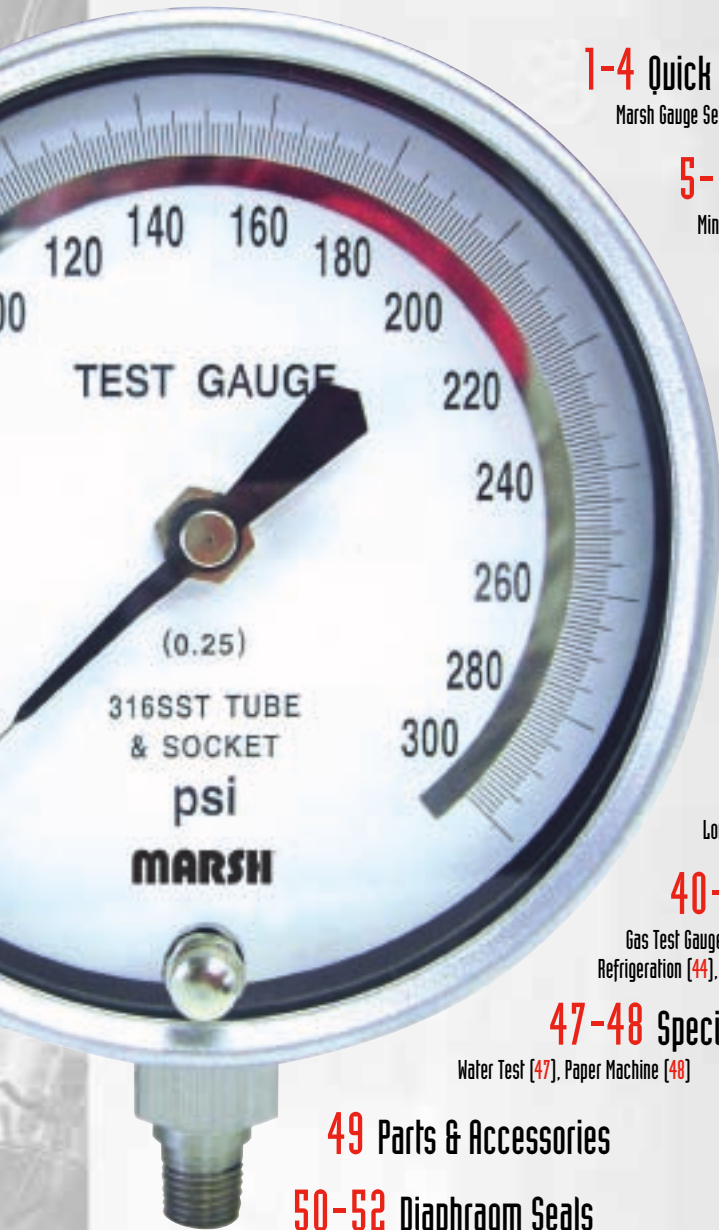


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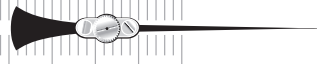
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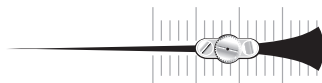
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GAUGE SERIES: MARSHALLTOWN VALUE SERIES	GAUGE SERIES: GENERAL SERVICE	GAUGE SERIES: 40/50MM LIQUID FILLED	GAUGE SERIES: SEVERE SERVICE 63MM & 100MM	GAUGE SERIES: 63MM & 100MM BRASS GAUGE
ACCURACY ASME: Grade B = $\pm 3/2/3$ ($\pm 2\%$ of range across middle half of scale)	ACCURACY ASME: Grade B = $\pm 3/2/3$ ($\pm 2\%$ of range across middle half of scale)	ACCURACY ASME: $\pm 2.5\%$ of range across full scale	ACCURACY ASME: 63mm: Grade B = $\pm 3/2/3$ ($\pm 2\%$ of range across middle half of scale) 100mm: Grade A $\pm 2/1/2$ ($\pm 1\%$ of range across middle half of scale)	ACCURACY ASME: 63mm: $\pm 1.6\%$ of range across full scale 100mm: Grade 1A $\pm 1\%$ of range across full scale of scale
CASE SIZE: 1½", 2", 2½", 3½", & 4½" diameter	CASE SIZE: 1½", 2", 2½", 3½", & 4½" diameter	CASE SIZE: 40mm & 50mm diameter	CASE SIZE: 63mm diameter 100mm diameter	CASE SIZE: 63mm diameter (2.5") 100mm diameter (4.0")
CASE MATERIAL: Steel, black painted	CASE MATERIAL: Steel, black painted	CASE MATERIAL: 304 Stainless Steel	CASE MATERIAL: 304 Stainless Steel	CASE MATERIAL: Forged brass
CASE STYLES: Lower Mount, Center Back Mount, U-Clamp, Right & Left Mounts	CASE STYLES: Lower Mount, Center Back, U-Clamp & Front Flange Mounts	CASE STYLES: Center Back Mount	CASE STYLES: Rolled ring, hermetically sealed case; Lower Mount, Center Back, U-Clamp & Front Flange Mount	CASE STYLES: Lower mount
TUBE & SOCKET: Copper Alloy	TUBE & SOCKET: Copper Alloy	TUBE & SOCKET: Copper Alloy tube with nickel plated brass socket	TUBE & SOCKET: Copper Alloy or 316 Stainless steel	TUBE & SOCKET: Copper Alloy
MOVEMENT: Brass	MOVEMENT: Brass	MOVEMENT: Brass	MOVEMENT: Brass	MOVEMENT: Brass
CONNECTIONS: ½ or ¾ NPT	CONNECTIONS: ½ or ¾ NPT	CONNECTIONS: 40mm: ½ NPT 50mm: ¾ NPT	CONNECTIONS: ¾ NPT	CONNECTIONS: 63mm: ¾ NPT 100mm: ¾ NPT
RANGES: 15 to 5,000 psi	RANGES: 0-30" Hg vacuum; compound ranges 30" Hg vacuum to 400 psi; and 15 to 5,000 psi	RANGES: 15 to 160 psi	RANGES: 0-30" Hg vacuum; compound ranges 30" Hg vacuum to 400 psi; and 15-10,000 psi	RANGES: 0 to 30" Hg vacuum; compound ranges 30" Hg vacuum to 200 psi; 15-10,000 psi
STANDARD DIAL: Dual Scale psi and kPa	STANDARD DIAL: Dual scale psi and kPa	STANDARD DIAL: Triple scale psi/BAR/kPa	STANDARD DIAL: Dual scale psi and kPa	STANDARD DIAL: Single scale psi
DIAL COLOR: Black markings on white	DIAL COLOR: Black markings on white	DIAL COLOR: Black markings on white	DIAL COLOR: Black markings on white	DIAL COLOR: Black markings on white
POINTER: Aluminum, black painted	POINTER: Aluminum, black painted	POINTER: Aluminum, black painted	POINTER: Aluminum, black painted	POINTER: Aluminum, black painted
WINDOW: Flat plastic with steel friction ring	WINDOW: 1½", 2", 2½", 3½" Acrylic, twist-in Clearlok; 4½" flat glass window with steel friction ring	WINDOW: Acrylic	WINDOW: Polycarbonate	WINDOW: Acrylic
FILL MEDIUM: N/A	FILL MEDIUM: N/A	FILL MEDIUM: Glycerine	FILL MEDIUM: Dry, glycerine, or silicone	FILL MEDIUM: Glycerine
VENT: N/A	VENT: N/A	VENT: Filler/Pressure relief plug	VENT: Rubber plug with snip-off feature	VENT: Rubber plug with snip-off feature




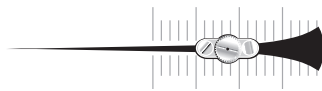
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GAUGE SERIES: 100MM STAINLESS STEEL	GAUGE SERIES: 100MM STAINLESS STEEL NACE OPTION	GAUGE SERIES: 'HW' 160MM STAINLESS STEEL	GAUGE SERIES: 100MM ELITE	GAUGE SERIES: QUALITY GAUGE
ACCURACY ASME: Grade 1A = ±1% full scale	ACCURACY ASME: Grade 1A = ±1% full scale	ACCURACY ASME: Grade 1A = ±1% full scale	ACCURACY ASME: Grade 1A = ±1% full scale	ACCURACY ASME: Grade A = ±2/1/2 (±1% of range across middle half of scale)
CASE SIZE: 100mm diameter	CASE SIZE: 100mm diameter	CASE SIZE: 160mm diameter	CASE SIZE: 100mm diameter	CASE SIZE: 3½" and 4¼" diameter
CASE MATERIAL: 304 Stainless steel	CASE MATERIAL: 304 Stainless steel	CASE MATERIAL: 304 Stainless steel	CASE MATERIAL: 304 Stainless steel	CASE MATERIAL: Steel, black painted
CASE STYLES: Lower Mount, Panel Mount with U-Clamp and three hole Front Flange Mount	CASE STYLES: Lower Mount	CASE STYLES: Lower Mount	CASE STYLES: Safecase with blow-out back construction; Lower Mount	CASE STYLES: Lower Mount, Flush case (Front Flange w/U-Clamp), Back Flange with Lower or Lower Back Mounts
TUBE & SOCKET: 316 Stainless steel	TUBE & SOCKET: 316 Stainless steel	TUBE & SOCKET: 316 Stainless steel with socket welded to the case	TUBE & SOCKET: 316 Stainless steel	TUBE: Copper Alloy up to 1,000 psi. Stainless steel tube, above 1,000 psi SOCKET: Copper Alloy
MOVEMENT: Stainless steel	MOVEMENT: Stainless steel	MOVEMENT: Stainless steel	MOVEMENT: Stainless steel rotary movement	MOVEMENT: Stainless steel
CONNECTIONS: ¼ NPT	CONNECTIONS: ¼ or ½ NPT	CONNECTIONS: ½ NPT	CONNECTIONS: ½ NPT	CONNECTIONS: ¼ or ½ NPT
RANGES: 30-10,000 PSI	RANGES: 15-20,000 PSI	RANGES: 15-20,000 PSI	RANGES: 0-30" Hg vacuum 30-10,000 PSI	RANGES: 0-30" Hg vacuum; compound ranges 30" Hg vacuum to 300 PSI; 15-20,000 PSI
STANDARD DIAL: Dual scale PSI and kPa	STANDARD DIAL: Dual scale PSI and kPa	STANDARD DIAL: Dual scale PSI and kPa	STANDARD DIAL: Dual scale psi and kPa	STANDARD DIAL: Single scale PSI
DIAL COLOR: Black markings on white	DIAL COLOR: Black markings on white	DIAL COLOR: Black markings on white	DIAL COLOR: Black markings on white	DIAL COLOR: Black markings on white
POINTER: Aluminum, black painted	POINTER: Aluminum, Adjustable Micrometer, black painted	POINTER: Aluminum, black painted	POINTER: Aluminum, black painted	POINTER: 3½": Aluminum, black painted with recalibrator. 4½": Aluminum, black painted, micro-adjustable
WINDOW: Acrylic	WINDOW: Safety glass	WINDOW: Safety glass	WINDOW: Safety glass	WINDOW: Glass
FILL MEDIUM: Dry, glycerine or silicone	FILL MEDIUM: Dry, glycerine, or silicone	FILL MEDIUM: Dry, glycerine, or silicone	FILL MEDIUM: Dry, glycerine or silicone	FILL MEDIUM: N/A
VENT: Rubber plug with snip-off feature	VENT: Rubber plug with snip-off feature	VENT: Rubber plug with snip-off feature	VENT: Internal compensating diaphragm	VENT: N/A

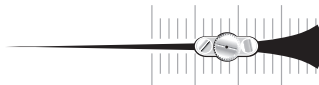


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GAUGE SERIES: TEST GAUGE	GAUGE SERIES: MASTER TEST GAUGE	GAUGE SERIES: INSPECTOR'S TEST GAUGE	GAUGE SERIES: PROCESS GAUGE	GAUGE SERIES: DIAPHRAGM GAUGE
ACCURACY ASME: Grade 2A = $\pm 0.50\%$ full scale	ACCURACY ASME: Grade 3A = $\pm 0.25\%$ full scale	ACCURACY ASME: Grade 2A = $\pm 0.50\%$ full scale	ACCURACY ASME: Grade 2A = $\pm 0.50\%$ full scale	ACCURACY ASME: Grade A = $\pm 2/12$ ($\pm 1\%$ of range across middle half of scale) and Grade B = $\pm 3/13$ ($\pm 2\%$ of range for ranges below 30" H ₂ O)
CASE SIZE: 4½" diameter	CASE SIZE: 6" diameter	CASE SIZE: 3" diameter	CASE SIZE: 4½" and 6" diameter	CASE SIZE: 2½", 3½", & 4½" diameter
CASE MATERIAL: Steel, black painted	CASE MATERIAL: 304 Stainless steel	CASE MATERIAL: Brass, nickel plated	CASE MATERIAL: Safecase polypropylene (turret style only) & aluminum	CASE MATERIAL: Steel, black painted
CASE STYLES: Lower Mount, Flush Mount (Front Flange with U-clamp & hinged ring)	CASE STYLES: Lower Mount	CASE STYLES: Lower Mount	CASE STYLES: Turret, Back Flange case, Front Flange Mount, Lower or Lower Back Mount	CASE STYLES: Lower Mount, Center Back, U-Clamp & Front Flange Mount
TUBE & SOCKET: Copper Alloy or 316 Stainless steel	TUBE & SOCKET: Copper Alloy	TUBE & SOCKET: Copper Alloy	TUBE & SOCKET: Copper Alloy or 316 Stainless steel	TUBE & SOCKET: Phosphor bronze diaphragm soft-soldered to brass socket
MOVEMENT: Stainless steel	MOVEMENT: Stainless steel	MOVEMENT: Brass	MOVEMENT: Stainless steel	MOVEMENT: Brass sector and pinion
CONNECTIONS: ¼ or ½ NPT	CONNECTIONS: ¼ or ½ NPT	CONNECTIONS: ¼ NPT	CONNECTIONS: ¼ or ½ NPT	CONNECTIONS: ¼ or ½ NPT and special connections
RANGES: 0 to 30" Hg vacuum; compound ranges 30" Hg vacuum to 300 psi; 15-10,000 psi	RANGES: 0 to 30" Hg vacuum; compound ranges 30" Hg vacuum to 300 psi; 15-10,000 psi	RANGES: 0 to 30" Hg vacuum; 15 to 1,000 psi	RANGES: 0 to 30" Hg vacuum; compound 30" Hg vacuum to 300 psi; 15 to 20,000 psi	RANGES: Dual scale with kPa; 0 to 200" H ₂ O vacuum; 0 to 300" H ₂ O, 0 to 10 psi, 0 to 160 oz/in ² . Triple scale 0-58 oz/in ² , inches H ₂ O & kPa
STANDARD DIAL: Single scale psi	STANDARD DIAL: Single scale psi	STANDARD DIAL: Dual scale psi and kPa	STANDARD DIAL: Single scale psi	STANDARD DIAL: Dual scale in. H ₂ O & kPa, psi & kPa, or Triple scale oz/in ² in. H ₂ O, & kPa
DIAL COLOR: Black markings on white with mirrored dial to avoid parallax	DIAL COLOR: Black markings on white with mirrored dial to avoid parallax	DIAL COLOR: Black markings on white	DIAL COLOR: Black markings on white	DIAL COLOR: Black markings on white
POINTER: Aluminum, black painted, micro-adjustable, knife-edge	POINTER: Aluminum, black painted, knife-edge	POINTER: Aluminum, black painted, knife-edge	POINTER: Aluminum, black painted, micro-adjustable	POINTER: Aluminum, black painted
WINDOW: Glass	WINDOW: Glass	WINDOW: Beveled glass	WINDOW: Acrylic	WINDOW: 2½" & 3½": Acrylic twist-in Clearlok 4½": Flat acrylic with steel friction ring
FILL MEDIUM: N/A	FILL MEDIUM: N/A	FILL MEDIUM: N/A	FILL MEDIUM: Dry, glycerine, or silicone	FILL MEDIUM: N/A
VENT: Blowout plug	VENT: Blowout plug	VENT: N/A	VENT: Internal compensating diaphragm	VENT: N/A



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<p>GAUGE SERIES: GAS PRESSURE TEST SET VACUUM TEST SET</p>	<p>GAUGE SERIES: GAS TEST GAUGES</p>	<p>GAUGE SERIES: PAPER MACHINE GAUGE</p>	<p>GAUGE SERIES: BIMETAL THERMOMETERS</p>
<p>ACCURACY ASME: Grade A = $\pm 2/1/2$ ($\pm 1\%$ of range across middle half of scale) and Grade B = $\pm 3/1/3\%$ for ranges (below 30" H₂O)</p>	<p>ACCURACY ASME: Grade B $\pm 3/2/3\%$ ($\pm 2\%$ of range across middle half of scale)</p>	<p>ACCURACY ASME: Grade A = $\pm 2/1/2$ ($\pm 1\%$ of range across middle half of scale)</p>	<p>ACCURACY ASME: $\pm 1\%$ of span</p>
<p>CASE SIZE: 2½"</p>	<p>CASE SIZE: 2" Diameter</p>	<p>CASE SIZE: 3½" diameter</p>	<p>CASE SIZE: 2", 3" & 5", standard stem lengths of 2½" to 24"</p>
<p>CASE MATERIAL: Provided in grey polyethylene case with 3 ft. of rubber tubing</p>	<p>CASE MATERIAL: Steel, black painted</p>	<p>CASE MATERIAL: Steel, chrome plated</p>	<p>CASE MATERIAL: 304 Stainless steel</p>
	<p>CASE STYLES: Mounting-Reducing Bell or Hex Style Housing Material-Reducing Bell: Iron, Black Painted Hex Body: Steel, Zinc Dichromate Plated</p>	<p>CASE STYLES: Lower Back Mount; Hinged ring case & moisture-proof with weep hole</p>	<p>CASE STYLES: Hermetically sealed; Center Back or Adjustable</p>
<p>TUBE & SOCKET: Phosphor bronze diaphragm soft-soldered to brass socket</p>	<p>TUBE & SOCKET: Copper Alloy</p>	<p>TUBE & SOCKET: Copper Alloy</p>	<p>TUBE & SOCKET: 304 Stainless steel stems</p>
<p>MOVEMENT: Brass sector and pinion</p>	<p>MOVEMENT: Brass</p>	<p>MOVEMENT: Stainless steel</p>	<p>MOVEMENT: Bimetal sensing element with external reset feature</p>
	<p>CONNECTIONS: ¼ NPTF</p>	<p>CONNECTIONS: ¼ NPT</p>	<p>CONNECTIONS: ¼ NPT (2" case only); ½ NPT (3" & 5" cases)</p>
<p>RANGES: 0 to 8.75 oz/in² 0 to 20 oz/in² 0 to 58 oz/in²</p>	<p>RANGES: <u>Bell Type</u> <u>Hex Type</u> 0-15 psi 0-15 psi 0-30 psi 0-30 psi 0-60 psi 0-60 psi 0-100 psi 0-100 psi</p>	<p>RANGES: 30 to 1,000 psi</p>	<p>RANGES: 11 dual scale ranges from -50° F through 1000° F (-50° C through 550° C)</p>
<p>STANDARD DIAL: Triple scale oz/in², in. H₂O, & kPa</p>	<p>STANDARD DIAL: Single Scale psi</p>	<p>STANDARD DIAL: Single scale psi</p>	<p>STANDARD DIAL: Dual scale in degrees Celsius & Fahrenheit</p>
<p>DIAL COLOR: Black markings on white</p>	<p>DIAL COLOR: Black markings on white</p>	<p>DIAL COLOR: Black markings on white</p>	<p>DIAL COLOR: Black markings on white</p>
<p>POINTER: Aluminum, black painted</p>	<p>POINTER: Aluminum, black painted</p>	<p>POINTER: Aluminum, black painted with recalibrator</p>	<p>POINTER: Aluminum, black painted</p>
<p>WINDOW: Acrylic, twist-in Clearlok</p>	<p>WINDOW: Polycarbonate</p>	<p>WINDOW: Glass lens, chrome plated brass ring with weather-tight seal</p>	<p>WINDOW: Glass</p>





SELECTION AND USE OF A PRESSURE GAUGE

When selecting a pressure gauge, it is important to consider the following factors to insure safety and accuracy:

1. Pressure range
2. Temperature range
3. Conditions affecting wear of the system
4. Case venting
5. Pressure fluid composition
6. Pressure fluid temperature
7. Ambient conditions
8. Method of mounting
9. Required accuracy

PRESSURE RANGE: A range of 2 times the operating pressure is recommended for safety and extended gauge life. The operating pressure should be limited to the middle 75% of range.

TEMPERATURE RANGE: Ambient temperature for General Service ("J") is -40° to 160°F. Ambient temperature for Severe Service ("J" & "X"), for Dry Gauges is -40° to 160°F and for Liquid Filled is 0° to 140°F.

SHOCK, VIBRATION, PULSATION, OR CORROSIVE ATMOSPHERE CONDITIONS: Liquid Filled Gauges have a fill material to lubricate the movement and reduce friction and wear. When used with a restrictor these gauges absorb vibration and dampen pressure shock and spikes. Liquid filling also prevents moisture or a corrosive atmosphere from affecting the gauge internals.

CASE VENTING: Process (Series "P") and Elite (Series "W") have a internal diaphragm which compensates for atmospheric changes that could affect the calibration of the filled gauge. Severe Service (Series "J" & "X") and 100mm (Series "HW") liquid filled gauges have an elastomeric vent fill plug tip which can be easily cut to permit case venting.

PRESSURE FLUID COMPOSITION: Since the sensing element of a pressure gauge may be exposed directly to the measured medium, consider the characteristics of this medium. It may be corrosive, it may solidify at various temperatures, or it may contain solids that will leave deposits inside the sensing element. For pressure fluids that will not solidify under normal conditions or leave deposits, a Bourdon Tube Gauge is acceptable Diaphragm Chemical Seals should be considered when gauge wetted parts are not compatible with the measured media. A chemical compatibility chart follows this section to aid in the selection of the proper sensing element or diaphragm seal material.

PRESSURE FLUID TEMPERATURE: Steam and other hot media may raise the temperature of the gauge components above safe working limits of the sealed joints. In these cases it is recommended that a syphon, cooling tower or chemical seal be used in conjunction with the pressure gauge Diaphragm Seals and remote capillary can also be considered for use with gauges or transducers which are subjected to very low or high ambient temperature.

AMBIENT CONDITIONS: The normal ambient temperature range for Marsh Instruments gauges is -40° to 160°F (-40° to +71°C) for Dry Gauges, -4° to 140°F (-20° to 60°C) for Glycerine filled gauges, and -40° to 140 °F (-40° to 60° C) for Silicone filled gauges. The error caused by temperature changes is ±0.3% per 18°F rise or fall, respectively. The reference temperature is 70°F (20°C). The correction is for the temperature of the gauge, and not the temperature of the measured medium. Remote gauge mounting using a diaphragm seal and capillary line is one alternative for applications involving extreme ambient temperature.

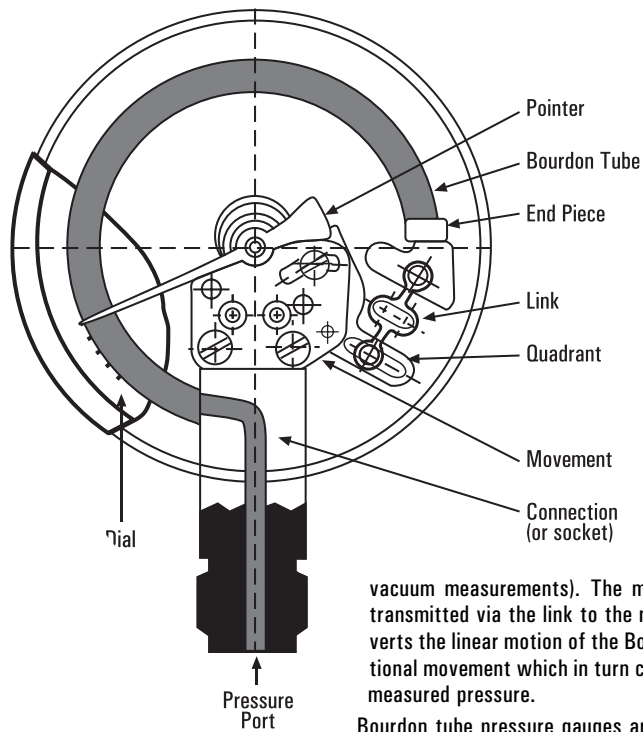
Moisture and weather effects must also be considered. Liquid Filled Gauges prevent condensation build up. For outdoor use, stainless steel, brass, or plastic cased gauges are recommended.

1-800-727-5646 SALES

1-304-387-4417 SALES FAX



PRESSURE GAUGE OPERATING PRINCIPLE



Bourdon tube pressure gauges are widely used in all branches of industry. The construction is simple yet rugged, and operation does not require any additional power source. The Bourdon tube element is directly exposed to the medium being measured and is normal made of copper alloy (brass) or stainless steel as the application demands.

The Bourdon tube measuring element is made of a thin walled tube that is either bent into a semi-circle (C-Shape tube) or spirally wound (coiled safety tube). When pressure is applied to the measuring system through the pressure port, the pressure causes the Bourdon tube to straighten itself, thus causing the end piece to move upward (or downward for vacuum measurements). The movement of the end piece is transmitted via the link to the movement. The movement converts the linear motion of the Bourdon tube end piece to a rotational movement which in turn causes the pointer to indicate the measured pressure.

Bourdon tube pressure gauges are designed for the measurement of pressure and vacuum and are generally suitable for all clean and non-clogging liquid and gaseous media.

Various types of Bourdon tubes are used. C-shape Bourdon tubes are typically used for ranges to 1,000 psi. Higher ranges use coiled Bourdon tubes for safety.

Bourdon tube pressure gauges are available to measure full vacuums, compound and pressure ranges from 0-10 psi to 0-20,000 psi with an accuracy from $\pm 0.25\%$ to $\pm 3/2/3\%$ of span (ASME Grade 3A to Grade B).



HOW THE DIAPHRAGM GAUGE WORKS

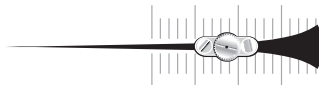


Diaphragm gauges are sensitive instruments used in low pressure applications not exceeding 10 psi. The diaphragm capsule is an elastic metal sensing element comprised of two thin wall diaphragms whose sides are soldered together to make the capsule.

Whenever air or gas enters the intake port (gauge connection), it travels into the diaphragm capsule.

As vacuum or pressure is applied to the diaphragm capsule, the walls of the capsule expand and contract in response to the change in pressure. This change is then transferred to a rotating rod and arm that rest on the outside of the capsule. The rotating rod is connected to a geared movement through a linkage system. Connected to a shaft, this system then drives the pointer over a dial marked in appropriate pressure or vacuum units.





CHEMICAL COMPATIBILITY TABLE

The media being measured must be compatible with the wetted parts of the pressure instrument. To use the chart below, locate the media whose pressure is to be measured and select a suitable material from those available. This is a simplified chart and assumes the media temperature is 200°F except for media with a "*" which must be below 100°F, Throttling devices and/or a liquid-filled instrument are recommended in applications with pulsation or vibration. These recommendations are only a guide, as service life is dependent on temperature, concentrations, catalysts that may be added, or other conditions beyond our control. Consult factory for specific applications and for any services not listed.

Media Application	Pressure Instrument Material				Media Application	Pressure Instrument Material				Media Application	Pressure Instrument Material			
	Brass or Bronze	316 SS	Monel	Diaphragm Seals**		Brass or Bronze	316 SS	Monel	Diaphragm Seals**		Brass or Bronze	316 SS	Monel	Diaphragm Seals**
Acetone*2	•	•	•		Ethyl Oxide > 99%	•	•	•		Palmitic Acid > 99%*2				
Acetic Acid < 40%		•			Ferric Chloride < 40%				•	Paraffin	•			
Acetic Anhydride				•	Ferric Sulfate < 10%		•			Phosphoric Acid < 80%*2		•		
Acetylene (Dry)		•			Ferrous Chloride < 30%				•	Photographic Solutions		•		
Acrolein 100%				•	Ferrous Sulfate < 50%				•	Pickling Solutions		•		
Air	•	•	•		Flurine Gas (Dry)		•	•		Picric Acid 10%		•		
Alcohol, Ethyl	•	•	•		Formaldehyde < 95%		•	•		Propane (Dry)		•	•	
Aluminum Chloride.10%				•	Formic Acid*2				•	Potassium Chloride				Consult Factory
Aluminum Sulfate 10-50%		•			Freons		•			Potassium Cyanide		•		
Ammonia Gas		•			Furfural < 10%				•	Potassium Permanganate		•		
Ammonium Chloride < 40%				•	Gallic Acid		•			Sea Water (Flowing)			•	
Ammonium Nitrate < 50%		•			Gas (for lighting)	•				Silver Nitrate < 70%				•
Ammonium Sulfate < 60%				•	Gasoline		•			Sodium Bicarbonate < 20%		•	•	
Aniline > 99%		•			Glucose			•		Sodium Bisulfate < 30%				•
Argon	•	•	•		Glycerine > 99%	•	•	•		Sodium Carbonate < 40%				Consult Factory
Beer		•			Hydrobromic Acid				•	Sodium Chromate < 60%	•	•	•	
Benzidine > 99%				•	Hydrochloric Acid				•	Sodium Cyanide				Consult Factory
Benzene < 50%		•	•		Hydrofluoric Acid				•	Sodium Hydroxide		•	•	
Benzoic Acid < 70%		•			Hydroflusilic Acid				•	Sodium Hypochlorite < 25%				•
Benzol	•				Hydrogen 2	•	•			Sodium Phosphate, Tri < 60%		•	•	
Bordeaus Mixture	•				Hydrogen Peroxide < 50%		•			Sodium Silicate < 50%		•	•	
Boric Acid < 25%		•			Kerosene	•	•	•		Sodium Sulfide < 50%				Consult Factory
Bromine (Dry)				•	Lacquers	•				Stannous Chloride < 10%		•		
Butane	•	•	•		Lactic Acid < 70%*2		•			Steam (Use siphon)	•	•	•	
Butanol	•				Lysol		•			Stearic Acid		•	•	
Butyric Acid < 25%		•			Magnesium Chloride < 40%				•	Sulfur Dioxide (Dry) > 99%				•
Calcium Chloride < 80%				•	Magnesium Sulfate		•			Sulfur Trioxide (Dry) > 99%				•
Calcium Hydroxide < 50%				•	Mercuric Chloride < 60%		•			Sulfurous Acid				•
Carbon Dioxide	•	•	•		Mercury > 99%				•	Tannic Acid < 80%	•	•	•	
Carbon Monoxide > 99%	•	•	•		Methyl Chloride				Consult Factory	Tanning Liquors				Consult Factory
Chlorine (Dry)				•	Methyl Salicylate				Consult Factory	Tartaric Acid < 50%		•	•	
Chlorine (Moist)*2				•	Milk		•			Tin Chloride (ous) < 10%		•		
Chloroform (Dry)		•	•		Naphtha > 99%	•	•	•		Toluene > 99%	•	•	•	
Chromic Acid				•	Naphthalene > 99%		•			Turpentine > 98%	•	•	•	
Citric Acid 10-50%		•			Nickel Chloride > 99%				•	Vegetable Oils		•		
Corn Oil		•			Nitric Acid < 95%*2		•			Vinegar		•		
Cottonseed Oil		•			Nitrogen	•	•	•		Water	•	•	•	
Creosote (Crude)		•			Nitrous Oxide				Consult Factory	Whiskey		•		
Crude Oil (Sour) (Use NACE)		•	•		Oleic Acid	•	•			Zinc Chloride < 35%*2				•
Crude Oil (Sweet)		•	•		Oxalic Acid*2				•	Zinc Sulphate < 40%				•
Ethyl Acetate	•	•	•		Oxygen (Gas)1	•	•	•						

1. Bronze and 316 Stainless Steel are acceptable for oxygen service, provided the instrument has been cleaned for service and is free from oil.

2. Over 1000 psi – entire system must be 316 Stainless Steel.

*Media temperature must be below 100°F

**Any standard bourdon tube or material may be used in conjunction with a diaphragm seal the gauge selection should be taken into consideration the corrosive environment in which it is to operate.



ACCURACY TABLE											
GAUGE PRODUCT	PAGE #	ACCURACY	1½"(40MM)	2 (50MM)	2½"	63MM	3½"	100MM	4½"	6" (160MM)	
GENERAL SERVICE											
GG Gauges	9	B	•	•							
General Service Gauges	10	B	•	•	•		•		•		
SEVERE SERVICE											
40/50mm Severe Service	14	B	•	•							
63mm Severe Service	15	B				•					
100mm Severe Service	17	A						•			
63mm Brass	19	A				•					
100mm Brass	19	1A						•			
PRECISION SERVICE											
Elite Stainless Steel	24	1A						•			
100mm Stainless Steel	20	1A						•			
Quality Series 100mm	21	1A						•			
"HW" Stainless Steel	23	1A						•		•	
Quality	25	A					•		•	•	
Test	27	2A							•	•	
Master Test	29	3A								•	
Inspector's Test	30	2A					3.0				
PROCESS											
Process	31	2A							•	•	
DIAPHRAGM GAUGE											
Low Pressure	35	A			•		•		•		
HVAC/R											
Contractor's HVAC	43	A							•		
Heating (Ft. H ₂ O)	44	A & B					•		•		
Refrigeration Ammonia	41	B				•	•				
Refrigeration	42	B			•		•				
Serviceman	39	B			•						
Manifold	40	B			•						
SPECIAL APPLICATION											
Water Test	45	B			•						
Paper Machine	46	A					•				
X-mas Tree Gauge	47	1A							•		

ASME B40.1 GRADE		ACCURACY
3A	± 0.25%	Full Scale
2A	± 0.50%	Full Scale
1A	± 1.0%	Full Scale
A	± 2/1/2%	± 1% over middle half of scale
B	± 3/2/3%	± 2% over middle half of scale



PRESSURE UNITS CROSS REFERENCE CHART

psi	atms.	"H ₂ O	mmH ₂ O	cmH ₂ O	oz./in ²	Kg/cm ²	"Hg	mmHg (Torr)	cm Hg	mbar	bar	Pa (N/m ²)	kPa	MPa
1	0.0681	27.71	703.8	70.38	16	0.0704	2.036	51.715	5.17	68.95	0.0689	6895	6.895	0.0069
14.7	1	407.2	10,343	1,034.3	235.1	1.033	29.92	760	76	1013	1.013	101,325	101.3	0.1013
0.0361	0.00246	1	25.4	2.54	0.5775	0.00254	0.0795	1.866	0.187	2.488	0.00249	248.8	0.249	0.00025
0.001421	0.000097	0.0394	1	0.1	0.0227	0.001	0.00289	0.0735	0.00735	0.098	0.000098	9.8	0.0098	0.00001
0.01421	0.000967	0.3937	10	1	0.227	0.001	0.0289	0.735	0.0735	0.98	0.00098	98	0.098	0.0001
0.0625	0.00425	1.732	43.986	4.40	1	0.0044	0.1273	3.232	0.323	4.31	0.00431	431	0.431	0.00043
14.22	0.968	394.1	100,010	1,001	227.6	1	28.96	735.6	73.56	980.7	0.981	98,067	98.07	0.0981
0.4912	0.03342	13.61	345.7	34.57	7.858	0.0345	1	25.4	2.54	33.86	0.0339	3386	3.386	0.00339
0.01934	0.001316	0.536	13.61	1.361	0.310	0.00136	0.0394	1	0.1	1.333	0.001333	133.3	0.1333	0.000133
0.1934	0.01316	5.358	136.1	13.61	3.10	0.0136	0.394	10	1	13.33	0.01333	1333	1.333	0.00133
0.0145	0.000987	0.4012	10.21	1.021	0.2321	0.00102	0.0295	0.75	0.075	1	0.001	100	0.1	0.0001
14.504	0.987	401.9	10,210	1021	232.1	1.02	29.53	750	75	1000	1	100,000	100	0.1
0.000145	0.00001	0.00402	0.102	0.0102	0.00232	0.00001	0.000295	0.0075	0.00075	0.01	0.00001	1	0.001	0.000001
0.14504	0.00987	401.9	102.07	10.207	2.321	0.0102	0.295	7.05	0.75	10	0.01	1,000	1	0.001
145.04	9.869	4019	102,074	10,207	2321	10.22,036	295.3	7500	750	10,000	10	1,000,000	1,000	1

To use this chart:

1. Find the column with the units you want to convert from
2. Move down that column until you find the "1"
3. Staying in the same row, move horizontally to the column with the units you are converting to
4. Multiply the number in that box by the amount you are changing from to get the converted value

Reference



PART NUMBER PREFIX GUIDE

Marsh Instrument part numbers begin with a letter prefix which helps identify the product

PREFIX	PRODUCT TYPE	SEE PAGES
D	Test Gauges	29
D	Inspector's Test Gauges	32
G	Diaphragm Gauges	37
G	Water Test Gauges	47
H	Quality Gauges	27
H	100mm Stainless Steel (L.F.)	22
HW	100mm Welded Socket	23
J	General Service Gauges	12
J	63mm Severe Service Gauges (L.F.)	17
L	Bimetal Thermometers	54
P	Process Gauges	33
W	100mm Elite Gauges (L.F.)	26
W	HVAC/R (Heating System, Contractor's, Refrigeration Ammonia, Manifold)	40-46
W	Paper Machine	48
X	100mm Severe Service Gauges (L.F.)	19
Y	Tridicators, Industrial Thermometers	59, 57
M	40mm & 50mm Severe Service	16
GG	Marshalltown Value Series	9

PART NUMBER SUFFIX GUIDE

Marsh Instruments part numbers end with a letter suffix to denote a special feature or options.

SUFFIX	OPTION	DESCRIPTION
A	Ring Options	Friction-Black (FB)
		Press-Black (PB)
		Press-Chrome (PC)
		Friction Chrome (FC)
B	Accuracy	ASME Grade 2A 0.5% (H%F);
		ASME Grade 1A, 1.0% (1%F);
		ASME Grade A 2-1-2% (1%H)
C	two piece stem on severe service	63mm Severe Service C
D	Oxygen Cleaned	
E	Single Scale psi only Dial	
F	Window Options	Safety Glass (SG)
		Acrylic (AY)
		Instrument Glass (GS)
		Polycarbonate (PC)
G	Weatherproof case	
H	Restrictors	
I	Fill Options	Silicone (SL)
		Glycerine (GL)
J	Case Options	Phenolic (PH); Brass (BR)
		Chrome (CR); Stainless Steel (SS)
		Polypropylene Turret (TR)
L	Metric Dial	L1 -Bar Only
		L2-kg/cm ² Only
		L3-kPa Only
		L4-MPa only
M	Custom Name on Dial or Service Printing	
P	Liquid Filled product	
R	Front Flange	
W	Dual Scale	W1 -psi & Bar
		W2-psi & kg/cm ²
		W3-psi & kPa
		W4-psi & MPa
Z	Pointers	Adjustable Pointers (AD)
		Max. Hand Assembly (MX)

NOTE: Not all options are available on all products, please consult factory

ABBREVIATIONS AND TERMS USED

p or psi	Pounds per square inch
kPa	kilopascals
Case	The case style
oz/in ²	Ounces per square inch
H ₂ O	Inches of water
ft. H ₂ O	Feet of water
Hg	Inches of mercury
VAC	Range is in vacuum

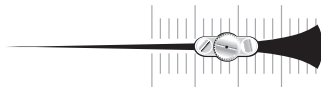
NOTE: Compound Ranges, where the gauge measures both vacuum and pressure are designated as: 30" Hg VAC to 100p = measures from 30 inches of mercury vacuum to 100psi pressure.

P	plain case (no flange or clamps)
F	front flange case (with U-clamp)
R	3 holed front flange (no clamp)
G	back flange case
H	hinged ring case (front flange case with U-clamp and removable cover)
UC	U-clamp case

CONNECTION : The process connection 1/8", 1/4", 1/2" – NPT diameter of connection (National Pipe Thread Standard)

LM	lower mount
LBM	lower back mount
CB	center back mount

REGISTERED TRADEMARKS: Viton®, Teflon®, & Delrin® are registered trademarks of the E.I. Dupont family of companies.



MARSH BELLOFRAM TERMS & CONDITIONS

I. GENERAL

- A. Customer purchase orders are binding only after written acceptance by Marsh Bellofram. Verbal orders shall not be accepted as binding until confirmed in writing by Marsh Bellofram.
- B. Prices are effective from date of publication and are subject to change without notice.
- C. Marsh Bellofram reserves the right, without prior notice to:
 1. Change and/or revoke any price.
 2. Change and/or revoke any provisions contained herein.
 3. Discontinue shipments to any customers.
 4. Resolve any inconsistencies, conflicts or ambiguities.
- D. Special production runs or product orders are subject to Marsh Bellofram requirements such as, but not limited to, minimum quantities and extended delivery times. On special production run products Marsh Bellofram reserves the right to over ship or under ship the purchase order quantity by up to 5% and invoice accordingly. Special orders are subject to cancellation charges.
- E. Minimum billing: \$60 net per order.

II. PAYMENT TERMS

- A. For customer with established credit terms: Net 30 days from shipment date.
- B. If credit is not established, payment plus estimated (By Marsh Bellofram) freight charges shall accompany order or arrangements shall be made for collect on delivery (C.O.D.)
- C. Marsh Bellofram reserves the right to revoke any credit extended to a customer if the customer fails to pay for any shipments when due. If in Marsh Bellofram's opinion there is a material adverse change in customer's financial condition, Marsh Bellofram shall have the right to suspend further shipments until receipt of adequate assurance of customer's ability to pay therefor.
- D. All shipments are F.O.B. Plant of Manufacture.
- E. The shipment is deemed accepted in good condition by the common carrier and title and all risk of loss or damage is transferred to customer upon that acceptance by the carrier. The customer is responsible for inspection the merchandise upon receipt. The customer shall insist that visible damage be noted on its copy of the freight bill. If the product has been lost or damaged in transit, the customer must file the claim with the carrier, as Marsh Bellofram bears no responsibility for any such loss or damage.
- F. All freight, handling and insurance charges shall be invoiced to the customer or shipped freight collect.
- G. All shipments are made by carriers of Marsh Bellofram's choice. Any special arrangements requested by customer shall be at customer's additional expense.
- H. Any quantity shortages, incorrect items, or billing errors shall be reported in writing to Marsh Bellofram within 15 days of delivery. Sales order and invoice numbers are to be furnished on all claims.
- I. Marsh Bellofram reserves the right to make delivery in installments. All such installments shall be separately invoiced and paid for when due, without regard to subsequent deliveries. Delay in delivery of any installment shall not relieve customer of his obligation to accept remaining deliveries.
- J. Marsh Bellofram shall not be liable for failure to deliver or delay in delivery occasioned by causes beyond Marsh Bellofram's control, including without limitation, lock-outs, fires, embargoes, war or other breakouts of hostilities, act of inability to obtain shipping space, machinery breakdowns, delays of suppliers, and domestic or foreign governmental acts or regulations. In the event of any delay in delivery due to such causes, unless otherwise agreed, time of delivery shall be deemed extended for a period of sixty (60) days. Customer shall extend the letter of credit if payment is to be made by letter of credit. If delivery is not made within such extended sixty (60) day period, contract shall be deemed cancelled without liability to either party.

III. CANCELED ORDERS

ORDER CANCELLATIONS CAN ONLY BE ACCEPTED BY WRITTEN REQUEST via FAX or MAIL.

All order cancellations result in a cancellation fee of at least 25% of the appropriate invoice of the finished item. Additional cancellation fees are:

1. Catalog Stock Items
- If cancelled less than 1 week before ship date, 25% cancellation fee.
2. Catalog Non-Stock Items
- If cancelled less than 30 days before ship date, full price.
3. Customer Specials
- If cancelled at any time, full price.

IV. LIMITED WARRANTY

- A. All Marsh Bellofram products are warranted against defects in workmanship materials under normal use for 1 year after date of purchase from Marsh Bellofram unless otherwise stated. (Proof of purchase is required). Any product which is determined by Marsh Bellofram to be defective in material or workmanship and returned to Marsh Bellofram, shipping costs prepaid, shall be, as the sole remedy, repaired or replaced at Marsh Bellofram's option.
- B. This warranty is expressly in lieu of all other warranties expressed or implied, including the warranties of merchantability and fitness for use and all other obligations or liabilities on the part of Marsh Bellofram, and Marsh Bellofram neither assumes nor authorizes any other person to assume for it, and other liability in connection with the sale hereunder. Marsh Bellofram disclaims any liability for product defects that are due to product misuse, improper product selection or misapplication.
- C. Marsh Bellofram shall not be liable for customer's costs, lost profits, good will or other special or consequential damages Marsh Bellofram's liability in all events is limited and shall not exceed, the value of merchandise involved.
- D. Remedies - Any controversy or claim arising out of or relating to the contract, or the breach thereof, shall be settled by arbitration in Hancock County, State of West Virginia in accordance with the commercial arbitration Rule of the American Arbitration Association, and judgement on the award render by the arbitrator(s) may be entered in a court having jurisdiction thereof.

V. MODIFICATION OF TERMS

This contract constitutes the entire agreement between the parties, all private representations and understanding having been merged herein. It may not be modified or terminated except in writing signed by a duly authorized representative of Marsh Bellofram. This contract shall be governed by and construed according to the laws of the State of West Virginia.



DISTRIBUTOR RETURN POLICY FOR PRESSURE GAUGES & ACCESSORIES

I. RETURN GOODS AUTHORIZATION (RGA)

- A. Merchandise returned to Marsh Bellofram for any reason must have a Marsh Bellofram Returned Goods Authorization (RGA) number. Warranty returns also require proof of purchase (invoice number, date, and an RGA number).
- B. An RGA is valid for 45 days from issuance and merchandise must arrive at Marsh Bellofram within that validity period.
- C. All material must be shipped freight prepaid.
- D. The RGA number must be clearly visible on the outside of the package. A packing list must be included which clearly shows the RGA number, quantity, product description and reason for return.
- E. No returns will be accepted without an authorized RGA (Return Goods Authorization)

II. MARSH BELLOFRAM CANNOT BE HELD RESPONSIBLE FOR ANY MERCHANDISE RETURNED WITHOUT AN RGA NUMBER.

- A. An RGA number is issued in good faith based upon customer's representation of the merchandise quantity, condition, age and reason for return. All returned material is subject to inspection by Marsh Bellofram. If the material is found to be other than that originally represented, the shipment will be returned at the customer's expense.
- B. An RGA may be requested by mail, fax or by telephoning Marsh Bellofram at 304-387-1200.
 1. Warranty Returns (see Warranty Policy): Limited in-warranty merchandise must have an RGA number and be returned freight prepaid. The merchandise will be repaired or replaced under Marsh Bellofram's warranty terms, it will be returned freight prepaid to the customer.
 2. Incorrect Shipments: For short shipments or incorrectly supplied merchandise, discrepancies must be reported within 15 days of receipt. For short shipments, a debit memo should be issued to Marsh Bellofram. Marsh Bellofram will then issue a credit memo, ship the missing merchandise freight prepaid and issue an invoice. For incorrectly supplied merchandise, all returns require an RGA number and must be returned freight prepaid. A debit memo should be issued to Marsh Bellofram for the freight. If a replacement is required, Marsh Bellofram will ship freight prepaid and invoice for the new product plus freight.
 3. General Terms for Returns (Exchange or Credit): Material requested to be returned will be considered if the following conditions are met:
 - a. Merchandise is unused, current standard catalog stock of latest design, with both product and packaging in saleable condition.
 - b. Merchandise shall have been purchased directly from Marsh Bellofram in the last 12 months.
 - c. Merchandise shall not have been purchased on a "product promotion" or other special pricing.
 4. Marsh Bellofram reserves the right to reject any return request. If accepted, the return will be under the terms specified herein. The following products are not returnable:

- a. Annual Merchandise Exchange Policy for Marsh Bellofram Distributors: Marsh Bellofram will normally accept one stock exchange in a 12 month period, for the purpose of increasing the flexibility of distributor's stock. This annual exchange is limited to distributors who are in good standing and whose accounts are current. The merchandise is subject to the product restrictions listed previously and limited to no more than 2% of the net invoiced sales from Marsh Bellofram to the distributor location during the previous 12 months. The value of the exchange will be determined by the current list price and current maximum published discount.

An offsetting order equal to the return is required.

1. The distributor shall issue a written request for an RGA number for the annual exchange showing quantity, product catalog number and description.
2. The exchange is subject to Marsh Bellofram approval and may be subject to an on-site inspection by Marsh Bellofram personnel. Please allow minimum 2 weeks for approval. Non-stock product or custom product is not returnable.
3. Upon approval of the exchange, Marsh Bellofram will inform the distributor of the net amount of the exchange for the scheduled date for return. The RGA number will be issued only upon receipt of a purchase order for an equal (net) value, calculated on current list price, current maximum published discount.
4. Upon receipt of RGA number, the distributor shall then package the authorized material and return freight prepaid to Marsh Bellofram, Newell, WV. The distributors bears liability for lost shipments or shipping damage.
5. All merchandise is subject to inspection upon receipt. Merchandise which is found to be damaged, modified, or in any other way ineligible for exchange, will be returned at the customer's expense and the value will be deducted from the exchange. A credit memo will then be issued for the net value of the exchange.
6. The replacement order will be shipped and invoiced against the new purchase order with freight at distributor's expense.
- b. Merchandise Returns for Credit: Merchandise returned for credit requires an RGA number, and is subject to a 25% restocking charge and must be returned freight prepaid. The amount of the credit will be determined as follows:
 1. Items returned within 90 days of purchase and with proof of purchase (copy of invoice) will be at invoiced price less applicable charges.
 2. All other will be calculated at current list price and current maximum published discount less 25% restocking fee.
 3. In addition to the standard restocking fee, gauges with accessories will be subject to a removal charge equal to the difference between the "installed" and "sold separately" prices.
 4. Solid fill thermometry products are non-returnable.
- c. Credit Memos:
 1. Where required, Marsh Bellofram will issue a credit memo for the returned or exchanged merchandise less any applicable restocking or removal charges.
 2. The credit memo will be issued only after receipt and inspection of merchandise.
 3. Deduction from payments shall not be made until the Marsh Bellofram issued credit memo has been received.

PRODUCT CLASSES AND OPTIONS

- A. Stock items: Shipped in 7 days or less, with no minimum quantity. *(Large quantities may require extended lead times.)*
- B. Non-stock items: Consult factory for quantities and lead times.
- C. Custom options on stock items: Dials, rings, windows, restrictors, and cosmetic changes - 4 weeks.
- E. Customer special class: Special connections and materials consult factory for quantities and lead times.



PRODUCT WARNINGS, CLAIMS, RECOMMENDATIONS AND NOTICES

WARNING: A failure resulting in injury or damage may be caused by pressure beyond top of scale, excessive vibration or pressure pulsation, excessive instrument temperature, corrosion of the pressure containing parts, or other misuse. For correct use and application of pressure gauges, refer to ASME standard B40.1 1998, entitled 'Gauges: Pressure Indicating Type: Elastic Element.' This document is available from The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10007.

WARNING: LIQUID FILL: Glycerine or Silicone when combined with strong oxidizing agents, including but not limited to chlorine, nitric acid, and hydrogen peroxide, can result in a spontaneous chemical reaction, ignition, or explosion which can cause property damage and personal injury. If gauges are to be used in such service, do not use glycerine or silicone fill. Consult factory for proper fill medium.

IMPORTANT NOTICE: Our recommendations, if any, for the use of these products are believed to be reliable. The greatest care is exercised in the selection of our raw materials and in our manufacturing operations. However, since the use of this product is beyond the control of the manufacturer, no guarantee or warranty, express or implied, is made to such use or effects incidental to such use, handling or possession or the results to be obtained whether in accordance with the directions claimed so to be. The manufacturer expressly disclaims responsibility therefor. Furthermore, nothing contained herein shall be construed as a recommendation to use any product in conflict with existing laws and/or patents covering any material or use.

LIMITED WARRANTY:

(1) All Marsh Instruments products are warranted against defects in workmanship or materials under normal use for one year after date of purchase from Marsh Instruments unless otherwise stated. (Proof of purchase is required). Any product which is determined by Marsh Instruments to be defective in material or workmanship and is returned to Marsh Instruments with shipping costs prepaid, shall be, as the sole remedy, repaired or replaced at Marsh Instruments' option.

(2) THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE AND OF ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF MARSH INSTRUMENTS, AND MARSH INSTRUMENTS NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE HEREUNDER. MARSH INSTRUMENTS DISCLAIMS ANY LIABILITY FOR PRODUCT DEFECTS THAT ARE DUE TO PRODUCT MISUSE, IMPROPER PRODUCT SELECTION OR MISAPPLICATION.

(3) Marsh Instruments shall not be liable for customer's costs, lost profits, good will or other special or consequential damages incurred in any way. Marsh Instruments' liability in all events is limited to, and shall not exceed, the value of merchandise involved.

NOTE: ALL MARSH INSTRUMENT PRODUCTS ARE SUBJECT TO CONTINUOUS IMPROVEMENT. THEREFORE, MATERIAL AND SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.



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