

BLISS
AMERICAS

Glass Level Gauge

Gauge Valve



Glass Level Gauge

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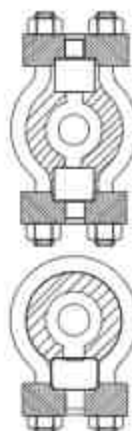


GAUGE SERIES

Large Chamber Gauges for Easy Level Reading of Boiling Liquid

Series L Large Chamber Gauges are designed to give an accurate liquid level reading of liquids that have a tendency to surge or boil. These gauges are highly effective in (1) Reducing the boiling effects of entrained gas being released under lowered pressure (2) The liquid itself being vaporized when pressure reaches a critical low point and (3) Boiling caused by temperature exceeding the boiling point of liquid. When the liquid being gauged has an unusually low boiling point, the gauge and valves should be insulated and the gauge equipped with non-frosting unit. Series L Chamber Gauges are of flat glass reflex or transparent design. The liquid chamber is constructed of heavy tubing, rustproofed and carefully slotted and machined to provide plain seats for the gaskets and glass assemblies.

SERIES - 'L'



PRESSURE-TEMPERATURE RATINGS

		Number of Window (Max. Pressure in Bars / PSI)								
*C / *F		1	2	3	4	5	6	7	8	9
Transparent										
40° / 104°	65 / 1203.5	77 / 1116.5	70 / 1015	64 / 930	55 / 855.5	53 / 786.5	47 / 681.5	41 / 594.5	35 / 507.5	
150° / 302°	88 / 987	81 / 884.5	57 / 826.5	52 / 754	47 / 618.5	43 / 523.5	38 / 551	29 / 420.5	25 / 362.5	
260° / 500°	80 / 725	47 / 618.5	44 / 636	40 / 580	36 / 522	33 / 478.5	29 / 420.5	25 / 362.5	22 / 315	
400° / 752°	30 / 435	28 / 406	27 / 391.5	24 / 348	22 / 315	20 / 290	18 / 261	16 / 232	14 / 203	
Reflex										
40° / 104°	165 / 2392.5	155 / 2247.5	145 / 2102.5	134 / 1943	124 / 1798	113 / 1638.5	103 / 1493.5	93 / 1348.5	83 / 1203.5	
150° / 302°	141 / 2344.5	132 / 1914	124 / 1758	116 / 1628	106 / 1507	99 / 1435.5	90 / 1325	82 / 1189	73 / 1058.5	
260° / 500°	117 / 1896.5	110 / 1595	103 / 1493.5	96 / 1392	90 / 1305	84 / 1218	77 / 1116.5	70 / 1015	64 / 928	
400° / 752°	88 / 1290.5	82 / 1189	77 / 1116.5	73 / 1058.5	69 / 1000.5	65 / 942.5	60 / 870	56 / 812	53 / 756.5	

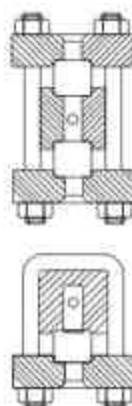
A General Purpose Gauge for Mid-Range Pressure Temperature Applications

Standard construction includes a solid one-piece chamber machined from carbon steel with covers, toughened glass and chrome-molybdenum bolts and nuts.

All metal parts are rustproofed. Recessed gasket seat prevent movement and insure leak-free service.

Series-M gauges are also available in a wide variety of materials to meet specific corrosive or extreme temperature conditions. They are also available with illuminators, non-frosting shields, heating tubes and brackets.

SERIES - 'M'

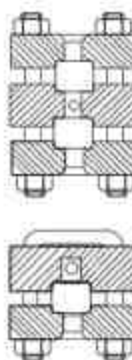


Transparent										
40° / 104°	138 / 2301	128 / 1855	121 / 1754.5	110 / 1595	104 / 1538	93 / 1348.5	86 / 1247	76 / 1102	69 / 1000.5	
150° / 302°	122 / 1769	118 / 1667.5	107 / 1551.5	100 / 1450	92 / 1334	84 / 1218	76 / 1102	69 / 1000.5	62 / 896	
260° / 500°	106 / 1837	100 / 1450	93 / 1348.5	86 / 1247	80 / 1160	72 / 1044	66 / 957	60 / 855.5	52 / 754	
400° / 752°	76 / 1102	73 / 1058.5	69 / 1000.5	62 / 896	59 / 855.5	52 / 754	46 / 696	42 / 608	38 / 551	
Reflex										
40° / 104°	208 / 2987	200 / 2900	186 / 2726	180 / 2610	172 / 2484	162 / 2348	153 / 2215.5	145 / 2102.5	138 / 2001	
150° / 302°	163 / 2663.5	175 / 2537.5	156 / 2456	160 / 2330	152 / 2204	144 / 2066	136 / 1972	129 / 1870.5	121 / 1754.5	
260° / 500°	166 / 2362	149 / 2180.5	142 / 2059	135 / 1957.5	128 / 1812.5	121 / 1754.5	114 / 1653	107 / 1551.5	100 / 1450	
400° / 752°	114 / 1653	110 / 1595	103 / 1493.5	97 / 1436.5	90 / 1305	86 / 1247	80 / 1160	72 / 1044	69 / 1000.5	

A Heavy Duty Gauge for Safe, Dependable Service

Heavy-duty Series H Gauges are available in both reflex and transparent types. These Gauges are designed and manufactured to highest industrial standards. Their dependability under difficult operating conditions is well known in the process industries. Series H Gauges have a one-piece liquid chamber machined from solid bar steel. Interchangeable sectional gauges and cover glasses are tightly locked over the liquid chamber with special bolts and nuts. Recessed gasket seats have a fine finish to provide a positively leak proof seal between the chamber and glass. All metal surface inside and outside including threaded areas are rustproof.

SERIES - 'H'



Transparent										
40° / 104°	207 / 3001.5	200 / 2900	190 / 2755	180 / 2610	172 / 2484	164 / 2378	155 / 2247.5	145 / 2102.5	138 / 2001	
150° / 302°	192 / 2784	178 / 2552	169 / 2450.5	161 / 2334.5	155 / 2247.5	148 / 2117	136 / 2001	131 / 1899.5	122 / 1769	
260° / 500°	161 / 2354.5	155 / 2247.5	150 / 2175	142 / 2059	133 / 1928.5	128 / 1856	121 / 1754.5	114 / 1653	106 / 1537	
400° / 752°	117 / 1896.5	111 / 1609.5	107 / 1551.5	102 / 1478	97 / 1406.5	93 / 1348.5	87 / 1261.5	80 / 1160	76 / 1102	
Reflex										
40° / 104°	276 / 4002	266 / 3867	259 / 3755.5	248 / 3606	242 / 3508	229 / 3320.5	222 / 3219	213 / 3086.5	207 / 3001.5	
150° / 302°	248 / 3586	239 / 3486.5	231 / 3349.5	224 / 3248	219 / 3117.5	207 / 3007.5	199 / 2885.5	192 / 2784	184 / 2668	
260° / 500°	212 / 3074	204 / 2968	196 / 2871	190 / 2755	185 / 2662.5	177 / 2566.5	170 / 2465	162 / 2349	156 / 2262	
400° / 752°	156 / 3305.5	153 / 2218.5	148 / 2146	142 / 2059	138 / 2001	131 / 1899.5	126 / 1827	119 / 1725.5	114 / 1653	

GLASS LEVEL GAUGE SELECTION GUIDE

Gauge Column

Selection		Suffix Codes										Description
A	Gauge Type	R										Reflex Gauge
		T										Transparent Gauge
		U										Tubular Gauge
		W										Weld Pad
B	No. Of Sections	1										Section 1
		2										Section 2
		3										Section 3
		4										Section 4
		5										Section 5
		6										Section 6
		7										Section 7
		8										Section 8
		9										Section 9
C	Glass Size	1										115 mm
		2										140 mm
		3										165 mm
		4										190 mm
		5										220 mm
		6										250 mm
		7										280 mm
		8										320 mm
		9										340 mm
D	Liquid Chamber type	L										Large Chamber
		M										Mid Pressure Chamber
		H										High Pressure Chamber
E	Material of Chamber	C										CS (A896)
		S										SST-316
		X										Special (specify)
F	Cover Material	1										A105
		2										F316
		X										Special (specify)
G	Fasteners	1										B7 & 2H
		2										B8 & 8M
		X										Special (specify)
H	Glass	8										T. Borosilicate
		X										Special (specify)
I	Gasket	N										IFG 5500
		G										Grafoil 55316 Reinforced
		P										PTFE
		X										Special (specify)
J	Cushion	N										IFG 5500
		G										Grafoil 55316 Reinforced
		P										PTFE
		X										Special (specify)
K	Gauge / Chamber Conn. Size	1										1/2" NPT (F)
		2										1/2" NPT with Union
		X										Special (specify)
L	Gauge / Chamber Connection	PN										Plain Nipple Screwed
		SU										Spherical Union
		PU										Plain Union
		XX										Special (specify)
M	Gauge connection Orientation	E										Top & Bottom (End)
		S										Side -Side(Close Hookup)
		X										Special (specify)
N	Visible Distance											XXXX Specify with Units

GLASS LEVEL GAUGE SELECTION GUIDE

Auto Shutoff- Valves

Selection		Suffix Codes						Description
O	Valve Model	00						No Valve
		10						Tubular LG Valve (Straight)
		20						Integral Bonnet
		26						Tubular LG Valve (Offset)
		40						Union Bonnet
		83						Straight Pattern With NPT(F) Gauge Connection
		84						Straight Pattern With NPT(F) Union Gauge Connection
		86						Offset Pattern With NPT(F) Gauge Connection
		87						Offset Pattern With NPT(F) Union Gauge
		XX						Special (Specify)
P	Body Material	C						A105
		S						F316
		X						Special (specify)
Q	Trim	S						SST 316
		X						Special (specify)
R	Closing	P						Plain
		O						Quick
S	Vessel / Tank Connection			SUM				Spherical Union Male
				SUF				Spherical Union Female
				PUM				Plain Union Male
				PUF				Plain Union Female
				SSM				Solid Shank Male
				FLG				Flanged
				XXX				Special (specify)
T	Vessel / Tank Conn. Size				1			1/2" NPT
					2			3/4" NPT
					3			3/4"150#
					4			3/4"300#
					5			1"150#
					6			1"300#
					X			Special (specify)
U	Ball Check				0			No Ball Check
					1			Ball Check Provided
V	Valve Packing					1		Graphite
						2		Graphite
						3		PTFE
						X		Special (specify)
W	Body-Bonnet Gasket					1		Sp. Wound SS316 + Graphite Filler
						2		Sp. Wound SS316 + Graphite Filler
						3		Sp. Wound SS316 + PTFE Filler
						X		Special (specify)
X	Accessories					00		Nil
						10		Illuminator (IA, IB)
						11		Illuminator (IC)
						20		Scale SST304, mm
						21		Scale SST316, mm
						30		Frost Shield
						40		Mica Shield
						41		KEL-F Shield
						50		Support Bracket
						60		Heating Jacket External
						61		Heating Jacket Internal
						70		Vent Plug 1/2" NPT
						71		Vent Valve 1/2" Ball NPT
						7X		Vent Valve Special
						80		Drain Plug 1/2" NPT
						81		Drain Valve 1/2" Ball NPT
						8X		Drain Valve Special
						90		PTFE Lined
						95		NACE Wetted Parts
						XX		Special (specify)

PROCESS GAUGES

Large Chamber Gauges for easy level reading of boiling liquids

Series-L Large Chamber Gauges are designed to give an accurate liquid level reading of liquids that have a tendency to surge or boil.

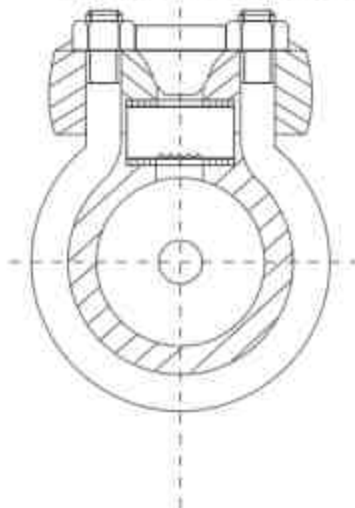
These gauges are highly effective in:

- 1) Reducing the boiling effects of entrained gas being released under lowered pressure.
- 2) The liquid itself being vaporised when pressure reaches a critical low point.
- 3) Boiling caused by temperature exceeding the boiling point of liquid.

When the liquid being gauged has an unusually low boiling point the gauge and valves should be insulated and the gauge equipped with non-frosting unit. Large chamber gauges are of flat glass Reflex or Transparent design. The Liquid Chamber is constructed of heavy tubing, rustproofed and carefully slotted and machined to provide plain seats for the gaskets and glass assemblies.

Covers are steel secured with specially designed bolts.

Series: R-L (Reflex)



LENGTHS:

Series-L gauges are available in nine standard visible glass lengths. Multiple Windows on a single piece liquid chamber are used for longer lengths.

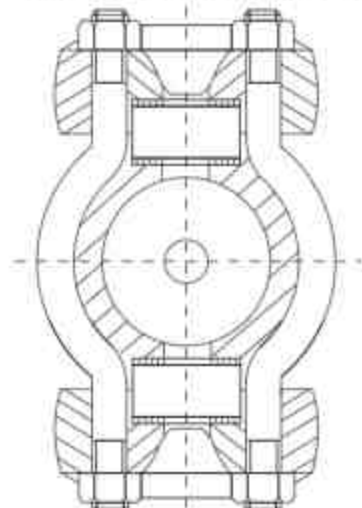
CONNECTIONS:

Standard Connections are 1/2" NPT or 3/4" NPT.

LIQUID CHAMBERS:

Heavy tubing gasket seats are machined on the face of the chamber and assembly torque are designed to prevent sidewise movement of gasket. Rustproofed.

Series: T-L (Transparent)



COVERS:

Rustproofed steel.

SPECIAL MATERIALS:

Materials to suit NACE applications, other special materials available on request.

BOLTS & NUTS:

Chrome molybdenum alloy steel bolts heat treated for strength and rustproof to provide maximum corrosion resistance.

TOUGHENED GLASS:

Toughened glass, resistant to thermal and mechanical shock. It is a tough, durable, moulded glass made under carefully controlled manufacturing techniques, in accordance with BS 3463, DIN 7081. Mica or plastic shields are recommended for transparent glasses when handling caustic, hydrofluoric acid or other media corrosive to glass.

GASKETS:

Die cut from highest quality material best suited for use with liquid indicated.

PRESSURE TEMPERATURE RATING

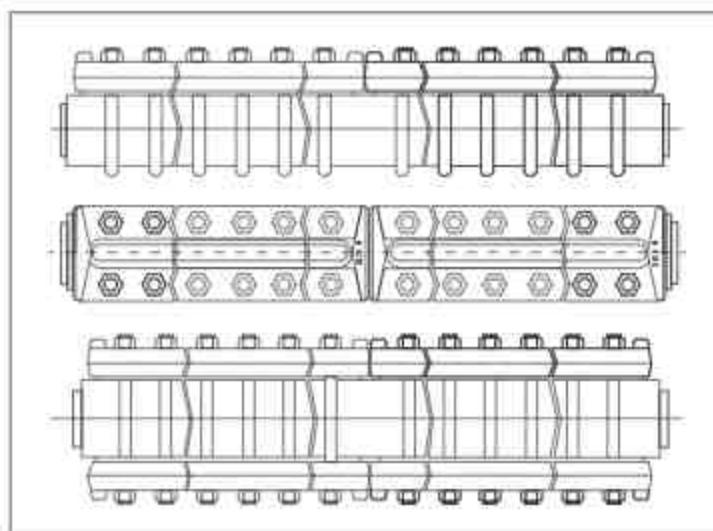
PRESSURE-TEMPERATURE CHART FOR REFLEX GAUGES

Series R-L	Size Number of Window								
Temp °C / °F	1	2	3	4	5	6	7	8	9
	Pressure (Bar / PSI)								
40° / 104°	166 / 2392.5	155 / 2247.5	145 / 2102.5	134 / 1943	124 / 1798	113 / 1638.5	100 / 1490.5	93 / 1348.5	83 / 1200.5
95° / 203°	133 / 2215.5	144 / 2088	135 / 1957.5	125 / 1812.5	115 / 1667.5	106 / 1537	97 / 1406.5	87 / 1261.5	78 / 1131
150° / 302°	141 / 2044.5	132 / 1914	124 / 1799	115 / 1662	106 / 1537	99 / 1435.5	90 / 1305	82 / 1189	73 / 1058.5
205° / 401°	126 / 1858	120 / 1740	113 / 1638.5	105 / 1522.5	98 / 1421	91 / 1319.5	83 / 1203.5	76 / 1102	69 / 1000.5
260° / 500°	117 / 1696.5	110 / 1595	103 / 1483.5	96 / 1392	90 / 1305	84 / 1218	77 / 1116.5	70 / 1015	64 / 928
315° / 600°	105 / 1522.5	99 / 1435.5	93 / 1348.5	87 / 1261.5	82 / 1189	76 / 1102	70 / 1015	64 / 928	59 / 855.5

PRESSURE-TEMPERATURE CHART FOR TRANSPARENT GAUGES

Series T-L	Size Number of Window								
Temp °C / °F	1	2	3	4	5	6	7	8	9
	Pressure (Bar / PSI)								
40° / 104°	83 / 1200.5	77 / 1116.5	70 / 1014	64 / 928	59 / 855.5	53 / 768.5	47 / 681.5	41 / 594.5	35 / 507.5
95° / 203°	75 / 1087.5	69 / 1000.5	64 / 928	58 / 841	52 / 754	47 / 681.5	42 / 609	37 / 538.5	31 / 449.5
150° / 302°	66 / 957	61 / 884.5	57 / 826.5	52 / 754	47 / 681.5	43 / 623.5	38 / 551	29 / 420.5	25 / 362.5
205° / 401°	59 / 855.5	55 / 797.5	50 / 726	46 / 667	42 / 609	37 / 536.5	33 / 478.5	29 / 420.5	25 / 362.5
260° / 500°	50 / 726	47 / 681.5	44 / 638	40 / 580	36 / 522	33 / 478.5	29 / 420.5	25 / 362.5	22 / 319
315° / 600°	43 / 623.5	39 / 565.5	37 / 536.5	33 / 478.5	30 / 435	28 / 406	25 / 362.5	22 / 319	19 / 275.5

NOTE: RATING SHOWN ARE FOR OUR STANDARD CARBON STEEL, AND TYPE 316 STAINLESS STEEL CONSTRUCTIONS.
 FOR OTHER MATERIALS CONTACT FACTORY



PROCESS GAUGES

A General Purpose Gauge for Mid-Range pressure temperature applications.

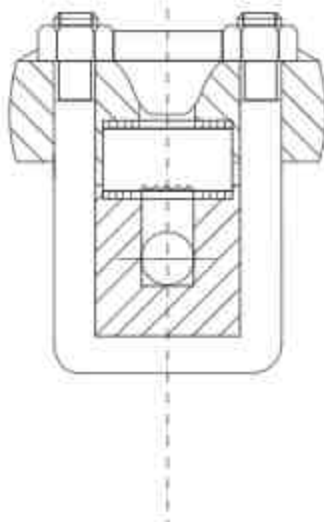
Series-M Liquid Gauges have been proven dependable and safe on thousands of installation.

Standard Construction includes a solid one- piece chamber machined from carbon steel with covers, toughened glass and chrome molybdenum bolts and nuts.

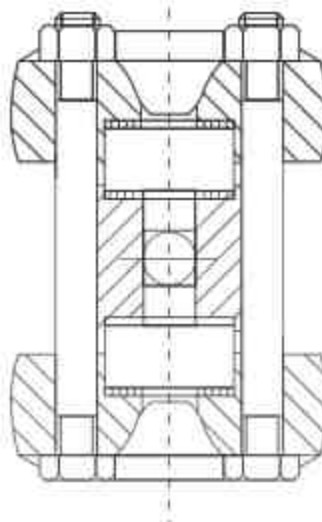
All metal parts are rustproofed. Recessed gasket seat prevent movement and insure leak-free service.

Series-M gauges are also available in a wide variety of materials to meet specific corrosive or extreme temperature conditions.

Series: R-M (Reflex)



Series: T-M (Transparent)



LENGTHS:

Series-M Gauges are available in nine standard visible glass lengths.

Multiple windows on a single piece liquid chamber are used for longer lengths.

CONNECTIONS:

Standard Connections are 1/2" NPT or 3/4" NPT.

LIQUID CHAMBERS:

Machined from solid bar stock of cold rolled carbon steel. Perfectly machined gasket seats prevent movement of gasket and insure leakproof performance. Rustproofed.

COVERS:

Rustproofed steel.

SPECIAL MATERIALS:

Materials to suit NACE applications, other special materials available on request.

BOLTS & NUTS:

Chrome molybdenum alloy steel bolts heat treated for strength and rustproofed to provide maximum corrosion resistance.

TOUGHENED GLASS:

Toughened glass, resistant to thermal and mechanical shock. It is a tough, durable, moulded glass made under carefully controlled manufacturing techniques, in accordance with BS 3463, DIN 7081. Mica or plastic shields are recommended for transparent glasses when handling caustic, hydrofluoric acid or other media corrosive to glass.

GASKETS:

Die cut from highest quality material best suited for use with liquid indicated.

PRESSURE TEMPERATURE RATING

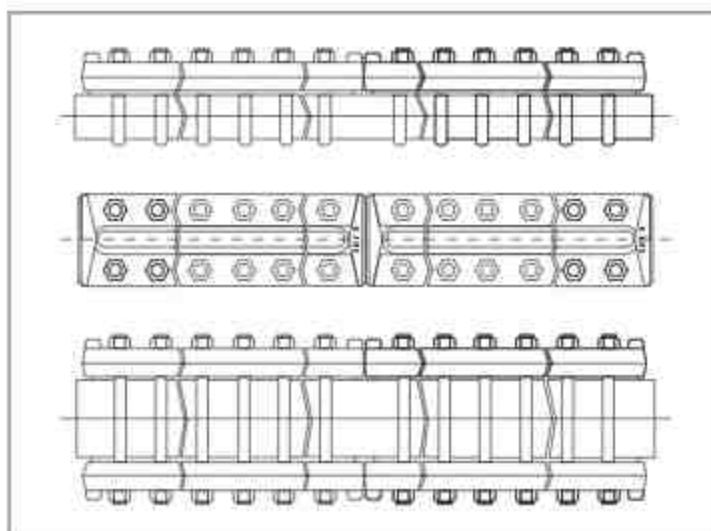
PRESSURE-TEMPERATURE CHART FOR REFLEX GAUGES

Series R-M		Size Number of Window								
Temp °C / °F	1	2	3	4	5	6	7	8	9	
	Pressure (Bar / PSI)									
40° / 104°	208 / 2987	200 / 2900	168 / 2728	180 / 2610	172 / 2494	162 / 2349	153 / 2218.5	145 / 2102.5	138 / 2001	
95° / 203°	198 / 2827.5	188 / 2706	179 / 2595.5	170 / 2465	162 / 2349	153 / 2218.5	144 / 2088	138 / 2001	131 / 1899.5	
150° / 302°	183 / 2653.5	175 / 2537.5	168 / 2406	160 / 2320	152 / 2204	144 / 2088	136 / 1972	129 / 1870.5	121 / 1754.5	
205° / 401°	170 / 2465	162 / 2349	155 / 2247.5	147 / 2131.5	140 / 2000	133 / 1928.5	125 / 1812.5	118 / 1711	111 / 1609.5	
260° / 500°	158 / 2282	149 / 2160.5	142 / 2059	135 / 1957.5	128 / 1812.5	121 / 1754.5	114 / 1653	107 / 1551.5	100 / 1450	
315° / 600°	140 / 2000	134 / 1943	128 / 1866	121 / 1754.5	115 / 1667.5	107 / 1551.5	102 / 1479	96 / 1377.5	90 / 1305	

PRESSURE-TEMPERATURE CHART FOR TRANSPARENT GAUGES

Series T-M		Size Number of Window								
Temp°C/°F	1	2	3	4	5	6	7	8	9	
	Pressure (Bar / PSI)									
40° / 104°	138 / 2001	126 / 1886	121 / 1754.5	110 / 1595	104 / 1508	93 / 1348.5	86 / 1247	79 / 1152	69 / 1000.5	
95° / 203°	121 / 1754.5	123 / 1783.5	115 / 1687.5	107 / 1551.5	99 / 1435.5	90 / 1305	81 / 1174.5	73 / 1056.5	66 / 957	
150° / 302°	122 / 1769	115 / 1667.5	107 / 1551.5	100 / 1450	92 / 1334	84 / 1218	76 / 1102	69 / 1000.5	62 / 899	
205° / 401°	115 / 1305	109 / 1580.5	101 / 1454.5	93 / 1348.5	86 / 1247	79 / 1145.5	72 / 1044	64 / 928	59 / 855.5	
260° / 500°	106 / 1537	100 / 1450	93 / 1348.5	86 / 1247	80 / 1160	72 / 1044	66 / 957	59 / 855.5	52 / 754	
315° / 600°	93 / 1348.5	88 / 1276	81 / 1174.5	76 / 1102	70 / 1016	64 / 928	59 / 855.5	52 / 754	47 / 681.5	

NOTE: RATING SHOWN ARE FOR OUR STANDARD CARBON STEEL, AND TYPE 316 STAINLESS STEEL CONSTRUCTIONS.
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PROCESS GAUGES

A Heavy Duty Gauge for safe, dependable service

Heavy-duty Series-H Gauges are available in both Reflex and Transparent types.

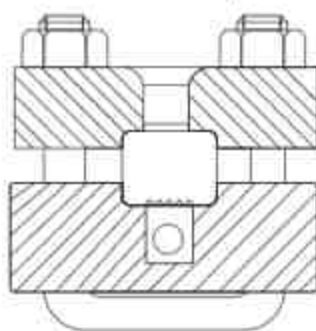
These Gauges are designed and manufactured to highest industrial standards. Their dependability under difficult operating conditions is well known in the process industries.

Series-H Gauges have a one-piece liquid chamber machined from solid bar steel. Interchangeable sectional gauges covers a glasses are tightly locked over the liquid chamber with special bolts and nuts.

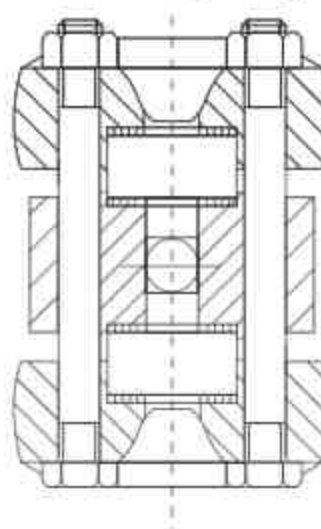
Recessed gasket seats have a fine finish to provide a positively leak proof seal between the chamber and glass.

All metal surface inside and out, including threaded areas, are rustproofed.

Series: R-H (Reflex)



Series: T-H (Transparent)



LENGTHS:

Series-H Gauges are available in nine standard visible glass lengths.

Multiple windows on a single piece liquid chamber are used for longer lengths.

CONNECTIONS:

Standard Connections are 1/2" NPT or 3/4" NPT.

LIQUID CHAMBERS:

Machined from solid bar stock of cold rolled carbon steel. Perfectly machined gasket seats prevent movement of gasket and insure leakproof performance. Rustproofed.

COVERS:

Rustproofed steel.

SPECIAL MATERIALS:

Materials to suit NACE applications, other special materials available on request.

BOLTS & NUTS:

Chrome molybdenum alloy steel bolts heat treated for strength and rustproofed to provide maximum corrosion resistance.

TOUGHENED GLASS:

Toughened glass, resistant to thermal and mechanical shock. It is a tough, durable, moulded glass made under carefully controlled manufacturing techniques, in accordance with BS 3463, DIN 7081. Mica or plastic shields are recommended for transparent glasses when handling caustic, hydrofluoric acid or other media corrosive to glass.

GASKETS:

Die cut from highest quality material best suited for use with liquid indicated.

PRESSURE TEMPERATURE RATING

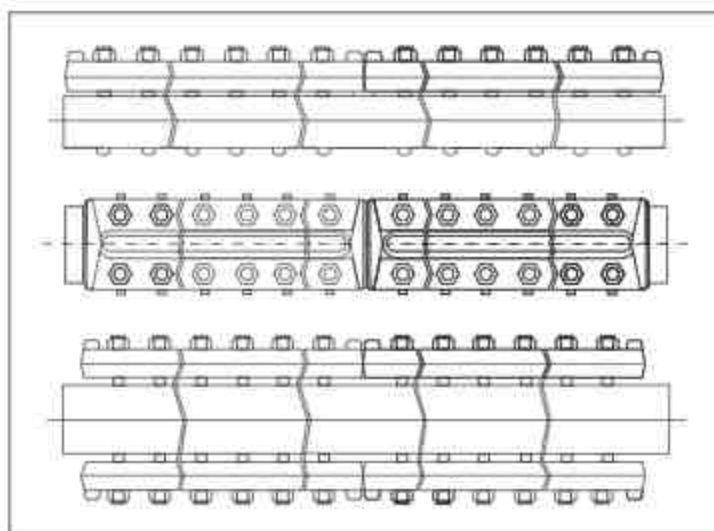
PRESSURE-TEMPERATURE CHART FOR REFLEX GAUGES

Series R-H		Size Number of Window							
Temp°C/°F	1	2	3	4	5	6	7	8	9
	Pressure (Bar / PSI)								
40° / 104°	276 / 4002	266 / 3857	259 / 3755.5	248 / 3598	242 / 3509	229 / 3320.5	222 / 3219	213 / 3086.5	207 / 3001.5
95° / 203°	262 / 3799	254 / 3683	247 / 3581.5	236 / 3422	229 / 3320.5	221 / 3204.5	213 / 3086.5	206 / 2987	197 / 2856.5
150° / 302°	248 / 3598	239 / 3485.5	231 / 3349.5	224 / 3248	215 / 3117.5	207 / 3007.5	199 / 2885.5	192 / 2784	184 / 2668
205° / 401°	229 / 3320.5	221 / 3204.5	214 / 3103	207 / 3001.5	200 / 2900	192 / 2784	185 / 2682.5	177 / 2566.5	170 / 2465
260° / 500°	212 / 3074	204 / 2958	198 / 2871	190 / 2755	185 / 2682.5	177 / 2566.5	170 / 2465	162 / 2349	156 / 2262
315° / 600°	192 / 2784	186 / 2697	179 / 2595.5	172 / 2494	166 / 2407	160 / 2320	153 / 2218.5	147 / 2131.5	141 / 2044.5

PRESSURE-TEMPERATURE CHART FOR TRANSPARENT GAUGES

Series T-H		Size Number of Window								
Temp°C/°F	1	2	3	4	5	6	7	8	9	
	Pressure (Bar / PSI)									
40° / 104°	207 / 3001.5	200 / 2900	190 / 2755	180 / 2610	172 / 2494	164 / 2378	155 / 2247.5	145 / 2102.5	138 / 2001	
95° / 203°	197 / 2856.5	191 / 2769.5	181 / 2624.5	172 / 2494	162 / 2349	156 / 2262	147 / 2131.5	140 / 2030	131 / 1899.5	
150° / 302°	192 / 2784	176 / 2562	169 / 2450.5	161 / 2334.5	155 / 2247.5	146 / 2117	138 / 2001	131 / 1899.5	122 / 1769	
205° / 401°	174 / 2523	166 / 2407	160 / 2320	152 / 2204	145 / 2102.5	137 / 1986.5	131 / 1899.5	121 / 1754.5	116 / 1682	
260° / 500°	161 / 2334.5	155 / 2247.5	150 / 2175	142 / 2069	133 / 1926.5	126 / 1838	121 / 1754.5	114 / 1653	106 / 1537	
315° / 600°	142 / 2069	135 / 1937.5	129 / 1870.5	124 / 1798	119 / 1726.5	113 / 1638.5	106 / 1522.5	100 / 1450	93 / 1345.5	

NOTE: RATING SHOWN ARE FOR OUR STANDARD CARBON STEEL, AND TYPE 316 STAINLESS STEEL CONSTRUCTIONS.
 FOR OTHER MATERIALS CONTACT FACTORY



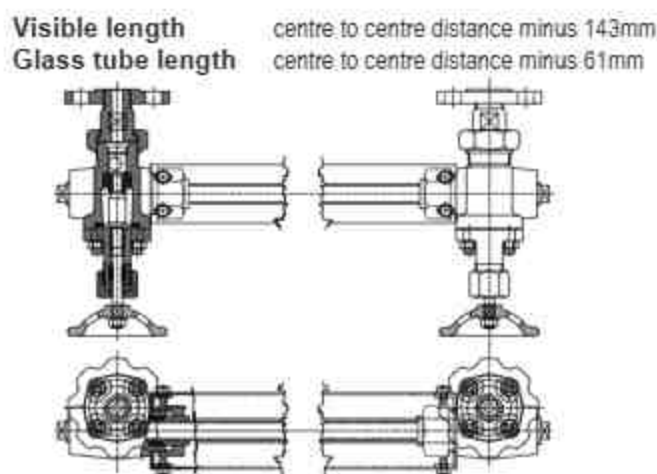
TUBULAR GAUGES

Tubular Glass Gauges for low pressure process and boiler drum application.

Tubular Glass Level Gauges comprise a length of 19mm outside diameter drawn borosilicate glass tube fitted each end with an offset isolating valve to permit connection to a vessel.

The series 26 isolating valves have a specially designed gland assembly for positive sealing onto the glass tube without imposing stress.

Lengths: Any single glass up to and including 200mm vessel centres. Longer lengths available on request.



**ISOLATING VALVE MATERIALS
SERIES 26**

VALVE BODY: Machined from carbon steel forging.

VALVE BONNET: Union type bonnet machined from carbon steel.

VALVE TRIM: Renewable seat, plug / spindle and ballcheck manufactured in 316 stainless steel.

HANDWHEEL/LEVER: Ductile iron.

PACKING: Spindle packing, multi ring non-asbestos compatible with service. Glass gland packing, rubber/PTFE.

CARBON STEEL PARTS: Are rustproofed to provide maximum corrosion resistance.

SPECIAL MATERIALS: Available to suit NACE specification MR-01-75 and/or specific liquid services.

Pressure rating: Maximum permitted working pressure varies with length - refer to table below:

Single Glass length (mm / inch)	Maximum working pressure for:	
	Temp upto 65°C / 149°F with no corrosion BARS / PSI	Steam boiler services upto 170°C / 338°F BARS / PSI
200 / 7.87	7 / 101.5	7 / 100
250 / 9.84	7 / 101.5	7 / 100
300 / 11.81	7 / 101.5	7 / 100
350 / 13.77	7 / 101.5	7 / 100
400 / 15.74	7 / 101.5	7 / 100
450 / 17.71	7 / 101.5	7 / 100
500 / 19.68	7 / 101.5	7 / 100
600 / 23.62	7 / 101.5	7 / 100

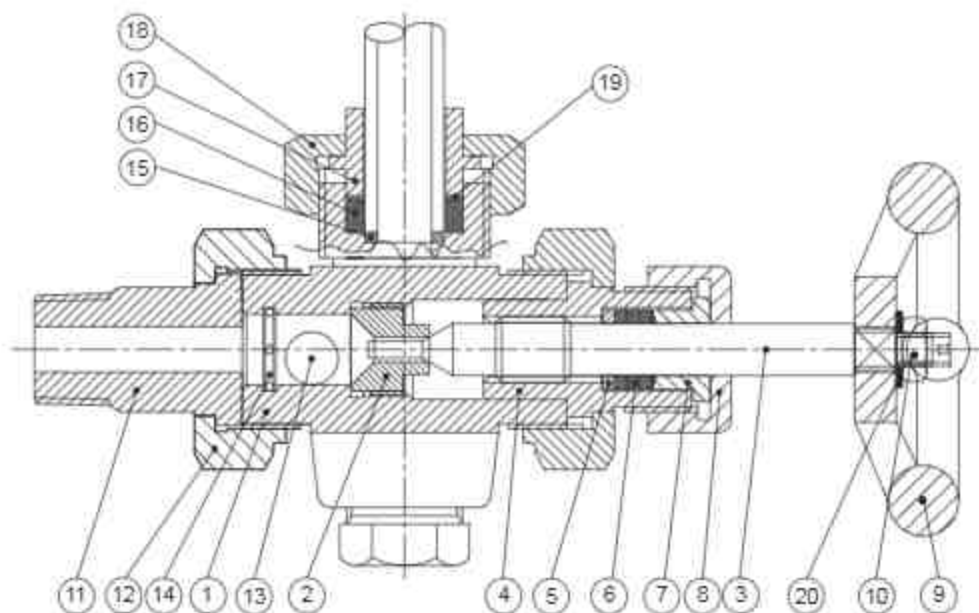
Gauges with glass lengths up to 600mm / 23.62 inch are suitable for Steam Boiler application when installed in accordance with the requirement of British Standard BS 759.

TUBULAR GAUGE VALVE

OPTIONAL FEATURES AND ACCESSORIES

Guard-Rod Protectors: Four (4) guard rods and holders to protect glass from mechanical shock is standard. Box type sheet metal protector is optional.

Safety Ballcheck: Valves can be furnished with a ballcheck for pressurized and vacuum service to provide positive isolation of liquid in the event of glass breakage.



SERIES-26 VALVE

PART NO.	PART NAME	QTY	STD MATERIAL	PART NO.	PART NAME	QTY	STD MATERIAL
1	VALVE BODY	1	STEEL	11	UNION PIN	1	STEEL
2	SEAT	1	316 SS	12	UNION NUT	1	STEEL
3	STEM	1	410 SS	13	BALL CHECK	1	316 SS
4	SLEEVE	1	STEEL	14	BALL CHECK STOP	1	316 SS
5	PACKING RING	1	STEEL	15	GLASS TUBE RING	1	STEEL
6	PACKING (VALVE)	4	GRAPHITE	16	PACKING (GLASS TUBE)	1	NITRILE
7	GLAND (VALVE)	1	STEEL	17	GLAND (GLASS TUBE)	1	STEEL
8	NUT-GLAND	1	STEEL	18	GLAND NUT	1	STEEL
9	HANDWHEEL	1	WCB	19	PACKING TOP	1	PTFE
10	NUT-STEM	1	STEEL	20	TAG PLATE	1	SS 304

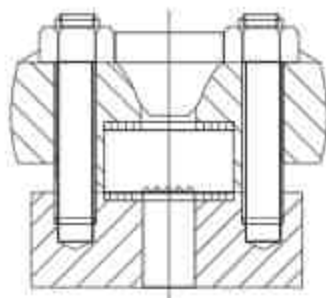
PROCESS GAUGES

Flat Glass Liquid Level Gauges designed to become an integral part of the vessel

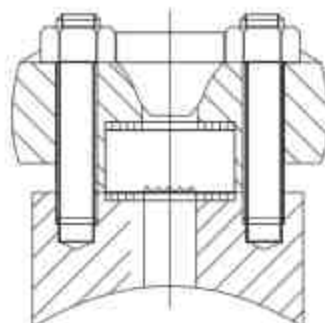
Weld Pad Gauges are used where conventional gauge and valve construction is impractical, e.g. because of solid matter in suspension, when thermal error due to piping to a gauge glass can not be tolerated, or where space restrictions suggest their use.

They are available in most standard sizes, with both Reflex and Transparent glasses. Reflex glasses are used where liquid level reading is the only requirement. Transparent gauges are usually used where there is also a requirement to see into the vessel or, with gauges installed on each side, through the vessel (e.g. interface applications.)

Series: WPM (Flat Back)



Series: WPM (Radiused Back)



LENGTHS:

Weld pad Gauges are available in nine standard visible glass lengths. Longer lengths can be achieved either by having multiple windows on a single piece or having several overlapping individual gauges (giving continuous visible length).

INSTALLATION:

The weld pad body is welded to the vessel after cutting a slot, or holes, in the vessel wall to match the slot in the gauge body.

PRESSURE LOADS:

Weld pad gauges will withstand loading due to the service pressure, but they are not designed to replace the vessel strength lost when the vessel wall is cut.

The vessel wall provides suitable vessel wall reinforcement to prevent distortion during cutting, installation and operation.

GAUGE BODY:

Machined from solid bar stock of cold rolled carbon steel rustproofed.

COVERS:

Rustproofed steels.

BOLTS & NUTS:

Chrome molybdenum alloy steel bolts heat treated for strength and rustproofed.

TOUGHENED GLASS:

Toughened glass, resistance to thermal and mechanical shock. It is tough, durable, moulded glass made under carefully controlled manufacturing techniques, in accordance with BS 3463, DIN 7081. Mica or plastic shields are recommended for transparent glasses when handling caustic, hydrofluoric acid or other media corrosive to glass.

GASKETS:

Die cut from highest quality material best suited for use with liquid indicated.

SPECIAL MATERIALS:

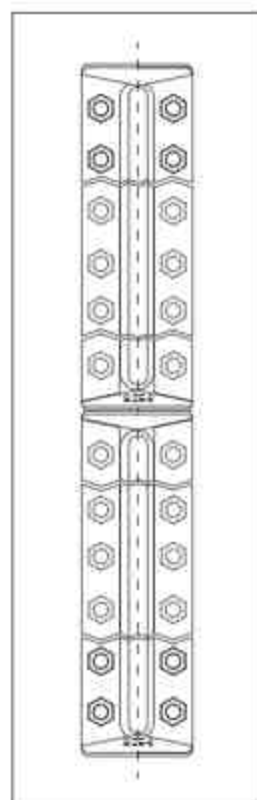
Materials to suit NACE applications, other special materials available on request.

PRESSURE TEMPERATURE RATING

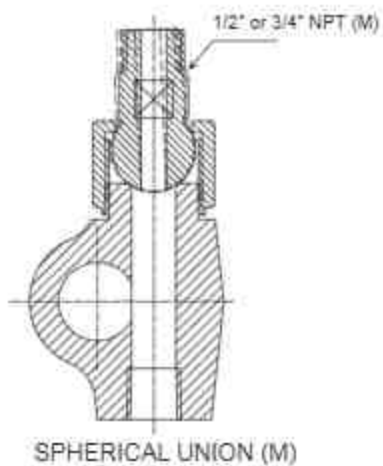
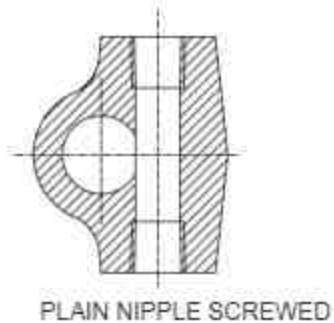
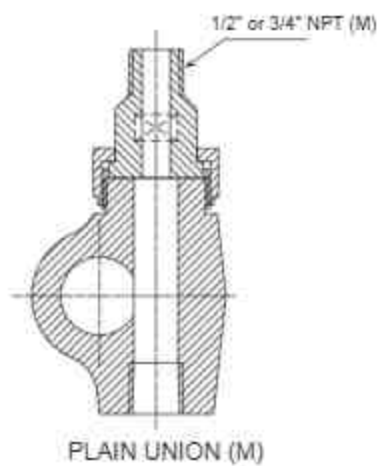
PRESSURE-TEMPERATURE CHART FOR WELD PAD GAUGE									
Series WPM	Size Number of Window								
	1	2	3	4	5	6	7	8	9
Temp°C/°F	Pressure (Bar / PSI)								
40° / 104°	207 / 3001.5	200 / 2900	190 / 2755	180 / 2610	172 / 2494	164 / 2378	155 / 2247.5	146 / 2102.5	138 / 2001
95° / 203°	197 / 2856.5	191 / 2769.5	181 / 2634.5	172 / 2494	162 / 2349	158 / 2292	147 / 2131.5	140 / 2030	131 / 1899.5
150° / 302°	192 / 2784	178 / 2562	169 / 2450.5	161 / 2334.5	155 / 2247.5	146 / 2117	138 / 2001	131 / 1899.5	122 / 1779
205° / 401°	174 / 2523	166 / 2407	160 / 2320	152 / 2204	146 / 2102.5	137 / 1986.5	131 / 1899.5	121 / 1754.5	116 / 1682
260° / 500°	161 / 2334.5	158 / 2247.5	150 / 2175	142 / 2059	133 / 1926.5	128 / 1838	121 / 1754.5	114 / 1653	106 / 1537
315° / 600°	142 / 2059	135 / 1957.5	129 / 1970.5	124 / 1798	119 / 1726.5	113 / 1638.5	106 / 1522.5	100 / 1450	95 / 1348.5

RATING SHOWN ARE FOR OUR STANDARD CARBON STEEL, AND TYPE 316 STAINLESS STEEL CONSTRUCTION.

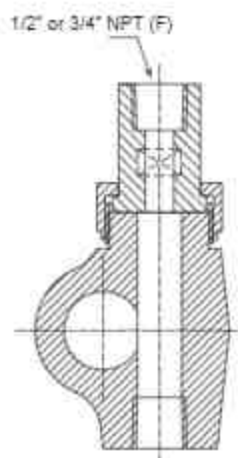
NOTE: It is the responsibility of the tank designer to determine the strength requirement of the method of attachment of the gauge to the tank.



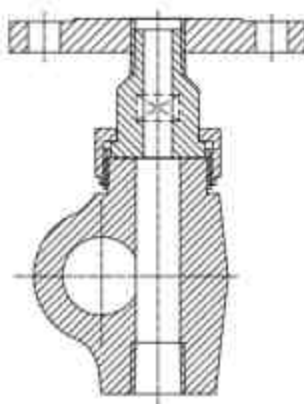
GAUGE CONNECTION OPTIONS



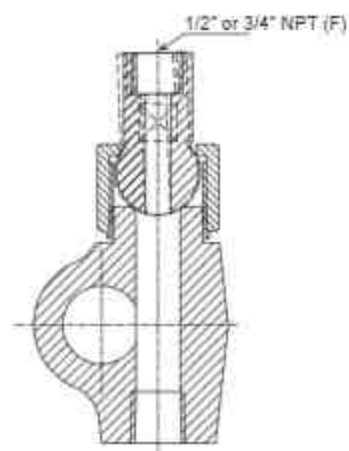
GAUGE CONNECTION OPTIONS



PLAIN UNION (F)



FLANGED



SPHERICAL UNION (F)

STANDARD VISIBLE LENGTH CHART

DIMENSIONS & WEIGHTS SERIES-M

Sect. X Size	Visible Range		Overall Length		Approximate Weight			
					Reflex, R-M		Transp., T-M	
	in	mm	in	mm	lbs	Kgs	lbs	Kgs
11	3 ³ / ₄	95	5 ¹ / ₄	133	8	3.6	10	4.5
12	4 ³ / ₄	121	6 ¹ / ₄	159	9	4.1	14	6.4
13	5 ³ / ₄	146	7 ¹ / ₄	184	11	5.0	17	7.7
14	6 ³ / ₄	171	8 ¹ / ₄	210	12	5.5	19	8.6
15	7 ⁷ / ₈	200	9 ⁵ / ₈	238	14	6.4	21	9.5
16	9 ¹ / ₈	232	10 ⁵ / ₈	270	16	7.3	24	10.9
17	10 ¹ / ₄	260	11 ³ / ₄	298	18	8.2	27	12.3
18	11 ⁷ / ₈	302	13 ³ / ₈	340	20	9.1	30	13.6
19	12 ⁵ / ₈	321	14 ¹ / ₈	359	21	9.5	32	14.5
23	13	330	14 ¹ / ₂	368	22	10.0	33	15.0
24	15	381	16 ¹ / ₂	419	25	11.4	38	17.3
25	17 ¹ / ₄	438	18 ³ / ₄	476	28	12.7	43	19.5
26	19 ³ / ₄	502	21 ¹ / ₄	540	32	14.5	49	22.3
27	22	559	23 ¹ / ₂	597	35	15.9	54	24.5
28	25 ¹ / ₄	641	26 ³ / ₄	679	40	18.2	61	27.7
29	26 ³ / ₄	679	28 ¹ / ₄	718	43	19.5	64	29.1
36	30 ³ / ₈	772	31 ⁷ / ₈	810	48	21.8	73	33.2
37	33 ³ / ₄	857	35 ¹ / ₄	895	53	24.1	80	36.4
38	38 ⁵ / ₈	981	40 ¹ / ₈	1019	60	27.3	92	41.8
39	40 ⁷ / ₈	1038	42 ⁵ / ₈	1076	64	29.1	97	44.1
47	45 ¹ / ₂	1156	47	1194	71	32.3	107	48.6
48	52	1321	53 ¹ / ₂	1359	80	36.4	122	55.5
49	55	1397	56 ¹ / ₂	1435	85	38.6	129	58.6
57	57 ¹ / ₄	1454	58 ³ / ₄	1492	88	40.0	134	60.9
58	65 ⁵ / ₈	1661	66 ⁷ / ₈	1699	100	45.5	152	69.1
59	69 ¹ / ₈	1756	70 ⁵ / ₈	1794	106	48.2	161	73.2
68	78 ³ / ₄	2000	80 ¹ / ₄	2038	120	54.5	187	85.0
69	83 ¹ / ₄	2115	84 ³ / ₄	2153	127	57.7	196	89.1
78	92 ¹ / ₈	2340	93 ⁵ / ₈	2378	140	63.6	221	100.5
79	97 ³ / ₈	2473	98 ⁷ / ₈	2511	148	67.3	230	104.5
88	105 ¹ / ₂	2680	107	2718	160	72.7	254	115.5
89	111 ¹ / ₂	2832	113	2870	169	76.8	265	120.5
98	118 ⁷ / ₈	3019	120 ³ / ₈	3058	185	83.8	272	123.4
99	125 ⁵ / ₈	3191	127 ¹ / ₈	3229	193	87.5	276	125.4

All dimensions in millimeters.

All weights are in kilograms.

All information stated above is approximate and is given for Guidance only.

Support brackets are provided on all gauges consisting of 5 sections or more.

For visible length other than shown in the chart contact factory.

OPTIONAL ACCESSORIES

BLISS ANAND Supplies variety of accessories with Level Gauges, on request.

1. Illuminator:

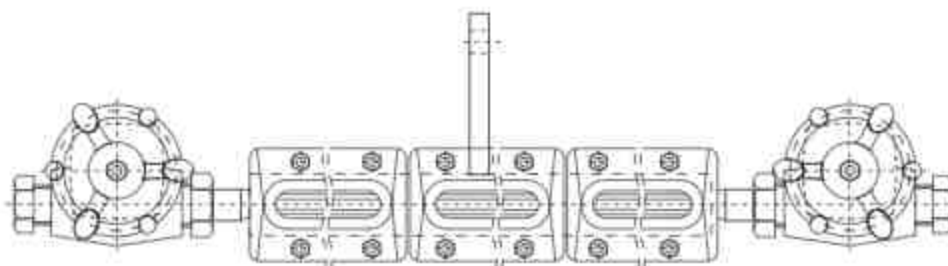
Transparent level gauge are supplied with illuminator both explosion proof and weather proof.

**2. Scales:**

Metallic engraved scale can be supplied with desired graduation.

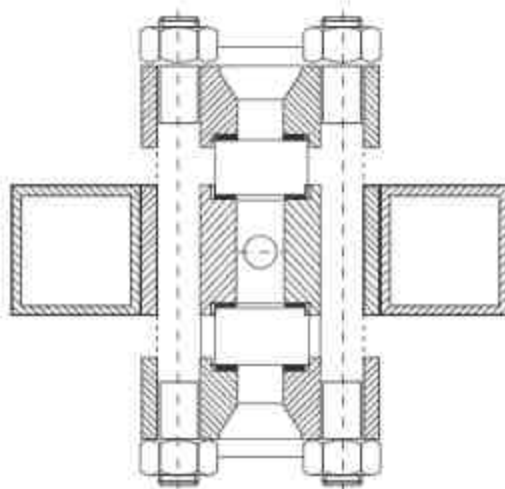
**3. Support Brackets:**

Support brackets are recommended when the overall gauge length exceeds 1.5 meters.

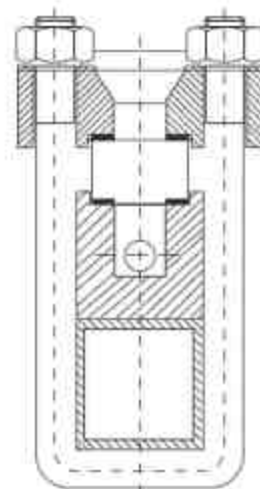


4. Heating jacket:

Heating jackets can be provided for process gauge both for reflex and transparent types.



H Type Transparent



M Type Reflex

5. Non-Frosting Shield:

Non-frosting Shields supplied for sub zero application for both reflex and transparent type level gauges.



Gauge Valve

BLISS
AMERICAS

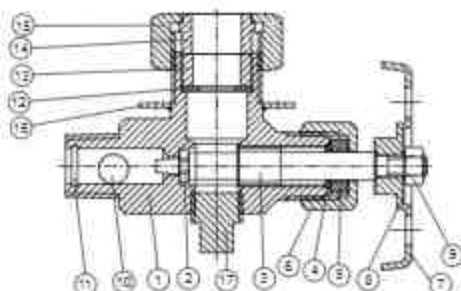
Index: Gauge Valve

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Series 10	23
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Series 80	26-28
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Gauge - Valve Combinations & Minimum C.C. Distance	30





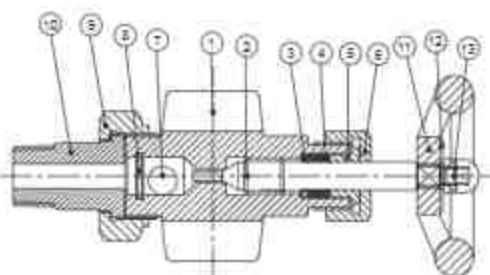
VALVE OPTIONS



SERIES - 10

100LBS@100 DEG F

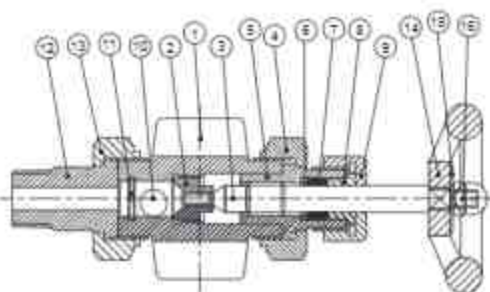
BLISS ANAND 10-TU valves feature straight type body with integrated seat and Elastomer (EPDM) Glass tube packing bush, with integral seat and PTFE valve cone. These are primarily used for tubular type level gages for low pressure & temperature applications. They are equipped with mounting clamps to fit glass protection rods. They also features a ball check arrangement.



SERIES - 20

4000 LBS @ 100°F, 2400 LBS @ 750°F

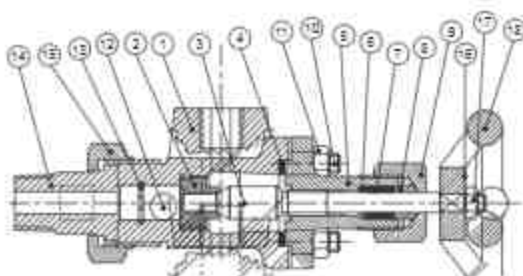
BLISS ANAND SERIES 20 valves features integrated of bonnet drop forged offset steel bodies, stainless steel trim with wide choice of connections. Their design incorporate ball check arrangements and union gauge connections. They are equipped with union gauge connections which permits simple installation and easy access to the ball check.



SERIES - 40

4000 LBS @ 100°F, 1500 LBS @ 750°F

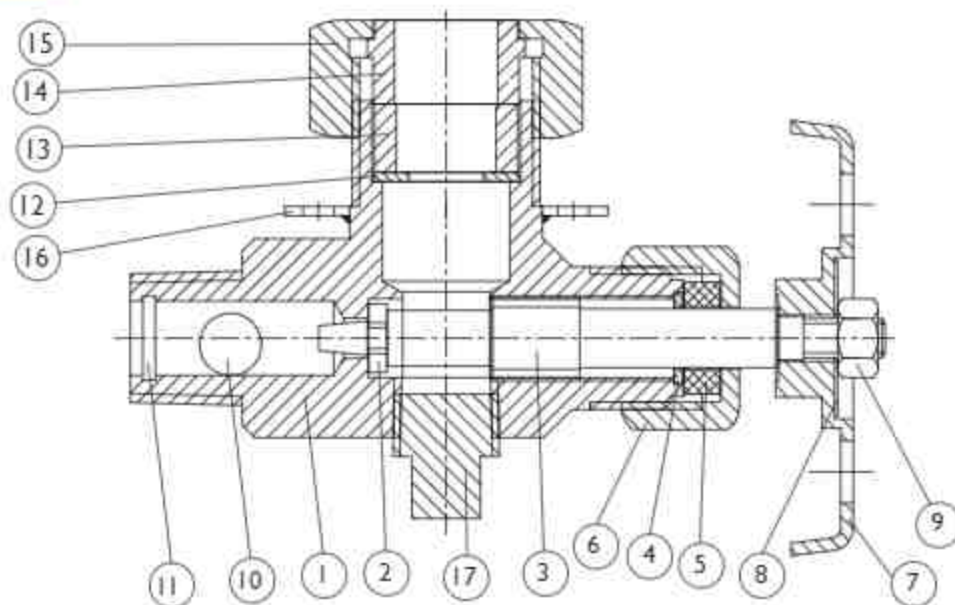
BLISS ANAND SERIES 40 valves are designed and built to the highest standard quality features such as regrindable and renewable seat and complete rust proofed carbon steel parts assuring long trouble free services union gauge connection enables gauges to be turned to any desired angle and removed of gauge without disturbing the valve which saves time in maintenance. Also the valve features union bonnet, and stem back seating.



SERIES - 80

4000 LBS @ 100°F, 1500 LBS @ 750°F

BLISS ANAND SERIES 80 valves are designed with bolted bonnet construction. Valves are equipped with stainless steel ball checks, stem back seating and offset construction. Union gauges connections is optional.



PART NO.	PART NAME	STD MATERIAL	PART NO.	PART NAME	STD MATERIAL
1	VALVE BODY	A-105	10	BALL CHECK	SS-316
2	VALVE WASHER	TEFLON	11	BALL CHECK STOP	SS-304
3	STEM	SS-304	12	WASHER	SS-304
4	STEM PACKING WASHER	SS-316	13	GLASS PACKING	EPDM
5	STEM PACKING	GRAFOIL	14	PACKING GLAND	STEEL
6	PACKING NUT	STEEL	15	GLASS PACKING NUT	STEEL
7	HANDWHEEL	ZINC	16	MOUNTING CLAMP	STEEL
8	TAG NAME PLATE	SS-304	17	PLUG	STEEL
9	STEM NUT	STEEL			

STANDARD FEATURES

SOFT SEAT VALVE CONE:

The valve features a soft seating valve cone in PTFE capped at the stem tip. This ensures zero leak when closed.

STRAIGHT BODY PATTERN:

The valve features a straight body pattern.

Standard Connections:

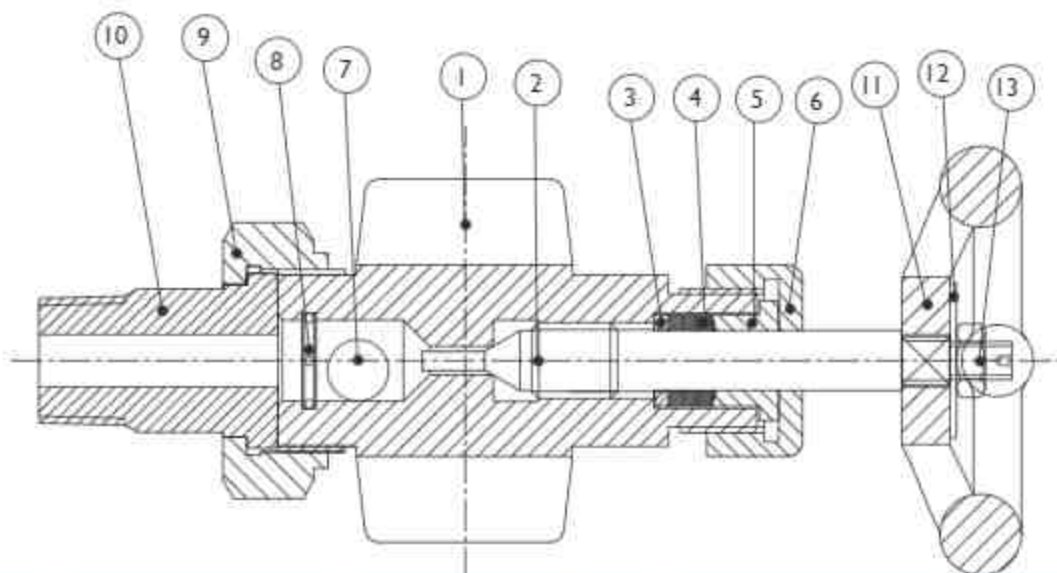
Vessel : 3/4" NPT male
 Drain : 3/4" NPT female
 Gauge : 3/8" NPT female

Optional Connections:

Vessel : 1/2" NPT male
 Vent & Drain : 1/4" NPT plugged

Safety Shut OFF:

Valves are provided with stainless steel ball check which instantaneously shuts off flow of the medium being gauged in the event of glass breakage.



PART NO.	PART NAME	STD MATERIAL
1	VALVE BODY	A-105 / F-316L
2	SPINDLE	SS-316L
3	GLAND STOPPER	SS-316
4	PACKING RING	GRAPHITE
5	GLAND FOLLOWER	SS-316
6	GLAND NUT	STEEL
7	BALL	SS-316

PART NO.	PART NAME	STD MATERIAL
8	BALL STOPPER	SS-304
9	TAIL PIECE	STEEL
10	UNION NUT	STEEL
11	HAND WHEEL	WCB
12	NAME PLATE	SS-304
13	HAND WHEEL NUT	STEEL

STANDARD FEATURES

BACKSEATING STEM:

When the valve is opened to its limit, the stem seats against the bonnet allowing the valve to be repacked while under pressure.

STRAIGHT BODY PATTERN:

The straight body is of a straight forward angle pattern, with the gauge, drain and vessel connections on intersecting centrelines.

OFFSET BODY PATTERN:

The Offset body is an angle pattern valve, with the centreline of the gauge and drain connections offset 22mm from the centreline of the vessel connections. Hence by removing the vent/Drain plugs, the interior of a top and bottom connected gauge glass may be cleaned without removing the gauge.

UNION GAUGE CONNECTION:

Both the straight and the offset can be furnished with a union gauge connection which allows a top and bottom connected gauge to be turned to any desired angle for convenient visibility. It also makes possible the removal of the gauge without removing the valves, a feature which saves time when the gauges must be cleaned or serviced.

Optional Connections:

Vessel : ½" NPT male or ¾" NPT male for socket weld or flanged to suit requirements. Series 20 valves can be supplied with ANSI 150, 300 or 600 integral flanges.

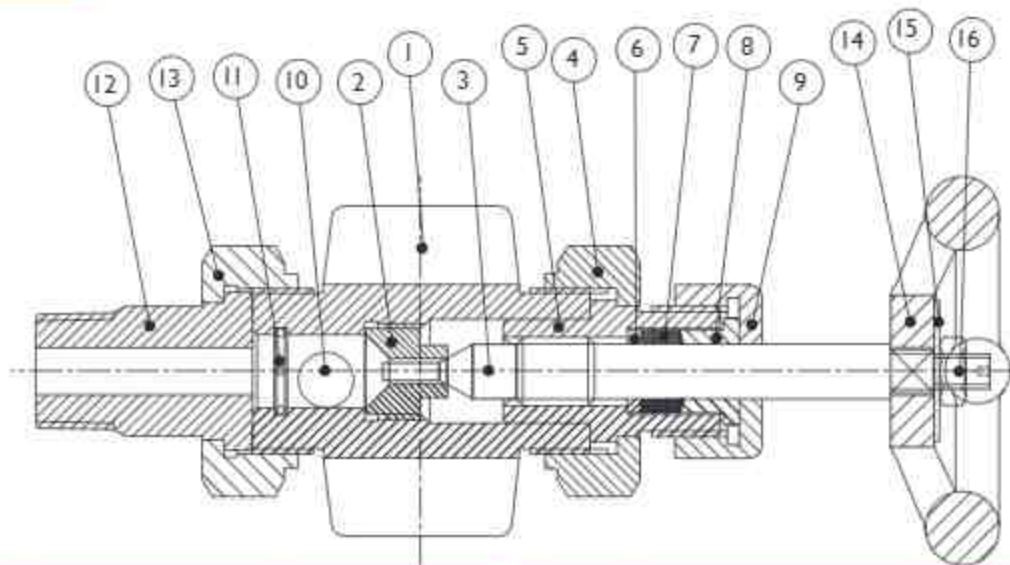
Gauges : On union connected valves ½" NPTmale or ¾" NPT male. On all valves ¾" NPT female screwed and ½" or ¾" female socket weld recess.

Vent/Drain : ¾" NPT female screwed and ½" or ¾" female socket weld recess. vent & drain valves on request.

Screwed connections are also available.
Quick closing optional.

Safety Shut Off:

Valves may be provided with stainless steel ballcheck which instantaneously shuts off flow of the medium being gauged in the event of glass breakage. The ball operates upstream from the seat and can be furnished for vacuum seating if required.



PART NO.	PART NAME	STD MATERIAL
1	VALVE BODY	A-105 / F-316L
2	RENEWABLE SEAT	SS-316
3	SPINDLE	SS-316L
4	BONNET NUT	STEEL
5	BONNET	STEEL
6	GLAND STOPPER	SS-316
7	PACKING RING	GRAPHITE
8	GLAND FOLLOWER	SS-316

PART NO.	PART NAME	STD MATERIAL
9	GLAND NUT	STEEL
10	BALL	SS-316
11	BALL STOPPER	SS-304
12	TAIL PIECE	STEEL
13	UNION NUT	STEEL
14	HAND WHEEL	WCB
15	NAME PLATE	SS-304
16	HAND WHEEL NUT	STEEL

STANDARD FEATURES

BACKSEATING STEM:

When the valve is opened to its limit, the stem seats against the bonnet allowing the valve to be repacked while under pressure.

STRAIGHT BODY PATTERN:

The straight body is of a straight forward angle pattern, with the gauge, drain and vessel connections on intersecting centrelines.

OFFSET BODY PATTERN:

The Offset body is an angle pattern valve, with the centreline of the gauge and drain connections offset 22mm from the centreline of the vessel connections. Hence by removing the vent/Drain plugs, the interior of a top and bottom connected gauge glass may be cleaned without removing the gauge.

UNION GAUGE CONNECTION:

Both the straight and the offset can be furnished with a union gauge connection which allows a top and bottom connected gauge to be turned to any desired angle for convenient visibility. It also makes possible the removal of the gauge without removing the valves, a feature which saves time when the gauges must be cleaned or serviced.

Standard Connections:

Vessel : 3/4" NPT male
Drain : 1/2" NPT female
Gauge : 1/2" NPT female

Optional Connections:

Vessel : 1/2" NPT male or 3/4" NPT male for socket weld or flanged to suit requirements. Series 40 valves can be supplied with ANSI 150, 300 or 600 integral flanges.

Gauges : On union connected valves 1/2" NPT male or 3/4" NPT male. On all valves 3/4" NPT female screwed and 1/2" or 3/4" female socket weld recess.

Vent/Drain: 3/4" NPT female screwed and 1/2" or 3/4" female socket weld recess. vent & drain valves on request.
 Screwed connections are also available.
 Quick closing optional.

Safety Shut Off:

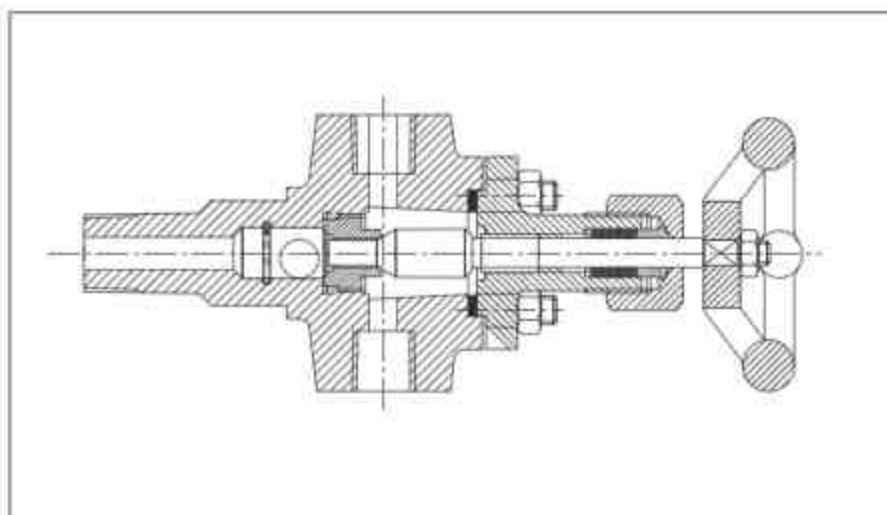
Valves may be provided with stainless steel ballcheck which instantaneously shuts off flow of the medium being gauged in the event of glass breakage. The ball operates upstream from the seat and can be furnished for vacuum seating if required.

GAUGE VALVES

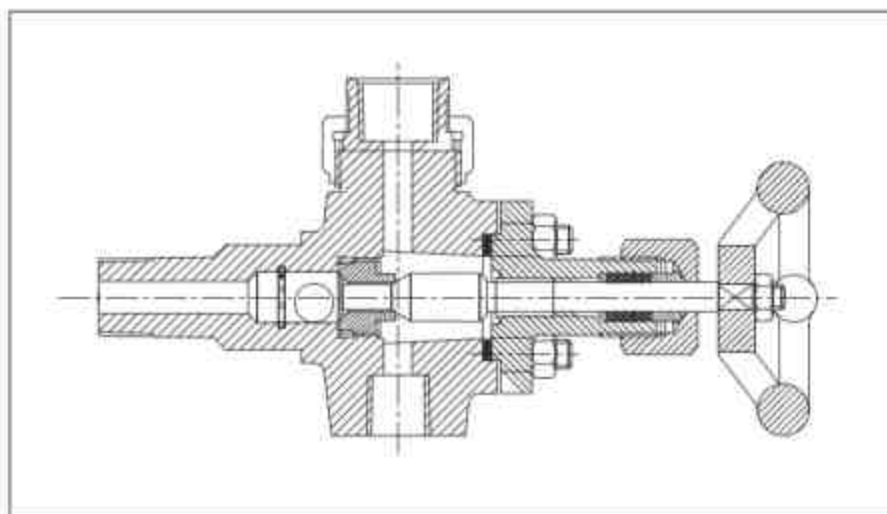
Gauge Valves With Bolted and Bonnet & Inside Screw, Designed to Reduce Threaded Connections.

These rugged valves are designed and manufactured for use with flat glass gauges, instruments piping and other applications.

Pressure Rating per intermediate rating ANSI 1250



83 STRAIGHT PATTERN WITH FEMALE NPT GAUGE CONNECTION, MALE VESSEL CONNECTION ON SOLID SHANK



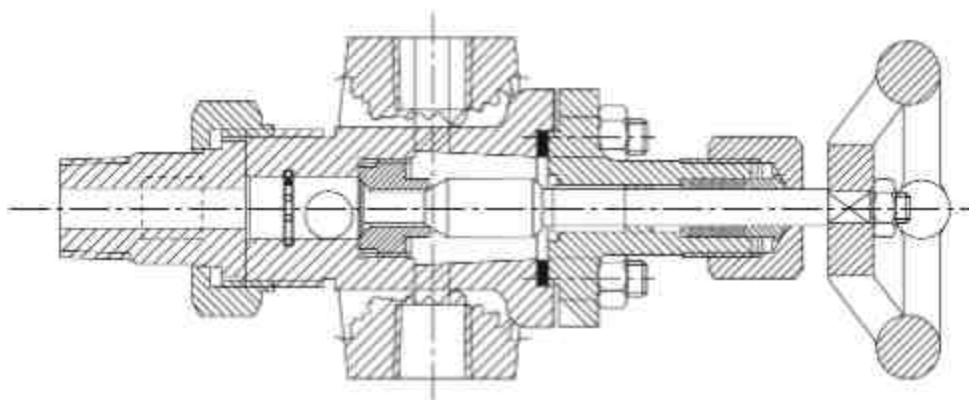
84 STRAIGHT PATTERN WITH FEMALE NPT UNION GAUGE CONNECTION, MALE VESSEL CONNECTION ON SOLID SHANK

GAUGE VALVES

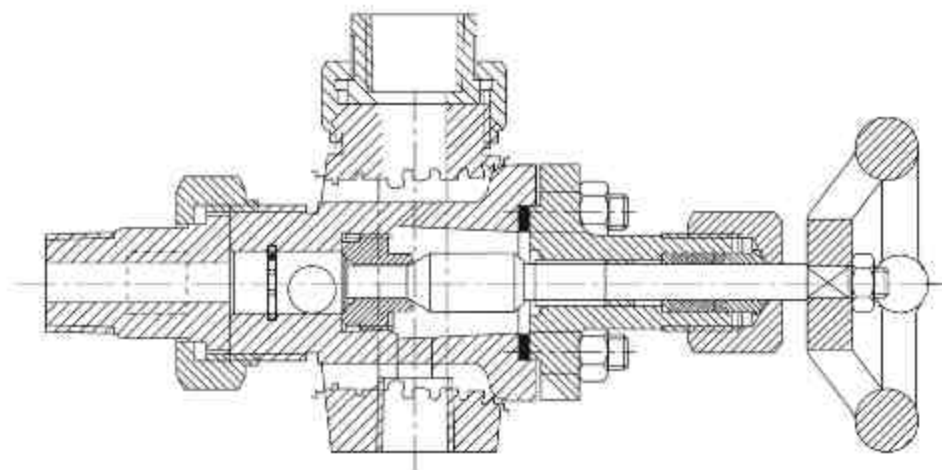
Gauge Valves With Bolted and Bonnet & Inside Screw, Designed to Reduce Threaded Connections.

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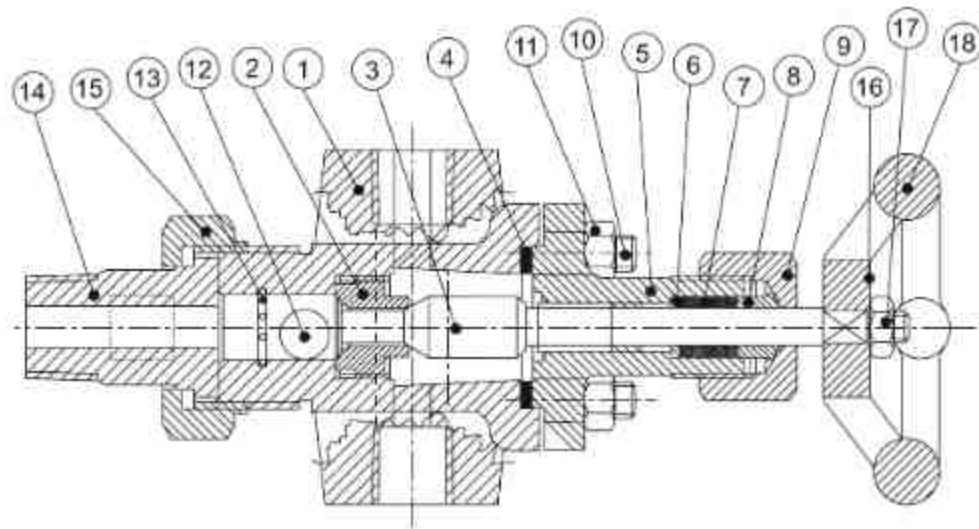
Pressure Rating per intermediate rating ANSI 1250



86 OFFSET PATTERN WITH FEMALE NPT GAUGE CONNECTION, MALE UNION VESSEL CONNECTION



87 OFFSET PATTERN WITH FEMALE NPT UNION GAUGE CONNECTION, MALE UNION VESSEL CONNECTION



PART NO.	PART NAME	STD MATERIAL
1	VALVE BODY	A-105 / F-316L
2	RENEWABLE SEAT	SS-316
3	SPINDLE	SS-316L
4	BONNET GASKET	SP WOUND SS 316+ GRAFOIL
5	BONNET	A-105/ F-316L
6	GLAND STOPPER	SS-316
7	PACKING RING	GRAPHITE
8	GLAND FOLLOWER	SS-316
9	GLAND NUT	STEEL

PART NO.	PART NAME	STD MATERIAL
10	BONNET STUD	A-193 GR. B7
11	BONNET NUT	A-194 GR. 2H
12	BALL	SS 316
13	BALL STOPPER	SS 304
14	TAIL PIECE	STEEL
15	UNION NUT	STEEL
16	HAND WHEEL	WCB
17	NAME PLATE	SS 304
18	HAND WHEEL NUT	STEEL

STANDARD FEATURES

BACKSEATING STEM:

When the valve is opened to its limit, the stem seats against the bonnet allowing the valve to be repacked while under pressure.

STRAIGHT BODY PATTERN:

The straight body is of a straight forward angle pattern, with the gauge, drain and vessel connections on intersecting centrelines.

OFFSET BODY PATTERN:

The Offset body is an angle pattern valve, with the centreline of the gauge and drain connections offset 22mm from the centreline of the vessel connections. Hence by removing the vent/drain plugs, the interior of a top and bottom connected gauge glass may be cleaned without removing the gauge.

UNION GAUGE CONNECTION:

Both the straight and the offset can be furnished with a union gauge connection which allows a top and bottom connected gauge to be turned to any desired angle for convenient visibility. It also makes possible the removal of the gauge without removing the valves, a feature which saves time when the gauges must be cleaned or serviced.

Standard Connections:

Vessel : 1/4" NPT male
Drain : 1/2" NPT female
Gauge : 1/2" NPT female

Optional Connections:

Vessel : 1/2" NPT male or 1/4" NPT male for socket weld or flanged to suit requirements.
Series 80 valves can be supplied with ANSI 150, 300 or 600 integral flanges.

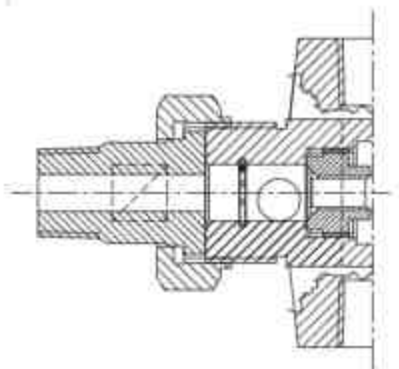
Gauges : On union connected valves 1/2" NPT male or 1/4" NPT male. On all valves 1/4" NPT female screwed and 1/2" or 1/4" female socket weld recess.

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Screwed connections are also available.
Quick closing optional.

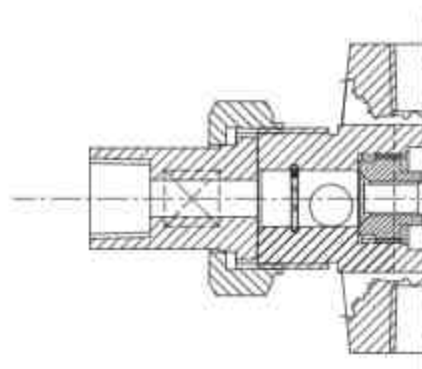
Safety Shut Off:

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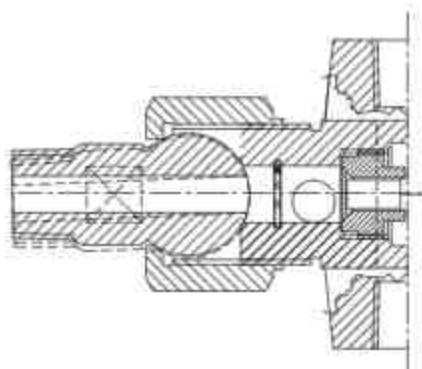
TANK CONNECTION OPTIONS



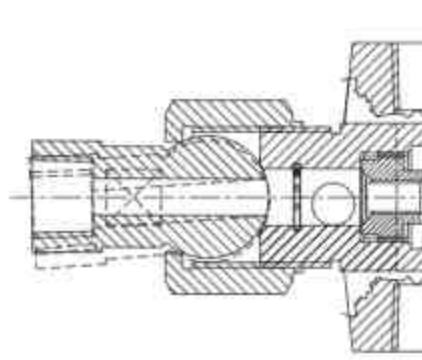
PLAIN UNION (M)



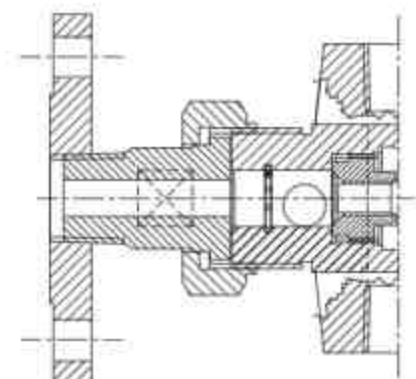
PLAIN UNION (F)



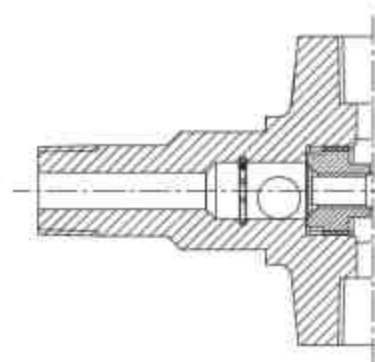
SPHERICAL UNION (M)



SPHERICAL UNION (F)



FLANGE PLAIN UNION (M)



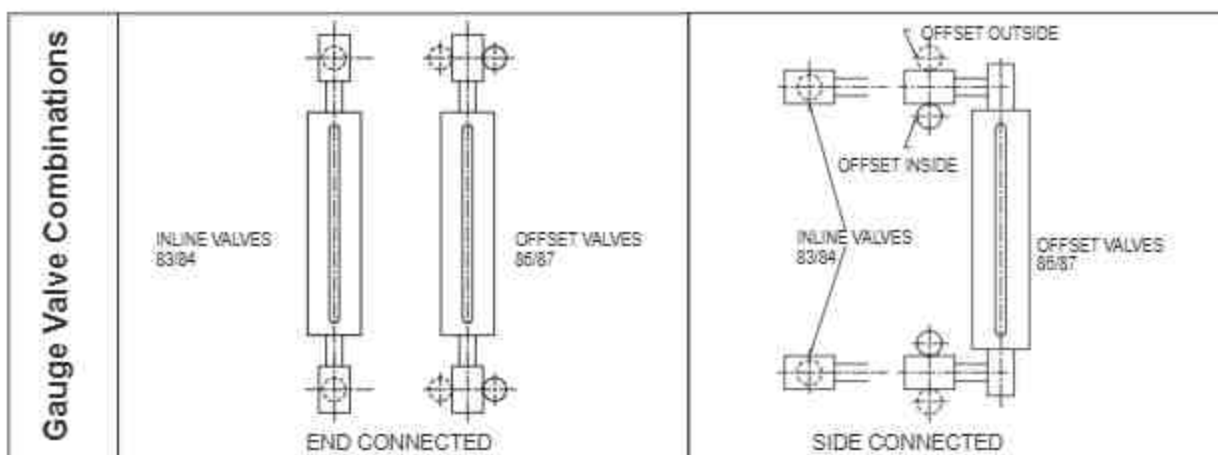
SOLID SHANK (M)

GAUGE VALVE

Liquid Level Gauges and Valves Minimum Vessel Centres (All dimensions in mm) and Gauge-Valve Combinations

Note: Standard connections are NPT female screwed on gauges and valves with assembling made using SCH 160 Male threaded adaptors. Other connection options are available including male and female unions, socket welds, flanges etc, however centres dimensions are subject to confirmation by Bliss Anand.

Connection		End /Top & Bottom										Side/Side					
Series		TL& RL		TM & RM				TH		RH		TL, RL, TM, RM, TH/RH					
Gauge Conn Size		1/2" & 3/4"		1/2"		3/4"		1/2"		3/4"		1/2"		3/4"			
Size No	Visible Length											In Line	Offset In Side	Offset Out Side	In Line	Offset In Side	Offset Out Side
		86	87	86	87	86	87	86	87	86	87	83	86	86	83	86	86
		83	84	83	84	83	84	83	84	83	84	84	87	87	84	87	87
11	95	248	308	222	283	235	295	254	314	235	295	133	89	178	143	98	187
12	121	273	333	248	308	260	321	279	340	260	321	159	114	203	168	124	213
13	146	298	359	273	333	286	346	305	365	286	346	184	140	229	194	149	238
14	171	324	384	298	359	311	372	330	391	311	372	210	165	254	219	175	254
15	200	352	413	327	387	340	400	359	419	340	400	238	194	283	248	203	292
16	232	384	445	359	419	371	432	391	451	371	432	270	225	314	279	235	324
17	260	413	467	387	448	400	460	419	479	400	460	298	254	343	308	264	352
18	302	454	514	429	489	441	502	460	521	441	502	340	285	384	349	305	394
19	321	473	533	448	508	460	521	479	540	460	521	359	314	403	368	324	413
23	330	483	543	457	518	470	530	489	549	470	530	368	324	413	378	333	422
24	381	533	594	508	568	521	581	540	600	521	581	419	375	464	429	384	473
25	438	581	651	565	625	578	638	597	657	578	638	476	432	521	486	441	530
26	502	654	714	629	689	641	702	660	721	641	702	540	495	584	549	505	594
27	559	711	772	686	746	699	759	718	778	699	759	597	552	641	606	562	651
28	641	794	848	768	829	781	840	800	860	781	840	679	635	724	689	645	733
29	679	832	892	806	867	819	879	838	899	819	879	718	673	762	727	683	772
36	772	924	984	899	959	911	972	930	991	911	972	810	765	854	819	775	864
37	857	1010	1070	984	1045	997	1057	1016	1076	997	1057	895	851	940	905	860	949
38	981	1133	1194	1108	1168	1121	1181	1140	1200	1121	1181	1019	975	1064	1029	984	1073
39	1038	1191	1251	1165	1225	1178	1238	1197	1257	1178	1238	1076	1032	1121	1086	1041	1130
47	1156	1308	1368	1283	1343	1295	1356	1314	1375	1295	1356	1194	1149	1238	1203	1159	1248
48	1321	1473	1534	1448	1508	1461	1521	1480	1540	1461	1521	1359	1314	1403	1368	1324	1413
49	1397	1549	1610	1524	1584	1537	1597	1556	1616	1537	1597	1435	1391	1480	1445	1400	1489
57	1454	1607	1667	1581	1641	1594	1654	1613	1673	1594	1654	1492	1448	1538	1502	1457	1546
58	1661	1813	1873	1788	1848	1800	1861	1819	1880	1800	1861	1699	1654	1743	1708	1664	1753
59	1756	1908	1969	1883	1943	1895	1956	1915	1975	1895	1956	1794	1749	1838	1803	1759	1848
68	2000	2153	2213	2127	2188	2140	2200	2159	2219	2140	2200	2038	1994	2083	2048	2003	2092
69	2115	2267	2327	2242	2302	2254	2315	2273	2334	2254	2315	2153	2108	2197	2162	2118	2207
76	2340	2492	2553	2467	2527	2480	2540	2499	2559	2480	2540	2378	2334	2423	2388	2343	2432
79	2473	2626	2686	2600	2661	2613	2673	2632	2692	2613	2673	2511	2467	2556	2521	2477	2566
88	2680	2832	2892	2807	2867	2819	2880	2838	2899	2819	2880	2718	2673	2762	2727	2683	2772
89	2832	2985	3045	2959	3019	2972	3032	2991	3051	2972	3032	2870	2826	2915	2880	2835	2924
98	3019	3172	3232	3146	3207	3159	3219	3178	3239	3159	3219	3058	3013	3102	3067	3023	3112
99	3191	3343	3404	3318	3378	3331	3391	3350	3410	3331	3391	3229	3185	3273	3239	3194	3283



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