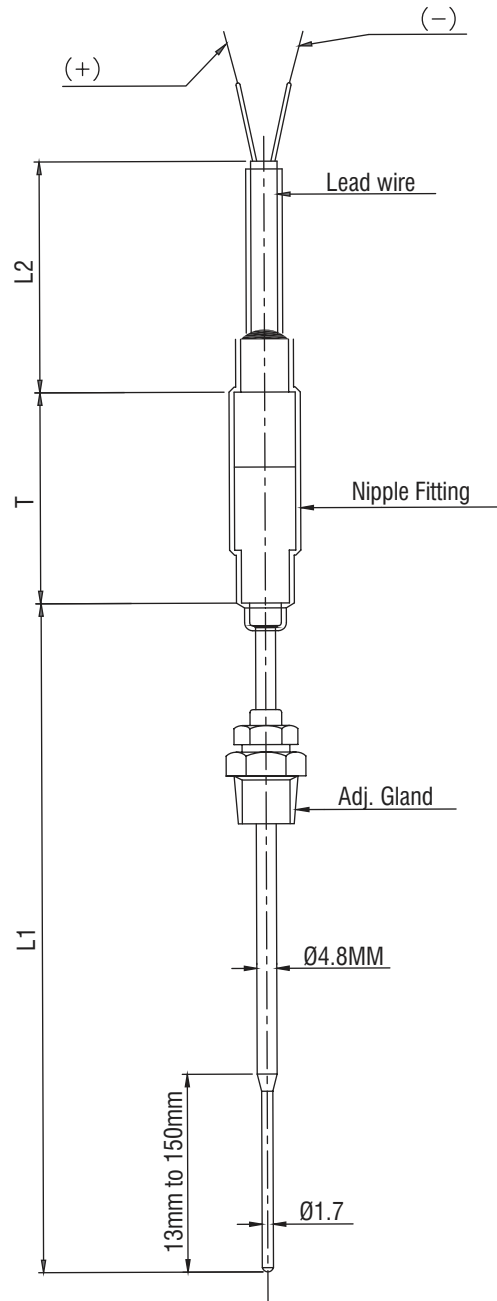




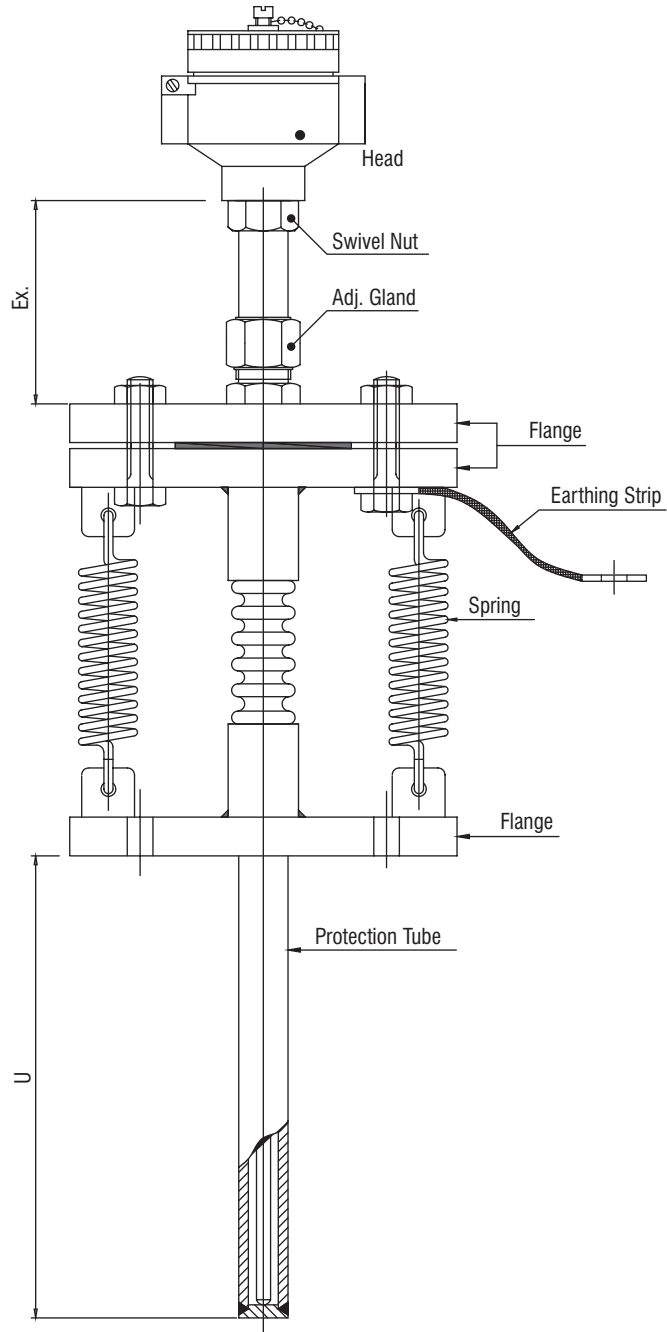
# **SPECIAL THERMOCOUPLES ASSEMBLIES**

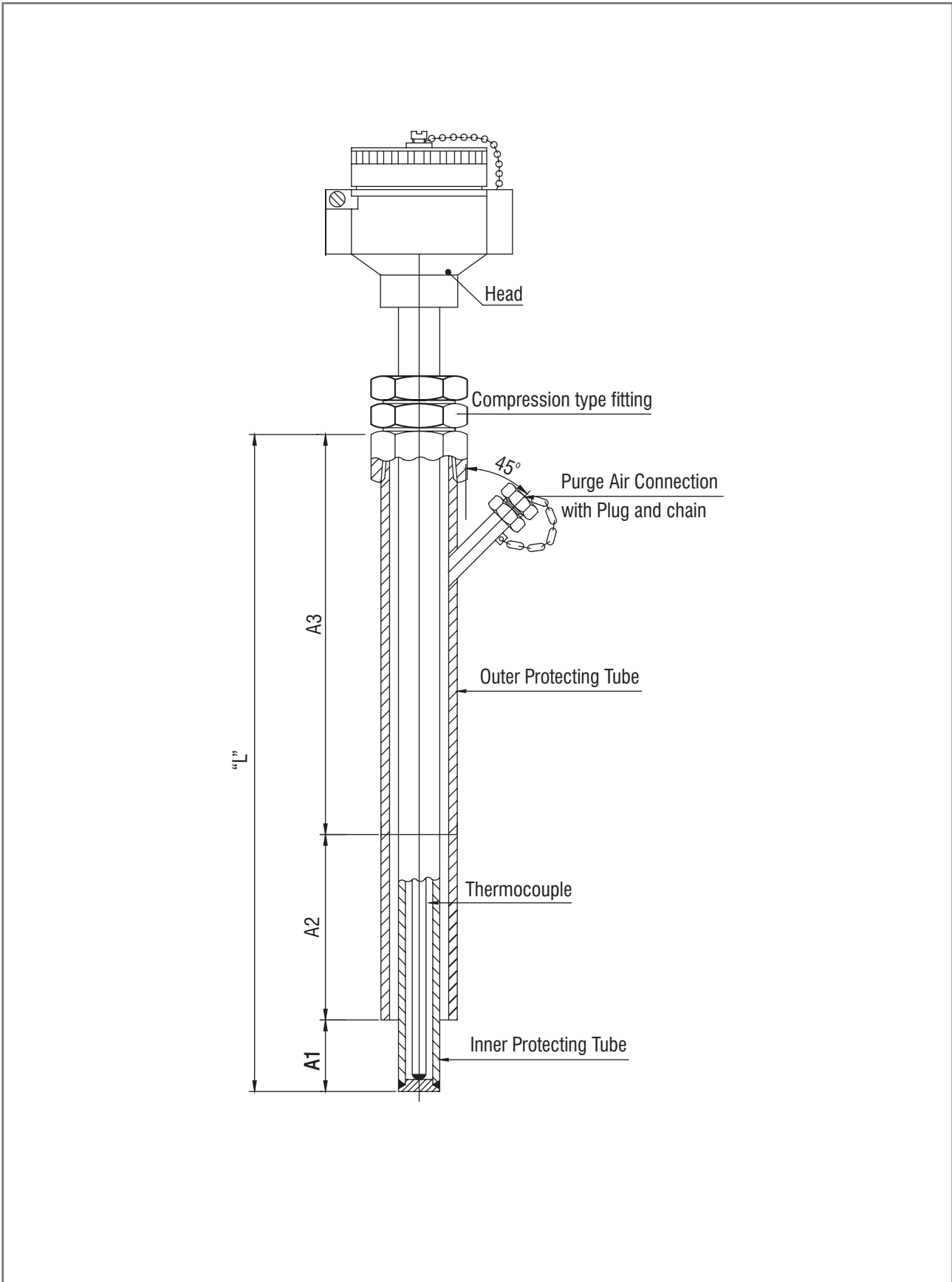


# Swaged Type Special Thermocouple Assembly for Quick Response

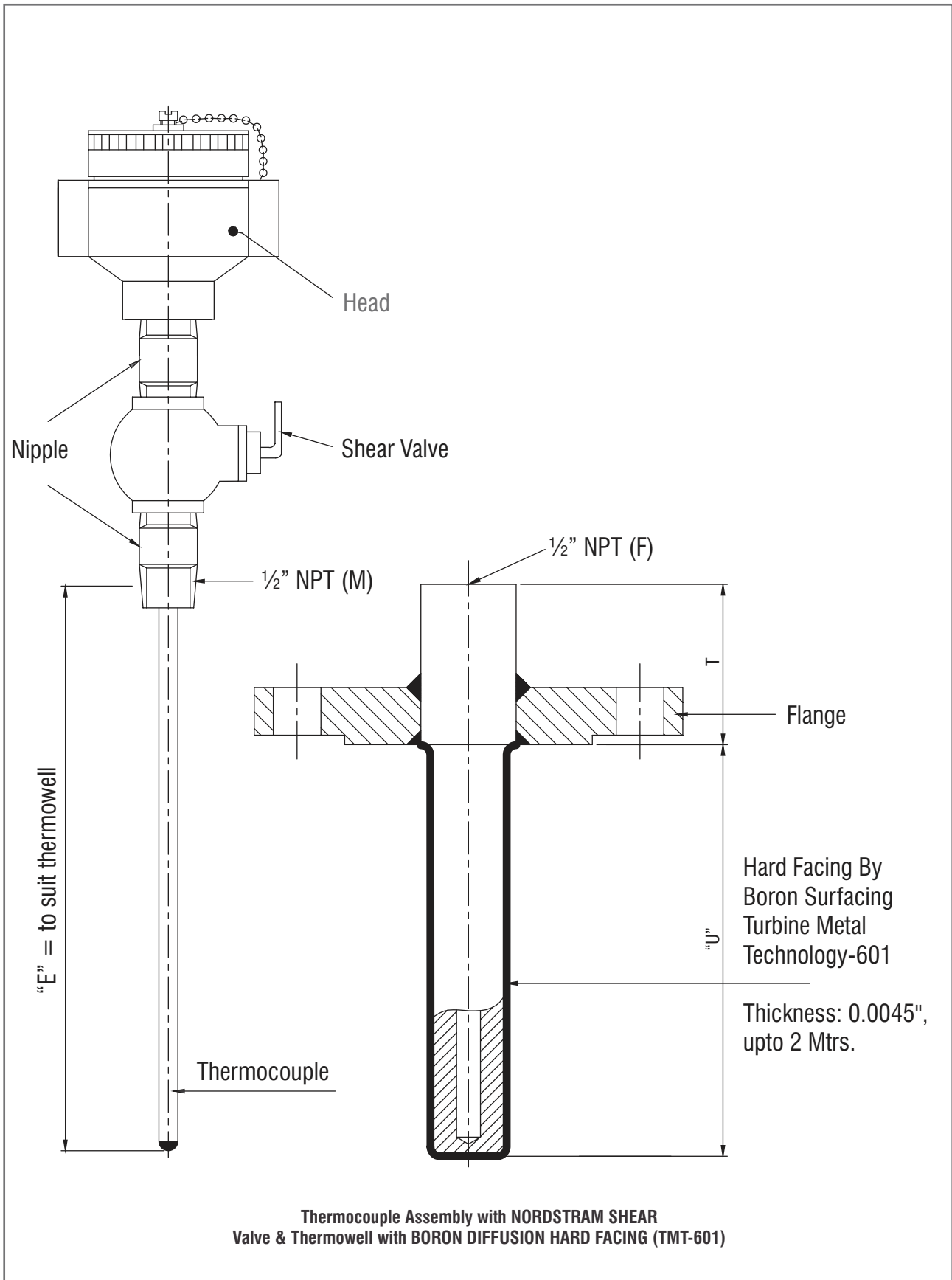


# Fully Spring Loaded Thermocouple / RTD Assembly for Vibration Application





# Thermocouple Assembly with NORDSTRAM SHEAR Valve



The conventional thermocouple is used with an outer protecting tube or thermowell to protect it from aggressive and corrosive process condition. This improves longevity of the thermocouple. However, response time is poor. To overcome above problem, *General* has designed MI Thickwall Thermocouple having thicker wall with relatively larger conductor diameters. This construction enable the user to insert the thermocouple directly in the process without a protecting tube or thermowell, improving response time considerably.

**Normal applications:**

Furnaces, rotary kilns, recuperators, skin temperature measurement of heater tubes.

**Advantages:**

- ❑ Faster response
- ❑ Longer lengths can be offered
- ❑ Pliable and easily routed
- ❑ Available in SS316, SS310, Inconel® 600, Incoloy® 800, SS446 sheath materials

**Type of thermocouple offered under Thickwall:**

- J (Iron constantan)
- K (Chromel alumel)
- E (Chromel constantan)



SHEATH DIA	WALL THICKNESS*	CONDUCTOR DIA *	
		(Nominal) Single	(Nominal) Duplex
8 mm	1.65 mm	1.12 mm	0.65 mm
9.5 mm	2.00 mm	1.40 mm	1.20 mm
10 mm	2.10 mm	1.40 mm	0.85 mm
12.7 mm	3.00 mm	1.80 mm	1.10 mm
15 mm	3.60 mm	2.00 mm	1.65 mm
17 mm	4.00 mm	2.20 mm	1.85 mm
19 mm	4.50 mm	2.45 mm	2.00 mm

\* These are standard dimensions. Special dimensions available on request.

*General* indigenised the Skin Thermocouple assemblies first time in India. Tube Skin Thermocouples manufactured by us are reliable for measurement and control of tube surface temperature in fire heaters. Accurate temperature measurement is important for prolonging heater tube life, for ensuring safe and efficient operation. We have been supplying tube skin thermocouple assemblies in quantities to majority of the projects in India as well as exporting to various countries.

The basic thermocouple is normally of 12.7 mm OD with relatively higher sheath wall thickness, mineral insulated (compacted MgO) and in variety of sheath materials such as SS310, SS446, Inconel® 600, Incoloy® 800 etc. The Junction is generally grounded. However ungrounded junction also is offered, as customer requires. Mineral Insulated (MI) thermocouple is manufactured by Cold drawing and annealing (heat treatment) process in controlled atmosphere. The heat treatment (which is controlled within +/- 2°C) is carried out in hydrogen atmosphere to avoid surface defects & partial oxidation of conductor.

## Major user industries

- Refineries & Petrochemical
- Oil & Gas
- Chemical
- Fertiliser
- Metal (ferrous/non ferrous)



## Different types available

- a. Knife Edge Wedge Type
- b. Washer Type
- c. Retractable Type
- d. Assemblies with Single or Multiple Expansion Loop



## Technical Notes on Tube Skin Type Assembly

1. **General** was the first company to actually indigenise the product. Earlier the product was fully imported. The product was started in Technical Collaboration with M/s BICC - Pyrotenax of Hebburn UK. **General** has also supplied this assembly in very big quantities to several countries such as UK, Germany, Italy & Middle East. **General** has approval for this product from most consultants in India & abroad.

2. **Raw Materials:** There are basically three raw materials that go in to manufacturing of Tube Skin, Thermocouple, they are as given below.

**Basic Mother Tube:** This is mostly SS310, SS446, Inconel® 600, Incoloy® 800 etc. This tube is required in seamless form and as it goes under several reduction, quality of input tube has to be very good. In view of this, tubes are procured only from established mills.

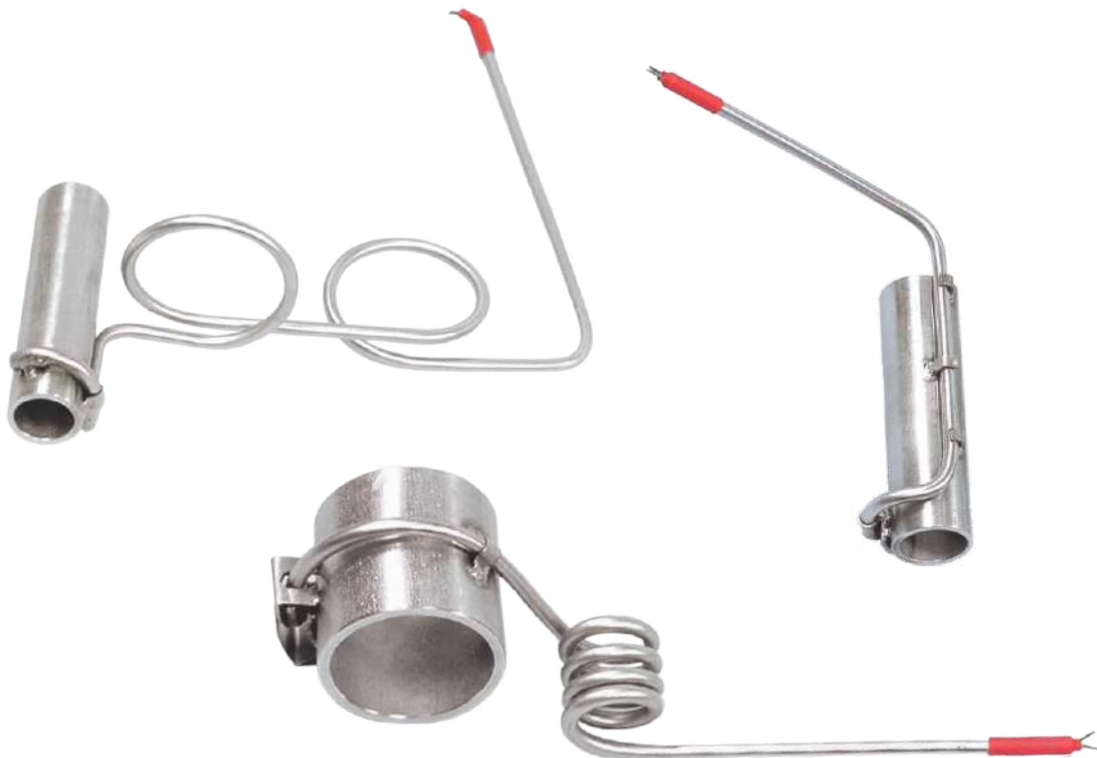
**Insulators:** MgO is used as mineral insulation. The material is imported from a German company - Who are pioneers in this field worldwide. The purity is very important for long life of thermocouple. We use over 99% pure MgO.

**Conductor:** Type K in most cases, conductors are of virgin quality. The initial conductor calibration as well as final calibration falls within half tolerance as a standard.

3. **Manufacturing Process of Mineral Insulated Thermocouple Thick-wall Cable (MITTC):** The manufacturing process involves cold drawing and heat treatment. The three raw materials are assembled as per requirement and are cold drawn on draw benches. The heat treatment process, in this case strand annealing, is the key area of concern as it decides the final quality of product. **General** has capability of drawing and annealing in very controlled conditions. The annealing is controlled within +/- 2°C. The heat treatment is requirement to be carried out in hydrogen atmosphere to avoid surface defects as well as partial oxidation of conductor material.

4. Final product conforms to specification as given.

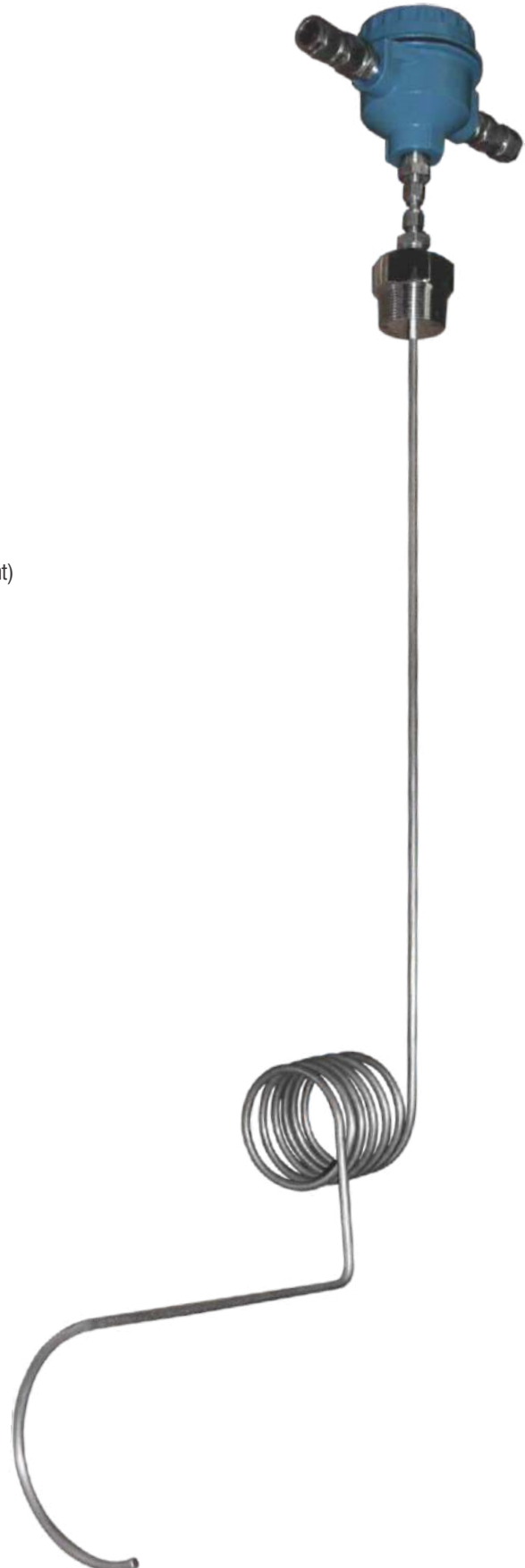
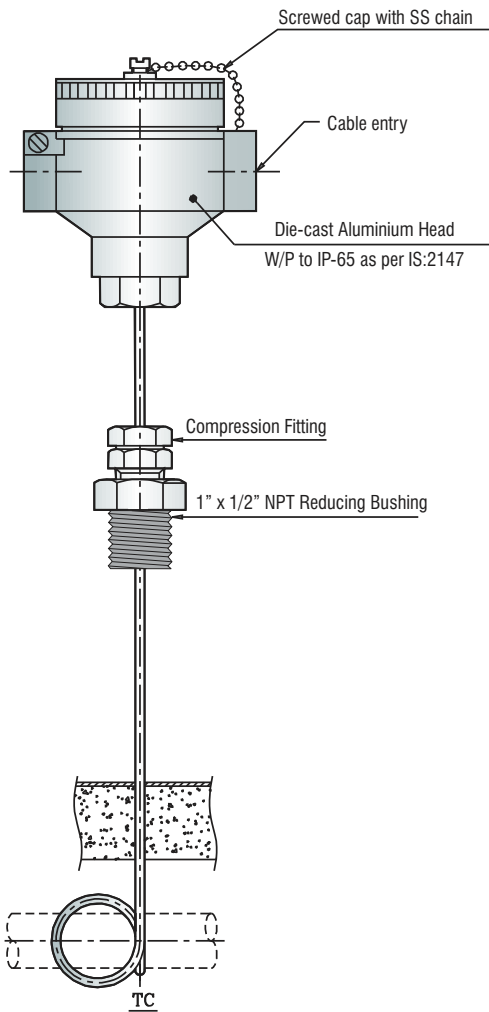
5. **Bending Process & Welding:** After the thick-wall cable is bent on automatic bending machines to get even circular diameters. The bends (D & 2D) are the expansion loops of the thermocouple.





## Specifications

<b>Sheath Materials Offered</b>	: SS446, Inconel® 600/601, SS310 (Other materials on request)
<b>Sheath Diameter</b>	: 9.5, 12.7 mm (½") (Higher diameter on request)
<b>Thermocouple Types</b>	: ANSI Type K, J, E, N
<b>Conductor Diameter</b>	: 1.8 mm (nominal) for 12.7 mm OD
<b>Sheath Thickness</b>	: 3.20 mm (nominal) for 12.7 mm OD
<b>Insulation Material</b>	: Compact mass of MgO (99% min Purity)
<b>Insulation Resistance</b>	: > 100 M Ohm @ 500VDC (Before grounding)
<b>Calibration</b>	: ANSI MC 96.1 / IEC 584 (Special Tolerance)
<b>Response Time</b>	: 10 seconds (after grounding)
<b>Heat Shield</b>	: Provided on request
<b>Junction Type</b>	: Grounded, Knife Edge Wedge Type
<b>Expansion Loop</b>	: Provided ex-factory (In accordance with customer requirement)



## Welding Procedure

1. Grind the surface of heater tube in the area of thermocouple junction location for removing scale and rust. Clean the area.
2. Clamp the thermocouple in the desired location.
3. Center of the wedge type pad must be ensured to be in contact with the heater tube.
4. Perform root weld pass on both sides of the pad using 1.57 mm dia filler rod. Welds must overlap each other & run full length of the pad.
5. Perform secondary weld pass on both sides of the pad using 2.36 mm dia filler rod. Welds to run full length of the pad.
6. Perform final weld pass on both sides of the pads using 2.36mm dia filler rod. Welds must extend 9.5mm minimum above tube surface & run full length of the pad.
7. For transverse mounted thermocouple, locate the retaining clip at the tangent point of the thermocouple and tube & weld at both ends using 2.36 mm dia filler rod.
8. For Axial mounted thermocouple, locate the retaining clip as desired & weld as mentioned under point no. 7 above.

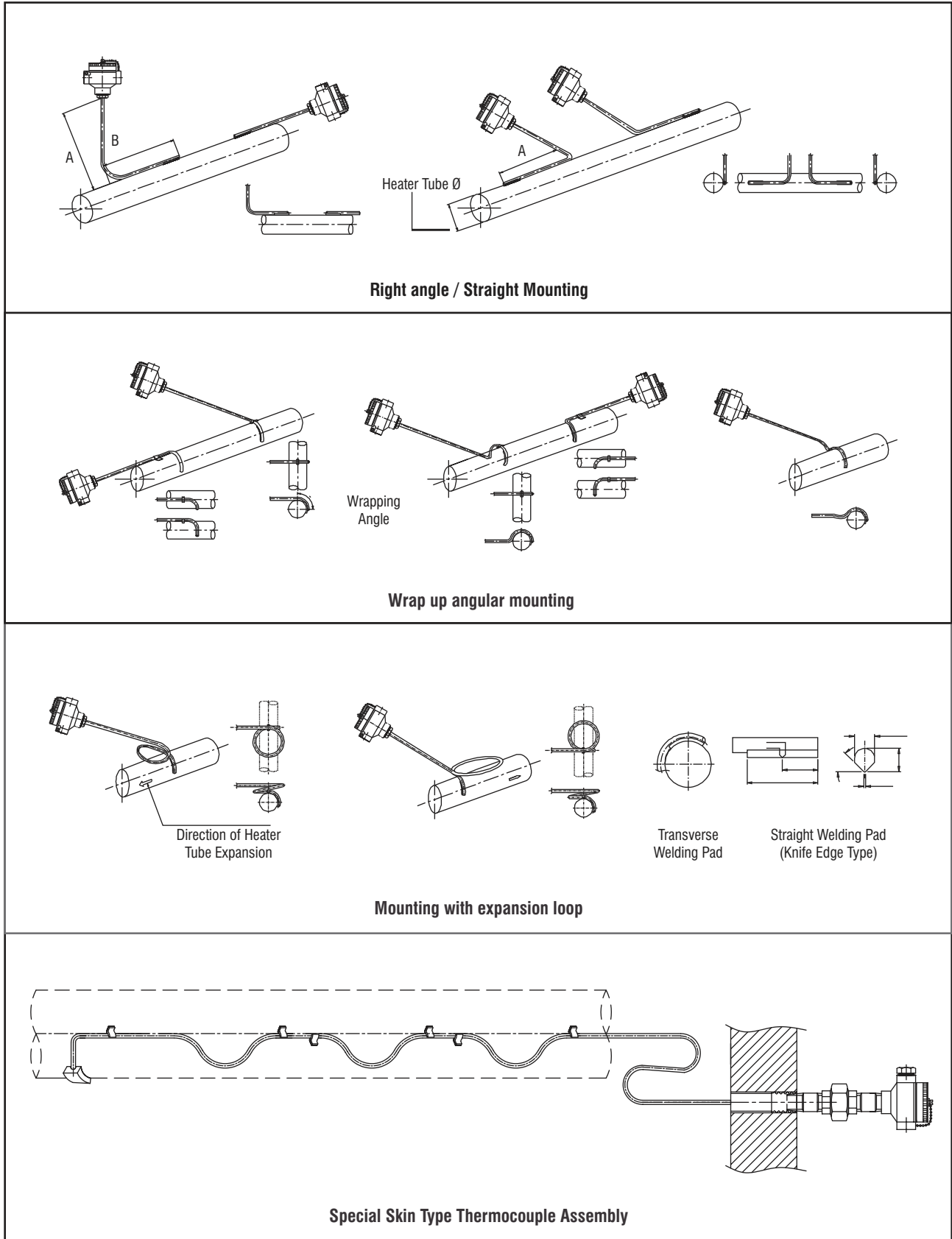
## Recommended weld filler rod material for SS446 sheathed thermocouple

HEATER TUBE MATERIAL	FILLER ROD MATERIAL
ASTM A312 TP 304, TP 309, TP 310	SS309-AWS A5.9, Class ER 309
ASTM A321 (Ti Stabilised)	SS309-AWS A5.9, Class ER309
ASTM A3347 (Cb Stabilised)	SS309-AWS A5.9, Class ER309
ASTM A335 P11, P22, P5, P9, ASTM A106	Inconel® 82-AWS A5.14, Class ER Ni Cr 3
Incoloy® 800	Inconel® 82-AWS A5.14, Class ER Ni Cr 3

**Note:** Filler rods & welding procedures for other sheath materials, types of thermocouples will be furnished on request



## Typical Installations of Tube Skin Thermocouple

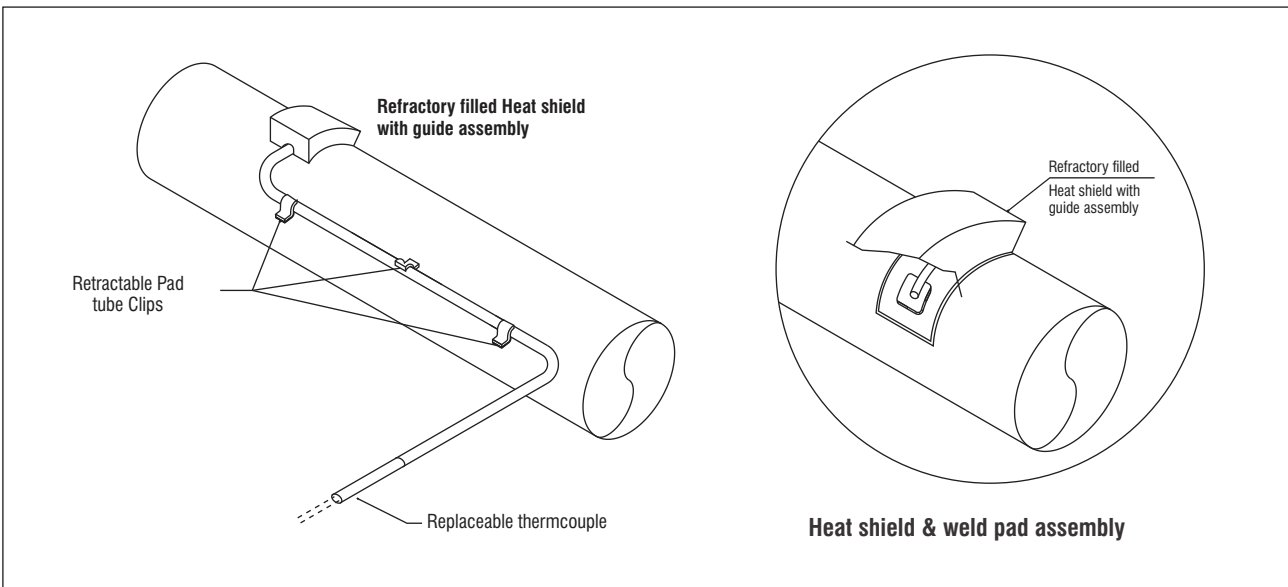


Conventional Tube Skin Thermocouple are to be welded to the heater tube. As this is hot working on heater tube, it poses several problems in terms of maintenance and longer shut down time. Each and every time a conventional tube skin thermocouple is installed, the heater tubes are required to be pressure tested as it has undergone welding.

*General's* retractable type thermocouples make replacement of thermocouple possible without any welding or any hot work on the tube. This results in significant amount of saving in terms of time as well as shut down costs.

## Major differences between conventional knife edge type thermocouple and retractable type thermocouple:

KNIFE EDGE TYPE	RETRACTABLE TYPE
<ul style="list-style-type: none"> <li>Weld pad welded to thermocouple.</li> <li>Weld Clips hold thermocouple in place can be used only once.</li> <li>Thermocouple cannot be removed without hot work on tube.</li> </ul>	<ul style="list-style-type: none"> <li>Weld pad fabricated has guide assembly.</li> <li>Weld Clips can be reused.</li> <li>Thermocouples are replaceable without performing hot work on heater tube.</li> </ul>



**Typical Installation**



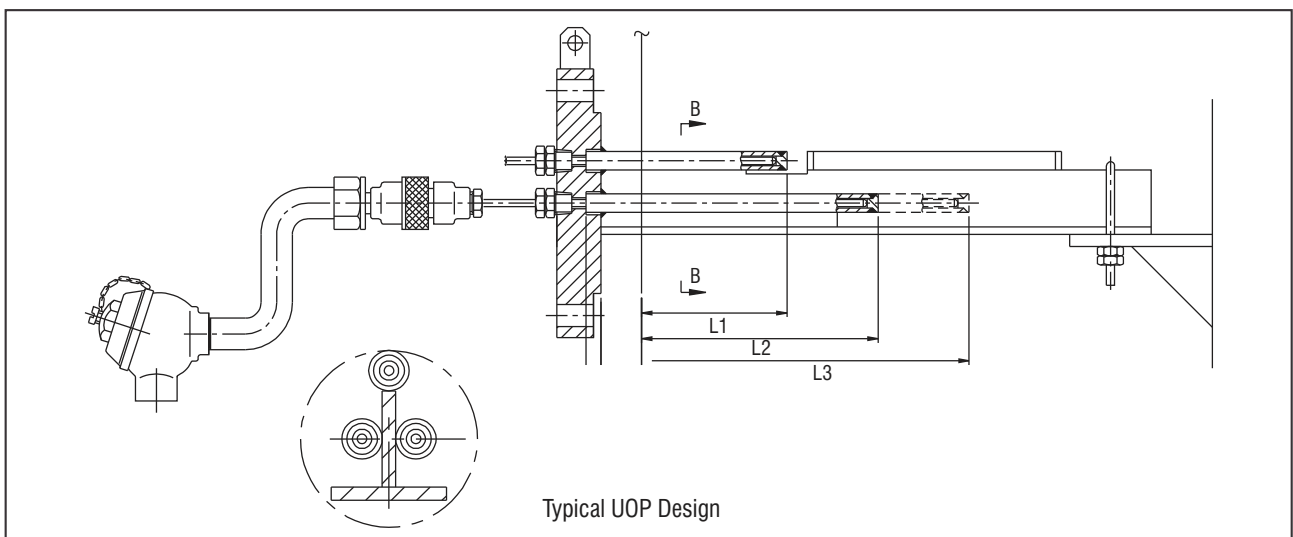
## Features

- Ideal for measuring temperature at various elevations
- Fully tailormade
- Proven track record in cross section of industries
- Can be offered with practically any length
- Cost effective & overcomes space limitation
- Different thermocouples with varied MOC possible.
- Construction enables user to remove thermocouple for maintenance

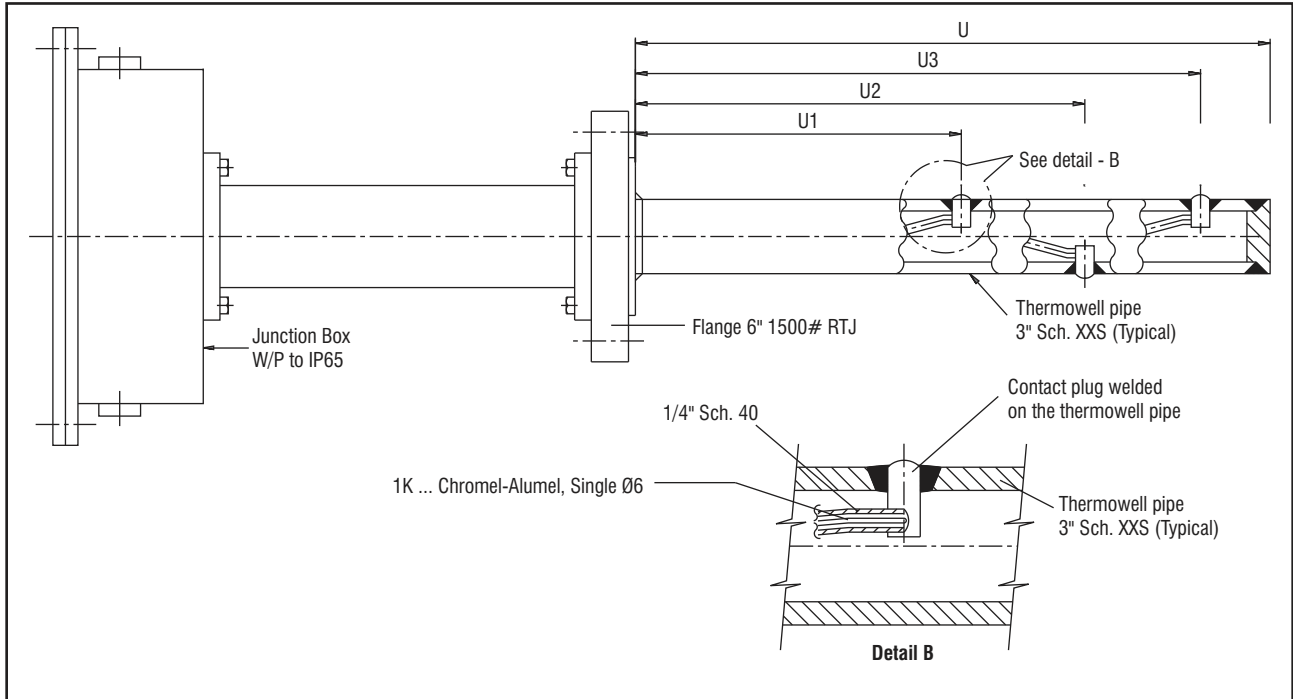
Where space limitations and cost consideration are of prime importance, multi-point thermocouple assemblies come into picture which are used for measuring and controlling temperature in a reactor having different temperature zones. Any thermocouple assembly with measuring junctions located at more than a one-immersion depth is commonly referred to as a multi-point. As the number of variations possible in multi-point assemblies is virtually limitless they are generally designed and manufactured to meet the requirements of individual applications. As different multi-point designs vary tremendously, careful consideration should be given to such variables as the positive location of measuring junctions and the ease/cost of replacement.

*General* with its vast experience has designed and developed several types of multipoint assemblies, which are performing satisfactorily at hundreds of installations in several parts of world. Some designs allow for replacement of individual elements while others require replacement of the entire assembly. In either case, complete shut down of the process line may not be required depending upon important design considerations. Testing of multipoint is another specialised area. Our manufacturing set-up is equipped with all latest testing equipments to perform all stringent tests.

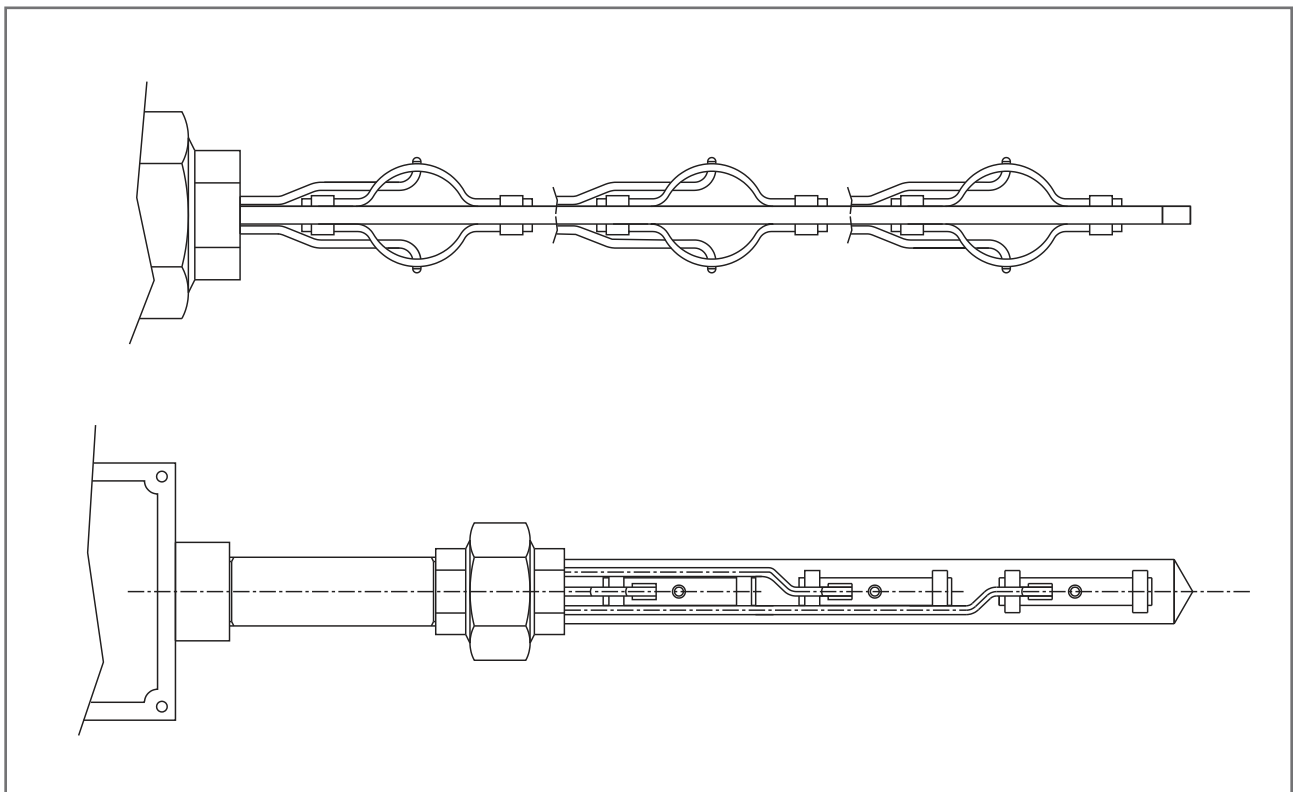
**Major user industries:** Refineries & Petrochemical, Oil & Gas, Chemical & Fertiliser.



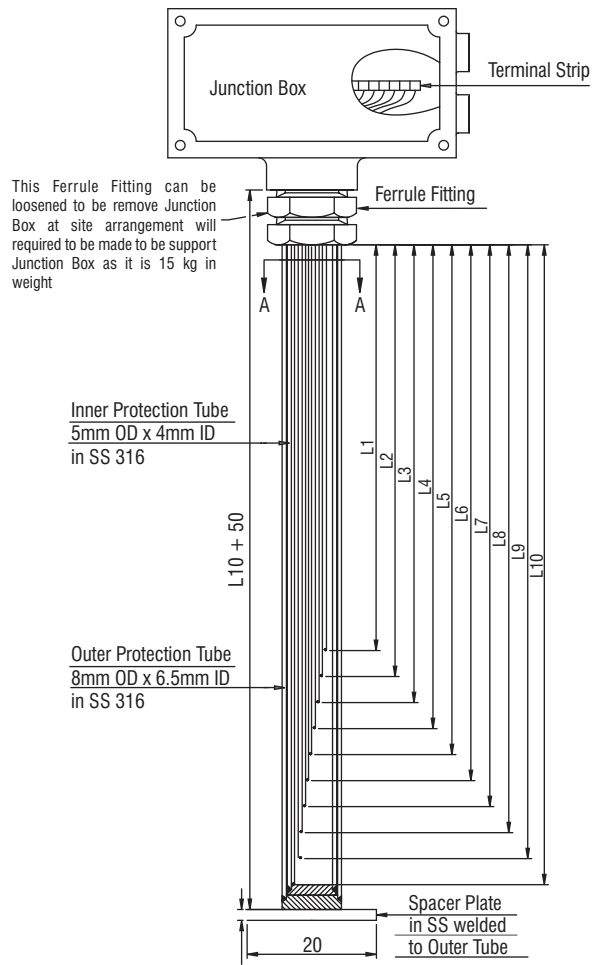
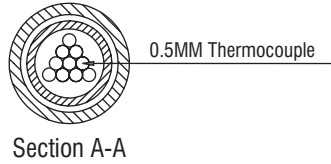
## Typical Constructions



Thermocouples at various levels inserted in individual guiding tubes which in turn are welded to outer protecting tube as shown.



Spring loaded (with the help of 'S' spring or leaf spring) thermocouples located at various points mounted on a plate enclosed in a protecting tube as shown above. The springs ensure proper contact with the protecting tube. As many as 33 points assembly was supplied as import substitution for a reputed fertiliser plant.



**Miniature Multipoint  
Thermocouple Assembly  
with 0.5 mm OD Thermocouple**





# Temperature Element Assemblies

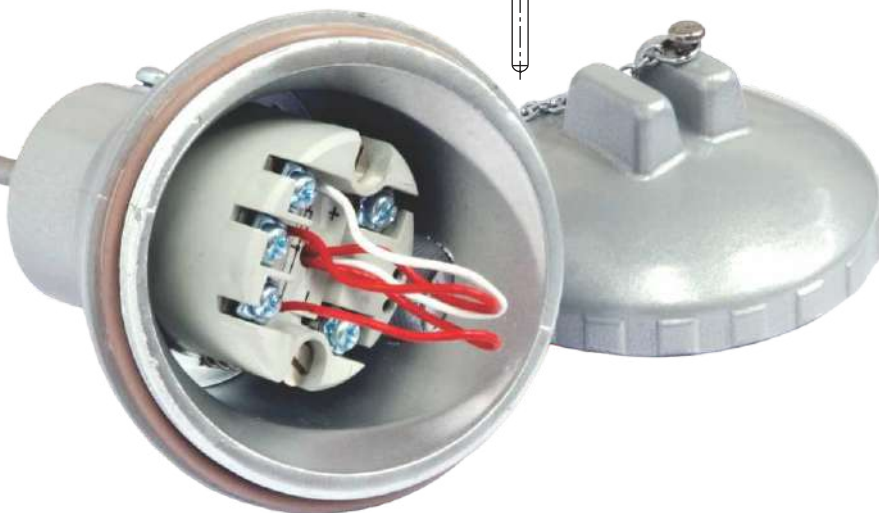
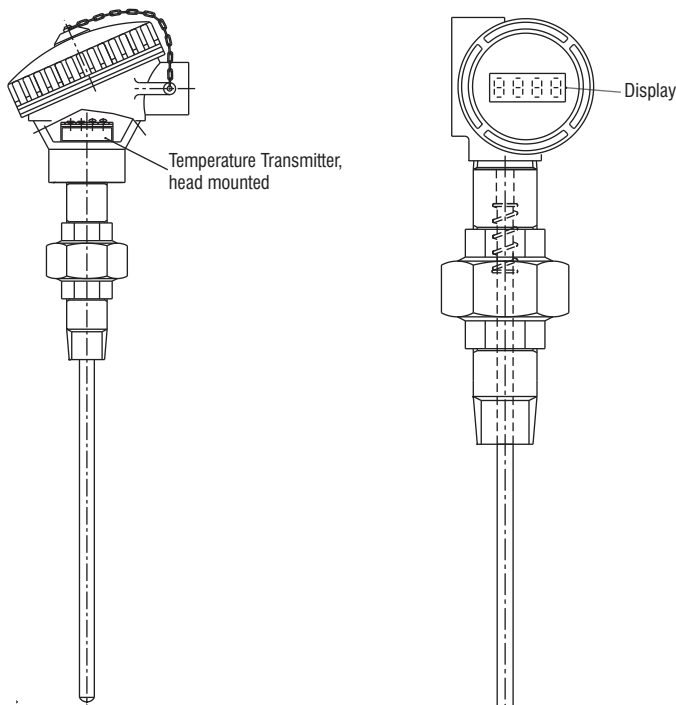
(Suitable for Temperature Transmitter)



## Special Assemblies

*General* has the capability of supplying temperature Element (T/c as well as RTD) assemblies suitable for temperature transmitters. The transmitter either can be mounted in the enclosure (Head) or connected to the extension (in the form of Nipple-union-nipple) that comes with built in enclosure. (with or without indication) The assemblies are offered complete with element, head & thermowell. In either case, the spring loading is provided ensures proper contact of the element to the bottom of thermowell. Moreover the assembly (if the transmitter is in our scope) will be duly calibrated.

The assemblies are generally suitable for various models of reputed make. We have been supplying these to major transmitter manufacturers across the globe.





# THERMOWELLS

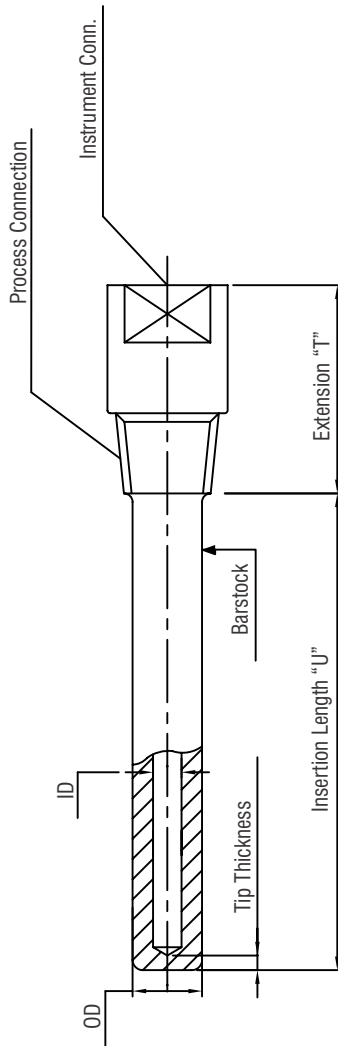
Thermowells are provided to protect the basic sensor from mechanical damage and corrosion. An extremely sturdy design may increase the life of the sensor but may lead to a poor response. Similarly, a delicate design will have poor life but will improve the response time. Therefore, a proper balance needs to be struck.

For given process parameters, *General* can arrive at an optimum Thermowell design considering aspects such as temperature, pressure, fluid velocity and corrosion. Such designs will conform to ASTM PTC 19.3.

The Thermowell material can be brass, SS304, SS316, SS316L, SS310, Inconel® 600, Incoloy® 800, Monel®, Hastelloy® depending upon the process parameters and type of fluid. For proper selection of Thermowell material, expert advice is available from our design department.



# TW BT 01 - Barstock Threaded Type Thermowell (Straight)



	Other Options
0	None
1	Plug & Chain
2	IBR
3	Radiography Test (RT) for Bore Concentricity
4	Ultrasonic Test (UT) for Bore Concentricity
5	NACE to MR-01-75/-MR-01-03

## TWBT - 01

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B
<b>410</b>	SS410	<b>MN4</b>	Monel® 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500
<b>S7L</b>	SS317L	<b>Ti2</b>	Ti-II
<b>N20</b>	Nickel 200		
**Special material on Request			

Thermowell Material

Thermowell Head Dia

Thermowell OD

Bore ID

Instrument Connection

Process Connection

Insertion Length ("U")

Extension Length ("T")

Tip Thickness

Pl. Specify in mm\*

Pl. Specify in mm

Pl. Specify in mm

THREADED - T					
Size	Code	Type	Code	M / F	Code
1/4"	<b>06</b>	NPS	<b>NS</b>	M	<b>M</b>
3/8"	<b>10</b>	NPT	<b>NT</b>	F	<b>F</b>
1/2"	<b>15</b>	BSP	<b>BP</b>		
3/4"	<b>20</b>	BSPT	<b>BT</b>		
1"	<b>25</b>	JIS-PF	<b>PF</b>		
1-1/2"	<b>40</b>	JIS-PT	<b>PT</b>		
2"	<b>50</b>	Gas	<b>GS</b>		
M20	<b>M20</b>	R	<b>RR</b>		
M24	<b>M24</b>	Rp	<b>RP</b>		
M27	<b>M27</b>	Pitch 1.5	<b>C</b>		
M33	<b>M33</b>	Pitch 2	<b>D</b>		

Pl. Specify in mm

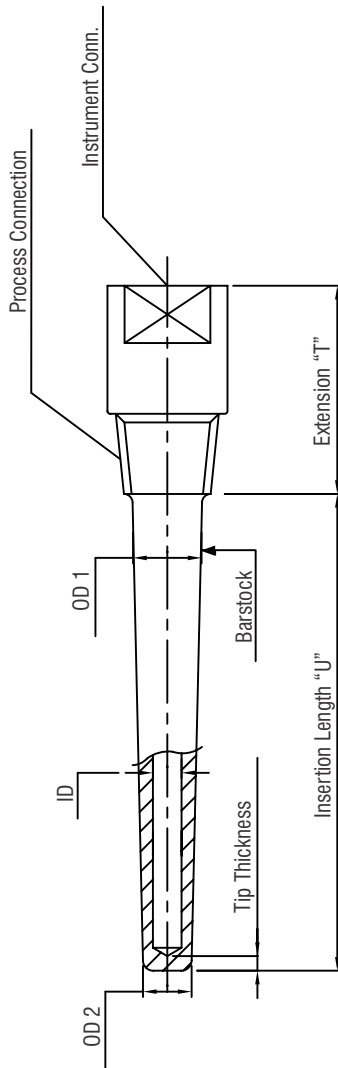
Pl. Specify in mm

Pl. Specify in mm

\* for Hexagonal Head, please specify the AF size in mm e.g. code: HEX36AF

Ordering Example:- TWBT01-S6S-32-18-11-T15NTF-T20BPM-250-50-5-2

# TW BT 02 - Barstock Threaded Type Thermowell (Taper)



Other Options	
0	None
1	Plug & Chain
2	IBR
3	Radiography Test (RT) for Bore Concentricity
4	Ultrasonic Test (UT) for Bore Concentricity
5	NACE to MR-01-75/-MR-01-03
19	Tapered for tail portion only (Pl. Specify length in mm)

## TWBT - 02

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B
<b>410</b>	SS410	<b>MN4</b>	Monel® 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500
<b>S7L</b>	SS317L	<b>TI2</b>	Ti-II
<b>N20</b>	Nickel 200		
**Special material on Request			

Thermowell Material

Thermowell Head Dia

Thermowell OD 1 (Cold End)

Thermowell OD 2 (Hot End)

Bore ID

Instrument Connection

Process Connection

Insertion Length ("U")

Extension Length ("T")

Tip Thickness

Pl. Specify in mm\*

Pl. Specify in mm

Pl. Specify in mm

Pl. Specify in mm

### THREADED - T

Size	Code	Type	Code	M / F	Code
1/4"	<b>06</b>	NPS	<b>NS</b>	M	<b>M</b>
3/8"	<b>10</b>	NPT	<b>NT</b>	F	<b>F</b>
1/2"	<b>15</b>	BSP	<b>BP</b>		
3/4"	<b>20</b>	BSPT	<b>BT</b>		
1"	<b>25</b>	JIS-PF	<b>PF</b>		
1-1/2"	<b>40</b>	JIS-PT	<b>PT</b>		
2"	<b>50</b>	Gas	<b>GS</b>		
M20	<b>M20</b>	R	<b>RR</b>		
M24	<b>M24</b>	Rp	<b>RP</b>		
M27	<b>M27</b>	Pitch 1.5	<b>C</b>		
M33	<b>M33</b>	Pitch 2	<b>D</b>		

Pl. Specify in mm

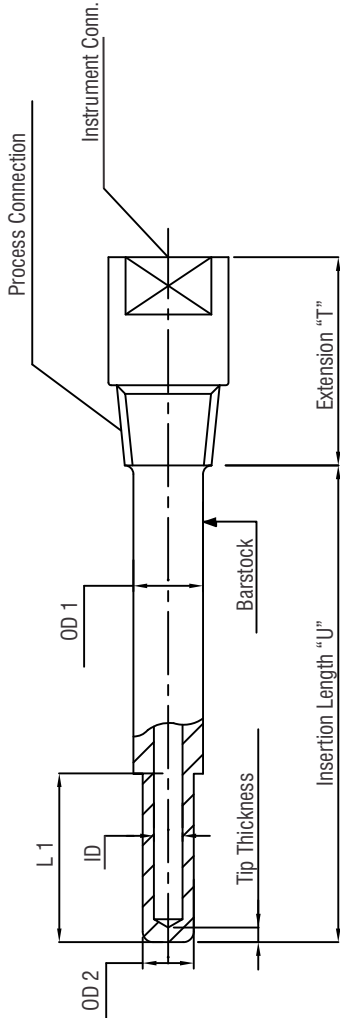
Pl. Specify in mm

Pl. Specify in mm

\* for Hexagonal Head, please specify the AF size in mm e.g. code: HEX36AF

Ordering Example:- TWBT02-S6S-HEX36AF-24-20-11-T15NTF-TM33DM-280-60-5-0

# TW BT 03 - Barstock Threaded Type Thermowell (Stepped)



Other Options	
0	None
1	Plug & Chain
2	IBR
3	Radiography Test (RT) for Bore Concentricity
4	Ultrasonic Test (UT) for Bore Concentricity
5	NACE to MR-01-75/-MR-01-03

## TWBT - 03

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B
<b>410</b>	SS410	<b>MN4</b>	Monel® 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500
<b>S7L</b>	SS317L	<b>Ti2</b>	Ti-II
<b>N20</b>	Nickel 200		
**Special material on Request			

Thermowell Material

Thermowell Head Dia

Thermowell OD 1 (Cold End)

Thermowell OD 2 (Hot End)

Bore ID

Instrument Connection

Process Connection

Insertion Length ("U")

Stepped Length ("L1")

Extension Length ("T")

Tip Thickness

Pl. Specify in mm\*

Pl. Specify in mm

Pl. Specify in mm

Pl. Specify in mm

### THREADED - T

Size	Code	Type	Code	M / F	Code
1/4"	<b>06</b>	NPS	<b>NS</b>	M	<b>M</b>
3/8"	<b>10</b>	NPT	<b>NT</b>	F	<b>F</b>
1/2"	<b>15</b>	BSP	<b>BP</b>		
3/4"	<b>20</b>	BSPT	<b>BT</b>		
1"	<b>25</b>	JIS-PF	<b>PF</b>		
1-1/2"	<b>40</b>	JIS-PT	<b>PT</b>		
2"	<b>50</b>	Gas	<b>GS</b>		
M20	<b>M20</b>	R	<b>RR</b>		
M24	<b>M24</b>	Rp	<b>RP</b>		
M27	<b>M27</b>	Pitch 1.5	<b>C</b>		
M33	<b>M33</b>	Pitch 2	<b>D</b>		

Pl. Specify in mm

Pl. Specify in mm

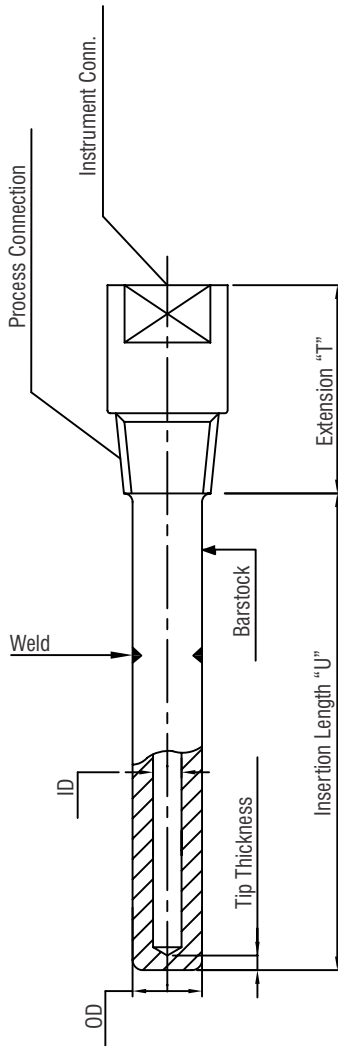
Pl. Specify in mm

Pl. Specify in mm

\* for Hexagonal Head, please specify the AF size in mm e.g. code: HEX36AF

Ordering Example:- TWBT03-S6S-36-24-18-11-T15NTF-T25NTM-300-100-60-5-1

# TW BT 04 - Multiple Barstock Threaded Type Thermowell



	Other Options
0	None
1	Plug & Chain
2	IBR
3	Radiography Test (RT) for Bore Concentricity
4	Ultrasonic Test (UT) for Bore Concentricity
5	NACE to MR-01-75/-MR-01-03

## TWBT - 04

Thermowell Material	Material	Code	Material
<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B
<b>410</b>	SS410	<b>MN4</b>	Monel® 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500
<b>S7L</b>	SS317L	<b>Ti2</b>	Ti-II
<b>N20</b>	Nickel 200		
**Special material on Request			

Thermowell Head Dia  Pl. Specify in mm\*

Thermowell OD  Pl. Specify in mm

Bore ID  Pl. Specify in mm

Instrument Connection

Process Connection

THREADED - T					
Size	Code	Type	Code	M / F	Code
1/4"	<b>06</b>	NPS	<b>NS</b>	M	<b>M</b>
3/8"	<b>10</b>	NPT	<b>NT</b>	F	<b>F</b>
1/2"	<b>15</b>	BSP	<b>BP</b>		
3/4"	<b>20</b>	BSPT	<b>BT</b>		
1"	<b>25</b>	JIS-PF	<b>PF</b>		
1-1/2"	<b>40</b>	JIS-PT	<b>PT</b>		
2"	<b>50</b>	Gas	<b>GS</b>		
M20	<b>M20</b>	R	<b>RR</b>		
M24	<b>M24</b>	Rp	<b>RP</b>		
M27	<b>M27</b>	Pitch 1.5	<b>C</b>		
M33	<b>M33</b>	Pitch 2	<b>D</b>		

Insertion Length ("U")  Pl. Specify in mm

Extension Length ("T")  Pl. Specify in mm

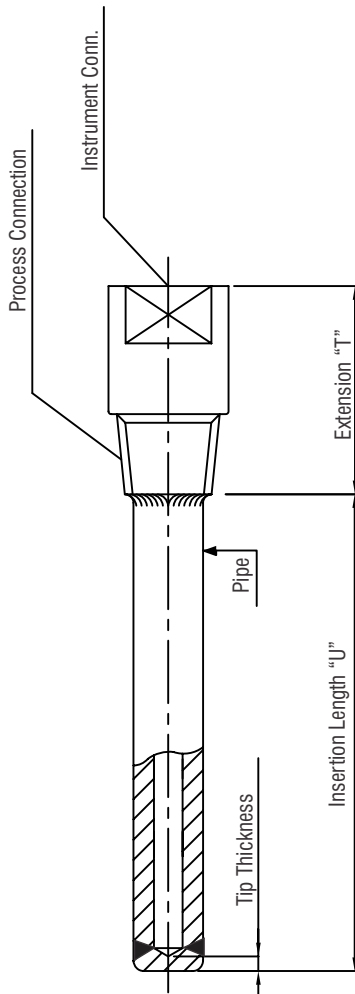
Tip Thickness  Pl. Specify in mm

\* for Hexagonal Head, please specify the AF size in mm e.g. code: HEX36AF

Ordering Example:- TWBT04-S6S-32-16-9-T15NTF-T15NTM-800-50-4-0



# TW FT 01 - Fabricated Threaded Type Thermowell



Other Options	
0	None
1	Plug & Chain
5	NACE to MR-01-75-/-MR-01-03

## TWFT - 01

### Thermowell Material

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B
<b>410</b>	SS410	<b>MN4</b>	Monel® 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500
<b>S7L</b>	SS317L	<b>TI2</b>	Ti-II
<b>N20</b>	Nickel 200		
**Special material on Request			

### Pipe Size & schedule

<b>15A</b>	1/2 " Sch 40
<b>15B</b>	1/2 " Sch 80
<b>15C</b>	1/2 " Sch 160
<b>20A</b>	3/4 " Sch 40
<b>20B</b>	3/4 " Sch 80
<b>25A</b>	1" Sch 40
<b>25B</b>	1" Sch 80
<b>25C</b>	1" Sch 160
<b>10x7</b>	10 mm x 7 mm
<b>14x9</b>	14 mm x 9 mm
<b>Other</b>	Consult Factory

### Instrument Connection

THREADED - T					
Size	Code	Type	Code	M / F	Code
1/4"	<b>06</b>	NPS	<b>NS</b>	M	<b>M</b>
3/8"	<b>10</b>	NPT	<b>NT</b>	F	<b>F</b>
1/2"	<b>15</b>	BSP	<b>BP</b>		
3/4"	<b>20</b>	BSPT	<b>BT</b>		
1"	<b>25</b>	JIS-PF	<b>PF</b>		
1-1/2"	<b>40</b>	JIS-PT	<b>PT</b>		
2"	<b>50</b>	Gas	<b>GS</b>		
M20	<b>M20</b>	R	<b>RR</b>		
M24	<b>M24</b>	Rp	<b>RP</b>		
M27	<b>M27</b>	Pitch 1.5	<b>C</b>		
M33	<b>M33</b>	Pitch 2	<b>D</b>		

### Process Connection

### Insertion Length ("U")

Pl. Specify in mm

### Extension Length ("T")

Pl. Specify in mm

### Tip Thickness

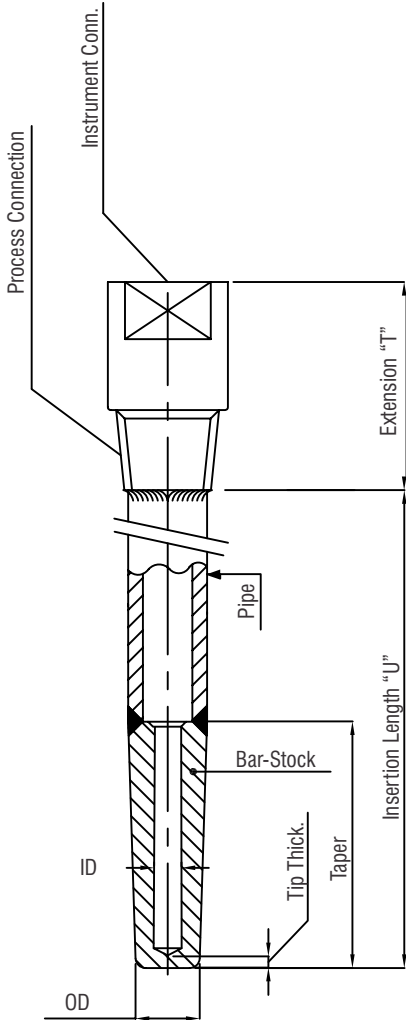
Pl. Specify in mm

Ordering Example:- TWFT01-S6S-(10x7)-T15NTF-T20BPM-1500-50-5-0

# TW FT 02 - Fabricated Threaded Type Thermowell (Pipe + Barstock)



## TWFT - 02



Other Options	
0	None
1	Plug & Chain
5	NACE to MR-01-75-/MR-01-03

Thermowell Material

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B
<b>410</b>	SS410	<b>MN4</b>	Monel® 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500
<b>S7L</b>	SS317L	<b>TI2</b>	Ti-II
<b>N20</b>	Nickel 200		
**Special material on Request			

Pipe Size & schedule

<b>15A</b>	1/2 " Sch 40
<b>15B</b>	1/2 " Sch 80
<b>15C</b>	1/2 " Sch 160
<b>20A</b>	3/4 " Sch 40
<b>20B</b>	3/4 " Sch 80
<b>25A</b>	1" Sch 40
<b>25B</b>	1" Sch 80
<b>25C</b>	1" Sch 160
<b>10x7</b>	10 mm x 7 mm
<b>14x9</b>	14 mm x 9 mm
<b>Other</b>	Consult Factory

Barstock OD at Tip

Pl. Specify in mm

Barstock ID

Pl. Specify in mm

Taper Length

Pl. Specify in mm

Instrument Connection

THREADED - T					
Size	Code	Type	Code	M / F	Code
1/4"	<b>06</b>	NPS	<b>NS</b>	M	<b>M</b>
3/8"	<b>10</b>	NPT	<b>NT</b>	F	<b>F</b>
1/2"	<b>15</b>	BSP	<b>BP</b>		
3/4"	<b>20</b>	BSPT	<b>BT</b>		
1"	<b>25</b>	JIS-PF	<b>PF</b>		
1-1/2"	<b>40</b>	JIS-PT	<b>PT</b>		
2"	<b>50</b>	Gas	<b>GS</b>		
M20	<b>M20</b>	R	<b>RR</b>		
M24	<b>M24</b>	Rp	<b>RP</b>		
M27	<b>M27</b>	Pitch 1.5	<b>C</b>		
M33	<b>M33</b>	Pitch 2	<b>D</b>		

Process Connection

Insertion Length ("U")

Pl. Specify in mm

Extension Length ("T")

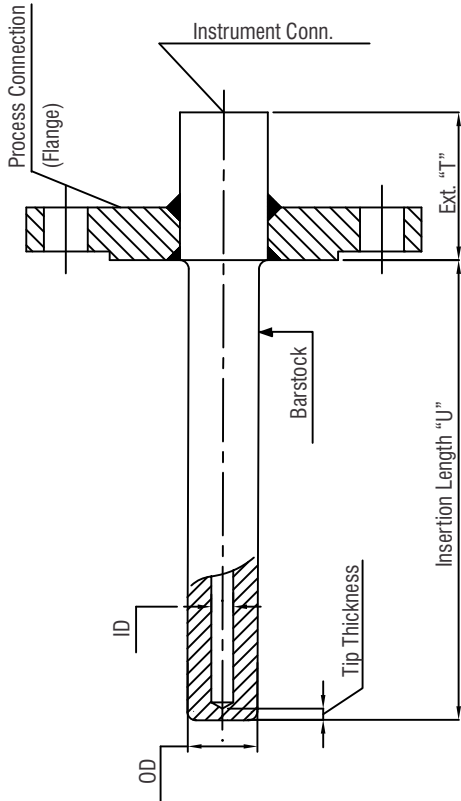
Pl. Specify in mm

Tip Thickness

Pl. Specify in mm

Ordering Example:- TWFT02-S6S-15A-16-7-150-T15NTF-T20BPM-1500-50-5-0

# TW BF 01 - Barstock Flanged Type Thermowell (Straight)



	Other Options
0	None
1	Plug & Chain
2	IBR
3	Radiography Test (RT) for Bore Concentricity
4	Ultrasonic Test (UT) for Bore Concentricity
5	NACE to MR-01-75-/MR-01-03
6	Radiography Test (RT) for weld joints
7	Full penetration weld
8	PWHT
9	H2 Service
10	1 mm Ti sleeve
11	1 mm Ni sleeve
12	1 mm Hac sleeve
13	0.4 mm Ta sleeve
14	1 mm PTFE coating
15	1 mm zirconium oxide coating
16	0.5 mm Tungsten carbide coating
17	1 mm Tungsten carbide coating
18	1 mm stellite coating

## TWBF - 01

Thermowell Material

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B
<b>410</b>	SS410	<b>MN4</b>	Monel® 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500
<b>S7L</b>	SS317L	<b>TI2</b>	Ti-II
<b>N20</b>	Nickel 200		

\*\*Special material on Request

Thermowell Head Dia

Pl. Specify in mm

Thermowell OD

Pl. Specify in mm

Bore ID

Pl. Specify in mm

Instrument Connection

THREADED - T					
Size	Code	Type	Code	M / F	Code
1/4"	<b>06</b>	NPS	<b>NS</b>	M	<b>M</b>
3/8"	<b>10</b>	NPT	<b>NT</b>	F	<b>F</b>
1/2"	<b>15</b>	BSP	<b>BP</b>		
3/4"	<b>20</b>	BSPT	<b>BT</b>		
1"	<b>25</b>	Gas	<b>GS</b>		
M20	<b>M20</b>	Pitch 1.5	<b>C</b>		

Process Connection

FLANGED - F					
Size	Code	Rating	Code	Facing	Code
1/2"	<b>15</b>	150	<b>A</b>	RF	<b>RF</b>
3/4"	<b>20</b>	300	<b>B</b>	FF	<b>FF</b>
1"	<b>25</b>	600	<b>C</b>	RTJ	<b>RJ</b>
1-1/2"	<b>40</b>	900	<b>D</b>	ST	<b>ST</b>
2"	<b>50</b>	1500	<b>E</b>	SG	<b>SG</b>
3"	<b>80</b>	2500	<b>F</b>	LT	<b>LT</b>
				LG	<b>LG</b>

Flange Material

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>S6L</b>	SS316L
<b>CST</b>	CS	<b>HCC</b>	Hastelloy® C-276
<b>410</b>	SS410	<b>HCB</b>	Hastelloy® B
<b>S7S</b>	SS317	<b>MN4</b>	Monel® 400
<b>S7L</b>	SS317L	<b>MN5</b>	Monel® 500
<b>TI2</b>	Ti-II	<b>N20</b>	Nickel 200

\*\*Special material on Request

Insertion Length ("U")

Pl. Specify in mm

Extension Length ("T")

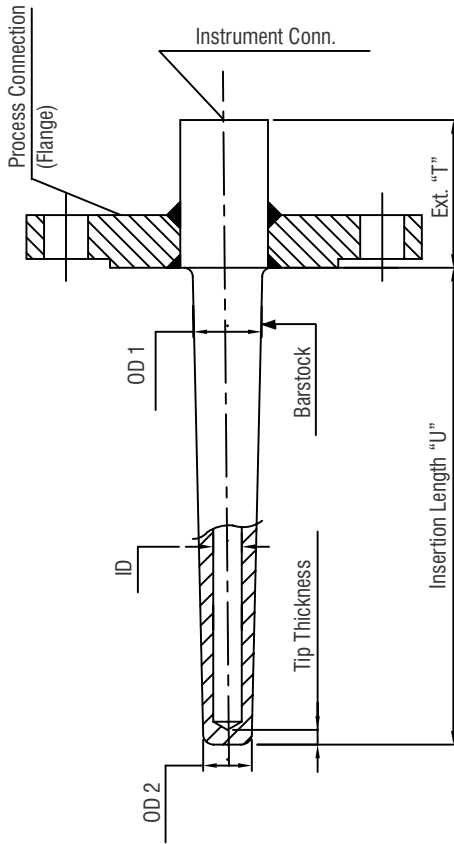
Pl. Specify in mm

Tip Thickness

Pl. Specify in mm

Ordering Example:- TWBF01-S6S-32-16-7-T15NTF-F25ARF-S6S-280-60-5-1

# TW BF 02 - Barstock Flanged Type Thermowell (Taper)



Other Options	
0	None
1	Plug & Chain
2	IBR
3	Radiography Test (RT) for Bore Concentricity
4	Ultrasonic Test (UT) for Bore Concentricity
5	NACE to MR-01-75-/MR-01-03
6	Radiography Test (RT) for weld joints
7	Full penetration weld
8	PWHT
9	H2 Service
14	1 mm PTFE coating
15	1 mm zirconium oxide coating
16	0.5 mm Tungsten carbide coating
17	1 mm Tungsten carbide coating
18	1 mm stellite coating
19	Tapered for tail portion only (Pl. Specify length in mm)

## TWBF - 02

**Thermowell Material**

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B
<b>410</b>	SS410	<b>MN4</b>	Monel® 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500
<b>S7L</b>	SS317L	<b>TI2</b>	Ti-II
<b>N20</b>	Nickel 200		

\*\*Special material on Request

**Head Dia**

Pl. Specify in mm

**OD 1 (Cold End)**

Pl. Specify in mm

**OD 2 (Hot End)**

Pl. Specify in mm

**Bore ID**

Pl. Specify in mm

**Instrument Connection**

THREADED - T					
Size	Code	Type	Code	M / F	Code
1/4"	<b>06</b>	NPS	<b>NS</b>	M	<b>M</b>
3/8"	<b>10</b>	NPT	<b>NT</b>	F	<b>F</b>
1/2"	<b>15</b>	BSP	<b>BP</b>		
3/4"	<b>20</b>	BSPT	<b>BT</b>		
1"	<b>25</b>	Gas	<b>GS</b>		
M20	<b>M20</b>	Pitch 1.5	<b>C</b>		

**Process Connection**

FLANGED - F					
Size	Code	Rating	Code	Facing	Code
1/2"	<b>15</b>	150	<b>A</b>	RF	<b>RF</b>
3/4"	<b>20</b>	300	<b>B</b>	FF	<b>FF</b>
1"	<b>25</b>	600	<b>C</b>	RTJ	<b>RJ</b>
1-1/2"	<b>40</b>	900	<b>D</b>	ST	<b>ST</b>
2"	<b>50</b>	1500	<b>E</b>	SG	<b>SG</b>
3"	<b>80</b>	2500	<b>F</b>	LT	<b>LT</b>
				LG	<b>LG</b>

**Flange Material**

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>S6L</b>	SS316L
<b>CST</b>	CS	<b>HCC</b>	Hastelloy® C-276
<b>410</b>	SS410	<b>HCB</b>	Hastelloy® B
<b>S7S</b>	SS317	<b>MN4</b>	Monel® 400
<b>S7L</b>	SS317L	<b>MN5</b>	Monel® 500
<b>TI2</b>	Ti-II	<b>N20</b>	Nickel 200

\*\*Special material on Request

**Insertion Length ("U")**

Pl. Specify in mm

**Extension Length ("T")**

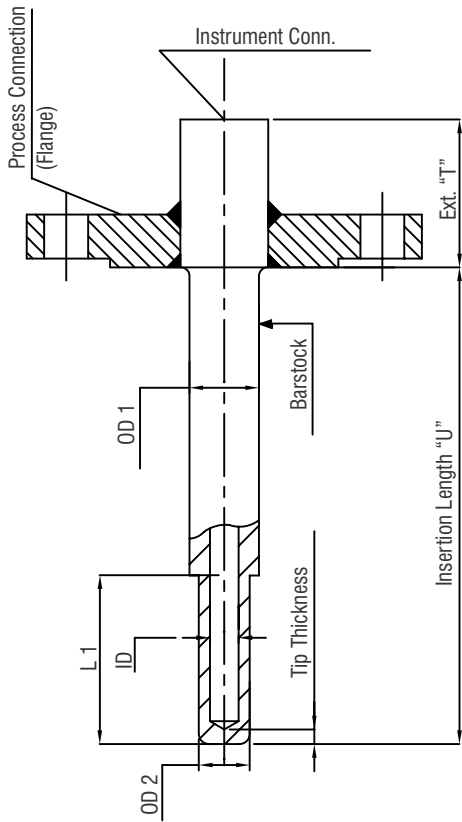
Pl. Specify in mm

**Tip Thickness**

Pl. Specify in mm

**Ordering Example:- TWBF02-S6L-34-22-18-11-T15NTF-F40BRF-S6L-320-65.6-4-19(150)**

# TW BF 03 - Barstock Flanged Type Thermowell (Stepped)



Other Options	
0	None
1	Plug & Chain
2	IBR
3	Radiography Test (RT) for Bore Concentricity
4	Ultrasonic Test (UT) for Bore Concentricity
5	NACE to MR-01-75/-MR-01-03
6	Radiography Test (RT) for weld joints
7	Full penetration weld
8	PWHT
9	H2 Service
14	1 mm PTFE coating
16	0.5 mm Tungsten carbide coating
17	1 mm Tungsten carbide coating
18	1 mm stellite coating

## TWBF - 03

Thermowell Material

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B
<b>410</b>	SS410	<b>MN4</b>	Monel® 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500
<b>S7L</b>	SS317L	<b>TI2</b>	Ti-II
<b>N20</b>	Nickel 200		

\*\*Special material on Request

Head Dia

Pl. Specify in mm

OD 1 (Cold End)

Pl. Specify in mm

OD 2 (Hot End)

Pl. Specify in mm

Bore ID

Pl. Specify in mm

Instrument Connection

THREADED - T					
Size	Code	Type	Code	M / F	Code
1/4"	<b>06</b>	NPS	<b>NS</b>	M	<b>M</b>
3/8"	<b>10</b>	NPT	<b>NT</b>	F	<b>F</b>
1/2"	<b>15</b>	BSP	<b>BP</b>		
3/4"	<b>20</b>	BSPT	<b>BT</b>		
1"	<b>25</b>	Gas	<b>GS</b>		
M20	<b>M20</b>	Pitch 1.5	<b>C</b>		

Process Connection

FLANGED - F					
Size	Code	Rating	Code	Facing	Code
1/2"	<b>15</b>	150	<b>A</b>	RF	<b>RF</b>
3/4"	<b>20</b>	300	<b>B</b>	FF	<b>FF</b>
1"	<b>25</b>	600	<b>C</b>	RTJ	<b>RJ</b>
1-1/2"	<b>40</b>	900	<b>D</b>	ST	<b>ST</b>
2"	<b>50</b>	1500	<b>E</b>	SG	<b>SG</b>
3"	<b>80</b>	2500	<b>F</b>	LT	<b>LT</b>
				LG	<b>LG</b>

Flange Material

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>S6L</b>	SS316L
<b>CST</b>	CS	<b>HCC</b>	Hastelloy® C-276
<b>410</b>	SS410	<b>HCB</b>	Hastelloy® B
<b>S7S</b>	SS317	<b>MN4</b>	Monel® 400
<b>S7L</b>	SS317L	<b>MN5</b>	Monel® 500
<b>TI2</b>	Ti-II	<b>N20</b>	Nickel 200

\*\*Special material on Request

Insertion Length ("U")

Pl. Specify in mm

Stepped Length ("L1")

Pl. Specify in mm

Extension Length ("T")

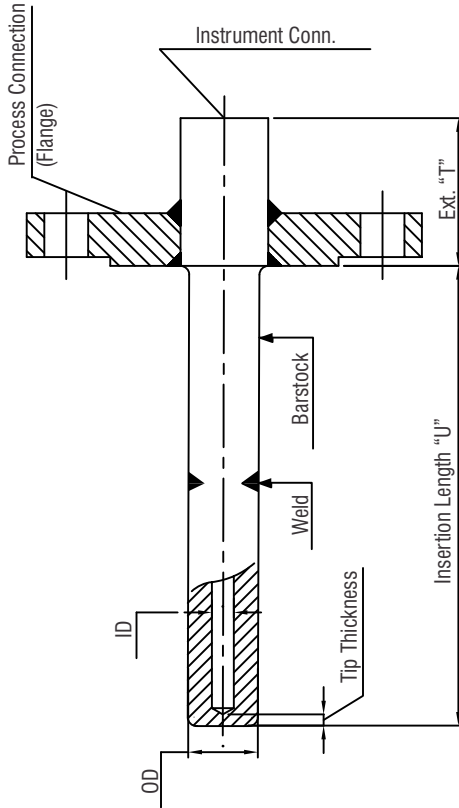
Pl. Specify in mm

Tip Thickness

Pl. Specify in mm

Ordering Example:- TWBF03-MN4-32-24-18-11-T15NTF-F40CRF-MN4-280-75-70-5-0

# TW BF 04 - Multiple Barstock Flanged Type Thermowell



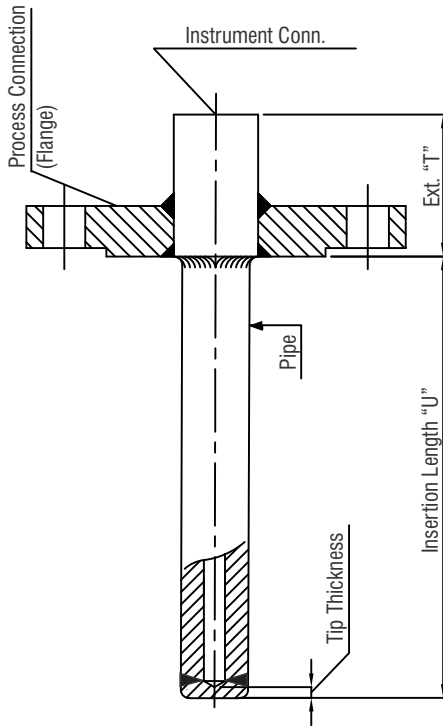
Other Options	
0	None
1	Plug & Chain
2	IBR
3	Radiography Test (RT) for Bore Concentricity
4	Ultrasonic Test (UT) for Bore Concentricity
5	NACE to MR-01-75/-MR-01-03
6	Radiography Test (RT) for weld joints
7	Full penetration weld
8	PWHT
9	H2 Service
10	1 mm Ti sleeve
11	1 mm Ni sleeve
12	1 mm Hac sleeve
13	0.4 mm Ta sleeve
14	1 mm PTFE coating
15	1 mm zirconium oxide coating
16	0.5 mm Tungsten carbide coating
17	1 mm Tungsten carbide coating
18	1 mm stellite coating

## TWBF - 04

<b>Thermowell Material</b>	<input type="text"/>	<table border="1"> <tbody> <tr><td><b>S4S</b></td><td>SS304</td><td><b>825</b></td><td>Incoloy® 825</td></tr> <tr><td><b>S6S</b></td><td>SS316</td><td><b>600</b></td><td>Inconel® 600</td></tr> <tr><td><b>310</b></td><td>SS310</td><td><b>800</b></td><td>Incoloy® 800</td></tr> <tr><td><b>446</b></td><td>SS446</td><td><b>321</b></td><td>SS321</td></tr> <tr><td><b>S4L</b></td><td>SS304L</td><td><b>KAN</b></td><td>Kanthal</td></tr> <tr><td><b>S6L</b></td><td>SS316L</td><td><b>HCC</b></td><td>Hastelloy® C-276</td></tr> <tr><td><b>CST</b></td><td>CS</td><td><b>HCB</b></td><td>Hastelloy® B</td></tr> <tr><td><b>410</b></td><td>SS410</td><td><b>MN4</b></td><td>Monel® 400</td></tr> <tr><td><b>S7S</b></td><td>SS317</td><td><b>MN5</b></td><td>Monel® 500</td></tr> <tr><td><b>S7L</b></td><td>SS317L</td><td><b>TI2</b></td><td>Ti-II</td></tr> <tr><td><b>N20</b></td><td colspan="3">Nickel 200</td></tr> </tbody> </table> <p>**Special material on Request</p>	<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825	<b>S6S</b>	SS316	<b>600</b>	Inconel® 600	<b>310</b>	SS310	<b>800</b>	Incoloy® 800	<b>446</b>	SS446	<b>321</b>	SS321	<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal	<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276	<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B	<b>410</b>	SS410	<b>MN4</b>	Monel® 400	<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500	<b>S7L</b>	SS317L	<b>TI2</b>	Ti-II	<b>N20</b>	Nickel 200												
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<b>Extension Length ("T")</b>	<input type="text"/>	Pl. Specify in mm																																																						
<b>Tip Thickness</b>	<input type="text"/>	Pl. Specify in mm																																																						

Ordering Example:- TWBF04-S6S-32-16-7-T15NTF-F25ARF-S6S-800-50-5-0

# TW FF 01 - Fabricated Flanged Type Thermowell



Other Options	
0	None
1	Plug & Chain
5	NACE to MR-01-75/-MR-01-03
6	Radiography Test (RT) for weld joints
7	Full penetration weld
8	PWHT
9	H2 Service
10	1 mm Ti sleeve
11	1 mm Ni sleeve
12	1 mm Hac sleeve
13	0.4 mm Ta sleeve
14	1 mm PTFE coating
15	1 mm zirconium oxide coating
16	0.5 mm Tungsten carbide coating
17	1 mm Tungsten carbide coating
18	1 mm stellite coating

## TWFF - 01

### Thermowell Material

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B
<b>410</b>	SS410	<b>MN4</b>	Monel® 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500
<b>S7L</b>	SS317L	<b>TI2</b>	Ti-II
<b>N20</b>	Nickel 200		
**Special material on Request			

### Pipe Size & schedule

<b>15A</b>	½" Sch 40	<b>15B</b>	½" Sch 80
<b>15C</b>	½" Sch 160	<b>20A</b>	¾" Sch 40
<b>20B</b>	¾" Sch 80	<b>25A</b>	1" Sch 40
<b>25B</b>	1" Sch 80	<b>25C</b>	1" Sch 160
<b>10x7</b>	10 mm x 7 mm		
<b>14x9</b>	14 mm x 9 mm		
<b>Other</b>	Consult Factory		

### Instrument Connection

THREADED - T					
Size	Code	Type	Code	M / F	Code
1/4"	<b>06</b>	NPS	<b>NS</b>	M	<b>M</b>
3/8"	<b>10</b>	NPT	<b>NT</b>	F	<b>F</b>
1/2"	<b>15</b>	BSP	<b>BP</b>		
3/4"	<b>20</b>	BSPT	<b>BT</b>		
1"	<b>25</b>	Gas	<b>GS</b>		
M20	<b>M20</b>	Pitch 1.5	<b>C</b>		

### Process Connection

FLANGED - F					
Size	Code	Rating	Code	Facing	Code
1/2"	<b>15</b>	150	<b>A</b>	RF	<b>RF</b>
3/4"	<b>20</b>	300	<b>B</b>	FF	<b>FF</b>
1"	<b>25</b>	600	<b>C</b>	RTJ	<b>RJ</b>
1-1/2"	<b>40</b>	900	<b>D</b>	ST	<b>ST</b>
2"	<b>50</b>	1500	<b>E</b>	SG	<b>SG</b>
3"	<b>80</b>	2500	<b>F</b>	LT	<b>LT</b>
				LG	<b>LG</b>

### Flange Material

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>S6L</b>	SS316L
<b>CST</b>	CS	<b>HCC</b>	Hastelloy® C-276
<b>410</b>	SS410	<b>HCB</b>	Hastelloy® B
<b>S7S</b>	SS317	<b>MN4</b>	Monel® 400
<b>S7L</b>	SS317L	<b>MN5</b>	Monel® 500
<b>TI2</b>	Ti-II	<b>N20</b>	Nickel 200
**Special material on Request			

### Insertion Length ("U")

Pl. Specify in mm

### Extension Length ("T")

Pl. Specify in mm

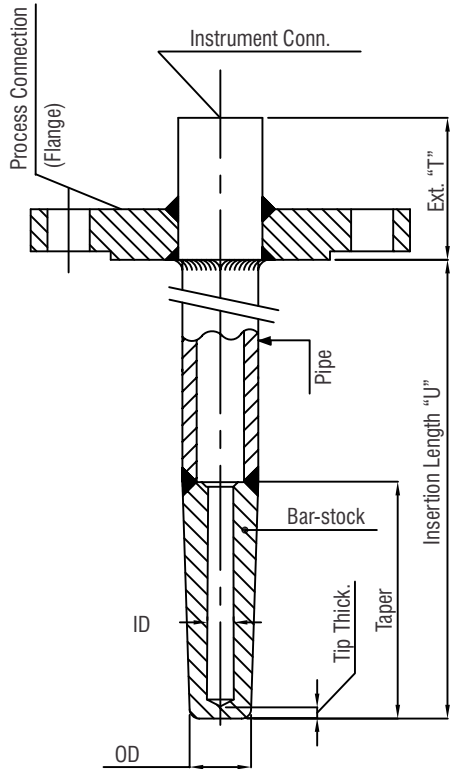
### Tip Thickness

Pl. Specify in mm

Ordering Example:- TWFF01-S6S-(14x9)-T15NTF-F25ARF-S6S-600-50-4-0



# TW FF 02 - Fabricated Flanged Type Thermowell (Pipe + Barstock)



**TWFF - 02**

**Thermowell Material**

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B
<b>410</b>	SS410	<b>MN4</b>	Monel® 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500
<b>S7L</b>	SS317L	<b>TI2</b>	Ti-II
<b>N20</b>	Nickel 200		
**Special material on Request			

**Pipe Size & schedule**

<b>15A</b>	½" Sch 40	<b>15B</b>	½" Sch 80
<b>15C</b>	½" Sch 160	<b>20A</b>	¾" Sch 40
<b>20B</b>	¾" Sch 80	<b>25A</b>	1" Sch 40
<b>25B</b>	1" Sch 80	<b>25C</b>	1" Sch 160
<b>10x7</b>	10 mm x 7 mm		
<b>14x9</b>	14 mm x 9 mm		
<b>Other</b>	Consult Factory		

**Barstock OD at Tip**

Pl. Specify in mm

**Barstock ID**

Pl. Specify in mm

**Taper Length**

Pl. Specify in mm

**Instrument Connection**

**FLANGED - F**

Size	Code	Rating	Code	Facing	Code
1/2"	<b>15</b>	150	<b>A</b>	RF	<b>RF</b>
3/4"	<b>20</b>	300	<b>B</b>	FF	<b>FF</b>
1"	<b>25</b>	600	<b>C</b>	RTJ	<b>RJ</b>
1-1/2"	<b>40</b>	900	<b>D</b>	ST	<b>ST</b>
2"	<b>50</b>	1500	<b>E</b>	SG	<b>SG</b>
3"	<b>80</b>	2500	<b>F</b>	LT	<b>LT</b>
				LG	<b>LG</b>

**Process Connection**

**Flange Material**

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>S6L</b>	SS316L
<b>CST</b>	CS	<b>HCC</b>	Hastelloy® C-276
<b>410</b>	SS410	<b>HCB</b>	Hastelloy® B
<b>S7S</b>	SS317	<b>MN4</b>	Monel® 400
<b>S7L</b>	SS317L	<b>MN5</b>	Monel® 500
<b>TI2</b>	Ti-II	<b>N20</b>	Nickel 200
**Special material on Request			

**Insertion Length ("U")**

Pl. Specify in mm

**Extension Length ("T")**

Pl. Specify in mm

**Tip Thickness**

Pl. Specify in mm

Other Options	
<b>0</b>	None
<b>1</b>	Plug & Chain
<b>5</b>	NACE to MR-01-75-/MR-01-03
<b>6</b>	Radiography Test (RT) for weld joints
<b>7</b>	Full penetration weld
<b>8</b>	PWHT
<b>9</b>	H2 Service
<b>14</b>	1 mm PTFE coating
<b>15</b>	1 mm zirconium oxide coating
<b>16</b>	0.5 mm Tungsten carbide coating
<b>17</b>	1 mm Tungsten carbide coating
<b>18</b>	1 mm stellite coating
<b>19</b>	Tapered for tail portion of 150 mm (Pl. Specify length in mm)

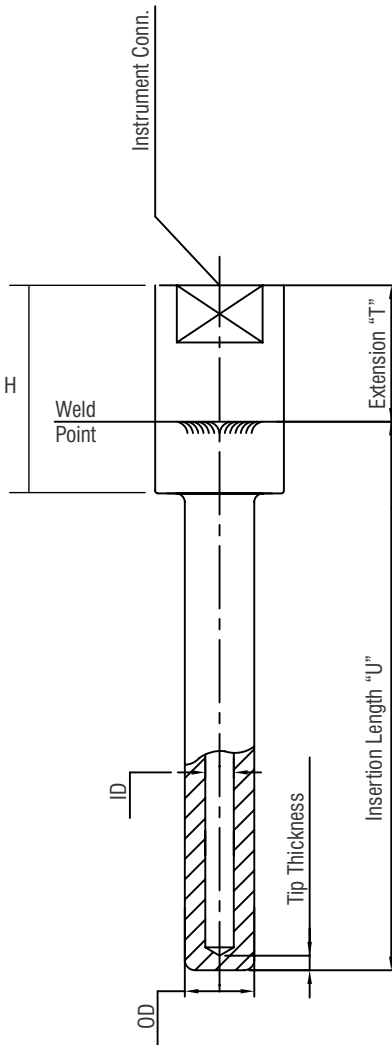
THREADED - T					
Size	Code	Type	Code	M / F	Code
1/4"	<b>06</b>	NPS	<b>NS</b>	M	<b>M</b>
3/8"	<b>10</b>	NPT	<b>NT</b>	F	<b>F</b>
1/2"	<b>15</b>	BSP	<b>BP</b>		
3/4"	<b>20</b>	BSPT	<b>BT</b>		
1"	<b>25</b>	Gas	<b>GS</b>		
M20	<b>M20</b>	Pitch 1.5	<b>C</b>		

**Ordering Example:- TWFF02-S6S-25B-18-11-150-T15NTF-F50BRF-S6S-1500-65.6-4-0**

# TW BW 01 - Barstock Weld in Thermowell (Straight)



## TWBW - 01



	Other Options
0	None
1	Plug & Chain
2	IBR
3	Radiography Test (RT) for Bore Concentricity
4	Ultrasonic Test (UT) for Bore Concentricity
5	NACE to MR-01-75/-MR-01-03

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B
<b>410</b>	SS410	<b>MN4</b>	Monel® 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500
<b>S7L</b>	SS317L	<b>Ti2</b>	Ti-II
<b>N20</b>	Nickel 200		
**Special material on Request			

Thermowell  
Material

Thermowell  
Head Dia

Thermowell OD

Bore ID

Instrument  
Connection

Process  
Connection

Insertion  
Length ("U")

Extension  
Length ("T")

Head  
Length (H)

Tip Thickness

Pl. Specify in mm

Pl. Specify in mm

Pl. Specify in mm

Weld in

Pl. Specify in mm

Pl. Specify in mm

Pl. Specify in mm

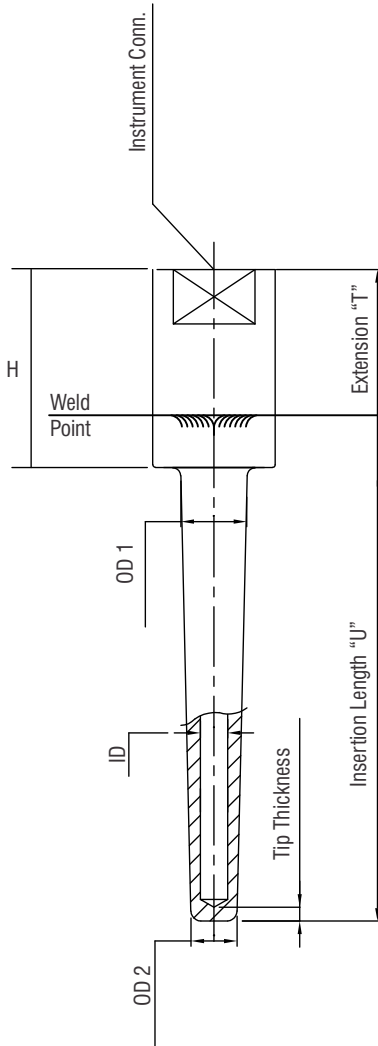
Pl. Specify in mm

### THREADED - T

Size	Code	Type	Code	M / F	Code
1/4"	<b>06</b>	NPS	<b>NS</b>	M	<b>M</b>
3/8"	<b>10</b>	NPT	<b>NT</b>	F	<b>F</b>
1/2"	<b>15</b>	BSP	<b>BP</b>		
3/4"	<b>20</b>	BSPT	<b>BT</b>		
1"	<b>25</b>	JIS-PF	<b>PF</b>		
M20	<b>M20</b>	JIS-PT	<b>PT</b>		
		Gas	<b>GS</b>		
		R	<b>RR</b>		
		Rp	<b>RP</b>		
		Pitch 1.5	<b>C</b>		

Ordering Example:- TWBW01-S6S-32-24-11-T15NTF-Weld in-250-50-75-6.5-0

# TW BW 02 - Barstock Weld in Thermowell (Taper)



Other Options	
0	None
1	Plug & Chain
2	IBR
3	Radiography Test (RT) for Bore Concentricity
4	Ultrasonic Test (UT) for Bore Concentricity
5	NACE to MR-01-75/-MR-01-03
19	Tapered for tail portion only (Pl. Specify length in mm)

## TWBW - 02

<b>S4S</b>	SS304	<b>825</b>	Incoloy <sup>®</sup> 825
<b>S6S</b>	SS316	<b>600</b>	Inconel <sup>®</sup> 600
<b>310</b>	SS310	<b>800</b>	Incoloy <sup>®</sup> 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy <sup>®</sup> C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy <sup>®</sup> B
<b>410</b>	SS410	<b>MN4</b>	Monel <sup>®</sup> 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel <sup>®</sup> 500
<b>S7L</b>	SS317L	<b>TI2</b>	Ti-II
<b>N20</b>	Nickel 200		
**Special material on Request			

Thermowell  
Material

Thermowell  
Head Dia

Thermowell  
OD 1 (Cold End)

Thermowell  
OD 2 (Hot End)

Bore ID

Instrument  
Connection

Process  
Connection

Insertion  
Length ("U")

Extension  
Length ("T")

Head  
Length (H)

Tip Thickness

Pl. Specify in mm

Pl. Specify in mm

Pl. Specify in mm

Pl. Specify in mm

### THREADED - T

Size	Code	Type	Code	M / F	Code
1/4"	<b>06</b>	NPS	<b>NS</b>	M	<b>M</b>
3/8"	<b>10</b>	NPT	<b>NT</b>	F	<b>F</b>
1/2"	<b>15</b>	BSP	<b>BP</b>		
3/4"	<b>20</b>	BSPT	<b>BT</b>		
1"	<b>25</b>	JIS-PF	<b>PF</b>		
M20	<b>M20</b>	JIS-PT	<b>PT</b>		
		Gas	<b>GS</b>		
		R	<b>RR</b>		
		Rp	<b>RP</b>		
		Pitch 1.5	<b>C</b>		

Weld in

Pl. Specify in mm

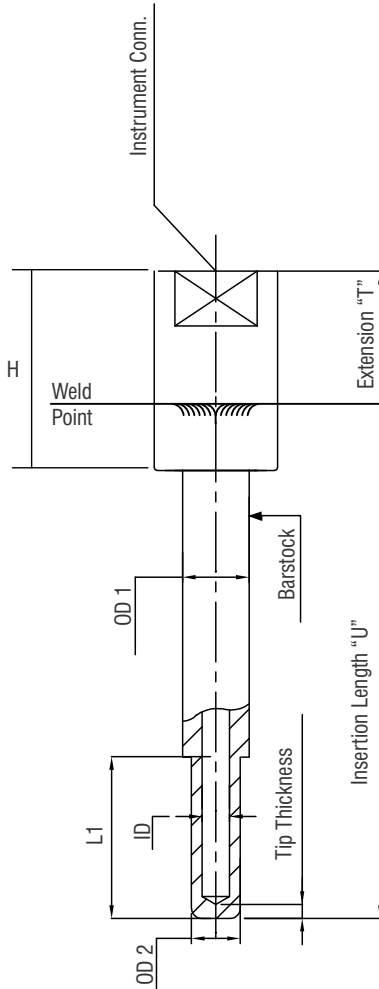
Pl. Specify in mm

Pl. Specify in mm

Pl. Specify in mm

Ordering Example:- TWBW02-S6S-34-26-20-11-T15NTF-Weld in-300-45-75-6-2

# TW BW 03 - Barstock Weld in Thermowell (Stepped)



	Other Options
0	None
1	Plug & Chain
2	IBR
3	Radiography Test (RT) for Bore Concentricity
4	Ultrasonic Test (UT) for Bore Concentricity
5	NACE to MR-01-75/-MR-01-03

## TWBW - 03

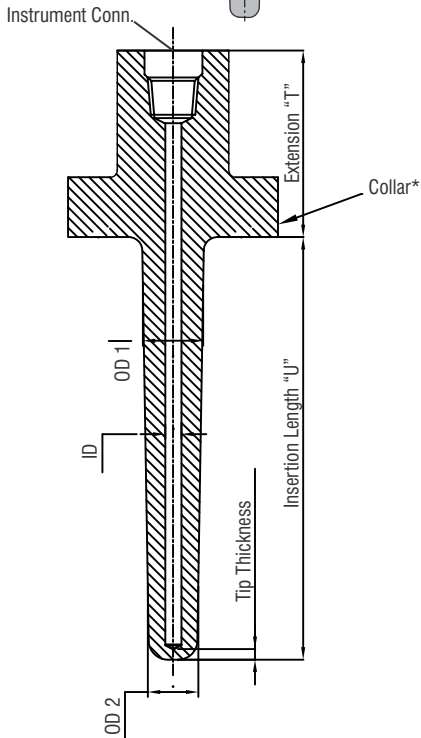
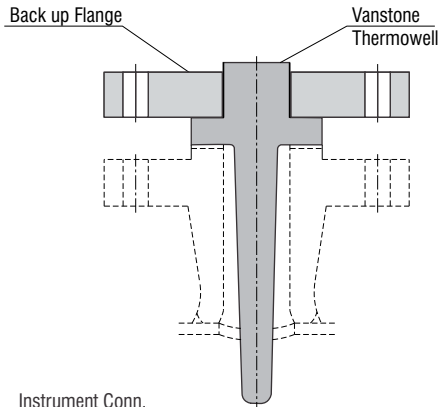
<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B
<b>410</b>	SS410	<b>MN4</b>	Monel® 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500
<b>S7L</b>	SS317L	<b>TI2</b>	Ti-Il
<b>N20</b>	Nickel 200		

\*\*Special material on Request

<b>Thermowell Material</b>	<input type="text"/>																																																																									
<b>Thermowell Head Dia</b>	<input type="text"/>	Pl. Specify in mm																																																																								
<b>Thermowell OD 1 (Cold End)</b>	<input type="text"/>	Pl. Specify in mm																																																																								
<b>Thermowell OD 2 (Hot End)</b>	<input type="text"/>	Pl. Specify in mm																																																																								
<b>Bore ID</b>	<input type="text"/>	Pl. Specify in mm																																																																								
<b>Instrument Connection</b>	<input type="text"/>	<table border="1"> <thead> <tr> <th colspan="6">THREADED - T</th> </tr> <tr> <th>Size</th> <th>Code</th> <th>Type</th> <th>Code</th> <th>M / F</th> <th>Code</th> </tr> </thead> <tbody> <tr> <td>1/4"</td> <td>06</td> <td>NPS</td> <td>NS</td> <td>M</td> <td>M</td> </tr> <tr> <td>3/8"</td> <td>10</td> <td>NPT</td> <td>NT</td> <td>F</td> <td>F</td> </tr> <tr> <td>1/2"</td> <td>15</td> <td>BSP</td> <td>BP</td> <td></td> <td></td> </tr> <tr> <td>3/4"</td> <td>20</td> <td>BSPT</td> <td>BT</td> <td></td> <td></td> </tr> <tr> <td>1"</td> <td>25</td> <td>JIS-PF</td> <td>PF</td> <td></td> <td></td> </tr> <tr> <td>M20</td> <td>M20</td> <td>JIS-PT</td> <td>PT</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>Gas</td> <td>GS</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>R</td> <td>RR</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>Rp</td> <td>RP</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>Pitch 1.5</td> <td>C</td> <td></td> <td></td> </tr> </tbody> </table>	THREADED - T						Size	Code	Type	Code	M / F	Code	1/4"	06	NPS	NS	M	M	3/8"	10	NPT	NT	F	F	1/2"	15	BSP	BP			3/4"	20	BSPT	BT			1"	25	JIS-PF	PF			M20	M20	JIS-PT	PT					Gas	GS					R	RR					Rp	RP					Pitch 1.5	C		
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		R	RR																																																																							
		Rp	RP																																																																							
		Pitch 1.5	C																																																																							
<b>Process Connection</b>	<input type="text"/>	WELD IN																																																																								
<b>Insertion Length ("U")</b>	<input type="text"/>	Pl. Specify in mm																																																																								
<b>Stepped Length ("L1")</b>	<input type="text"/>	Pl. Specify in mm																																																																								
<b>Extension Length ("T")</b>	<input type="text"/>	Pl. Specify in mm																																																																								
<b>Head Length (H)</b>	<input type="text"/>	Pl. Specify in mm																																																																								
<b>Tip Thickness</b>	<input type="text"/>	Pl. Specify in mm																																																																								

Ordering Example:- TWBW03-S6S-34-26-20-11-T15NTF-Weld in-250-100-50-80-5-0

# TW BV 01 - Vanstone Type Thermowell



\* Collar OD shall be same as RF Dia of Back up Flange

	Other Options
0	None
1	Plug & Chain
2	IBR
3	Radiography Test (RT) for Bore Concentricity
4	Ultrasonic Test (UT) for Bore Concentricity
5	NACE to MR-01-75/-MR-01-03

## TW BV - 01

Thermowell Material

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>KAN</b>	Kanthal
<b>S6L</b>	SS316L	<b>HCC</b>	Hastelloy® C-276
<b>CST</b>	CS	<b>HCB</b>	Hastelloy® B
<b>410</b>	SS410	<b>MN4</b>	Monel® 400
<b>S7S</b>	SS317	<b>MN5</b>	Monel® 500
<b>S7L</b>	SS317L	<b>TI2</b>	Ti-II
<b>N20</b>	Nickel 200		

\*\*Special material on Request

OD 1 (Cold End)

Pl. Specify in mm

OD 2 (Hot End)

Pl. Specify in mm

Bore ID

Pl. Specify in mm

Instrument Connection

THREADED - T					
Size	Code	Type	Code	M / F	Code
1/4"	<b>06</b>	NPS	<b>NS</b>	M	<b>M</b>
3/8"	<b>10</b>	NPT	<b>NT</b>	F	<b>F</b>
1/2"	<b>15</b>	BSP	<b>BP</b>		
3/4"	<b>20</b>	BSPT	<b>BT</b>		
1"	<b>25</b>	Gas	<b>GS</b>		
M20	<b>M20</b>	Pitch 1.5	<b>C</b>		

Process Connection

FLANGED - F					
Size	Code	Rating	Code	Facing	Code
1-1/2"	<b>40</b>	150	<b>A</b>	RF	<b>RF</b>
2"	<b>50</b>	300	<b>B</b>	FF	<b>FF</b>
3"	<b>80</b>	600	<b>C</b>	RTJ	<b>RJ</b>
		900	<b>D</b>	ST	<b>ST</b>
		1500	<b>E</b>	SG	<b>SG</b>
		2500	<b>F</b>	LT	<b>LT</b>
				LG	<b>LG</b>

Back up Flange Material

<b>S4S</b>	SS304	<b>825</b>	Incoloy® 825
<b>S6S</b>	SS316	<b>600</b>	Inconel® 600
<b>310</b>	SS310	<b>800</b>	Incoloy® 800
<b>446</b>	SS446	<b>321</b>	SS321
<b>S4L</b>	SS304L	<b>S6L</b>	SS316L
<b>CST</b>	CS	<b>HCC</b>	Hastelloy® C-276
<b>410</b>	SS410	<b>HCB</b>	Hastelloy® B
<b>S7S</b>	SS317	<b>MN4</b>	Monel® 400
<b>S7L</b>	SS317L	<b>MN5</b>	Monel® 500
<b>TI2</b>	Ti-II	<b>N20</b>	Nickel 200

\*\*Special material on Request

Insertion Length ("U")

Pl. Specify in mm

Extension Length ("T")

Pl. Specify in mm

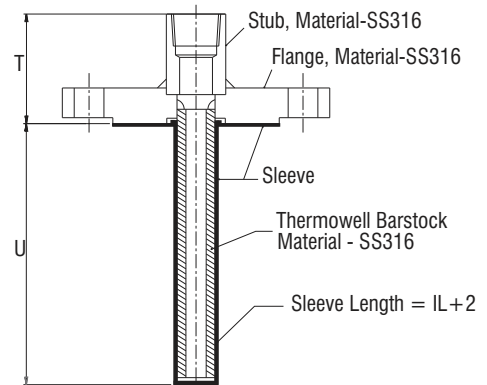
Tip Thickness

Pl. Specify in mm

Ordering Example:- TWBV01-S6L-30-18-7-T15NTF-50BRF-CST-255-50-5-0

## Sleeved (Lined) Thermowell

One of the most economical solutions to protect the thermowells from chemically aggressive fluids is to provide a bar-stock flanged thermowell made out of conventional stainless steel (SS316) with loose lining in the form of a sleeve on the entire wetted portion. This will provide strength from stainless steel & corrosion resistance from the lining.

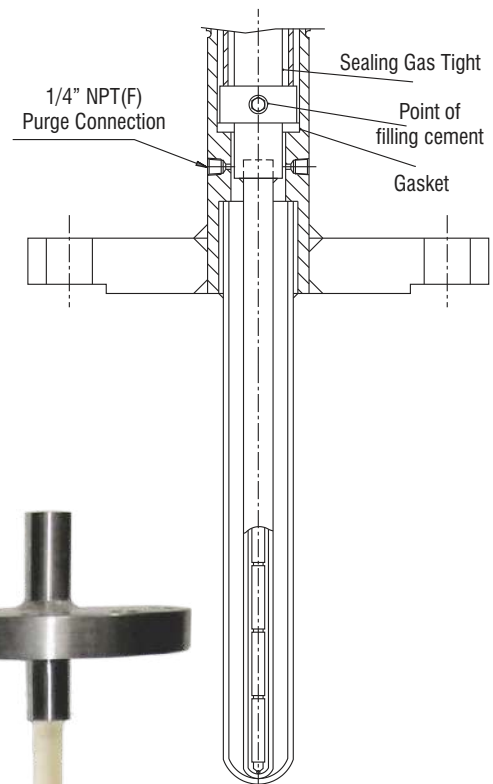


## Thermowells for use in high temperature applications

For high temperature applications, generally, Ceramic protecting tubes are used in different industries such as Iron & Steel, glass, cement etc. It has high resistance to thermal shocks. It is inert to most chemicals and has a high dielectric strength. These are primarily used to protect noble metal thermocouples (like R, S & B type) They are available in variety of sizes. Normally it is cemented (by high temperature withstanding cement) to metal tubes (which are termed as holding tubes). The process connection slides or is welded to this metallic portion of the tube. For double protection, inner ceramic tube is also used. Mainly two grades of ceramic are used. Ceramic 610 (also termed as Mullite) & Ceramic 710 (recrystallised Alumina-99.5% purity) can withstand up to 1500°C & 1800°C respectively. It should be remembered that it has poor mechanical shock resistance. It is impervious to gases at high temperatures.

**Silicon Carbide** protecting tubes are also used generally as a secondary protection for applications such as Kilns, Furnaces, Stove Dome etc. Recrystallised silicon carbide has a very high abrasion resistance. Also used for flue gas application or incinerators in waste management system. It can withstand 1600°C & direct flame impingement. It is extremely hard & chemically inert. It resists most of the acids, molten salts. Generally used in conjunction with ceramic tube.

**Cermet (LT-1)** which is metal ceramic composite (combination of chromium & aluminium oxide) is stable in oxidising atmospheres upto 1300°C. Cermet tubes are stronger & more resistant to thermal & mechanical shocks than ceramic protecting tubes. Main area of usage is in molten copper, open hearth furnace, blast furnace. Ceramic primary tube is recommended when Cermet is used.



## Special Thermowells

One of the most difficult problems in temperature measurement of process parameters has been the rapid wearing out of Thermowells made out of conventional stainless steel. Various factors could cause the failure of the thermowells, the most difficult, have been the erosion due to severe particle impingement. The corrosion due to chemically aggressive fluids; the combination of high temperature, high velocity fluids & the thermal shock faced by the sensor protective sheaths in the glass & metallurgical industries.

With an experience of over three decades, *General* is in a position to offer some solutions to most of these problems. Some of the standard designs are described and illustrated in this literature.

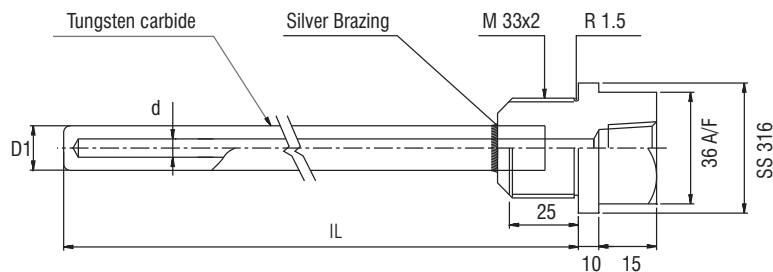


## Solid Sintered Tungsten Carbide Thermowell

These thermowells are ideally suited for use in very abrasive environment such as in air preheaters & coal mills of coal based power plants (mill classifier or pulveriser outlet) or steam generation units, for temperature measurement of coal and air mixture.

### Typical Specifications

- Type** : Built-up threaded
- Material** : Solid Sintered Tungsten Carbide brazed to 316 SS threaded bushing.
- Process connection** : M33 x 2 or as required
- Bore** : 7 mm, 10.5 mm
- Outer diameter** : 16 mm, 20 mm as standard or else to be specified
- Immersion length** : IL - 160, 200, 250, 320, 400
- Extension length** : EL - 100, 160 in the form of ½" schedule 80 nipple generally
- Note** : When the length are longer, it is recommended to use tungsten carbide only for the tail portion of say 200 to 250 mm.



Sensor & Bulb dia (mm)	d	D1	IL
MI TC 6 mm dia	6.5	16	160, 200, 250, 320, 350
MI RTD 6 mm dia	6.5	16	160, 200, 250, 320, 350
Temp Gauge or Switch 10 mm dia	10.5	20	160, 200, 250, 320, 350



### In-House Testing facilities for Thermowells

1. **Dimensional** : As per approved drawing & data sheet
2. **Hydro Test** : For barstock threaded 100 Kg/cm<sup>2</sup> (internal as standard) and more as per customer requirement
  - : External if applicable
  - : Flanged Thermowells - Internal / external - 1.5 times the operating pressure
  - : Internal - 100 kg/cm<sup>2</sup> for ratings below 600# & 200 kg/cm<sup>2</sup> above 600# rating
  - : External - In accordance with flange rating
3. **Bore Concentricity** : By using "D" meter (Ultrasonic thickness tester) - Wall thickness measurement - Sample 5% at two different points & each at 180° angle to each other
  - : Radiography test by external lab (X-Ray) for immersion length portion (optional)
4. **Dye Penetration Test** : For weld joints of thermowell / protecting tube
5. **Threading Check** : Process thread & instrument thread - Check by thread gauge
6. **PMI Test**

### Optional Tests

1. Hardness Test
2. PWHT - Post weld heat treatment
3. Intra Granular Corrosion Test
4. Corrosion test as per A293 Method C
5. Ferrite No. Test
6. Impact test
7. Radiography for bore concentricity and weld joint as applicable
8. Physical, Chemical & Micro Analysis as applicable
9. PMI test (Positive Material Identification)
10. IBR Test

# Corrosive Service Guide



CORROSIVE AGENT	Deg C	CONC %	RECOMMENDED MATERIAL
Acetic Acid (Glacial)	200	ALL	316 SS
Acetic Acid	140	80%	Hast. C
	200	50%	316 SS
	140	80%	Carp. 20*
Acetic Anhydride	130	ALL	Hast. C
	200	ALL	316 SS*
Acetone	200	ALL	316 SS
Acetylene	200	ALL	304 SS
Alcohol, Ethyl	90	ALL	Hast. C
	200	ALL	316 SS*
Aluminium Chloride (Aqueous)	140	ALL	Hast. B
	140	ALL	Nickel *
Aluminium Nitrate (Saturated)	90	ALL	446 SS
	90	ALL	316 SS*
Aluminium Sulfate (Saturated)	90	ALL	Titanium
	90	ALL	316 SS*
Ammonia (Anhydrous)	290	ALL	316 SS
Ammonia (Gas)	90	ALL	304 SS
Ammonium Chloride	90	ALL	Titanium
	290	ALL	Nickel *
	70	50%	Nickel
Ammonium Hydroxide	30	ALL	Steel
	80	ALL	Steel *
Ammonium Nitrate	90	ALL	Carp.20
Ammonium Sulfate	90	SAT	Hast. B
	140	SAT	304 SS*
	90	10-40%	Titanium
	200	10-40%	316 SS*
Amyl Acetate	140	ALL	304 SS
Aniline	250	ALL	304 SS
Barium Chloride (Saturated)	90	ALL	Hast. C
	290	ALL	Inconel *
Barium Hydroxide (Saturated)	100	50%	Carp. 20
	200	ALL	316 SS*
Beer	90		SS 304
Benzene (Benzol)	100	ALL	Carp. 20
	100	ALL	304 SS*
Benzoic Acid	200	ALL	Titanium
	200	ALL	304 SS*
Black Liquor	240	ALL	TFE
	190	ALL	FEP
	90	ALL	Carp. 20 *
Bleach (Active Chlorine)	60	12.50%	Hast. C
Borax	200	ALL	316 SS
Boric Acid	290	ALL	Hast C
	90	ALL	Nickel *
Brine Acid	60	ALL	Hast. C
	30	ALL	Brass *
Bromine (Liquid)	290	ALL	Tantalum
	90	ALL	Aluminum *
Butane	170	ALL	Steel
Butyl Acetate	90	ALL	Titanium
	190	ALL	316 SS *
Butyl Alcohol	200	ALL	316 SS
Butyric Acid	140	ALL	Carp. 20
	200	ALL	316 SS*
Calcium Disulfite	90	ALL	TFE
	190	ALL	FEP
	170	ALL	316 SS*
Calcium Chlorate	240	ALL	TFE
	190	ALL	FEP
	90	ALL	316 SS*
Calcium Chloride(Saturate)	170	ALL	Hast. C
	90	ALL	Cap 20*

CORROSIVE AGENT	Deg C	CONC %	RECOMMENDED MATERIAL
Calcium Hydroxide	90	50%	Hast. C
	90	SAT	304 SS *
Carbonic Acid	290	ALL	Carp. 20
	170	ALL	316 SS*
Carbonic Dioxide (Dry)	430	ALL	Brass
Carbonated Beverages	100	ALL	304 SS
Carbon Disulfide	90	ALL	Titanium
	200	ALL	316 SS *
Carbon Tetrachloride	90	ALL	304 SS
Chlorine (Gas)	90	ALL	Monel
	200	ALL	316 SS*
	70	ALL	Hast. C
Chlorine (Gas - Moist )	180	ALL	Hast. B
Chloroform Acid	90	ALL	Nickel
Chloroform	90	ALL	Carp. 20 *
	90	50%	Titanium
Chromic Acid	90	50%	Hast. C*
	130	ALL	Hast. C*
Citric Acid	90	ALL	Carp. 20*
	90	ALL	Titanium
Copper Chloride	90	ALL	Hast. C*
	150	ALL	304 SS
Copper Nitrate 300 ALL 304 SS	90	ALL	Hast. C
Copper Sulfate 200 ALL Hast. C	200	ALL	316 SS*
Corn Oil	240	ALL	TFE
	190	ALL	FEP
	170	ALL	316 SS*
	90	ALL	304 SS*
Crude Oil	240	ALL	TFE
Cyanogen Gas	190	ALL	FEP
	170	ALL	316 SS*
	90	ALL	304 SS
Ether	90	ALL	Titanium
Ethyl Acetate	90	ALL	316 SS*
	200	ALL	316 SS
Ethyl Chloride (Dry)	290	ALL	Carp. 20
Ethylene Glycol	90	ALL	304 SS*
	90	ALL	Hast. C
Ethylene Oxide	20	ALL	316 SS*
	200	ALL	316 SS
Fatty Acids	200	ALL	Titanium
Ferric Chloride	140	ALL	Hast. C*
	30	ALL	Carp. 20
Ferric Sulfate	50	ALL	316 SS
	90	ALL	Titanium
Ferrous Sulfate	30	ALL	304 SS*
	90	ALL	304 SS
Formaldehyde	50	50%	304 SS*
	50-290	50%	304 SS*
Formic Acid (Anhydrous)	90	ALL	Cap. 20
Freon (F-11)	200	ALL	Monel
	200	ALL	316 SS*
Furfural	200	ALL	304 SS*
	200	ALL	TFE
Gallic Acid	240	ALL	FEP
	190	ALL	316 SS*
Gasoline (Unleaded)	200	ALL	Hast. C
	150	ALL	446 SS
	20	ALL	Steel*
	170		

# Corrosive Service Guide



CORROSIVE AGENT	Deg C	CONC %	RECOMMENDED MATERIAL
Gasoline (Refined)	240		TFE
	190		FEP
	90		Steel*
Glucose	30	ALL	Nickel
	190	ALL	316 SS*
Glue	30	ALL	Hast. B
	60	ALL	Steel*
Glycerine	130	ALL	304 SS
Iodine	250	ALL	Hast. C
	20	ALL	Nickel
Hydrogen Peroxide	90	90%	Hast. C
Hydrogen Sulfide (Dry)	70	ALL	316 SS
	290	ALL	316 SS
Hydrobromic Acid	90	50%	Titanium
	120	50%	Hast. B*
Hydrochloric Acid	60	38%	Hast. B
Hydrocyanic Acid	240	ALL	TFE
	190	ALL	FEP
	170	ALL	316 SS*
Hydrofluoric Acid	240	ALL	TFE
	190	ALL	FEP
	90	ALL	Hast. C*
Hydrogen Chloride (Gas, Dry)	290	ALL	Carp
Hydrogen Fluoride (Dry)	40	ALL	304 SS
	200	ALL	304 SS*
Kerosene	240	ALL	TFE
	190	ALL	FEP
	170		
Ketones	30	ALL	Hast. C
	130	ALL	316 SS*
Lactic Acid	150	ALL	Titanium
	120	ALL	Hast. B*
Lime (sulfur)	240	ALL	TFE
	190	ALL	FEP
	150	ALL	316 SS*
Linseed Oil	60	ALL	Carp. 20
	30	ALL	Steel*
Magnesium Chloride	140	ALL	Nickel
	90	50%	Carp. 20*
Magnesium Hydroxide	90	ALL	304 SS
Magnesium Sulfate	90	60%	Nickel
	170	ALL	316 SS*
Mercuric Chloride	140	ALL	Tantalum
	80	10%	Hast. C*
Mercury	290	ALL	304 SS
Methyl Chloride(Dry)	170	ALL	316 SS
Methylene Chloride	90	ALL	Carp. 20
Milk	90	304	SS 380
Naphtha	20	ALL	446 SS
	120	ALL	304 SS
Natural Gas	240		TFE
	190		FEP
	40		Steel*
Nickel Chloride	90	80%	Hast. C 3040SS*
Nickel Sulfate	80	10%	Tantalum
	90	ALL	304 SS*
Nitric Acid	20	ALL	304 SS
	90	40%	304 SS
Nitrobenzene	140	ALL	Carp. 20
	170	ALL	316 SS*
Oleic Acid	140	ALL	316 SS
Oleum	50	40%	Hast. C
	120	ALL	316 SS*
Oxalic Acid	90	ALL	Tantalum
	90	ALL	Carp. 20*
Oxygen	270	ALL	Tantalum
	20	ALL	446 SS
	170	ALL	316 SS*
Palmitic Acid	240	ALL	TFE
	190	ALL	FEP
	200	ALL	304 SS*
Phenol (Carbolic Acid)	290	ALL	316 SS

CORROSIVE AGENT	Deg C	CONC %	RECOMMENDED MATERIAL
Phosphoric Acid	90	50-85%	Hast. C
Photographic Solutions	40	50-85%	Carp. 20
Picric Acid	170	ALL	316 SS
	30	ALL	Titanium
	20	ALL	Aluminum
	200	ALL	316 SS*
Potassium Bromide	90	30%	Titanium
	90	30%	446 SS
Potassium Carbonate	90	50%	304 SS
Potassium Chlorate	170	30%	316 SS
Potassium Hydroxide	90	50%	Nickel
Potassium Nitrate	170	80%	Aluminum
	280	80%	446 SS*
Potassium Permanganate	20	20%	Hast. C
	170	20%	316 SS*
Potassium Sulfate	170	10%	316 SS
Propane	60	ALL	446 SS
	30	ALL	Brass
Pyrogalllic Acid	30	ALL	Copper
	170	ALL	316 SS*
Salicylic Acid	120	ALL	Hast. C
	170	ALL	316 SS*
Sea Water (Stagnant)			Monel
Sea Water (Cavitation)	(20)		316 SS
Soap Solutions	20	ALL	446 SS
	50	ALL	Nickel*
Sodium Bicarbonate	170	20%	316 SS
Sodium Bisulfite	70	10%	316 SS
Sodium Carbonate	90	10-40%	Carp. 20
	90	30%	Carp. 20
	290	10-100%	Hast. B*
Sodium Chloride	30	30%	Nickel
Sodium Fluoride	70	ALL	Monel
	80	ALL	Carp. 20*
Sodium Hydroxide	100	70%	Monel
	70	ALL	316 SS*
Sodium Nitrate	170	60%	316 SS*
Sodium Nitrite	90	SAT	Titanium
	90	40%	304 SS*
Sodium Peroxide	20	10%	446 SS
Sulfur	290	ALL	304 SS
	70	ALL	Alloy 556
Sulfur Chloride (Dry)	30	ALL	Tantalum
	290	ALL	Nickel*
Sulfur Dioxide (Dry)	50	ALL	Steel
	290	ALL	316 SS*
Sulfur Trioxide (Dry)	240	ALL	TFE
	190	ALL	FEB
	290	ALL	304 SS*
Sulfuric Acid	40	100	Carp. 20
	120	60%	Hast. B
Sulfurous Acid	70	ALL	Titanium
	180	ALL	Carp. 20
Steam (Law Pressure)			Inconel
(Medium Pressure)			304 SS*
(High Pressure)			Nickel
Tannic Acid	90	10	304 SS*
	90	ALL	20% Titanium
Tartaric Acid	200	ALL	304 SS*
Titanium Tetrachloride	30	ALL	304 SS
	140	ALL	Carp.
Toulene (Toluol)	170	ALL	Titanium
	90	ALL	Steel
Trichloroacetic Acid	90	ALL	304 SS
	240	ALL	TFE
	190	ALL	FEP
	90	ALL	Hast. C*
Trichloroethylene	70	ALL	Inconel
Turpentine	90	ALL	304 SS
Whiskey and Wine		ALL	304 SS
Xylene (Xylo)	90	ALL	446 SS
Zinc Chloride	80	TO 70%	Titanium
	290	ALL	Hast. B
Zinc Sulfate	90	SAT	316 SS

## EMITTANCE VALUES FOR POLISHED AND OXIDIZED METALS

WAVE LENGTH	0.6-1.1 $\mu\text{m}$		2-2.8 $\mu\text{m}$		5 $\mu\text{m}$				8 - 14 $\mu\text{m}$
	SMOOTH POLISH	SMOOTH OXIDIZED	SMOOTH POLISH	SMOOTH OXIDIZED	SMOOTH POLISH	SMOOTH OXIDIZED	SMOOTH POLISH	SMOOTH OXIDIZED	SMOOTH OXIDIZED
Alimel	0.32	0.90	0.25	0.90	0.10	0.90	0.10	0.90	
Aluminium	0.15	0.25	0.10	0.20	0.05	0.15	0.08	0.15	0.9*
Brass	0.20	0.70	0.10	0.70	0.05	0.70	0.07	0.70	
Carbon Steel	0.33	0.75	0.25	0.75	0.11	0.75	0.15	0.75	0.8
Chromel	0.33	0.90	0.25	0.90	0.10	0.90	0.15	0.90	0.9
Chromium	0.40	0.70	0.30	0.70	0.19	0.70	0.25	0.70	
Cobalt	0.33	0.75	0.25	0.75	0.15	0.75	0.20	0.75	
Copper	0.10	0.70	0.04	0.70	0.02	0.70	0.03	0.70	
Graphite (Smooth)	0.80	-	0.80	-	0.80	-	0.80	-	0.8
Iron	-	-	0.25	0.70	0.09	0.70	0.15	0.70	0.8
Lead	0.25	0.70	0.15	0.70	0.08	0.70	0.10	0.70	
Manganese	0.45	0.90	0.30	-	0.20	0.90	0.22	0.90	
Molybdenum	0.38	-	0.28	0.90	0.18	-	0.15	-	-
Nichrome	0.36	0.90	0.26	0.90	0.17	0.90	0.22	0.90	0.9
Nickel	0.32	0.90	0.15	0.90	0.06	0.90	0.08	0.90	
Platinum	0.27	-	0.18	-	0.06	-	0.10	-	-
Silver	0.05	0.80	0.03	0.80	0.03	0.80	0.03	0.80	
Silicon	0.70	-	0.7	-	0.70	-	0.70	-	-
Stainless Steel	0.33	0.85	0.25	0.85	0.10	0.85	0.15	0.85	0.8
Tantalum	0.27	0.70	0.10	0.70	0.07	0.70	0.08	0.70	
Tin	0.35	0.60	0.22	0.60	0.18	0.60	0.18	0.60	
Tungsten	0.40	0.60	0.10	0.60	0.05	0.60	0.06	0.60	
Vanadium	0.36	0.75	0.29	0.75	0.18	0.75	0.25	0.75	
Zinc	0.20	0.50	0.07	0.50	0.03	0.50	0.15	0.50	
Zirconium	0.30	0.40	0.22	0.40	0.14	0.40	0.15	0.40	

\*The values listed refer to flat polished specimens and to the oxides formed on these surfaces. Roughening of these surfaces raises the emittance values. A long narrow hole or crevice in any of the above produces a blackbody with  $e=1.0$

\*\*Electrolytically Anodized  
Not Oxidised

## Nominal Analysis of Metal Protection Tubes

AISI ASTM	EN DIN	C% Max	Mn% Max	Si% Max	S% Max	P% Max	Cr% Max	Ni% Max	Others %
202	-	0.15	7.5-10	1.00	0.030	0.060	17.00-19.00	4.00-6.00	-
303	1.4305	0.15	2.00	1.00	0.15 Min	0.20	17.00-19.00	8.00-10.00	Cu:1% max
304	1.4301	0.08	2.00	1.00	0.030	0.045	18.00-20.00	8.00-11.00	-
304L	1.4306	0.03	2.00	1.00	0.030	0.045	18.00-20.00	8.00-12.00	-
310	1.4841	0.25	2.00	1.50	0.030	0.045	24.00-26.00	19.00-22.00	-
316	1.4401	0.08	2.00	1.00	0.030	0.045	16.00-18.00	10.00-14.00	Mo: 2.00-3.00
316L	1.4404	0.03	2.00	1.00	0.030	0.045	16.00-18.00	10.00-14.00	Mo: 2.00-3.00
316Ti	1.4571	0.08	2.00	1.00	0.030	0.045	16.00-18.00	10.00-14.00	Ti : Min (5xC%), Mo: 2.00-3.00
321	1.4541	0.08	2.00	1.00	0.030	0.045	17.00-19.00	9.00-12.00	Ti : Min (5xC%)
347 SS	-	0.80	2.00	1.00	0.030	0.045	17.00-19.00	9.00-13.00	Nb : 10x C%
446 SS	-	0.20	1.50	1.00	0.030	0.040	23.00-27.00	-	N: 0.25
253 MA	-	-	0.6	1.7	-	-	21	11	Ce: 0.04 N: 0.17
Kanthal 1	-	-	-	-	-	-	22	-	Al: 5.8
Inconel 600	-	0.15	1.00	0.50	0.015	0.030	14.00-17.00	72.00	Trace Co <Cu:0.50
Inconel 625	-	0.10	0.50	0.50	0.015	0.030	21.5	Bal.	Mo9 Nb+ Ta: 3.7
Inconel 825	-	0.05	1.0	0.50	0.03	0.030	19.5-23.5	38-46	Al: <0.2, Ti:0.6-1.2, Mo:2.5-3.5
Inconel 800	-	0.10	1.50	1.00	0.015	0.030	19.00-23.00	30.00-35.00	Trace Cu, Trace Co, Al, Ti
UMCo-50	-	0.05-0.15	0.30-1.00	1.00	0.020	0.020	26.00-30.00	3.00	Co 50 Trace Mo
Hastelloy B	-	0.05	1.00	1.00	0.03	0.04	-	Bal.	Fe: 5.0, Mo: 28, Co: 2.5, V:0.6
Hastelloy C-276	-	0.002	1.00	0.08	0.03	0.04	14.5-16.5	Bal.	Mo: 15-17 Trace W, Co, V
Hastelloy X	-	0.05	1.00	1.00	0.030	0.040	20.50-23.00	Bal.	Mo: 8-10.00, W:0.6, Co: 1.5, trace B
Monel 400	-	Monel 400	Monel 400	Monel 400	Monel 400	Monel 400	Monel 400	Monel 400	Monel 400







# LEVEL INSTRUMENTS

# Introduction



**General Instruments** - A name recognized worldwide as a synonym for high-quality work, entrepreneurial spirit and innovative strength. The company is not only known for a complete product line in primary process control instrumentation and controls, but also offers the most modern integrated automation systems with its primary sensors. The field of expertise extends from applications in the largest chemical petrochemicals, oil and gas, refineries, fertilizers, metal and food & beverages plants. **General Instruments** operates wherever there is controlled flow of vapours, gases, liquids and chemicals.

The history of **General** is filled with the spirit of invention. The company was founded by Capt. Manohar Kulkarni in the year 1966 making the oldest family venture as today's largest process control instrumentation organisation. His first patent marked the beginning of a development which still today represents one of the company's main product lines. The Mumbai headquarters and the affiliated companies worldwide employ and train over 1000 people to become highly skilled specialists with a genuine commitment to the company.

The reason for this loyalty to the company can be found in the sound working environment. There are still old ties between the descendants

of the original owner and many of the employees whose average length of service exceeds 30 years. The progressive, yet traditional management team is committed to the name, **General** and the quality in technical competence and partnership it stands for.

Introducing one of the most critical product lines in the **General** Manifold is the level instruments. With its marked precision and technical know how, the state of art level gauges and level switches are manufactured to meet all most critical applications in level sensing and control.

**General Instruments** - Level Division, has the integrated systems of HART and Fieldbus with its most accurate level transmitters which are integrated in one of its design of magnetostrictive type with magnetic level gauge, besides having displacement type level transmitter and high end level switches, and also flow switches.

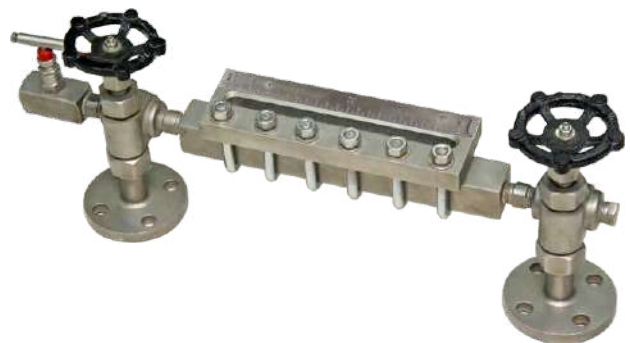
The applications range from Cryo Engineering designs for media applications at -196 deg cent till operating temperature of 550 deg cent and for pressure range of high vacuum service till 200 bar application.

## Your Applications and Our Products - The Perfect Match

Wherever there is level to be controlled accurately, companies rely on **General** controls and systems. **General Instruments** applies expert economical solutions based on its broad, proven product line tailored to the specific applications.

The basis for this success is the cooperation of the Research and Development, Design and Production departments, practical engineering and the continuous dialogue with the customer. Strict adherence to quality standards by the employees is also a prerequisite for top efficiency and best quality resulting in the satisfaction of the customer.

**General Instruments** Level division relies on experience. This wealth of information forms a solid basis to provide solutions for any challenging application.



Plants using **General** level equipment produce plastics, chemicals, pharmaceuticals, food, petroleum products and paper. Innovative **General** level range equipment is a fundamental component for mechanical equipment and provides users with a competitive edge in the international marketplace.

Transparent and reflex level gauge for level control provide economical solutions with IBR certifications for power plant applications at 525 deg cent and at 72 bar g

More than 100 **General** level gauge with integrated HART transmitter with ATEX certified, integrated with magnetic level gauge at medium temperatures between -30°C and +200°C are used at one of the largest petrochemical plant in India.

High end precision level control applications for drum level control and boiler level control operated at 82 bar g and at 425 deg cent, external cage design top mounted level switch LS 2000





## Chemical Industry



We constantly draw on the experience and recommendations passed on by our customers in the chemical, petrochemical and refinery industry during the development of our gauges. For example, the PP gauge body - gauge connection nipple joint is now considered at the design specs of IEC std of thickness and its test applicability, was developed by *General* Level division and has been adopted in standards used by the chemical industry.

*General* Level division supplies lightweight and heavy-duty level gauges designed as modular assemblies for chemical process engineering in all commonly used materials and in accordance with the industrial standards of DIN, ANSI and JIS as well as high-pressure level gauges according to the standard.

Our standard product range includes high density packings, metal bellows seal, pressure-balanced plugs, heating jackets as well as corrosion-resistant, low-noise and low-wear internal auto ball check valve trims.

*General* Level range has the right solution even for special applications such as Cyro Engineering, PSA plants, sterile processes and tank blanketing. Innovative accessories including smart Level transmitters integrated with our magnetic level gauge, auto ball check valves, vent and drain isolation shut off valves, and limit sensor switches round off our product line.

## Petrochemical and Refinery Industry



*General* level division possesses level gauges suitable for any type of application in oil and gas processing plants. The modular level instrument assemblies are available at short notice in all common pressure ratings and materials.

Materials, dimensions and flanges correspond to the important industrial standards and allow the equipment to be used in worldwide applications .

*General* level gauges can be customized to meet the individual requirements of any application, enabling them to be adapted to the most difficult requirements under the most adverse conditions.

Innovative accessories such as the integrated smart Ex d level transmitters ensure that data can be exchanged safely in the process and that malfunctions and faults can be detected quickly.

*General* level gauges are designed to handle even difficult process conditions where standard level gauges are not sufficient. *General* level division uses special components and accessories that enhance the level gauges performance. In addition, highly specific level gauge series have been created to meet even the most extraordinary requirements. On top of that, *General* level division can tailor level instruments that are perfectly adapted to the specific conditions in your plant.

## Power Generation



*General* level division supplies to power stations and recycling plants with a wide variety of level instruments ranging from simple level applications, high-quality feedwater and minimum flow recirculation applied level measurement device, steam pressure reducing measurements to complete high-pressure and low-pressure bypass stations applications as well as spray and steam atomizing desuperheaters applications

Level gauges designs include with globe or angle bodies in forged versions only that can be fitted with either flanges or buttweld ends. Our level gauge measurements can be controlled conventionally or equipped with state-of-the-art bus technology conforming to HART or Foundation Fieldbus specifications.

Certifications meeting Refinery, oil and gas, petrochemical, power applications applicable to all level instruments Consortium.

# Transparent Level Gauges

General

## Features

- Transparent level gauge applicable upto 200 kg/cm<sup>2</sup> and upto 400 deg cent
- Cryo applications upto (-)196 deg cent
- Toughened glass and borosilicate glass
- For applicability in critical, acidic, cryo and high temperature zone
- IBR certified device available
- NACE, H2S service compatibility applicable
- Non frost extension and high temperature extension
- Heat tracing available
- CE applicability
- Applicable for refinery, petrochemical, chemical, power, radioactive, fertilizer, food, pharma, metal industry applications



## Concept and Principle of operation

Liquid Level Gauge provides direct observation of liquid level in a tank/vessel, rising and falling level of the liquid inside the tank/vessel can be observed through the glass assembled in the gauge. The liquid level is discriminated in the form of different transparency of the two media. The gauge is mainly recommended for color liquids, steam water and interface liquid level.

Transparent Liquid Level Gauges, designed and built for a wide range of high temperature and high pressure applications. Our transparent level gauge is used to make, besides other applications include observation of the level of corrosion-proof and chromatic liquids.

## Technical Specifications: Material of Construction

<b>Type of Gauge</b>	a) Low Pressure - 30kg/cm <sup>2</sup> b) Medium Pressure - 100kg/cm <sup>2</sup> c) High Pressure - 200kg/cm <sup>2</sup>
<b>Mounting Orientation</b>	Top - Bottom Vertical Side - Side Right Side - Side Left
<b>Temperature</b>	Upto 400°C Cryo applicability application - non frost at the glass max. upto 200 kg/cm <sup>2</sup> & upto (-) 196°C
<b>CCD</b>	Max. upto 3000mm
<b>Liquid Chamber</b>	In forged construction: Carbon steel, SS304, SS304L, SS316, SS316L, Monel, Titanium, Inconel 600, Hastelloy C, Polypropylene, Other on request (subject to pressure & Temperature Condition)
<b>Cover Plate</b>	In forged construction: Carbon steel, SS304, SS304L, SS316, SS316L, Monel, Titanium, Inconel 600, Hastelloy C, Polypropylene
<b>Cushion</b>	CAF, PTFE, Grafoil with SS prignated
<b>Gasket</b>	CAF, PTFE, Grafoil with SS prignated
<b>Fastner</b>	SS, ASTM A 193 Gr B7 / A194 Gr 2H / Anodized Aluminium (for PP moc)
<b>Scale</b>	Aluminium, Aluminium with powder coated, SS304, SS316, Acrylic
<b>Glass</b>	Applicable till 320°C as per DIN 708/ 7081, BS 3463, JS B 8211, Toughened Borosilicate glass
<b>Process Connection</b>	Screwed / Flanged / Socket Weld and other on request

## Technical Specifications: Technical Data

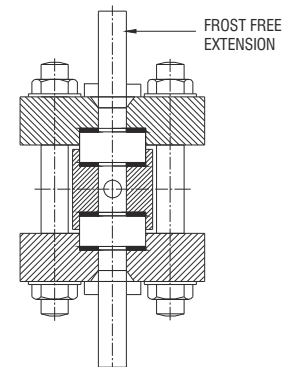
<b>Isolation Valve</b>	Auto Ball Check Valve a) Screwed bonnet offset construction suitable upto 50 kg/cm <sup>2</sup> b) Bolted bonnet offset construction suitable above 50 kg/cm <sup>2</sup> c) Material construction as per wetted part
<b>Vent</b>	1/2" Plugged / 1/2" Needle Valve / 1/2" Ball Valve / 1/2" Globe Valve / 1/2" Gate Valve, other on request
<b>Drain</b>	1/2" Plugged / 1/2" Needle Valve / 1/2" Ball Valve / 1/2" Globe Valve / 1/2" Gate Valve, other on request
<b>Optional</b>	a) Protection Shield for temperature upto 550°C - Mica Shield b) Illuminator - Weatherproof IP 67 c) Illuminator - Flameproof Gr.IIA/IIB d) Illuminator - Flameproof Gr.IIC e) Non-Frost Extension for extreme low temperature application f) Heating Jacket - to read the level of high congelable or ebullient liquid g) IBR Certification

## Special Application

### Cryo Application

If a conventional level gauge is used for extreme low temperature applications, it becomes difficult to observe the level of liquid as the gauge front tends to freeze. To get rid of this problem, an acrylic non-frosting plate is mounted in front of the gauge. So the observation of the liquid level is much easier this way.

Our Non-Frosting Transparent Level Gauges are classified depending on the process temperature, they height of the non-frosting plate window may be selected from 80 to 250 mm.



Transparent

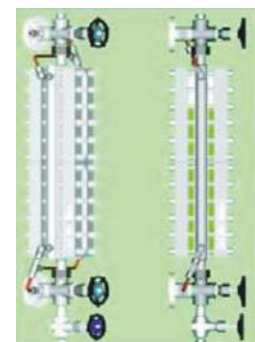
### Technical Specifications: Temp. rating and dimensions of non-frosting plates

<b>Temperature °C</b>	0...-20	-21...-45	-46...-100	-101...-160	-161...-200
<b>Recommended Materials</b>	LTCS	LTCS	304SS	316SS	316LSS
<b>Acrylic Height mm</b>	80	100	150	200	250

### Jacket Type

For a jacket type requirement application. This gauge is used to read the level of high congelable or ebullient liquids. The principle is to inflow a steam for congelable liquids and a cold water for ebullient liquids through the inside of the jacket to ensure accurate and reliable level observation.

This type is used for observing the fluid by changing it into state of liquid after heating or cooling it through jacket according to fluid's features. Our standard is that the inlet of the jacket for steam or cold water is 1/2" NPT(M) and or 15 NB flange. Others are available on request.



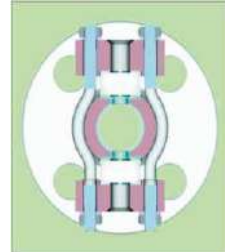
# Transparent Level Gauges



## Special Application

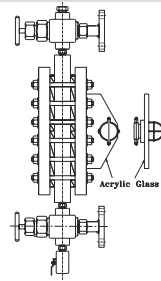
### Corrosion Application

More severe demands may often be required on liquid level gauges in terms of resistance to corrosion, and this is accomplished by lining or coating all wetted parts. The most important aspect of this process is the preparation of the metal substrate.



### Illuminator

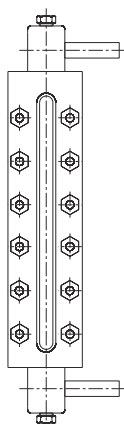
Transparent level gauges with illuminator are useful for observing the fluid level in a dim place or at night by using an explosion-proof and weather-proof. The illuminator can be mounted on all types of transparent level gauges.



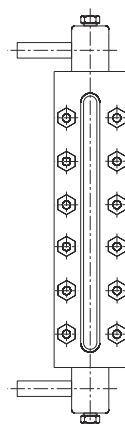
### Technical Specifications: Illuminator Specifications

<b>Rating</b>	Upto 15 W / 25W GLS Lamp or 15W LED Lamp with or without Flashing 240 VAC
<b>Construction</b>	In cast alloy LM6
<b>Gas Group</b>	IIA, IIB, IIC as per IS 2148 / 2004
<b>Deg of protection</b>	IP66 as per IS : 12063/1987
<b>CCE Certificate</b>	A/P/HQ/MH/104/1817
<b>Earthing</b>	2 Nos. External & 1 No. Internal
<b>Paint</b>	Epoxy Powder Coated Light Grey shade 631 of IS:5
<b>Cable Entry</b>	2 Nos. 3/4" ET With cable glands
<b>Mounting</b>	Transparent acrylic sheet with mounting bracket

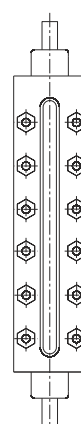
### Process Orientation



Side-Side (Left)



Side-Side (Right)



Top Bottom



# Transparent Level Gauges

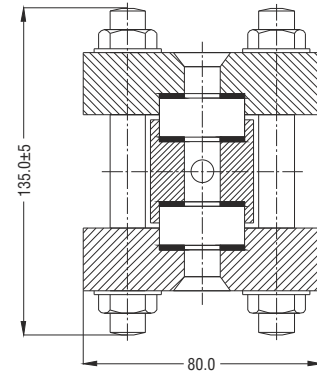


## Construction and dimensional cross sectional overview

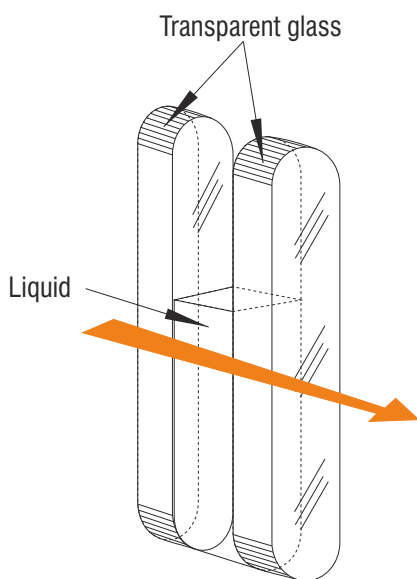
The gauge consists of a body having machined to have a liquid where high temperature and corrossions are liable to occur, it can be furnished with a mica shield to prevent it from being corroded. There types are preferably used for reservoir tanks that require a relatively long visible length by constructing the supporter.

The transparent level gauge is assembled firmly with gasket, transparent glass, cushion gasket and gauge cover on the body by stud-bolts. The most advantage of this type is that it has no invisible sections (dead band). Our standard overlapped section is 10 mm as minimum and the gauge is so designed that supporting brackets can be equipped to protect a long multiple connected gauge from distortion of fall down. The scale plate to mount alongside the gauge may be available on request by customers to observe the liquid level more accurately.

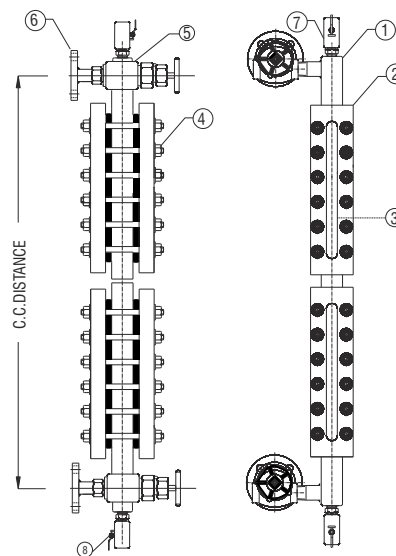
The gauge is used with a special reflex type gauge glass which has wider V-shaped refractive grove and red coating on the outside of the glass. It provides a clear observation of liquid level because of made refracting red colour on th V-groove for steam or beyond portion of the level and it's colour of fluid itself for liquid portions.



**Transparent Construction (Sectional View)**



**Principle of transparent level glass**



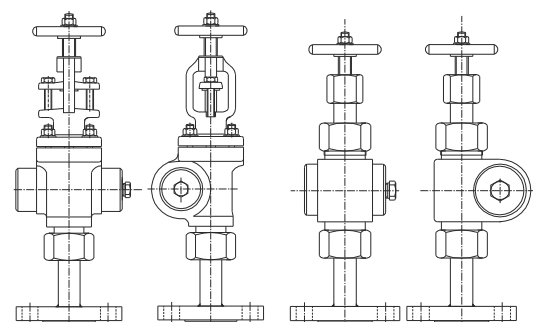
**Specification**

- 1 Main Chamber
- 2 Cover plate
- 3 Transparent Glass
- 4 Bolt & Nuts
- 5 Isolation Valve
- 6 Process Connection
- 7 Vent Ball Valve
- 8 Drain Ball Valve

## Isolation Valve

Bolted and screwed bonnet offset construction to attain device durability, high stability, low hysteresis, high leakage class, bolted bonnet construction for high temperature and pressure, all construction in forged only with the best level 1 radiographed and attain high leakage class of 10(-5) mbar lt/sec.

Screwed connection for low temperature and pressure with full forged construction and with best of level 1 radiography and attain high leakage sealing class of 10(-4) mbar lt/sec.



**Bolted Bonnet      Screwed Bonnet**  
**Isolation Valve**

# Ordering Information

**TLG** AA-TL-1000-F03-ZE-VD-WD-VW-WW-XW-UW-QV-RV-SO-Z



Type	
AA	Low Pressure - 30kg/cm <sup>2</sup>
AB	Medium Pressure - 100kg/cm <sup>2</sup>
AC	High Pressure - 200kg/cm <sup>2</sup>

Orientation of Process Connection	
TK	Top-Bottom Vertical (Partial Visibility)
TL	Side-Side Right (Full Visibility)
TM	Side-Side Left (Full Visibility)

Centre to Centre Distance	
1000	Indicate the required Centre to Centre Distance in mm

Process Connection			
Flanged Connection			
F01	1/2", 150# RF	F11	1", 300# RF
F02	3/4", 150# RF	F12	1.5", 300# RF
F03	1", 150# RF	F13	2", 300# RF
F04	1.5", 150# RF	F19	1", 600# RF
F05	2", 150# RF	F20	1.5", 600# RF
F09	1/2", 300# RF	F21	2", 600# RF
F10	3/4", 300# RF	XX	Any Other*
Threaded Connection			
B04	1/2"BSP (M)	N04	1/2"NPT (M)
B05	3/4"BSP (M)	N05	3/4"NPT (M)
B06	1"BSP (M)	N06	1"NPT (M)
B07	1.5"BSP (M)	N07	1.5"NPT (M)
B08	2"BSP (M)	N08	2"NPT (M)
XX	Any Other*		

MOC of Connection			
ZA	CS (A105)	ZJ	Monel 400
ZB	CS (A106)	ZK	Monel 500
ZC	SS 304	ZL	Titanium
ZD	SS 304L	ZM	Hastelloy 'B'
ZE	SS 316	ZN	Hastelloy 'C'
ZF	SS 316L	ZO	Inconel 600
ZI	PP	XX	Any Other*

MOC of Chamber			
VA	CS	VG	Monel 400
VB	SS 304	VH	Monel 500
VC	SS 304L	VI	Titanium
VD	SS 316	VJ	Hastelloy 'B'
VE	SS 316L	VK	Hastelloy 'C'
VF	PP	VL	Inconel 600
XX	Any Other*		

Optional			
NF	Non-frost Extension	IQ	Illuminator -FlameProof Gr. IIA/ IIB
HJ	Heating Jacket	IR	Illuminator -FlameProof Gr. IIC
SX	Mica Shield	IB	IBR
IP	Illuminator -WeatherProof	XX	Any other*
Z	NIL		

Calibration Scale			
SO	Aluminium with Powder Coat	SQ	SS304
		SR	SS316
SP	Aluminium	SS	Acrylic

Drain			
RU	1/2" NPT (F), Plug	RX	1/2" Ball Valve
RV	3/4" NPT (F), Plug	RY	1/2" Gate Valve
RW	1/2" Needle Valve	RZ	1/2" Globe Valve

Vent			
QU	1/2" NPT (F), Plug	WX	1/2" Ball Valve
QV	3/4" NPT (F), Plug	QY	1/2" Gate Valve
QW	1/2" Needle Valve	QZ	1/2" Globe Valve

Isolation Valve	
UW	Screwed Bonnet Offset Construction
UX	Bolted Bonnet Offset Construction
UY	Nipple
UZ	Needle Valve

Gasket	
XW	C.A.F.
XX	P.T.F.E.
XY	Graphoil

Cusion	
WW	C.A.F.
WX	P.T.F.E.
WY	Graphoil

Fasteners	
VV	ASTM A 193 Gr. B7 / ASTM A 194 Gr. 2H
VW	SS
VX	Anodized Aluminium
VY	CS Plated

MOC of Cover Plate			
WA	CS	WG	Monel 400
WB	SS 304	WH	Monel 500
WC	SS 304L	WI	Titanium
WD	SS 316	WJ	Hastelloy 'B'
WE	SS 316L	WK	Hastelloy 'C'
WF	PP	WL	Inconel 600
XX	Any Other*		

Note: \* Please consult factory

# Reflex Level Gauges

# General

## Features

- Reflex level gauge applicable upto 200 kg/cm<sup>2</sup> and upto 400 deg cent
- Cryo applications upto -196 deg cent
- Toughened borosilicate glass with serrations
- For applicability in critical, acidic, cryo and temperature zone
- IBR certified device available
- NACE, H2S service compatibility applicable
- Non frost extension
- Heat tracing available
- Applicable for refinery, petrochemical, chemical, power, radioactive, fertilizer, food, pharma, metal industry applications



## Concept and Principle of operation

Liquid Level Gauge provides direct observation of liquid level in a tank/vessel rising and falling level of the liquid inside the tank/vessel can be observed through the glass assembled in the gauge.

Reflex Liquid Level Gauges use the R-form sight glasses. One side surface of Reflex Glass to use flat glass has several grooves for reflecting prism. The principle of the Reflex Glass is based on the difference in the refractive indices of liquid and gas or in particular of water and steam. Liquid level shows conspicuously dark hard colour for liquid space and light white colour for empty space. These Reflex series are not used with a mica shield. The Reflex Gauge is assembled firmly with gasket, reflex glass, cushion gasket and gauge cover on the body by U-bolts.

Reflex Liquid Level Gauges, designed and built for a wide range of high temperature and high pressure applications. Our reflex level gauge is used to make, besides other applications include observation of the level of corrosion-proof and chromatic liquids. The most advantage of this type is for easy level reading of boiling liquids. When liquids are boiling, their bubbles make the surface level indistinct. The manual adjustment of isolation valve at the input of the media entering the chamber reduces the bubbling. Therefore the level gauge ease to read the level or bubbling liquids. It also provides advantages for highly dense and viscous liquids, as the body is made of forged construction only.

This level gauge is designed and manufactured for easy and accurate reading the liquid level of highly foamy liquids. The gauge has a relatively spacious internal area where foamy liquid is held from forming foams.

## Technical Specifications: Technical Data

<b>Type of Gauge</b>	a) Low Pressure - 30kg/cm <sup>2</sup> b) Medium Pressure - 100kg/cm <sup>2</sup> c) High Pressure - 200kg/cm <sup>2</sup>
<b>Mounting Orientation</b>	Top - Bottom Vertical Side - Side Right Side - Side Left Side - Side Back (Right/Left)
<b>Temperature</b>	Upto 400°C
<b>CCD</b>	Max. upto 3000mm
<b>Liquid Chamber</b>	In forged construction: Carbon steel, SS304, SS304L, SS316, SS316L, Monel, Titanium, Inconel 600, Hastelloy C, PolyPropylene, Other on request (Subject to pressure & Temperature Condition)
<b>Cover Plate</b>	In forged construction: Carbon steel, SS304, SS304L, SS316, SS316L, Monel, Titanium, Inconel 600, Hastelloy C, PolyPropylene
<b>Cushion</b>	CAF, PTFE, Grafoil with SS prignated
<b>Gasket</b>	CAF, PTFE, Grafoil with SS prignated
<b>Fastner</b>	SS, ASTM A 193 Gr B7 / A194 Gr 2H / Anodized Aluminium (for PP moc)

# Reflex Level Gauges



## Technical Specifications: Table-1 Technical Data

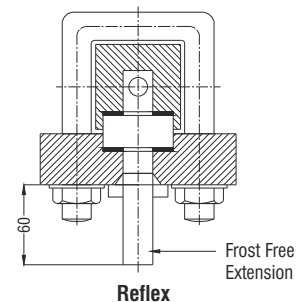
<b>Scale</b>	Aluminium anticorrosion powder coated and SS engraved in mm
<b>Glass</b>	Applicable till 320°C as per DIN 708 / 7081, BS 3463, JS B 8211, Toughened Borosilicate glass
<b>Process Connection</b>	Screwed / Flanged / Socket Weld and other on request.
<b>Isolation Valve</b>	Auto Ball Check Valve a) Screwed Bonnet offset construction suitable upto 50 kg/cm <sup>2</sup> b) Bolted Bonnet offset construction suitable above 50 kg/cm <sup>2</sup> c) Material Construction as per wetted part
<b>Vent</b>	1/2" Plugged / 1/2" Needle Valve / 1/2" Ball Valve / 1/2" Globe Valve / 1/2" Gate Valve
<b>Drain</b>	1/2" Plugged / 1/2" Needle Valve / 1/2" Ball Valve / 1/2" Globe Valve / 1/2" Gate Valve
<b>Optional</b>	a) Non-Frost Extension for extreme low temperature application b) Heating Jacket - to read the level of high congelable or ebullient liquid c) IBR Certification

## Special Application

### Cryo Application

If a conventional level gauge is used for extreme low temperature applications, it becomes difficult to observe the level of liquid as the gauge front tends to freeze. To get rid of this problem, an acrylic non-frosting plate is mounted in front of the gauge. So the observation of the liquid level is much easier this way.

Our Non-Frosting Reflex Level Gauges are classified depending on the process temperature, they height of the non-frosting plate window may be selected from 80 to 250 mm.



### Technical Specifications: Temp rating and dimensions of non-frosting plates

Temperature °C	0...-20	-21...-45	-46...-100	-101...-160	-161...-200
<b>Recommended Materials</b>	LTCS	LTCS	304SS	316SS	316LSS
<b>Acrylic Height mm</b>	80	100	150	200	250

### Jacket Type

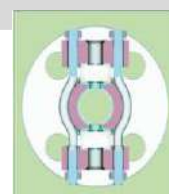
For a jacket type requirement application. This gauge is used to read the level of high congelable or ebullient liquids. The principle is to inflow a steam for congelable liquids and a cold water for ebullient liquids through the inside of the jacket to ensure accurate and reliable level observation.

This type is used for observing the fluid by changing it into state of liquid after heating or cooling it through jacket according to fluid's features. Our standard is that the inlet of the jacket for steam or cold water is 1/2" NPT(M) and or 15 NB flange. Others are available on request.



### Corrosion Application

More severe demands may often be required on liquid level gauges in terms of resistance to corrosion, and this is accomplished by lining or coating all wetted parts. The most important aspect of this process is the preparation of the metal substrate.



# Reflex Level Gauges



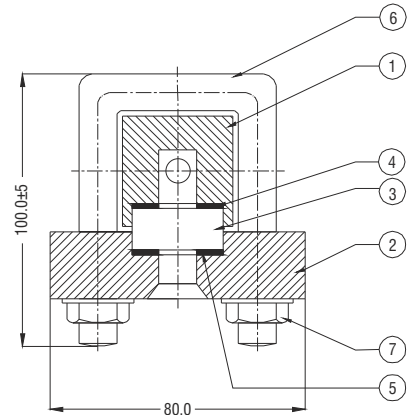
## Construction and dimensional cross sectional overview

The gauge consists of a body having machined to have a liquid where high temperature are liable to occur, the glass is toughened borosilicate glasses are used. These reflex gauges preferably used for reservoir tanks that require a relatively long visible length by constructing the supporter.

The reflex level gauge is assembled firmly with gasket, reflex glass, cushion gasket and gauge cover on the body by U bolts.

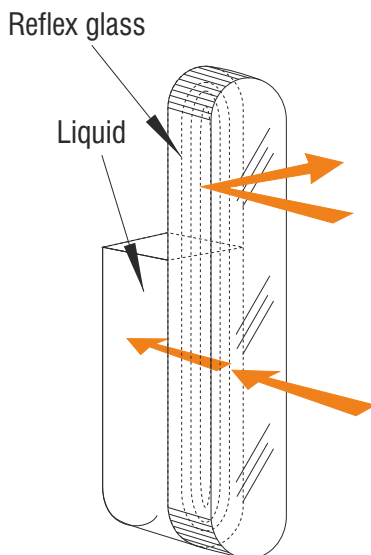
The most advantage of this type is that it has no invisible sections (dead band). Our standard overlapped section is 10 mm as minimum and the gauge is so designed that supporting brackets can be equipped to protect a long multiple connected gauge from distortion or fall down. The scale plate to mount alongside the gauge may be available on request by customers to observe the liquid level more accurately.

The gauge is used with a special reflex type gauge glass which has wider V-shaped refractive groove and red coating on the outside of the glass. It provides a clear observation of liquid level because of made refracting red colour on th V-groove for steam or beyond portion of the level and it's colour of fluid itself for liquid portions.

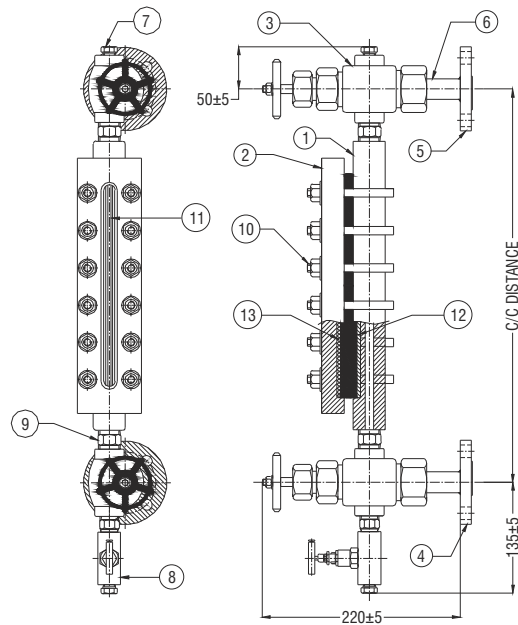


**Reflex**

- 1 Liquid Chamber
- 2 Cover Plate
- 3 Reflex Glass
- 4 Gasket
- 5 Cushion
- 6 "u" Bolt
- 7 Nuts & Washer



**Principle of reflex level glass**



**Reflex**

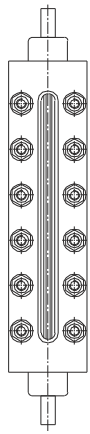
- 1 Liquid Chamber
- 2 Cover Plate
- 3 Isolation Valve
- 4 Inlet Process Flange
- 5 Outlet Process Flange
- 6 Tail Piece
- 7 Vent Plug
- 8 Drain Valve
- 9 Nipple
- 10 Fastener
- 11 Reflex Glass
- 12 Gasket
- 13 Cushion

Basic GA drawing indicating the top bottom design with CCD interface with visible length. The distance between cover plate and bolted bonnet offset construction is 70mm and that of screwed bonnet is 80mm. The glass edge is approx 8mm more in each case against the isolation valve in top bottom design

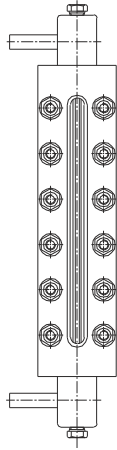
# Reflex Level Gauges



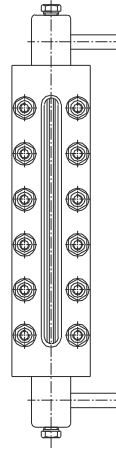
## Process Orientation



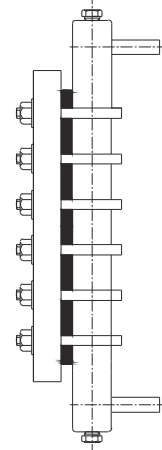
Top/Bottom



Side/Side (Right)



Side/Side-Left



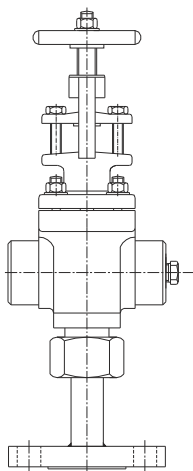
Side/Side-Back (Left/Right)

Orientation of Process Connection

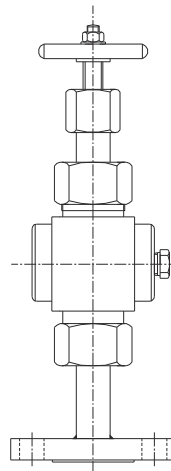
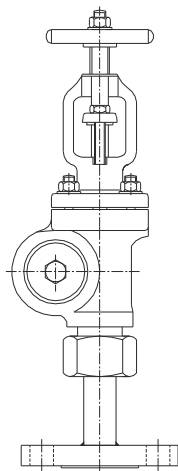
## Isolation Valve

Bolted and screwed bonnet offset construction to attain device durability, high stability, low hysteresis, high leakage class, bolted bonnet construction for high temperature and pressure, all construction in forged only with the best level 1 radiographed and attain high leakage class of 10(-5) mbar lt/sec.

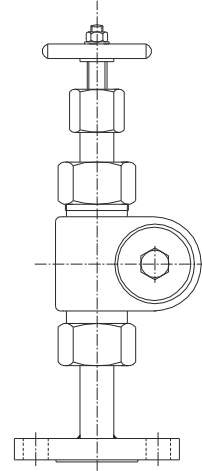
Screwed connection for low temperature and pressure with full forged construction and with best of level 1 radiography and attain high leakage sealing class of 10(-4) mbar lt/sec.



Bolted Bonnet



Screwed Bonnet



## Isolation Valve

# Ordering Information

**RLG** AA-TL-1000-F03-ZE-VD-WD-VW-WW-XW-UW-QU-RU-SO-Z



Type	
AA	Low Pressure - 30kg/cm <sup>2</sup>
AB	Medium Pressure - 85kg/cm <sup>2</sup>
AC	High Pressure - 165kg/cm <sup>2</sup>
AD	Very High Pressure - 200kg/cm <sup>2</sup>

Orientation of Process Connection	
TK	Top-Bottom Vertical (Partial Visibility)
TL	Side-Side Right (Full Visibility)
TM	Side-Side Left (Full Visibility)
TN	Side-Side Back (Right/Left)

Centre to Centre Distance	
1000	Indicate the required Centre to Centre Distance in mm.

Process Connection			
Flanged Connection			
F01	1/2", 150# RF	F11	1", 300# RF
F02	3/4", 150# RF	F12	1.5", 300# RF
F03	1", 150# RF	F13	2", 300# RF
F04	1.5", 150# RF	F19	1", 600# RF
F05	2", 150# RF	F20	1.5", 600# RF
F09	1/2", 300# RF	F21	2", 600# RF
F10	3/4", 300# RF	XX	Any Other*
Threaded Connection			
B04	1/2"BSP (M)	N04	1/2"NPT (M)
B05	3/4"BSP (M)	N05	3/4"NPT (M)
B06	1"BSP (M)	N06	1"NPT (M)
B07	1.5"BSP (M)	N07	1.5"NPT (M)
B08	2"BSP (M)	N08	2"NPT (M)
XX	Any Other*		

MOC of Connection			
ZA	CS (A105)	ZJ	Monel 400
ZB	CS (A106)	ZK	Monel 500
ZC	SS 304	ZL	Titanium
ZD	SS 304L	ZM	Hastelloy 'B'
ZE	SS 316	ZN	Hastelloy 'C'
ZF	SS 316L	ZO	Inconel 600
ZI	PP	XX	Any Other*

MOC of Chamber			
VA	CS	VG	Monel 400
VB	SS 304	VH	Monel 500
VC	SS 304L	VI	Titanium
VD	SS 316	VJ	Hastelloy 'B'
VE	SS 316L	VK	Hastelloy 'C'
VF	PP	VL	Inconel 600
XX	Any Other*		

Optional	
NF	Non-frost Extension
HJ	Heating Jacket
XX	Any Other*
Z	NIL

Calibration Scale	
SO	Aluminium with Powder coat
SP	Aluminium
SQ	SS304
SR	SS316
SS	Acrylic

Drain			
RU	1/2" NPT (F), Plug	RX	1/2" Ball Valve
RV	3/4" NPT (F), Plug	RY	1/2" Gate Valve
RW	1/2" Needle Valve	RZ	1/2" Globe Valve

Vent			
QU	1/2" NPT (F), Plug	WX	1/2" Ball Valve
QV	3/4" NPT (F), Plug	QY	1/2" Gate Valve
QW	1/2" Needle Valve	QZ	1/2" Globe Valve

Isolation Valve	
UW	Screwed Bonnet Offset Construction
UX	Bolted Bonnet Offset Construction
UY	Nipple
UZ	Needle Valve

Gasket	
XW	C.A.F.
XX	P.T.F.E.
XY	Graphoil
Cusion	
WW	C.A.F.
WX	P.T.F.E.
WY	Graphoil

Fasteners	
VV	ASTM A 193 Gr. B7 / ASTM A 194 Gr. 2H
VW	SS
VX	Anodized Aluminium
VY	CS Plated

MOC of Cover Plate			
WA	CS	WG	Monel 400
WB	SS 304	WH	Monel 500
WC	SS 304L	WI	Titanium
WD	SS 316	WJ	Hastelloy 'B'
WE	SS 316L	WK	Hastelloy 'C'
WF	PP	WL	Inconel 600

Note: \* Please consult factory



# Tubular Level Gauges

General

## Features

- Tubular level gauge applicable upto 10 kg/cm<sup>2</sup> and upto 150 deg cent
- Forged bodies
- Toughened borosilicate glass with designs to suit pressure and temperature rating
- For applicability in critical acidic, non acidic, and in high temperature zone
- Available with C Channel options with SS, CS, MS with anticorrosion powder coat, MS
- NACE, H2S service compatibility applicable
- CE applicability
- Also available with 1.6 to 4 mm lining PTFE / PFA with SS
- Applicable for refinery, petrochemical, chemical, power, radioactive, fertilizer, food, pharma, metal industry applications

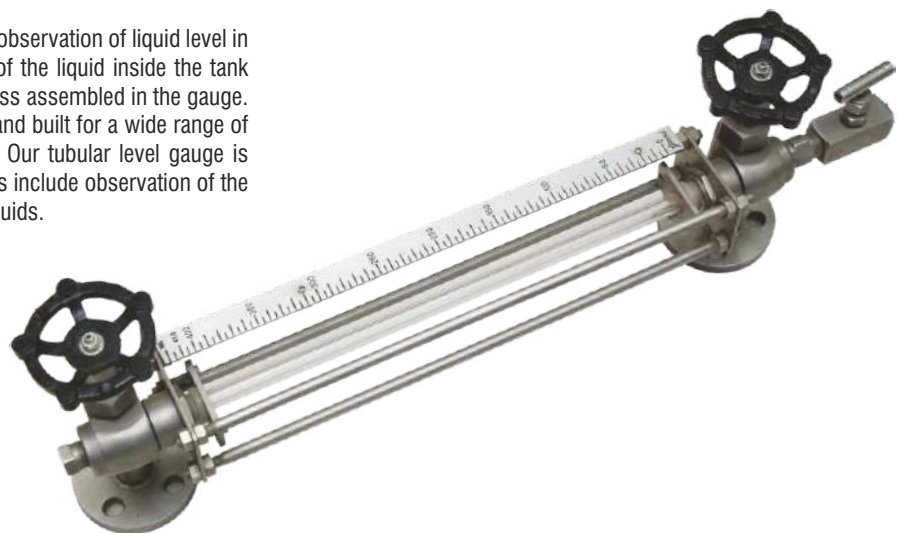


## Concept and Principle of operation

The tubular type level gauge is the simplest shape of direct reading level apparatus for maximum pressure up to 10 bar and maximum temperature of 150°C. The gauge glass is built in the protective tube. Check balls inserted in the upper and lower valve to stop flow instantaneously when the glass is broken. The protector having a circular form is constructed to prevent glass breakage from external sources. For glass tube gauges only of center to center dimensions in excess of 2.000 mm, it is possible to manufacture any required c to c by using coupling in the middle of the gauge. Depending on the nature of the liquid, tubes made from various PFA, Acrylic or Vinyl tube are also available. Tubular glass with a linear red coating on the back is available to make level observation more clear.

This Liquid Level Gauge provides direct observation of liquid level in a tank/ vessel. Rising and falling level of the liquid inside the tank /vessel can be observed through the glass assembled in the gauge. Tubular Liquid Level Gauges, designed and built for a wide range of temperature and pressure applications. Our tubular level gauge is used to make, besides other applications include observation of the level of corrosion-proof and chromatic liquids.

The most advantage of this type is for easy level reading of boiling liquids restricting in temperature application rating. When liquids are boiling, their bubbles make the surface level indistinct. The manual adjustment of isolation valve at the input of the media entering the chamber reduces the bubbling. Therefore the level gauge ease to read the level or bubbling liquids. It also provides advantages for highly dense and viscous liquids, as the body is made of seamless pipe. This level gauge is designed and manufactured for easy and accurate reading the liquid level of highly foamy liquids. The gauge has a relatively spacious internal area where foamy liquid is held from forming foams.



## Technical Specifications: Technical Data

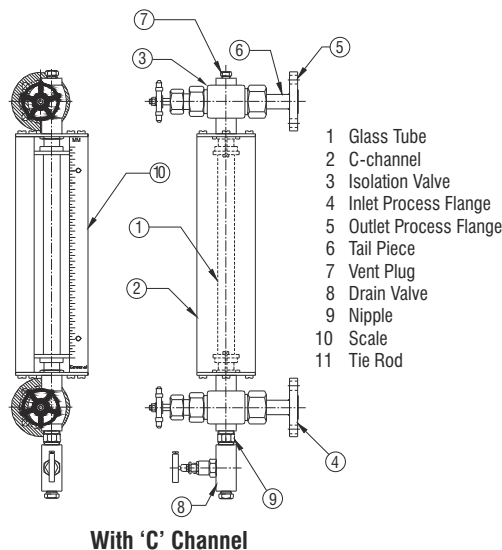
<b>Type of Gauge</b>	Tubular Level Gauge - TULG
<b>Mounting</b>	Top-Bottom
<b>Pressure</b>	Upto 10 kg/cm <sup>2</sup>
<b>Temperature</b>	Upto 150°C
<b>CCD</b>	Max. upto 2000mm
<b>MOC of Wetted Parts</b>	CS, SS304, SS304L, SS316, SS316L, PP and other on request
<b>Glass Tube</b>	OD 16mm or 19mm
<b>Glass Protection</b>	a) M.S. Tie Rods b) SS Tie Rod c) MS powder Coated 'C' Channel d) SS 'C' Channel
<b>Process Connection</b>	Screwed / Flanged / Socket Weld and other on request
<b>Isolation Valve</b>	Auto Ball Check Valve a) Screwed Bonnet offset construction b) Material Construction as per wetted part
<b>Vent</b>	1/2" Plugged / 1/2" Needle Valve / 1/2" Ball Valve / 1/2" Gate Valve / 1/2" Globe Valve
<b>Drain</b>	1/2" Plugged / 1/2" Needle Valve / 1/2" Ball Valve / 1/2" Gate Valve / 1/2" Globe Valve
<b>Calibration Scale</b>	Aluminium, Aluminium with powder coated, SS304, SS316, Acrylic
<b>Special</b>	P.T.F.E. lined on wetted part - Flange orientation

## Construction and Dimensional Cross Sectional Overview

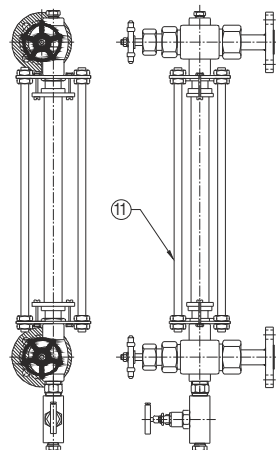
The gauge consists of a body having machined to have a liquid where high temperature are liable to occur, the glass is heavy borosilicate glasses are used. These tubular gauges preferably used for all applications with the simplest solution keeping the temperature and pressure rating known.

The tubular level gauge is assembled firmly with heavy toughened borosilicate glass with tie rods or C Channel, special packing arrangement is made to ship larger CCD with tie rods and or with C Channel, as the delicacy with glass oriented design is subjected to damage in transit.

The most advantage of this type is that it has no invisible sections (dead band). Our standard overlapped section is 10 mm as minimum and the gauge is so designed that supporting brackets can be equipped to protect a long multiple connected gauge from distortion of fall down. The scale plate to mount alongside the gauge may be available on request by customers to observe the liquid level more accurately.



With 'C' Channel



With Tie Rods



With 'C' Channel



With Tie Rods

# Ordering Information

## Ordering Information

**TULG** 1000-F03-ZE-VD-16-YZ-UW-QU-RU-SO-XX-Z



Centre to Centre Distance	
<b>1000</b>	Indicate the required Centre to Centre Distance in mm.

Process Connection			
Flanged Connection			
<b>F01</b>	1/2", 150# RF	<b>F11</b>	1", 300# RF
<b>F02</b>	3/4", 150# RF	<b>F12</b>	1.5", 300# RF
<b>F03</b>	1", 150# RF	<b>F13</b>	2", 300# RF
<b>F04</b>	1.5", 150# RF	<b>F19</b>	1", 600# RF
<b>F05</b>	2", 150# RF	<b>F20</b>	1.5", 600# RF
<b>F09</b>	1/2", 300# RF	<b>F21</b>	2", 600# RF
<b>F10</b>	3/4", 300# RF	<b>XX</b>	Any Other*
Threaded Connection			
<b>B04</b>	1/2"BSP (M)	<b>N04</b>	1/2"NPT (M)
<b>B05</b>	3/4"BSP (M)	<b>N05</b>	3/4"NPT (M)
<b>B06</b>	1"BSP (M)	<b>N06</b>	1"NPT (M)
<b>B07</b>	1.5"BSP (M)	<b>N07</b>	1.5"NPT (M)
<b>B08</b>	2"BSP (M)	<b>N08</b>	2"NPT (M)
<b>XX</b>	Any Other*		

MOC of Connection	
<b>ZA</b>	CS (A105)
<b>ZB</b>	CS (A106)
<b>ZC</b>	SS 304
<b>ZD</b>	SS 304L
<b>ZE</b>	SS 316
<b>ZF</b>	SS 316L
<b>ZI</b>	PP
<b>XX</b>	Any Other*

MOC of Wetted Parts	
<b>VA</b>	CS
<b>VB</b>	SS 304
<b>VC</b>	SS 304L
<b>VD</b>	SS 316
<b>VE</b>	SS 316L
<b>VF</b>	PP
<b>XX</b>	Any Other*

Special Features	
<b>PE</b>	PTFE Lined, CS Flange
<b>PF</b>	PTFE Lined, SS304 Flange
<b>PG</b>	PTFE Lined, SS304L Flange
<b>PH</b>	PTFE Lined, SS316 Flange
<b>PI</b>	PTFE Lined, SS316L Flange
<b>XX</b>	Any Other*
<b>Z</b>	NIL

Calibrated Scale	
<b>SO</b>	Aluminium with power coat
<b>SP</b>	Aluminium
<b>SQ</b>	SS304
<b>SR</b>	SS316
<b>SS</b>	Acrylic

Drain			
<b>RU</b>	1/2" NPT (F), Plug	<b>RX</b>	1/2" Ball Valve
<b>RV</b>	3/4" NPT (F), Plug	<b>RY</b>	1/2" Gate Valve
<b>RW</b>	1/2" Needle Valve	<b>RZ</b>	1/2" Globe Valve

Vent			
<b>QU</b>	1/2" NPT (F), Plug	<b>WX</b>	1/2" Ball Valve
<b>QV</b>	3/4" NPT (F), Plug	<b>QY</b>	1/2" Gate Valve
<b>QW</b>	1/2" Needle Valve	<b>QZ</b>	1/2" Globe Valve

Isolation Valves	
<b>UW</b>	Screwed Bonnet Offset Construction
<b>N</b>	Needle Valves

Glass Protection	
<b>VZ</b>	M.S. Tie Rods
<b>WZ</b>	SS Tie Rods
<b>XZ</b>	MS Powder Coated 'C' Channels
<b>YZ</b>	SS 'C' Channels

Glass Tube	
<b>16</b>	16 mm O.D.
<b>19</b>	19 mm O.D.

# Magnetic Level Gauges & Level Transmitters

*General*

Magnetic Level Gauges provides clear, high clarity indication of liquid level. Magnetic Level Gauges are principally designed as an alternative to glass level gauges. MLGs are now widely used in all industries as they avoid direct contact with indicator system; it eliminates need of glass for direct level indication and prevents chemical spillage due to breakage of glass.

## Features

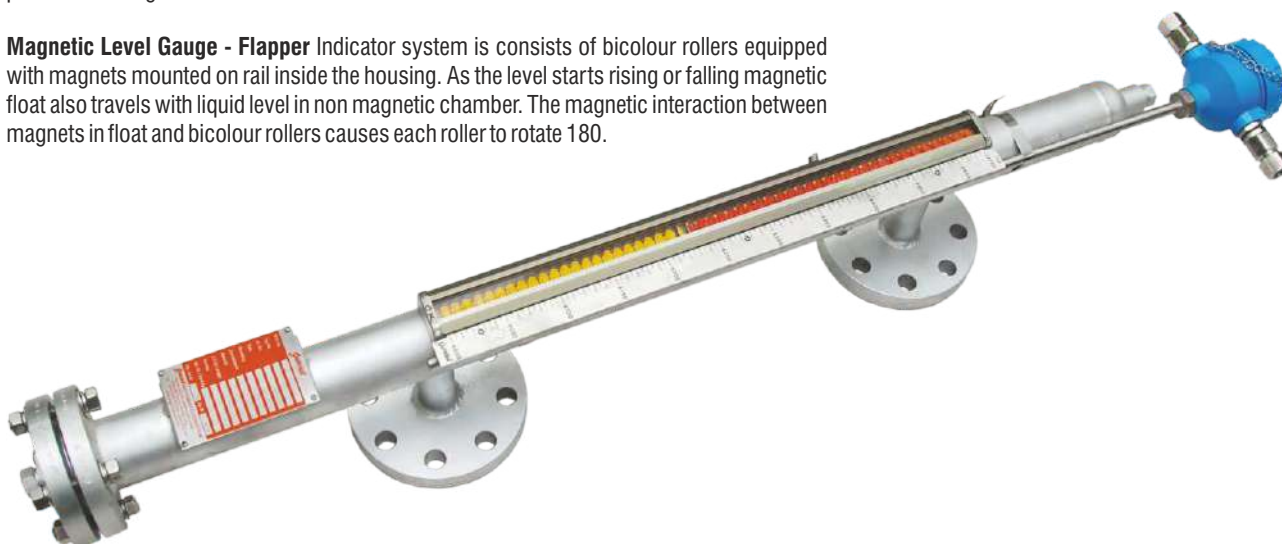
- Magnetic level gauge applicable upto 100 kg/cm<sup>2</sup> and upto 300 deg cent
- Cryo applications upto -196 deg cent
- Jacketed design applicable
- For applicability in critical, acidic, cryo and high temperature zone
- IBR certified device available
- NACE, H2S service compatibility applicable
- Heat tracing available
- Viscous media (max upto 380 cst and upto 100 deg cent) besides other acidic, non acidic, steam water media
- CE applicability
- Device fully compatible for conductive and non conductive media
- Special float design to enable to meet low critical specific gravity
- Design applicability test with special media available
- Applicable for refinery, petrochemical, chemical, power, radioactive, fertilizer, food, pharma, metal industry applications
- CCOE approved switches available, ATEX, FM certified available on demand
- Versions available with analog and digital (HART) and FIELDBUS transmitters fully integrated with the system for level gauge and transmitter
- CCOE approved and ATEX and FM versions applicable for HART and analog transmitters available



## Concept and Principle of operation

Magnetic Level Gauges operates on the principle of magnetic field coupling to provide fluid level information. Float chamber is typically constructed having process connections that matches to the vessel connections. Float size and weight is determined by the process fluid, pressure, temperature and the specific gravity of the process fluid. Float contains magnets to provide 360 magnetic flux field.

**Magnetic Level Gauge - Flapper** Indicator system is consists of bicolour rollers equipped with magnets mounted on rail inside the housing. As the level starts rising or falling magnetic float also travels with liquid level in non magnetic chamber. The magnetic interaction between magnets in float and bicolour rollers causes each roller to rotate 180.



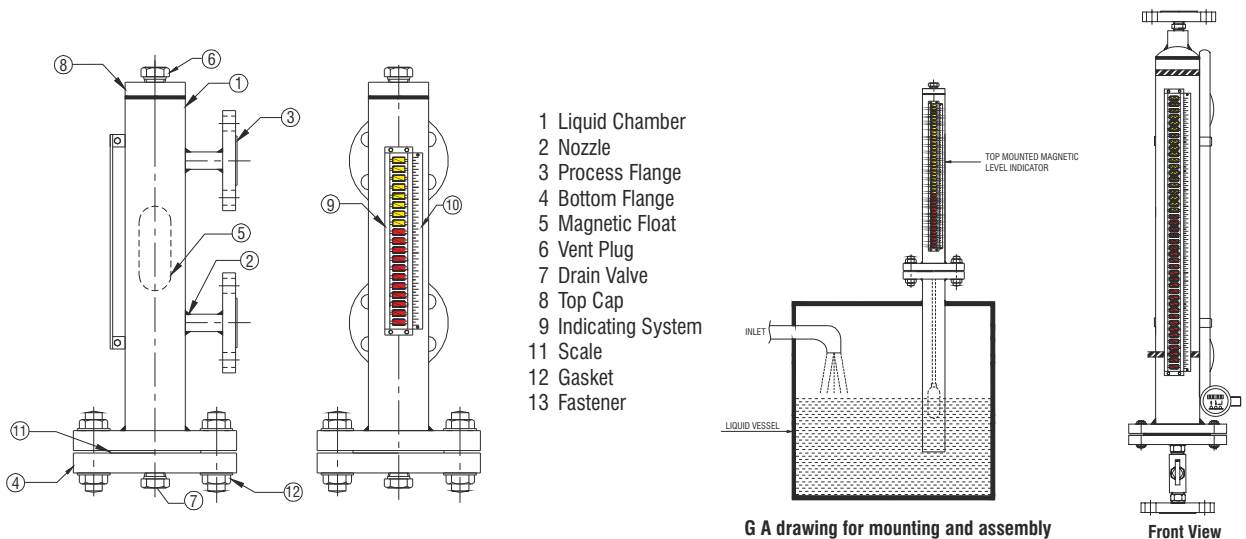
# Magnetic Level Gauges & Level Transmitters

# General

## Technical Specifications: Table-1 Technical Data

<b>Type of Gauge</b>	Magnetic Level Gauge - MLG
<b>Mounting Orientation</b>	Top Mounted Side Mounted
<b>Pressure</b>	Upto 100 kg/cm <sup>2</sup>
<b>Temperature</b>	Upto 300°C
<b>CCD</b>	Max. upto 7000mm
<b>Liquid Chamber</b>	In forged construction: SS304, SS304L, SS316, SS316L, PP, Titanium, Inconel 600, Hastelloy C, Other on request subject to pressure & temperature condition
<b>MOC of Float</b>	In forged construction: SS304, SS304L, SS316, SS316L, PP, Titanium, Inconel 600, Hastelloy C
<b>Gasket</b>	CAF, PTFE, Grafoil with SS pregated
<b>Fastner</b>	CS Plated, SS
<b>Scale</b>	Aluminium, Aluminium anticorrosion powder coated and SS engraved in mm
<b>Indicating System</b>	Bicolour flapper in ABS/ Aluminium/ SS with 4mm length & 0.25mm thickness with aligned magnets
<b>Protection box for bicolour flapper &amp; follower type</b>	In mild steel, Aluminium, SS304, SS316 base on the requirements of atmospheric condition
<b>Process Connection</b>	Flanged
<b>Vent</b>	1/2" Plugged / 1/2" Needle Valve / 1/2" Ball Valve / 1/2" Globe Valve / 1/2" Gate Valve
<b>Drain</b>	1/2" Plugged / 1/2" Needle Valve / 1/2" Ball Valve / 1/2" Globe Valve / 1/2" Gate Valve
<b>Specific gravity</b>	Please specify
<b>Limit Switch Assembly</b>	Snap acting 1 SPDT Microswitch, 5A,230VAC
<b>Switch Housing</b>	Die Cast Aluminium Weatherproof to IP-67 Die Cast Aluminium Explosionproof suitable for Gr. IIA, IIB Die Cast Aluminium Explosionproof suitable for Gr. IIC
<b>Cable Entry</b>	1 no / 2 nos. of 3/4"ET(F)
<b>Optional</b>	Still well for top mounted construction

## Construction and Dimensional Cross Sectional Overview



G A drawing for mounting and assembly

Front View

With HART transmitter mounted on a 900# application gauge at CCD of 4000 mm with magnetostrictive principle for chemical plant application.

# Magnetic Level Gauges & Level Transmitters



## Ordering Information

**MLG** SM-1000-F03-ZE-VD-XD-VW-XW-QU-RU-SO-LX-Z



### Orientation of Process Connection

<b>MT</b>	Top Mounted
<b>SM</b>	Side Mounted

### Centre to Centre Distance

<b>1000</b>	Indicate the required Centre to Centre Distance in mm
-------------	---

### Process Connection

#### Flanged Connection

<b>F01</b>	1/2", 150# RF	<b>F13</b>	2", 300# RF
<b>F02</b>	3/4", 150# RF	<b>F17</b>	1/2", 600# RF
<b>F03</b>	1", 150# RF	<b>F19</b>	1", 600# RF
<b>F04</b>	1.5", 150# RF	<b>F20</b>	1.5", 600# RF
<b>F05</b>	2", 150# RF	<b>F21</b>	2", 600# RF
<b>F09</b>	1/2", 300# RF	<b>F48</b>	1", 900# RTJ
<b>F10</b>	3/4", 300# RF	<b>F49</b>	1.5", 900# RTJ
<b>F11</b>	1", 300# RF	<b>F50</b>	2", 900# RTJ
<b>F12</b>	1.5", 300# RF	<b>XX</b>	Any Other*

#### MOC of Connection

<b>ZC</b>	SS 304	<b>ZK</b>	Monel 500
<b>ZD</b>	SS 304L	<b>ZL</b>	Titanium
<b>ZE</b>	SS 316	<b>ZM</b>	Hastelloy B
<b>ZF</b>	SS 316L	<b>ZN</b>	Hastelloy C
<b>ZI</b>	PP	<b>ZO</b>	Inconel 600
<b>XX</b>	Any Other*		

#### MOC of Chamber

<b>VB</b>	SS 304	<b>VH</b>	Monel 500
<b>VC</b>	SS 304L	<b>VI</b>	Titanium
<b>VD</b>	SS 316	<b>VJ</b>	Hastelloy 'B'
<b>VE</b>	SS 316L	<b>VK</b>	Hastelloy 'C'
<b>VF</b>	PP	<b>VL</b>	Inconel 600
<b>XX</b>	Any Other*		

#### MOC of Float

<b>XB</b>	SS 304	<b>XH</b>	Monel 500
<b>XC</b>	SS 304L	<b>XI</b>	Titanium
<b>XD</b>	SS 316	<b>XJ</b>	Hastelloy 'B'
<b>XE</b>	SS 316L	<b>XK</b>	Hastelloy 'C'
<b>XF</b>	PP	<b>XL</b>	Inconel 600
<b>XX</b>	Any Other*		

### Optional

<b>LX</b>	Limit Switch with Die cast Aluminium Weatherproof IP-67
<b>LY</b>	Limit Switch with Die cast Aluminium Flameproof suitable to Gr. IIA/ IIB
<b>LZ</b>	Limit Switch with Die cast Aluminium Flameproof suitable to Gr. IIC
<b>IB</b>	IBR
<b>Z</b>	NIL

### Calibration Scale

<b>SO</b>	Aluminium with Powder coat
<b>SP</b>	Aluminium
<b>SQ</b>	SS304
<b>SR</b>	SS316
<b>SS</b>	Acrylic

### Drain

<b>RU</b>	1/2" NPT (F), Plug	<b>RX</b>	1/2" Ball Valve
<b>RV</b>	3/4" NPT (F), Plug	<b>RY</b>	1/2" Gate Valve
<b>RW</b>	1/2" Needle Valve	<b>RZ</b>	1/2" Globe Valve

### Vent

<b>QU</b>	1/2" NPT (F), Plug	<b>WX</b>	1/2" Ball Valve
<b>QV</b>	3/4" NPT (F), Plug	<b>QY</b>	1/2" Gate Valve
<b>QW</b>	1/2" Needle Valve	<b>QZ</b>	1/2" Globe Valve

### Gasket

<b>XW</b>	C.A.F.
<b>XX</b>	P.T.F.E.
<b>XY</b>	Graphoil

### Fasteners

<b>VV</b>	ASTM A 193 Gr. B7 / ASTM A 194 Gr. 2H
<b>VW</b>	SS
<b>VX</b>	Anodized Aluminium
<b>VY</b>	CS Plated

Note: \* Please consult factory



# Float & Tape Level Gauges



## Features

- Float and tape gauge are applicable for upto 50 bar pressure and upto 400 deg cent
- NACE, H2S service compatibility applicable
- Applicable for refinery, petrochemical, chemical, power, radioactive, fertilizer, food, pharma, metal industry applications
- Options with switch version available

**General** Float and tape Type level Indicator is the version applicable for level indication system in Water, Furnace oil, Chemicals, Acids storage tank level measurement.

Available in two types:

- Guided Type
- Unguided Type



## Tank Gauge Installation:

**Float and tape gauging is suitable for almost all product applications and tank types**

- Accuracy  $\pm 2$  mm with 400 mm diameter float
- Least Count 1 mm
- Measuring range 0 to 20 meters
- with dial / counter (Optional: 0 to 30 meters with counter)
- Suitable for upto 50 kg/cm<sup>2</sup> pressure
- Suitable for upto 400 deg cent temperature
- Dial size max upto 500mm and other on special accuracy and demand

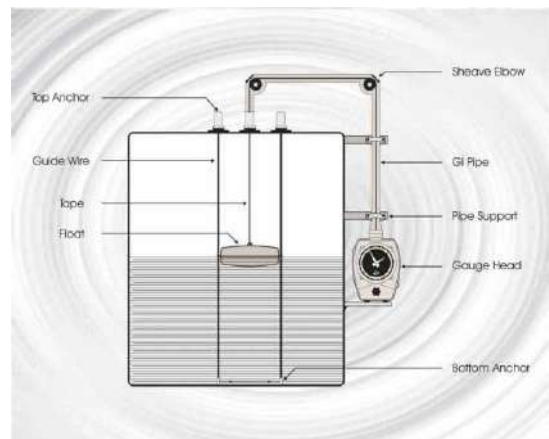
It is an economical mechanical gauge provides high accuracy in mm. Largely used in Refineries, Oil Depots, Chemical and Fertilizer Industries. Useful for medium and large size charged or empty tanks. It may be cone roof, floating roof, underground or gas holding tank. It covers critical applications like corrosive & aggressive acids (using non-metallic wetted parts) & liquids with fumes (using vapor seal).

### Less Maintenance:

Once carefully installed gives trouble free operations for a number of years (with periodic maintenance). A specially designed cylindrical body floats on liquid surface on account of its buoyancy. The liquid level is transmitted by means of a tape connected to float on one side and gear mechanism on the other side. Gears rotate the pointer on a dial or counter mechanism to display readings. A drum and spring mechanism provides constant tension on tape to keep it straight and thus balancing the force due to apparent float weight on one side and spring tension on other side.

## Float Guide wires:

Guide wires provide stability for the float during turbulent conditions and increased accuracy by reducing the horizontal movement of the float across the surface of the product. Accessories are available to allow in-service installations, such as weighted anchors that maintain tension in the guide wires without the need for welding inside the tank.





# Float & Tape Level Gauges



## Technical Specifications:

<b>Type of Gauge</b>	Guided type ----- FBI/G Unguided type ----- FBI/U
<b>Mounting</b>	Top
<b>Pressure</b>	Upto 50 kg/cm <sup>2</sup>
<b>Temperature</b>	Upto 40°C
<b>Measuring range</b>	Max. upto 25000mm
<b>Accuracy</b>	1%
<b>MOC Of Float</b>	SS316, SS316L, PP, PTFE, Monel, Titanium, Alloy 20
<b>MOC Of Wire (Float &amp; Guide)</b>	SS316, SS316L, SS304L, PTFE
<b>MOC Of Flange</b>	SS316, SS316L, PP, PTFE, Monel, Titanium, Alloy 20, PVDF
<b>Dial Counter</b>	150mm up to 500mm
<b>MOC Of Dial Counter</b>	Die cast aluminium with anticorrosion powder coat
<b>Dial Enclosure</b>	IP 65
<b>Dial Counter holder</b>	SS316, GI, A106, SS316L
<b>Anchor plate for Guide &amp; Float Wire</b>	SS304, A106, SS316, SS316L, SS304L, Monel, hastelloy, Alloy 20
<b>Process Connection</b>	Flanged

## Special Materials

Standard, moderate, severe and extreme service kits are available for applications involving extreme temperatures, pressures or aggressive products. There kits include material options for specific parts that make contact with the product in the tank, tape piping or gauge head, such as:

- Steel
- Aluminium
- Stainless steel

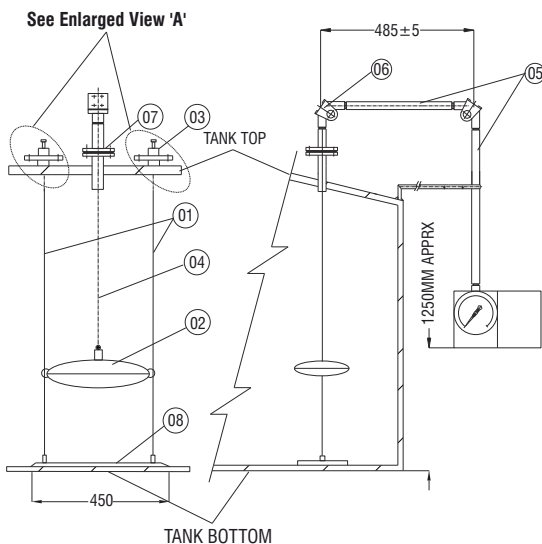
## Product Type

Due to the float and tape measurement technique, the following are just some of the products suitable for level measurement using a float and tape device:

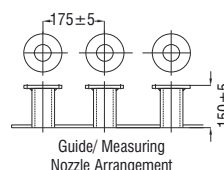
- Crudes
- Gasoline
- Jet fuel
- AV (Aviation) gas - high octane gas for small aircraft
- Diesel
- Chemicals
- Additives
- Solvents
- Water

## G A Drawing Applicable

Indicator system with scale board for long distance viewing and metric dial counter for ground reading purpose



- 01 Guide Wire
- 02 Float
- 03 Guide Rope Tension Assembly
- 04 Float Rope
- 05 Protection Limb
- 06 Pulleys
- 07 Flange
- 08 Anchor Plate
- 09 Scale Board
- 10 Pointer



Enlarged View A

# Ordering Information

## FTLG GT-XD-WQ-F01-ZA-XX-Z



Type	
GT	Guided Type
UT	Unguided Type

MOC of Float	
XD	SS316
XE	SS316L
XF	PP
XH	Monel 500
XI	Titanium
XK	Hastelloy C

MOC of Wire	
WQ	SS304
WR	SS304L
WS	SS316
WT	SS316L
WU	PP

Process Connection	
Flanged Connection	
F01	1/2", 150# RF
F02	3/4", 150# RF
F03	1", 150# RF
F04	1.5", 150# RF
F05	2", 150# RF
F09	1/2", 300# RF
F10	3/4", 300# RF
F11	1", 300# RF
F12	1.5", 300# RF
F13	2", 300# RF

Range	
XX	Please Specify
Z	NIL

MOC of Connection	
ZA	CS (A105)
ZB	CS (A106)
ZC	SS 304
ZD	SS 304L
ZE	SS 316
ZF	SS 316L

# Float & Board Level Gauges



## Features

- Float and Board gauge applicable upto 50 kg and upto 400 deg cent
- NACE, H2S service compatibility applicable
- Applicable for refinery, petrochemical, chemical, power, radioactive, fertilizer, food, pharma, metal industry applications
- Options with switch version available

## Concept and Principle of operation

*General* Float and Board Type level Indicator is the version applicable for level indication system in Water, Furnace oil, Chemicals, Acids storage tank level measurement.

Available in two types:

- Guided Type
- Unguided Type



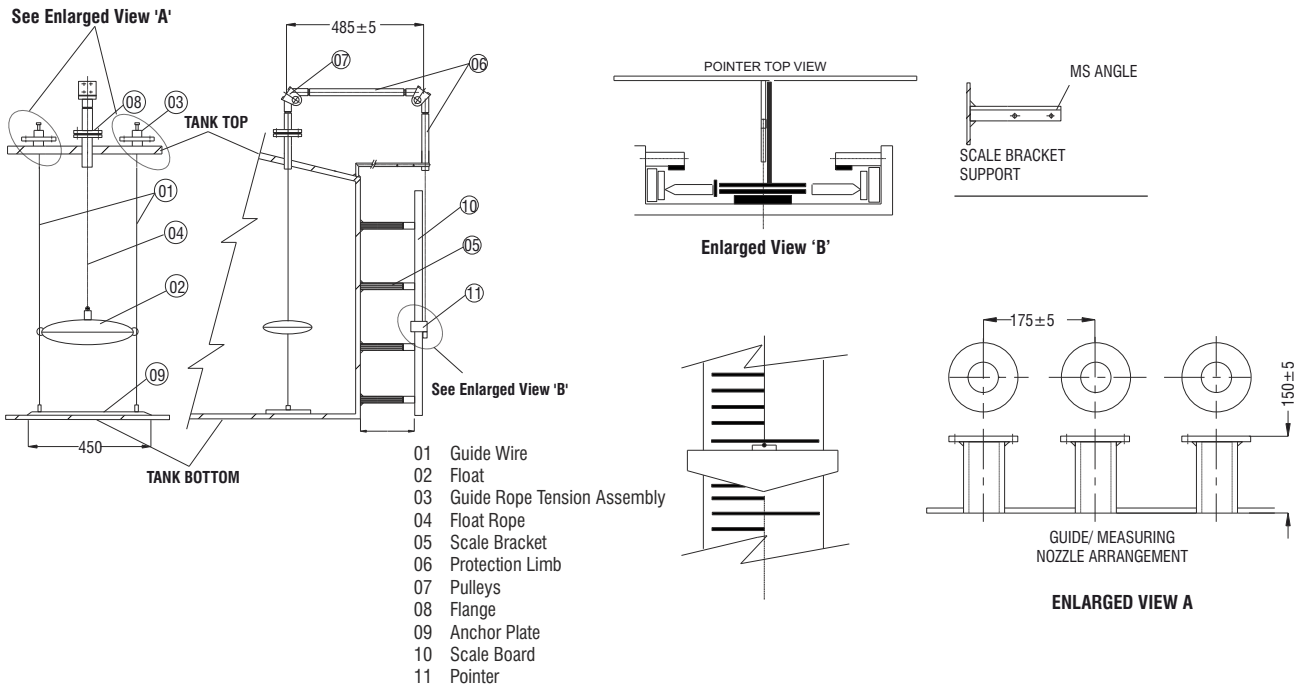
## Technical Specifications:

<b>Type of Gauge</b>	"Guided type ----- FBI/G Unguided type ----- FBI/U"
<b>Mounting</b>	Top
<b>Pressure</b>	Upto 50 kg/cm <sup>2</sup>
<b>Temperature</b>	Upto 400°C
<b>Measuring range</b>	Max. upto 15000mm ----- For Guided type Max. upto 5000mm ----- For Unguided type
<b>MOC of Float</b>	SS316, SS316L, PP, PTFE, Monel, Titanium, Alloy 20
<b>MOC of Wire</b>	SS316, SS316L, SS304L, PTFE, PP
<b>Accuracy</b>	5%
<b>Calibrated Gauge Board</b>	6" wide, Aluminium white powder coating with black graduation
<b>Least Count</b>	10-25mm
<b>Process Connection</b>	Flanged
<b>Optional</b>	With switch version available

# Float & Board Level Gauges

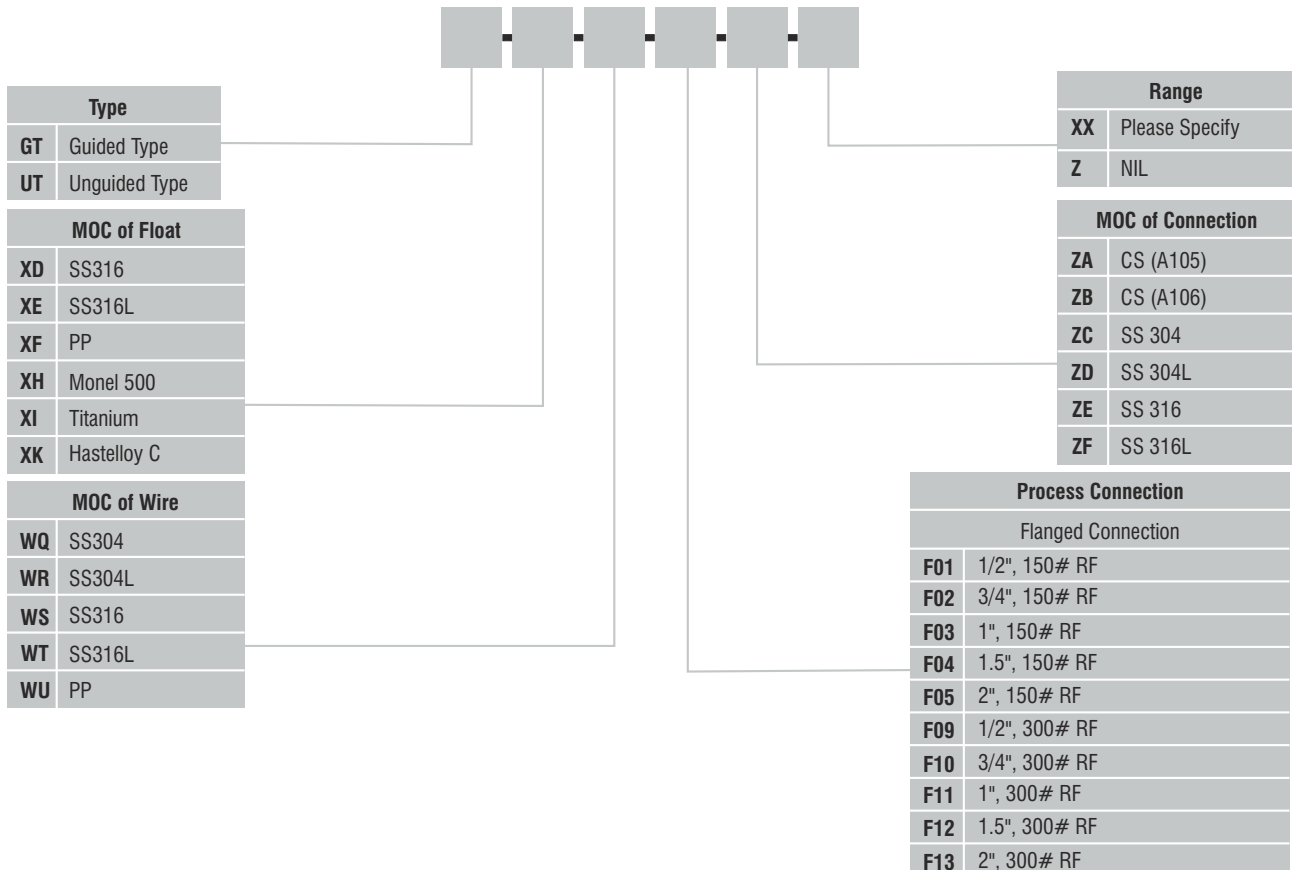


## G A Drawing Applicable



## Ordering Information

**FBLG** GT-XD-WS-F03-ZE-Z



# Chambers for Guided Wave Radar



## Features

- Applicable upto 150 kg and upto 550 deg cent
- Cryo applications upto -196 deg cent
- Jacketed design applicable
- For applicability in critical, acidic, cryo and high temperature zone
- IBR certified device available
- NACE, H2S service compatibility applicable
- Heat tracing available
- Viscous media (max upto 380 cst and upto 100 deg cent) besides other acidic, non acidic, steam water media
- Device fully compatible for conductive and non conductive media
- Applicable for refinery, petrochemical, chemical, power, radioactive, fertilizer, food, pharma, metal industry applications

## Concept and Principle of Operation

*General Instruments Consortium* offers chambers for guided wave radar technology wherein the chambers offer the component for the GWR to assemble on the chamber for achieving level measurement.

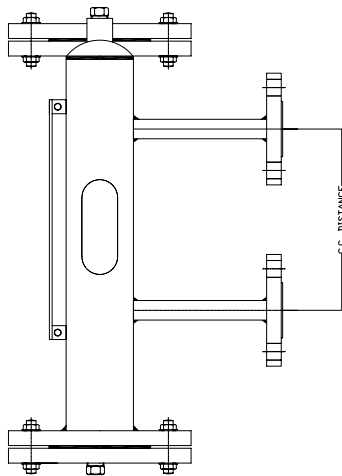
The chambers are technically installed vertically directly to the vessel and the fluid will flow into it and enable the GWR to sense the level accordingly.

These chambers are thus required to meet all sorts of applications where the material is essentially required to meet NACE, IBR, H2S.

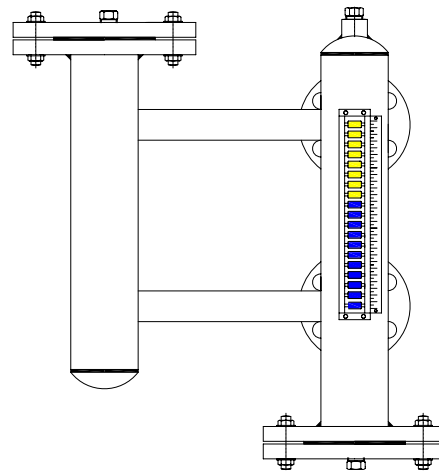
Our chambers meet all such critical requirements and can cater to pressure upto 150 bar and upto 550 deg cent applications.

## Technical Data Sheet - 1

<b>MOC type</b>	Forged, chamber schedule 10,10S, 20, 40, 100, 160, 250
<b>MOC type for flange</b>	Forged
<b>MOC of chamber</b>	SS316, SS316L, SS304L, Alloy20, PP, PVDF, PTFE, PTFE coated, PTFE lined, hastelloy
<b>CCD</b>	Upto 5000mm
<b>MOC of flange</b>	SS316, SS316L, SS304L, Alloy20, PP, PVDF, PTFE, PTFE coated, PTFE lined, hastelloy



Side View



Front View

GIC Magnetic level gauge with chamber connection for guided wave radar transmitter for refinery and petrochemicals application

## Technical Data Sheet - 2

<b>Product</b>	Chambers for Guided wave radar
<b>Application</b>	For both conductive and non conductive liquids and mixtures of gas and liquid
<b>Surface tension of the liquid</b>	Lowest to the highest
<b>Refractive index of the liquid</b>	Lowest to the highest
<b>Reynolds No</b>	Min 1250
<b>Viscosity</b>	Min 0.1cp to max 200 cp at operating temp
<b>Span of level measurement with accuracy defined, in a single stretch</b>	200mm to 5000mm
<b>Accuracy</b>	0.2% of the complete span
<b>Repeatability</b>	0.5% of the complete span
<b>Hysteresis</b>	0.2% of the span
<b>Max Velocity at the input of the measuring device</b>	10m/s for liquid and 40 m/s for mix for gas and liquid
<b>Application</b>	Acids, alkalies, steam water, hot water, resin liquid, molasis, thermic fluid, rock slat paste, syrup, metal deforming liquids, food molasis
<b>Operating pressure range</b>	28mm wc to 150 kg
<b>Operating temperature</b>	550 deg cent
<b>Operating density</b>	340 kg/m <sup>3</sup> to 1800 kg/m <sup>3</sup>
<b>Helium leak test level</b>	10(-5)mbarltr/sec
<b>Thermal coefficient of expansion</b>	0.2/deg cent
<b>Communication with control room</b>	Yes with integrated design of transmitter
<b>IBR certified</b>	YES
<b>ATEX certified</b>	Not applicable
<b>CCOE certified</b>	YES
<b>Most demand in industry</b>	All Refinery / petrochemical and oil and gas and chemical application
<b>Most applicable application</b>	Automation control systems in all refinery / petrochemical
<b>Applications for closed tanks (undergnd) / vessels</b>	Yes with top mounting design with integrated transmitter model
<b>Application for open tanks (above gnd) / vessels</b>	Yes
<b>Applicable for most corrosive nature atmosphere</b>	Yes
<b>SAFETY IN LINE (SIL certification)</b>	Yes SIL2 most rated in MLG with transmitter
<b>Exclusive cryogenic application</b>	YES
<b>Ambient condition for the device applicability</b>	Minus 40 deg to plus 60 deg cent (because of magnetism)
<b>Guaranteed full life cycles of operations</b>	5,00,000
<b>Dynamic response test applicability</b>	Most linear stable reading at upto 60 decibels reading and then at 0.15 fall at upto100 decibels
<b>Most applicable against constant interference of Electromagnetic Interference</b>	Most linear output upto 2000Hz
<b>View Interface system</b>	Magnetic flapper assembly, capsule type, transmitter HART / FF (display at Control Room)
<b>Exclusive boiler application</b>	Recommended with EMI interference worked out
<b>Application in Biopharma industry</b>	Yes
<b>Application in cement industry</b>	Cement water with high surface tension
<b>Application in oil and gas application</b>	Offshore and onshore at all applications medias
<b>Application in fertilisers</b>	Yes and at Ammonia plant / Urea plant / Bagging plant / Ammonia storage, CNA/ Sulphuric acid / Methanol plant
<b>Application in petrochemical plants</b>	HDPE / CCU / Boiler
<b>Application in refinery</b>	CRU / CCU / ARU / DCU / DHDS plants and for HSD manufacture and Aviation fuel
<b>Application in food and beverages</b>	Yes for all applications related to food and beverage industry

# Float Operator Level Transmitters

*General*

## Features

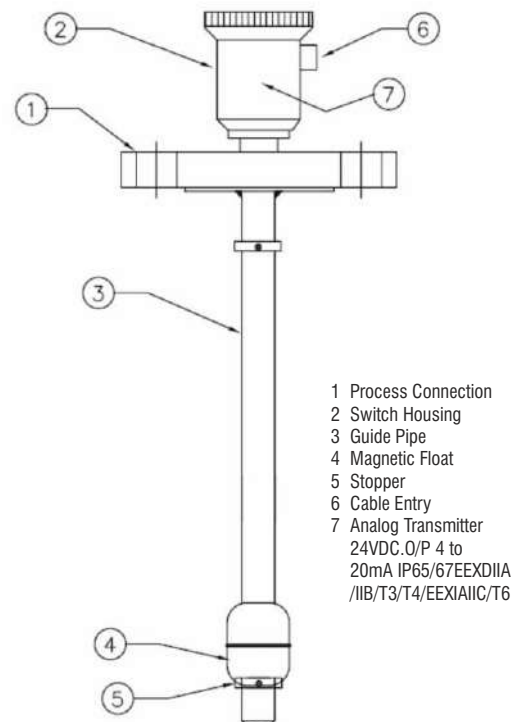
- Displacer type level transmitter with application upto 100 bar and 350 deg cent application
- Heavy walled floats for critical application
- Tight sealing versions for float sensors with level transmitter to enable correct application solutions, with sealing internals at 10(-3/-4) mbarltr/sec available
- Insertion length defined for 5000mm, other lengths on request and confirmation on design
- Durability defined on sealing and pressure and temperature application
- Improved reliability with dual opposed magnet design which provides snap action
- Applicable with various versions of MOC's depending on pressure and temperature, versions with Stainless and steel, hastelloy, monel, PTFE, PP, Titanium available
- Versions with flange, screwed, welded available
- IBR versions available
- Applicable for H2S, NACE, certified
- Level transmitter is CCOE approved and certified for IP67, IP65
- Certified for group IIA/IIB, IIC
- Enclosure at die cast aluminium and SS available
- Application with PTFE lined coating at special 1.6 mm thickness and PTFE floats for critical media available
- Versions with ATEX and FM certified available on request
- Local Display



Application in petrochemical complex with varied specific gravity

## Concept and Principle of Operation

This is top mounted displacer type level transmitter provided continues set points. It uses float that glides on the surface of liquids. This level switch consists of Terminal Enclosure, Float Stem with Reed Switches and resistor and Float with magnets assembled inside. This type of level transmitter can be used for continuous level controls for both closed and open tanks. When level rises float travels with the liquid on the float stem and when it comes in contact with the reed switches, due to magnetic force reed switch changes its contact. This type of level transmitter is used for lengths upto 5000 mm, other lengths on request and confirmation on design. It is recommended to use perforated still well for lengths more than 3000 mm.



G A Drawing for assembly and mounting



# Float Operator Level Transmitters



## Technical Specifications: Table-1 Material of Construction

<b>Float</b>	PTFE, PP, PVDF, SS316, SS304, SS316L, SS304L, Monel, Titanium, Hastelloy
<b>Float stem</b>	PTFE lined SS, PP lined SS, PVDF lined SS, SS316, SS304, SS316L, SS304L, Monel, Titanium, Hastelloy
<b>Flange</b>	PTFE, PP, PVDF, SS316, SS304, SS316L, SS304L, Monel, Titanium, Cast Carbon Steel, Hastelloy
<b>Switch enclosure</b>	Die cast aluminium, SS304, SS316, SS316L
<b>Cable gland</b>	Brass, PBS Plastic, SS316, SS304, SS316L
<b>Stopper</b>	Metal stoppers of relevant material compatible to media

## Technical Specifications: Table-2

<b>Float</b>	38X200mm upto 60X160mm and upto 68X100mm
<b>Float</b>	Specific gravity = 0.4, till 1.2
<b>Float Stem</b>	500mm to 5000mm, other lengths on request and confirmation on design
<b>Float stem width</b>	12.5mm and 16mm
<b>Flange</b>	2" till 6", ANSI RF, FF, 125-250AARH, DIN std DN50 till 150, BS10TabE, socket weld, butt weld, weld neck flange in ANSI
<b>Float</b>	Pressure design till 40 kg / 60 kg / 100 kg
<b>Flange rating</b>	max rating ANSI 600# and DN PN 100
<b>Cable gland</b>	Double compression, metal cable normal glands, 1/2" NPT F, 3/4" ET, M20, PG 13.5, PG16
<b>Flange</b>	Forged, cast versions, radiography level - 1 / 2 versions available
<b>Float weight</b>	60gms to 200 gms depending specific gravity
<b>Float stem weight</b>	Max upto 200 gms depending on size / length
<b>Flange weight</b>	500gms till 30 kg depending float dimensions which inturn would density of media and other accessories
<b>Temperature application</b>	-100 deg cent till 350 deg cent
<b>Pressure application</b>	Upto 100 kg/cm <sup>2</sup> g
<b>Analog transmitter output</b>	4- 20 m A
<b>Analog transmitter principle</b>	Reed switch
<b>Analog transmitter power supply</b>	230 VAC, 5 A or 24VDC, 0.5 A
<b>Analog transmitter out put in split range</b>	Split range of 4...12 m A and 12...20 m A, others on request
<b>Analog transmitter internal resistance</b>	200M ohms
<b>Transmitter accuracy</b>	3%
<b>Transmitter repeatability</b>	0.15%
<b>Transmitter certifications</b>	CCOE, FM, ATEX, CE (versions applicability on request)
<b>Transmitter enclosure</b>	EExia IICT6, EExd IIA/IIB, EExd IIC and IP65
<b>HART transmitter principle</b>	Reed switch, LVDT
<b>HART transmitter accuracy</b>	1.5 %
<b>HART transmitter output in split range</b>	Adjustable as per HART software
<b>HART programmable software</b>	With serial interface adapter with HART interface to calibrate
<b>HART transmitter feature</b>	SIL2 certified
<b>HART transmitter feature</b>	Slave circuitry operation with MASTER as an additional option on request
<b>HART output</b>	4 to 20 m A, other on request
<b>HART transmitter internal resistance</b>	440 ohms
<b>HART transmitter enclosure</b>	EExia IICT6, EExd IIA/IIB, EExd IIC and IP65
<b>HART transmitter certifications</b>	CCOE, FM, ATEX, CE (Versions applicability on request)

# Flow Switches



## Features

- Flow control designed for upto 5000 LPM with process connection upto 2"
- Applications upto 40 bar and upto 250 deg cent available
- Flow switch with options of special bellows to cater to high flows, high pressure and high temperature
- Bellows with better hysteresis for the overall flow switch accuracy
- IBR versions available
- Applicable for H2S, NACE, certified
- Switch is CCOE approved and certified for IP67
- Switch certified for group IIA/IIB, IIC
- Switch enclosure at die cast aluminium and SS available
- Versions with ATEX and FM certified available
- Durability defined on sealing and pressure and temperature application
- Improved reliability with dual opposed magnet design which provides snap action
- Applicable with various versions of MOC's depending on pressure and temperature, versions with Stainless and steel, hastelloy, monel, PTFE, PP, Titanium available

## Concept and Principle of Operation

*General Instruments Consortium* has designed flow switches for the direct control of fluid flow in pipelines and ducts. These switches are magnetically or mechanically actuated. This is simple, reliable and economical solution to control or monitor flow in process lines. GIC offers two types of Flow Switches:

- Inline type
- Top mounted version

This is direct mounted type flow switch in pipe line. This consists of Switch assembly, Body, Bellows and Flapper. This is mounted in horizontal position. Flapper is connected to bellow assembly. When flow reaches beyond set flow the flapper moves in the direction of flow. The displacement of flapper causes actuation of the microswitch through bellow assembly. Inline type flow switch is available upto 50 NB line size and above 50 NB Top mounted is recommended. There are no vertical moving parts and is therefore maintenance free. These flow switches can be mounted in horizontal as well as vertical lines.



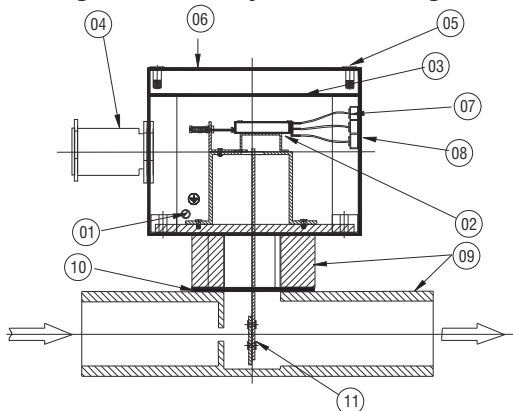
## Technical Specifications: Table-1 Material of Construction

<b>Displacer Flapper</b>	SS316, SS304, SS316L, SS304L, Monel, Titanium, Hastelloy, others on request PTFE lined SS, PP lined SS, PVDF lined SS, SS316, SS304, SS316L, SS304L, Monel, Titanium, Hastelloy
<b>Flange Switch enclosure Cable gland</b>	SS316, SS304, SS316L, SS304L, Monel, Titanium, cast carbon steel, Hastelloy Die cast aluminium, SS304, SS316, SS316L
<b>Bellows</b>	Brass, PBS plastic, SS316, SS304, 316L SS316, SS316L, Monel, SS304, Phosphor Bronze

## Technical Specifications: Table-2 Technical Data

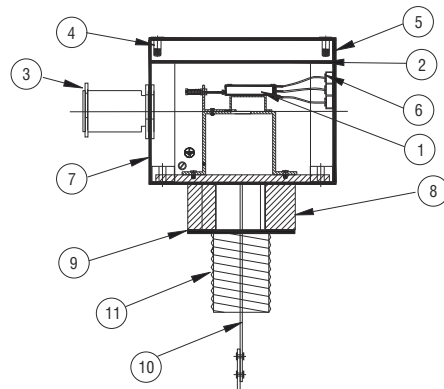
<b>Flapper length</b>	12mm till 200mm depending on flow for control
<b>Flapper thickness</b>	0.15mm till 2.3 mm depending on pressure and temperature
<b>Bellow</b>	Double walled with 20, 30 and 40 convolutions and thickness of bellow more than the convolutions travel/length of the bellow
<b>Process connection</b>	½" till 2", ANSI RF, FF, 125-250AARH, DIN std DN15, 20, 25, 40, 50, socket weld, butt weld, weld neck flange in ANSI and screwed connection NPT and BSP
<b>Float</b>	Pressure design till 40 kg
<b>Flange rating</b>	max rating ANSI 600# and DN PN 100
<b>Cable gland</b>	Double compression, metal cable normal glands, ½" NPT F, ¾" ET, M20, PG 13.5, PG 16
<b>Switch</b>	SPDT, 230 VAC, 5 A or 24VDC, 0.5 A
<b>No of cable entries</b>	Max two
<b>Switch enclosure</b>	IP65, IP66, IP67
<b>Switch enclosure</b>	EExia IICT6, EExd IIA/IIB, EExd IIC
<b>Switch accuracy</b>	Max upto 1%
<b>Switch hysteresis</b>	Max upto 0.5% to 1%
<b>Switch repeatability</b>	Max upto 1%
<b>Switch certifications</b>	CCOE, FM, ATEX, CE (versions applicability on request)
<b>Flange</b>	Forged, cast versions, radiography level - 1 / 2 versions available
<b>Flow switch weight</b>	1.6 kg till 8 kg depending on configure of flow requirement
<b>Temperature application</b>	Upto 250 deg cent
<b>Pressure application</b>	Upto 40 kg/cm <sup>2</sup> g
<b>Flow in LPM in control</b>	2 LPM till 20 LPM for ½" process connection and pipe size 8 LPM to 40 LPM for ¾" pipe size 15 LPM to 190 LPM for 1" pipe size 30 LPM to 215 LPM for 1½" pipe size 40 LPM to 360 LPM for 2" pipe size 60 LPM to 700LPM for 3" pipe size 90 LPM to 1500 LPM for 4" pipe size 125 LPM to 3000LPM for 6" pipe size 200 LPM to 4000 LPM for 8" pipe size 250 LPM to 5000LPM for 10" pipe size
<b>Differential pressure</b>	75mmwc till 150 mmwc

### G A Drawing for assembly and mounting



- 1 Earthing Screw
- 2 Micro Switch
- 3 Cover Gasket
- 4 Cable Entry
- 5 Cover Bolts
- 6 Enclosure Cover
- 7 Terminals
- 8 Enclosure
- 9 Body
- 10 Body Gasket
- 11 Flapper

**Inline**



- 1 Micro Switch
- 2 Cover Gasket
- 3 Cable Entry
- 4 Cover Bolts
- 5 Enclosure Cover
- 6 Terminals
- 7 Enclosure
- 8 Enclosure
- 9 Body Gasket
- 10 Flapper
- 11 Process Conn.

**Top Mounted**

# Ordering Information

## FS IN-F01-ZA-ZC-SI-PU-MQ-Z



Type	
IN	Inline
MT	Top Mounted

Process Connection	
Flanged Connection	
F01	1/2", 150# RF
F02	3/4", 150# RF
F03	1", 150# RF
F04	1.5", 150# RF
F05	2", 150# RF
F09	1/2", 300# RF
F10	3/4", 300# RF
F11	1", 300# RF
F12	1.5", 300# RF
F13	2", 300# RF

Threaded Connection	
B04	1/2"BSP (M)
B05	3/4"BSP (M)
B06	1"BSP (M)
B07	1.5"BSP (M)
B08	2"BSP (M)
N04	1/2"NPT (M)
N05	3/4"NPT (M)
N06	1"NPT (M)
N07	1.5"NPT (M)
N08	2"NPT (M)

MOC of Body	
ZA	CS(A105)
ZB	CS(A106)
ZC	SS 304
ZD	SS 304L
ZE	SS 316
ZF	SS 316L

Cable Entry	
MQ	One
MR	Two
Z	NIL

Enclosure	
PU	Die Cast Aluminium Weatherproof to IP – 67
PV	Die Cast Aluminium Flameproof suitable to Gr. IIA / IIB
PW	Die Cast Aluminium Flameproof suitable to Gr. IIC

Microswitch	
SI	1 SPDT
SJ	2 SPDT

MOC of Flapper	
ZC	SS 304
ZD	SS 304L
ZE	SS 316
ZF	SS 316L

# Direct Insert Type Level Switches



## Features

- Float level switch with application upto 60 bar and 350 deg cent application
- Heavy walled floats for critical application
- Tight sealing versions for float sensors with switch to enable correct application solutions, with sealing internals at 10(-3/-4) mbar ltr / sec available
- Insertion length defined for 3000mm
- Switching differential upto 2mm
- Durability defined on sealing and pressure and temperature application
- Improved reliability with dual opposed magnet design which provides snap action
- Applicable with various versions of MOC's depending on pressure and temperature, versions with Stainless and steel, Hastelloy, monel, PTFE, PP, Titanium available
- Special magnet attractor to meet high temperature and pressure
- Versions with flange, screwed, welded available
- Applicable for H2S, NACE, certified
- Switch is CCOE approved and certified for IP67
- Switch certified for group IIA/IIB, IIC
- Switch enclosure at die cast aluminium and SS available
- Application with PTFE lined at special 1.6 mm thickness and PTFE floats for critical media available
- Versions with ATEX and FM certified available

## Concept and Principle of Operation

Direct insert or direct mounted level switch uses the counterbalance principle. It consists of float and float stem with counterbalance weight and switch mechanism with magnet attractor.

In this type there are two versions applicable:

- Direct insert side mounted LS1000-SM
- Direct insert top mounted LS1000-MT

### LS1000-SM: Side Mounted direct insert mounted level switch

#### Principle of operation:

In this type of Level Switch Float held in horizontal position and moves upwards and downwards with rising and falling level in the tank / vessel. This movement results in a rotary motion of the attractor causes actuation of microswitch. To improve reliability it employs dual opposed magnet design which provides snap action.

## Application

This type of level switch is mounted directly on the tank / vessel having horizontal nozzle as shown in figure. The tank / vessel connection must be located at the elevation where set level is to occur. Applications are suitable in cryo tanks and applications for high temperature with special material are also applicable



Exproof IIC version for LS1000-SM



Weather proof version of LS1000-SM

## Direct Insert Type Level Switches



### LS 1000: Top Mounted Direct Insert Mounted Level Switch

This is direct mounted type level switch. This provides contact changeover at a selected elevation level in the tank / vessel. Switch is mounted on top of the tank / vessel and coupled with float assembly rides on the liquid surface with rising and falling of level. The magnet attractor is connected on the isolating tube as shown in figure. As the level rises stem head of float assembly reaches upto attractor causes actuation of microswitch. To improve reliability the stem guide isolated just above the float. This type of level switch issued for lengths upto 3000mm.



Exproof IIC version for LS1000MT

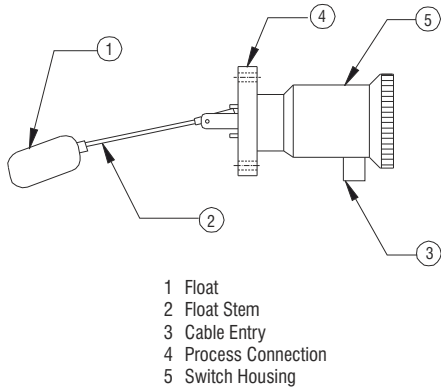


Weather proof version of top mounted LS1000MT

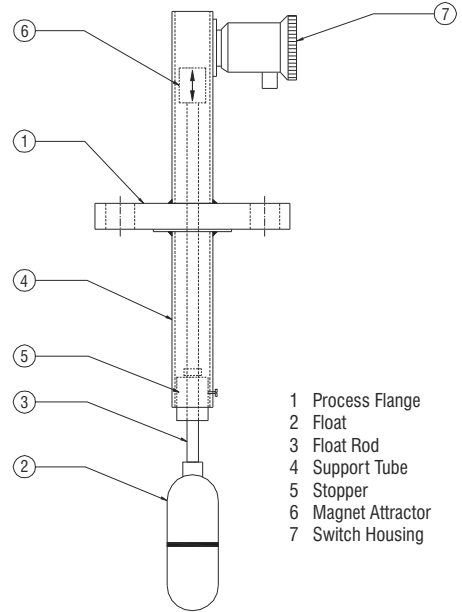
### Technical Specifications: Table-1 Technical data

<b>Type</b>	Direct Insert Type
<b>Mounting</b>	Side Mounted / Top Mounted
<b>Switch Housing</b>	Die Cast Aluminium Weatherproof to IP-67 Die Cast Aluminium Explosionproof suitable for Gr. IIA, IIB Die Cast Aluminium Explosionproof suitable for Gr. IIC
<b>Switch Type</b>	Snap Acting 1SPDT / 2SPDT Microswitch, 5A, 230VAC / 0.5A, 24VDC
<b>Cable Entry</b>	1 no / 2 nos. of 3/4"ET(F), 1/2"NPT(F), M20x1.5(F)
<b>Process Connection</b>	Flanged in various sizes
<b>Flange MOC</b>	SS304, SS316, SS316L, Monel400, Titanium, Inconel 600, Hastelloy-C Others on request
<b>Float/Stem MOC</b>	SS304, SS304L, SS316, SS316L, Monel400, Titanium, Inconel 600, Hastelloy-C Others on request
<b>Specific gravity</b>	Please specify
<b>Pressure</b>	Up to 100kg/cm <sup>2</sup> g
<b>Temperature</b>	(-100) to 350°C
<b>Switch certification</b>	CCOE, FM, ATEX, CE (Versions applicability on request)

# Direct Insert Type Level Switches



Side mounted direct insert level switch



Top mounted direct insert level switch

## G A Drawing for assembly and mounting

## Ordering Information

**LS1000 SM-F05-ZC-RA-SI-PU-MQ**



Model	
Direct Insert Type Level Switch	LS1000

Type	
SM	Side Mounted
MT	Top Mounted

Process Connection	
Flanged Connection	
F05	2", 150# RF
F06	2.5", 150# RF
F13	2", 300# RF
F14	2.5", 300# RF
XX	Any Other

MOC of Connection			
ZC	SS 304	ZK	Monel 500
ZD	SS 304L	ZM	Hastelloy-B
ZE	SS 316	ZN	Hastelloy-C
ZF	SS 316L	ZO	Inconel 600

Cable Entry	
MQ	One
MR	Two

Enclosure	
PU	Die Cast Aluminium Weatherproof to IP - 67
PV	Die Cast Aluminium Flameproof suitable to Gr. IIA / IIB
PW	Die Cast Aluminium Flameproof suitable to Gr. IIC

Microswitch	
SI	1 SPDT
SJ	2 SPDT

MOC of Float Assembly			
RA	SS 304	RF	Monel 500
RB	SS 304L	RG	Hastelloy-B
RC	SS 316	RH	Hastelloy-C
RD	SS 316L	RI	Inconel 600



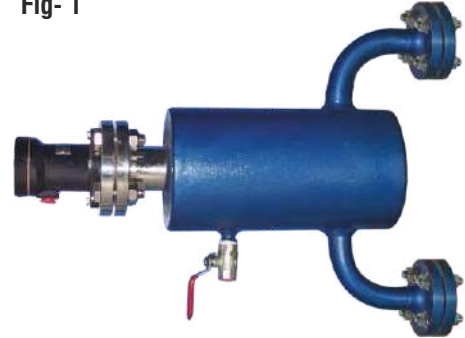
# External Chamber Type Level Switches



## Features

- Float level switch with application upto 100 bar and 350 deg cent application
- Heavy walled floats for critical application
- CCD length defined for upto 2500mm
- Switching differential upto 10mm
- Durability defined on sealing and pressure and temperature application
- Improved reliability with dual opposed magnet design which provides snap action
- Applicable with various versions of MOC's depending on pressure and temperature, versions with Stainless and steel, hastelloy, monel, PTFE, PP, Titanium available
- Special magnet attractor to meet high temperature and pressure
- Versions with flange, screwed, welded available
- Applicable for H2S, NACE, certified
- Switch is CCOE approved and certified for IP67
- Switch certified for group IIA/IIB, IIC
- Switch enclosure at die cast alluminium and SS available
- Application with PTFE lined at special 1.6 mm thickness and PTFE floats for critical media available
- Versions with ATEX and FM certified available

Fig- 1



Series LS2000-SM

## Concept and Principle of Operation

*General Instruments Consortium* offers External Cage Type Level Switches for single level set point. This is trouble free, consistent and inexpensive solution to control Level in the tanks / vessels.

In this type there are two versions applicable

- External cage chamber side mounted with side mounted switch LS 2000SM
- External cage chamber side mounted with top mounted switch LS 2000MT

### Principle of operation:

1. External cage chamber side mounted with side mounted switch LS 2000SM

This type of level switch consists of fabricated external cage with inlet-outlet process connections having fixed distance. The switch assembly is mounted horizontally on the external cage as shown in figure-1.

### Application:

The external cage type level switch is mounted outside the tank / vessel which significantly reduce effect of turbulence. It also provides ease of online maintenance without impeding the process conditions.

2. External cage chamber side mounted with top mounted switch LS 2000MT

This type of level switch assembly is mounted vertically on the external cage as shown in figure-2. The external cage type level switch is mounted outside the tank / vessel which significantly reduces effect of turbulence.

Fig- 2



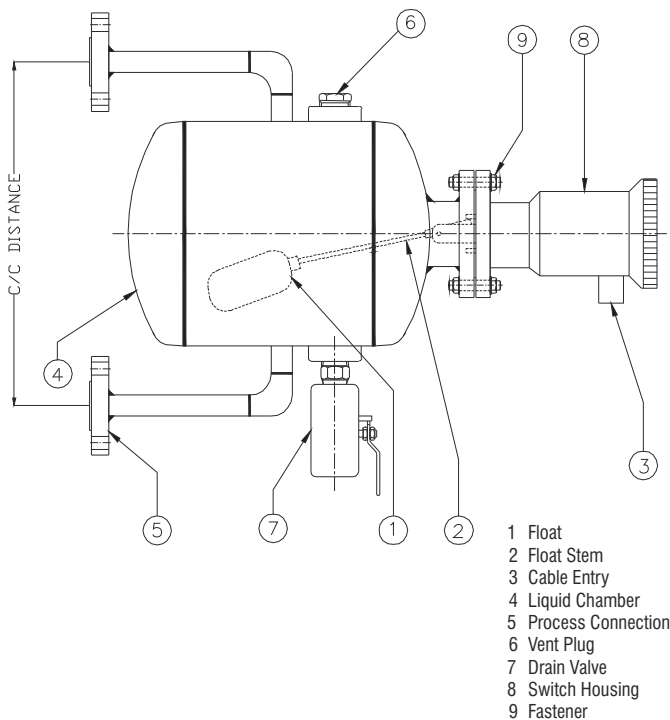
External cage chamber side mounted with top mounted switch LS2000

# External Chamber Type Level Switches

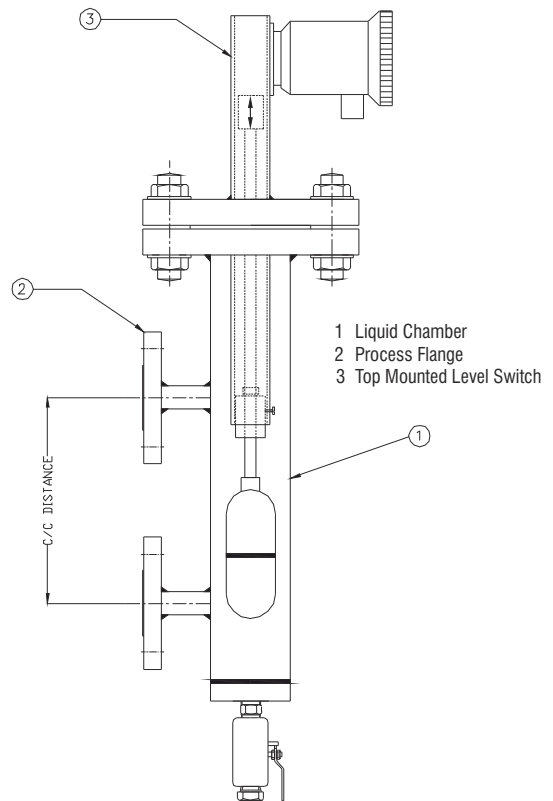


## Technical Specifications: Table-1 Technical data

<b>Type</b>	External Chamber Type
<b>Mounting</b>	Side Mounted on tank
<b>Switch Mounting</b>	Side / Top mounted on external cage chamber
<b>Switch Housing</b>	Die Cast Aluminium Weatherproof to IP-67 Die Cast Aluminium Explosionproof suitable for Gr. IIA, IIB Die Cast Aluminium Explosionproof suitable for Gr. IIC
<b>Switch Type</b>	Snap Acting 1SPDT/2SPDT Microswitch, 5A, 230VAC /0.5A, 24VDC
<b>Cable Entry</b>	1 no / 2 nos. of 3/4"ET(F), 1/2"NPT(F), M20x1.5(F)
<b>Process Connection</b>	Flanged in various sizes
<b>Flange MOC</b>	SS304, SS316, SS316L, Monel400, Titanium, Inconel 600, Hastelloy-C. Others on request
<b>Float/Stem MOC</b>	SS304, SS304L, SS316, SS316L, Monel400, Titanium, Inconel 600, Hastelloy-C. Others on request
<b>External cage MOC</b>	CS, SS304, SS304L, SS316, SS316L, Monel400, Titanium, Inconel 600, Hastelloy-C. Others on request
<b>Specific gravity</b>	Please specify
<b>Pressure</b>	Up to 100kg/cm <sup>2</sup> g
<b>Temperature</b>	(-20) to 350 <sup>o</sup> c
<b>Switch certification</b>	CCOE, FM, ATEX, CE (Versions applicability on request)
<b>Switch CCD Length</b>	Up to 2000mm



**Side Mounted Switch**



**Top Mounted Switch**

# Ordering Information

## LS2000 LS2000-SM-XX-F01-ZC-RA-QU-RU-SI-PU-MQ



Model	
External Chamber Type Level Switch	LS2000

Type	
SM	Side Mounted
MT	Top Mounted

Center to Center Distance	
XX	Please Specify

Process Connection	
Flanged Connection	
F01	1/2", 150# RF
F02	3/4", 150# RF
F03	1", 150# RF
F04	1.5", 150# RF
F05	2", 150# RF
F09	1/2", 300# RF
F10	3/4", 300# RF
F11	1", 300# RF
F12	1.5", 300# RF
F13	2", 300# RF
XX	Any Other

MOC of Connection			
ZC	SS 304	ZK	Monel 500
ZD	SS 304L	ZM	Hastelloy-B
ZE	SS 316	ZN	Hastelloy-C
ZF	SS 316L	ZO	Inconel 600

MOC of External Chamber			
RA	SS 304	RF	Monel 500
RB	SS 304L	RG	Hastelloy-B
RC	SS 316	RH	Hastelloy-C
RD	SS 316L	RI	Inconel 600

Cable Entry	
MQ	One
MR	Two

Enclosure	
PU	Die Cast Aluminium Weatherproof to IP – 67
PV	Die Cast Aluminium Flameproof suitable to Gr. IIA / IIB
PW	Die Cast Aluminium Flameproof suitable to Gr. IIC

Microswitch	
SI	1 SPDT
SJ	2 SPDT

Drain	
RU	1/2" NPT (F), Plug
RV	3/4" NPT (F), Plug
RW	1/2" Needle Valve
RX	1/2" Ball Valve
XX	Any Other

Vent	
QU	1/2" NPT (F), Plug
QV	3/4" NPT (F), Plug
QW	1/2" Needle Valve
WX	1/2" Ball Valve
XX	Any Other

# Displacer Type Level Switches



## Features

- Level Switch with application upto 40 bar and 250 deg cent application
- Heavy walled level sensor for critical application
- Insertion length defined for 10000mm
- Switching differential upto 10mm
- Durability defined on sealing and pressure and temperature application
- Improved reliability with dual opposed magnet design which provides snap action
- Applicable with various versions of MOC's depending on pressure and temperature, versions with Stainless and steel, hastelloy, monel, PTFE, PP, Titanium available
- Versions with flange, screwed, welded available
- Applicable for 2S, NACE, certified
- Switch is CCOE approved and certified for IP67
- Switch certified for group IIA/IIB, IIC
- Switch enclosure at die cast alluminium and SS available
- Application with PTFE lined at special 1.6 mm thickness and PTFE floats for critical media available
- Versions with ATEX and FM certified available



## Concept and Principle of Operation

*General* offers Top Mounted Sensor Operated Level Switches for single and multiple level set points:

### Series TMLS/3000

This is top mounted type level switch provided single or multiple set points. It uses Level sensor that do float on the surface of liquids with certain immersed section with respect to design. Working principle of the level switch is based on a buoyancy principle.

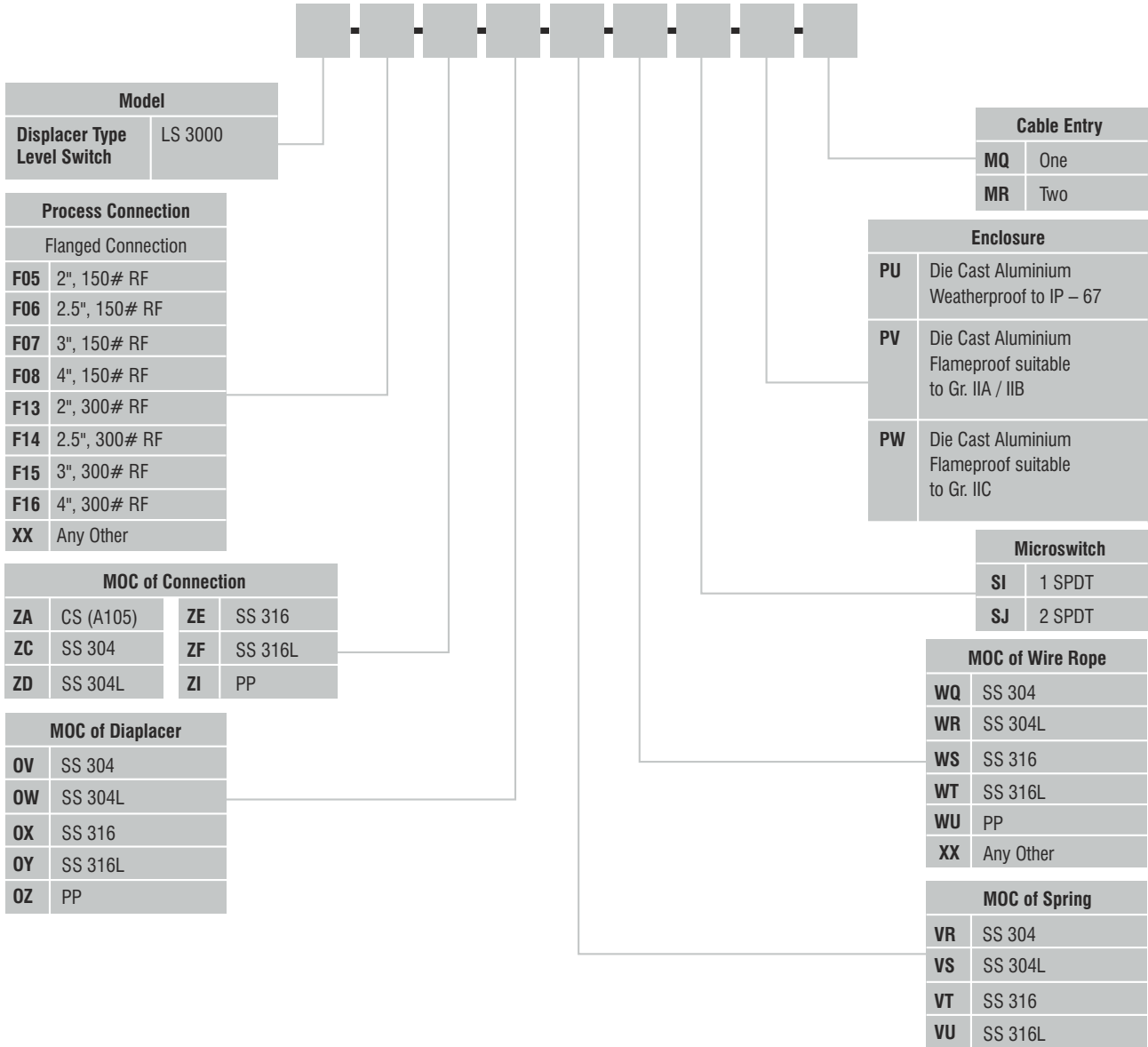
This level switch is consists of Switch Assembly, Wire Rope with Spring Assembly and level sensor suspended on spring. Level sensor having more density than the process liquid is used. Spring selection is determined by the weight of the level sensor. When level rises it the level sensor is submerged as per the design consideration and amount of weight equal to the weight of process liquid is displaced. This displacement relieves the spring tension which is related to tension constant R, causes the actuation of microswitch. This type of level switch is used for lengths upto 10000 mm.

## Technical Specifications: Table-1 Technical Data

<b>Type</b>	Displacer Operated Level Switch
<b>Mounting</b>	Top Mounted
<b>Switch Housing</b>	Die Cast Aluminium Weatherproof to IP-67 Die Cast Aluminium Explosionproof suitable for Gr. IIA, IIB Die Cast Aluminium Explosionproof suitable for Gr. IIC
<b>Switch Type</b>	Snap Acting 1SPDT/2SPDT Microswitch, 5A, 230VAC /0.5A, 24VDC
<b>Cable Entry</b>	1 no / 2 nos. of 3/4"ET(F), 1/2"NPT(F), M20x1.5(F)
<b>Process Connection</b>	Flanged in various sizes
<b>Flange MOC</b>	CS,SS304, SS316, SS316L, PP Other on request
<b>Displacer MOC</b>	SS304, SS304L, SS316, SS316L, PP Other on request
<b>Wire Rope MOC</b>	SS304, SS304L, SS316, SS316L, PP Other on request
<b>Spring MOC</b>	SS304, SS304L, SS316, SS316L, PP Other on request
<b>Specific gravity</b>	Please specify
<b>Pressure</b>	Up to 40kg/cm <sup>2</sup> g
<b>Temperature</b>	250°C
<b>Switch certification</b>	CCOE, FM, ATEX, CE (Versions applicability on request)
<b>Switch Insertion Length</b>	Up to 10000mm

# Ordering Information

## LS3000 F05-ZA-OV-VR-WQ-SI-PU-MQ



Model	
Displacer Type Level Switch	LS 3000

Process Connection	
Flanged Connection	
F05	2", 150# RF
F06	2.5", 150# RF
F07	3", 150# RF
F08	4", 150# RF
F13	2", 300# RF
F14	2.5", 300# RF
F15	3", 300# RF
F16	4", 300# RF
XX	Any Other

MOC of Connection			
ZA	CS (A105)	ZE	SS 316
ZC	SS 304	ZF	SS 316L
ZD	SS 304L	ZI	PP

MOC of Diaplacer	
OV	SS 304
OW	SS 304L
OX	SS 316
OY	SS 316L
OZ	PP

Cable Entry	
MQ	One
MR	Two

Enclosure	
PU	Die Cast Aluminium Weatherproof to IP – 67
PV	Die Cast Aluminium Flameproof suitable to Gr. IIA / IIB
PW	Die Cast Aluminium Flameproof suitable to Gr. IIC

Microswitch	
SI	1 SPDT
SJ	2 SPDT

MOC of Wire Rope	
WQ	SS 304
WR	SS 304L
WS	SS 316
WT	SS 316L
WU	PP
XX	Any Other

MOC of Spring	
VR	SS 304
VS	SS 304L
VT	SS 316
VU	SS 316L

# Multiport Level Top Mounted Level Switches



## Features

- Float level switch with application upto 100 bar and 350 deg cent application
- Heavy walled floats for critical application
- Insertion length defined for 4500mm
- Switching differential upto 10mm
- Durability defined on sealing and pressure and temperature application
- Improved reliability with dual opposed magnet design which provides snap action
- Applicable with various versions of MOC's depending on pressure and temperature, versions with SS, hastelloy, monel, PTFE, PP, Titanium available
- Versions with flange, screwed, welded available
- Applicable for H2S, NACE, certified
- Switch is CCOE approved and certified for IP67, IP65
- Switch certified for group IIA/IIB, IIC
- Switch enclosure at die cast aluminium and SS available
- Application with PTFE lined at special 1.6 mm thickness and PTFE floats for critical media available
- Versions with ATEX and FM certified available



## Concept and Principle of Operation

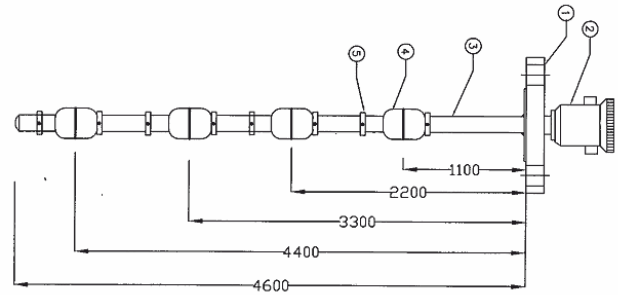
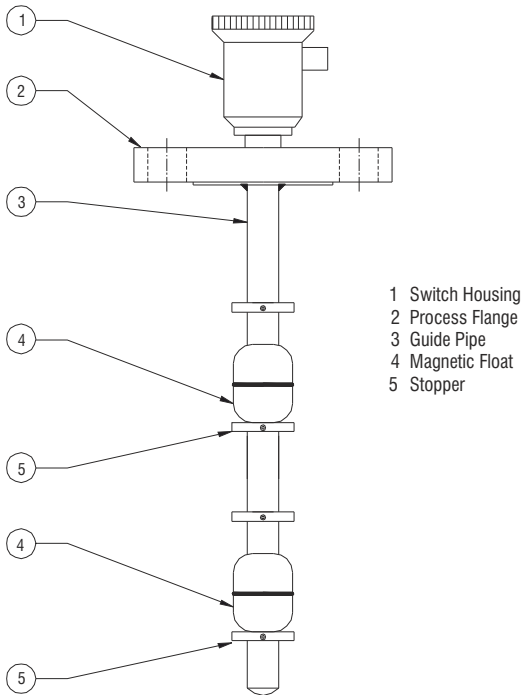
This is top mounted type level switch provided single or multiple set points. It uses float that glides on the surface of liquids. This level switch consists of Terminal Enclosure, Float Stem with Reed Switches and Float with magnets assembled inside. This type of level switch can be used for single or multiple level controls. When level rises float travels with the liquid on the float stem and when it comes in contact with the reed switches located at a predetermined length of the stem, due to magnetic force reed switch changes its contact. This type of level switch is used for lengths upto 4500 mm. It is recommended to use perforated still well for lengths more than 2500 mm.

## Technical Specifications: Table-2 Technical Data

<b>Type</b>	Multiport Level Top Mounted Level Switch
<b>Mounting</b>	Top Mounted
<b>Switch Housing</b>	Die Cast Aluminium Weatherproof to IP-67 Die Cast Aluminium Explosionproof suitable for Gr. IIA, IIB Die Cast Aluminium Explosionproof suitable for Gr. IIC
<b>Switch Type</b>	Reed Switch- 0.5A, 230VAC
<b>Cable Entry</b>	1 no / 2 nos. of 3/4"ET(F), 1/2"NPT(F), M20x1.5(F)
<b>Process Connection</b>	Flanged in various sizes
<b>Flange MOC</b>	CS, SS304, SS316, SS316L, PP. Others on request
<b>Float MOC</b>	SS304, SS304L, SS316, SS316L, PP. Others on request
<b>Stem MOC</b>	SS304, SS304L, SS316, SS316L. Others on request
<b>Stopper</b>	Metal Stopper of relevant material compatible to media
<b>Specific gravity</b>	Please specify
<b>Pressure</b>	Up to 100kg/cm <sup>2</sup> g
<b>Temperature</b>	(-100) to 350°C
<b>Switch certification</b>	CCOE, FM, ATEX, CE (Versions applicability on request)
<b>Switch Insertion Length</b>	Upto 4500mm

# Multiport Level Top Mounted Level Switches

# General



A specified application for multilevel set point in chemical industry with PTFE lined floats and float stem with 3" flange at 300# rating with pressure at 40 bar and at 140 deg cent

Four set point level switch applicable for:

- Paper industry
- Chemical industry
- Petrochemicals
- Refineries
- Fertilizers
- Food industry
- Pharma industry

Float Operated Level Switch

## Ordering Information

### LS4000 F05-ZA-YK-QU-PU-MQ

Process Connection	
Flanged Connection	
F05	2", 150# RF
F06	2.5", 150# RF
F07	3", 150# RF
F08	4", 150# RF
F13	2", 300# RF
F14	2.5", 300# RF
F15	3", 300# RF
F16	4", 300# RF

MOC of Connection			
ZA	CS (A105)	ZE	SS 316
ZC	SS 304	ZF	SS 316L
ZD	SS 304L	ZI	PP

MOC of Float	
YK	SS 304
YL	SS 304L
YM	SS 316
YN	SS 316L

Cable Entry	
MQ	One
MR	Two

Enclosure	
PU	Die Cast Aluminium Weatherproof to IP – 67
PV	Die Cast Aluminium Flameproof suitable to Gr. IIA / IIB
PW	Die Cast Aluminium Flameproof suitable to Gr. IIC

MOC of Float Stem	
YK	SS304
YL	SS304L
YM	SS316
YN	SS316L



## Features

Sight flow Indicator is the simplest instrument for viewing flow of different type of fluids in the process line.

General Instruments Consortium offers sight flow indicators of following types:

- Double Window - Plain
- Double Window - Rotary Wheel
- Double Window - Flapper
- Double Window - Drip Tube
- Double Window - Ball
- Full View

### Double Window - Plain

This type of sight flow indicator is recommended where flow is turbulent. This flow indicator is used to monitor vertical or horizontal flow.

### Double Window - Rotary Wheel

This type of sight flow indicator is best suited for the lines carrying dark solutions where rotary movement can be easily detected.



### Double Window - Flapper

This type of sight flow indicator is recommended for vertical upward as well as horizontal flow. This flow indicator is suitable for colourless and transparent fluids.

### Double Window - Drip Tube

This type of sight flow indicator is particularly recommended for vertically downwards flow lines having intermittent flow e.g. flow lines in distillation columns.

### Double Window - Ball

This type of sight flow indicator is suitable for colourless gas flow. Usually recommended for vertically upwards and horizontal flow.

### Full View

This type of sight flow indicator is used for viewing the process flow to assure that the flow is continuous or to note the process turbidity, colour etc.

## Technical Specifications: Table-1 Material of Construction

<b>Type</b>	Double Window - Plain / Rotary Wheel / Flapper / Drip Tube / Ball, Full View
<b>Body</b>	CS, SS 304, SS 304L, SS 316, SS 316L, others on request
<b>Retainer Flange</b>	CS, SS 304, SS 304L, SS 316, SS 316L, others on request
<b>Cushion / Gasket</b>	C.A.F. / P.T.F.E. / Graphoil
<b>Glass</b>	Toughened Borosilicate
<b>Process Connection</b>	Flanged / Screwed
<b>Fasteners</b>	SS, ASTM A193 Gr. B7 / A 194 Gr. 2H

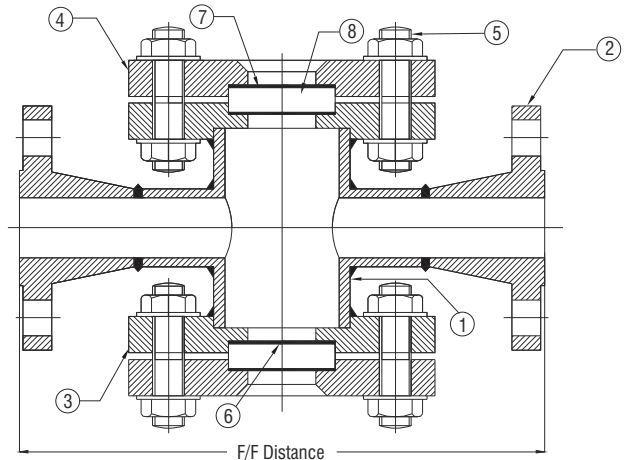
# Sight Flow Indicators



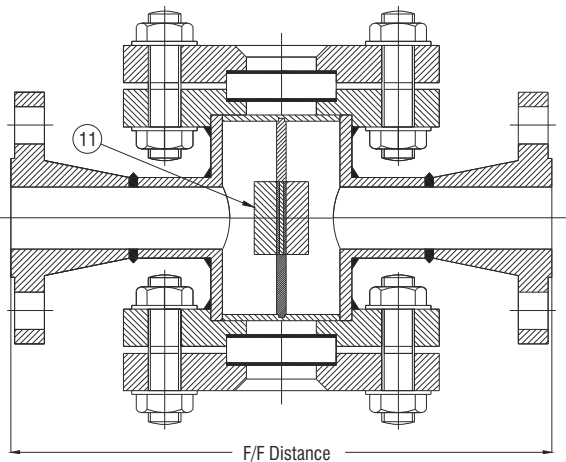
## Face to face distance for all designs

1/2" process connection	FFD = 160mm
3/4" process connection	FFD = 160mm
1" process connection	FFD = 160mm
1 1/2" process connection	FFD = 190mm
2" process connection	FFD = 225mm
3" process connection	FFD = 275mm
4" process connection	FFD = 360mm
6" process connection	FFD = 450mm
8" process connection	FFD = 630mm
10" process connection	FFD = 750mm

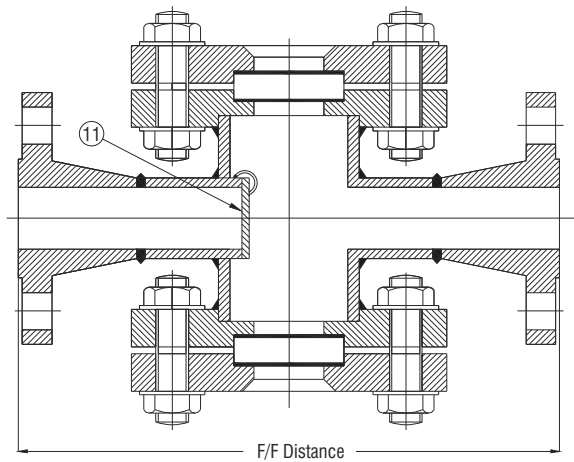
- |                  |                 |
|------------------|-----------------|
| 1 Body           | 7 Cushion       |
| 2 Process Flange | 8 Glass         |
| 3 Glass Holder   | 9 Flapper       |
| 4 Cover Plate    | 10 Drip Tube    |
| 5 Fastener       | 11 Rotary Wheel |
| 6 Gasket         |                 |



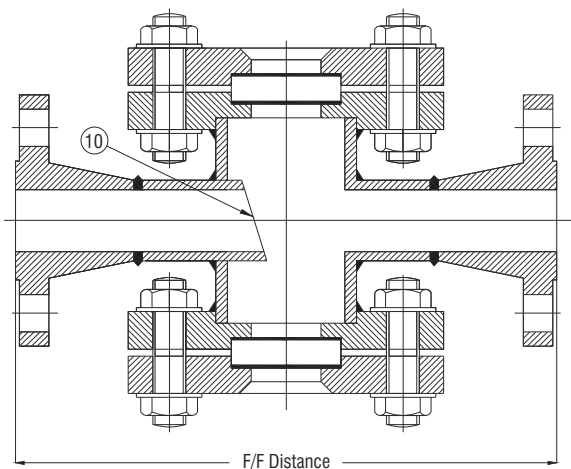
Double Window - Plain



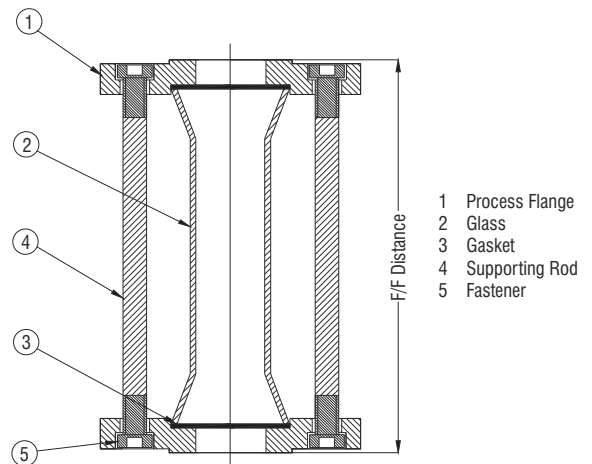
Double Window - Rotary Wheel



Double Window - Flapper



Double Window - Drip Tube

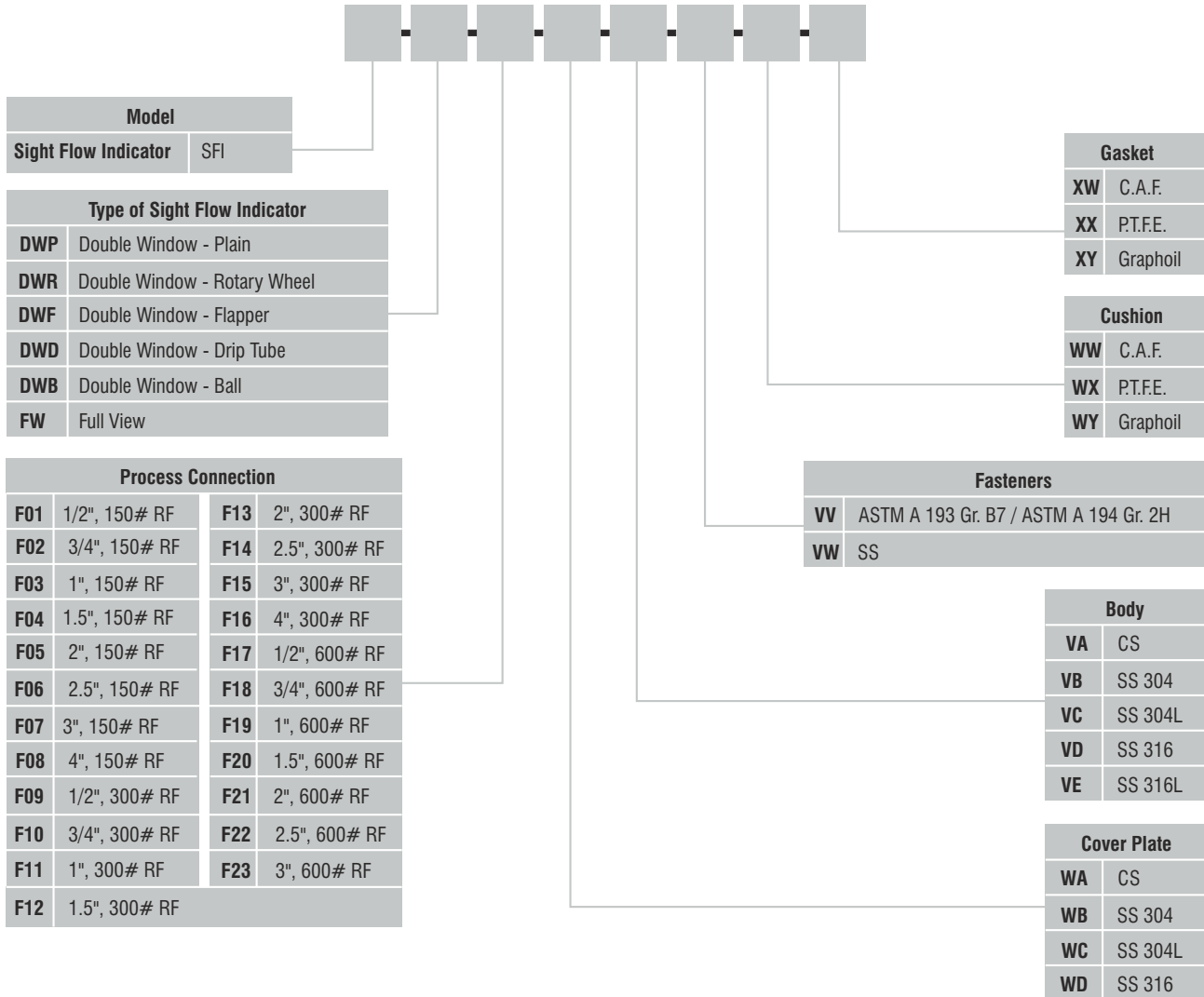


Full View

**G A Drawing for assembly and mounting**

# Ordering Information

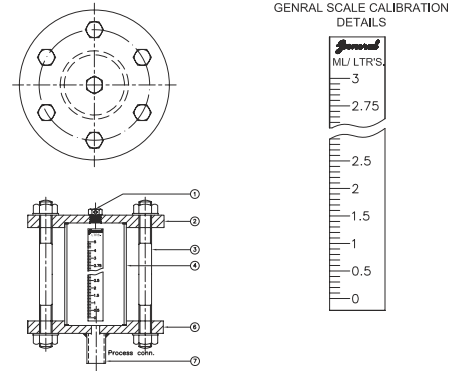
## SFI DWP-F01-WA-VA-VV-WW-XW



# Calibration Pots



*General* Calibration Pots provides a fast, easy and economical means of checking the flow rate of chemical metering pumps. The most accurate test of metering pump flow rate is to measure drawdown rate on the suction side, while leaving the discharge undisturbed in its normal steady state operating condition. Pump flow rate verification on a periodic basis or after maintenance is important to system accuracy.

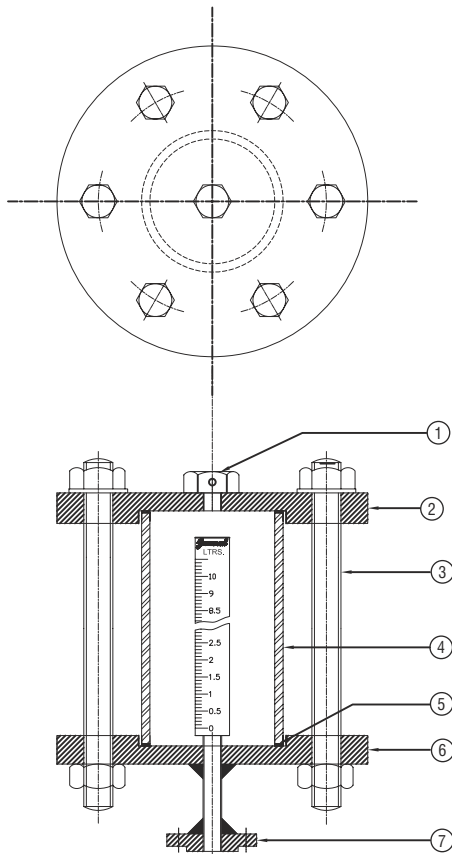


## Features

Rugged metal frame construction with top and bottom plate, and fastened with tie rods. Shielded glass / Acrylic model available for acids and strong chemicals. Calibrated scales were protected from harsh chemicals by lamination on both sides.

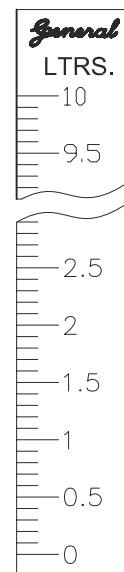
### Specifications:

- Available with screwed or flanged connection
- MOC - C.S. / SS 304 / SS 316 / Solid Acrylic or PP / HDPE / U-PVC / C-PVC / PP-H / PTFE / PVDF
- Measuring Cylinder: Borosilicate Glass / Plexi Glass
- Connection Size: 15NB to 50NB Flanged type, 15NB to 25NB Screw type
- Capacity - 50ml to 105000ml



- 1 Vent Plug
- 2 Top Cover
- 3 Hardware
- 4 Cylinder
- 5 Gasket
- 6 Bottom Cover
- 7 Process Inlet Conn

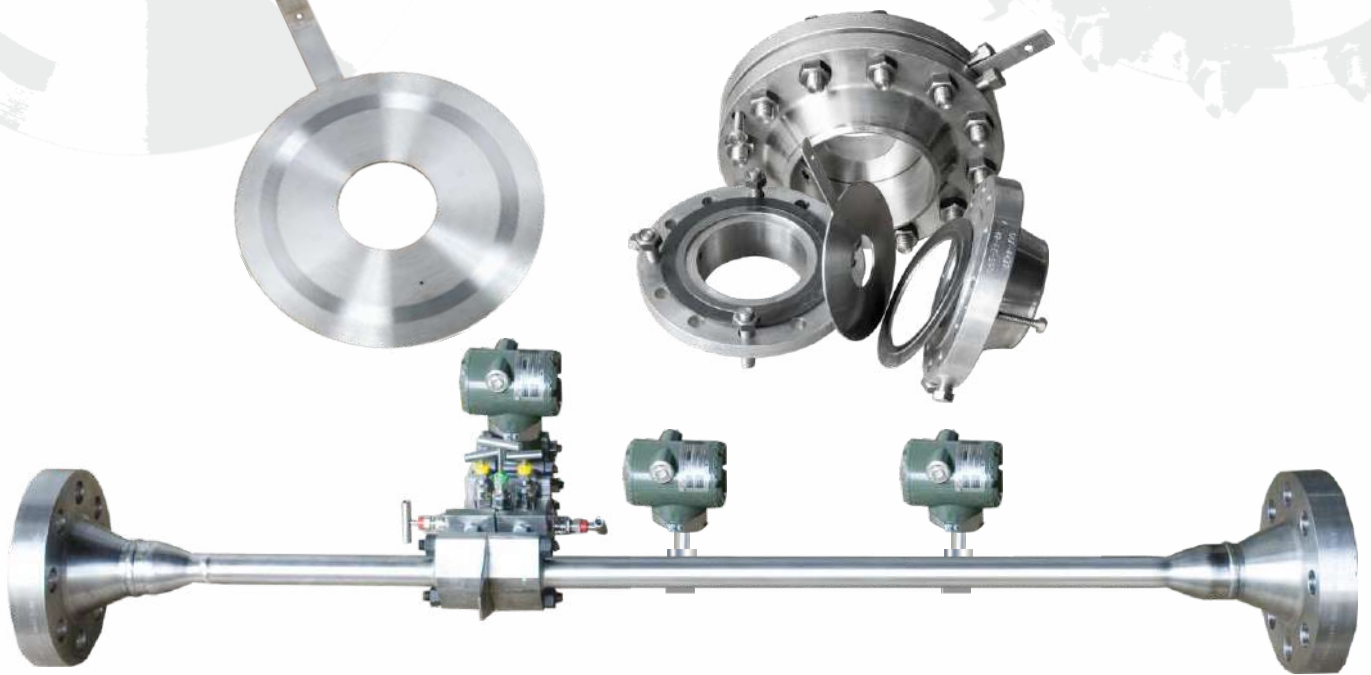
### GENERAL SCALE CALIBRATION DETAILS



# Pressure & Temperature Chart for our Liquid Chambers



Material and nominal pressure	Temperature in deg cent and operating pressure in bar g (below are the indicative max operating pressure) Hydro test with water can be performed at 1.3 times the max pressure or 1.5 times the normal pressure																
		-150 deg cent & below	-100 deg cent	-50 deg cent	20 deg cent	100 deg cent	120 deg cent	150 deg cent	200 deg cent	250 deg cent	300 deg cent	350 deg cent	400 deg cent	450 deg cent	500 deg cent	550 deg cent	600 deg cent
	ANSI																
<b>Forged Carbon steel (-10 to +400)</b>	150				16	16	16	14.8	14	12.8	11	10	9.2				
	300				40	40	40	36.9	35	32	28	24	23.1				
	600				64	64	64	55.3	50	45	40.6	37.8	36.4				
	900				100	100	100	87.5	80	71.1	64.4	60	57.8				
	1500				160	160	160	141.3	130	113.8	103	96	92.5				
<b>Forged carbon steel for low temp application (-100 to +300)</b>	150		16	16	16	12.8	12	9	7	5	5						
	300		40	40	40	32	32	30.4	28.8	28	27.2						
	600		63	63	63	50.4	49	47.8	45.3	44.1	42.8						
	900		100	100	100	80	76	74	72	70	68						
	1500		160	160	160	128	123	121.8	115.2	112	108						
<b>Forged carbon steel for high temp application (-10 to 600 deg cent)</b>	150																
	300				40	40	40	40	38	36.5	34	31.4	29.6	27.9	17.8	12	8
	600				63	63	63	63	60	57.6	53.6	49.4	46.7	43.9	28	16	11
	900				100	100	100	100	95.2	91.4	85	78.5	74.1	69.8	44.5	27	16
	1500				170	170	170	160	152.3	146.2	136.1	125.6	118.6	111.7	71.3	35	21
<b>Forged SS316 (-10 to +550 deg cent)</b>	150				16	15.5	14	13.8	12.3	11.4	10.5	10.1	9.6	9.2	9.	8.7	
	300				25	24.2	22.5	21.7	19.2	17.8	16.4	15.7	15	14.5	14	13.5	
	600				40	38.8	35	34.8	30.8	28.5	26.2	25.1	24	23	22	21	
	900				63	61.2	57	54.9	48.6	45	41.4	39.6	37.8	36	34	32	
	1500				100	97.1	90	87	77	71	65	62	60	55	51	46	
<b>Forged SS304 (-200 to +300 deg cent)</b>	150	16	16	16	16	15.3	14	13.6	12	11.2	10.5						
	300	25	25	25	25	24	22.6	21.3	18.7	17.6	16.5						
	600	40	40	40	40	38.4	36	34.2	30	28.2	26.4						
	900	63	63	63	63	60.4	55	53.6	47.2	44.4	41.5						
	1500	100	100	100	100	91.5	84	81.5	71.5	67.2	62.9						
<b>Forged SS316L (-200 to +450 deg cent)</b>	150	16	16	16	16	13.3	12	11.2	10.5	10.2	8.4	6.5	5.5	4.6			
	300	40	40	40	40	38.8	36	34.8	30.8	28.5	26.2	25.1	24	24			
	600	83	83	83	83	69.6	62.8	58.3	54.9	54	52	50	46	44			
	900	124	124	124	104.4	94.2	87.5	83	82.4	78.2	75.2	69.6	67.9	66.8			
	1500	190	190	190	170	155	145	140	137	130	125	115	113	111			
<b>Forged SS304L (-200 to +500 deg cent)</b>	150	16	16	16	16	15.2	14	13.9	12.6	11.3	10	9.6	9.1	9.1	9.1		
	300	40	40	40	40	38.1	36	34.9	31.6	28.3	25	24	22.9	22	20		
	600	63	63	63	63	60.1	56	54.9	49.8	44.6	39.5	37.8	36	34	32		
	900	100	100	100	100	91	85	83	75.9	67.6	59.8	57	54	51	45		
	1500	150	150	150	150	136.8	130	125	113	101	89	86	82	79	75		
<b>Titanium (-100 to +300)</b>	150		16	16	16	16	16	15.6	14	13.2	12.5						
	300		25	25	25	25	25	25	22	19	18						
	600		40	40	40	40	40	36	34	32	30						
	900		63	63	63	63	63	58	53	50	48						
<b>Hastealloy (-10 to +400)</b>	150				12	12	12	10.8	9.6	8.2	6	5	4.2				
	300				31	31	31	27.9	26	23	19	15	14.1				
<b>Monel (-20 to +400)</b>	150				14	14	14	12.8	12	10.8	9	8	7.2				
	300				35	35	35	31.9	30	27	23	19	18.1				
<b>PolyPropylene (-50 to +100)</b>	150			10	9	8											
	300			12	11	9											
<b>PTFE (-120 to +135)</b>	150		10	10	10	9	7										
	300		12	12	12	7	5										



# FLOW ELEMENTS



**General Instruments** - A name recognized worldwide as a synonym for high-quality work, entrepreneurial spirit and innovative strength. We are not only known for a complete product line in instrumentation and controls, but also offer the most modern integrated automation systems. Our field of expertise extends from applications in the largest chemical plants to oil and gas, power, offshore platforms, refineries to applications in Cryogenics and high temperature zone. **General** operates wherever there is controlled flow of vapors, gases and liquids.

The history of **General** is filled with the spirit of invention. The company was founded by Capt. Manohar Kulkarni in the year 1966 making the oldest family venture as today's largest process control instrumentation organisation. His first patent marked the beginning of a development which still today represents one of the company's main product lines.

The Mumbai headquarters and the affiliated companies worldwide employ and train over 1000 people to become highly skilled specialists with a genuine commitment to the company.

The reason for this loyalty to the company can be found in the sound working environment. There are still old ties between the descendants of the original owner and many of the employees whose average length of service exceeds 30 years. The progressive, yet traditional management team is committed to the name General, and the quality in technical competence and partnership it stands for.

Introducing, one of the most critical product lines in the **General** Manifold is the flow measuring and control elements. With its marked precision and technical know how, the state of art measuring and control elements are manufactured to meet all most critical applications in flow sensing and control.

## Your Applications and Our Products - The Perfect Match

### Chemical & Petrochemicals



As a main vendor, for process control instruments, we provide a comprehensive product range for chemical processes: from valves in modular design made of all common materials and exotic alloys according to DIN, ANSI and JIS to high-pressure and low pressure multistage assemblies, averaging pitot tubes and orifice assemblies all complying with important company standards. Forged bodies, live-loaded packings, metal bellows, pressure-balanced plugs, heating jackets as well as corrosion-resistant, valve trims for control valves, temperature and pressure compensated integral assemblies and temperature compensated averaging pitot tubes and bidirectional averaging pitot tubes are included in our product portfolio for this field.

We also provide solutions for highly specialized tasks, such as cryogenic applications, aseptic processes and tank blanketing. Round off our product range. Smart instruments including our communication-enabled transmitters for flow, pressure and temperature transmitters for compensation techniques allow efficient asset management and predictive maintenance.

### Food and Beverages



Perfect hygiene is essential in the food industry. As a result, the aseptic orifice flow elements with temperature and pressure compensated integral assemblies manufactured by General are tailored to the highest requirements applicable to food processing.

They ensure low-germ and sterile processes; the materials and designs used comply with the stringent FDA regulations. Of course, our valves can also be fitted with all common connections, such as flanges, hygienic couplings, Tri-Clamp® connections or welding ends. General is working on all and various application for product upgradations in field of control applications

Our sensor and level transmitters and flow transmitters combine vibration resistance and measuring accuracy with quick response times. They also meet the highest aseptic standards and are suitable for CIP (cleaning-in-place) and SIP (sterilization-in-place).



## Life Sciences and Pharmaceutical



When Producing Drugs Or When using enzymes, cells and microorganism for technical purposes, any contamination could pose a risk to the final result of the process. Control engineering and equipment from General, establish the right conditions for safe processes thanks to the tailor-made integral assemblies which works under the principle of constant Reynolds number. The pressure and temperature compensation further adds to the regularity of production maintaining the correct dosing of the medicines. Critical heart attack dosage are the best example of maintaining the temperature related processing by integral assemblies.

To meet the high requirements stipulated in the regulations, our control valve bodies are made of stainless steel and so are our flow elements. All wetted surfaces are precision-turned or polished. Additional electro polishing is used to achieve surfaces with glossy or high-gloss finishes, which reduces the surface roughness to no more than 0.25  $\mu\text{m}$ . The valve bodies, integral assemblies, orifice assemblies, metre run assemblies are free of cavities and suitable for CIP (cleaning-in-place) or SIP (sterilization-in-place).

EPDM and PTFE diaphragms are used to shut off the valve towards the actuator and the atmosphere. End connections are available as either detachable or fixed for all flow elements and valve applications. Exact dosing and proportioning, which are indispensable in this sector, are ensured by the high control accuracy characteristic of all our products.

## Oil and Gas



The oil and gas sector supplies the fuels and lubricants used in everyday life. Extraction and processing of the raw materials often occur under rough conditions, particularly if they take place in extreme climate zones or offshore. This calls for particularly reliable and corrosion-resistant instruments with a long service life. The products from General Instruments are perfectly tailored to these requirements.

Our control and flow elements equipment is installed in upstream and downstream processes. We can supply orifice assembly, averaging pitot tube, multistage assemblies, modular control valves in various pressure ratings, materials and styles at short notice. The stainless steel versions of our process flow elements and valves, actuators also withstand the severest offshore conditions. In addition, highly resistant materials are available for installation on FPSO (Floating Production, Storage and Offloading) units or drilling rigs. For LNG (Liquefied Natural Gas) applications on shore and on tankers, we offer special cryogenic equipment to meet all safety requirements.

We develop and produce highly specialized series for unusual control tasks. In addition, we provide tailored multistage and orifice and valves to meet the specific requirements defined by the customer.

## Power Plants



Power plants produce the most important "raw material" for a properly functioning economy and society: electricity. General Instruments supplies the necessary control equipment, from simple control valves, high-quality multistage assemblies and averaging pitot tubes, orifice assemblies for feed water and minimum flow recirculation valves to steam pressure reducing stations with integral assemblies and multistage assemblies. High-pressure and low-pressure bypass stations valves as well as spray and steam atomizing desuper heaters with our special pressure and temperature compensated integral assemblies round off our product range for the energy sector.

Valve designs include globe, in forged versions that can be fitted with either flanges or welding ends. Our actuator range comprises pneumatic, electric and hydraulic actuators that can be controlled conventionally or equipped with state-of-the-art bus technology conforming to HART®, FOUNDATION™ fieldbus or PROFIBUS specifications. Depending on the pressure drop to be handled, single-stage or multi-stage assemblies, with noise reducing and removal of choking, are used.

## Paper Industry



Paper remains indispensable, even in the electronic age. When making pulp and processing it further to get paper, large flows of media must be routed through the individual production steps in a defined time sequence. General instruments has the right control and measuring technology for this field.

Our products ensure efficient processes during the mechanical and chemical treatment of the pulp. Thanks to their high control and measuring accuracy, the fresh water required for the processes is used economically and waste water treatment does not burden the environment or resources.

In the paper machines, our products are involved in the entire steam and condensate system, the exact control of the basis weight and humidity profile as well as the optimum drying of the paper webs. Innovative flow measuring accessories, such as our smart flow transmitters for integral attachment, ensure the safe exchange of data in the process and allow for predictive maintenance.

## Mining Industry



Mining provides a large proportion of the raw materials needed for modern technologies. General Instruments supply the averaging pitot tubes, integral and orifice assemblies and multistage assemblies to regulate and control valves required in deep mining to vent, cool and drain shafts.

Our control valves also play an important role in the extraction of metals. Where mechanical separation processes no longer suffice, the metal is leached with the help of chemicals. To do so, ground ore is mixed with different liquids. Usually, the created slurries are highly abrasive and corrosive. Controlling them requires equipment that functions reliably even under the most adverse conditions and requires minimum maintenance.

Our multistage and orifice assemblies used in these applications, They not only withstand corrosive solutions and the strong abrasion, they are also resistant to the heavy vibration found at many places in the huge plants.

In addition, the valves fulfil ecologically relevant control tasks in recovering and treating the water used. Innovative smart accessories, such as our smart flow transmitters for integral attachment, ensure the safe exchange of data in the process and allow for predictive maintenance.

## Information on physics of designing General's Orifice assembly

**General** Instruments orifice plate is a device used for measuring flow rate. Either a volumetric or mass flow rate may be determined, depending on the calculation associated with the it. It uses the same principle, namely Bernoulli's principle which states that there is a relationship between the pressure of the fluid and the velocity of the fluid. When the velocity increases, the pressure decreases and vice versa.

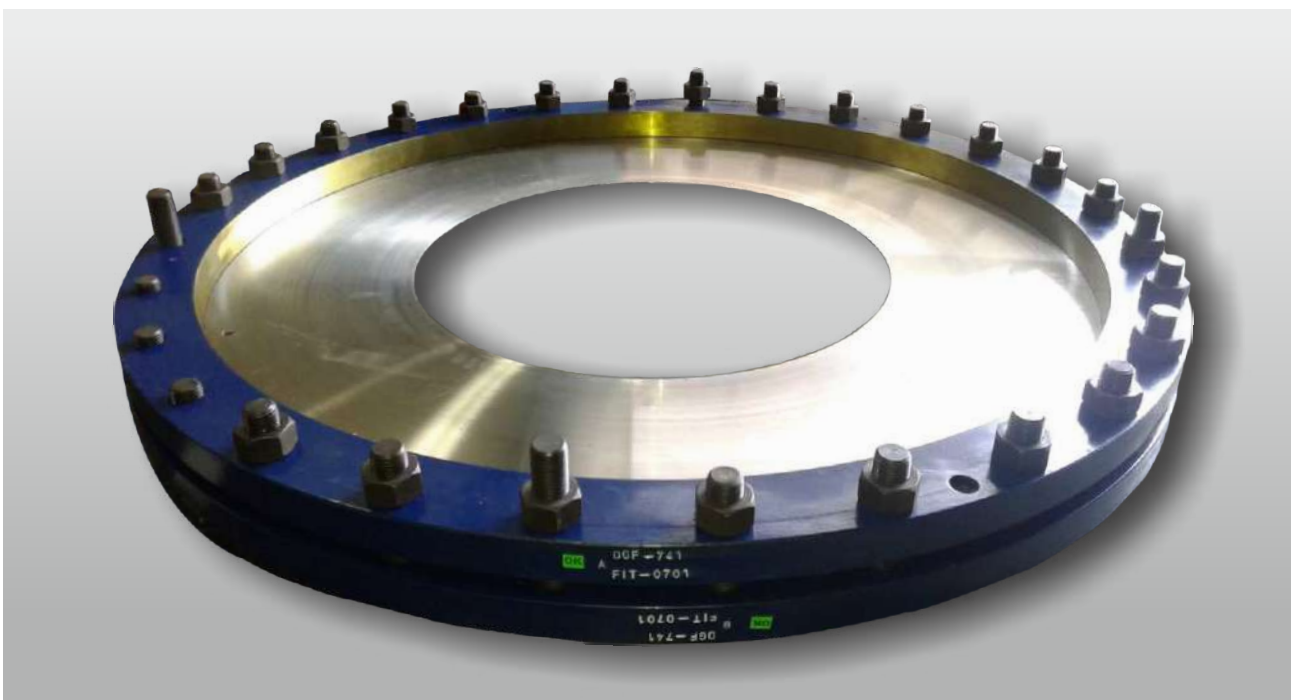
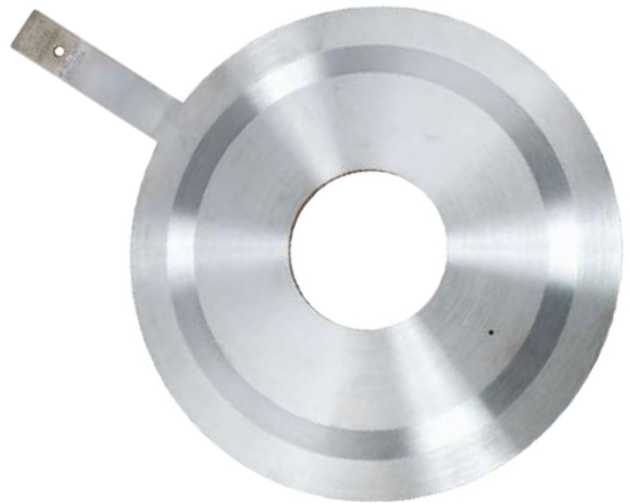
### Description

**General**'s orifice plate is a thin plate with a hole in the middle or edge depending on design as per application. It is usually placed in a pipe in which fluid flows. When the fluid reaches the orifice plate, the fluid is forced to converge to go through the small hole; the point of maximum convergence actually occurs shortly downstream of the physical orifice, at the so-called vena contracta point. As it does so, the velocity and the pressure changes. Beyond the vena contracta, the fluid expands and the velocity and pressure change once again. By measuring the difference in fluid pressure between the normal pipe section and at the vena contracta, the volumetric and mass flow rates can be obtained from Bernoulli's equation.

### Orifice assemblies manufacturing std. as per ISO 5167, AGA-3, and as per B16.5, B16.47, B16.36

Orifice plates are most commonly used primary elements for flow measurement in pipelines based on the principle of measurement of 'differential pressure' created when an obstruction is placed in the fluid flow, due to increase in fluid velocity.

Orifice Plates cover a wide range of applications of fluid and operating conditions. They give an acceptable level of uncertainties at lowest cost and long life without regular maintenance.

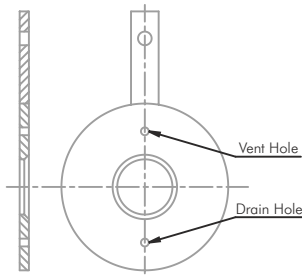




## Types of Orifice Plate

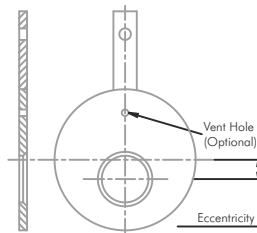
We manufacture orifice plates, restriction orifice plates, with or without carrier ring, meter run assemblies, integral orifice plates to suit customer's requirements.

We have fully equipped integrated designing, manufacturing and testing facilities which are among the best in country. Over the years we have manufactured and supplied orifice plate assemblies to many prestigious projects in the domestic as well as international market.



**Square Edged Concentric**

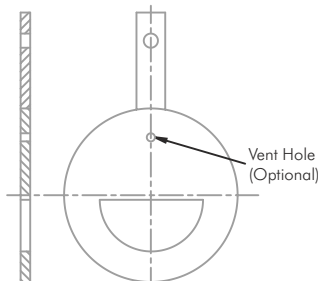
These are most commonly used for flow measurement. This has special features such as simple structures, high accuracy, and ease of installation & replacement. The orifice plates are correctly finished to the dimensions, surface roughness, and flatness to the applicable standard. These plates are recommended for clean liquids, gases & steam flow, when the Reynold number 75000.



### Eccentric

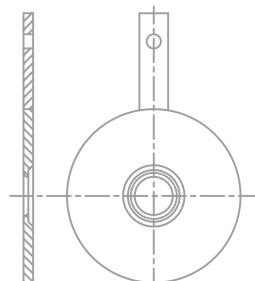
For liquids containing solid particles that are likely to sediment or for vapors likely to deposit water condensate, this orifice plate is used with its eccentric bore bottom flush with the bottom of the piping inside surface so that the sedimentation of such inclusions are avoided. Likewise, for gases or vapors, it may be installed with its eccentric bore top flush with the ID of the piping to avoid stay of gas or vapor in its vicinity.

Type of orifice plate	Reynolds	Application	Viscosity @ 30°C
Square edge concentric	5000 onwards	For all applications with clean of foreign particles	0.01cp to 10cp
Conical entrance	80 to 1500	High viscosity measuring capacity leading to ruling off application which requires accuracy at lowest reynolds, thus effectively rid off applications of magnetic and vortex	0.01cp to 150cp
Eccentric	3000 to 12000	For liquids containing solid particles that are likely to sediment or for vapors likely to deposit water condensate, also used for bottom flush application	0.01cp to 15cp
Quadrant edge	1500 to 9000	Viscous fluids and all and most for Fertilizer and petrochemicals	0.01cp to 40cp
Segmental	5000 to 20000	Sedimentation process application	0.01cp to 20cp



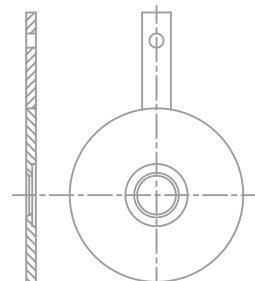
### Segmental

Segmental orifice plates are most useful where there are substantial entrained water or air and also if there are suspension in the fluids. This avoids build up in front of the orifice plate. The orifice hole is placed at the bottom for gas service and top for liquids.



### Quadrant Edge

The inlet edge of the bore of this orifice plate is rounded to a quarter circle. This orifice plate is usually used for viscous fluids & Reynolds number between 1500 to 9000.



### Conical Entrance

These conical entrance orifice plates are used for low Reynolds number in the range of 80 to 1500 and give more constant or predictable discharge coefficient. At lower Reynolds numbers, the discharge coefficient of square edge orifice plate may change by as much as 30%. These are more usable for viscous service.

## General's Orifice Performance

Principally, *General's* orifice plate is a precision instrument. In best circumstances, the inaccuracy of Orifice plates can possibly fall in the range of 0.75-1.5%. However, there are numerous error causing conditions which can terribly affect the accuracy of General's Orifice plate.

Following factors are used to judge the performance of Orifice plate:

1. Precision in the bore calculations
2. Quality of the installation
3. Condition of the plate itself
4. Orifice area ratio
5. Physical properties of the fluid flow under measurement, refer the free length table mentioned below

### Further class of installation depends upon following factors

- Tap location and circumstance. Generally, there are three ways to position a pressure tap.
- Provision of the process pipe
- Competence of straight pipe runs
- Gasket intervention
- Misalignment of pipe and orifice bores

### Extra detrimental conditions consist of

- Dulling of the sharp edge or nicks caused due to corrosion or erosion
- Warpage of the plate because of waterhammer and dirt
- Grease or secondary phase deposits on any of the orifice surface

Any of the above said conditions has the tendency to affect the discharge coefficient of an orifice plate to a large extent.

## Orifice Plates

### Specifications

Design: Conforms to DIN 1952, BS 1042, ISO-5167

Types: Square edge concentric, Quadrant edged, Conical entrance, Eccentric, Segmental

Plate material: SS304, SS316, SS316L as standard. Hastelloy-C, Monel, PP, PVC, PTFE coated, etc. can be given on request.

Orifice Bore: In accordance with ISO-5167, BS-1042, ASME MFC 3M, R.W.Miller, L.K.Spink, AGA-3

Tab Plate: In the same material as plate & is welded to orifice plate. Tab plate integral to the Orifice plate (i.e. without welding) can also be offered as a special case.

Vent / Drain: Vent or Drain holes are provided as per customer's requirement. The diameter of the vent or drain holes are as per General's standard (Refer Annexures)

Flange Union: Weld neck, Slip on, Threaded, Socket welded with RF or

RTJ facing - Orifice flanges are in accordance with ASME B16.36 with minimum flange rating of 300# for sizes up to 8" or male - female flanges in accordance with ASME B16.5, ASME B16.47 series A/B.

Pressure Tappings: Corner tappings are recommended for sizes upto 1 1/2"; Flange taps from 2" to 16"; D - D/2 taps for higher sizes.

Gasket: CAF as per IS: 2712 Gr 0/1, SS spiral wound + CAF, SS spiral wound + Grafoil, SS spiral wound + PTFE are normally supplied as per process requirement. Other materials available on request.

For RTJ flanges the plate is fixed on the plate holder. The plate holder softer than flange & acts as a gasket.

Studs / Nuts: ASTM A193 Gr.B7/A-194 Gr.2H as standard, Other material on request.

Jack Screw: ASTM A193 Gr.B7 as standard, Other material on request.

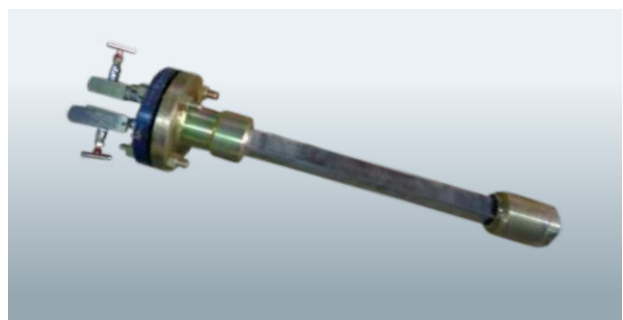
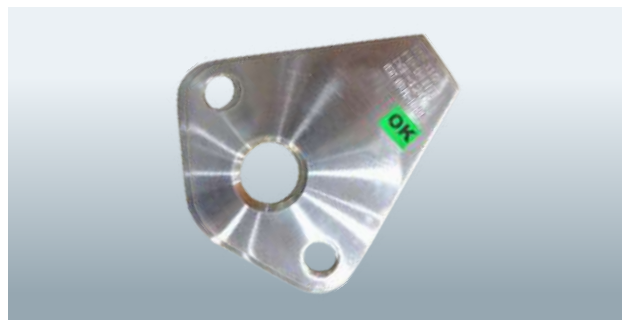
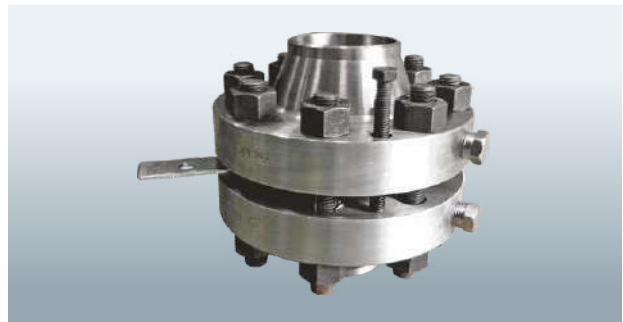
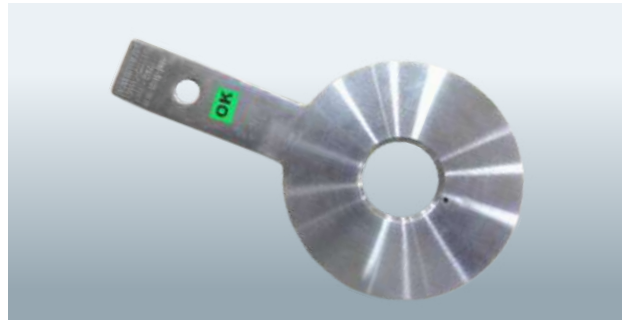
## Other temperature and pressure combinations and your solutions, please revert to General Engineering and design team

<b>Orifice assembly size and rating</b>	1/2" to 64", and rating 150# to 2500#
<b>Plate thickness defined</b>	3.18, 6.35, 9.52, 12.7 as standard and other on request
<b>Fastners</b>	A193GrB7/ A194Gr2H and A193GrB8/ A194Gr8
<b>Flanges MOC</b>	SS316, A105, A182F11, A182F22, PP, PTFE, SS316L, SS304, SS304L, Hastelloy, Monel
<b>Flanges type</b>	Weld Neck, Slip on Socket Weld with RF/RTJ Facing
<b>Orifice plate MOC</b>	SS316, PP, PTFE, SS316L, SS304, SS304L, Hastelloy, Monel



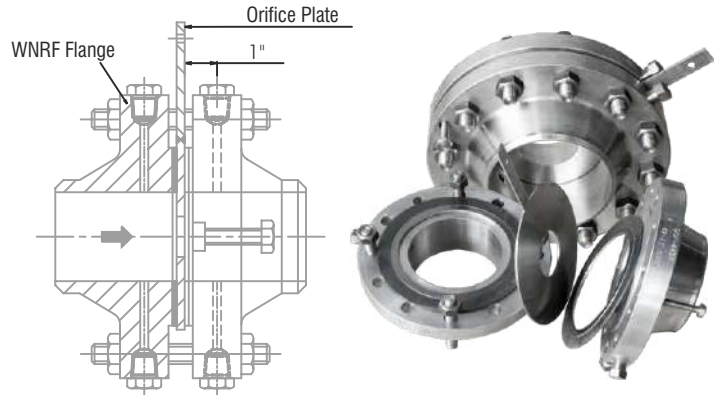
## Sizing and selection of Flow Elements, Orifice & Averaging Pitot Tube.

1. Media
2. Media pressure
3. Media density
4. Media temperature
5. Media viscosity
6. Pipe size
7. Flow rate thru pipe
8. Velocity defined for liquid at 6m/sec, for gas max upto 40m/sec, and steam upto 60m/sec
9. For higher differential pressure to be maintained, refer for either flow measurement or for pressure killing application
10. If for pressure killing, select restriction plates
11. Single and multistage will be defined based on the choking condition is, depending on flow rate
12. To control noise please consider multistage
13. To control and remove choking, consider multistage only
14. To practice higher efficiency of plant for pure gas and liquid applications, prefer averaging pitot tube
15. Multiport averager helps you with most precise and higher flow recovery coefficient
16. Higher flow recovery means low upstream and downstream free length
17. For solid laden liquids and gasses prefer our direct acting orifices, segmental and eccentric design plates
18. For high viscous medias prefer conical entrance type
19. With integral assemblies we offer most required processes medias for cold box applications



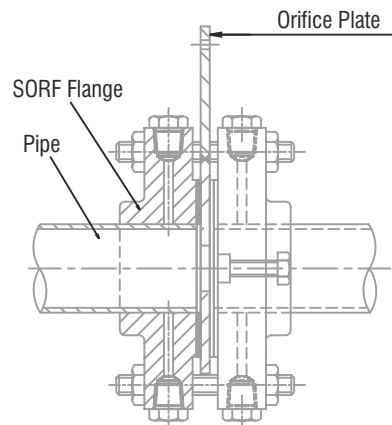
## Various types of orifice assemblies

- The weld neck flange assembly is designed to transfer stresses to the pipe, thereby reducing high stress concentrations at the base of the flange. The pressure tappings are provided through the flange which are at a distance of 25.4mm (1") from the relevant face of the plate. Weldneck flanges are preferred since the joint between flange and pipe can be subjected to radiography, to ensure quality of welding joint



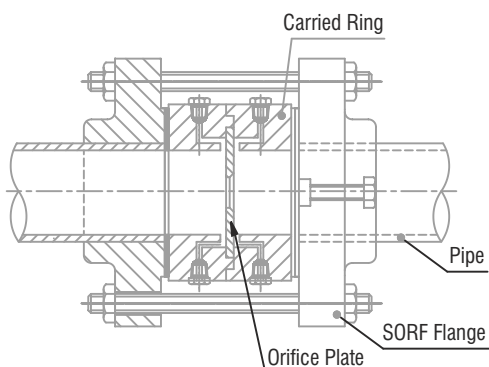
**Orifice Assembly with WNRF Flange & Flange Taps**

- The slip on flange has a low hub because the pipe slips into the flange prior to the welding. It is welded both from inside and out to provide sufficient strength and prevent leakage. The slip on flanges are bored slightly larger than the OD of the matching flange. SORF flanges are not preferred where pressure tapping through flange is required, since after welding in line blocks the tapping holes which need to be drilled at site after welding in line.



**Orifice Assembly with SORF Flange & Flange Taps**

- Orifice assembly with carrier ring and flange union is provided to facilitate pressure tapping, by means of corner tappings. This construction is generally used for lower sizes (less than 2"). However carrier rings can be used for higher line sizes also.



**Orifice Plate with Carrier Ring & Flange Union**



**Carrier Ring**



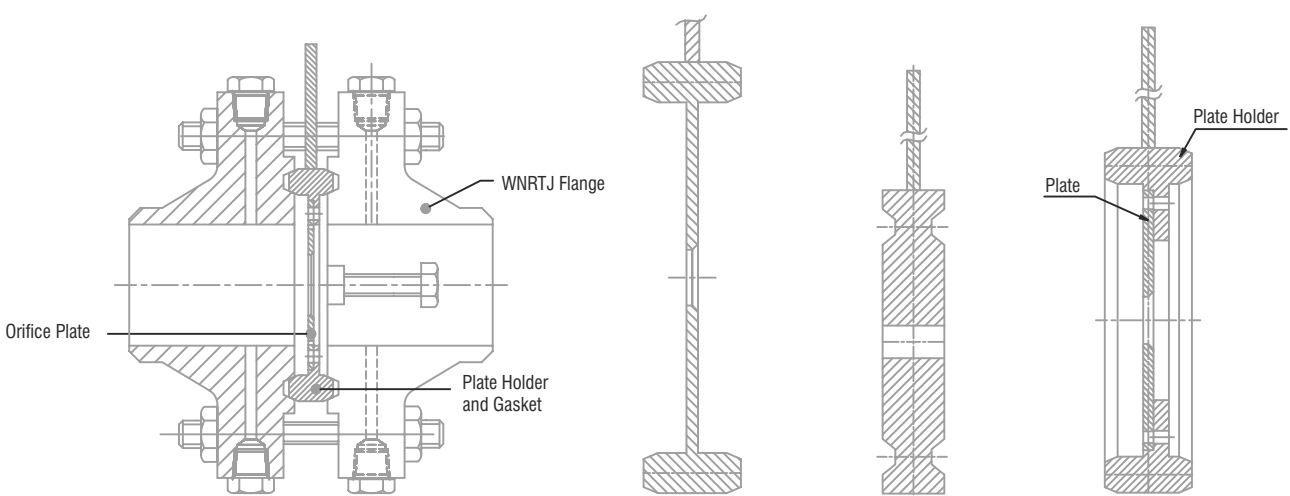
# Orifice Plate Assembly



The Plate Holder Assembly is a combination of plate holder and an orifice plate designed for ring tongue joint (RTJ) flanges. The plate holder has a function of holding the orifice plate and also a function as a gasket to prevent leakage of the process fluid. The plate holder has an oval or octagonal ring for mounting between ring tongue joint flanges. This metallic sealing system is applicable to a fluid of high temperature and high pressure. The pressure tapping system normally is of the flange tap type.

Orifice plate is screwed to the plate holder. Generally the plate holder is of soft iron material. The Orifice plate is available in standard material such as SS316, SS304, SS316L, Monel, Hastelloy-C, etc. Other materials are available on request. The plate holder along with the orifice plate can be also machined from one piece.

RTJ holder material is selected so that the RTJ holder hardness is less than that of flange hardness.



**Plate with Plate Holder mounted in between RTJ Flanges**

**Integral RTJ**

**Integral RTJ with Female Groove**

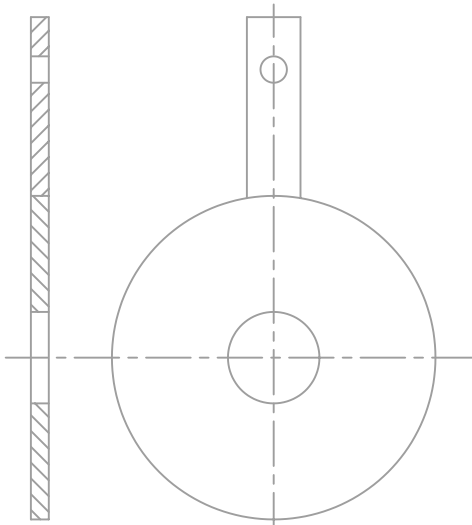
**Orifice Plate with RTJ Holder**

# Single / Multistage Restriction Orifice Assemblies



## General's Restriction orifice plate and its assemblies

The restriction orifices are used for reducing fluid pressure and are designed somewhat different from the orifice plates that are used for measuring flow rates. They are designed to slip between the piping flanges.



**Single Stage Restriction Orifice**



**Multiple Restriction Orifice Assembly**

While single restriction orifices are often sufficient to meet the requirements, there are situations where limitations arise due to process conditions making the single restriction orifices unacceptable. In such situations, use of multiple restriction in series is a better solution.

The foremost consideration for the case of multiple restriction is the pressure drop. This applies whether or not the fluid is liquid or vapor/gas. Higher pressure drop implies higher velocities resulting in vibration and noise problems.

The other consideration is not just about maximum permitted pressure drop and this is particularly for gas flow. If the process condition indicates that critical flow will occur with the use of single restriction plate, care should be exercised to avoid operating well beyond the critical pressure drop. Critical implies a pressure drop across the device exceeding 50 percent of the absolute upstream pressure at which point sonic velocity is reached.

Construction of Multistage Orifice Assembly comprises of multiple restriction orifice plates separated by a distance of one pipe diameter and welded with the pipes in between them. End connection is either suitable for butt welding or with end flanges. IBR Form IIC certificate can be provided as per requirement.

# Single / Multistage Restriction Orifice Assemblies



Standard as per R.W. Miller / ISO5167, AGA-3.

**General Instruments manufactured multistage orifice assemblies** are another type of measuring flow with high differential pressure meters effectively removing cavitation and flashing conditions. It also helps in killing pressure and thus effectively acting as a pressure reducing element. These are basically used to detect flow of fluids, gasses, steam, steam water, acids, alkalies, crudes, high viscous fluids, fluids with solid particles, condensation liquids. General make of multistage assemblies lead to a precise measure of differential pressure leading to the most precise flow rate taking care of all factors of fluid cavitation related to its vapour pressure. The design is applicable from 1/2" to 64" of flow measurement. For higher sizes of impact and pressure reducing kindly do contact the design and engineering team of General. It is measured at right angles to the flow direction, In a averaging General make Multistage assemblies the kinetic energy of the flowing fluid is transformed into potential energy for measurement of fluid flow velocity by effectively abruting to 40% recovery in between two stages and thus, effectively removing the choking content of the fluid in gas and steam and removing cavitation in especially liquid state thus essentially reducing industrial noise and restricting to below 80 decibels.

## Applications

- Gas and Liquid Flows
- High Pressure Drops

## Prevents

- Cavitation and Flashing in Liquid flows
- Choked flow in gases.
- Excessive Noise / Vibration

Restriction orifice plates have traditionally been used to reduce pressures in GAS AND LIQUID FLOWS by forcing the flow through a restricted bore. The precise pressure drop is produced by accurately calculating the orifice bore, having taken into account all the relevant process and flow conditions.

Where very HIGH PRESSURE DROPS in liquid flows are required MULTISTAGE RESTRICTION ORIFICE ASSEMBLIES may be required to achieve the desired pressure drop whilst preventing problems such as CAVITATION, FLASHING and high NOISE and VIBRATION levels.

CAVITATION is a potentially damaging, erosive condition which occurs when the internal pressure of the liquid passing through the orifice falls below its vapour pressure and vapour bubbles form. Further downstream from the orifice the pressure recovers sufficiently to collapse the bubbles with extreme violence. Cavitation calculations are performed during the design stage of a Multistage RO to calculate cavitation factors at each stage in the orifice assembly.

FLASHING is a similar phenomenon to cavitation except that the process pressure never recovers sufficiently to collapse the gas bubbles resulting in two phase flow - liquid and gas - downstream of the orifice. Erosion of pipe work and valves and other instrumentation can occur due to the impact of liquid droplets carried at high speed in the vapour flow.

CHOKED FLOW IN GASES - also know as critical flow - occurs when too large a pressure drop is attempted across a single orifice plate, or when too large flows are forced thru a lesser inlet pipe size. In such cases the flow through the orifice will become sonic, at which point no further increase in flow can be achieved by either increasing the upstream pressure or lowering the downstream pressure. General make multistage RO will enable staged reductions in pressure to prevent choked flow occurring.

General make Multistage ROs are manufactured from a wide range of materials and are engineered to meet specific project process conditions and requirements. Plates are usually welded into pipe with a separation of one pipe diameter, the number of plates and orifice bores being determined by calculation. Process connections to existing pipe work can be either standard process flanges or machined ends suitable for butt welding.

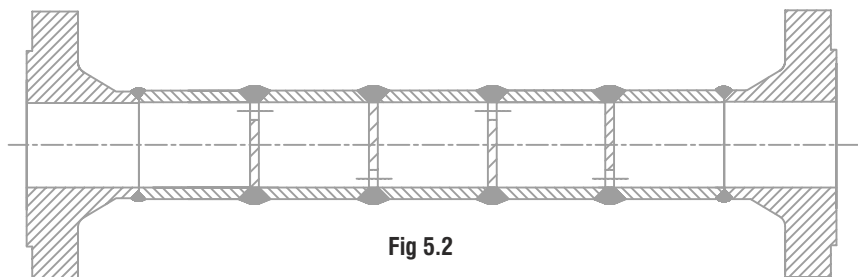


Fig 5.2  
Multiple Restriction Orifice Assembly

# Integral Orifice Assembly

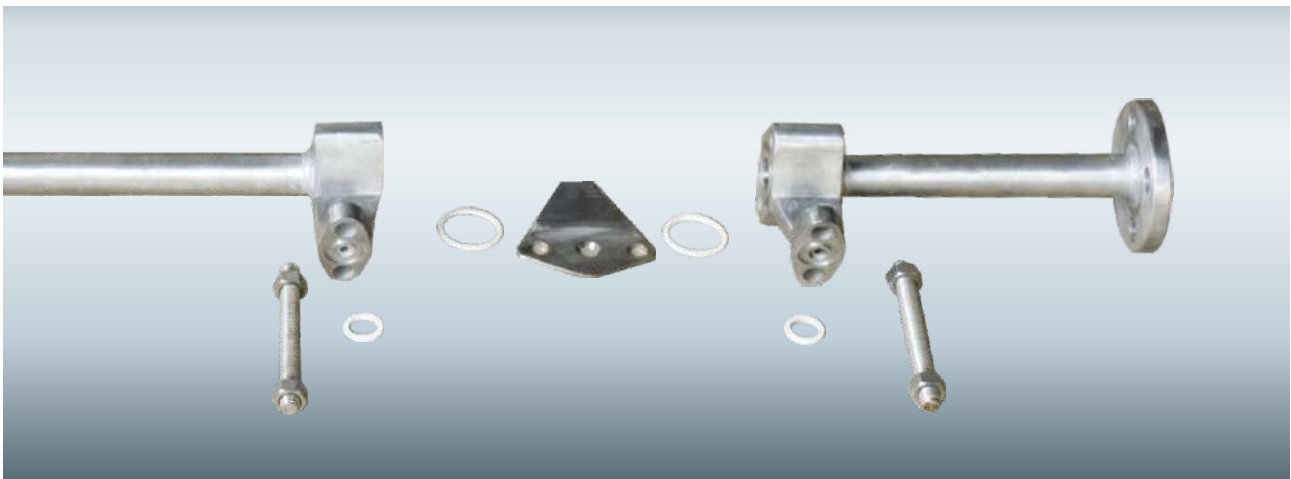
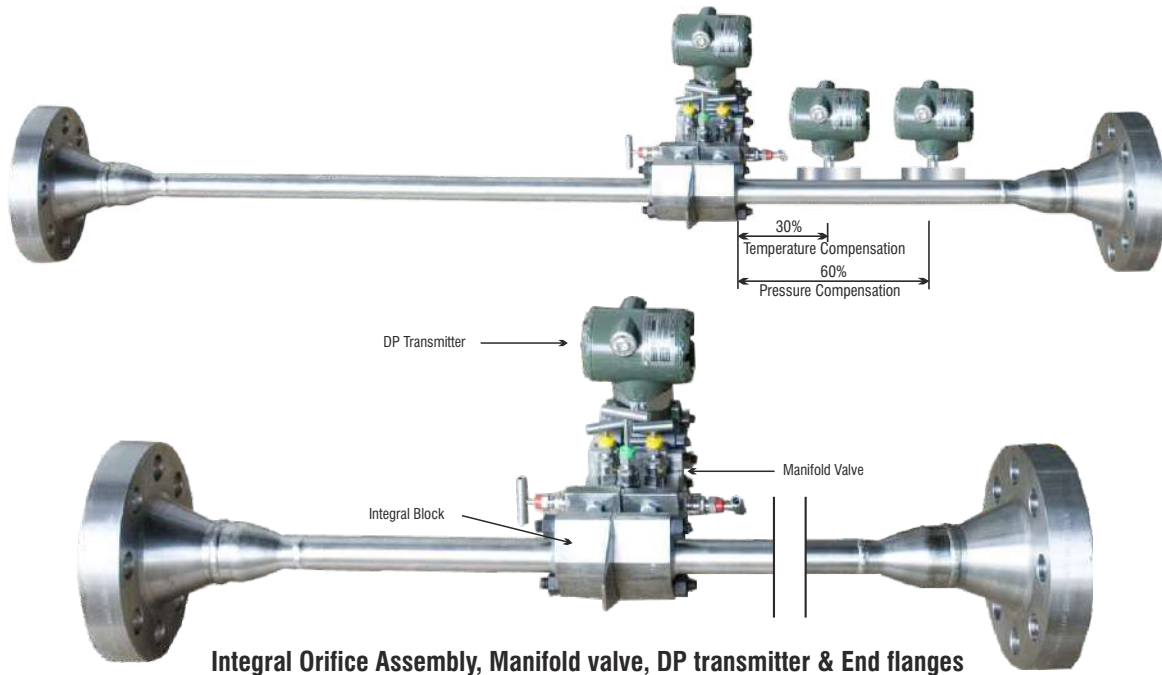


Integral assembly Std as per B16.5, B16.36, B16.47 Series B, ISO5167, AGA-3, ASME, MFC 14M 2003

**General** Instruments manufactured integral orifice assemblies are another type of measuring flow device, which caters to the principle of maintaining constant Reynolds number through out the process of media entering and processed and finally out of the assembly.

This is possible with the precision manufactured device wherein the input flange, with pipe chamber, the orifice assembly and the outlet pipe chamber and the subsequent flange for the flange end connection, all shall be attributed to constant Reynolds number.

We manufacture Integral meter run assembly upto 2".



## Advantages of using Integral Meter run assembly:

Use of an integral orifice flow meter will eliminate the three measurement inaccuracies recorded in small orifice line installations.

- The Integral Orifice honed body reduces ID uncertainty
- By inserting precision bored upstream and downstream sections of pipe, the velocity profile distortion due to pipe roughness is reduced.
- The self-centering design of the Integral Orifice Plate eliminates plate misalignment.

## Improves reliability and maintenance costs

The integral orifice flow meter eliminates impulse lines, reducing leak points by over 50% and decrease start-up time due to the flexibility of numerous process connection options. The direct mount design minimizes line plugging by eliminating long lines, small-bore ports, and crevices while providing consistently reliable installations.

- Accuracy up to  $\pm 0.5\%$  of volumetric flow rate.
- Integral manifold head allows direct mounting of DP transmitters.
- Ideal fluid types: liquid, gas, and steam.

# Meter Run Assembly



Meter runs are supplied as a complete unit of normally 1M length to ensure the necessary straight pipe length to achieve highest possible efficiency.

These are available with line sizes mostly below 50mm with corner tap. These are used for the measurement of small flow rates precisely where high accuracy of flow rates is required.

IBR Form IIC certificate can be provided for meter runs as per requirement.



## Types of Meter Runs:

1. Orifice Flange union with Meter - run.
2. Orifice flange union with Carrier ring & Meter - run.

Generally Meter-run pipe is recommended with upstream length of 750mm and downstream length of 250mm.

Meter runs sizes above 50mm are also available as per the customers or process requirements.

MOC: Orifice Plate in SS 316, SS 304 & other on request.

End Connection: Socket Weld, Screwed and Flanged ends with meter run piping suitable to ANSI, IS & DIN flanges

We comply Meter Tube Internal Diameter Roundness Tolerance, in strict accordance as per American Gas Association Report No. 3 Part 2.

Any internal diameter measured in distance one pipe diameter will be less than the 0.25% of the mean diameter for the upstream side.

$$\left| \frac{\text{Any diameter within one } DJ-D_{\text{mean}}}{D} \times 100 \right| \leq 0.25\%$$

Also the percentage difference between the maximum and minimum measured internal diameter through all upstream meter tube will be less than 0.5%

$$\left| \frac{\text{Maximum Diameter}-\text{Minimum Diameter}}{D_{\text{mean}}} \times 100 \right| \leq 0.5\%$$

For the downstream side any internal diameter measured will be less than 0.5% of the mean diameter for the downstream side.

$$\left| \frac{\text{Any downstream diameter } DJ-D_{\text{mean}}}{D} \times 100 \right| \leq 0.5\%$$



# Meter Run Assembly



## Specification:

Material of construction of pipe chamber	SS316, SS316L, A106, SS304, SS304L, Monel, Hastalloy, PP, PTFE
Material of orifice plate	SS316, SS316L, SS304, SS304L, Monel, Hastalloy, PP, PTFE
Material of construction of the end connection	SS316, SS316L, A106, SS304, SS304L, Monel, Hastalloy, PP, PTFE
End connections	Flanged, BWE
Line size assemblies	1/2 to 2" for integral meter run assemblies and till 40" for meter run
Manifold block	3 way or 5 way in SS316 or SS316L or in A105
Isolation valve	Ball, needle, globe, 1/2" NPT F in A105, SS316, SS316L, SS304, SS304L, monel, PP, PTFE
Pressure Rating	150# to 2500#
Application	Integral meter Run - where direct mounting of DPT is required. Meter tube - where high accuracy measurement required each as gas metering, custody transfer and application
Orifice plates	Square edge, concentric, segmental, eccentric, quadrant edge
Media	Steam, steam water, water, acids, mixed phase, air, gasses, liquids all forms, liquids not less than Reynolds 1250



**General** Flow Nozzle is used in typically high-velocity, non-viscous, erosive flow. They are suitable for determining the flow rates of fluids at high temperature and high pressure.

Flow Nozzles are erosion-resistant, consistently accurate and virtually maintenance-free. They perform a wide variety of applications that include air, water, steam, gas, chemical substances and high temperature applications. The rounded design provides a more effective sweep-through of particles in the flow stream, which extends product life by reducing wear and potential damage. Flow Nozzles are manufactured in strict accordance with ASME MFC-3M, BS-1042 and ISO-5167 standards. For critical measurement applications, wet calibration at reputed flow laboratories can be offered. Also we have an IBR approval for our manufacturing unit hence we can provide IBR form IIC certificate for flow nozzles.

Flow Nozzles have a smooth elliptical inlet leading to a throat section with a sharp outlet. Restriction in the fluid flow causes a pressure drop, which relates to the flow rate by applying Bernoulli's equation. The smooth inlet of the flow nozzle results in a higher coefficient of discharge than most other differential meters. This higher efficiency means greater flow capacity when compared to most other differential meters of the same size.

## Salient Features & Benefits

- Widely used for high pressure and high temperature steam flow
- Useful for flow measurement at high velocities
- Rounded inlet not subject to wear or damage, extending product life
- Better sweep-through effect for debris and liquids, eliminate damming effect
- Lower susceptibility to erosion
- Extended product life with no moving parts

There are three types of Flow Nozzles

- ISA 1932, with corner taps
- ASME long radius, low beta ratio ( $0.20 < b < 0.5$ ), with throat tap
- ASME long radius, high beta ratio ( $0.25 < b < 0.8$ ), with radius taps ( $D & D/2$ )

ASME long radius, low beta ratio Nozzle with throat taps is used in steam turbine performance test as per ASME PTC-6 code.

ISA-1932 nozzle can be mounted with carrier ring or in between flanges with corner taps.

Long radius nozzle are normally with weld-in branch pipe with radius taps.

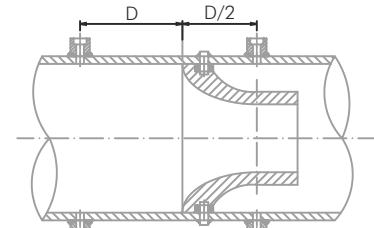
To avoid welding of dissimilar metals, nozzles are also installed in the pipe with holding ring.





## Holding Ring Type Flow Nozzle

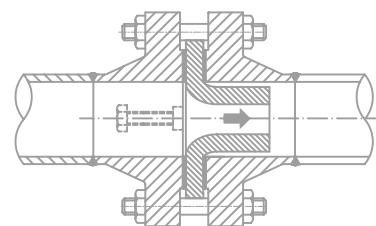
These types of nozzles are designed for installation in a pipe without flanges. The flow nozzle is installed with the help of holding ring and locating pins which are made of same material as that of pipe thereby eliminating welding of dissimilar materials and also eliminating more welding joints in a shorter pipe lengths because of high pressure areas



**Long Radius High Beta Ratio Holding Ring Type Nozzle**

## Flanged Type Flow Nozzle

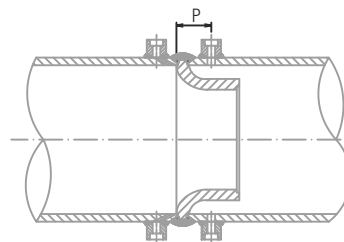
These types of nozzles are used for insertion between pipe flanges, where frequent maintenance is required in the line. These types of nozzle are very rarely used



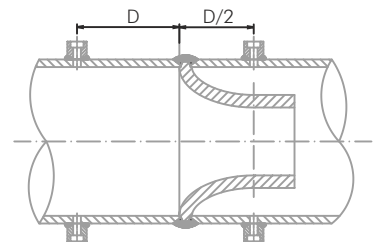
**Flanged Type Flow Nozzle**

## Weld-in Type Flow Nozzle

This type of nozzle has a machined tongue around its greatest diameter designed to fit between beveled ends of both inlet and outlet pipe section. The pipe sections, with the nozzle in place are firmly clamped and welded. The weld-in flow nozzle is used where flanges are not applicable such as high temperature and pressure applications in power plant installations, feed water, etc.



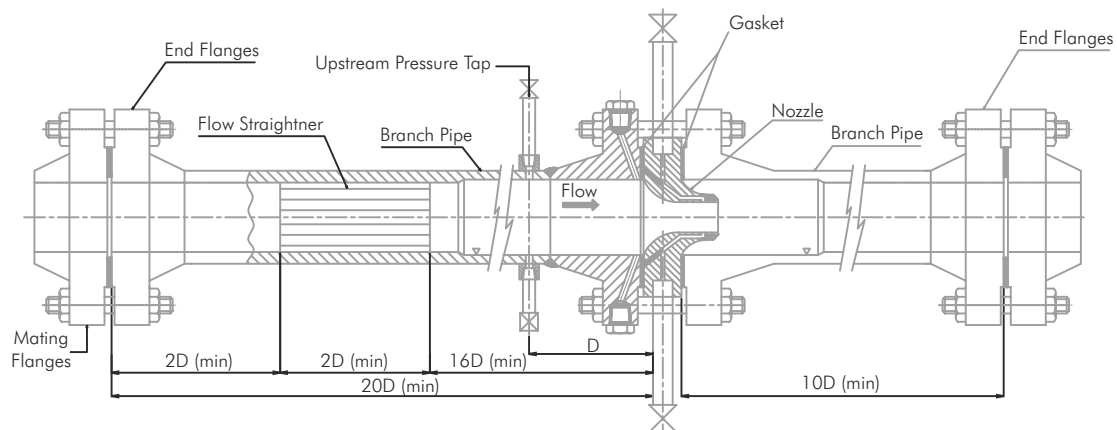
**ISA1932 Weld-In Type Nozzle Corner Tappings**



**Long Radius High Beta Ratio Weld-In Type Nozzle (Radius Tappings)**

## Flanged Type Throat-tap Flow Nozzle

Flange type throat-tap flow nozzle is used when extreme accuracy and repeatability required. In most cases this type of nozzle is purchased with a complete flow section and laboratory flow calibrated. This type of nozzles are manufactured in strict accordance with ASME performance test code PTC-6.



**Flow Nozzle Assembly as per ASME PTC-6**



**General** Venturi Tubes serve users with accurate measurement of non-viscous fluids in clean & dirty streams. Venturi Tubes are virtually maintenance-free and corrosion-resistant. Venturi tubes are manufactured in strict accordance with ASME MFC-3M, BS-1042 and ISO-5167 standards. These measurement standards provide users with +/-1.0% uncertainty of discharge coefficient. For critical measurement applications, wet calibration at reputed flow laboratories can be offered.

Venturi Tube is a low pressure drop metering device. It offers constant accuracy, low susceptibility to erosion, high-pressure recovery, and installation at any angle from horizontal to vertical. Corrosion-resistant and virtually maintenance-free, this measurement product performs in a wide variety of applications that include air, water, vapor, steam, gas, chemical substances, sludge and slurry applications.

The classical Venturi Tube is made up of an entrance cylinder of the same diameter as the pipe connected to a conical convergent section, a cylindrical throat, and a conical divergent section. The high pressure taps are located on the middle of inlet section and the low pressure taps are located at the middle of the throat section. A piezometer ring is sometimes used for differential pressure measurement. This consists of several holes in the plane of the tap locations. Each set of holes is connected together in an annular slot to give an average pressure.

### Salient Features & Benefits

- Can be used on slurries and dirty fluids
- Lower susceptibility to erosion
- Low permanent pressure loss
- Extended product life with no moving parts
- Vertical or horizontal installation



# Venturi Tubes



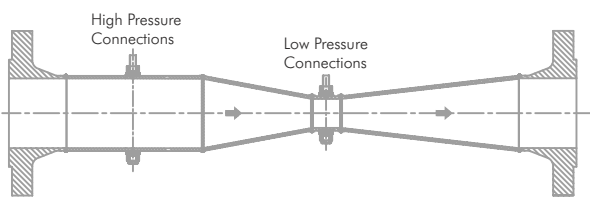
Up to 8", the entire venturi is machined from a single solid bar-stock. Above 10", the venturi is fabricated from sheet.

Many times the piping geometry does not allow full length of the Venturi Tube. In such case, 'Truncated' classical Venturi Tube can be offered wherein the divergent section can be truncated down by about 35% of its length without modifying the divergent angle. The outer diameter of the divergent section is less than the inside diameter D of the pipe.

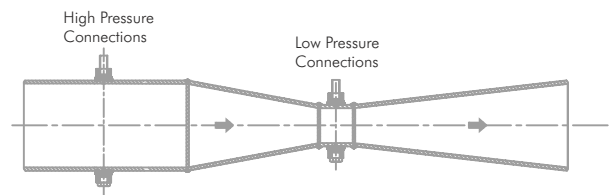
The throat restricts the fluid flow resulting in a pressure drop. This differential pressure relates to the flow rate by applying Bernoulli's equation. The angled inlet and outlet cones help control the pressure recovery, making the Venturi the most efficient of all the differential meters available.

This results in lower permanent pressure loss and greater capacity than other differential meters of the same size. Permanent pressure loss is generally 5% to 20% of the differential pressure, depending on the bore size selected.

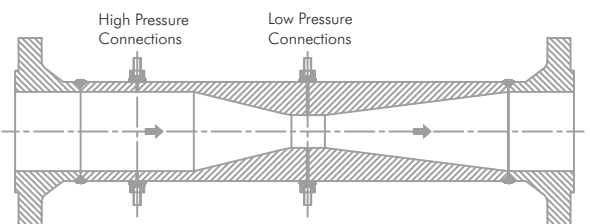
*General* Venturi Tubes serve users with accurate measurement of non-viscous fluids in clean & dirty streams. Venturi tubes are virtually maintenance-free and corrosion-resistant. Venturi tubes are manufactured in strict accordance with ASME MFC-3M, BS-1042 and ISO-5167 standards. These measurement standards provide users with +/- 1.0% uncertainty of discharge coefficient for critical measurement applications. This results in lower permanent pressure loss and greater capacity than other differential meters of the same size. Permanent pressure loss is generally 5% to 20% of the differential pressure, depending on the bore size selected.



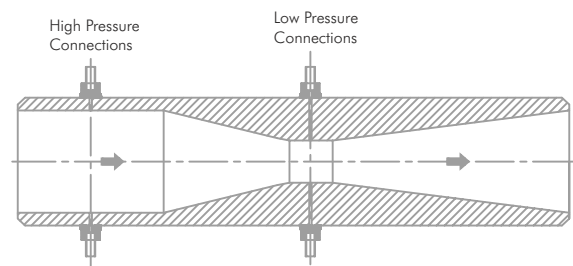
**Fabricated with Flanged ends**



**Fabricated with Beveled ends**



**Machined with Flanged ends**



**Machined with Beveled ends**

# Compact Orifice Flow Meter



*General's* compact orifice flow meter is the next version of orifice assembly, It produces the most accurate & repeatable measurement when used in single phase flow or steam flow.

The compact flow meter gives the advantage of most simple installation & direct mounting of DP transmitter thereby eliminating the need of tube, fittings & other accessories.

This flow meter uses corner tap design of ISO-5167.

## Features & Benefits:

- Fully integrated solution eliminates the need of fittings, tubing, valve, adaptors, manifold & mounting brackets
- Unique wafer body allows for installation in any flange location
- Unique design ensures the proper alignment within pipe, resulting in higher accuracy.

## Compact Flow meter specifications:

- Line sizes : 1/2" to 12"
- Orifice plate design: Square Edged Concentric
- Orifice pressure taps: Corner taps
- Beta ratio: 0.4 / 0.65
- Service: Liquid / Gas / Vapour
- Temperature Limit:
  - For direct Mounting: upto 110°C.
  - For remote mounting: upto 454°C.
- Maximum working pressure: Pressure suitable upto 600#



**Typical Orifice Bore sizes (mm):** The table below shows the typical bore values for compact orifice flow meter.

Line size	With Beta ratio = 0.4	With Beta Ratio = 0.65
1/2" (15 NB)	6.32mm	10.27mm
1" (25 NB)	10.65mm	17.31mm
1.5" (40 NB)	16.36mm	26.58mm
2" (50 NB)	21.00mm	34.13mm
3" (80 NB)	31.16mm	50.64mm
4" (100 NB)	40.90mm	66.46mm
6" (150 NB)	61.62mm	100.13mm
8" (200 NB)	81.08mm	131.76mm
10" (250 NB)	101.80mm	165.43mm
12" (300 NB)	121.92mm	198.12mm

Above Orifice bore calculation is considering sch. STD

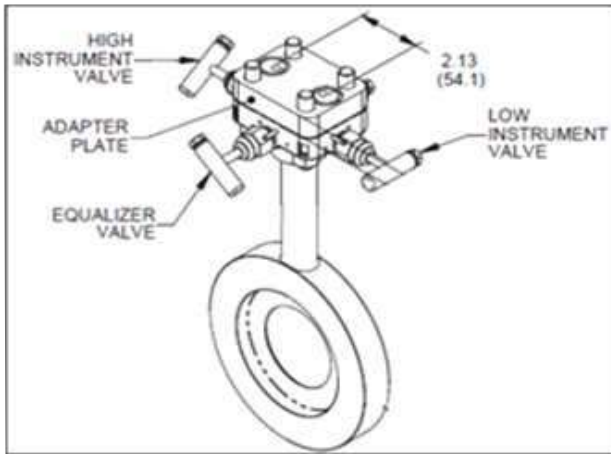
## Straight length requirement for Compact Flow meter

Upstream Straight Length	Beta Ratio →	0.45	0.60
	Reducer		5
Single 90° bend or Tee		16	44
Two or more 90° bend in same plane		10	44
Two or more 90° bend in different plane		50	60
Expander		12	28
Ball/gate Valve (fully open)		12	18
Downstream straight length		6	7

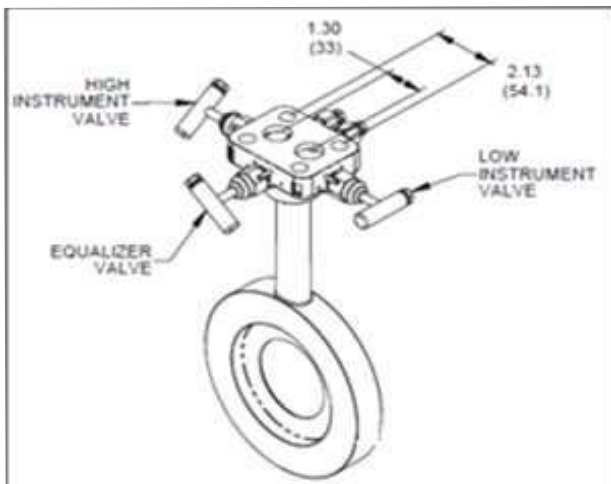
# Compact Orifice Flow Meter

*General*

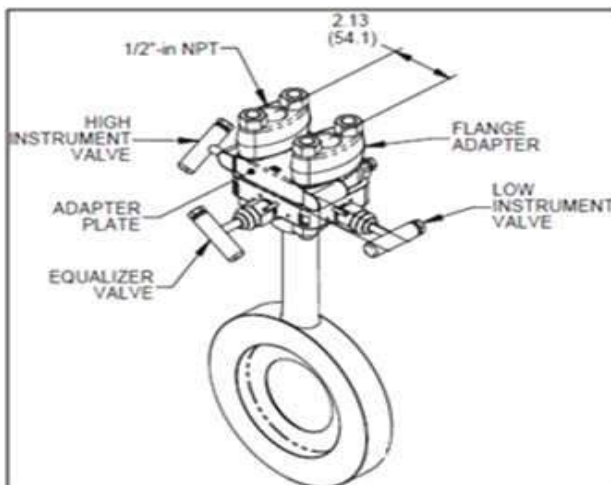
Typical arrangement of compact orifice flow meter:



Arrangement for Traditional 3way Manifold



Arrangement for Direct Mounting Of DPT



Arrangement for Direct Mounting Of DPT





# Averaging Pitot Tube

# General

Averaging Pitot tube is a multiport self averaging flow meter. It is a primary element for flow measurement of gas, liquid, vapour in pipelines and ducts based on the principle of measurement of differential pressure created when an obstruction is placed in the fluid flow due to increase in fluid velocity.

## Principle of operation

Averaging pitot tube is nothing but an element which is suppose to measure the flow rate and offer the differential pressure to the flow meter mounted on top. The averaging pitot tube works on the 80% velocity of the media rate at the top of the centre line in a velocity gradient in a pipe line or duct and 70% velocity of the media in the below portion of the centre line. it does not work on the centre line velocity which is 100% for the media as what a orifice, a ventury and nozzle, and many more flow meter works. Thus the velocity of the media is perfectly averaged out and offered for DP measurement in the flow meter.

The differential pressure created by the dynamic force at the inlet and static force at the output, creates the average at the out put to enable the flow rate measurement more accurately with lesser free length

For bidirectional measurement, the concept is completed by holes at the other side for measurement, at 1.5% lesser than the length at the dynamic side of the unidirectional flow measurement device.

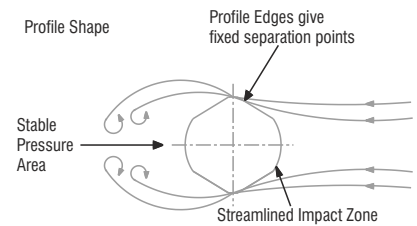
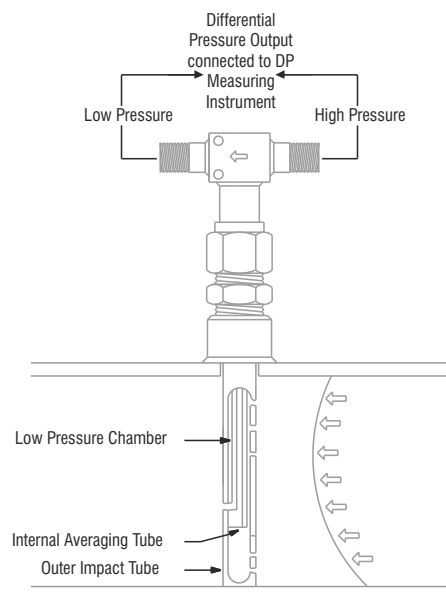
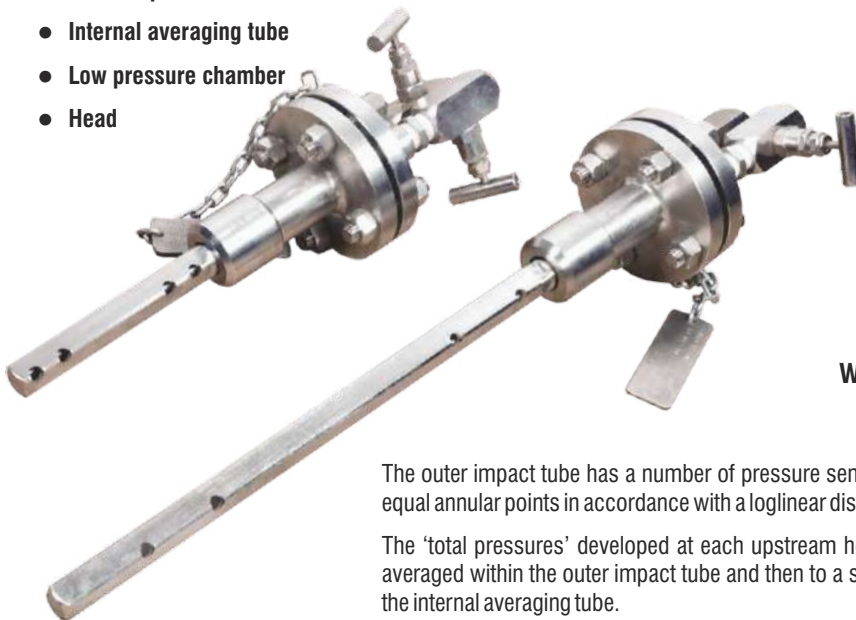
## Features:

- Unique profile shape enables high flow rate turn down
- Dual averaging for better accuracy
- Suitable for Liquid ,gas and steam flow measurement
- Repeatability of measurement  $\pm 0.1 \%$
- Short upstream and downstream straight pipe lengths
- Long term accuracy unaffected by wear.

Averaging pitot tubes are generally used for large line sizes or ducts where other primary devices become relatively expensive.

Averaging Pitot tube comprises of following components:

- Outer impact tube
- Internal averaging tube
- Low pressure chamber
- Head



## Working Principle of Averaging Pitot Tube

The outer impact tube has a number of pressure sensing holes facing upstream which are positioned at equal annular points in accordance with a loglinear distribution.

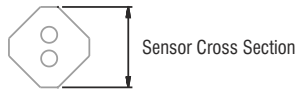
The 'total pressures' developed at each upstream hole by the impact of the flowing medium are firstly averaged within the outer impact tube and then to a second order (and more accurately) averaged within the internal averaging tube.

This pressure is represented at the head as the high pressure component of the DP output. The low pressure component is generated from a single sensing hole located on the downstream side of the outer impact tube.

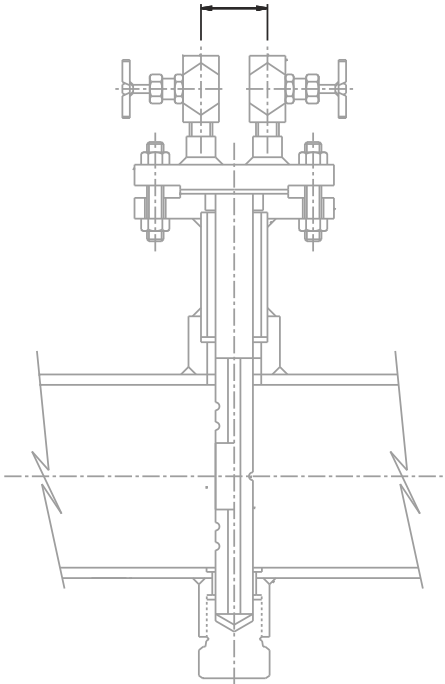
Stable flow coefficient which is the result of typical diamond shape, makes it a reliable flow measuring primary flow element.

Simple and inexpensive, long term accuracy within acceptable limits over wide range of flow, low permanent pressure loss & minimum operating cost makes it ideal choice of any design engineer.

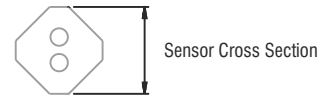
# Averaging Pitot Tube



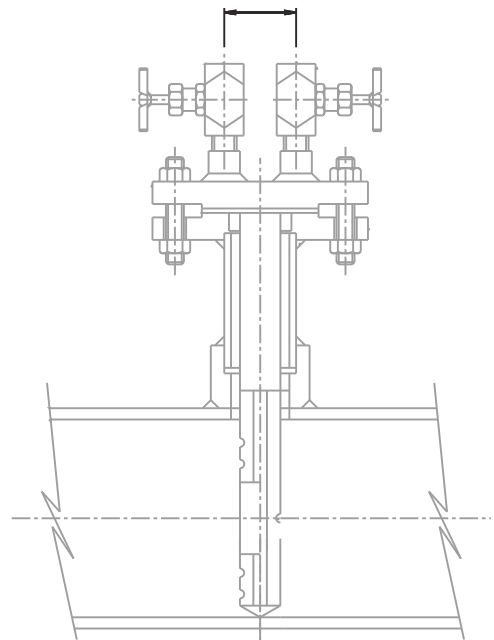
2.15" (54 mm)



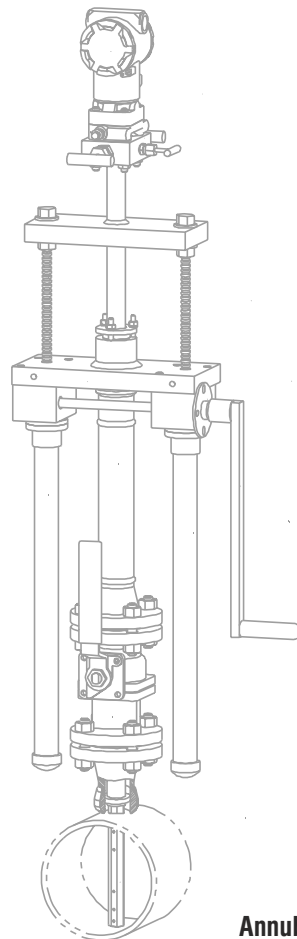
**Averaging Pitot Tube with End Support**



2.15" (54 mm)



**Averaging Pitot Tube without End Support**



**Annubar with Gear Drive Mechanism**



# Averaging Pitot Tube



## Straight Run Requirements

	Upstream dimension					Downstream Dimensions	
	Without vanes		With vanes				
	In plane A	Out of plane A	A'	C	C'		
1.		8	10	—	—	—	4
		—	—	8	4	4	4
2.		11	16	—	—	—	4
		—	—	8	4	4	4
3.		23	28	—	—	—	4
		—	—	8	4	4	4
4.		12	12	—	—	—	4
		—	—	8	4	4	4
5.		18	18	—	—	—	4
		—	—	8	4	4	4
6.		30	30	—	—	—	4
		—	—	8	4	4	4

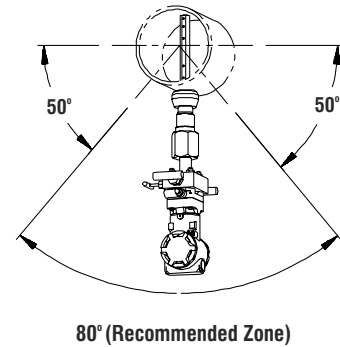
# Averaging Pitot Tube



## Installation, Location and Orientation

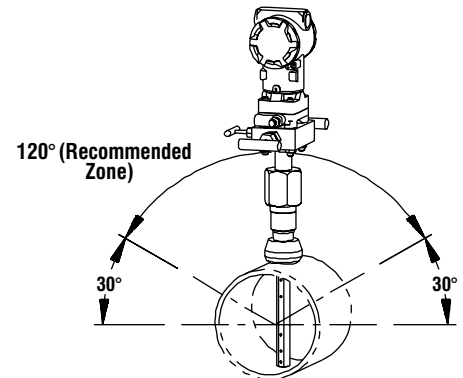
**Annubar Orientation** Proper venting or draining must be considered when selecting a location. For liquid service, mount the side drain/vent valve upward; this allows gases to vent. For gas service, mount the drain/vent valve down to allow any accumulated liquid to drain. In steam service, fill lines with water to prevent contact of the live steam with the electronics; condensate chambers are not needed because the volumetric displacement of the electronics is negligible.

**Horizontal Pipe: Steam Application** Due to the possibility of air getting trapped in the probe, the Annubar should be located per as per the drawing below. The area between 0° and 50° (50° angle) should not be used unless full bleeding of air from the probe is possible. Figure 7.5 illustrates the recommended location of the flowmeter.



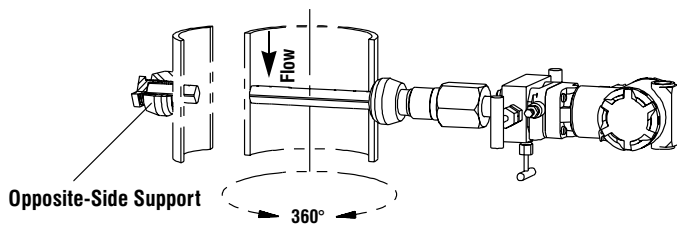
**Figure 7.5**  
Liquid or Steam Service In a horizontal Pipe

**Horizontal Pipe: Air and Gas Applications** The Annubar should be located on the upper half of the pipe, at least 30° above the horizontal line. Figure 7.6 illustrates the recommended location of the flowmeter.



**Figure 7.6**  
Air and Gas Applications in a Horizontal Pipe.

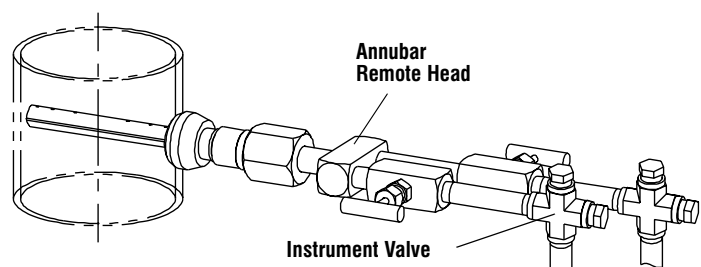
**Vertical Pipe: Gas, and Steam Applications** Liquid, Air, The Annubar can be installed in any position around the circumference of the pipe, provided the vents are positioned properly for bleeding or venting. Vertical pipe installations require more frequent bleeding or venting depending on the location. Figure 7.7 illustrates the recommended location of the flowmeter.



**Figure 7.7**  
Liquid, Air, and Gas Applications in a Vertical Pipe.

Remote mounting is required for steam installations; see Figure 7.8

**Figure 7.8.**  
Steam Service in a Vertical Pipe.



# Wedge Flow Meter

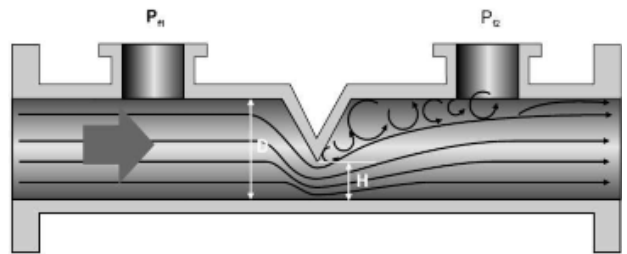
*General*

## Introduction

Wedge flow metering is designed for highly viscous, slurry type, or contaminated line fluid applications, including difficult-to-meter, air entrained liquids, as well as particulate entrained, high viscosity, or slurry solutions. Examples of these applications include: raw sewage, sludge, tar sands, pulp mash, cement, liquid asphalt, and molten sulfur.

The design principle of this product is based on Bernoulli's theorem (the Continuity and energy balance equations). An engineered "WEDGE" restriction creates a predicable differential pressure condition that can be equated to mass or volumetric flow. Flow Range are determined by the H/D ratios

The meters consists of a flow body with (see above) wedge "V" shape throttle restriction. This restriction creates a differential pressure between (P1) before and (P2) after the wedge. (P2) below which is proportion to the square of the volumetric flow rate. The wedge restriction has no critical surface dimensions, or sharp edges, that will affect measurement accuracy as the result of normally expected wear



## Construction

Design and calculation standards :	EN, PED 97/23 EC, ANSI/ASME and RW Miller
Sizes	DN 50 -900 2"-36"
Pressure rating :	PN 10 - 250, 150 -1500 lbs
Material :	Carbon steel A105N, A106 Gr. B, AISI 316, Duplex, Super Duplex, 6Mo, heat resisting steels, other materials on request
Mounting style :	Flanges connection according to DIN or ANSI
Pressure taps :	DN 50 and DN 80, 2" and 3"
Flange facing :	Flat or raised face according to DIN 2526 or flat, raised face or ring type joint according to ANSI B 16.5
Element ratio (H/D) :	0,2, 0,3, 0,4 and 0,5 (0,4 is standard).

## Technical Data

Accuracy :	+/- 4-5 % (un-calibrated), +/- 0,5 % (calibrated).
Repeatability :	+/- 0,2 %
Pressure loss :	40 % of measured differential pressure with ratio H/D 0,4
Limits for Reynolds No. :	Re > 500
Viscosity :	Up to 3000 Cp
Installation requirement :	down to 5 x D up-stream and 2 x D down-stream

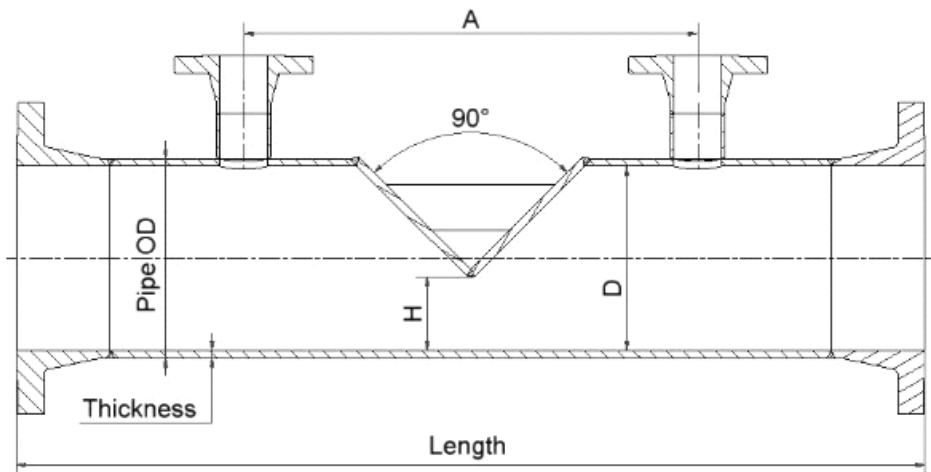
# Wedge Flow Meter



## Advantages

- Very suitable for viscous liquids. Not sensitive to solid particles in the fluid.
- Bi-directional flow possible.
- For very low Reynolds Nos.
- Suitable for erosive fluids.
- No risk of clogging. Self cleaning.
- Accessories
- Shut 'off valves and condensing chambers for steam flow measurement.

## Dimensions



DN/Inch	A	Length 150 - 600 lbs	Length 900 - 1500 lbs	Length PN16 - 100	Length PN160 - 250
50/2"	300	770	770	500	500
65	334	810	810	550	550
80/3"	372	880	880	600	600
100/4"	422	900	940	850	800
125/5"	476	980	1060	920	700
150/6"	528	1030	1140	990	900
200/8"	604	1140	1300	1100	1000
250/10"	694	1270	1470	1220	1100
300/12"	784	1370	1620	1340	1200
350/14"	836	1440	1690	1410	1300
400/16"	914	1540	1810	1510	1400
18"	1004	1640	1930	-	1500
500/20"	1108	1760	2090	1660	1600
600/24"	1248	1930	2330	1770	1800
700/28"	1390	2130	-	1910	2000
750/30"	1468	2240	-	1990	2100
800/32"	1544	2340	-	2240	2200
900/36"	1678	2520	-	2090	2400

# Flow Straighteners and Flow Conditioner



**General Instruments** manufactures flow conditioners and flow straighteners for flow meter, process and pump system applications.

Most flow meter technologies require significant and often unattainable upstream and downstream straight-run to meet and sustain specified accuracy. Similarly, most pump and compressor manufacturers recommend significant straight-run to ensure even flow into the pump to minimize wear and maximize service life.

Flow straighteners / conditioners reduce straight-run requirements to just a few diameters. General flow straighteners / conditioners eliminate the flow distortion effects of elbows, pipe expansion or reductions, valves, dampeners and other disrupters to produce a swirl-free, symmetrical and repeatable flow profile to the flow meter, pump, or other critical components.

Further, our flow conditioners have extremely low pressure drop, resulting in significant energy cost savings over alternative flow conditioning technologies.

Flow Straighteners / conditioners are available in straight-pipe runs, a unique 90° elbow, and insertion panel designs for virtually any pipe, tube or duct size.

**General flow conditioners and straighteners enhance accuracy for many flowmeter technologies**

Flowmeters require a swirl-free repeatable and symmetric velocity profile to operate within stated accuracy specifications. Flow disturbances caused by ball valves, elbows, headers, and blowers for example may adversely affect a flowmeters accuracy.

**There are two ways to mitigate flow disturbances.**

1. Maintain sufficient straight run upstream of the meter.
2. Utilize General Elbow flow conditioners / straightner.

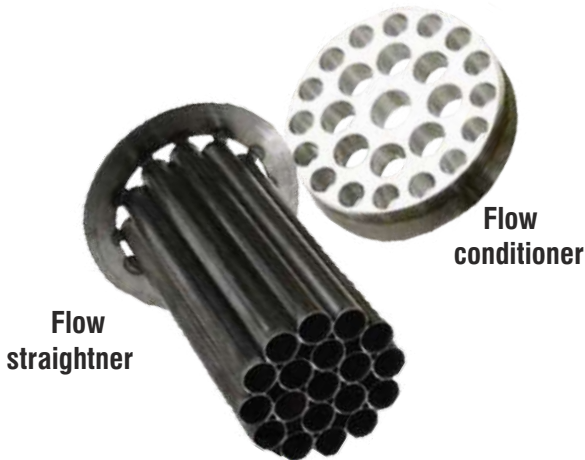
Our flow conditioner's technology is ideally suited to work in various medias including gas, steam, liquids, slurries, sludges, hydrocarbons, and more. The flow conditioner outperforms all other flow conditioning technologies with respect to minimal pressure loss, non-fouling design, and repeatable flow profiles. The following highlights summarize the advantages of using this technology with various flow metering technologies.



# Flow Straighteners and Flow Conditioner



Bundle formation depending on pipe size and beta value consideration on available free space



Below summarized for beta value of 0.6 to 0.7 wherein beta is ID of bore divide by OD of the orifice sensor / flow sensor, for flow conditioner. General Flow conditioner to placed strictly in the upstream of the flow sensor at 2D distance for it to be effective.

Bundle formation depending on pipe size and beta value consideration on available free space

<b>Flow straightener</b>	
Flanged ends	A105, SS316, LF2, SS316L, SS304, PP, PTFE, SS304L, other material on request
Pipe chamber holding the bundle of tubes	A106, SS, Mild steel, SS304L, SS316L, Low carbon steel for low temp, PP, PTFE, and other material on request
Tube bundles	A106, SS304, SS304L, SS316L, monel, PP, PTFE, others on request
Dimensions	Based on selection of tubes thickness and no of tubes within a pipe size on free length availability
<b>Flow Conditioner</b>	
Flanged ends	A105, SS316, LF2, SS316L, SS304, PP, PTFE, SS304L, other material on request
Dimensions	Based on selection of tubes thickness and no of tubes within a pipe size on free length availability
No of holes	On selection and sizing with dimensions as per engineering calculation

## Condensate Pots

We manufacture complete range of condensate pots which requires in many process industries. Condensate pots are generally used for measurement of steam/ vapor which condense to liquid state at the ambient temperature.

These are also used to cool down very high temperature liquids and to maintain a constant liquid head above the instrument. These can be installed in both horizontal & vertical position.

We manufacture these condensate pots as per customer's requirement and design in various sizes 2", 3" and 4" etc.

Condensate pots are manufactured in various grades of Carbon steel, Alloy steel & stainless steel. IBR Form IIC certificate can be provided for condensate pots.





# Flow Calibration Test Bench for Flow Elements



## Flow Calibration bench for Orifice and Valves:

**General Instruments Consortium** enters into a new age of flow calibration bench. The unit is now ready for:

**Table 9.1**

<b>Flow Calibration</b>	Orifice assembly upto 12"	Upto 8" from beta value 0.15 till 0.9 and 10" and 12" till beta 0.15 to beta = 0.5	Accuracy, max upto 0.5%	Hysteresis is max upto 0.2%	Repeatability = 0.25%	For 10" and 12" for beta = 0.55 till 0.8, the accuracy shall be max upto 1.5%	Standard being followed is under ISO 5167 and IEC 60534-2, also confirming to the basic BS code 1042	Conditions applicable for volumetric designing and provisions under gravimetric conditions available on demand
<b>Flow Calibration</b>	Valves with size upto 12"	For kv value equal to 1440 m3/hr	Accuracy, max upto 0.5%	Hysteresis is max upto 0.2%	Repeatability = 0.25%	No restrictions till 12" size	Under strictly to IEC 60534-2	Strictly to volumetric conditions as per required IEC 60534-2

The orifice assembly or the flow control element, valve, is calibrated under fluid mechanics standards of ISO 5167 and IEC 60534 standards. The process and the procedure of the measuring flow calibration of the device and the design is as per the international standards applicable for volumetric and gravimetric conditions

The flow calibration bench for upto 12" size, is applicable for pressure rating upto 3 kg /cm<sup>2</sup>g and for all ambient conditions. The testing media is water. The calibration unit is under free length or straight length as per the ISO standards for mounting in such conditions applicable for orifice assemblies with water as media and with calculated beta value to decide the free length for calibration of sensors. For valves, the condition is kept at ambient conditions with water and based on IEC 60534 standard the flow coefficient value of the valve is matched with desired flow rate applicable under differential pressure conditions, under applicable and available free or straight lengths

The bench gets the water from an underground tank with an overall capacity of (7500mmX1500mmX2000mm)...m<sup>3</sup> which is having a magnetic level gauge mounted to check the level of water. The level in turn helps to clear the pressure applicable under the centrifugal pump which is mounted to the side to generate the desired and the requisite pressure for the flow assembly, either valve or orifice.

The differential pressure in the assembly is created by either manually adjusting the input pressure, with adjustable valves at the input line to the device for calibration or by pneumatically adjusting the variations thru control pneumatic actuators adjusting to set points .

The differential pressure is maintained and fixed for the assembly under measurement, by adjusting the downstream valve and is adjusted at



**Table 9.2**

Adjustment of pressure at downstream of assembly	Differential pressure at the assembly maintained
2.5 kg/cm <sup>2</sup> g	5000mmwc
2.55 kg/cm <sup>2</sup> g	4500mmwc
2.6 kg/cm <sup>2</sup> g	4000mmwc
2.65 kg/cm <sup>2</sup> g	3500mmwc
2.7 kg/cm <sup>2</sup> g	3000mmwc
2.75 kg/cm <sup>2</sup> g	2500mmwc
2.8 kg/cm <sup>2</sup> g	2000mmwc
2.85 kg/cm <sup>2</sup> g	1500mmwc
2.9 kg/cm <sup>2</sup> g	1000mmwc
2.95 kg/cm <sup>2</sup> g	500mmwc



## Annexure 1: Orifice Plate Dimensions

NB mm (")	A ± 0.40						RATING 150 TO 2500					
	RATING						≤ 315° C			> 315° C		
	150	300	600	900	1500	2500	W	TOLER	T +0 -0.25	W	TOLER	T +0 -0.25
	150	300	600	900	1500	2500	W	TOLER	T +0 -0.25	W	TOLER	T +0 -0.25
25 (1)	66.7	73.0	73.0	79.4	79.4	85.7	3.18			0.51	6.35	
40 (1.1/2)	85.7	95.3	95.3	98.4	98.4	117.5	3.18	+0.12		0.76	6.35	
50 (2)	104.8	111.1	111.1	142.9	142.9	146.1	3.18			0.79	6.35	
80 (3)	136.5	149.2	149.2	168.3	174.6	196.9	3.18	-0.25		0.79	6.35	
100 (4)	174.6	181.0	193.7	206.4	209.6	235.0	3.18			1.59	9.52	
150 (6)	222.3	250.8	266.7	288.9	282.6	317.5	3.18			1.59	9.52	± 0.25
200 (8)	279.4	308.0	320.7	358.8	352.4	387.4	3.18			3.18	12.7	
250 (10)	339.7	362.0	400.1	435.0	435.0	476.3	6.35		SEE	3.18	12.7	
300 (12)	409.6	422.3	457.2	498.5	520.7	549.3	6.35		NOTE	3.18	12.7	
350 (14)	450.8	485.8	492.1	520.7	577.9		6.35	± 0.25	-2	3.18	12.7	SEE NOTE -2
400 (16)	514.4	539.8	565.2	574.7	641.4		6.35			6.35	12.7	
450 (18)	549.3	596.9	612.8	638.2	704.9		6.35			6.35	12.7	
500 (20)	606.4	654.1	682.6	698.5	755.7		6.35			6.35	12.7	
600 (24)	717.6	774.7	790.6	838.2	901.7		6.35			6.35	12.7	

Note: All rating as per ASME

### Legends:

D - Internal Diameter of the Pipe

NB - Nominal Bore

d - Orifice Bore Diameter.

A - Orifice Plate OD

T - Throat Thickness

Dimensions in mm unless otherwise specified.

### Note

- For bidirectional flow bevelling shall not be provided.
- Valvues of 'T' shown in this standard are valid for the corresponding 'W' and d/D (β) between 0.25 and 0.70 Incl when the values are not shown and for β < 0.25 and β > 0.70, T shall be calculated every time and shall not be higher than the smaller of the values resulting from the following Ratios :

$$\frac{d}{8} \cdot \frac{D}{50} \cdot \frac{D-d}{8}$$

## Annexure 2: Drain / Vent Dimensions

d		TOLER.
From	To	
<25.400	-	-
25.400	88.900	2.38
88.901	104.775	3.18
104.776	127.000	3.97
127.001	152.400	4.76
152.401	171.450	5.56
171.451	190.500	6.35
190.501	212.725	7.14
212.726	234.950	7.94
234.951	254.000	8.73
254.001	276.225	9.53
276.226	317.500	11.11
317.501	336.550	11.91
>336.550	-	12.70

## Annexure 3: Orifice Bore'd' tolerance

d		TOLER.
From	To	
<6.350		0.007
6.350	9.625	0.013
9.526	12.700	0.015
12.701	15.875	0.020
15.876	19.050	0.023
19.051	22.225	0.025
22.226	25.400	0.030
25.401	31.750	0.036
31.751	38.100	0.043
38.101	44.450	0.051
44.451	127.000	0.064
>127.000		0.0005 x d

# Manufacturing & Testing Facilities for Flow Elements



- Flow Calibration Test Bench
- IBR Testing and Compatibility
- Hydrotesting facility upto 400 kg/cm<sup>2</sup>
- Hydrotest rig upto 6" line size & pressure upto 80 kg/cm<sup>2</sup>
- PMI Testing Facility
- Radiography Facility
- PWHT Facility
- O<sub>2</sub> Cleaning Facility and Test Bench
- Sand Blasting Machine
- Painting Facility
- 2 Axis CNC Machines
- 3 Axis VMC machine
- In-house welding facility with ARGON & ARC welding
- Plasma cutting Machine upto 35 mm thickness
- Lathe machines, upto 2.5 mtr plate OD
- Drilling Machine
- Grinding Machine
- Cutting Machine



3 Axis VMC Machine



Lathe Machine



Shop Floor



Hydrotest Rig upto 6" line size and pressure upto 80kg/cm<sup>2</sup>



Lathe Machine upto 2.5 m plate OD



PMI Testing Test Bench

Calibration Test Bench



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