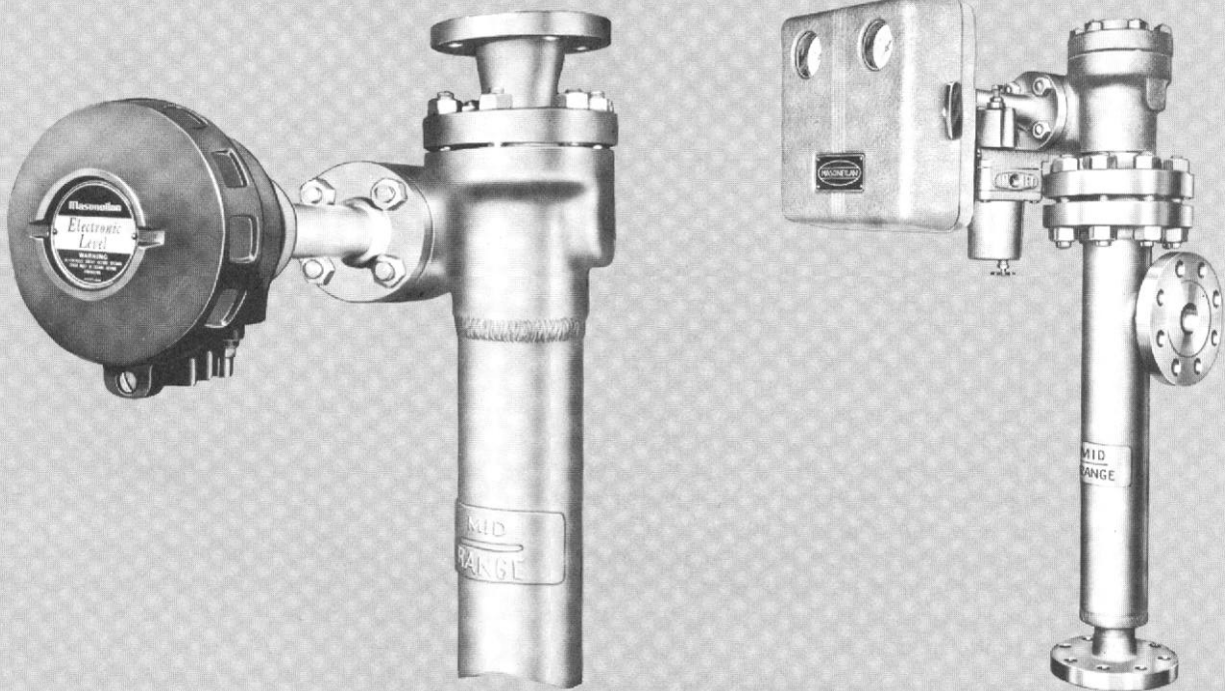


# 12000 Series Liquid Level Control Instrumentation



**Masoneilan**

**DRESSER**

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## Foreword

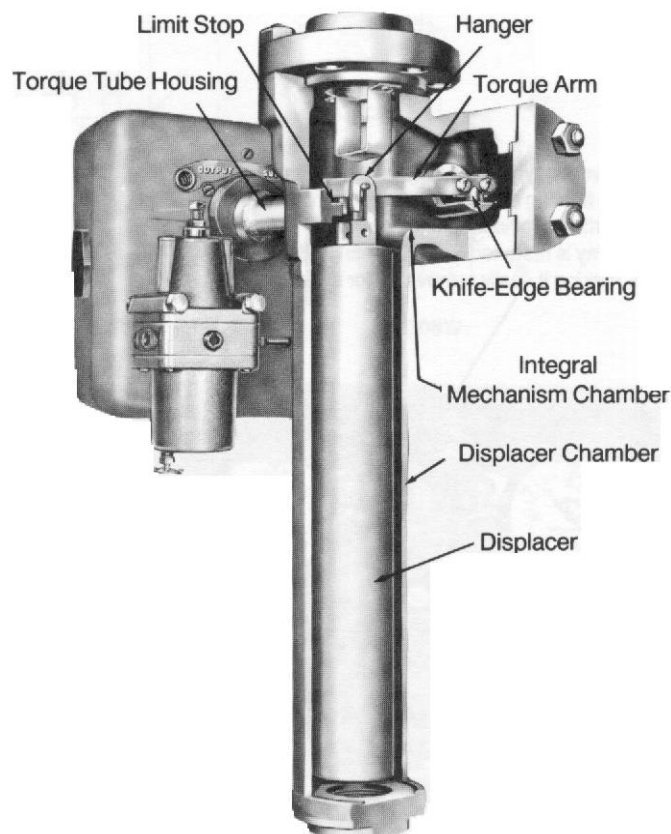
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The Masoneilan 12000 Series of liquid level control instruments includes pneumatic controllers and transmitters, electronic transmitters and mechanical level switches. They are used to measure and control liquid level, specific gravity and liquid interface.

All 12000 Series liquid level control instruments operate by Archimedes' Principle: when a body is partly or completely immersed in any liquid, it loses weight equal to the weight of the liquid displaced. The instruments use a displacer attached to a torque tube assembly, which provides a simple and accurate means of transmitting motion from the displacer to the control mechanism.

The displacer is always heavier than the liquid displaced at full immersion. Although the displacer rises and falls with level changes, its movement is substantially less than the actual level movement. The difference in movement between displacer and liquid level is dependent on the cross-sectional area of the displacer, the specific gravity of the liquid and the stiffness of the torque tube. Level ranges of from a few inches to several feet can be obtained by varying the cross-sectional area and length of displacer.

## Construction



### Displacer

Standard displacers are made of AISI Type 316 stainless steel tubing and selected so that standard control mechanisms can be used, without modification, for all ranges. Monel, Hastelloy B or C, Durimet 20, copper and solid Teflon\*, etc., are also available.

### The Torque Tube Assembly

The Torque Tube Assembly is so designed that it provides a simple and accurate means of transmitting motion from the displacer to the control mechanism. The torque tube is the torsion spring of the level measuring system, designed to provide the most desirable combination of load carrying ability and low operating stress. The torque tube, torque tube rod, bushing, torque arm block and housing extension are made of a single alloy welded together to form an integral unit.

### Chamber Assembly

The chamber assembly has been designed for compactness and light weight to facilitate handling and installation. The lower part of the assembly (displacer chamber) houses the displacer, while the upper chamber (mechanism chamber) houses the

torque arm and serves to connect the displacer chamber to the torque tube housing. Where top and bottom connections are desired, upper and lower chambers are an integral unit, since top and bottom connections permit installation with instrument in any desired position relative to the vessel. Steel and alloy chambers with one or more side connections are available with a mid-flange (ANSI Class 600) permitting field orientation of instrument to the vessel. Side connected models are also available with integral chambers (12000W Series).

### Hanger and Stop

The hanger provides a simple yet reliable attachment of the displacer to the torque arm while keeping friction to a minimum.

### Hanger Extension

Integral or detachable extensions are available for all controllers with internally mounted displacers. They can be supplied in any length up to 5 feet, using  $\frac{3}{16}$ " diameter solid rod. Other lengths are possible with an appropriate length of cable.

\* DuPont's Registered Trademark

## Pneumatic Controllers and Transmitters

**Relay:** Balanced type, featuring large capacity and frictionless floating action. A plunger in a removable metering orifice provides for instantaneous cleaning. The relay is fastened to the air manifold by two screws, making it easily removable for servicing.

**Cover:** Hinged to the case by stainless steel pins. The cover, as well as glassed gauge openings, is gasketed for outdoor service. A positive cam-type latch insures tight closing.

**Control Setting Mechanism:** Provides smooth, positive adjustment of the set point through full level range. Both knob plate and scale are reversible to coincide with controller action.

In pneumatic-set controllers an additional subassembly is substituted for the normal control setting mechanism to provide for pneumatic positioning of the set point. This makes the 12840 Series ideal for cascade control loops.

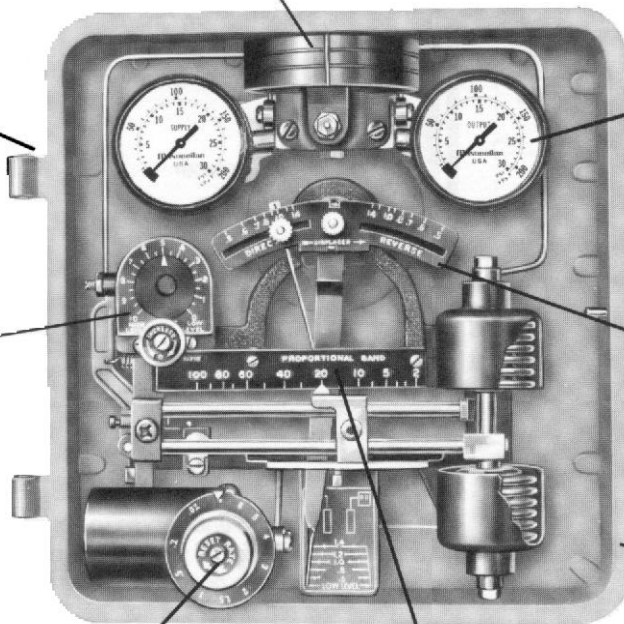
**Reset Rate Adjustment:** Scale is calibrated from 0.02 to 6.0 repeats per minute. Wide intervals at the lower end of the scale (between 0.02 and 1.0) permit precise settings at low reset rates.

**Proportional Band Setting:** Easy adjustment is made by a positive self-aligning clamp located in the front of the instrument. A four inch direct reading scale indicates the proportional band setting in percent of total level range. Standard range for all controllers is 2-100%. Differential-gap controllers and pneumatic transmitters are also available.

**Enclosed Gauges:** Indicate supply and output pressures. Protected from weather, corrosive, cleaning or painting conditions. A Model 77-4 Filter-Regulator is provided to regulate the air supply pressure.

**Reversing Arc:** Provides for direct or reverse action for either left or right hand mounting and for specific gravity adjustment to compensate for effect of specific gravity on displacer travel.

**Rugged Enclosure:** Weather-proof, die cast aluminum. Two sizes are available to provide for either single or duplex controller mechanisms.



## Numbering System

Mounting	Proportional	Pneumatic Transmitter	Differential Gap	Proportional-Reset	Pneumatic Set	Pneumatic Set with Proportional-Reset	Electronic Transmitter	Level Switch
Top and Bottom Threaded	12800	12820	12830	12810	12840	12850	12120	12000-40
Flanged	12801	12821	12831	12811	12841	12851	12121	12001-40
Side and Side* Threaded	12809	12829	12839	12819	12849	12859	12129	12009-40
Flanged	12802	12822	12832	12812	12842	12852	12122	12002-40
Top and Side* Threaded	12805	12825	12835	12815	12845	12855	12125	12005-40
Flanged	12808	12828	12838	12818	12848	12858	12128	12008-40
Side and Bottom* Threaded	12806	12826	12836	12816	12846	12856	12126	12006-40
Flanged	12807	12827	12837	12817	12847	12857	12127	12007-40
Top of Vessel	12803	12823	12833	12813	12843	12853	12123	12003-40

\*Mid-flange in displacer chamber is supplied as standard with carbon steel chambers; for integral chamber add suffix "W" to model numbers 2, 5, 6, 7, 8 and 9. Since integral chambers are standard on 12800 and 12801, the "W" is omitted on the model number.

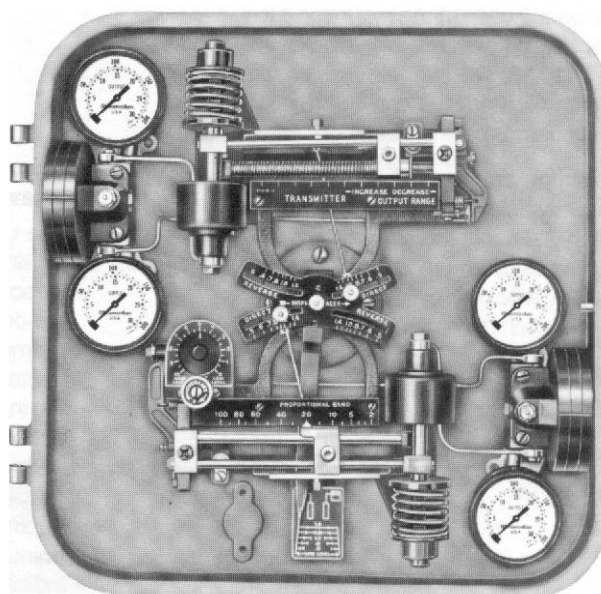
## Duplex Controllers

There are many installations for which two output signals are required from a single pneumatic liquid level control system. For example, the output of a Proportional-Reset controller mechanism is fed to a control valve. A secondary mechanism—the transmitter—can be added to provide a signal to a pneumatic recorder or indicator. The Masonellan Duplex Controller generates two output signals using one chamber, torque tube and instrument case. This design allows for an easy, compact installation.

Choose the primary control mechanism and use that to select the basic model number from the table at the top of this page. Add one of the following suffix numbers to the basic model number in order to specify the secondary mechanism:

Second Mechanism	Add Suffix To Model Number
Proportional Controller	-00
Proportional-Reset Controller	-10
Transmitter	-20
Differential Gap Controller	-30

In our example, assume that the chamber has Top and Bottom Flanged connections. With the primary control mechanism being Proportional-Reset, the basic model number is 12811. Add the suffix -20 to specify a transmitter as a second mechanism.



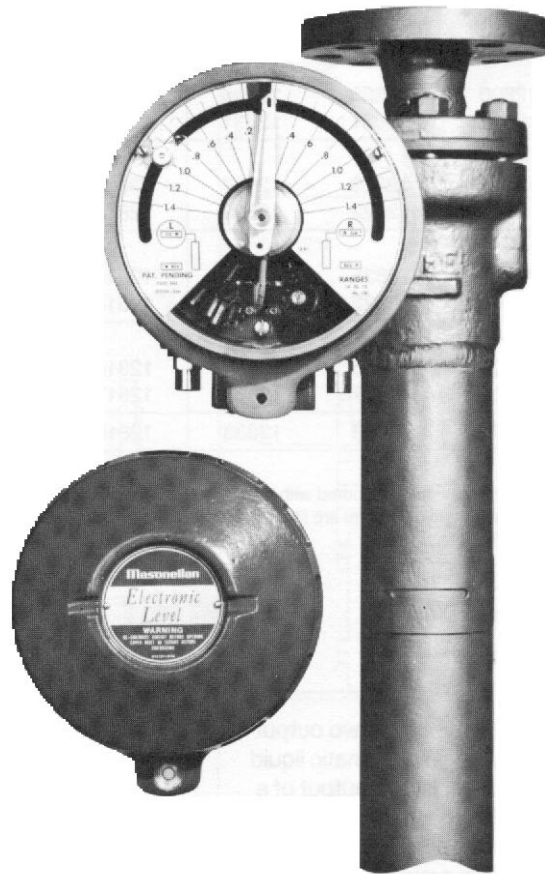
## Electronic Transmitter

The Masoneilan Series 12120 two-wire electronic liquid level transmitter assures you of sensitive, stable operation from an instrument that is modular in construction and is little affected by vibration or ambient temperature. It is designed to be used with the time proven Masoneilan 12000 Series variable displacement measuring element and torque tube.

The standard transmitter provides a 4-20 or 10-50 milliamp signal to remotely located receivers such as recorders, indicators or controllers and meets I.S.A. standards of load compatibility for Type 2, Class U instruments. The built-in calibrator allows adjustment for specific gravity without resort to the typical water column technique and provides a means for rapid periodic maintenance checks. Level changes cause a rotation of the torque rod and the sensor (rotary variable differential transformer RVDT). The signal is rectified and amplified to produce standard signal levels. Direct or reverse action signals are available from a standard unit. The instrument mechanism is housed in a rugged cast and anodized aluminum case with an epoxy finish. The case meets Class I, Division I, Group B, explosionproof design requirements and comparable codes in France, Germany, Canada and Japan. Buna-N O-rings on the case at the mounting face and cover provide a completely weatherproof seal per NEMA ICS 1-110.15. The instrument is certified intrinsically safe for Groups B, C and D with a number of popular instrument systems.

Construction is simple and rugged. All parts are of low mass, inherently balanced and free of vibration effects. The rotary sensor is thermally isolated from the 12000 Series torque tube and is coupled to the torque rod by a flexible bellows coupling which provides isolation from thermal expansion.

The 12120 Series transmitter is modular in construction. All electrical components are mounted on a glass epoxy printed circuit board and are of high quality. The sensor is contained in a completely integral module.



### A time-saving approach to level instrument calibration

The 12120 Series instrument calibration becomes a big time saver particularly if the transmitter is in an inaccessible location or periodic calibration checks are desired. The calibration mechanism consists of a simple torsion wire spring (with a pointer) connected to the torque rod. During calibration of span the indicator is set at the desired specific gravity. Calibration is accomplished by rotating the pointer to the indicator, applying a torque to the torque rod, which results in a movement of the sensor appropriate for setting the range desired. The pointer is held at the specific gravity setting by the indicator on the graduated plate. The indicator also serves as fixed indication of the range and specific gravity at which the instrument was set.

## Liquid Level Switch

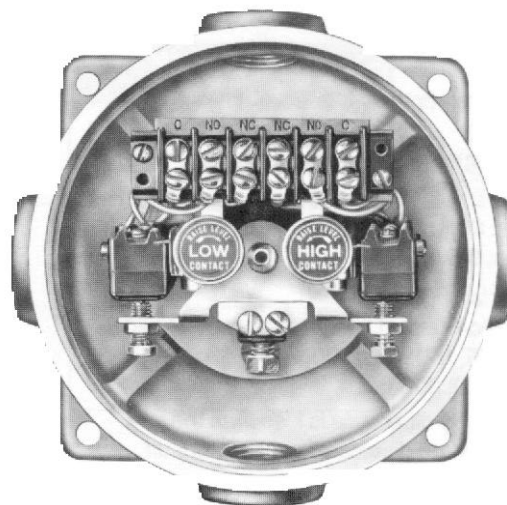
The Model 12000-40 Liquid Level Switch provides electrical indication or control, in some instances, of changes in liquid level, by actuating signal lights, audible alarms, solenoids, motors and other electrical devices. This unit combines the field tested 12000 Series measuring element with two snap-acting switches and setting mechanisms. Electrical components are enclosed in an explosion-proof housing. Standard internal wiring permits the user to wire externally for a variety of signal combinations.

The precision-built snap-acting switches, with double-throw contact arrangement, are mounted integrally on a single frame. A rocker arm, attached to the end of the torque rod, actuates the switches. Settings are made by means of micrometer adjusting knobs, marked to indicate direction of rotation for adjusting contact points. With a liquid of 1.0 specific gravity, a level change of approximately 5% of the level range (10% on ANSI Class 1500 and 2500 units) is required to reset a switch contact from "make" to "break," or vice versa. The detente (reset) is inversely proportional to the specific gravity or interface gravity differences . . . i.e., with a specific gravity of 0.5, 10% of the level range will be required to reset switch contact.

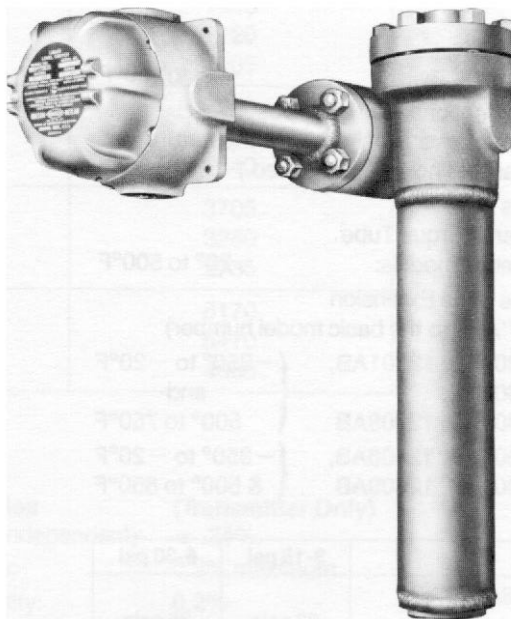
Explosion-proof housing and components are suitable for housing temperatures as high as 180°F. Where process might cause housing temperature to exceed this value, a torque tube extension should be used. The housing is designed for Class I, Division 1, Groups C and D.

The standard switch is designed for use with specific gravities, or specific gravity differences, between 0.5 and 1.4. Special switches are available for other specific gravities. Either left hand or right hand mounting may be supplied. Left hand mounting will be furnished unless otherwise specified.

Ratings of switch are 115/230 volts AC, 5 amps maximum; or 110 volts DC, 0.3 amps maximum, non-inductive only.



Switch Mechanism



Mounted on 12000 Chamber

## Product Specifications

### Applications

Liquid Level Measurement and Control

Standard Ranges:

14", 24", 32", 48", 60", 72", 84", 96", 120"

Specific Gravity Limits

12120 Series: 0.2 to 1.4

12800 Series: 0.5 to 1.4

Liquid-Liquid Interface

Minimum Specific Gravity Difference between Fluids

ANSI Class 125, 150, 250, 300, 600, 900: 0.2

ANSI Class 1500, 2500: 0.4

If the specific gravity difference is less than the above, a non-standard displacer is used. Consult factory for details.

Specific Gravity (Liquid Density):

Consult Masoneilan for application assistance.

### Functional Characteristics

#### 12800 Series

Temperature Limits

Instrument Case: -40° to 180°F

(If the instrument case will be exposed to temperatures above 180°F, a high temperature relay and gasket should be specified.)

Process Limits

1) With Standard Torque Tube

All 12800 Series models: -20° to 500°F

2) With Torque Tube Extension

(add suffix "AB" to the basic model number)

(a) 12800AB, 12801AB, 12803AB, 12805AB, 12808AB

{ -350° to -20°F  
and  
500° to 750°F

(b) 12802AB, 12806AB, 12807AB, 12809AB

{ -350° to -20°F  
& 500° to 850°F

Output	3-15 psi	6-30 psi
Recommended Supply Pressure	20 psig	35 psig
Steady State Air Consumption at Recommended Supply Pressure	0.20 scfm	0.25 scfm

Action: Direct or Reverse

Operator Adjustments

Proportional Band: 2-100%

Reset: 0.02-6 repeats/min.

Differential Gap: 5-100%

#### 12120 Series

Temperature Limits

Transmitter Head: -30° to 165°F

Process Limits

1) With Standard Torque Tube

All 12120 Series models: -150° to 300°F

2) With Torque Tube Extension

(a) 12120AB, 12121AB, 12123AB, 12125AB, 12128AB

{ -350° to -150°F  
and  
300° to 750°F

(b) 12122AB, 12126AB, 12127AB, 12129AB

{ -350° to -150°F  
& 300° to 850°F

Output: 4-20 or 10-50 mA

Power Supply

Voltage: 24V dc recommended

12.5V dc minimum

95V dc maximum

Action:

Direct or Reverse

Explosionproof

Housing:

Factory Mutual approved for use in Class I, Division 1, Groups B, C and D Class I, Division 2, Groups B, C and D indoor and outdoor hazardous locations.

Intrinsic Safety:

Factory Mutual approved as intrinsically safe with many typical control systems. Consult Masoneilan for barrier types.

Enclosure Ratings

12120 Series: NEMA types 1, 4, 4X, 7, 9, 12



## Product Specifications

### 12000 Series—General

Working Pressure Limits—determined by the operating temperature and process connection rating.

ANSI Rating of Process Connection	Material	Process Temperature at Face of Connection, °F	Maximum Static Pressure, psig
Class 150	Steel	–20 to 100	285
		–20 to 300	230
		–20 to 600	140
	316 St. St.	–20 to 100	275
		–20 to 300	215
		–20 to 600	140
Class 300	Steel	–20 to 100	740
		–20 to 300	655
		–20 to 600	550
	316 St. St.	–20 to 100	720
		–20 to 300	560
		–20 to 600	450
Class 600	Steel	–20 to 100	1480
		–20 to 300	1315
		–20 to 600	1095
	316 St. St.	–20 to 100	1440
		–20 to 300	1120
		–20 to 600	905
Class 900	Steel	–20 to 100	2220
		–20 to 300	1970
		–20 to 600	1640
Class 1500	Steel	–20 to 100	3705
		–20 to 300	3280
		–20 to 600	2735
Class 2500	Steel	–20 to 100	6170
		–20 to 300	5470
		–20 to 600	4560

### Performance Characteristics

#### 12800 Series

Linearity (independent):  $\pm 0.3\%$   
 Hysteresis: 0.6% maximum  
 Repeatability: 0.2%  
 Dead Band: less than 0.1%  
 Temperature Effect at  
 Specific Gravity of 1.0: less than 1.5%/50°F

#### 12120 Series

(Transmitter Only)  
 Linearity (independent):  $\pm .25\%$   
 Hysteresis: 0.2% maximum  
 Repeatability: 0.2%  
 Dead Band: less than 0.1%  
 Temperature Effect at  
 Specific Gravity of 1.0: less than 1.5%/50°F  
 Typical Frequency  
 Response: Corner frequency = 1Hz

## Selection Table

### Connections—Ratings

Basic Model No.ⓐ	Mounting Types	Sizes and Type Connectionsⓑ	Material	ANSI Class	RangesⒸ Inches
12800	Top and Bottom	1½" and 2" Threaded	Steel	600	All ranges
12801	Top and Bottom	1½" and 2" Flanged 1½" and 2" Flanged	Steel Steel	150, 300, 600 1500, 2500	All ranges 14, 32
12802	Side and Side	1½" and 2" Flanged 2" Flanged	Steel Steel	150, 300, 600 1500, 2500	All ranges 14, 32
ⓐ12803	Top Vessel	4" Flanged 4" Flanged	Steel Steel	150, 300, 600 900, 1500, 2500	All ranges All ranges
12805	Top and Side	1½" and 2" Threaded	Steel	600	All ranges
12806	Side and Bottom	1½" and 2" Threaded	Steel	600	All ranges
12807	Side and Bottom	1½" and 2" Flanged 2" Flanged	Steel Steel	150, 300, 600 1500, 2500	All ranges 14, 32
12808	Top and Side	1½" and 2" Flanged 1½" and 2" Flanged	Steel Steel	150, 300, 600 1500, 2500	All ranges 14, 32
12809	Side and Side	1½" and 2" Threaded	Steel	600	All ranges

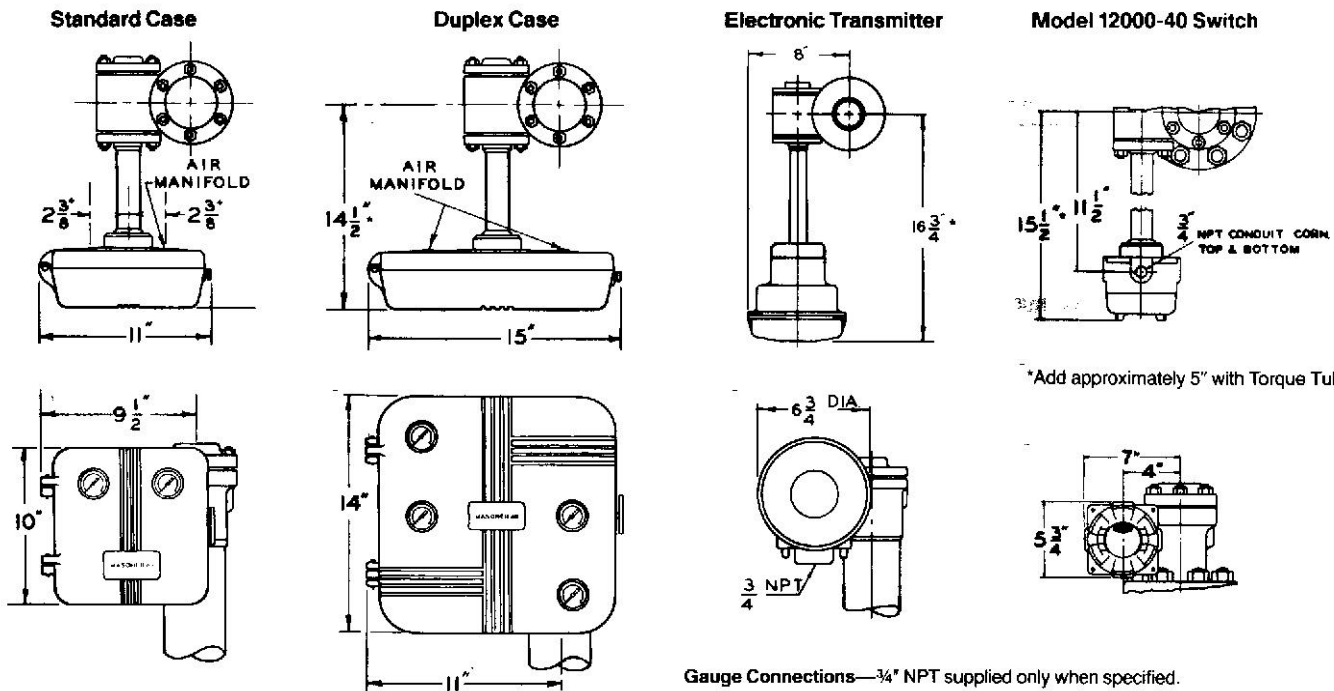
ⓐ Table also applies to associated model numbers for various control mechanisms and duplex models, as well as for the 12120 Series electronic transmitters.

ⓑ Flanged connections standard raised face or ring joint.

Ⓒ Standard Ranges: 14", 24", 32", 48", 60", 72", 84", 96", 120".

Ⓓ Sectional Displacers may be used with these models.

## Dimensions—Instrument



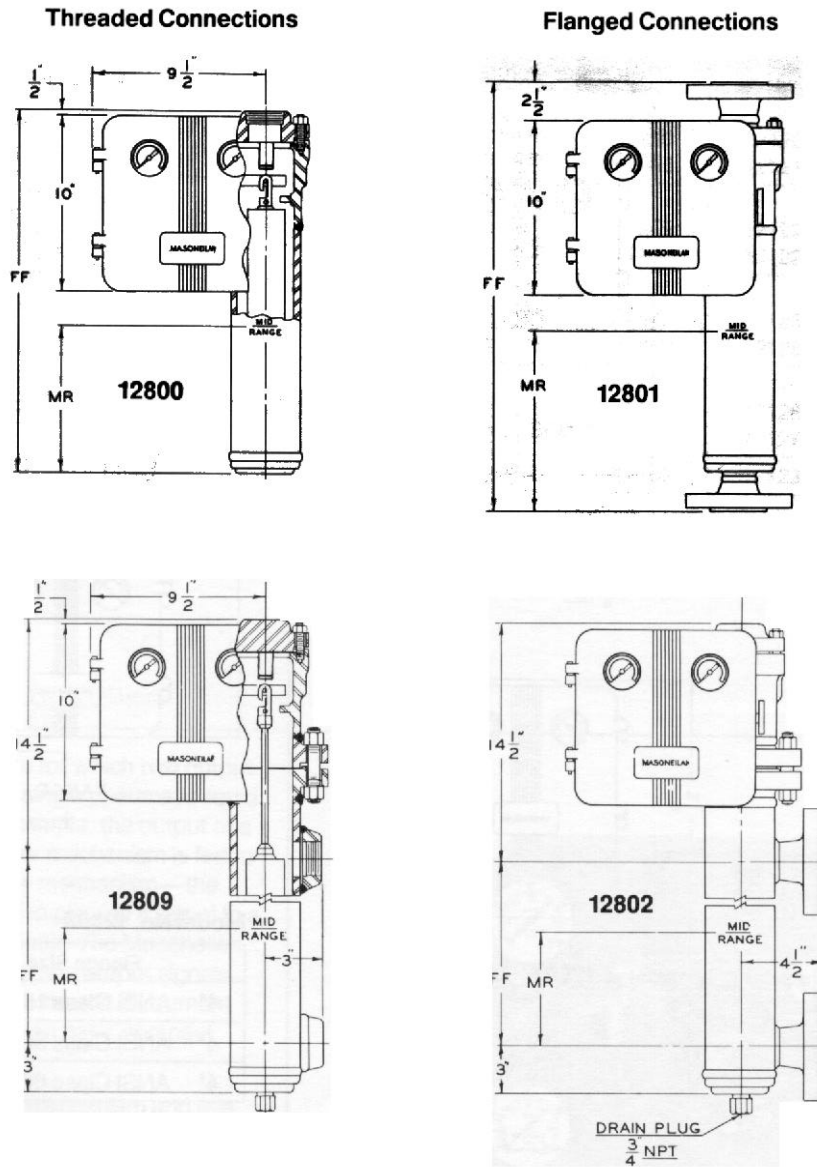
\*Add approximately 5" with Torque Tube Extension.

Gauge Connections—3/4" NPT supplied only when specified.

Vent, Drain or Flushing Connections—3/4" NPT supplied only when specified.

Air Connections—1/4" NPT

**Dimensions—Top-Bottom and Side-Side Mounting**



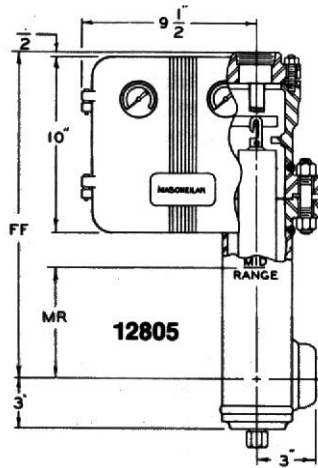
**Dimensions (inches)**

Range	12800		12801		12809		12802	
	FF	MR	FF	MR	FF	MR	FF	MR
14	22	9	26	11	14	7	14	7
24	32	14	36	16	24	12	24	12
32	40	18	44	20	32	16	32	16
48	56	26	60	28	48	24	48	24
60	68	32	72	34	60	30	60	30
72	80	38	84	40	72	36	72	36
84	92	44	96	46	84	42	84	42
96	104	50	108	52	96	48	96	48
120	128	62	132	64	120	60	120	60

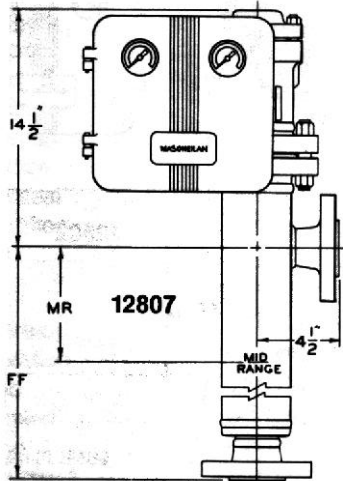
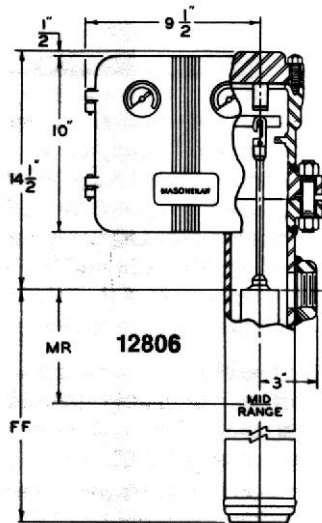
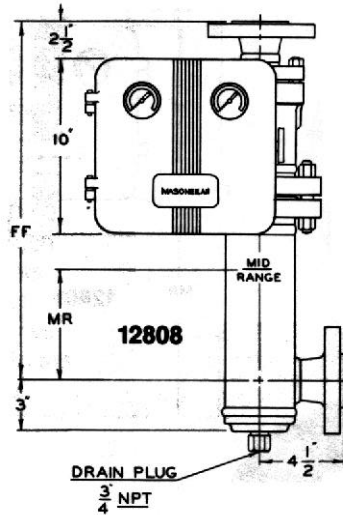
## Dimensions

### Top-Side and Side-Bottom Mounting

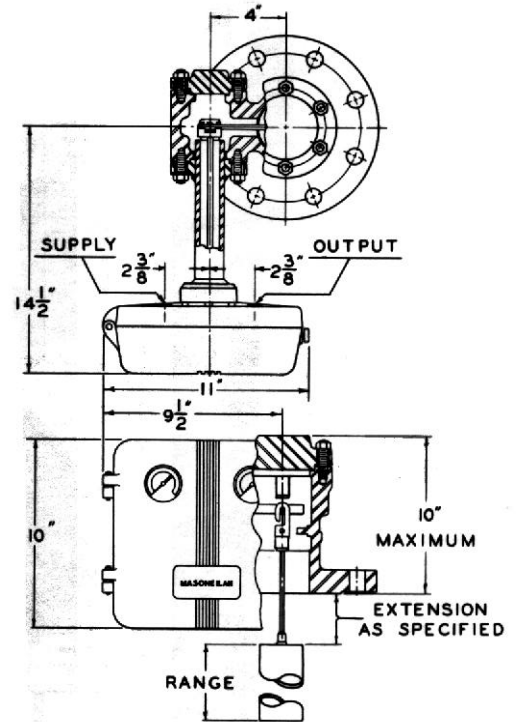
#### Threaded Connections



#### Flanged Connections



### Top Mounting



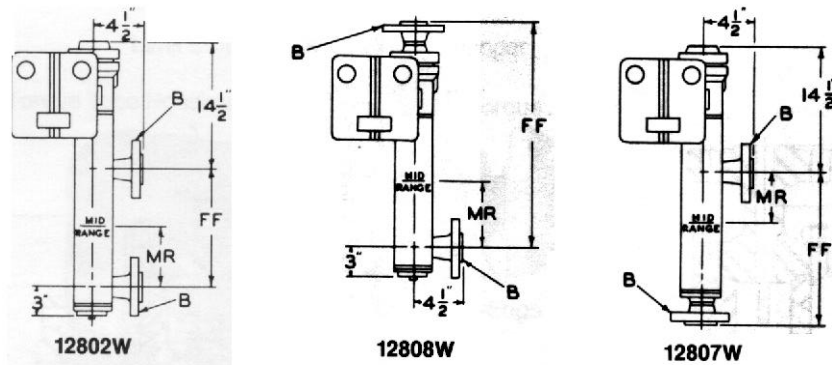
#### Model No. 12803

Flange Size	
4"	ANSI Class 150 Steel
4"	ANSI Class 300 Steel
4"	ANSI Class 600 Steel

### Dimensions (inches)

Range	12805		12808		12806		12807	
	FF	MR	FF	MR	FF	MR	FF	MR
14	20	7	22	7	16	7	18	7
24	30	12	32	12	26	12	28	12
32	38	16	40	16	34	16	36	16
48	54	24	56	24	50	24	52	24
60	66	30	68	30	62	30	64	30
72	78	36	80	36	74	36	76	36
84	90	46	92	42	86	42	88	42
96	102	48	104	48	98	48	100	48
120	126	60	128	60	122	60	124	60

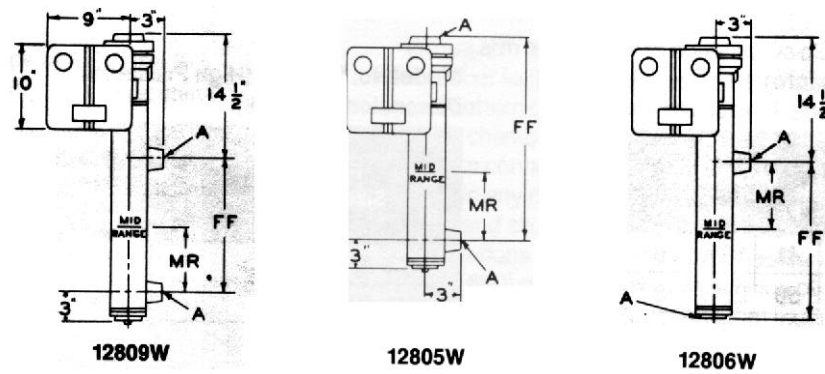
**Dimensions—Integral Chambers**



Dimensions (inches)

Range	12802W		12808W		12807W	
	FF	MR	FF	MR	FF	MF
14	14	7	22	7	18	7
24	24	12	32	12	28	12
32	32	16	40	16	36	16
48	48	24	56	24	52	24
60	60	30	68	30	64	30
72	72	36	80	36	76	36
84	84	42	92	42	88	42
96	96	48	104	48	100	48
120	120	60	128	60	124	60

Flanged Connections B = 1½"–2" size, ANSI Class 150, 300, 600 rating.

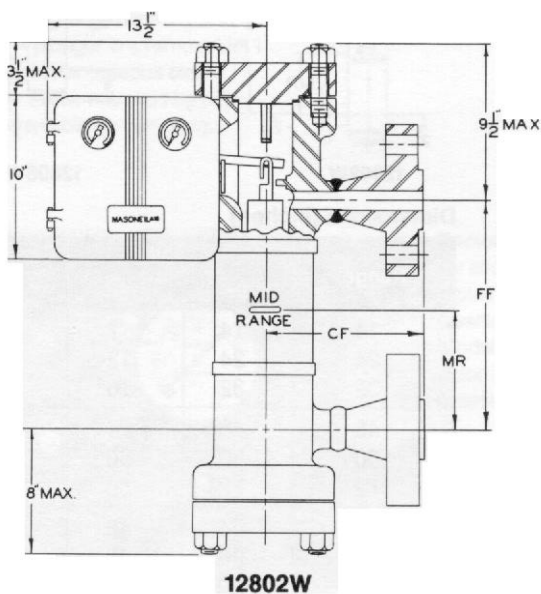
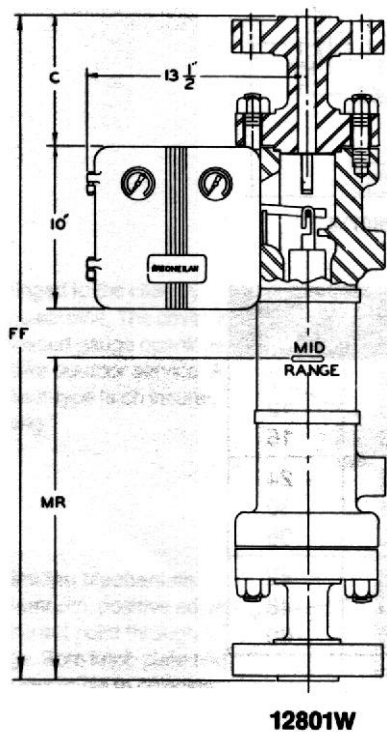


Dimensions (inches)

Range	12809W		12805W		12806W	
	FF	MR	FF	MR	FF	MF
14	14	7	22	7	16	7
24	24	12	30	12	26	12
32	32	16	38	16	34	16
48	48	24	54	24	50	24
60	60	30	66	30	62	30
72	72	36	78	36	74	36
84	84	42	90	42	86	42
96	96	48	102	48	98	48
120	120	60	126	60	122	60

Threaded Connections A = 1½"–2" NPT, ANSI Class 600.

## Dimensions—High Pressure Chambers



**Model No. 12801W (High Pressure)**  
Dimensions (inches)

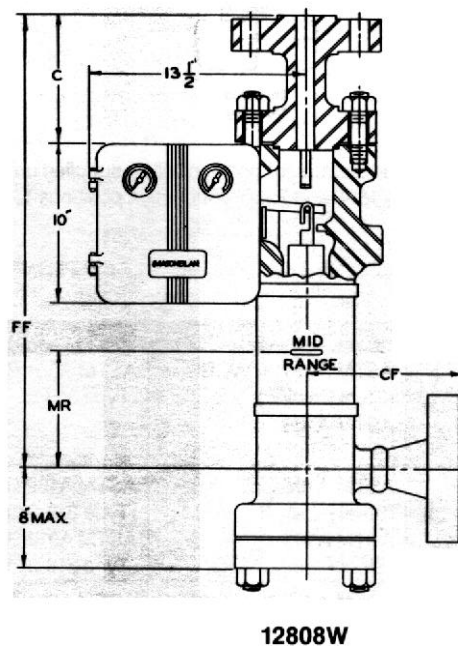
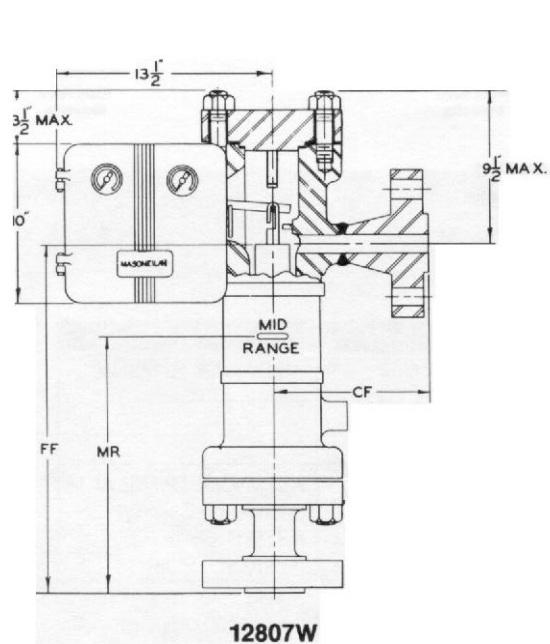
Range	ANSI Class 1500			ANSI Class 2500		
	FF	MR	C	FF	MR	C
14	39	19	6 <sup>3</sup> / <sub>4</sub>	41	19 <sup>5</sup> / <sub>8</sub>	8
32	57	28	6 <sup>3</sup> / <sub>4</sub>	59	28 <sup>5</sup> / <sub>8</sub>	8

**Model No. 12802W (High Pressure)**  
Dimensions (inches)

Flange Size & Type	ANSI Class 1500 CF	ANSI Class 2500 CF
1 <sup>1</sup> / <sub>2</sub> ANSI Facing	7 <sup>1</sup> / <sub>4</sub>	9 <sup>1</sup> / <sub>8</sub>
1 <sup>1</sup> / <sub>2</sub> RTJ Facing	7 <sup>1</sup> / <sub>4</sub>	9 <sup>3</sup> / <sub>16</sub>
2 ANSI Facing	8	9 <sup>3</sup> / <sub>4</sub>
2 RTJ Facing	8 <sup>1</sup> / <sub>16</sub>	9 <sup>13</sup> / <sub>16</sub>

Range	ANSI Class 1500		ANSI Class 2500	
	FF	MR	FF	MR
14	14	7	14	7
32	32	16	32	16

## Dimensions—High Pressure Chambers



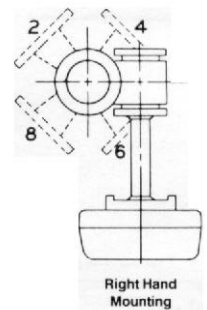
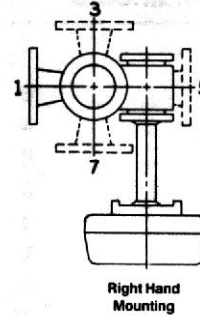
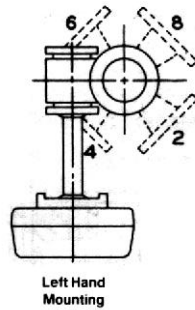
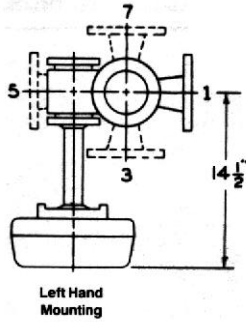
### Dimensions (inches)

Range	12807W				12808W					
	ANSI Class 1500		ANSI Class 2500		ANSI Class 1500			ANSI Class 2500		
	FF	MR	FF	MR	FF	MR	C	FF	MR	C
14	26	19	26 <sup>5</sup> / <sub>8</sub>	19 <sup>5</sup> / <sub>8</sub>	27	7	6 <sup>3</sup> / <sub>4</sub>	28 <sup>3</sup> / <sub>8</sub>	7	8
32	44	28	44 <sup>5</sup> / <sub>8</sub>	28 <sup>5</sup> / <sub>8</sub>	45	16	6 <sup>3</sup> / <sub>4</sub>	46 <sup>3</sup> / <sub>8</sub>	16	8

Flange Size & Type	ANSI Class 1500 CF	ANSI Class 2500 CF
1 <sup>1</sup> / <sub>2</sub> ANSI Facing	7 <sup>1</sup> / <sub>4</sub>	9 <sup>1</sup> / <sub>8</sub>
1 <sup>1</sup> / <sub>2</sub> RTJ Facing	7 <sup>1</sup> / <sub>4</sub>	9 <sup>3</sup> / <sub>16</sub>
2 ANSI Facing	8	9 <sup>3</sup> / <sub>4</sub>
2 RTJ Facing	8 <sup>1</sup> / <sub>16</sub>	9 <sup>13</sup> / <sub>16</sub>

## Orientation—All Models

### Top View



Flange connection position 1 and left hand instrument position will be supplied unless otherwise specified.  
For high pressure chambers (ANSI Class 1500 and 2500) connection positions 1, 3 and 7 only are available.

## Materials

Part	Carbon Steel	Type 316 St.St.	Type 304 St. St.	Monel 400
Mechanism Chamber <sup>①</sup>	ASTM A216 Gr WCB (Steel Casting) ASTM A105 (Steel Forging)	ASTM A351 Gr CF8M (Type 316 St. St. Casting)	ASTM A351 Gr CF8 (Type 304 St. St. Casting)	ASTM A296 Gr M35W (Monel 400 Casting)
Displacer Chamber	ASTM A106 GrB (Steel Pipe) ASTM A105 (Steel Forging)	ASTM A182 Gr F316 (Type 316 St. St. Forging) ASTM A312 Gr (Type 316 St. St. Pipe)	ASTM A351 Gr CF8 (Type 304 St. St. Casting) ASTM A312 Type 304 (Type 304 St. St. Pipe)	ASTM A296 Gr M35W (Monel 400 Casting) ASTM B165 (Monel 400 Pipe)
Torque Tube Housing	ASTM A513 Gr MT1015 Type 5 (Steel Tubing) ASTM A105 (Steel Forging)	ASTM A351 Gr CF8M (Type 316 St. St. Casting)	ASTM A351 Gr CF8 (Type 304 St. St. Casting)	ASTM A296 Gr M35W (Monel 400 Casting)
Torque Tube <sup>② ③</sup>	ASTM B167 (Inconel 600)	ASTM A269 Gr Type 316 (Type 316 St. St.)	ASTM A269 Gr Type 304 (Type 304 St. St.)	Monel K500
Torque Arm <sup>⑤</sup>	ASTM A276 Type 316 (Type 316 St. St.)	ASTM A276 Type 316 (Type 316 St. St.)	ASTM A276 Type 304 (Type 304 St. St.)	ASTM B164 CLA (Monel 400)
Knife Edge	ASTM A276 Type 316 (Type 316 St. St.)	ASTM A276 Type 316 (Type 316 St. St.)	ASTM A276 Type 304 (Type 304 St. St.)	ASTM B164 CLA (Monel 400)
Displacer <sup>③ ④</sup>	ASTM A269 Gr Type 316 (Type 316 St. St.)	ASTM A269 Gr Type 316 (Type 316 St. St.)	ASTM A269 Gr Type 316 (Type 316 St. St.)	ASTM B165 (Monel 400)
Gaskets	Iron Jacket Iron Clad Grafoil	Type 316 Jacket 316 Clad Grafoil	Type 304 Jacket 316 Clad Grafoil	Monel Jacket Monel Clad Grafoil
Bolting <sup>⑥</sup>	ASTM A193 Gr B7 ASTM A194 Gr 2H (Alloy Steel Stud & Nut)	ASTM A193 Gr B7 ASTM A194 Gr 2H (Alloy Steel Stud & Nut)	ASTM A193 Gr B7 ASTM A194 Gr 2H (Alloy Steel Stud & Nut)	ASTM A193 Gr B7 ASTM A194 Gr 2H (Alloy Steel Stud & Nut)

① Includes Top Flange & Blind Flange

② Includes Torque Tube, Housing Extension, Torque Rod, Bushing & Torque Arm Block

③ Other Materials Available

④ Includes Hanger & Extension when required

⑤ Includes Screws

⑥ Standard stud materials are suitable for temperatures of -20°F to 1000°F. Consult factory for alternate materials for lower temperatures.

Facilities: Brazil, Canada, France, Germany, Italy, Japan, Mexico, Netherlands, Singapore, Spain, United Kingdom, United States

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