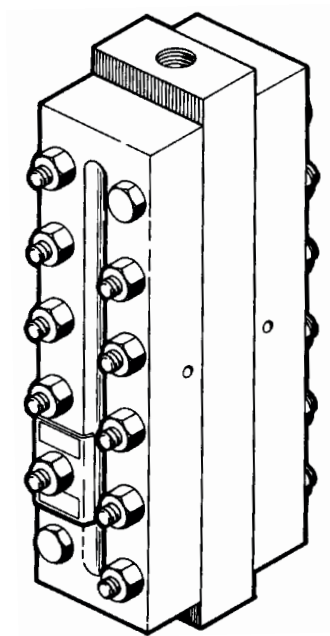




PENBERTHY MODEL TU ULTRA-HIGH PRESSURE DIRECT READING LIQUID LEVEL GAUGES

Ultra-high pressure flat glass gauges for extraordinary pressure and vapor requirements



FEATURES

- Reliable, easy to understand level reference.
- Gives users the ability to inspect liquid characteristics visually.
- Non-intrusive.
- Operation is independent of most liquid characteristics. Multiple liquids can be processed through the same vessel without concerns for density, surface turbulence, dielectric conductivity etc.
- No electrical power required. Provides accurate direct liquid level measurement in remote locations where power is not available. Not affected by power failures.
- Optional offshore coating 2600 protection; ideal cost-effective solution for corrosive offshore environments.
- NACE materials available for sour gas service.
- Used for verification of other level instrument technology.
- Pressure activated seal and unique clamping method enables high pressure rating.
- Cross ties between vision slots provide higher strength chamber due to reduction of unsupported beam length.

GENERAL APPLICATION

Model TU gauges are designed to be used in direct reading liquid level measurement for ultra-high pressure tank applications in the petroleum, chemical, natural gas and general process industries. They are not recommended for steam/water applications.

TECHNICAL DATA

Materials: Carbon, low-temp. carbon or stainless steel cover and chamber; Buna-N gaskets, IFG-5500 cushions; Tempered Borosilicate glass rated to 600°F (316°C)

Glass size: 1, 3, 4, 5, 7

Visible length: 3¹⁷/₃₂" to 33²³/₃₂" (95 to 856 mm)

Connections: End or side; threaded, socketweld or flanged

Pressure ratings (max): 6000 psig (414 barg)

Temperature range: -20 to 500°F (-29 to 260°C)

PENBERTHY MODEL TU ULTRA-HIGH PRESSURE DIRECT READING LIQUID LEVEL GAUGES

OVERVIEW

OVERVIEW

TU gauges provide optimum versatility and can be used for most offshore applications and in other corrosive environments. Their method of clamping and sealing the glass differs from other gauges in that the glass does not experience stress concentrations imposed by bolting. The glass becomes a floating member between two solidly bolted blocks of rigid plate.

The pressure-activated seal principle provides a self-adjusting means of maintaining a tight joint between glass and liquid chamber. The gasket system compensates for machining variations.

Because glass can take a tremendous amount of evenly loaded compression, the gauge can withstand extremely demanding pressure requirements.

Process liquid levels are observed through the glass as it rises and falls in the gauge chamber.

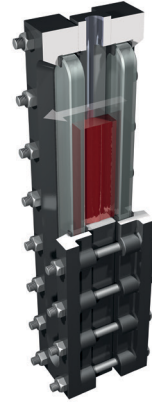
Model TU – Transparent style gauge

Transparent style gauges have a vision slot on both sides of the chamber. Light enters the gauge from the side opposite the observer so that both the level of a liquid and its characteristics can be seen. Illuminators are available for use with transparent gauges for easier liquid observation in dark environments.

All materials in TU gauges conform to ASTM specifications.

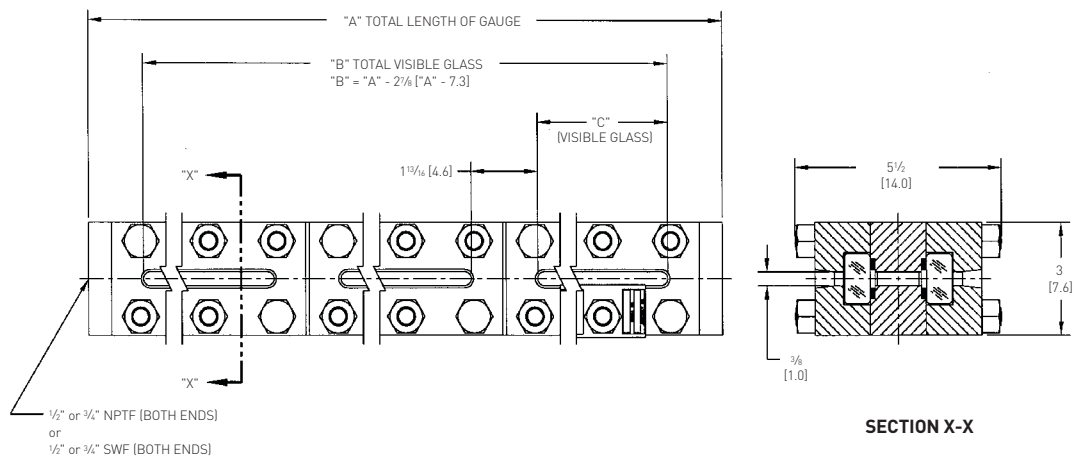
TRANSPARENT

(Model TL shown for illustrative purposes only)



PENBERTHY MODEL TU ULTRA-HIGH PRESSURE DIRECT READING LIQUID LEVEL GAUGES

DIMENSIONS - END CONNECTED



DIMENSIONS - END CONNECTED

Glass size	Dim. 'C' in inches (cm)	Dimension 'A' in inches (cm)										Quantity per section		
		1	2	3	4	5	6	7	8	9	10	Bolt	Stud	Nut
1	3.53 (9.0)	6.50 (16.5)	11.75 (29.8)									4	4	8
3	5.53 (14)	8.50 (21.6)	15.75 (40.0)	23.09 (58.7)								4	6	12
4	6.53 (16.6)	9.50 (24.1)	17.75 (45.10)	26.09 (66.3)	34.44 (87.5)							4	6	12
5	7.66 (19.4)	10.62 (27.0)	20.00 (50.8)	29.47 (74.9)	38.94 (98.9)	48.40 (123.0)	57.87 (147.0)	67.34 (171.1)	76.81 (195.1)	86.28 (219.2)	95.75 (243.2)	4	8	16
7	10.03 (25.5)	13.00 (33.0)	24.75 (62.9)	36.59 (92.9)	48.44 (123.0)	60.28 (153.1)	72.12 (183.2)	83.97 (213.3)	95.81 (243.4)	107.66 (273.4)	119.50 (303.5)	4	10	20

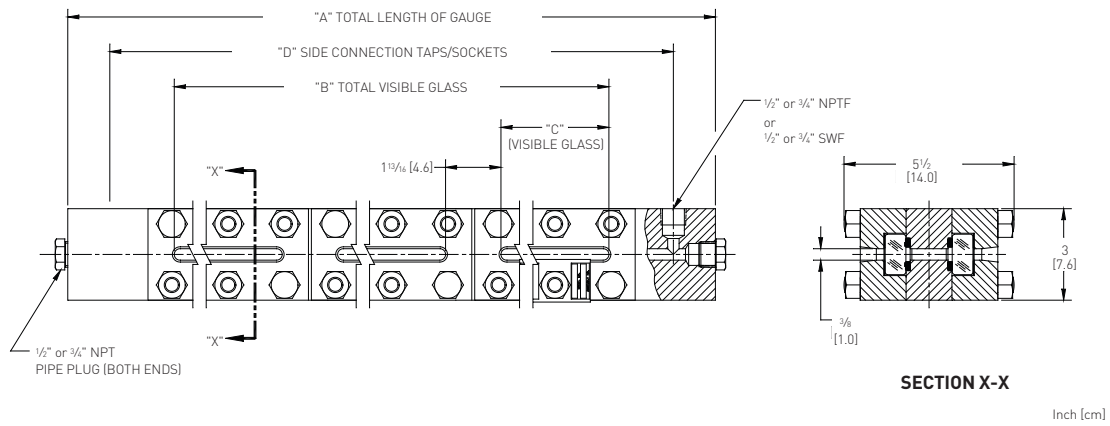
Unit designation is assigned as follows:

Example: 3TU5 Gauge

- The first number equals the number of gauge sections (3);
- The next two letters indicate gauge model (TU – Transparent Ultra High Pressure);
- The last number denotes glass size (5).

PENBERTHY MODEL TU ULTRA-HIGH PRESSURE DIRECT READING LIQUID LEVEL GAUGES

DIMENSIONS - SIDE CONNECTED



Unit designation is assigned as follows:

Example: 3TU5 Gauge

The first number equals the number of gauge sections (3);
 The next two letters indicate gauge model (TU – Transparent Ultra High Pressure);
 The last number denotes glass size (5).

DIMENSIONS - SIDE CONNECTED

		Minimum and maximum dimensions 'D' in inches (cm) for 1/2" or 3/4" NPT/socketweld connections									
		Centers available in 1/8" increments between minimum and maximum									
		Standard side connection is to the right side of the gauge vision									
		Number of sections									
Glass size		1	2	3	4	5	6	7	8	9	10
1	min	5.75 [14.6]	11.12 [28.3]								
	max	7.62 [19.4]	15.00 [38.1]								
3	min	7.75 [19.7]	15.12 [38.4]	22.50 [57.2]							
	max	8.62 [21.9]	17.00 [43.2]	25.37 [64.5]							
4	min	8.75 [22.2]	17.12 [43.5]	25.5 [64.8]	33.87 [86.0]						
	max	9.75 [24.8]	19.25 [48.9]	28.75 [73.0]	38.25 [97.2]						
5	min	9.87 [25.1]	19.37 [49.2]	28.87 [73.3]	38.37 [97.50]	50.62 [128.6]	56.75 [144.1]	66.75 [169.5]	76.25 [193.7]	85.62 [217.5]	95.12 [241.6]
	max	12.12 [30.8]	24.00 [51.0]	35.87 [91.1]	47.25 [120.0]	59.50 [151.1]	69.37 [176.2]	83.25 [211.5]	95.12 [241.6]	106.87 [271.5]	118.75 [301.6]
7	min	12.25 [31.1]	24.12 [61.3]	36.00 [91.4]	47.37 [120.3]	59.62 [151.4]	69.50 [176.5]	83.37 [211.8]	95.25 [241.9]	107.00 [271.8]	118.87 [301.9]
	max	15.00 [38.1]	25.37 [64.5]	38.25 [97.2]	59.50 [151.1]	69.37 [176.2]	83.25 [211.5]	95.12 [241.6]	106.87 [271.5]	118.75 [301.6]	128.50 [326.4]

		Dimension 'A' in inches (cm)										Quantity per section		
		Number of sections										Bolt	Stud	Nut
Glass size	Dim. 'C' in inches (cm)	1	2	3	4	5	6	7	8	9	10			
1	3.53 [9.0]			For 1/2" NPT or socketweld connections: Dimension 'D' + 2.75 [7.0]							4	4	8	
3	5.53 [14.0]			For 3/4" NPT or socketweld connections: Dimension 'D' + 3.50 [8.9]							4	6	12	
4	6.53 [16.6]											4	6	12
5	7.66 [19.4]											4	8	16
7	10.03 [25.5]											4	10	20

PENBERTHY MODEL TU ULTRA-HIGH PRESSURE DIRECT READING LIQUID LEVEL GAUGES

PRESSURES/TEMPERATURES

PRESSURE/TEMPERATURE RATINGS USING STANDARD GASKET MATERIAL

Glass size	Maximum working pressure psig (kPa) at temperatures to:					
	100°F (38°C)	200°F (93°C)	250°F (121°C)	300°F (149°C)	400°F (204°C)	500°F (260°C)
All	6000 (41370)	6000 (41370)	6000 (41370)	6000 (41370)	6000 (41370)	6000 (41370)

PRESSURE/TEMPERATURE RATINGS USING STANDARD GASKET MATERIAL AND STEEL MR0175/MR0103 NACE BOLTING

Glass size	Maximum working pressure psig (kPa) at temperatures to:					
	100°F (38°C)	200°F (93°C)	250°F (121°C)	300°F (149°C)	400°F (204°C)	500°F (260°C)
All	5400 (37230)	5400 (37230)	5400 (37230)	5400 (37230)	5400 (37230)	5400 (37230)

PRESSURE/TEMPERATURE RATINGS USING STANDARD GASKET MATERIAL AND STAINLESS STEEL MR0175/MR0103 NACE BOLTING

Glass size	Max. working pressure psig (kPa) at temp. up to:	
	100°F (38°C)	
1	6000 (41370)	
3	5830 (40200)	
4	4950 (34130)	
5	5295 (36510)	
7	3300 (22750)	

PENBERTHY MODEL TU ULTRA-HIGH PRESSURE DIRECT READING LIQUID LEVEL GAUGES

MATERIAL SPECIFICATIONS

MATERIAL SPECIFICATIONS

Ref No.	Description	Standard Materials				Optional materials
		Carbon steel to -20°F	STS wetted to -20°F	STS construction to -325°F	Sour gas service to -20°F	
1	Cover	Carbon steel SA516 Gr. 70		ASTM A240 316L STS	Carbon steel SA516 Gr. 70	None
2	Chamber	ASME SA515 Gr. 70 Carbon steel	ASTM A276 316/316L STS		ASME SA515 Gr. 70 Carbon steel per NACE MR0175 and/or MR0103	None
3	Stud	ASTM A193 Carbon steel Gr. B7		ASTM A193 316 STS Cl. 2 Gr. B8M	ASTM A193 Carbon steel Gr. B7	None
4	Nut	ASTM A194 Carbon steel Gr. 2 or 2H		ASTM A194 316 STS Gr. 8M	ASTM A194 Carbon steel Gr. 2 or 2H	None
7	Gasket/ Retainer	Buna-N w/ 302 STS retainer				Teflon® (virgin) w/ special chamber Viton® w/ 302 STS retainer
8	Cushion	Garlock IFG-5500				None
48	Glass	Transparent style tempered Borosilicate				None
100	Cap screw	ASTM A193 Carbon Steel Gr. B7		ASTM A193 316 STS Cl. 2 Gr. B8M	ASTM A193 Carbon Steel Gr. B7	None
125	Washer	ASTM B633 Zinc plated Carbon steel		18-8 STS (302-304 STS)	ASTM B633 Zinc plated Carbon steel	None
331	Band	Rubber				None

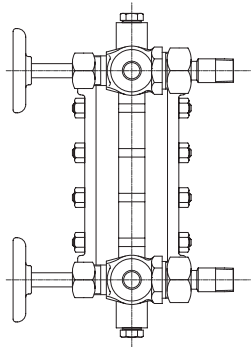
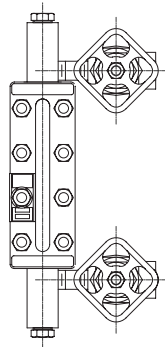
PENBERTHY MODEL TU ULTRA-HIGH PRESSURE DIRECT READING LIQUID LEVEL GAUGES

ACCESSORIES

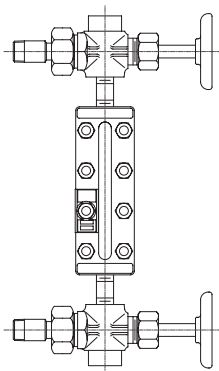
Gaug cocks

Penberthy model 600 offset pattern gaug cocks isolate the gauge chamber from the liquid contents of the vessel. Gaug cocks can be factory assembled in a variety of configurations.

SIDE CONNECTED GAUGE W/ GAUGE COCKS



END CONNECTED GAUGE W/ GAUGE COCKS



Illuminators

Complementary illuminators are designed to improve liquid level observation by providing proper light distribution over the entire visible length of the transparent gauge when ambient light is insufficient. The illuminator is designed to be mounted readily on virtually any transparent gauge.

Single and double incandescent units are available for one or two section gauge models. Models are offered with 25 watt or 60 watt ratings, are explosion proof and dust tight and meet Class 1, Division II, Groups B, C and D service.

Continuous LED illuminators are available in sections up to 74" long. Multiple illumination sections can be stacked to accommodate virtually any visible length.

Flexible fiberglass insulation blanket

Lightweight, silicone coated fiberglass cover and liner, with or without Polytetrafluoroethylene (PTFE) window. Can be used with frost proof extensions and illuminator.

Frost-proof extensions

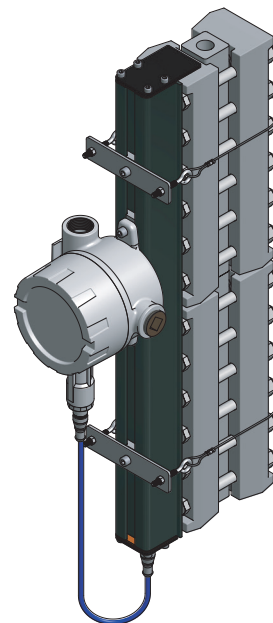
Clear plastic windows that fit over the visible part of the glass in flat glass gauges.

In low temperature applications, they inhibit build-up of frost over the visible part of the gauge, preventing obstruction of the liquid level view.

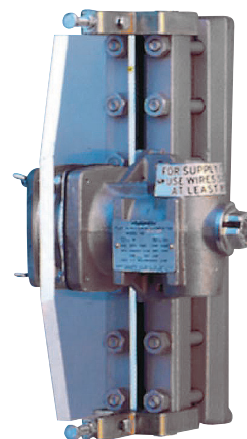
Gauge scales

Attach to gauge cover to provide a graduated read out of liquid level. Available in a variety of units, feet/inch and meter/centimeter are standard.

LED ILLUMINATOR



INCANDESCENT ILLUMINATOR



PENBERTHY MODEL TU ULTRA-HIGH PRESSURE DIRECT READING LIQUID LEVEL GAUGES

ORDERING INFORMATION – PART 1

SELECTION GUIDE - PART 1

Example:	1	TU	3	C	C	C
Number of Sections						
1	1 Section					
2	2 Section					
3	3 Section					
Model						
TU	Ultra HP Transparent Gauge					
Glass Size						
1	Size 1 (Except 3 Section)					
3	Size 3					
4	Size 4					
5	Size 5					
7	Size 7					
Wetted Parts Material						
C	Carbon Steel SA 515 Gr. 70 [Standard]					
S	316/316L Stainless Steel					
Cover Material						
C	Carbon Steel [Standard]					
S	316/316L Stainless Steel					
Bolting Material						
C	STL A193 B7/A194 2H [Standard]					
S	SST A193 B8M/A194 8M					
N	STL NACE A193 B7M/A194 2HM					

PART 2 - PAGE 9

X	C	B	6	C	B
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PART 3 - PAGE 10

T	S	XXXX	U	A	S	X
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PENBERTHY MODEL TU ULTRA-HIGH PRESSURE DIRECT READING LIQUID LEVEL GAUGES

ORDERING INFORMATION – PART 2

PART 1 - PAGE 8

SELECTION GUIDE - PART 2

PART 3 - PAGE 10

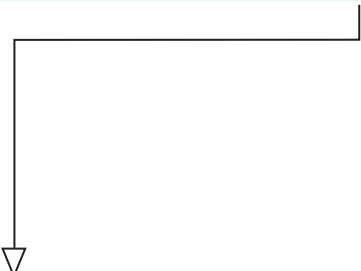
1	TU	3	C	C	C	Example:	X	C	B	6	C	B	T	S	XXXX	U	A	S	X
						NACE MR-01-75 AND/OR MR-0103													
						X None													
						W NACE wetted													
						E Environmental													
						Connection Size													
						C 1/2" [Standard]													
						E 3/4"													
						Connection Type													
						B NPT Female [Standard]													
						D Socketweld Female													
						F Plugged													
						G Socketweld Male													
						Pressure Class													
						X None													
						1 P CL150													
						3 P CL300													
						6 P CL600													
						9 P CL900													
						F P CL1500													
						T P CL2500													
						Connection Size													
						X None													
						C 1/2" [Standard]													
						E 3/4"													
						Connection Type													
						X None													
						B NPT Female [Standard]													
						D Socketweld Female													

PENBERTHY MODEL TU ULTRA-HIGH PRESSURE DIRECT READING LIQUID LEVEL GAUGES

ORDERING INFORMATION – PART 3

PART 1 - PAGE 8

1 TU 3 C C C



PART 2 - PAGE 9

X C B 6 C B

SELECTION GUIDE - PART 3

Example: T S XXXX U A S X

Option	Description
Pressure Class	
X	None
1	P CL150
3	P CL300
6	P CL600
9	P CL900
F	P CL1500
T	P CL2500
Connection Location	
X	None
S	Right Side Connected [Standard]
L	Left Side Connected
Connection Dimension	
XXXX	None
0000	Inches (first 2 digits = number of whole inches, last 2 digits = fraction of an inch in hundredths) Example: 45 ³ / ₈ = 4538
Gasket Material	
U	Buna-N w/ SS Retainer [Standard]
T	PTFE Teflon
V	Viton® w/ SS Retainer
Cushion Material	
A	Garlock IFG-5500 [Standard]
Paint Specification	
X	None
S	Standard
O	Offshore Spec 2600 Paint
Option 1 Description	
X	None
A	USA Only

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