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2/2016

Questtec SOLUTIONS

The New Standard of Level

Glass-Trac Level-Trac
Steam-Trac Magne-Trac

Quest-Tec Solutions Glass-Trac Training Guide

Gage Code For Glass-Trac Gages

Denotes Window Size -

1 thru 9

Special Feature -

K	Kel-F Shield
E	Electrically Heated
CH	Close Hookup
FP	Non-Frosting
HC	External Heated
M	Mica Shield
T	Internal Heating
EP	Explosion Proof Illuminator

7 2 - R L FP CH

Number of Sections

Series (L, M, H, LC, WP (Weld Pad)

Type of Glass: R = Reflex
T = Transparent

Client: ____________________ Ref: ____________________	Sheet of	Rev

GAGE GLASSES	GAGE COCKS
1. Gage Column ☐ Cocks ☐ Assembled with Nipples ☐ Unassembled ☐ 2. Type: Reflex ☐ Transparent ☐ Tubular ☐ Large Chamber ☐ Weld Pad ☐ 3. Conn.: Size and Type ________ Top & Bot. ☐ Side ☐ Back ☐ Vent ________ Drain ________ 4. Material ________ 5. Min. Rating ________ 6. Options: Illuminator ☐ Mica Shield ☐ Internal Tube ☐ External Jkt. ☐ Non-Frost ☐ Ext. Length ________ Calib. Scale ☐ Other ________ 7. Manufacturer Model ________	8. Type: Offset ☐ Straight ☐ 9. Conn.: Vessel ______ ______ Vent/Drain ______ 10. Material: Body ________ Trim ________ 11. Min. Rating ________ 12. Construction: ________ 13. Type of Conn.: Vessel ________ Gage ________ 14. Bonnet ________ 15. Options: Ball Checks ☐ Renewable Seats ☐ Other ________ 16. Manufacturer Model ________

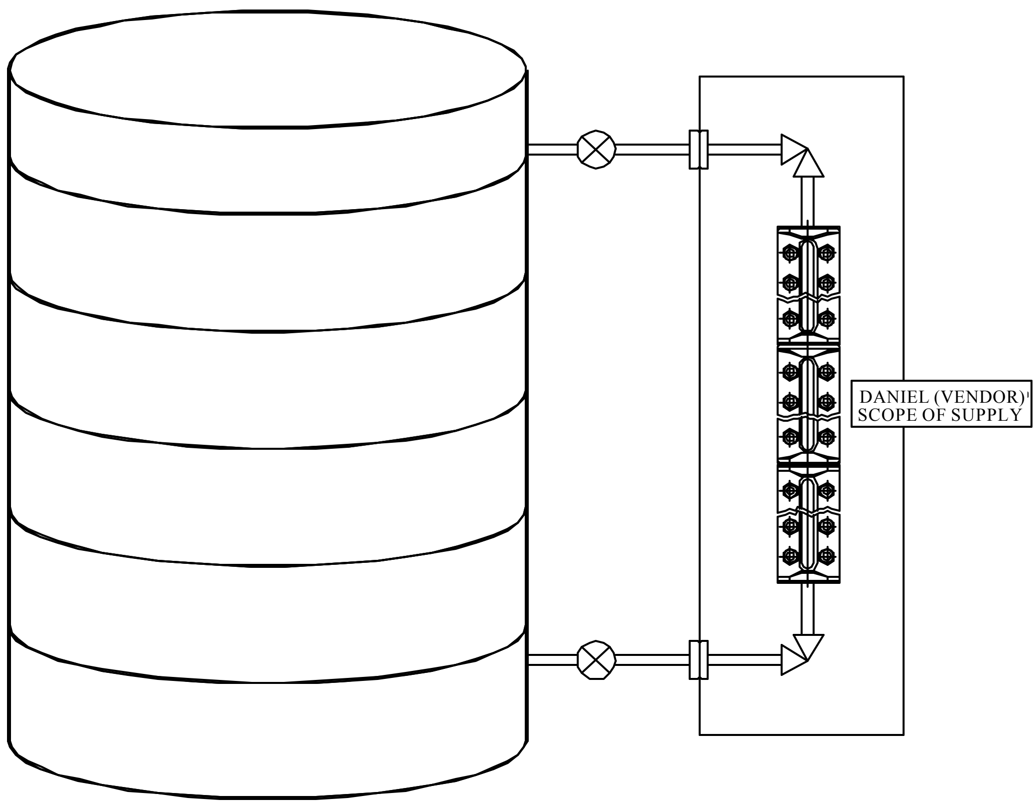
Item	Quan.	Tag No.	Visible Glass	Centerline Conn.	Model No.	Operating		Service	Remarks
						Press.	Temp.		

Specify recessed gasket sealing surface on level gage chamber.

4003-D Greenbriar, Stafford, Texas 77477, U.S.A.
Tel: (281)240-0440 Fax: (281)240-2440

1. SCOPE OF SUPPLY

Glass-Trac Level Gages & Valves will typically supply the level gage and gage valves



The gage will usually be assembled to the valves **with threaded nipples.**

Glass-Trac gage valves are used because of several specialized features. These include ball checks, connection angles and vent/drain connections. Additionally, all Glass-Trac gage valves are built with bodies designed to support the weight of the gage.

Specifying engineers should note on data sheets all **drain, vent, plug or coating** requirements that are to be supplied by the gage vendor. Additionally, notes pertaining to items such as Hydrostatic pressure test should be noted on data sheets.

2. TYPE

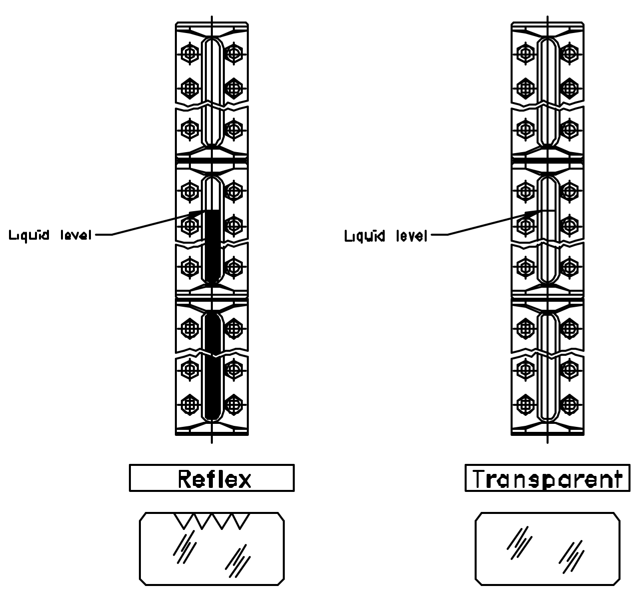
REFLEX

Reflex glass is most common and has prisms molded into the process side. Level indication will show black for liquid, and white for gas. Level indication is obvious and illuminators are rarely required. Reflex gages have glass on the viewing side only, and the single cover per section is held in place with U-bolts. **The glass cannot be shielded from process,** as the shield will prevent liquid from filling the spaces between prisms. *Reflex gages are less expensive than transparent gages, and are suitable for most process conditions.* **DO NOT SPECIFY FOR STEAM ABOVE 300 PSIG (2068 KPaG).**

TRANSPARENT

Transparent glass is flat on both sides. Level indication depends on the color of the liquid or meniscus. Transparent gages have flat glass on both sides of the chamber to allow sufficient light to enhance viewing. Illuminators are usually used to supplement ambient light. Since transparent glass is flat on both sides, the *glass may be shielded by mica or PCTFE (Formerly Kel-F®, a registered trademark of 3M)*. Specify transparent gages where:

- Liquid-liquid interface must be viewed;
- Shields to protect the glass must be used;
- Steam above 300 PSIG (2068 KPaG) is to be gaged, using mica shields;
- Liquid viscosity may foul reflex prisms.



TUBULAR

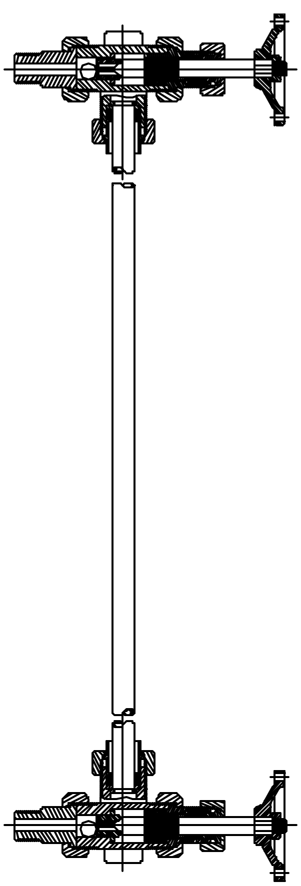
Tubular gages consist of a piece of tubular glass or clear plastic held between an upper and lower valve. The tube will be held in place with a stuffing box at the valve. Specify tubular gages only in safe, low pressure (below 200 PSIG/1378 KPaG) applications, as they are fragile compared to armored gages. Visible range is calculated using the manufacturer's data.

Types of tube commonly available include:

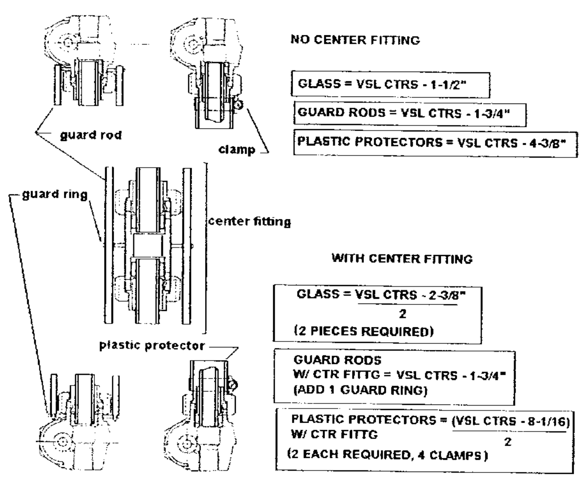
- High Pressure Borosilicate-A heavy wall clear glass tube.
- Red-Line Pyrex - This glass has a red line on the back. Where liquid is present a solid red color will be observed, similar to a household thermometer.
- Polycarbonate-Durable plastic tube.
- PCTFE (Formerly Kel-F) chemical resistant plastic tube.

Tubular gages should be protected with either guard rods (minimal protection) or plastic protectors.

Glass-Trac Model 1T Tubular Gage



For tubular gage lengths over 72” (1830 mm), Glass-Trac manufactures a center fitting. This should be specified in either carbon steel or stainless steel. The center fitting allows the use of two pieces of glass to cover longer spans.

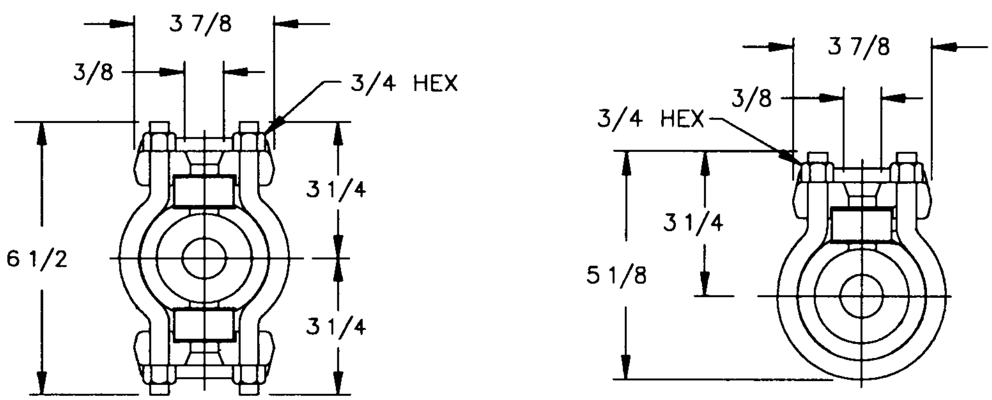


TUBULAR GAGE CALCULATIONS

General note;
Tubular gages have visibility = vsl ctrs - 5"
A center fitting blocks 4-5/16" of visibility

LARGE CHAMBER

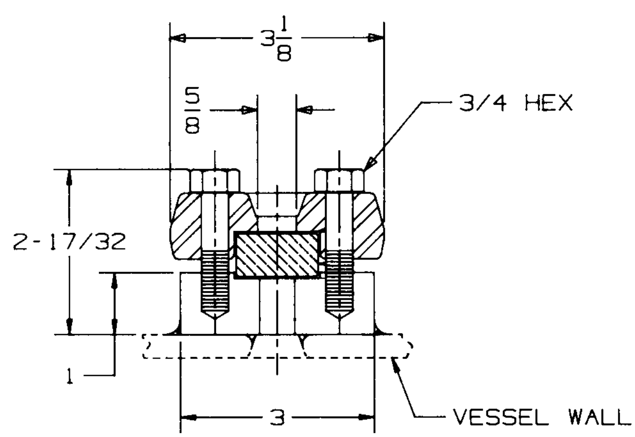
Large Chamber gages must be specified as reflex or transparent. Chambers are constructed of heavy duty seamless steel pipe. The larger ID chamber (2 1/8" Nominal should be specified) allows gaging of liquids that boil at ambient temperature such as Liquid Natural Gas. They should also be used for extremely viscous liquids. Gage connections are typically 3/4" (20) NPT, at minimum (1/2" NPTF is available).



TRANSPARENT (CH) **REFLEX (STD.)**

WELD PAD

Weld Pads must be specified as reflex or transparent, and are welded directly on the vessel. Any radius must be noted on the data sheet. Both reflex and transparent weld pad gages will have one piece of glass per section.



SECTION X-X
REFLEX

3. CONNECTIONS

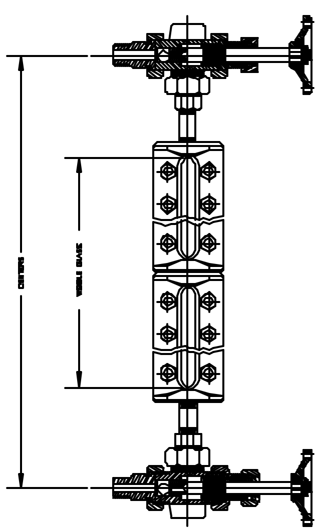
In reference to the process connection between the gage and the gage valve, most gages are specified with **1/2" (15) NPTF. N**ormally there is no additional cost for 3/4" (20) NPTF. Flanges may be used for gage to valve connections and must be used for lined gages.

Location must also be specified. Flexibility in field installation is greatest with **Top & Bottom** or **End** Connections. This allows the vessel centerline to be altered by changing nipple lengths. Additionally, they are the least expensive.

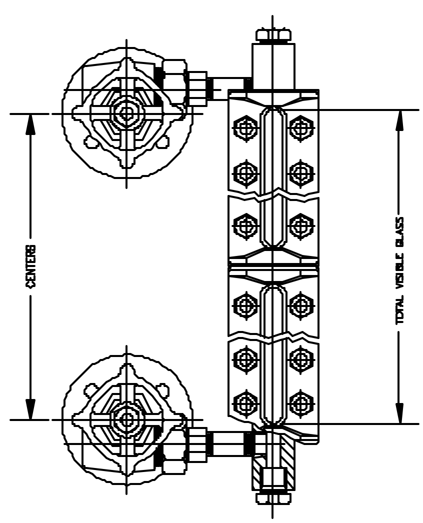
Side connections (Close Hook-up) are used for minimal vessel centerline connections. Side connected gages will typically cost 10 to 20% more than Top and Bottom connected gages, as the chamber is extended to clear the gage cover, and tapped on the side to meet the specified valve centers. There is less flexibility in the field with side connected gages, as the nipple length does not affect the valve centerline dimension. The gage will have vent and drain connections, supplied with plugs by the gage vendor.

Back connections are rarely used, and are only appropriate for reflex type gages. Back connections are the same as side connections, except that the tapping is

opposite the viewing side.



Top & Bottom Connections



Side Connections

Vent and Drain connections are only valid for side or back connected gages.

4. MATERIAL

Traditionally, the material specification applies to the gage chamber as this is the only metal wetted part. Most hydrocarbons are safely gaged using carbon steel chamber stock. For more corrosive applications, specify 316L Stainless Steel. For service below -50°F, 316L SS should be specified for both chambers and covers.

GLASS will be tempered borosilicate for temperatures below 317°C (600°F). Tempered aluminosilicate is used for temperatures between 317°C and 427°C (800°F).

GASKETS are generally vendor standard non-asbestos. Other materials such as TFE or Graphite must be specified with a note. Shields should also be specified under the *Accessories* heading and may only be used with transparent type gages.

Consult the corrosion table for specific compatibilities. Use mica or PCTFE shields where Borosilicate Glass is not recommended.

COVER material should generally be carbon steel as the cover is not a wetted part. Stainless steel is used only in very corrosive atmospheric environments or cold service.

BOLTS and NUTS are generally acceptable in steel. However, where special coatings are to be used (such as for offshore service), it is strongly recommended to specify Stainless Steel. This will prevent damage to coating due to regularly scheduled re-torque.

The following page provides material specifications for standard Glass-Trac gage models. Optional materials are available and frequently used. However, specifying standard materials (where possible) will ensure the lowest cost.

All Glass-Trac gages have wetted parts fully complying with NACE MR-01-75.

Note: NACE MR-01-75, Paragraph 6.3.1.1 reads: "Bolting that is not directly exposed to sour environments and are not to be buried, insulated, equipped with flange protectors, or otherwise denied direct atmospheric exposure may be furnished to applicable standards such as ASTM A 193 Grade B7." Gage bolting is not in contact with process.

MATERIAL SPECIFICATIONS FOR STANDARD GLASS-TRAC GAGE MODELS

ITEM	PART	SERIES L		SERIES M		SERIES H	
1	Chamber	Carbon Steel A-108 1018	Stainless Steel ASTM 276 316L	Carbon Steel A-108 1018	Stainless Steel ASTM 276 316L	Carbon Steel A-108 1018	Stainless Steel ASTM 276 316L
2	Gasket	Non-Asbestos Fiber		Non-Asbestos Fiber		Non-Asbestos Fiber	
3	Glass	Tempered Borosilicate		Tempered Borosilicate		Tempered Borosilicate	
4	Cushion	Non-Asbestos Fiber		Non-Asbestos Fiber		Non-Asbestos Fiber	
5	Cover	Carbon Steel A105		Carbon Steel A105		Carbon Steel A105	
6	Bolt/U-Bolt	Carbon Steel ASTM A193 Grade B7 Rust Proofed		Carbon Steel ASTM A193 Grade B7 Rust Proofed		Carbon Steel ASTM A193 Grade B7 Rust Proofed	
7	Nut	Carbon Steel ASTM A194 2H		Carbon Steel ASTM A194 2H		Carbon Steel ASTM A194 2H	

ITEM	PART	SERIES LC		WELD PAD	
1	Chamber	Carbon Steel ASTM A106	Stainless Steel ASTM 276 316	Carbon Steel A108 C1018	Stainless Steel A276 316L
2	Gasket	Non-Asbestos Fiber		Non-Asbestos Fiber	
3	Glass	Tempered Borosilicate		Tempered Borosilicate	
4	Cushion	Non-Asbestos Fiber		Non-Asbestos Fiber	
5	Cover	Carbon Steel A105		Carbon Steel A105	
6	Bolt/U-Bolt	Carbon Steel ASTM A193 Grade B7		Carbon Steel ASTM A193 Grade B7	
7	Nut	Carbon Steel ASTM A194 2H		Carbon Steel ASTM A194 2H	

Material / Fluid Compatibility Table

The following information has been compiled from reliable sources and may be used as a guide in considering the use of several materials with various process fluids. However, due to differences in specific requirements and operating conditions, the compatibility ratings listed below must not be construed as "guarantees".

Process Fluids	Materials of Construction Including Packing & Gaskets										
	Cast Iron	Carbon Steel	Bronze	Type 316 SS	Borosilicate Glass	TFE-FEP Teflon	Neoprene	Viton	Non Asbestos Seals	Polysolfone	Garlock IFG-5500
Acetaldehyde	C	C	D	A	A	A	D	D			B
Acetate Solvents	B	A	A	A	A	A	D		A	D	
Acetic Acid (Aerated)	D	D	D	A	A	A	C	C	D	A	
Acetic Acid (Air Free)	D	D	B	A	A	A	C	C	D	A	
Acetic Acid (Crude)	C	C	C	A	A	A	D	C	D	A	
Acetic Acid (Pure)	C	C	C	A	A	A	D	C	D		
Acetic Acid (10%)	C	C	C	A	A	A	D	C	D	A	A
Acetic Acid (80%)	C	C	C	A	A	A	D	C	D	A	
Acetic Anhydride	D	D	C	B	A	A	C	D		D	
Acetone	A	A	A	A	A	A	C	D	A	D	B
Acetylene	A	A	B	A	A	A	A	A	A		A
Acrylonitrile	C	A	A	A	A	A	D	D	A	D	
Air	A	A	A	A	A	A	A	A			A
Alcohols	C	B	B	B	A	A	A	C	A		
Alcohol –Amyl	C	B	B	A	A	A	A	B	A	A	
Alcohol-Butyl	C	B	B	A	A	A	A	A	A	A	
Aluminum Chloride (Dry)	B	B	B	A	A	A	B	A	A	A	
Aluminum Sulfate (Alums)	C	C	C	A	A	A	A	A	A	A	
Alums	C	C	C	A	B	A	A	A	A		A
Amines	C	B	A	A	A	A	D				
Ammonia, Anhydrous	B	A	D	A	A	A	B	A	A		
Ammonia (Aqueous)	A	A	D	A	A	A	B	A	A	A	
Ammonia Solutions	B	B	D	A	A	A	B				
Ammonium Bicarbonate	B	C	B	B	A	A	A				A
Ammonium Carbonate	B	B	B	B	A	A	A	A	A		
Ammonium Chloride	D	D	D	C	A	A	A	A	A		A
Ammonium Hydroxide (28%)	C	C	D	B	C	A	A	A	A		A
Ammonium Hydroxide (Conc.)	C	C	D	B	C	A	A	A		A	A
Ammonium Monophosphate	D	D	D	B	A	A	A				
Ammonium Nitrate	D	D	D	A	A	A	A	B		A	
Ammonium Phosphate (Dibasic)	D	D	C	B	A	A	A			A	
Ammonium Phosphate(Tribasic)	D	D	C	B	A	A	A				
Ammonium Sulfate	C	C	B	B	A	A	A	C	A		
Amyl Acetate	C	C	B	B	A	A	D	D	A	D	B
Aniline	C	C	C	B	A	A	C	D		D	C
Aniline Dyes	C	C	C	A	A	A	B	A	A		
Antimony Trichloride	D	D	D	D	A	A	C				
Apple Juice	D	D	C	B	A	A	A				
Arsenic Acid	D	D	D	B	A	A	A			A	
Asphalt Emulsion	B	B	A	A	A	A	B	A	A		
Asphalt Liquid	B	B	A	A	A	A	C		A		
Barium Carbonate	B	B	B	B	A	A	A		A		
Barium Chloride	C	C	B	C	A	A	A	A	A	A	A
Barium Hydroxide	B	C	B	B	A	A	A	A	A	A	
Barium Sulfate	C	C	C	B	A	A	A	A	A	A	
Barium Sulfide	C	C	C	B	A	A	A	A	A		
Beer (Alcohol Industry)	D	D	A	A	A	A	A	A	A		
Beet Sugar Liquors	B	B	A	A	A	A	A		A		
Benzene (Benzol)	B	B	B	B	A	A	D	A	A	D	A
Benzaldehyde	B	A	A	A	A	A	D	D	A	D	
Benzoic Acid	D	D	B	B	A	A	A	A		D	B
Black Sulfate Liquor	C	A	B	A	A	A	A			B	
Borax Liquors	C	C	A	B	B	A	A		A		
Boric Acid	D	D	B	B	A	A	A		A	A	A
Brines	C	C	B	B	A	A	A		A		
Bromine (Dry)	D	D	A	D	A	A	A		A		
Bromine (Wet)	D	D	B	D	A	A	D	A		A	
Bunker Oils (Fuel Oils)	B	B	B	A	A	A	B	A	A		
Butadiene	B	B	C	A	A	A	C		A		
Butane	B	B	A	B	A	A	B	A	A		A
Butylene	A	A	A	A	A	A	D	A	A		
Buttermilk	D	D	D	A	A	A	A				
Butyric Acid	D	D	C	B	A	A	C	A	A	D	A
Calcium Bisulfite	D	D	B	B	A	A	A		A	A	
Calcium Carbonate	D	D	C	B	A	A	A		A		
Calcium Chloride	C	C	B	B	A	A	A	A		A	A
Calcium Hydroxide	C	C	A	B	A	A	A	A	A		A
Calcium Hypochlorite	D	D	D	C	A	A	B		D	A	A
Calcium Sulfate	C	C	C	B	A	A	A	A	A	A	
Carbolic Acid	D	D	B	B	A	A	D			D	

Note: All ratings are for process fluids at ambient temperatures, except as noted.
A – **Excellent**, B – **Good**, C – **Fair**, D – **Not Recommended**, Blank – **Lacking Information**

Process Fluids	Materials of Construction Including Packing & Gaskets										
	Cast Iron	Carbon Steel	Bronze	Type 316 SS	Borosilicate Glass	TFE-FEP Teflon	Neoprene	Viton	Non Asbestos Seals	Polysolfone	Garlock IFG-5500
Carbon Bisulfide	B	B	C	B	A	A	D		A		
Carbon Dioxide	B	A	A	A	A	A	B	A	A	D	A
Carbonic Acid	D	D	D	B	A	A	A	A	A	A	
Carbon Tetrachloride (Dry)	B	B	C	A	A	A	D	A		D	B
Carbon Tetrachloride (Wet)	D	D	D	B	A	A	D	A	A	D	B
Carbonated Water	B	B	B	A	A	A	A	A			
Castor Oil	B	B	A	A	A	A	B	A	A		A
China Wood Oil (Tung)	C	C	C	A	A	A	B		A		
Chlorinated Solvents (Dry)	C	C	C	B	A	A	D		D		
Chlorine Gas (Dry)	B	B	C	B	A	A	C	A	A		
Chlorine (Wet)	D	D	D	D	D	A	D	A	D	D	B
Chloroacetic Acid	D	D	C	D	A	A	C		D	D	
Chlorobenzene (Dry)	B	B	B	A	A	A	D	A	A	D	
Chloroform (Dry)	B	B	B	A	A	A	D	A	A	D	B
Chlorosulphonic Acid (Dry)	B	B	B	B	A	A	D	D		D	
Chlorosulphonic Acid (Wet)	D	D	D	D	A	A	D	D			
Chrome Alum	B	B	C	A	A	A	B	A			
Chromic Acid	D	D	D	C	A	A	D	A	D	D	C
Citrus Juice	D	D	B	B	A	A	A	A	A	B	
Coconut Oil	C	C	B	B	A	A	B		A		
Coffee Extracts (Hot)	C	C	B	A	A	A					
Coke Oven Gas	B	B	C	A	A	A	C		A		
Cooking Oil	B	B	B	A	A	A	B				
Copper Acetate	D	D	D	A	A	A			A		
Copper Chloride	D	D	D	C	A	A	A				
Copper Nitrate	D	D	D	B	A	A	A	A			
Copper Sulfate	D	D	D	B	A	A	A	A	A	A	A
Corn Oil	C	C	B	B	A	A	B		A		
Cottonseed Oil	C	C	B	B	A	A	B	A	A	A	
Creosote Oil	B	B	B	B	A	A	D				C
Cresylic Acid	D	C	C	B	A	A	D				
Crude Oil, Sweet	B	B	B	A	A	A	B	A	A	D	
Crude Oil, Sour	C	B	C	A	A	A	B	A		D	
Cutting Oils, Water Emulsions	B	B	A	A	A	A	B				
Cyclophexane	A	A	A	A	A	A	D	A	A	A	
Diacetone Alcohol	A	A	A	A	A	A	C		A		
Diesel Fuels	A	A	A	A	A	A	C	A	A	A	A
Diethylamine	A	A	A	A	A	A	C	D			
Dowtherms	B	B	A	A	A	A	D		A		
Drilling Mud	B	B	B	A	A	A	A	A			
Drip Cocks, Gas	B	B	B	A	A	A	C				
Dry Cleaning Fluids	B	B	C	A	A	A	D				
Drying Oil	B	C	C	B	A	A	B				

Process Fluids	Materials of Construction Including Packing & Gaskets										
	Cast Iron	Carbon Steel	Bronze	Type 316 SS	Borosilicate Glass	TFE-FEP Teflon	Neoprene	Viton	Non Asbestos Seals	Polysolfone	Garlock IFG-5500
Epsom Salt	C	C	B	B	A	A	A		A		
Ethane	B	B	A	B	A	A	B		A		B
Ethers	B	A	B	A	A		C	D	A	D	
Ethyl Acetate	C	B	C	B	A	A	D	D	A	A	B
Ethyl Acrylate	C	C	B	A	A	A			A		
Ethyl Alcohol	B	B	B	B	A	A	A	A	A		A
Ethyl Chloride (Dry)	B	B	B	A	A	A	C	B			B
Ethyl Chloride (Wet)	D	D	C	B	A	A	C	B	A		B
Ethylene Glycol	B	B	B	B	A	A	A	A	A	A	A
Ethylene Oxide	B	B	A	B	A	A	D	D	A		
Fatty Acids	D	D	B	A	A	A	B	A	A		
Ferric Chloride	D	D	D	D	A	A	A	A	D		
Ferric Nitrate	D	D	D	C	A	A	A	A		A	
Ferric Sulfate	D	D	D	B	A	A	A	A	A	A	
Ferrous Chloride	D	D	B	D	A	A	A		D	A	
Ferrous Sulfate	D	D	B	B	A	A	A	A	A	A	
Ferrous Sulfate (Sat.)	C	C	C	A	A	A	C			A	
Fertilizer Solutions	C	B	C	B	A	A	B				
Fish Oils	B	B	B	A	A	A	B		A		
Fluorine (Dry)	D	D	D	D	A	A		A			
Fluorosilicic Acid	D	D	A	B	A	A	C			A	
Food Fluids and Pastes	C	C	B	A	A	A	B				
Formaldehyde (Cold)	B	A	A	A	A	A	B	A		A	
Formaldehyde (Hot)	D	D	B	C	A	A	B	A		A	A
Formic Acid (Cold)	D	D	B	B	A	A	A	D	A	A	
Formic Acid (Hot)	D	D	B	B	A	A		D			
Freon (Dry)	B	B	B	A	A	A	C	B	A	D	
Fruit Juices	D	D	B	A	A	A	A				
Fuel Oil	B	B	B	A	A	A	B	A	A	D	
Furfural	B	A	A	A	A	A	C	D			
Gallic Acid	D	D	C	B	A	A	A	A	A		
Gas, Manufactured	B	B	B	B	A	A	A	B			
Gas, Natural	B	B	B	A	A	A	A	B			
Gas Odorizers	B	B	A	B	A	A	B				
Gasoline (Leaded)	B	A	A	A	A	A	D	A	A	A	
Gasoline (Unleaded)	B	A	A	A	A	A	D	A	A	A	
Gasoline (Aviation)	B	A	A	A	A	A	D	A			
Gasoline (Motor)	B	A	A	A	A	A	D	A	A		
Gasoline (Sour)	B	B	B	A	A	A	D	A			
Gelatin	D	D	A	A	A	A	A		A		
Glucose	B	B	A	A	A	A	A	A	A		
Glue	A	A	B	B	A	A	A		A		
Glycerine or Glycerol	B	B	B	A	A	A	A	A	A	A	A

Note: All ratings are for process fluids at ambient temperatures, except as noted.
A – **Excellent**, B – **Good**, C – **Fair**, D – **Not Recommended**, Blank – **Lacking Information**

Process Fluids	Cast Iron	Carbon Steel	Bronze	Type 316 SS	Borosilicate Glass	TFE-FEP Teflon	Neoprene	Viton	Non Asbestos Seals	Polysolfone	Garlock IFG-5500
	Materials of Construction Including Packing & Gaskets										
Glycols	B	B	B	B	A	A	A	A	A	A	
Grease	A	A	B	A	A	A	B	A	A		
Heptane	B	B	A	A	A	A	B	A	A	A	A
Hexane	B	B	B	B	A	A	C	A	A	A	
Hexanol, Tertiary	A	A	A	A	A	A			A		
Hydraulic Oil, Petroleum Base	B	A	B	A	A	A	B	A	A		
Hydrobromic Acid	D	D	D	D	A	A	C		D	A	
Hydrochloric Acid (Air Free)	D	D	D	D	A	A	C	A	D	A	
Hydrocyanic Acid	C	C	D	A	A	A	B			A	
Hydrofluoric Acid	D	D	D	D	D		C	B	D	A	C
Hydrogen Gas (Cold)	B	B	B	A	A	A	B	A	A		
Hydrogen Peroxide (Dilute.)	D	D	B	B	A	A	A	B	A	A	
Hydrogen Peroxide (Conc.)	D	D	D	B	A	A	D		D		
Hydrogen Sulfide (Dry)	B	B	C	A	A	A	A	D			
Hydrogen Sulfide (Wet)	D	C	D	B	A	A	A	D	A		
Hydrofluosilicic Acid	D	D	A	C	A	A	A	A			
Hypo (Sodium Thiosulfate)	C	D	C	A	A	A	A				
Hypochlorites, Sodium	D	D	D	C	A	A	D	A	D		
Illuminating Gas	A	A	A	A	A	A	B				
Ink	D	D	C	A	A	A	A	A			
Iodine (Wet)	D	D	D	D	A	A	B				
Iodoform	C	B	C	A	A	A			A		
Iso-octane	B	A	A	A	A	A	C		A	A	A
Isopropyl Alcohol	B	B	B	B	A	A	C		A		A
Isopropyl Ether	B	A	A	A	A	A	C		A		
JP-4 Fuel	A	A	A	A	A	A	C	A	A	A	
JP-5 Fuel	A	A	A	A	A	A	C	A	A	A	
JP-6 Fuel	A	A	A	A	A	A	C	A	A		
Kerosene	B	B	A	A	A	A	C	A	A	C	A
Ketchup	D	D	D	A	A	A	A				
Ketones	A	A	A	A	A	A	D				
Lacquers (and Solvents)	C	C	A	A	A	A	D		A		
Lactic Acid (Dilute Cold)	D	D	D	A	A	A	A	A	A	A	A
Lactic Acid (Dilute Hot)	D	D	D	A	A	A	C	A	A	A	A
Lactic Acid (Conc. Cold)	D	D	D	A	A	A	A	A	A	A	
Lactic Acid (Conc. Hot)	D	D	D	B	A	A	C	A	A	A	
Lard Oil	C	C	A	B	A	A	B	A	A		
Lead Acetate	D	D	C	B	A	A	A		A	A	
Linoleic Acid	B	B	B	A	A	A	B		A		
Linseed Oil	A	A	B	B	A	A	B		A	A	A
Liquefied Pet. Gas (LPG)	B	B	A	B	A	A	B	A	A		
Lubricating Oil	A	A	B	A	A	A	B	A	A	A	

Process Fluids	Cast Iron	Carbon Steel	Bronze	Type 316 SS	Borosilicate Glass	TFE-FEP Teflon	Neoprene	Viton	Non Asbestos Seals	Polysolfone	Garlock IFG-5500
	Materials of Construction Including Packing & Gaskets										
Magnesium Bisulfate	B	B	B	A	A	A					
Magnesium Chloride	D	C	B	B	A	A	A	A		A	
Magnesium Hydroxide	B	B	B	A	A	A	A	A	A	A	
Magnesium Hydroxide (Hot)	B	B	D	A	A	A	A	A	A	A	
Magnesium Sulfate	B	B	B	B	A	A	A	A	A	A	A
Maleic Acid	D	B	B	B	A	A	A		A		
Malic Acid	D	D	B	B	A	A	A	A	A		A
Mayonnaise	D	D	D	A	A	A	A				
Mercuric Chloride	D	D	D	C	A	A	A	A			A
Mercuric Cyanide	D	D	D	A	A	A					
Mercury	A	A	D	A	A	A	A	A	A		
Methane	B	B	A	B	A	A	B		A		
Methyl Acetate	B	B	A	A	A	A	D		A		
Methyl Acetone	A	A	A	A	A	A	D		A		
Methyl Alcohol	B	B	B	B	A	A	A		A	D	A
Methylamine	B	B	D	A	A	A					
Methyl Cellosolve	B	B	A	A	A	A			A		
Methyl Chloride	B	B	A	A	A	A	C		A	D	B
Methyl Ethyl Ketone	A	A	A	A	A	A	D		A	D	B
Methyl Formate	C	C	A	B	A	A	B				
Methylene Chloride	B	B	A	A	A	A	D		A	D	B
Milk	D	D	A	A	A	A	A	A	A		
Mine Waters (Acid)	D	D	C	C	A	A	A				
Mineral Oil	B	B	B	A	A	A	B	A	A	A	A
Mineral Spirits	B	B	B	B	A	A	C		A		
Mixed Acids (Cold)	C	C	D	A	A	A					
Molasses, Edible	C	C	A	A	A	A	A	A			
Molasses, Crude	A	A	A	A	A	A	A	A			
Muriatic Acid	D	D	D	D	A	A	B		D		
Mustard	B	B	A	A	A	A	A				
Naptha	B	B	B	B	A	A	C	A			A
Naphthalene	B	A	B	B	A	A	D	A	A		
Nickel Ammonium Sulfate	D	D	D	A	A	A					
Nickel Chloride	D	D	D	A	A	A	A	A	A	A	
Nickel Nitrate	D	D	D	B	A	A	A				
Nickel Sulfate	D	D	D	B	A	A	A	A	A	A	
Nicotinic Acid	B	B	A	A	A	A					
Nitric Acid (10%)	D	D	D	A	A	A	B	A	D	C	
Nitric Acid (30%)	D	D	D	A	A	A	C	A	D	D	
Nitric Acid (80%)	D	D	D	A	A	A	D	A	D	D	
Nitric Acid (100%)	A	A	D	A	A	A	D	A	D	D	
Nitric Acid anhydrous	A	A	D	A	A	A	D			A	

Note: All ratings are for process fluids at ambient temperatures, except as noted.
A – **Excellent**, B – **Good**, C – **Fair**, D – **Not Recommended**, Blank – **Lacking Information**

Process Fluids	Cast Iron	Carbon Steel	Bronze	Type 316 SS	Borosilicate Glass	TFE-FEP Teflon	Neoprene	Viton	Non Asbestos Seals	Polysolfone	Garlock IFG-5500
	Materials of Construction Including Packing & Gaskets										
Nitrobenzene	B	B	D	B	A	A	D	D		D	
Nitrogen	A	A	A	A	A	A	A		A		A
Nitrous Acid (10%)	D	D	D	B	A	A	A				
Nitrous Gases	C	B	D	A	A	A		A			
Nitrous Oxide	C	B	D	B	A	A	B		A		
Oils, Animal	C	C	B	B	A	A	B	A		A	
Oil, Cottonseed	C	C	B	B	A	A	B	A		A	
Oils, Fish	B	B	B	A	A	A	B				
Oils, Fuel	B	B	B	A	A	A	B				
Oils, Lube	A	A	B	A	A	A	B	A			
Oils, Mineral	B	B	B	A	A	A	B	A			
Oil, Petroleum (Refined)	B	A	B	A	A	A	B	A	A		
Oil, Petroleum (Sour)	C	B	C	A	A	A	B				
Oil-Water Mixtures	B	B	A	A	A	A	B	A			
Oleic Acid	C	C	B	B	A	A	C	A	A	A	A
Oleum	C	B	B	B	A	A	C	A	D		
Olive Oil	B	B	B	A	A	A	B				
Oxalic Acid	D	D	B	B	C	A	A		D		B
Oxygen	B	B	A	A	A	A		A	A		
Ozone (Wet)	C	C	B	A	A	A		C			
Ozone (Dry)	A	A	A	A	A	A		C			
Paints and Solvents	A	A	A	A	A	A	D			A	
Palmitic Acid	C	C	B	B	A	A	B		A		A
Palm Oil	C	C	B	B	A	A	B				
Paraffin	B	B	A	A	A	A	B		A		
Paraformaldehyde	B	B	B	B	A	A	B				
Pentane	B	B	A	A	A	A	B		A		A
Perchlorethylene (Dry)	B	B	C	A	A	A	D		A	D	B
Petrolatum	C	C	B	B	A	A	B		A		
Phenol	D	D	B	B	A	A	D				C
Phosphoric Acid (10%) Cold	D	D	D	B	A	A	A		D	A	A
Phosphoric Acid (10%) Hot	D	D	D	D	A	A	A		D	A	
Phosphoric Acid (50%) Cold	D	D	D	B	A	A	B		D	A	
Phosphoric Acid (50%) Hot	D	D	D	D	A	A	B		D	A	
Phosphoric Acid (85%) Cold	B	B	D	A	A	A	B		D	A	
Phosphoric Acid (85%) Hot	C	C	D	A	A	A	B		D	A	
Phthalic Acid	C	C	B	B	A	A	C				A
Picric Acid	D	D	B	B	A	A	A	A			
Pine Oil	B	B	B	A	A	A	C		A		
Pineapple Juice	C	C	C	A	A	A	A				
Potassium Bisulfite	D	D	C	B	A	A	A		A		
Potassium Bromide	D	D	C	A	A	A	A		A		
Potassium Carbonate	B	B	B	B	A	A	A			A	A

Process Fluids	Cast Iron	Carbon Steel	Bronze	Type 316 SS	Borosilicate Glass	TFE-FEP Teflon	Neoprene	Viton	Non Asbestos Seals	Polysolfone	Garlock IFG-5500
	Materials of Construction Including Packing & Gaskets										
Potassium Chlorate	B	B	B	B	A	A	A			A	A
Potassium Cyanide	B	B	D	B	A	A	A			A	A
Potassium Dichromate	C	C	D	B	A	A	A	A		A	A
Potassium Diphosphate	A	A	B	A	A	A	A				
Potassium Ferricyanide	C	C	D	B	A	A	A				
Potassium Ferrocyanide	C	C	B	B	A	A	A				
Potassium Hydroxide (Dilute Cold)	C	C	B	B	A	A	A				
Potassium Hydroxide (Dilute Hot)	A	A	D	A	A	A	A	B	D	B	
Potassium Hydroxide (to 70% Cold)	B	A	D	A	A	A	A	B	D	B	
Potassium Hydroxide (to 70% Hot)	B	A	D	A	A	A	B	B	D	B	
Potassium Iodide	C	C	D	B	A	A	A				
Potassium Nitrate	B	B	B	B	A	A	A			A	A
Potassium Permanganate	B	B	B	B	A	A	A			A	A
Potassium Sulfate	C	B	B	B	A	A	A		A	A	
Potassium Sulfide	B	B	B	A	A	A			A		
Potassium Sulfite	B	B	B	A	A	A			A		
Producer Gas	B	B	B	B	A	A	B		A		B
Propane	B	B	A	B	A	A	B		A		B
Propyl Alcohol	B	B	A	A	A	A	C		A	B	
Propylene Glycol	B	B	B	B	A	A	A		A		
Pyrogallic Acid	B	B	B	B	A	A	A				
Quench Oil	B	B	B	A	A	A	B				
Resins and Rosins	C	C	A	A	A	A	C				
Road Tar	A	A	A	A	A	A	C				
Roof Pitch	A	A	A	A	A	A	C				
RP-1 Fuel	A	A	A	A	A	A	C				
Rubber Latex Emulsions	B	B	A	A	A	A					
Rubber Solvent	A	A	A	A	A	A	C				
Salad Oil	C	C	B	B	A	A	A				
Salicylic Acid	D	D	C	A	A	A	A		A		
Salt	C	C	B	B	A	A	A		A		
Sea Water	D	D	C	A	A	A	A		A		A
Shellac (Bleached)	B	A	A	A	A	A	A				
Shellac (Orange)	B	A	A	A	A	A	A				
Silver Nitrate	D	D	D	B	A	A	C		A	A	
Soap Solutions (Stearates)	B	A	A	A	A	A	A	A	A	A	
Sodium Acetate	C	C	B	B	A	A	B	D	A	A	
Sodium Aluminate	C	C	B	B	A	A	A		A		A
Sodium Bicarbonate	C	C	B	B	A	A	A	A		A	A
Sodium Bisulfate (10%)	D	D	B	A	A	A	A		A	A	
Sodium Bisulfite (10%)	D	D	B	A	A	A	A		A		
Sodium Borate	C	C	B	B	A	A	A		A	A	
Sodium Bromide (10%)	D	C	B	B		A	A				

Note: All ratings are for process fluids at ambient temperatures, except as noted.
A – **Excellent**, B – **Good**, C – **Fair**, D – **Not Recommended**, Blank – **Lacking Information**

Process Fluids	Cast Iron	Carbon Steel	Bronze	Type 316 SS	Borosilicate Glass	TFE-FEP Teflon	Neoprene	Viton	Non Asbestos Seals	Polysolfone	Garlock IFG-5500
	Materials of Construction Including Packing & Gaskets										
Sodium Carbonate	B	B	B	B	C	A	A	A	D	A	
Sodium Chlorate	C	C	B	B	A	A	A			A	
Sodium Chloride	C	C	B	B	A	A	A	A	A	A	A
Sodium Chromate	B	B	C	A	A	A	A			A	
Sodium Cyanide	B	B	D	B	A	A	A			A	
Sodium Fluoride	D	D	C	B	A	A	A				
Sodium Hydroxide (Cold) 20%	A	A	A	A	A	A	A	B	D	A	
Sodium Hydroxide (Hot) 20%	B	B	A	A	C	A	B	A	D	C	
Sodium Hydroxide (Cold) 50%	A	A	A	A	C	A	A	A	D	A	
Sodium Hydroxide (Hot) 50%	B	B	A	A	C	A	B	A	D	C	
Sodium Hydroxide (Cold) 70%	A	A	A	A	C	A		A	D	A	
Sodium Hydroxide (Hot) 70%	B	B	A	A	C	A		A	D	D	
Sodium Hypochloride	D	D	D	D	C	A	D		D		
Sodium Metaphosphate	B	B	C	A	A	A	A		A		
Sodium Metasilicate (Cold)	C	C	B	A	A	A	A				
Sodium Metasilicate (Hot)	D	D	B	A	A	A					
Sodium Nitrate	B	B	B	B	A	A	A			A	
Sodium Perborate	B	B	B	B	A	A	A		A		
Sodium Peroxide	C	C	D	B	A	A	A				
Sodium Phosphate (Dibasic)	C	C	C	B	C	A	A		A		
Sodium Phosphate (Tribasic)	C	C	C	B	C	A	B		A		
Sodium Silicate	B	B	B	B	A	A	A	A		A	A
Sodium Silicate (Hot)	C	C	C	B	A	A		A		A	
Sodium Sulfate	B	B	B	A	A	A	A	A	A		A
Sodium Sulfide	B	B	D	B	C	A	A	A	A	A	A
Sodium Sulfide (Hot)	C	C	D	B	A	A		A	A		
Sodium Thiosulfate	B	B	B	A	A	A	A	A	A	A	
Soybean Oil	C	C	B	A	A	A	B		A		
Stannic Chloride	D	D	C	D	A	A	A	A		A	
Starch	C	C	B	B	A	A	A				
Steam (212º F.)	A	A	A	A	A	A	D	D	A	A	A
Stearic Acid	C	C	C	B	A	A	C		A		A
Stoddard Solvent	B	B	B	B	A	A	C	A	A		
Styrene	B	A	A	A	A	A	D		A		
Sugar Liquids	B	B	A	A	A	A	A				
Sulfate, Black Liquor	C	C	C	B	A	A	A				
Sulfate, Green Liquor	C	C	C	B	A	A	A		A		
Sulfate, White Liquor	C	C	C	B	A	A	A				
Sulphur	C	C	D	B	A	A		A	A	D	
Sulphur Dioxide (Dry)	B	B	B	A	A	A	C		A		C
Sulphur Trioxide (Dry)	B	B	B	A	A	A	D		A		
Sulfuric Acid (0-7%)	D	D	C	B	A	A	A	A		D	
Sulfuric Acid (20%)	D	D	C	D	A	A	B	A			C

Process Fluids	Cast Iron	Carbon Steel	Bronze	Type 316 SS	Borosilicate Glass	TFE-FEP Teflon	Neoprene	Viton	Non Asbestos Seals	Polysolfone	Garlock IFG-5500
	Materials of Construction Including Packing & Gaskets										
Sulfuric Acid (50%)	D	D	B	D	A	A	C	A	D	D	C
Sulfuric Acid (100%)	B	B	A	A	B	A	D	A	D	D	C
Synthesis Gas	B	B	B	B	A	A	B				
Tall Oil	B	B	B	B	A	A	B		A		
Tannic Acid	C	C	B	B	A	A	B	A		A	A
Tar and Tar Oil	A	A	A	A	A	A	C				
Tartaric Acid	D	D	A	B	A	A	A		A	A	A
Tetraethyl Lead	C	C	B	B	A	A					
Toluene or Toluol	A	A	A	A	A	A	D		A	D	A
Tomato Juice	C	C	C	A	A	A	A	A			
Transformer Oil	B	A	B	A	A	A	B		A		A
Tributyl Phosphate	A	A	A	A	A	A	C		A		
Trichloroethylene	C	B	B	B	A	A	D	A	A	D	B
Tung Oil	B	B	B	A	A	A	B		A		
Turpentine	B	B	B	B	A	A	D	A	A	A	A
Urea	C	C	B	B	A	A			A	D	
Varnish	C	C	A	A	A	A	A		A		
Vegetable Oil, Edible	B	B	B	A	A	A	B		A		
Vegetable Oil, Non-edible	B	B	B	A	A	A	B		A		
Vinegar	D	D	B	A	A	A	D	A	A	A	
Water, Distilled (Aerated)	D	D	A	A	A	A	A	A	A	A	
Water, Fresh	C	C	A	A	A	A	A	A	A	A	A
Water, Sea	D	D	B	A	A	A	A	A	A	A	
Wax Emulsions	B	A	A	A	A	A	B				
Waxes	A	A	A	A	A	A	B				
Whiskey and Wine	D	D	A	A	A	A	A	A	A		
Xylene (Dry)	B	B	A	A	A	A	D	A	A	D	A
Zinc Chloride	C	D	D	D	A	A	A	A	A	A	
Zinc Hydrosulfite	B	A	C	A	A	A	A				
Zinc Sulfate	D	D	B	B	A	A	A	A	A	A	

Note: All ratings are for process fluids at ambient temperatures, except as noted.
A – **Excellent**, B – **Good**, C – **Fair**, D – **Not Recommended**, Blank – **Lacking Information**

5. MINIMUM RATING

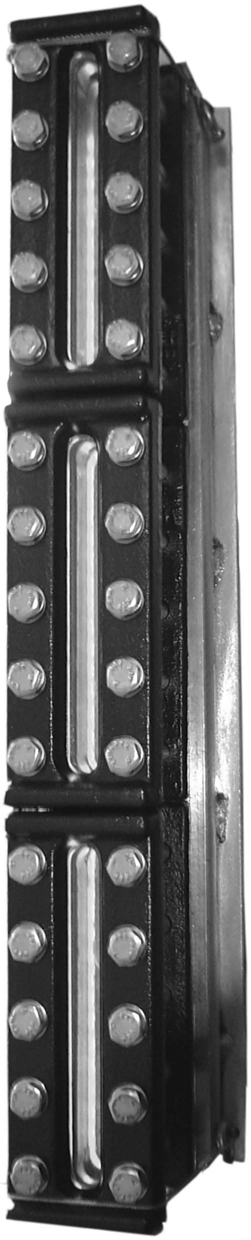
The rating of gages depends on the glass size and should always meet or exceed the design pressure of the vessel, and will be the determinant in the selection of gage model series. Pressure ratings for glass gages are specified to glass size, regardless of the number of sections. For example, *Size 9* Glass for the *Series RM* gage is rated 2250 PSIG at 100° F, regardless of the number of sections. Manufacturer's ratings are generally given for temperatures to 700° F. Aluminosilicate should be used for temperatures between 600°F and 800°F.

The table below gives the standard pressure ratings for Glass-Trac gages at 38°C (100° F), for the largest glass sizes. The longest standard glass size is 9. Consult the Glass-Trac catalog for smaller glass sizes and higher temperature ratings.
Steam service requires additional consideration. Please consult the Glass-Trac catalog for more complete information.

REFLEX GAGES						TRANSPARENT GAGES				
Gage Series	KPaG	PSIG	BarG	Kg/cm²		Gage Series	KPaG	PSIG	BarG	Kg/
Series RL-LC Large Chamber	4964	720	49.64	50.6		Series TL-LC Large Chamber	3447	500	34.4	35
Series RL	12410	1800	124	126.5		Series TL	3447	500	34.4	35
Series RM	15513	2250	155	158		Series TM	6894	1000	68.9	70.3
Series RH	20684	3000	206.8	210.9		Series TH	1378	2000	137.8	140.6

GAGE ACCESSORY:

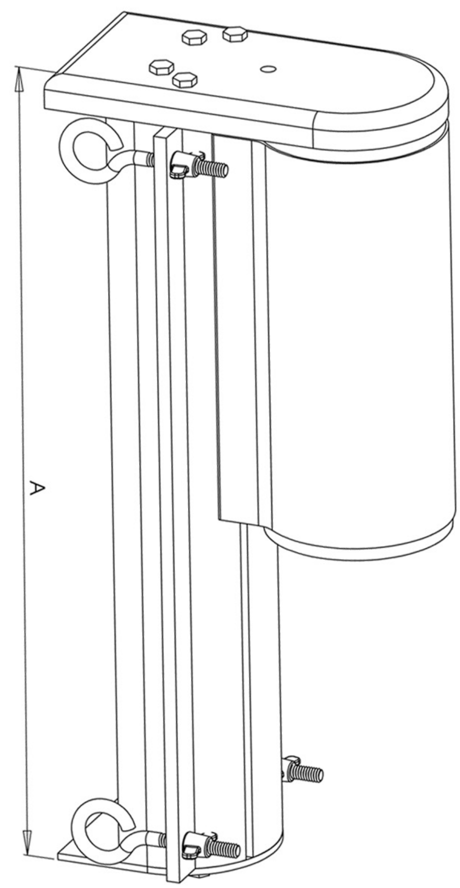
Illuminators (Explosion-Proof)



The Quest-Tec Solutions ***See-Level*™** LED Illuminator for hazardous locations utilizes the latest technology to provide brilliant green back lighting to any process gage. Innovative circuitry allows for the use of an individual light source every ½" along the length of any gage. With a life span of over 100,000 hours each, light source is likely to never need replacing. Even in the event of an individual lamp failure, the design provides lighting overlap ensuring that the fluid level is always illuminated. All of this is accomplished with a meager 5 watts of power usage.

Through the use of new attachment techniques, the ***See-Level*™** Illuminator readily mounts to any brand of existing or new process gages in a matter of minutes without the loosening of any cover bolting. Mounting requires no special tools or modifications to the existing structure. Set it up, attach the power and go! It's that easy.

The modular design allows for a single illuminator to be manufactured to your specific visible length eliminating the labor involved in mounting and wiring multiple illuminators.



MICA SHIELDS

Mica Shields are used with most process media that will corrode glass. The most common is steam above 2069 KPaG (300 PSIG) Working Steam Pressure (WSP). Transparent glass must be used to provide a flat surface to back the shield. Glass-Trac (who supplies high quality mica) recommends specifying .009-.012" thickness to ensure long lasting mica. Mica is a laminate type, naturally occurring material resistant to alkaline and can be used in high temperatures. Reliability is determined by total thickness and relative freedom from air pockets. As a layer of mica degrades in service, a new layer is exposed. Thickness is usually achieved by two sheets of mica. When a shield is used, the glass is no longer considered a wetted part.

PCTFE (Formerly KEL-F) SHIELDS

PCTFE Shields are a common alternative to mica shields and extremely resistant to chemical corrosion, but ineffective in protection from steam. Kel-F should be specified with a 0.062" thickness where a gasket will not be used. On the data sheet, PCTFE is listed as “Other”.

The corrosion chart following the “Materials” page lists chemical compatibilities of borosilicate glass. Wherever a process is rated “C” or “D”, a shield should be used.

Externally Heated / Cooled Externally

Glass-Trac Externally Heated/Cooled Gages may be either low Pressure or Mid Pressure, Reflex, or Transparent and have 1/2" or 3/4" NPT Connections. Pressure-temperature ratings and sizes remain the same as standard flat gages.

On externally heated/cooled gages a metal tube is employed to transmit heating or cooling fluid. The tubing starts from an adaptor nut on one valve, passes along a machined groove in the gage body wall and connects to the adaptor nut in the opposite valve. Fluid piped through the tubing serves as the heating or cooling media. Gages bodies (liquid chambers) are made extra long to accommodate the groove and tubing.

Most Common heating fluids are steam and hot water. To cool gages, methane, propane, freon and ammonia refrigerants are used.

The adaptor nut on the gage valves can be fitted with either a 1/2" NPT Female Tank connection or a 3/4" NPT Male Tank connection.

Valve Types 1, 2, and 4 may be used.

When Ordering Glass-Trac Externally Heated/Cooled Gages, add HC to the gage size number.

EXTERNAL JACKET

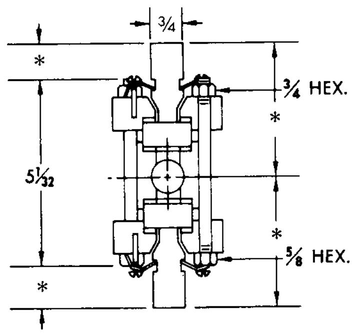
Flexible Insulation Jacket can be provided with clear specifications as to what is required.

Figu

NON-FROST EXTENSION AND EXTENSION LENGTH

For process temperatures below -18ºC (0ºF), it is likely that frost will build up around a gage due to contact with the ambient temperature. When this is likely, a non-frost extension should be specified. Glass-Trac recommends using the following table to determine extension length.

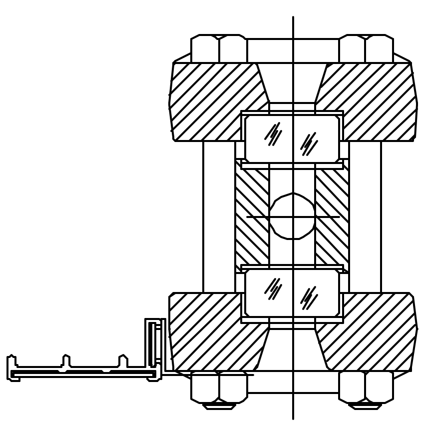
Process Temperature		Extension Length	
ºC	**ºF**	**mm**	**inches**
-18	0	76	1 5/8”
-73	-100	102	2 5/8”
-129	-200	127	3 5/8”

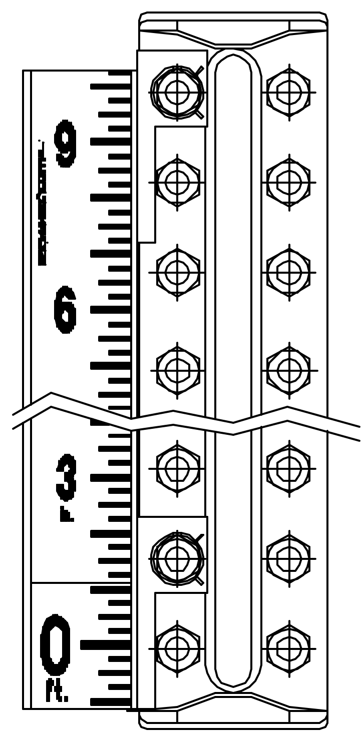


*Depends on Extension Length

CALIBRATED SCALE

A calibrated scale can be mounted alongside the viewing face of the gage. Gage scales should be calibrated in inches, centimeters, or percentage.



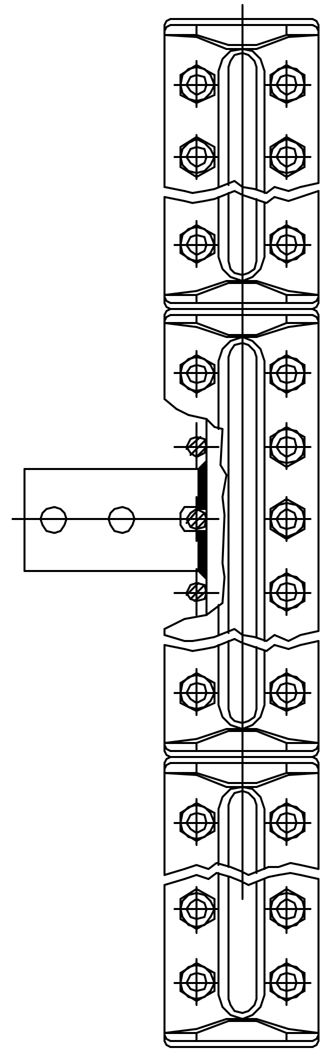


OTHER

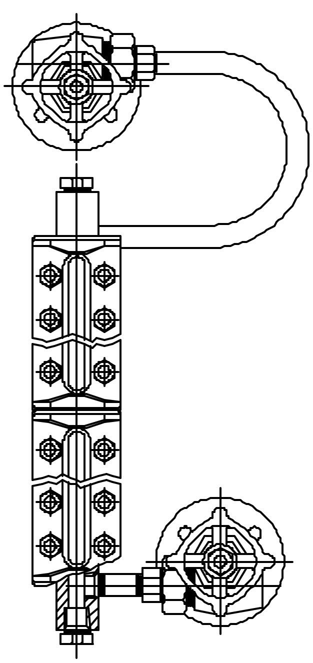
Support Plates

Gages with more than five sections are recommended to have additional support due to weight considerations. Glass-Trac can supply support plates welded to the gage chamber.

As the addition of another critical installation dimension results, most users establish policy against gages longer than five sections.



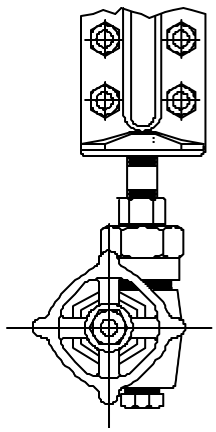
Expansion Coil



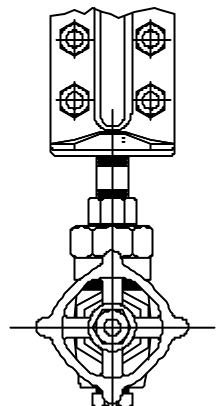
All steam applications above 5171 KPaG (750 PSIG) should have expansion coils specified between the top valve and the gage. This will allow expansion and contraction of the gage assembly without damaging the integrity of gage connections. Refer to our Direct Reading Water Gage Selection Guide Bulletin 110-01.

8. VALVE TYPE

Gage valves are normally angle type valves with several specialized features. All top and bottom connected gages should be used with offset valve bodies. This will allow the user to clean the gage by using a bottle brush through the vent or drain connections as the stem-vessel axis passes alongside the vent/drain-gage connection axis. Most valves sold are offset where the stem intersects at an angle.

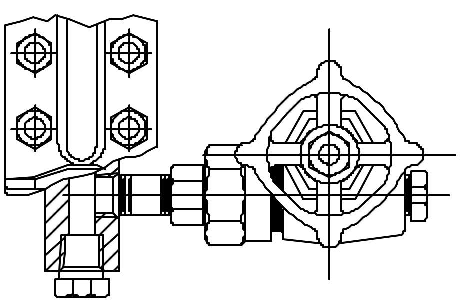


Offset Pattern Valve

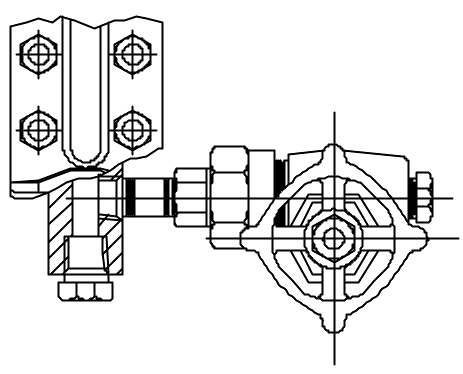


Straight Pattern Valve

On side connected gages, offset valves offer the closest vessel centers as the offset can be used to make the vessel center dimension smaller than the gage centers. With straight pattern valve bodies, the gage centers are equal to the valve vessel centers.



Offset Inside/Close Hook-up

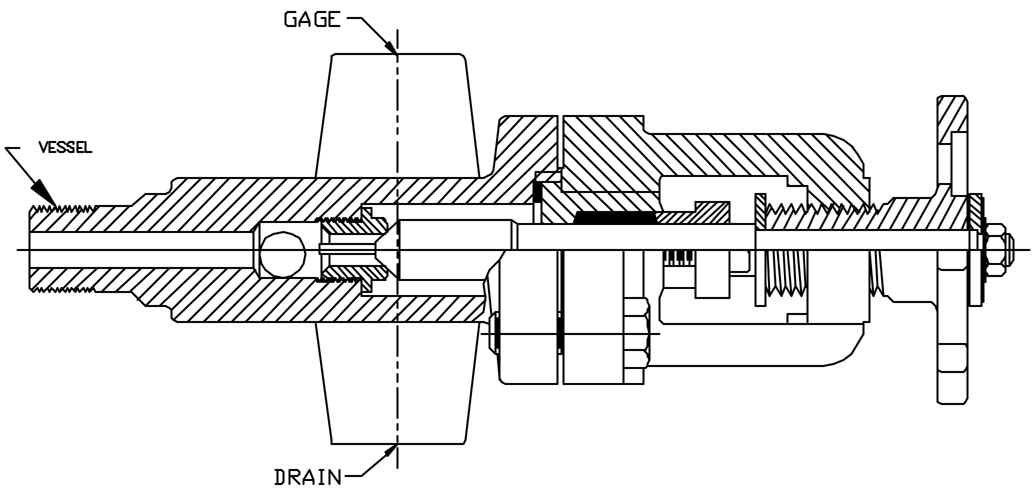


Offset Outside

Note: The Vessel Connection is on the same plane as the handwheel/stem assembly

9. CONNECTIONS-SIZE

Gage valves normally have three connections: vessel, gage, and vent/drain.



On the data sheet, this line should be limited to specifying the connection size.

Virtually all gage valves have a 3/4" vessel connection tailpiece. When a 2" flange is specified for the vessel connection, the manufacturer will use a reducing flange to mate with the vessel tailpiece.

The gage connection will usually be coupled onto the gage by using a male threaded pipe nipple. This will be 1/2" or 3/4" depending on what was specified under Item 3 on the gage. Regardless of the size or type, it is important that the specification here is compatible with the specification on the gage size, Item 3.

The vent/drain connection will usually be 1/2" NPT female. Should the vent/drain connections require flanges, it is important to make a clear note on each data sheet. At minimum, the vent/drain connection should be supplied "plugged". Gage manufacturers do not plug this connection unless it is noted on the data sheet.

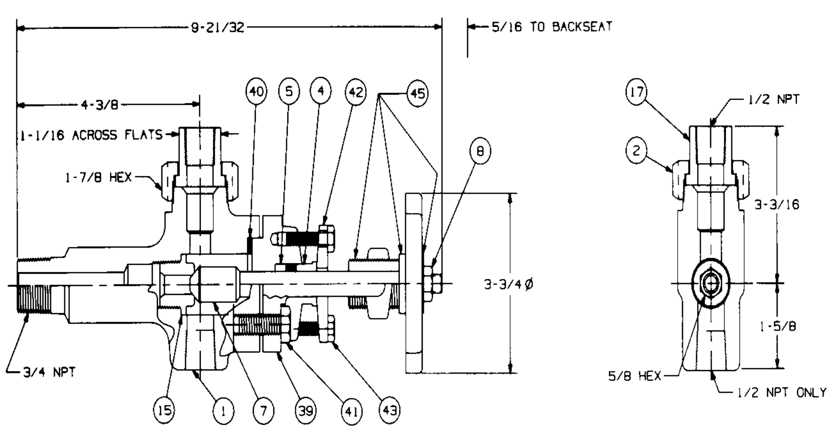
10. MATERIAL

The valve body material should be consistent with the gage chamber. The primary difference will be that the valve bodies are usually forged and the gage chambers are usually certified bar. The exact specifications may differ. For example, ASTM A-108-1018CDSR is Carbon Steel certified bar for gage chambers and A105 forged material for valve bodies.

Trim parts consist of the valve stem, seat (if renewable), and ball check. At minimum, these should be specified “SS”. Most manufacturers use 400 or various 300 series stainless steels for standard trim material. *Do not specify “316 SS” unless absolutely required for an application as there will be a premium added to the valve price.*

PARTS

ITEM NO.	NAME	MATERIAL	ITEM NO.	NAME	MATERIAL
1	BODY	**CARBON STEEL**	39	YOKE	FORGED STEEL
2	UNION NUT	CARBON STEEL	40	YOKE GASKET	**304 SS/FLEXITE**
4	PACKING FOLLOWER	STEEL	41	YOKE BOLT	ALLOY STEEL
5	PACKING RING	TEFLON	42	PRESSURE BAR	FORGED STEEL
7	STEM	416 S.S.	43	PRESSURE BAR SCREW	ALLOY STEEL
8	STEM NUT	CARBON STEEL	45	STEM-SCREW-HANDLE NAME PLATE ASSEMBLY	304 S.S./ZINC IRON/304 S.S.
15	SEAT	416 S.S.			
17	FEMALE CONNECTOR	CARBON STEEL	46	OUTER THRUST WASHER	STEEL



TYPE 5U

Weight per set approximately 12 lbs.

½" NPT & 1" NPT OPTIONAL.
½" IPS & 1" IPS BEVELED ENDS OPTIONAL

Wetted gage valve parts typically consist of the body, trim and all tailpieces. Where NACE MR-01-75 is to be invoked, care must be taken to ensure all wetted parts are in compliance. (See Price List For Adder)

11. MINIMUM RATING

Glass-Trac valve bodies are built to support the weight of the gage. Therefore, the valve rating will usually exceed the service.

Valve Series	PSIG	KPaG	BarG	Kg/cm²
Series 7's Outside Screw & Yoke	1,440	9228	99.2	101.2
Series 2's Inside Screw Union Bonnet	4,000	27579	275.7	281.2
Series 1's Inside Screw Integral Bonnet	4,000	27579	275.7	281.2
Series 3's Heavy Duty Outside Screw Bolted Bonnet	4,000	27579	275.7	281.2
Series 5's Outside Screw Bolted Bonnet	1,440	9228	99.2	101.2
Series 4's Inside Screw & Union Bonnet	4,000	27579	275.7	281.2

12. CONSTRUCTION

On the data sheet, this line should address the thread characteristics—plain closing or quick closing.

- Plain Closing/Handwheel — One and 1/2 turns will open the valve. About 4 1/2 turns to back stem all the way out.
- Quick Opening/Lever — 1/4 turn will open the valve; this is recommended for all steam applications. About 1 1/2 turns to back stem all the way out.

13. TYPE OF CONNECTIONS

VESSEL CONNECTIONS

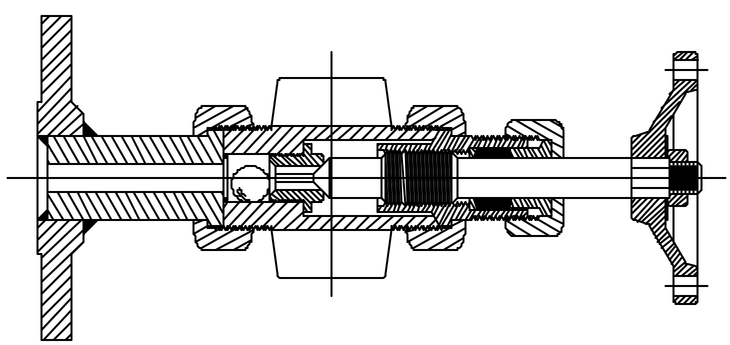
Most gage valves will be equipped with flanges for connection to the vessel nozzles. Most gage manufacturers consider 3/4" NPT male to be the "standard" vessel connection. This is in an effort to simplify ordering and pricing structures. The flange will be added to the basic valve.

In addition to specifying flange size and rating, it is important to clarify whether union or nonunion vessel connections are needed. Glass-Trac recommends avoiding the unions at the vessel connections as this is not isolable in the event of a leak. Solid shank works best with most flanges. Either way, "union" or "solid shank" should be clearly stated on the data sheet. Additionally, it is wise to state any welding requirements - the primary types are:

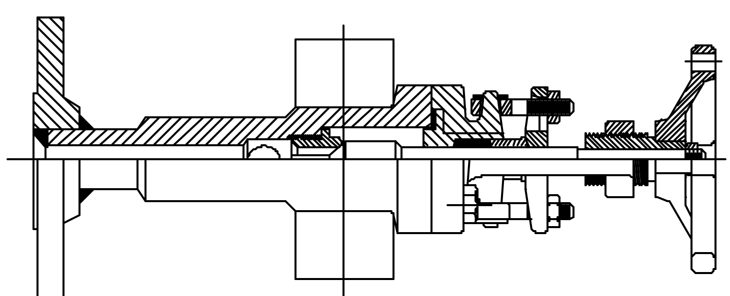
- Slip-on Flanges (Fillet weld on both sides of the flange)
- Socket Weld (Fillet weld on one side of the flange)
- Full Penetration Butt Weld (Using a weld neck flange)

Threaded flanges should be avoided wherever possible.

Union Vessel Connection



Solid Shank Vessel Connection



GAGE CONNECTION

Union Gage Connections are strongly recommended as this allows the installation crew the option of adjusting the orientation of a top and bottom connected gage by rotating the viewing face as required. Additionally, any maintenance is simplified by the case in which the gage can be removed for servicing.

Union connections may be flat or spherical. A flat union will offer the best sealing surface. A spherical union will allow the installation crew to overcome slight errors in vessel tapping.

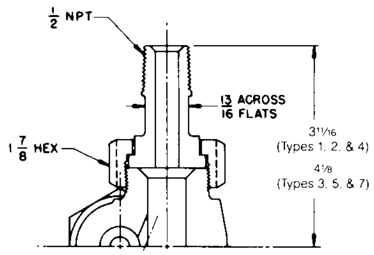


FIG. VIII

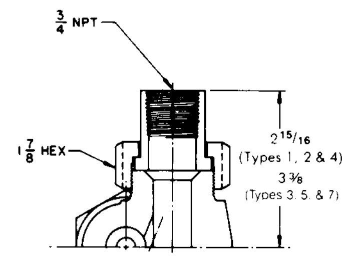


FIG. XV

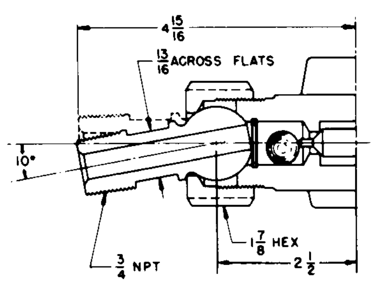


FIG. III

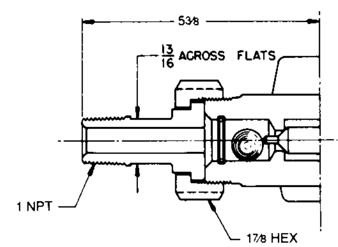
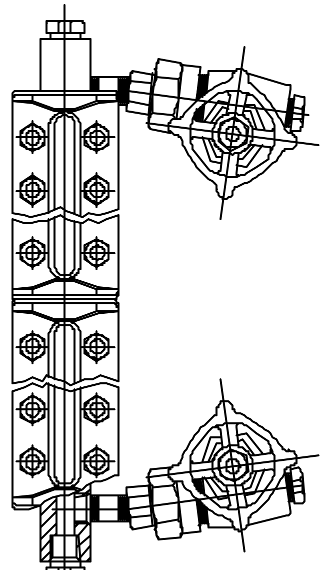
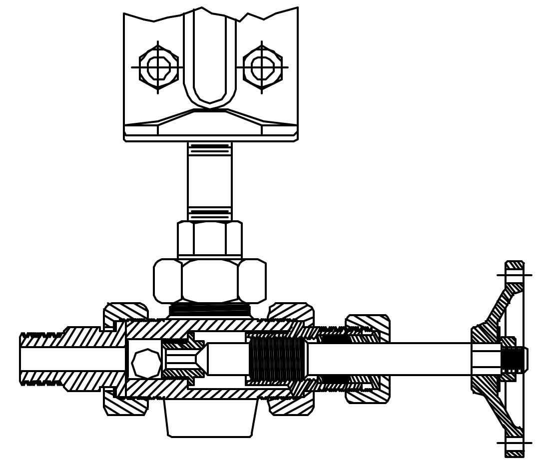


FIG. XII

Effect of Spherical Union



Female NPT Connections that are rigid. This requires the vessel tapping to be perfect with regards to dimension and orientation. The gage cannot be turned or removed unless the complete assembly is removed from the vessel.



Flanged Gage Connections are not used very often and will require coordination with the manufacturer for minimum assembled centers, as published literature will generally address threaded connections.

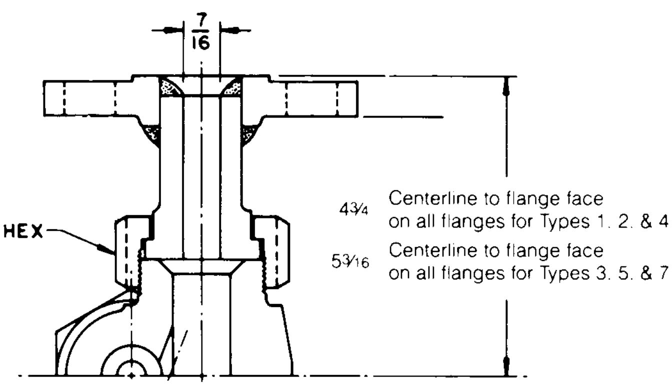
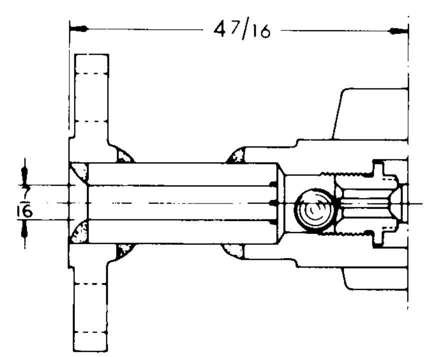


FIG. XVII



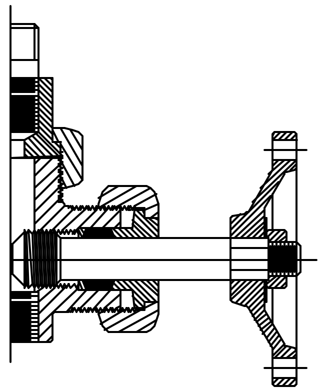
(SPECIFY SIZE AND ANSI PRESSURE RATING OF REQUIRED FLANGE)

FIG. XXVIII

14. BONNETS

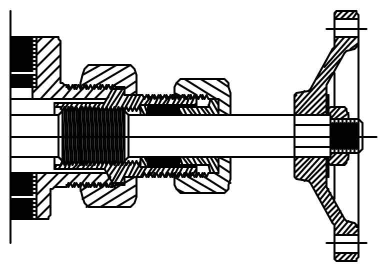
INTEGRAL BONNET

Bonnets hold the packing against the valve stem. The integral or screwed bonnet is the lowest cost type of valve but does not allow sufficient access to the interior of the valve body for a renewable seat. This valve is not recommended except for very non-critical applications.



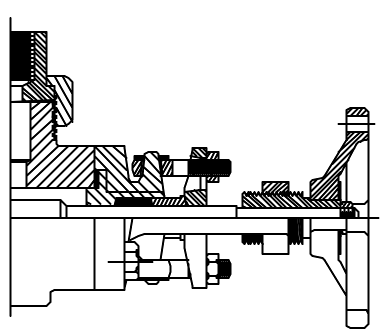
UNION BONNET

The union bonnet is held in place with a union nut and allows the valve packing to be removed from the body with the sleeve for ease of service. Most importantly, the valve seat is renewable and will be constructed of stainless steel (at minimum) regardless of the body material.



BOLTED BONNET, OUTSIDE SCREW & YOKE

This valve is strongly recommended and standard features include a backseating stem (a low cost option to save money and packings), renewable seat, and outside stem threads.



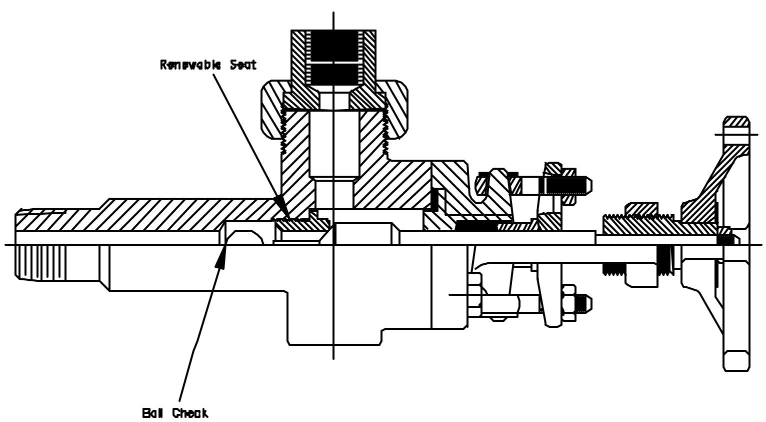
15. OPTIONS

BALL CHECKS

All Glass-Trac Process Gage Valves have ball checks as standard equipment. The ball check will prevent loss of tank contents in the event of gage failure. *Ball checks should not be specified or used in Vacuum Service or Steam.* (Steam gages will require periodic blowdown, the ballcheck will prevent steam from passing through the gage.)

RENEWABLE SEAT

Renewable seats are standard with Union Bonnet or Outside Screw & Yoke valves. Although the renewability is desirable, it is generally more important that the material can be specified as part of the valve trim. Integral (or Screwed) Bonnet valves are not available with renewable seats. NOTE: Renewable Seat is an ambiguous term. Care should be taken by engineers evaluating technical proposals that valve seats are removable. This specification is not intended to include integral seats as available with



VERTICAL RISING BALL CHECKS

Per ASME Section 1, ball checks are <u>not</u> required for boiler drums. Where ball checks are used for boiler drum applications, they should be vertical rising and on the lower (water) valve only. If ball checks are used on the upper (steam) valves, the gage cannot be blown down as the ball check will engage.

STEAM JACKETS

Glass-Trac manufactures a true jacketed valve for use with jacketed gages. This is available in straight pattern, union bonnet configuration only.