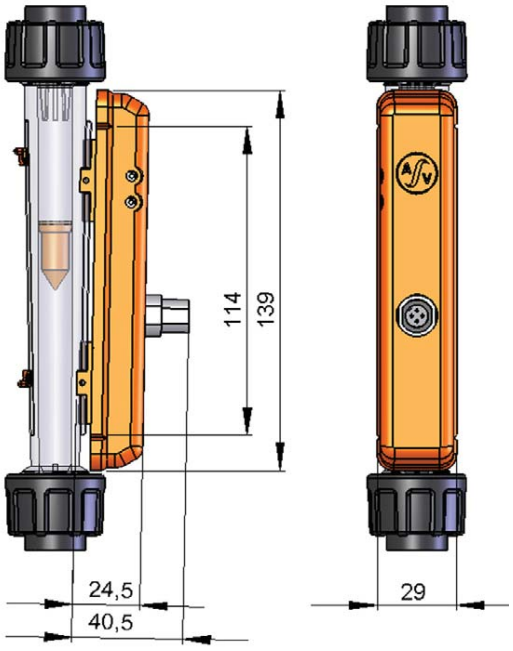
ZE3075 Flow Transmitters

for FC flow meters

The **ZE3075** flow transmitter provides a 2- wire 4–20 mA output signal omit generated by precise detection of the position of the magnetic float.

The magnetic float travels along the reed chain of switches activating them.

This micro-processor controlled unit is field calibrated.



technical

- **2-Wire technology**
- **4–20 mA analog output** (4-20.1 for 8 VDC supply; 4-22.0 for 28 VDC supply
- **18–30 VDC input**
- **Field calibration**
- **Non-volatile value storage**
- **Measuring length:** 114 mm (4.5")
- **Measuring resolution:** 3.5 mm (0.138")
- **Measuring accuracy:** 3%
- **Temperature range:** –20°C(–4°F) to 70°C(158°F)

INSTALLATION

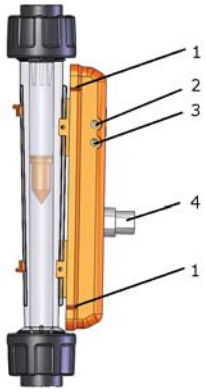
Screw clamps are used to fit the ZE3075 on the dovetail guide of the flow meter.

During installation, ensure that the top and bottom notches of the ZE3075 coincide with the 10% and 100% marks on the flow meter scale.

Following this, proceed with the wiring according to the diagram.

COMPONENTS

1. Alignment notches for the proper location of the transmitter
2. Potentiometer for the upper limit value of the output signal
3. Potentiometer for the lower limit value of the output signal
4. Plug connector



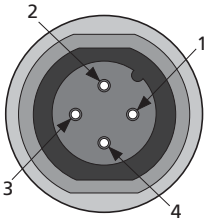
WIRING

The unit is connected with a commercially available unshielded cable.

Where electro-magnetic interference is to be expected, we recommend the use of a shielded cable.

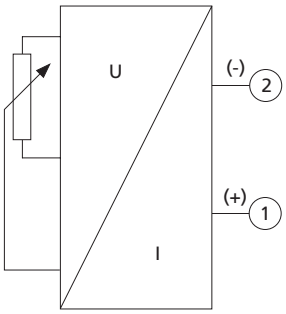
Cable cross section: max. 0.75 mm² cable outer diameter: 6 to 8 mm.

Flange Connector



1. Signal (+)
2. Signal (+)
3. n.c.
4. n.c.

Circuit Diagram



CALIBRATION

Compensation between the non-linear scaling of the flowmeter and the linear output signal of the flow data sensor must be performed by adjusting, preferably between 20% and 80% of the flow rate.

20% corresponds to 7.2mA and 80% to 16.8mA.

- Connect the ampermeter and the respective voltage supply to the flow data sensor
- Allow 20% of the flow to pass through the FC flow meter
- Set the min. trimmer potentiometer (3) such that the corresponding current (7.2mA) is shown in the ampermeter
- Allow 80% of the flow to pass through the FC flow meter
- Set the max. trimmer potentiometer (3) such that the corresponding current (16.8mA) is shown in the ampermeter
- Check the values at 20% and 80% several times and repeat the adjustment, if required

CHEMLINE PLASTICS
SUPERIOR FLOW SOLUTIONS

55 Guardsman Road, Thornhill, ON, L3T 6L2, Canada | ISO 9001:2008 Certified
tel.905.889.7890 | fax.905.889.8553 | request@chemline.com | chemline.com

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4 – DETAILED TECHNICAL DOCUMENTATION

4.3 – SHOP DRAWINGS

4.3.11 – ACTIFLO RECIRCULATION LINE MODIFICATION

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Project name:	AMARUQ
Project#:	5000218009
Document #:	SPK_0011_ACP
by:	LJ
chkd:	GP
appvd:	CB

SUBMITTAL PACKAGE

ACTIFLO RECIRCULATION LINE

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Project name: AMARUQ

Project#: 5000218009

Document #: SPK_0011_ACP

by: LJ

chkd: GP

appvd: CB

ACTIFLO RECIRCULATION LINE

FIELD INSTALLATION DRAWING

OIM manual section: 4.3.11.1

REFER TO 5000218009_FI_0002_ACP_VWT

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Project name: AMARUQ

Project#: 5000218009

Document #: SPK_0011_ACP

by: LJ

chkd: GP

appvd: CB

ACTIFLO RECIRCULATION LINE

HYDRAULIC PROFILE

OIM manual section: 4.3.11.2

REFER TO 5000218009_HY_0001_GEN_VWT

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Project name:	AMARUQ
Project#:	5000218009
Document #:	SPK_0011_ACP
by:	LJ
chkd:	GP
appvd:	CB

ACTIFLO RECIRCULATION LINE

VALVES

OIM manual section: 4.3.11.4

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CS-301-400 : Identification sheet

VWTC PROJECT NUMBER:	5000218009	REV:	1
PROJECT NAME:	AEM AMARUQ	SUBMITTED TO (COMPANY):	AGNICO EAGLE MINES
ENGINEER:	Gabriel Hébert	SUBMITTED TO (RESPONSIBLE)	
PROJECT MANAGER:	Clément B	PROJECT NUM REFERENCE.:	
PHONE NUMBER:		LOT NUMBER:	

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
CFF	VABLSS305300	C2-022	DIA: 38 mm (1-1/2")	HYDROCYCLONE	TYPE: BALL VALVE//MANUFACTURER : PMP//MODEL : A201 (1-1/2")//CONNECTION TYPE : THREADED | 38 mm (1-1/2")//BODY : ASTM 351 GR. CF8M// SEAL | SEAT :RPTFE | PTFE// STEM : SS 316			ACTIFLO RECIRCULATION LINE MODIFICATION		

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2 Piece Ball Valve
Full Port

A201
1000 WOG
1/4" – 3" NPT

Adjustable PTFE Packing

Investment Cast Body CF8M Body

PTFE Body Seal

Full Bore Design

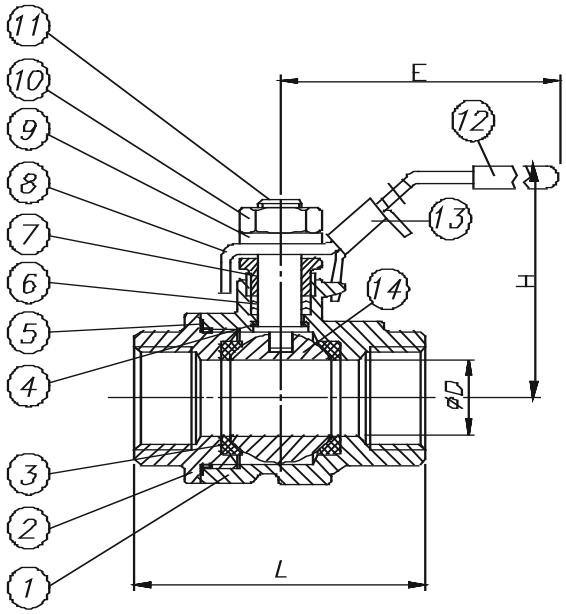
Stainless Steel Latch Lock Handle

Blow-out Proof Stem

Solid Ball & Stem

Bi-Directional RPTFE Seats

Pressure Rating
- 1/4" – 2" 1000 WOG
- 2-1/2" – 3" 800 WOG



NO	PART NAME	QTY	SPECIFICATION	
1	BODY	1	WCB	CF8M
2	END CAP	1	WCB	CF8M
3	SEATS	2	RPTFE	RPTFE
4	THRUST WASHER	1	PTFE	PTFE
5	BODY GASKET	1	PTFE	PTFE
6	STEM PACKING	3	PTFE	PTFE
7	PACKING GLAND	1	SS304	SS304
8	HANDLE	1	C.S.	SS304
9	HANDLE WASHER	1	C.S.	SS304
10	HANDLE NUT	1	C.S.	SS304
11	STEM	1	SS304	SS316
12	HANDLE SLEEVE	1	PLASTIC	PLASTIC
13	LOCKING DEVICE	1	C.S.	SS304
14	BALL	1	SS304	SS316

SIZE		1/4"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"
D	in	0.46	0.50	0.50	0.75	1.00	1.25	1.50	2.00	2.50	3.00
	mm	10	12	15	20	25	32	40	50	65	80
L	in	2.13	2.13	2.68	3.03	3.58	3.98	4.25	4.88	7.28	8.07
	mm	54	54	68	77	91	101	108	124	185	205
H	in	2.32	2.32	2.36	2.91	3.03	3.43	3.66	4.21	5.71	6.10
	mm	59	59	60	74	77	87	93	107	145	155
E	in	4.49	4.49	4.49	5.43	5.43	7.28	7.68	7.68	10.24	10.24
	mm	114	114	114	138	138	185	195	195	260	260

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CS-301-1110 : Identification sheet

VWTC PROJECT NUMBER:	5000218009	REV:	1
PROJECT NAME:	AEM AMARUQ	SUBMITTED TO (COMPANY):	AGNICO EAGLE MINES
ENGINEER:	Gabriel Hébert	SUBMITTED TO (RESPONSIBLE)	
PROJECT MANAGER:	Clément B	PROJECT NUM REFERENCE.:	
PHONE NUMBER:		LOT NUMBER:	

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
CFF	VABLSS200267	PI2-011-V001	DIA: 13 mm (1/2")	ISOLATION VALVE	TYPE: TWO PIECE BALL VALVE | 1000 psi W.O.G.//MANUFACTURER : CFF//MODEL : SS-2 (1/2")//CONNECTION TYPE : THREADED | 13 mm (1/2")//BODY : 316 SS// SEAL | SEAT :PTFE | TEFLON// STEM : 316 SS | C/W MANUAL LEVER			ACTIFLO RECIRCULATION LINE MODIFICATION		
CFF	VABLSS200267	PI2-011-V002	DIA: 13 mm (1/2")	ISOLATION VALVE	TYPE: TWO PIECE BALL VALVE | 1000 psi W.O.G.//MANUFACTURER : CFF//MODEL : SS-2 (1/2")//CONNECTION TYPE : THREADED | 13 mm (1/2")//BODY : 316 SS// SEAL | SEAT :PTFE | TEFLON// STEM : 316 SS | C/W MANUAL LEVER			ACTIFLO RECIRCULATION LINE MODIFICATION		
CFF	VABLSS200267	PI2-012-V001	DIA: 13 mm (1/2")	ISOLATION VALVE	TYPE: TWO PIECE BALL VALVE | 1000 psi W.O.G.//MANUFACTURER : CFF//MODEL : SS-2 (1/2")//CONNECTION TYPE : THREADED | 13 mm (1/2")//BODY : 316 SS// SEAL | SEAT :PTFE | TEFLON// STEM : 316 SS | C/W MANUAL LEVER			ACTIFLO RECIRCULATION LINE MODIFICATION		

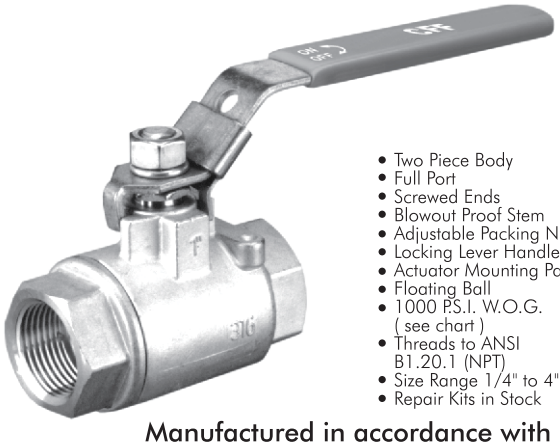
SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
CFF	VABLSS200267	PI2-012-V002	DIA: 13 mm (1/2")	ISOLATION VALVE	TYPE: TWO PIECE BALL VALVE | 1000 psi W.O.G.//MANUFACTURER : CFF//MODEL : SS-2 (1/2")//CONNECTION TYPE : THREADED | 13 mm (1/2")//BODY : 316 SS// SEAL | SEAT :PTFE | TEFLON// STEM : 316 SS | C/W MANUAL LEVER			ACTIFLO RECIRCULATION LINE MODIFICATION		
CFF	VABLSS200267	PI2-021-V001	DIA: 13 mm (1/2")	ISOLATION VALVE	TYPE: TWO PIECE BALL VALVE | 1000 psi W.O.G.//MANUFACTURER : CFF//MODEL : SS-2 (1/2")//CONNECTION TYPE : THREADED | 13 mm (1/2")//BODY : 316 SS// SEAL | SEAT :PTFE | TEFLON// STEM : 316 SS | C/W MANUAL LEVER			ACTIFLO RECIRCULATION LINE MODIFICATION		
CFF	VABLSS200267	PI2-021-V002	DIA: 13 mm (1/2")	ISOLATION VALVE	TYPE: TWO PIECE BALL VALVE | 1000 psi W.O.G.//MANUFACTURER : CFF//MODEL : SS-2 (1/2")//CONNECTION TYPE : THREADED | 13 mm (1/2")//BODY : 316 SS// SEAL | SEAT :PTFE | TEFLON// STEM : 316 SS | C/W MANUAL LEVER			ACTIFLO RECIRCULATION LINE MODIFICATION		
CFF	VABLSS200267	PI2-022-V001	DIA: 13 mm (1/2")	ISOLATION VALVE	TYPE: TWO PIECE BALL VALVE | 1000 psi W.O.G.//MANUFACTURER : CFF//MODEL : SS-2 (1/2")//CONNECTION TYPE : THREADED | 13 mm (1/2")//BODY : 316 SS// SEAL | SEAT :PTFE | TEFLON// STEM : 316 SS | C/W MANUAL LEVER			ACTIFLO RECIRCULATION LINE MODIFICATION		

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
CFF	VABLSS200267	PI2-022-V002	DIA: 13 mm (1/2")	ISOLATION VALVE	TYPE: TWO PIECE BALL VALVE | 1000 psi W.O.G.//MANUFACTURER : CFF//MODEL : SS-2 (1/2")//CONNECTION TYPE : THREADED | 13 mm (1/2")//BODY : 316 SS// SEAL | SEAT :PTFE | TEFLON// STEM : 316 SS | C/W MANUAL LEVER			ACTIFLO RECIRCULATION LINE MODIFICATION		
CFF	VABLSS200268	V2-012	DIA: 20 mm (3/4")	DRAIN VALVE	TYPE: TWO PIECE BALL VALVE | 1000 psi W.O.G.//MANUFACTURER : CFF//MODEL : SS-2 (3/4")//CONNECTION TYPE : THREADED | 20 mm (3/4")//BODY : 316 SS// SEAL | SEAT :PTFE | TEFLON// STEM : 316 SS | C/W MANUAL LEVER			ACTIFLO RECIRCULATION LINE MODIFICATION		
CFF	VABLSS200268	V2-013	DIA: 20 mm (3/4")	DRAIN VALVE	TYPE: TWO PIECE BALL VALVE | 1000 psi W.O.G.//MANUFACTURER : CFF//MODEL : SS-2 (3/4")//CONNECTION TYPE : THREADED | 20 mm (3/4")//BODY : 316 SS// SEAL | SEAT :PTFE | TEFLON// STEM : 316 SS | C/W MANUAL LEVER			ACTIFLO RECIRCULATION LINE MODIFICATION		
CFF	VABLSS200268	V2-022	DIA: 20 mm (3/4")	DRAIN VALVE	TYPE: TWO PIECE BALL VALVE | 1000 psi W.O.G.//MANUFACTURER : CFF//MODEL : SS-2 (3/4")//CONNECTION TYPE : THREADED | 20 mm (3/4")//BODY : 316 SS// SEAL | SEAT :PTFE | TEFLON// STEM : 316 SS | C/W MANUAL LEVER			ACTIFLO RECIRCULATION LINE MODIFICATION		

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
CFF	VABLSS200268	V2-023	DIA: 20 mm (3/4")	DRAIN VALVE	TYPE: TWO PIECE BALL VALVE | 1000 psi W.O.G.//MANUFACTURER : CFF//MODEL : SS-2 (3/4")//CONNECTION TYPE : THREADED | 20 mm (3/4")//BODY : 316 SS// SEAL | SEAT :PTFE | TEFLON// STEM : 316 SS | C/W MANUAL LEVER			ACTIFLO RECIRCUL ATION LINE MODIFICA TION		

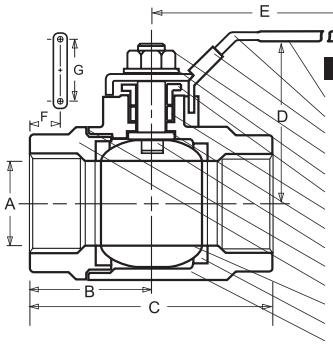
C.F.F. SS · SERIES
316 STAINLESS STEEL VALVES

SS·2 BALL



- Two Piece Body
- Full Port
- Screwed Ends
- Blowout Proof Stem
- Adjustable Packing Nut
- Locking Lever Handle
- Actuator Mounting Pad
- Floating Ball
- 1000 P.S.I. W.O.G. (see chart)
- Threads to ANSI B1.20.1 (NPT)
- Size Range 1/4" to 4"
- Repair Kits in Stock

Manufactured in accordance with ISO 9002 quality standards.



	NAME/MATERIAL
1	Plastic Cover/ Plastic
2	Handle/ Stainless Steel 304
3	Lock Device/ Stainless Steel 304
4	Stem Nut/ Stainless Steel 304
5	Stem Washer/ Stainless Steel 304
6	Gland Nut/ Stainless Steel 304
7	Stem Packing/ Teflon
8	Thrust Washer/ Rein. Teflon 15% GFT
9	Stem/ Stainless Steel 316
10	Joint Gasket/ Teflon
11	Cap/ Stainless Steel 316; CF 8M
12	Ball/ Stainless Steel 316
13	Seat/ Rein. Teflon 15% GFT
14	Body/ Stainless Steel 316; CF 8M

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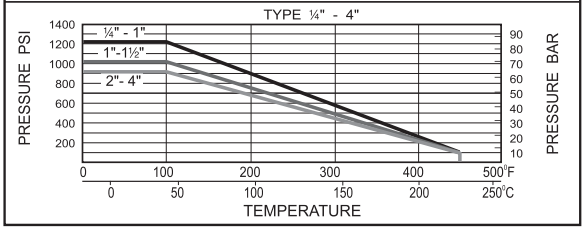
www.cffstainless.com

SS · 2 BALL VALVE

DIMENSIONS								
	Nominal Size	(mm/in) A	(mm/in) B	(mm/in) C	(mm/in) D	(mm/in) E	(mm/in) F	(mm/in) G
8	¼	11.6	30	60	45	110	12.7	28.45
		0.457	1.181	2.362	1.772	433.1	0.50	1.120
10	⅜	12.7	30	60	45	110	12.7	28.45
		0.50	1.181	2.362	1.772	433.1	0.50	1.120
15	½	15	32	64	45	130	12.7	28.45
		0.591	1.260	2.520	1.772	5.118	0.50	1.120
20	¾	20	38.5	77	50	130	22.10	34.80
		0.787	1.516	3.032	1.969	5.118	0.87	1.37
25	1	25.4	45	90	65	155	22.10	38.10
		1.00	1.772	3.543	2.559	6.102	0.87	1.37
32	1¼	32	50	100	70	155	23.62	38.10
		1.260	1.967	3.937	2.756	6.102	0.93	1.50
40	1½	38.1	59	118	75	185	23.62	38.10
		1.50	2.323	4.646	2.953	7.283	0.93	1.50
50	2	50.8	68.5	137	85	185	23.62	38.10
		2.00	2.697	5.398	3.346	7.283	0.93	1.50
65	2½	65	82.5	165	136	250	—	70
		2.561	3.248	6.496	5.364	9.843	—	2.756
80	3	80	97.5	195	149	250	—	70
		3.152	3.839	7.677	5.866	9.843	—	2.756

Design and materials are subject to change without notice.

PRESSURE/TEMP. RATING



FLOW COEFFICIENT CV										
Size (in.)	¼	⅜	½	¾	1	1¼	1½	2	2½	3
Cv	6	7	10	25	35	46	80	110	310	360
Operating Torques (lbs.)	36	36	43	65	101	158	187	230	430	1380

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www.cffstainless.com

CS-312-110 : Identification sheet

VWTC PROJECT NUMBER:	5000218009	REV:	1
PROJECT NAME:	AEM AMARUQ	SUBMITTED TO (COMPANY):	AGNICO EAGLE MINES
ENGINEER:	Gabriel Hébert	SUBMITTED TO (RESPONSIBLE)	
PROJECT MANAGER:	Clément B	PROJECT NUM REFERENCE.:	
PHONE NUMBER:		LOT NUMBER:	

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
PMP	ST-312-110	V2-010	DIA: 63 mm (2-1/2")	DRAIN VALVE	TYPE: PLUG | 175 PSI//MANUFACTURER : PRATT//MODEL : 601N1-L/2-1/2"//CONNECTION TYPE : FLANGED | 63 mm (2-1/2")//BODY : CAST IRON// SEAL | SEAT :FONTE DUCTILE REVETUE EN CAOUTCHOU | NICKEL// STEM : N/A			ACTIFLO RECIRCULATION LINE MODIFICATION		
PMP	ST-312-110	V2-011	DIA: 63 mm (2-1/2")	DRAIN VALVE	TYPE: PLUG | 175 PSI//MANUFACTURER : PRATT//MODEL : 601N1-L/2-1/2"//CONNECTION TYPE : FLANGED | 63 mm (2-1/2")//BODY : CAST IRON// SEAL | SEAT :FONTE DUCTILE REVETUE EN CAOUTCHOU | NICKEL// STEM : N/A			ACTIFLO RECIRCULATION LINE MODIFICATION		
PMP	ST-312-110	V2-020	DIA: 63 mm (2-1/2")	DRAIN VALVE	TYPE: PLUG | 175 PSI//MANUFACTURER : PRATT//MODEL : 601N1-L/2-1/2"//CONNECTION TYPE : FLANGED | 63 mm (2-1/2")//BODY : CAST IRON// SEAL | SEAT :FONTE DUCTILE REVETUE EN CAOUTCHOU | NICKEL// STEM : N/A			ACTIFLO RECIRCULATION LINE MODIFICATION		

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
PMP	ST-312-110	V2-021	DIA: 63 mm (2-1/2")	DRAIN VALVE	TYPE: PLUG | 175 PSI//MANUFACTURER : PRATT//MODEL : 601N1-L/2-1/2"//CONNECTION TYPE : FLANGED | 63 mm (2-1/2")//BODY : CAST IRON// SEAL | SEAT :FONTE DUCTILE REVETUE EN CAOUTCHOU | NICKEL// STEM : N/A			ACTIFLO RECIRCULATION LINE MODIFICATION		

ISO 9001 CERTIFIED

MILLIKEN
VALVE COMPANY

MILLCENTRIC®
ECCENTRIC PLUG VALVE

MILLIKEN
VALVE COMPANY

Milliken Valve offers the following for your water and wastewater needs:

- Eccentric Plug Valves
  - Series 601/600 Flanged & MJ
  - Series 601S Stainless Steel
  - Series 601RL Rubber Lined
  - Series 602 High Pressure
  - Series 603 Threaded End
  - Series 604E Three Way
  - Series 606 Grooved End
  - Series 611/610 Flanged & MJ
  - Model 625 UL /CGA Listed
- AWWA Swing Check Valves
- Wafer Check Valves
- Flex Check
- Spring Loaded Check Valves
- AWWA Butterfly Valves
- General Service Butterfly Valves

The Milliken Valve Company designs, develops, manufactures and markets plug, butterfly, and check valves and their respective controls and actuators. These valves are used primarily in the water, wastewater, and industrial markets.

Milliken Valve was started over two decades ago manufacturing the eccentric plug valve for the waste water and HVAC marketplace. Growth has been constant with the addition of a AWWA butterfly valve, general service butterfly valve, swing check valve, rubber flapper check valve, double disc check valve, wafer (outside spring) check valve, globe style check valve and compact wafer check valve.

Milliken believes that in order to satisfy customers, our products need to be considered the best design and the highest quality within the industry. All of our valves have had extensive testing before they are marketed or sold. Milliken's quality standards are a step above the industry norm, and Milliken is committed to standing behind its products in the field. All valves are tested in complete conformance to applicable standards before shipment. In addition, valve designs are routinely sent to independent testing facilities to ensure they meet or exceed expectations.

MILLIKEN
VALVE COMPANY

Millcentric Eccentric Plug Valve

Suggested Specifications

The Milliken criteria of quality, reliability, safety and value are embodied in the Millcentric® Eccentric valve, setting higher standards for dependable performance with excellent features achieved by the utilization of the very latest design and manufacturing techniques.

- Computer Aided Design
- High Integrity Casting
- CNC manufacturing delivers consistent sizes on all components

All complemented by rigorous Quality Control System

Body

Conforming to AWWA C504 wall thickness, the MILLCENTRIC valve body casting is in ASTM A126 CL B cast iron using high pressure molding techniques. Alternative flanged, grooved or mechanical joint ends are available.

Flange diameter, thickness and drilling conform to ANSI B16.1 Class 125 or 250.

Grooved ends meet AWWA C-606 for ductile or steel pipe. Mechanical joints to AWWA C111 (ANSI A21.11).

Seat

The MILLCENTRIC valve incorporates as standard, on 3" and larger, a ⅛" thick welded 99% nickel seat for corrosion and erosion resistance specifically profiled for low torque and extended seat life.

Stem Seal

High integrity sealing by combining the advantages of a resilient and abrasion resistant U-Cup seal. From vacuum to high pressure, the self-adjusting sealing system (per AWWA C504) gives positive, trouble-free service and is retained independently of the plug stem or external torque device, therely eliminating periodic maintenance.

Bearings

The plug rotates in permanently lubricated 316 grade stainless steel bearings, located in the body and bonnet, along with upper and lower PTFE thrust washers, which ensure consistently low operating torque.

Plug

Supported on integral trunnions, the plug is totally encapsulated with an elastomer that is molded on 2½" – 48" and vulcanized on 54" and larger to the casting providing tight shut off even under vacuum conditions. High integrity corrosion-free sealing is achieved by a variety of abrasion resistant elastomers which protect the plug right up to the trunnions. When assembled, the light compression of the elastomers onto PTFE thrust washers, prevents entry of abrasive materials into the bearings.

Bonnet Seal

Superior "O" ring sealing with metal/metal contact means lower bolting stresses compared with compression gaskets.

Flow

The port design (round on 2½" – 12" and rectangular on 14" and larger) with streamlined internal contours gives the highest industry capacity straight through flow in the full open position, reducing turbulence and pressure drop and the effect of erosive media. Handling of sludges and slurries is therefore enhanced.

Interchangeable

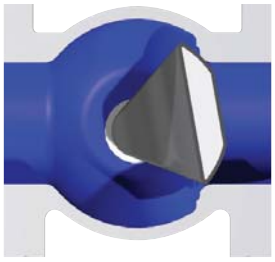
Because of the common face to face dimension with wedge gate valves (3" – 12"), fitting the tight shut-off rotary MILLCENTRIC valve into existing systems is accomplished without pipeline modifications.

Travel Stops

Adjustable open and closed travel stops are fitted as standard on both wrench and gear operated MILLCENTRIC valves.

Suggested Specifications

- Valve in closed position for bubble tight shut-off
- Normal flow direction gives pressure assisted sealing
- Torques are low even in reverse flow



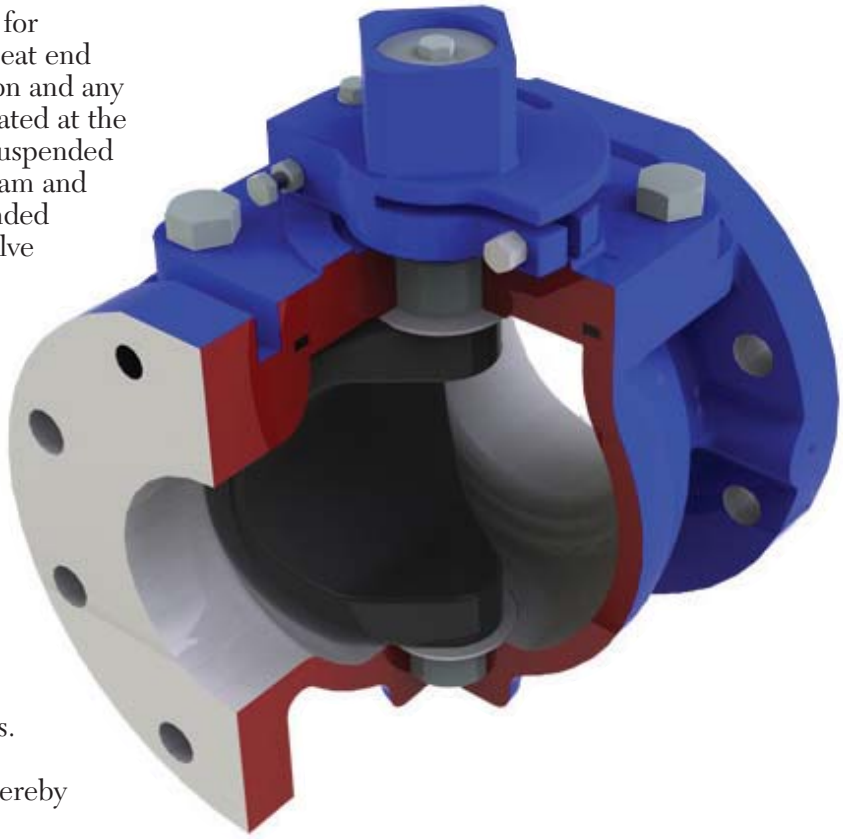
- Plug rotates away from the seat for instant opening
- Seat wear and operating torque reduced
- No further seat contact until valve is closed again

- Design of Millcentric plug valve allows modulating control over the full 90˚ travel
- Ideally suited for balancing service
- Standard rotary valve provides control and tight shut off in one valve

- Plug is out of flow path when fully open
- Straight through, uninterrupted smooth flow
- Round port reduces turbulence and erosion, lowers pumping costs and can be “pigged” to clean the pipeline

Installation

The Millcentric® plug valve is suitable for flow and shut-off in either direction. Seat end downstream is the preferred orientation and any reverse flow requirement should be stated at the time of order. For use on fluids with suspended solids, installation with the seat upstream and the valve stem horizontal is recommended with, plug rotation to the top of the valve will ensure smooth operation.



In-Line Maintenance

In the unlikely event of stem leakage, the stem seals can be easily replaced without removing the bonnet. Access to the body for cleaning or inspection does not require removal from the line.

Modular Construction

Design of the bonnet and stem allows for on-site adaption of gear operators, power actuators, or extension devices on to standard valves. Conversion can be easily undertaken without removing the valve bonnet, thereby minimizing downtime.

Power Operation

Pneumatic, electric or hydraulic operation is available, complete with accessories such as limit switches, solenoid valves and positioners when required.

Technical Data

ORDERING INFORMATION

Valve Types	Designation
Mechanical Joint Cast Iron	600
Mechanical Joint Ductile Iron	610
ANSI 125 Flanged Cast Iron	601
ANSI 125 Flanged Ductile Iron	611
ANSI 150 Flanged Ductile Iron	621
ANSI 250 Flanged Ductile Iron	602
ANSI 125 Grooved for Steel Pipe	606S
ANSI 125 Grooved for Ductile Pipe	606D
ANSI 150 Flanged 316SS	601S
SEAT	
Nickel (3" & Larger)	N
Epoxy (2½" ONLY)	E
316SS (on stainless steel valve only)	S
Rubberlined	RL
Glasslined	GL
ELASTOMER TRIM	
EPDM	0
Buna-Nitrile	1
Viton	2
Neoprene	3
Natural	4
MANUAL OPERATORS	
Above Ground Gear and Handwheel	AGHW
Above Ground Gear with 2" Nut	AGNUT
Buried Gear with 2" Nut	BG
Memory Stop Gear with Handwheel	MGHW
Lever / Wrench (8" & smaller)	L
Direct Nut (8" & smaller)	TC

Example: 4" 601N3AGHW = 4" ANSI 125 Flanged, Nickel Seat, Neoprene plug with Above Ground Gear and Handwheel

Valves are only tested for bi-directional shut-off if specified at time of order. Contact Milliken for bi-directional ratings.

NOTE: We recommend mechanical joint or buried flanged valves to have gear operators

NOTE: We recommend valves for bi-directional service to have gear operators

PRESSURE RATING

12" and smaller	ANSI 125	175 psi
14" and larger	ANSI 125	150 psi
20" and smaller	ANSI 150	285 psi
12" and smaller	ANSI 250	400 psi
14" and larger	ANSI 250	300 psi

Body Hydrotest = 150% of rated pressure / Seat Test = 100% of rated pressure
Testing per AWWA C517

ELASTOMERS AVAILABLE FOR MILLCENTRIC VALVE

Natural rubber is also available.

Nitrile

A general purpose material sometimes referred to as BUNA-N or HYCAR with a –20°F to 212°F temperature range. Used on sewage, water, hydrocarbon and mineral oils.

EPDM

An excellent polymer for use on chilled water through to LP steam applications having a temperature range of –35°F to 250°F. Resistance to many acids, alkalies, detergents, phosphate esters, alcohols and glycols is an added benefit.

Neoprene

This versatile material shows outstanding resistance to abrasion and ozone. Chemical resistance to a wide range of petroleum base products and dilute acids and alkalies. Temperature range –20°F to 225°F.

Viton

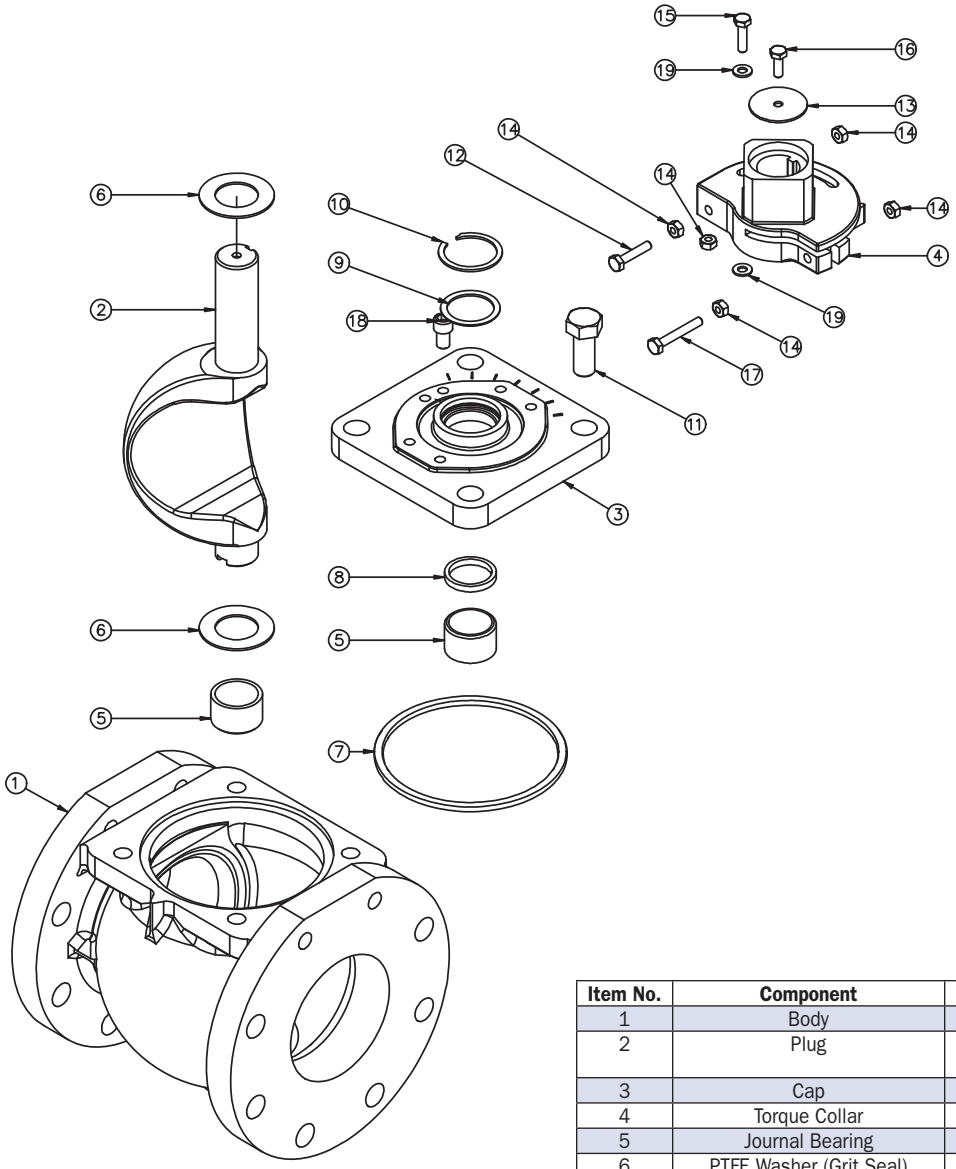
Retention of mechanical properties at high temperature is an important feature of this elastomer: temperature range is –10°F to 300°F. It also has excellent resistance to oils, fuels, lubricants and most mineral acids and aromatic hydrocarbons.
Note: Not for water or steam applications.

Elastomer Selection Chart

Service	Elastomer	Average Useful Temp. Range	Service	Elastomer	Average Useful Temp. Range	Service	Elastomer	Average Useful Temp. Range
Acetone	EPDM	–35°F to 250°F	Caustic Soda	EPDM	–35°F to 250°F	Oil, Animal	Nitrile	–20°F to 212°F
Air	EPDM	–35°F to 250°F	Cement Slurry	EPDM	–35°F to 250°F	Oil, Mobil Therm Light	Viton	10°F to 250°F
Air w/Oil	Nitrile	0°F to 212°F	Copper Sulphate	EPDM	–35°F to 250°F	Oil, Mobil Therm 600	Viton	10°F to 250°F
Alcohol AMYL	EPDM	0°F to 212°F	Creosote (Coal)	Nitrile	–20°F to 212°F	Oil, Mobil Therm 603	Nitrile	–20°F to 212°F
Alcohol Aromatic	Viton	10°F to 250°F	Coal Slurry	Nitrile	–20°F to 212°F	Oil, Lubricating	Nitrile	–20°F to 212°F
Alcohol Butyl	Neoprene	–20°F to 225°F	Diesel Fuel No. 3	Nitrile	–20°F to 212°F	Oil, Vegetable	Nitrile	–20°F to 212°F
Alcohol Denatured	Nitrile	–20°F to 212°F	Diethylene Glycol	EPDM	–35°F to 250°F	Paint, Latex	Nitrile	–20°F to 212°F
Alcohol Ethyl	EPDM	–20°F to 250°F	Ethylene Glycol	EPDM	–35°F to 250°F	Phosphate Ester	EPDM	–35°F to 250°F
Alcohol Grain	Nitrile	–20°F to 212°F	Fatty Acid	Nitrile	–20°F to 212°F	Propane	Nitrile	–20°F to 212°F
Alcohol Isopropyl	Neoprene	–20°F to 225°F	Fuel Oil No. 2	Nitrile	–20°F to 212°F	Rape Seed Oil	EPDM	–35°F to 250°F
Alcohol Methyl	EPDM	–20°F to 250°F	Fertilizer Liquid $H_4N_2O_2$	EPDM	–35°F to 250°F	Sewage with Oils	Nitrile	–20°F to 212°F
Ammonia Anhydrous	Neoprene	–20°F to 225°F	Gasoline Keg	Nitrile	–20°F to 212°F	Sodium Hydroxide 20%	EPDM	–35°F to 250°F
Ammonium Nitrate	EPDM	–20°F to 250°F	Gas Natural	Nitrile	–20°F to 212°F	Starch	EPDM	–35°F to 250°F
Ammonia, water	EPDM	–20°F to 250°F	Glue, Animal	Nitrile	–20°F to 212°F	Steam to 250°F	EPDM	–35°F to 250°F
Animal Fats	Nitrile	–20°F to 212°F	Green Liquor	EPDM	–20°F to 212°F	Stoddard, Solvent	Nitrile	–20°F to 80°F
Black Liquor	EPDM	–20°F to 250°F	Hydraulic Oil (Petro)	Nitrile	–20°F to 212°F	Sulphuric Acid 10% 50%	Neoprene	–20°F to 158°F
Blast Furnace Gas	Neoprene	–20°F to 225°F	Hydrogen	Nitrile	–20°F to 212°F	Sulphuric Acid 100%	Viton	10°F to 300°F
Butane	Nitrile	–20°F to 212°F	JF4, JP5	Viton	–20°F to 212°F	Trichloroethylene Dry	Viton	10°F to 300°F
Bunker Oil "C"	Nitrile	–20°F to 212°F	Kerosene	Nitrile	0°F to 212°F	Triethanol Amine	EPDM	–35°F to 250°F
Calcium Chloride	EPDM	–20°F to 250°F	Ketone	EPDM	–35°F to 250°F	Varnish	Viton	10°F to 300°F
Carbon Dioxide	EPDM	–20°F to 250°F	Lime Slurry	EPDM	–35°F to 250°F	Water, Fresh	EPDM	–35°F to 250°F
Carbon Monoxide (Cold)	Neoprene	–20°F to 150°F	Methane	Nitrile	–20°F to 212°F	Water, Salt	EPDM	–35°F to 250°F
Carbon Monoxide (Hot)	Viton	10°F to 300°F	Methyl Ethyl Ketone	EPDM	–35°F to 250°F	Xylene	Viton	10°F to 300°F
Carbon Tetrachloride	Viton	10°F to 300°F	Naptha (Berzin)	Nitrile	–20°F to 212°F			

NOTE: Above elastomer/temperature chart are guidelines only. See Milliken Compatibility Chart for specific applications.

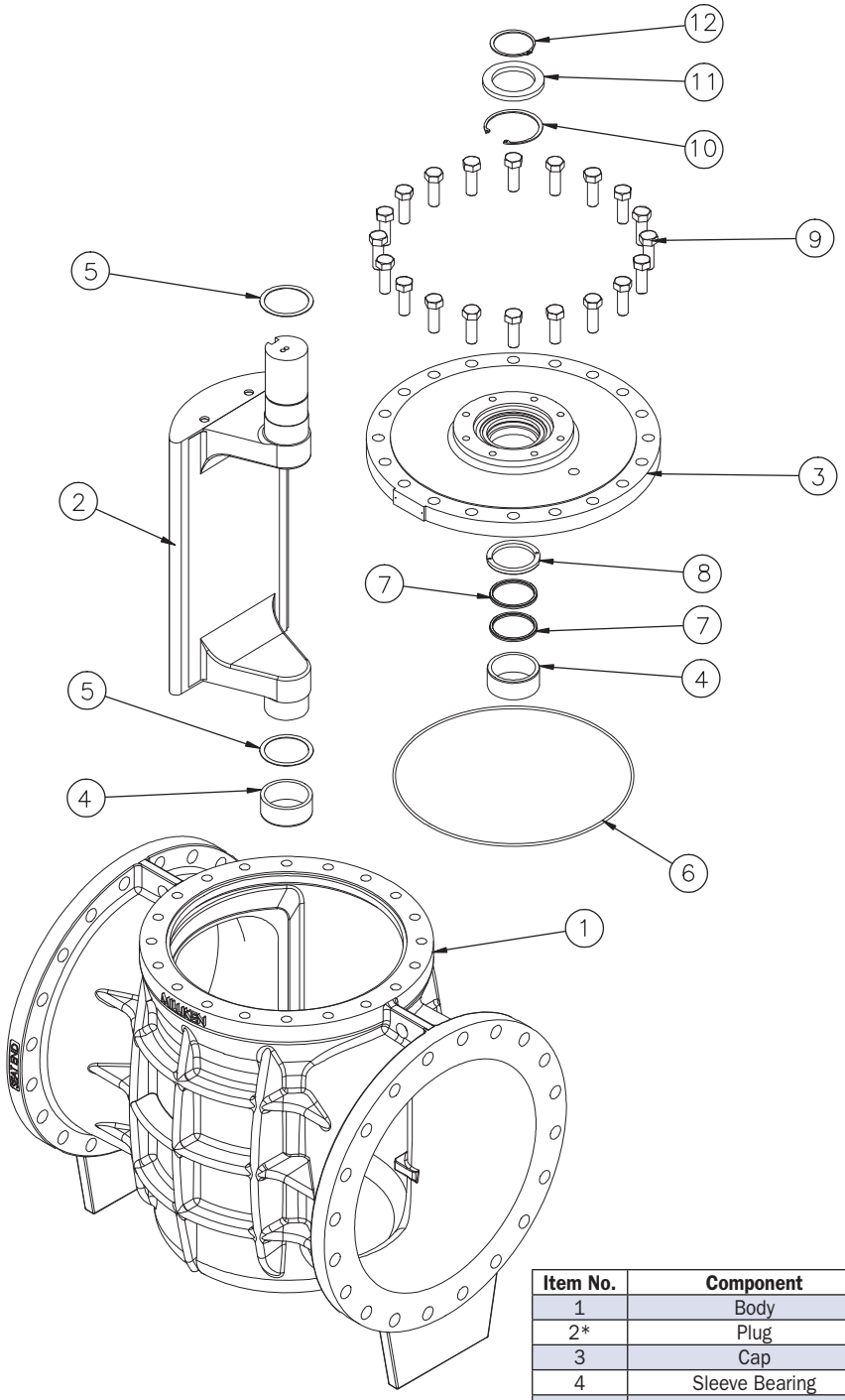
Standard Materials of Construction, Fig. 601/600, 12" & Smaller



Item No.	Component	Material
1	Body	Cast Iron A126 Class B
2	Plug	Rubber Coated Ductile Iron ASTM A536
3	Cap	Cast Iron A126 Class B
4	Torque Collar	Ductile Iron ASTM A536
5	Journal Bearing	St.Steel — ANSI 316
6	PTFE Washer (Grit Seal)	PTFE
7	O Ring	Elas. as Spec.
8	U Cup Seal	Elas. as Spec.
9	Washer	Brass — ASTM B-138-675
10	Internal Snap Ring	Spring Steel
11	Setscrew	Steel (Zinc Plated)
12*	Closed Stop	Steel (Zinc Plated)
13*	Locking Washer	Steel
14*	Nut	Steel (Zinc Plated)
15*	Open Stop	Steel (Zinc Plated)
16*	Setscrew	Steel (Zinc Plated)
17*	Torque Bolt	Steel (Zinc Plated)
18*	Travel Stop	Steel
19*	Washer	Steel

*NOTE: Torque Collar Assembly on 8" and Smaller

Standard Materials of Construction, Fig. 601/600, 14" & Larger



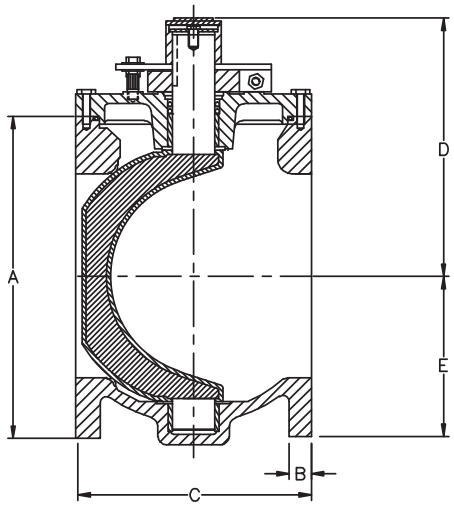
Item No.	Component	Material	Qty.
1	Body	Cast Iron A126 Class B	1
2*	Plug	Rubber Coated See Note 1	1
3	Cap	Cast Iron A126 Class B	1
4	Sleeve Bearing	Stainless Steel/Bronze	2
5	PTFE Washer (Grit Seal)	PTFE	2
6	Cap "O" Ring	Elas. as Spec.	1
7	U Cup Seal	Elas. as Spec.	2
8*	Seal Retaining Ring	See Note 2	1
9	Cap Screw	Steel (Zinc Plated)	A/R
10	Internal Snap Ring	Spring Steel	1
11	Support Collar	Steel	1
12	External Snap Ring	Spring Seal	1

*NOTE 1: Plugs: Ductile Iron — ASTM A536 on 14" – 20"
Cast Iron — A126 Class B on 24" and larger

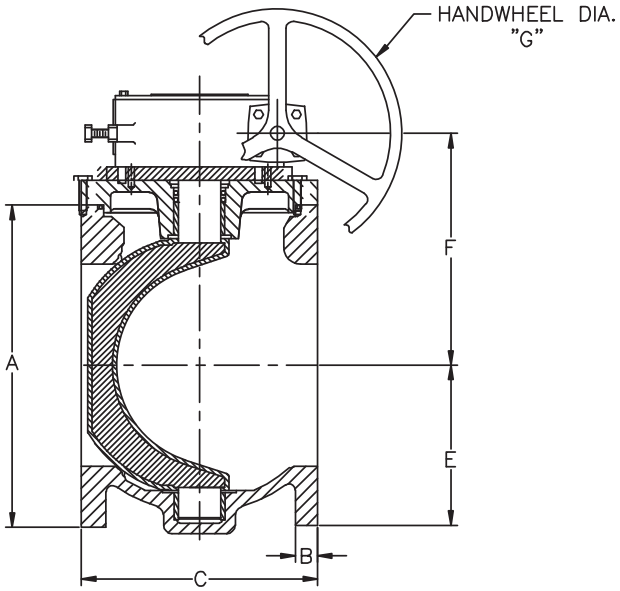
*NOTE 2: Seal Retaining Ring: Brass — ASTM B-138-675 on 14" – 20"
Steel on 24" and larger

Fig. 601 Cast Iron / 611 Ductile Iron – Flanged End
2½" – 12", 175 PSI

2½" – 8" VALVES ONLY



2½" – 12" VALVES



FLANGED END — ANSI 125								
SIZE	2.50	3	4	5	6	8	10*	12*
A	7.00	7.50	9.00	10.00	11.00	13.50	16.00	19.00
B	.69	.75	.94	.94	1.00	1.13	1.19	1.25
C	7.50	8.00	9.00	10.00	10.50	11.50	13.00	14.00
D	6.19	6.19	7.25	8.38	8.38	10.69	—	—
E	3.50	3.75	4.50	5.75	5.75	7.63	8.88	10.00
F	5.16	5.16	6.31	7.56	7.56	9.63	11.13	12.81
G	6.00	6.00	6.00	6.00	6.00	12.00	12.00	12.00
WEIGHT (approx.)	30	40	70	105	115	190	345**	440**

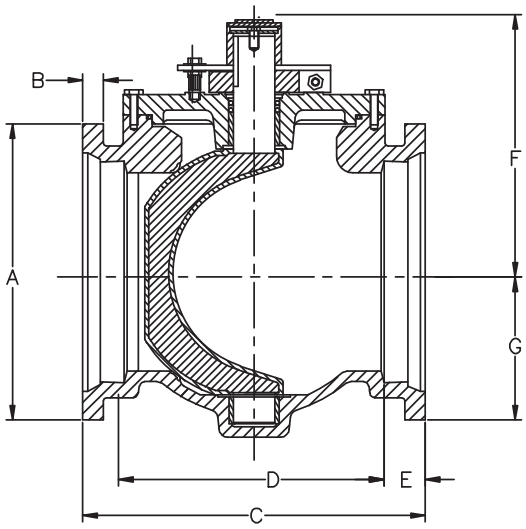
*10" & above have gear operators as standard

**Weight includes gear operator

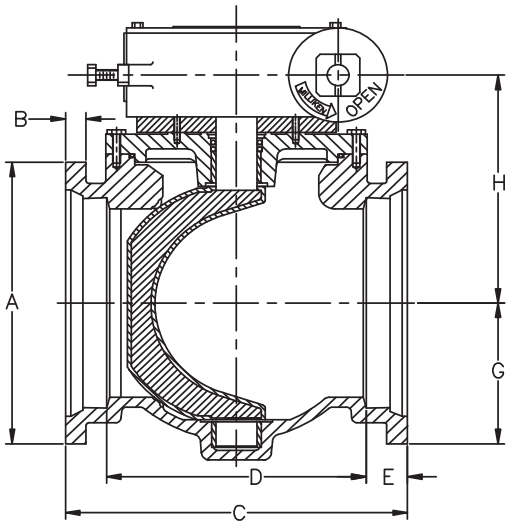
NOTE: Drawings are for information purposes only; please request certified drawings before preparing piping diagrams

Fig. 600 Cast Iron / 610 Ductile Iron – Mechanical Joint 3" – 12", 175 PSI

3" – 8" VALVES ONLY



3" – 12" VALVES



MECHANICAL JOINT END						
SIZE	3	4	6	8	10*	12*
A	7.69	9.00	11.13	13.38	15.63	17.94
B	.94	1.00	1.06	1.13	1.19	1.25
C	11.50	14.25	15.75	17.38	15.63	20.75
D	6.00	9.25	10.75	12.39	14.39	15.75
E	2.75	2.50	2.50	2.50	2.50	2.50
F	6.19	7.25	8.38	10.69	—	—
G	3.84	4.50	5.56	6.69	7.81	8.97
H	5.16	6.31	7.56	9.63	11.13	12.81
WEIGHT (approx.)	50	80	125	200	360**	480**

*10" & above have gear operators as standard

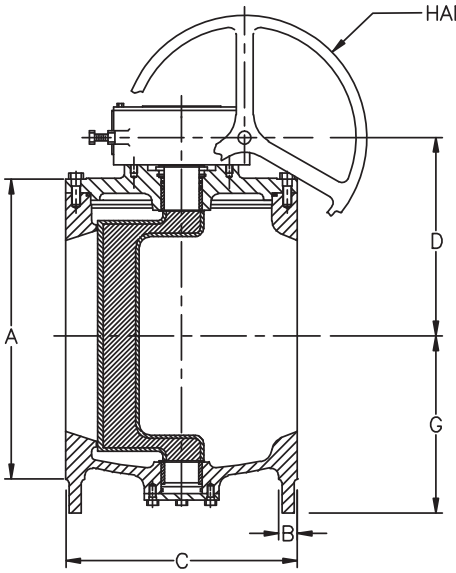
**Weight includes gear operator

We recommend gears on all Mechanical Joint Valves

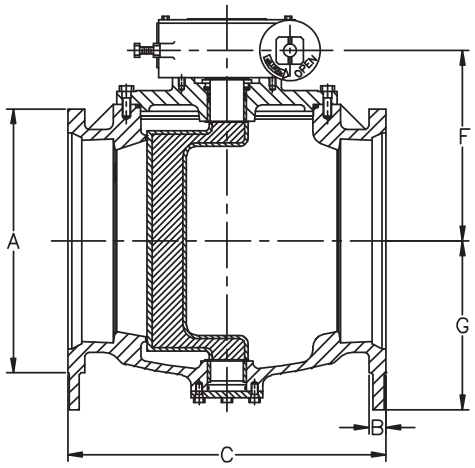
NOTE: Drawings are for information purposes only; please request certified drawings before preparing piping diagrams

Fig. 601 Cast Iron / 611 Ductile Iron Flanged End
Fig. 600/610 Ductile Iron Mechanical Joint End
14" & Larger, 150 PSI

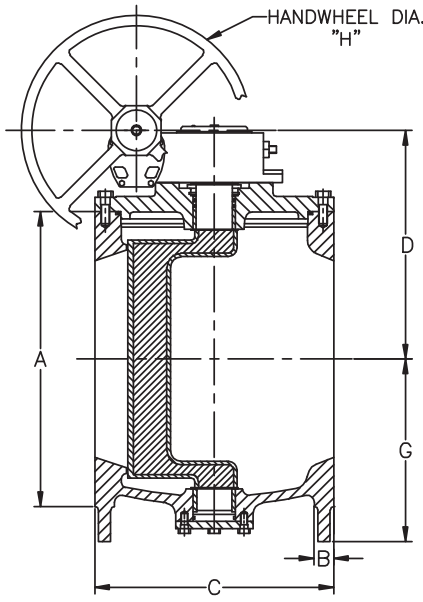
14" –20" VALVES



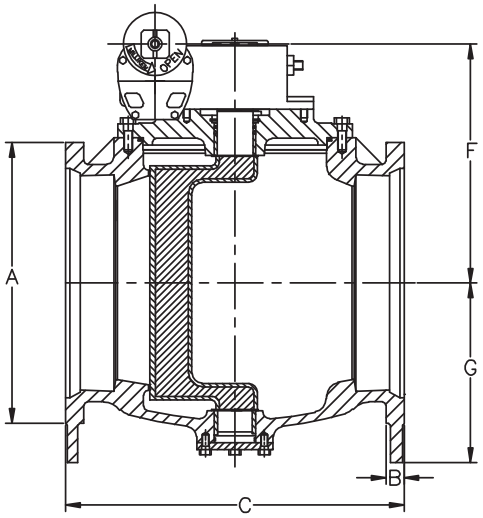
14" –20" VALVES



24" VALVES AND LARGER



24" VALVES AND LARGER



FLANGED END — ANSI 125										
SIZE	14	16	18	20	24	30	36	42	48	54
A	21.00	23.50	25.00	27.50	32.00	38.75	46.00	53.00	59.00	66.25
B	1.38	1.44	1.56	1.69	1.88	2.13	2.38	2.63	2.75	3.00
C	17.00	17.75	21.50	23.50	42.00	51.00	60.00	72.00	84.00	96.00
D	14.56	15.81	16.36	17.63	25.13	29.00	33.51	33.88	39.57	50.86
G	13.00	14.00	15.00	16.00	21.62	24.43	29.00	29.00	36.00	36.00
H	18.00	18.00	18.00	18.00	24.00	24.00	24.00	30.33	30.00	30.00
WEIGHT (approx.)	905	1030	1355	1880	3800	5200	6950	10160	13350	15100

Flanged Valves Meet ANSI B16.1

MECHANICAL JOINT END									
SIZE	14	16	18	20	24	30	36	42	48
A	20.13	22.56	24.84	27.06	31.50	39.13	46.00	53.13	60.00
B	1.31	1.38	1.43	1.50	1.62	1.68	2.00	2.00	2.00
C	24.50	27.25	29.25	31.00	42.00	51.00	60.00	72.00	84.00
F	14.56	15.81	16.36	17.63	25.13	29.00	33.51	33.88	39.57
G	13.00	14.00	15.00	16.00	21.62	24.75	29.00	29.00	36.00
WEIGHT (approx.)	905	1030	1355	1880	3800	5200	6950	10160	13350

Mechanical Joint Valves Meet ANSI 21.11 & AWWA C-111

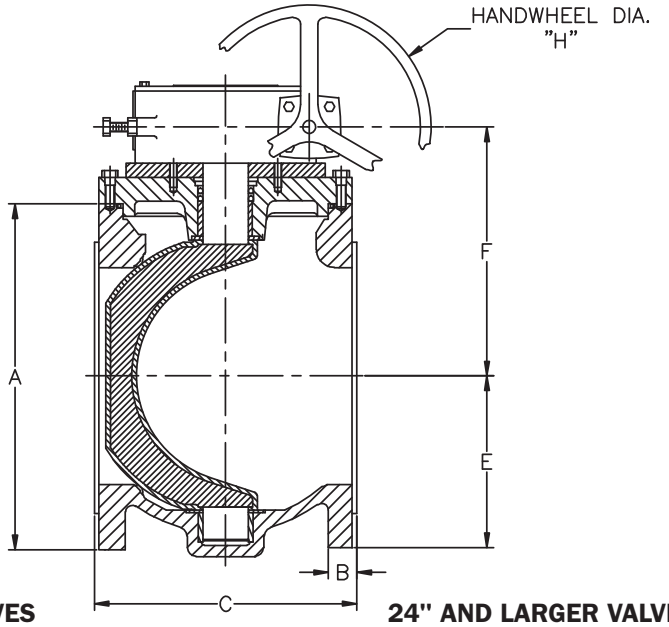
Weight includes gear operator

NOTE: Drawings are for information purposes only; please request certified drawings before preparing piping diagrams.

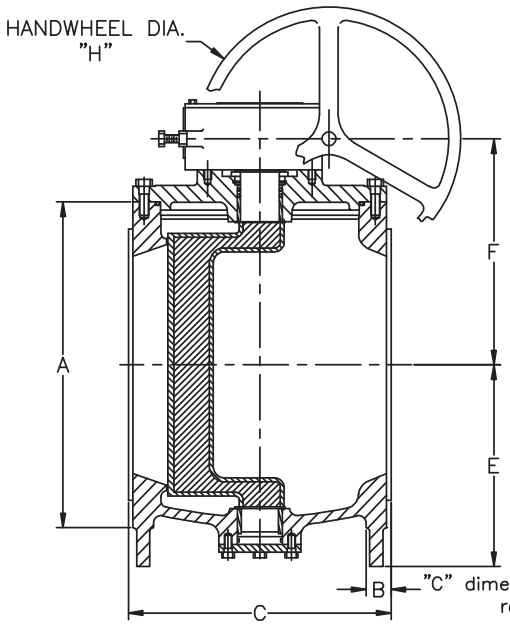
NOTE: Dimensions on 60" and larger available upon request.

Fig. 602 Class 250 Flanged End
2½" – 12", 400 PSI, 14" – 36", 300 PSI

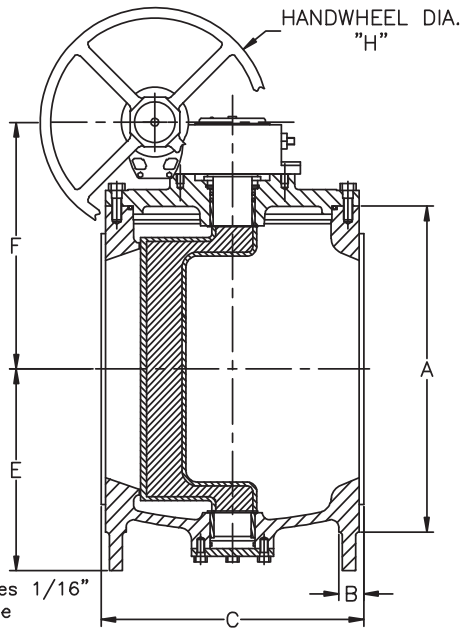
2½" – 12" VALVES



14" – 20" VALVES



24" AND LARGER VALVES



"C" dimen. includes 1/16" raised face

FLANGED END — ANSI 250															
SIZE	2.50	3	4	5	6	8	10	12	14	16	18	20	24	30	36
A	7.50	8.25	10.00	11.00	12.50	15.00	17.50	20.50	23.00	25.50	28.00	30.50	36.00	43.00	50.00
B	1.06	1.13	1.25	1.38	1.44	1.63	1.88	2.00	2.12	2.25	2.38	2.50	2.75	3.00	3.38
C	9.50	11.13	12.00	15.00	15.88	16.50	18.00	19.75	18.50	19.38	23.13	25.00	42.88	51.88	61.00
E	3.50	3.75	4.50	5.75	5.75	17.63	8.88	10.00	13.00	14.00	15.00	16.00	21.62	24.75	29.00
F	5.16	5.16	6.31	7.56	7.56	9.63	11.13	12.81	14.56	15.81	16.36	17.63	22.81	27.59	33.00
H	6.00	6.00	6.00	6.00	6.00	12.00	12.00	12.00	18.00	18.00	18.00	18.00	24.00	24.00	24.00
WEIGHT (approx.)	70	80	120	162	170	275	398	590	980	1125	1830	2060	4160	5700	7670

All above have gear operators as standard

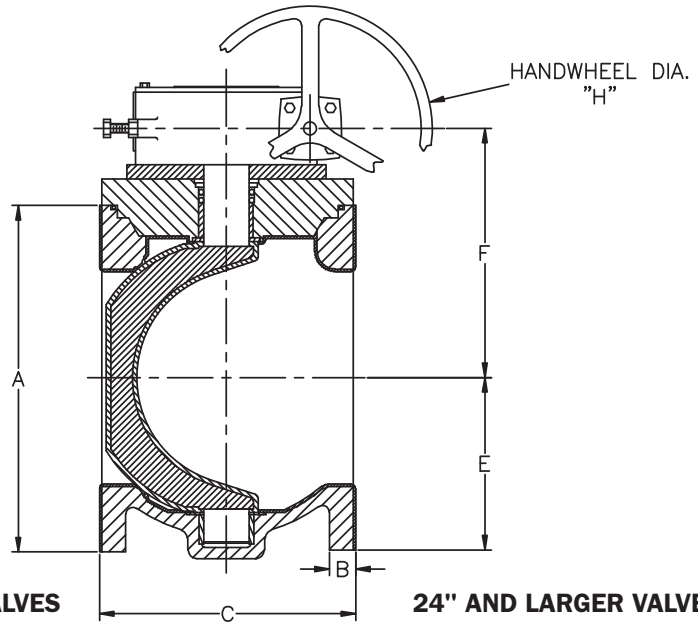
Weight includes gear operator

NOTE: Drawings are for information purposes only; please request certified drawings before preparing piping diagrams

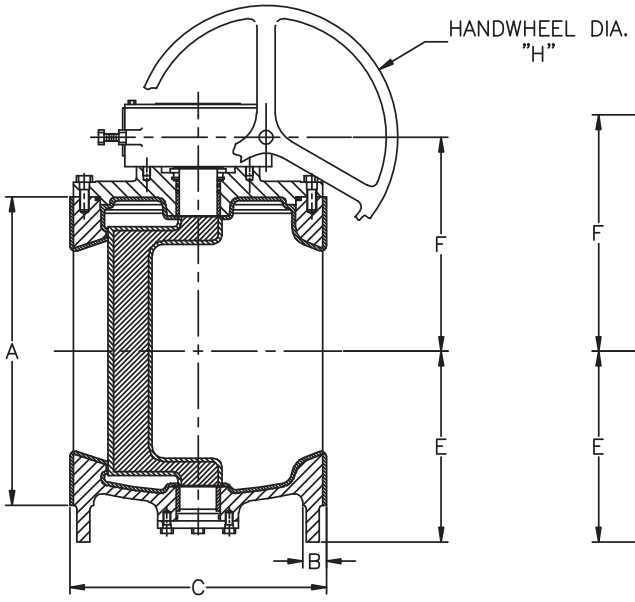
NOTE: Dimensions on 42" and larger available upon request

Fig. 601RL Rubberlined – Flanged End
3" – 12", 175 PSI, 14" & Larger, 150 PSI

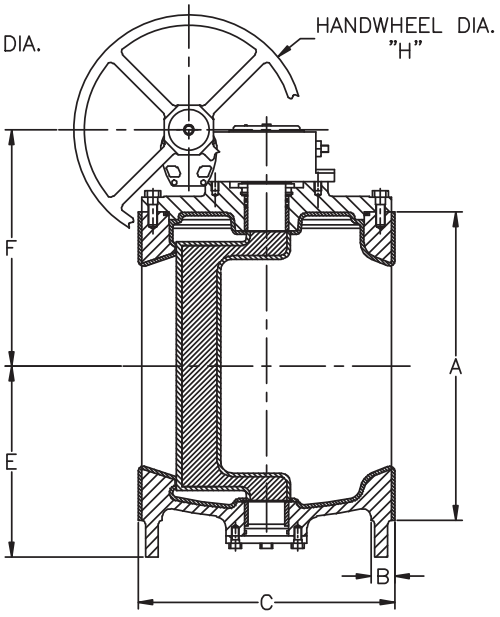
3" – 12" VALVES



14" – 20" VALVES



24" AND LARGER VALVES



FLANGED END — ANSI 125 RUBBER LINED															
SIZE	3	4	5	6	8	10	12	14	16	18	20	24	30	36	42
A	7.50	9.00	10.00	11.00	13.50	16.00	19.00	21.00	23.25	25.00	27.50	32	38.75	46.00	53.00
B	.88	1.07	1.07	1.13	1.26	1.32	1.38	1.26	2.25	2.38	2.50	2.75	3.00	3.38	3.38
C	8.25	9.25	10.25	10.75	11.75	13.25	14.25	17.25	18.00	21.75	23.75	42.25	51.25	60.25	72.25
E	3.75	4.50	7.75	7.75	7.63	8.88	10.00	13.00	14.00	15.00	16.00	21.63	24.75	29.00	29.00
F	5.16	6.31	7.56	7.56	9.63	11.13	12.81	14.56	15.81	16.36	17.63	25.13	29.00	33.51	33.88
H	6.00	6.00	6.00	6.00	12.00	12.00	12.00	18.00	18.00	18.00	18.00	24.00	24.00	24.00	24.00
WEIGHT (approx.)	70	100	135	145	240	345	440	905	1030	1355	1880	3800	5200	6940	10160

All above have gear operators as standard

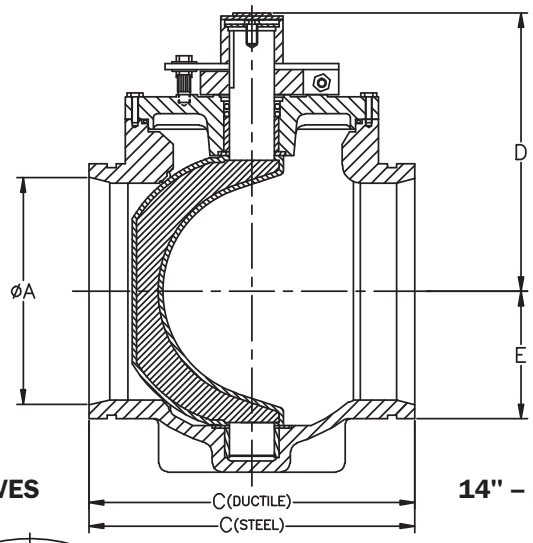
Weight includes gear operator

NOTE: Drawings are for information purposes only; please request certified drawings before preparing piping diagrams

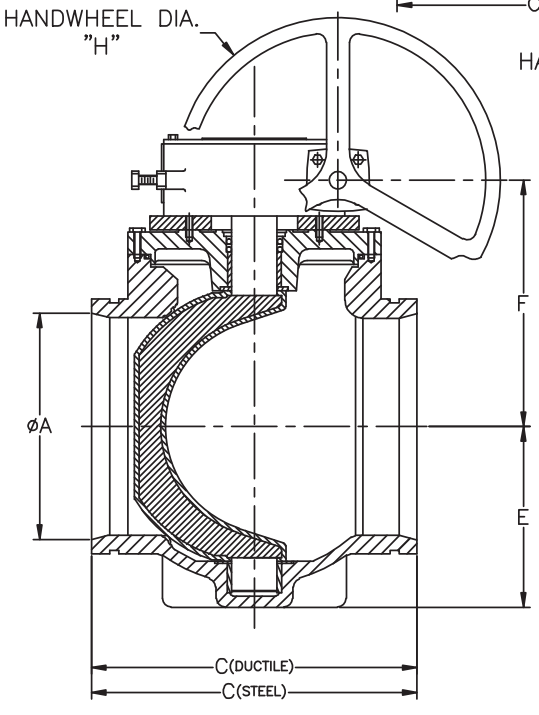
NOTE: Dimensions on 48" and larger available upon request

Fig. 606 Grooved End
2½" – 12", 175 PSI, 14" – 20", 150 PSI

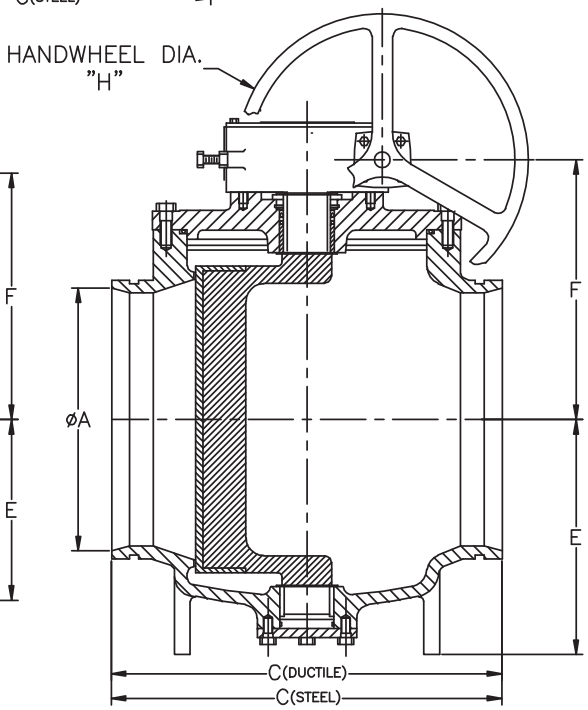
2½" – 8" VALVES



2½" – 12" VALVES



14" – 20" VALVES



GROOVED END — AWWA 606												
SIZE	2.50	3	4	5	6	8	10*	12*	14*	16*	18*	20*
A	2.50	3.00	4.00	5.00	6.00	8.00	10.00	12.00	14.00	15.25	16.19	18.06
C (Duct.)	N/A	9.06	10.25	N/A	12.50	14.00	16.56	18.00	21.63	N/A	27.50	30.00
C (Steel)	7.13	8.50	10.13	12.38	12.38	13.88	16.44	17.88	21.63	22.50	27.50	30.00
D	6.19	6.19	7.25	8.38	8.38	10.69	—	—	—	—	—	—
E	3.50	3.75	4.50	5.75	5.75	7.63	8.88	10.00	10.00	14.00	15.00	16.00
F	5.16	5.16	6.31	7.56	7.56	9.63	11.13	12.86	13.56	15.81	16.35	17.63
H	6.00	6.00	6.00	6.00	6.00	12.00	12.00	12.00	12.00	18.00	18.00	18.00
WEIGHT (approx.)	20	30	50	70	80	145	325**	420**	RTF	RTF	RTF	RTF

*10" & above have gear operators as standard

**Weight includes gear operator

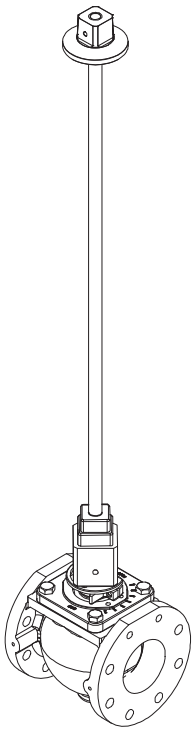
NOTE: Drawings are for information purposes only; please request certified drawings before preparing piping diagrams

NOTE: Larger sizes are available. Contact Milliken Valve for data.

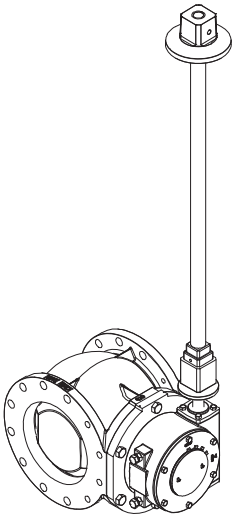
Adaption

A range of extended stems & floor mounted stands for remote operation, particularly in buried service, are available.
Chainwheels & locking devices are readily incorporated onto the Millcentric Valve.

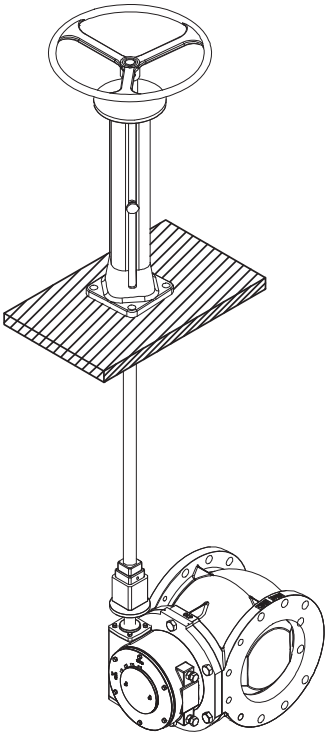
Valve with extended stem & 2" nut (Only for 8" and smaller valves)



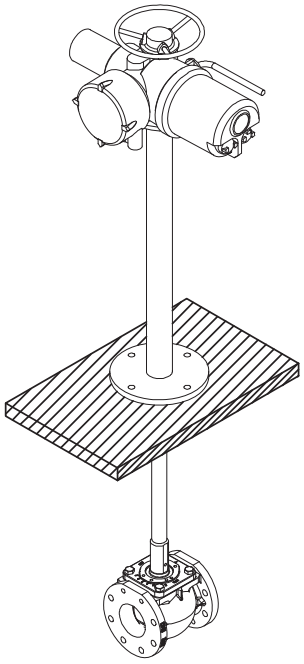
Valve with extended stem, buried gear and 2" nut



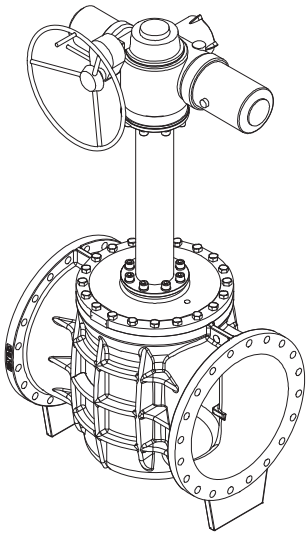
Valve with indicating floorstand



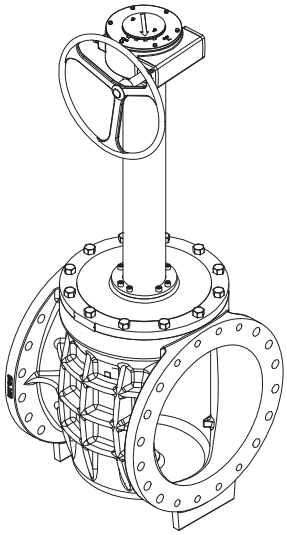
Valve with non-indicating floorstand & motor operator



Valve with extended bonnet & motor operator



Valve with extended bonnet with gear



Technical Specification Series 601/600 Valves

TECHNICAL SPECIFICATION
ECCENTRIC PLUG VALVES
AWWA C517-09 Standards
Series 601/600 Valves

Valves shall be of the non-lubricated eccentric type with an elastomer covering all seating surfaces. The elastomer shall be suitable for the service intended. Flanged valves shall be manufactured in accordance with **ANSI B16.1 Class 125/150** including facing, drilling and flange thickness. Mechanical joint ends shall be in compliance with **AWWA/ANSI C-111-92**. Grooved ends shall be manufactured to the dimensions of **ANSI/AWWA C606** for ductile or steel pipe as required. Ports shall be round on sizes 2½"-12" and rectangular port design on valves 14" and larger. All valves shall be capable of being "pigged" with a soft pig when required.

Valve bodies shall be of **ASTM A-126 Class B** cast iron in accordance with **AWWA C-517-09 Section 4.3.3.1**. Valves 3" and larger shall be furnished with a welded-in overlay seat of ⅛" thick of not less than 99% nickel in accordance with **AWWA C-517-09, Section 4.3.3.4**. Sprayed, plated or screwed-in seats are not acceptable.

Plugs shall be of **ASTM A-536-Grade 65-45-12** for sizes 20" and smaller, and **ASTM A126 Class B Cast Iron** for sizes 24" and larger in compliance with **AWWA C-517-09 Sections 4.3.3.1 and 4.3.3.2**. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit from entering the bearing and seal area.

Valves shall be furnished with replaceable sleeve type bearings conforming to **AWWA C-517-09, Section 4.3.3.6**. Bearings shall be of sintered, oil impregnated type 316 stainless steel **ASTM A-743 Grade CF-8M**. Valve shaft seals shall be of the "U" cup type in accordance with **AWWA C-517-09 Section 4.4.7**. Seals shall be self adjusting and repackable without removing the bonnet from the valve.

Wrench operated valves 2½"-8" shall be capable of being converted to worm gear or automated operation without removing the bonnet or plug from the valve. All wrench operated valves shall be equipped with a 2" square nut for use with removeable levers or extended "T" handles.

Worm gear operators, where required, shall be of the heavy duty construction with the ductile iron quadrant supported on the top and bottom by oil impregnated bronze bearings. The worm gear and shaft shall be manufactured of hardened steel and run on high efficiency roller bearings.

Valves shall be designed and manufactured to shut off bubble tight at 175 psi for valves 2½"-12" and 150 psi for valves 14" and larger. Each valve shall be given a hydrostatic and seat test with the test results being certified when required by the customer. Certified copies of Proof-of-Design test reports shall be furnished as outlined in **AWWA C-517-09 Section 5.2.2** when requested.

Plug valves shall be Millcentric **Series 601/600** as manufactured by **Milliken Valve Company of Bethlehem, Pennsylvania**.

Technical Specification Series 602 Class 250 Valves

TECHNICAL SPECIFICATION
ANSI CLASS 250 ECCENTRIC PLUG VALVES
AWWA C517-09 Standards
Series 602 Valves

Valves shall be of the non-lubricated eccentric type with an elastomer covering all seating surfaces. The elastomer shall be suitable for the service intended. Flanged valves shall be manufactured in accordance with **ANSI B16.1 Class 250** including facing, drilling and flange thickness. Ports shall be round on sizes 2½" through 12" to facilitate "pigging" when required. Valves 14" and larger shall be of a rectangular port design.

Valve bodies shall be of **ASTM A-536 Grade 65-45-12** ductile iron in accordance with **AWWA C-517-09 Section 4.3.3.2**. Valves 3" and larger shall be furnished with a welded-in overlay seat of ⅛" thick of not less than 99% nickel in accordance with **AWWA C-517-09 Section 4.3.3.4**. Sprayed, plated or screwed-in seats are not acceptable.

Plugs shall be of **ASTM A-536-Grade 65-45-12** in compliance with **AWWA C-517-09 Section 4.3.3.2**. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit form entering the bearing and seal area.

Valves shall be furnished with replaceable sleeve type bearings conforming to **AWWA C-517- 09 Section 4.3.3.6**. Bearings shall be of sintered, oil impregnated type 316 stainless steel **ASTM A-743 Grade CF-8M**. Valve shaft seals shall be of the "U" cup type in accordance with **AWWA C-517-09 Section 4.4.7**. Seals shall be self adjusting and repackable without removing the bonnet from the valve.

Worm gear operators shall be of the heavy duty construction with the ductile iron quadrant supported on the top and bottom by oil impregnated bronze bearings. The worm gear and shaft shall be manufactured of hardened steel and run on high efficiency roller bearings. All worm gear operators shall be sized for bi-directional shutoff at the valves design pressure rating.

Valves shall be designed and manufactured to shut off bubble tight at 400 psi for valves 2½"-12" and 300 psi for valves 14"-48" with pressure behind the plug.

Each valve shall be given a hydrostatic and seat test with the test results being certified when required by the customer. Certified copies of Proof-of-Design test reports shall be furnished as outlined in **AWWA C-517-09 Section 5.2.2** when requested.

Plug valves shall be **Series 602** as manufactured by **Milliken Valve Company of Bethlehem, Pennsylvania**.

Technical Specification Series 601RL Rubberlined Valves

TECHNICAL SPECIFICATION
RUBBERLINED ECCENTRIC PLUG VALVES
AWWA C517-09 Standards
Series 601RL Valves

Valves shall be of the non-lubricated eccentric type with an elastomer covering all seating surfaces. The elastomer shall be suitable for the service intended. Flanged valves shall be manufactured in accordance with **ANSI B16.1 Class 125/150** including facing, drilling and flange thickness. Mechanical joint ends shall be in compliance with **AWWA/ANSI C-111- 92**. Grooved ends shall be manufactured to the dimensions of **ANSI/AWWA C606** for ductile or steel pipe as required. Ports shall be round on sizes 2½"-12" and rectangular port design on valves 14" and larger. All valves shall be capable of being "pigged" with a soft pig when required.

Valve bodies shall be of **ASTM A-126 Class B** cast iron in accordance with **AWWA C- 517-09 Section 4.3.3.1**. The interior of the valve bodies shall be covered with a suitable elastomer with a minimum thickness of ⅛". The elastomer shall extend through the valve flow way and onto the flanges to ensure a positive seal.

Plugs shall be of **ASTM A-536-Grade 65-45-12** for sizes 20" and smaller, and **ASTM A126 Class B Cast Iron** for sizes 24" and larger in compliance with **AWWA C-517-09 Sections 4.3.3.1 and 4.3.3.2**. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit from entering the bearing and seal area.

Valves shall be furnished with replaceable sleeve type bearings conforming to **AWWA C-517-09, Section 4.3.3.6**. Bearings shall be of sintered, oil impregnated type 316 stainless steel **ASTM A-743 Grade CF-8M**. Valve shaft seals shall be of the "U" cup type in accordance with **AWWA C-517-09 Section 4.4.7**. Seals shall be self adjusting and repackable without removing the bonnet from the valve.

Worm gear operators shall be of the heavy duty construction with the ductile iron quadrant supported on the top and bottom by oil impregnated bronze bearings. The worm gear and shaft shall be manufactured of hardened steel and run on high efficiency roller bearings. All worm gear operators shall be sized for bi-directional shutoff at the valves design pressure rating.

Valves shall be designed and manufactured to shut off bubble tight at 175 psi for valves 2½"-12" and 150 psi for valves 14" and larger. Each valve shall be given a hydrostatic and seat test with the test results being certified when required by the customer. Certified copies of Proof-of-Design test reports shall be furnished as outlined in **AWWA C-517-09 Section 5.2.2** when requested.

Plug valves shall be Millcentric® **Series 601RL** as manufactured by **Milliken Valve Company of Bethlehem, Pennsylvania**.

Technical Specification Series 601S – Stainless Steel Valves

TECHNICAL SPECIFICATION
STAINLESS STEEL ECCENTRIC PLUG VALVES
AWWA C517-09 Standards
Series 601S Valves

Valves shall be of the non-lubricated eccentric type with an elastomer covering all seating surfaces. The elastomer shall be suitable for the service intended. Flanged valves shall be manufactured in accordance with **ANSI B16.1 Class 125** including facing, drilling and flange thickness. Ports shall be round on sizes 2½"-12" and rectangular port design on valves 14" and larger. All valves shall be capable of being "pigged" with a soft pig when required.

Valve bodies shall be of **CF8M (316 stainless steel)**. Valves shall be furnished with 316 stainless steel seat in accordance with **AWWA C-517-09 Section 4.3.3.4**.

Plugs shall be of **CF8M (316 stainless steel)**. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit from entering the bearing and seal area.

Valves shall be furnished with replaceable sleeve type bearings conforming to **AWWA C-517-09 Section 4.3.3.6**. Bearings shall be of sintered, oil impregnated type 316 stainless steel **ASTM A-743 Grade CF-8M**. Valve shaft seals shall be of the "U" cup type in accordance with **AWWA C-517-09 Section 4.4.7**. Seals shall be self adjusting and repackable without removing the bonnet from the valve.

Wrench operated valves 2½"-8" shall be capable of being converted to worm gear or automated operation without removing the bonnet or plug from the valve. All wrench operated valves shall be equipped with a 2" square nut for use with removable levers or extended "T" handles.

Worm gear operators, where required, shall be of the heavy duty construction with the ductile iron quadrant supported on the top and bottom by oil impregnated bronze bearings. The worm gear and shaft shall be manufactured of hardened steel and run on high efficiency roller bearings. All worm gear operators shall be sized for bi-directional shutoff at the valves design pressure rating.

Valves shall be designed and manufactured to shut off bubble tight at 175 psi for valves 2½"-12" and 150 psi for valves 14" and larger. Each valve shall be given a hydrostatic and seat test with the test results being certified when required by the customer. Certified copies of Proof-of-Design test reports shall be furnished as outlined in **AWWA C-517-09 Section 5.2.2** when requested.

Plug valves shall be Millcentric® **Series 601S** as manufactured by **Milliken Valve Company of Bethlehem, Pennsylvania**.

Technical Specification Series 611/610 Ductile Iron Valves

TECHNICAL SPECIFICATION
DUCTILE IRON ECCENTRIC PLUG VALVES
AWWA C517-09 Standards
Series 611/610 Valves

Valves shall be of the non-lubricated eccentric type with an elastomer covering all seating surfaces. The elastomer shall be suitable for the service intended. Flanged valves shall be manufactured in accordance with **ANSI B16.1 Class 125/150** including facing, drilling and flange thickness. Mechanical joint ends shall be in compliance with **AWWA/ANSI C-111-92**.Grooved ends shall be manufactured to the dimensions of **ANSI/AWWA C606** for ductile or steel pipe as required. Ports shall be round on sizes 2½"-12" and rectangular port design on valves 14" and larger. All valves shall be capable of being "pigged" with a soft pig when required.

Valve bodies shall be of **ASTM A-536 Grade 65-45-12** in accordance with **AWWA C-517-09 Section 4.3.3.2**. Valves 3" and larger shall be furnished with a welded-in overlay seat of ⅛" thick of not less than 99% nickel in accordance with **AWWA C-517-09, Section 4.3.3.4**. Sprayed, plated or screwed-in seats are not acceptable.

Plugs shall be of **ASTM A-536-Grade 65-45-12** for all sizes in accordance with **AWWA C-517-09 Section 4.3.3.2**. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit from entering the bearing and seal area.

Valves shall be furnished with replaceable sleeve type bearings conforming to **AWWA C-517-09, Section 4.3.3.6**. Bearings shall be of sintered, oil impregnated type 316 stainless steel **ASTM A-743 Grade CF-8M**. Valve shaft seals shall be of the "U" cup type in accordance with **AWWA C-517-09 Section 4.4.7**. Seals shall be self adjusting and repackable without removing the bonnet from the valve.

Wrench operated valves 2½"-8" shall be capable of being converted to worm gear or automated operation without removing the bonnet or plug from the valve. All wrench operated valves shall be equipped with a 2" square nut for use with removeable levers or extended "T" handles.

Worm gear operators, where required, shall be of the heavy duty construction with the ductile iron quadrant supported on the top and bottom by oil impregnated bronze bearings. The worm gear and shaft shall be manufactured of hardened steel and run on high efficiency roller bearings. All worm gear operators shall be sized for bi-directional shutoff at the valves design pressure rating.

Valves shall be designed and manufactured to shut off bubble tight at 175 psi for valves 2½"-12" and 150 psi for valves 14" and larger. Each valve shall be given a hydrostatic and seat test with the test results being certified when required by the customer. Certified copies of Proof-of-Design test reports shall be furnished as outlined in **AWWA C-517-09 Section 5.2.2** when requested.

Plug valves shall be Millcentric® **Series 611/610** as manufactured by **Milliken Valve Company of Bethlehem, Pennsylvania**.

Technical Specification Series 601GL Glass Lined Valves

TECHNICAL SPECIFICATION
GLASS LINED ECCENTRIC PLUG VALVES 3"-30"
AWWA C517-09 Standards
Series 601GL/600GL Valves

Valves shall be of the non-lubricated eccentric type with an elastomer covering all seating surfaces. The elastomer shall be suitable for the service intended. Flanged valves shall be manufactured in accordance with **ANSI B16.1 Class 125/150** including facing, drilling and flange thickness. Mechanical joint ends shall be in compliance with **AWWA/ANSI C-111-92**. Grooved ends shall be manufactured to the dimensions of **ANSI/AWWA C606** for ductile or steel pipe as required. Ports shall be round on sizes 3"-12" and rectangular port design on valves 14" and larger. All valves shall be capable of being "pigged" with a soft pig when required.

Valve bodies shall be of **ASTM A-126 Class B** cast iron in accordance with **AWWA C-517-09 Section 4.3.3.1**. Interior of valves shall be glass lined at .008-.012 mils thickness, covering the entire interior of valve bodies and stopping at the flange faces.

Plugs shall be of **ASTM A-536-Grade 65-45-12** for sizes 20" and smaller, and **ASTM A126 Class B Cast Iron** for sizes 24" and larger in compliance with **AWWA C-517-09 Sections 4.3.3.1 and 4.3.3.2**. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit from entering the bearing and seal area.

Valves shall be furnished with replaceable sleeve type bearings conforming to **AWWA C-517-09, Section 4.3.3.6**. Bearings shall be of sintered, oil impregnated type 316 stainless steel **ASTM A-743 Grade CF-8M**. Valve shaft seals shall be of the "U" cup type in accordance with **AWWA C-517-09 Section 4.4.7**. Seals shall be self adjusting and repackable without removing the bonnet from the valve.

Wrench operated valves 2½"-8" shall be capable of being converted to worm gear or automated operation without removing the bonnet or plug from the valve. All wrench operated valves shall be equipped with a 2" square nut for use with removeable levers or extended "T" handles.

Worm gear operators, where required, shall be of the heavy duty construction with the ductile iron quadrant supported on the top and bottom by oil impregnated bronze bearings. The worm gear and shaft shall be manufactured of hardened steel and run on high efficiency roller bearings. All worm gear operators shall be sized for bi-directional shutoff at the valves design pressure rating.

Valves shall be designed and manufactured to shut off bubble tight at 175 psi for valves 2½"-12" and 150 psi for valves 14" and larger. Each valve shall be given a hydrostatic and seat test with the test results being certified when required by the customer. Certified copies of Proof-of-Design test reports shall be furnished as outlined in **AWWA C-517-09 Section 5.2.2** when requested.

Plug valves shall be Millcentric Series **601GL/600GL** as manufactured by **Milliken Valve Company of Bethlehem, Pennsylvania**.

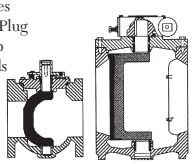
Notes


MILLIKEN
VALVE COMPANY

Series 600/601
Eccentric Plug Valve

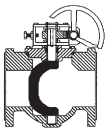
Flanged and MJ

Welded Nickel Seat
Stainless Steel Bearings
ANSI-B16.1 Flanges
Solid Ductile Iron Plug
Low Pressure Drop
Flanged & MJ Ends
Sizes 2"-72" FL
Sizes 3"-48" MJ



Series 601SS
Eccentric Plug Valve

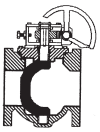
Integral Stainless Seat
Stainless Bearings
Stainless Steel Body
ANSI B16.5 Class 150 Flanges
Solid Stainless Steel Plug
Low Pressure Drop
Size: 1/2"-24"



Series 601RL
Eccentric Plug Valve

Rubber Lined

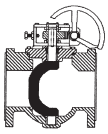
Soft or Hard Rubber Lining
Stainless Steel Bearings
ANSI B16.1 Flanges
Solid Ductile Iron Plug
Low Pressure Drop
Sizes 3"-54"
Metal Plugs Available
– Consult Factory



Series 602
Eccentric Plug Valve

High Pressure

Welded Nickel Seat
Stainless Steel Bearings
ANSI B16.1 Class 250 Flanges
Solid Ductile Iron Plug
Low Pressure Drop
Sizes 2-1/2"-54"



Series 603
Eccentric Plug Valve

Threaded End

Solid Ductile Iron Plug
Round Port
Low Pressure Drop
Memory Stop
NPT End Connections
Sizes 1/2"-2"

Series 604E
Eccentric Plug Valve

Three Way Valve

Epoxy Seat
Solid Ductile Iron Plug
Stainless Steel Bearings
Low Pressure Drop
Lift & Turn NOT Required
High Solids & Flow Capacity
Sizes 3"-16"

Series 606
Eccentric Plug Valve

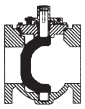
Grooved End

Welded Nickel Seat
Stainless Steel Bearings
AWWA C-606 Grooved
Solid Ductile Iron Plug
Low Pressure Drop
Ductile or Steel Pipe
Sizes 3"-24"

Series 611/610
Eccentric Plug Valve

Flanged and MJ

Ductile Iron Body
ANSI B16.1 Flanges
MJ AWWA C111
Welded Nickel Seat
Solid Ductile Iron Plug
Low Pressure Drop
Sizes 2"-72" FL
Sizes 3"-48" MJ



Model 625
Eccentric Plug Valve

Available in Threaded
and Flanged Ends
Rated for 175 psi
Sizes 1/2"-4"
UL/CGA Listed

Series 8000
AWWA Swing Check

Full waterway
Weight or Spring
Bronze/SS Body Seat Ring
Bronze/Buna/EPDM disc insert
Sizes 2"-36"

Series 8500
AWWA Swing Check

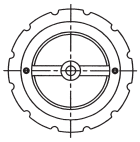
Full waterway
Ductile Iron Construction
Weight or Spring
Air Cushion
SS body seat ring
Buna disc insert
Sizes 3"-24"

Series 9000
AWWA Swing Check

Clear waterway
Weight or Spring
Air or Oil Cushion
Bronze/SS Body seat ring
Bronze/Buna/EPDM disc insert
Sizes 3"-72"

Model 720A
Wafer Check Valve

Center Guided
Check Valve
Rated for 250 psi
SS Disc/EPDM Seat
Sizes 2"-12"



Series 700
Wafer Check Valve

Wafer Check Valve

ANSI Class 125/150
High Flow Capacity
Narrow Face-to-Face
Sizes 3"-12"
316 SS Internals
Disc Position Indicator

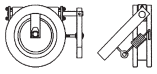


Figure 851
Flex Check

Million Cycle Certification
Complete Ductile Iron Construction
285 psi Pressure Rating
Fully Epoxy Lined Interior
No Internal Shafts, Bearings or Bushings
No External Levers, Weights or Springs
Hard or Soft
Rubberlining Available
2"-24" Size Range
Backflush Devices
Proximity Switches

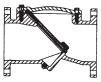


Figure 510A/511A
AWWA Butterfly Valve

Complies with AWWA C-504
Class 150B Flanged or MJ
Cast iron body and disc
Seat in body
Flow through disc on
24" and larger
Epoxy Paint on all sizes
standard
3" - 72"

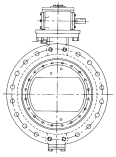


Figure 565/566
General Service
Butterfly Valve

Meets MSS SP 67
Cast Iron Body
Bronze Disc
Other Materials Upon Request
Wrench or Gear
Operated Available
2"-24" Size Range

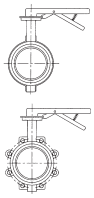


Figure 740A
Double Disc Check Valve

Wafer pattern
check valve
rated for 250 psi.
Available in sizes
2"-36" with a
SS Disc/EPDM Seat

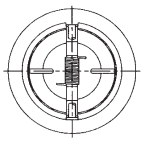
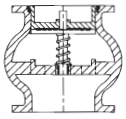


Figure 821A
Globe Style Check Valve

Center guided
check valve.
SS Disc/EPDM Seat
and is available
in sizes 2"-24".



- ***ISO 9001:2000 Certified***
- ***Field Services Available***
- ***Engineering Services***

MILLIKEN
VALVE COMPANY

Bethlehem, PA
Phone (610) 861-8803
Fax (610) 861-8094

www.millikenvalve.com

MILLIKEN VALVE

ISO 9001 Certified

1/2” - 2” MILLCENTRIC® ECCENTRIC PLUG VALVE

MILLIKEN VALVE

Milliken Valve offers the following for your water and wastewater needs:

- Eccentric Plug Valves
  - Series 601/600 Flanged & MJ
  - Series 601S Stainless Steel
  - Series 601RL Rubber Lined
  - Series 602 High Pressure
  - Series 613 Threaded End
  - Series 604 Three Way
  - Series 606 Grooved End
  - Series 611/610 Flanged & MJ
  - Series 625 UL/CGA Listed
- AWWA Swing Check Valves
- Wafer Check Valves
- Flex Check Valves
- Spring Loaded Check Valves
- AWWA Butterfly Valves
- General Service Butterfly Valves

Milliken Valve designs, develops, manufactures and markets plug valves and check valves which are available with various accessories, controls and actuators. These valves are used primarily in the water, wastewater and industrial markets.

Milliken Valve was founded over 25 years ago and manufactures the eccentric plug valve for water, wastewater and industrial applications. Milliken has grown consistently until it is now a leading manufacturer of high quality plug valves.

Milliken has a quality management system independently certified to ISO 9001.

A market leading, wide selection of plug valves are available for most water, wastewater and industrial applications:

Multiport 100% Port 3-Way Plug Valve

- 3-Way Valve 3" – 16", suitable for flow diversion and isolation.

Eccentric Plug Valve

- Size range ½" - 72"
- Pressure rating up to Class 250
- Rubber lined 3" and larger
- Glass lined 3" and larger
- Stainless steel ½" - 48"

Flex Check Valve

The eccentric plug valve is perfectly complemented by a soft-seated flexible-disc check valve in sizes 2" to 24" and is available with manual back-flushing device, position indicator and limit switch.

Swing Check Valve

Milliken Valve also has a wide selection of high quality metal or soft seated swing check valves in sizes 2" to 72" with accessories available for spring or weight assisted closing and air cushion or oil decelerator anti-slam devices under the respected CCNE brand.

Overview of Valve Details - 1/2" - 2"

The Milliken criteria of quality, reliability, safety and value are embodied in the MILLCENTRIC® Eccentric valve, setting higher standards for dependable performance with excellent features achieved by the utilization of the very latest design and manufacturing techniques.

- Computer Aided Design
- High Integrity Casting
- CNC manufacturing delivers consistent sizes on all components

All complemented by a rigorous Quality Control System

Body

The MILLCENTRIC valve body casting is ASTM A536 65-45-12 ductile iron using high pressure molding techniques. Threaded connection available on 1/2"-2" sizes. Flanged connection available on 2" size.

Flange diameter, thickness and drilling conform to ANSI B16.1 Class 125.

Seat

The valve seat shall be furnished with an overlay of corrosion and abrasion resistant epoxy.

Stem Seal

High integrity sealing by combining the advantages of a resilient and abrasion resistant U-Cup seal. From vacuum to high pressure, the self-adjusting sealing system (per AWWA C504) gives positive, trouble-free service and is retained independently of the plug stem or external torque device, thereby eliminating periodic maintenance.

Bearings

The plug rotates in permanently lubricated stainless steel bearings, located in the body and bonnet, along with upper and lower PTFE thrust washers which ensure consistently low operating torque.

Plug

Supported on integral trunnions, the plug is totally encapsulated with an elastomer that is molded to the casting providing tight shut off even under vacuum conditions. High integrity corrosion-free sealing is achieved by a variety of abrasion resistant elastomers which protect the plug right up to the trunnions. When assembled, the light compression of the elastomers onto PTFE thrust washers prevents entry of abrasive materials into the bearings.

Bonnet Seal

Superior “O” ring sealing with metal/metal contact means lower bolting stresses compared with compression gaskets.

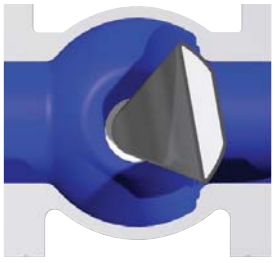
Flow

The full round port design with streamlined internal contours gives the highest industry capacity straight through flow in the full open position, reducing turbulence and pressure drop and the effect of erosive media. Handling of sludges and slurries is therefore enhanced.

Travel Stops

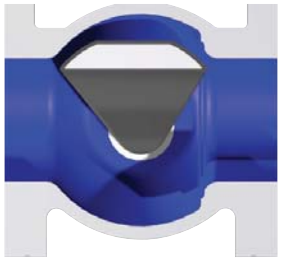
Adjustable open and closed travel stops are fitted as standard on both wrench and gear operated MILLCENTRIC valves.

- Valve in closed position for bubble tight shut-off
- Normal flow direction gives pressure assisted sealing
- Torques are low even in reverse flow



- Plug rotates away from the seat for instant opening
- Seat wear and operating torque reduced
- No further seat contact until valve is closed again

- Design of MILLCENTRIC® plug valve allows modulating control over the full 90˚ travel
- Ideally suited for balancing service
- Standard rotary valve provides control and tight shut off in one valve



- Plug is out of flow path when fully open
- Straight through, uninterrupted smooth flow
- Round port reduces turbulence and erosion, lowers pumping costs and can be “pigged” to clean the pipeline

Installation

The MILLCENTRIC® plug valve is suitable for flow and shut-off in either direction. Seat end downstream is the preferred orientation and any reverse flow requirement should be stated at the time of order. For use on fluids with suspended solids, installation with the seat upstream and the valve stem horizontal is recommended with plug rotation to the top of the valve.

In-Line Maintenance

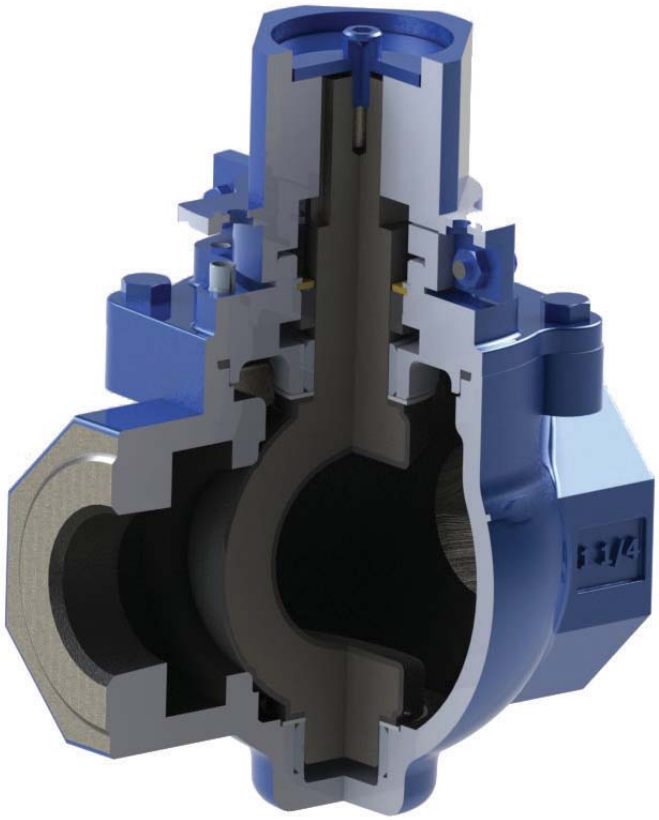
In the unlikely event of stem leakage, the stem seals can be easily replaced without removing the bonnet. Access to the body for cleaning or inspection does not require removal from the line.

Modular Construction

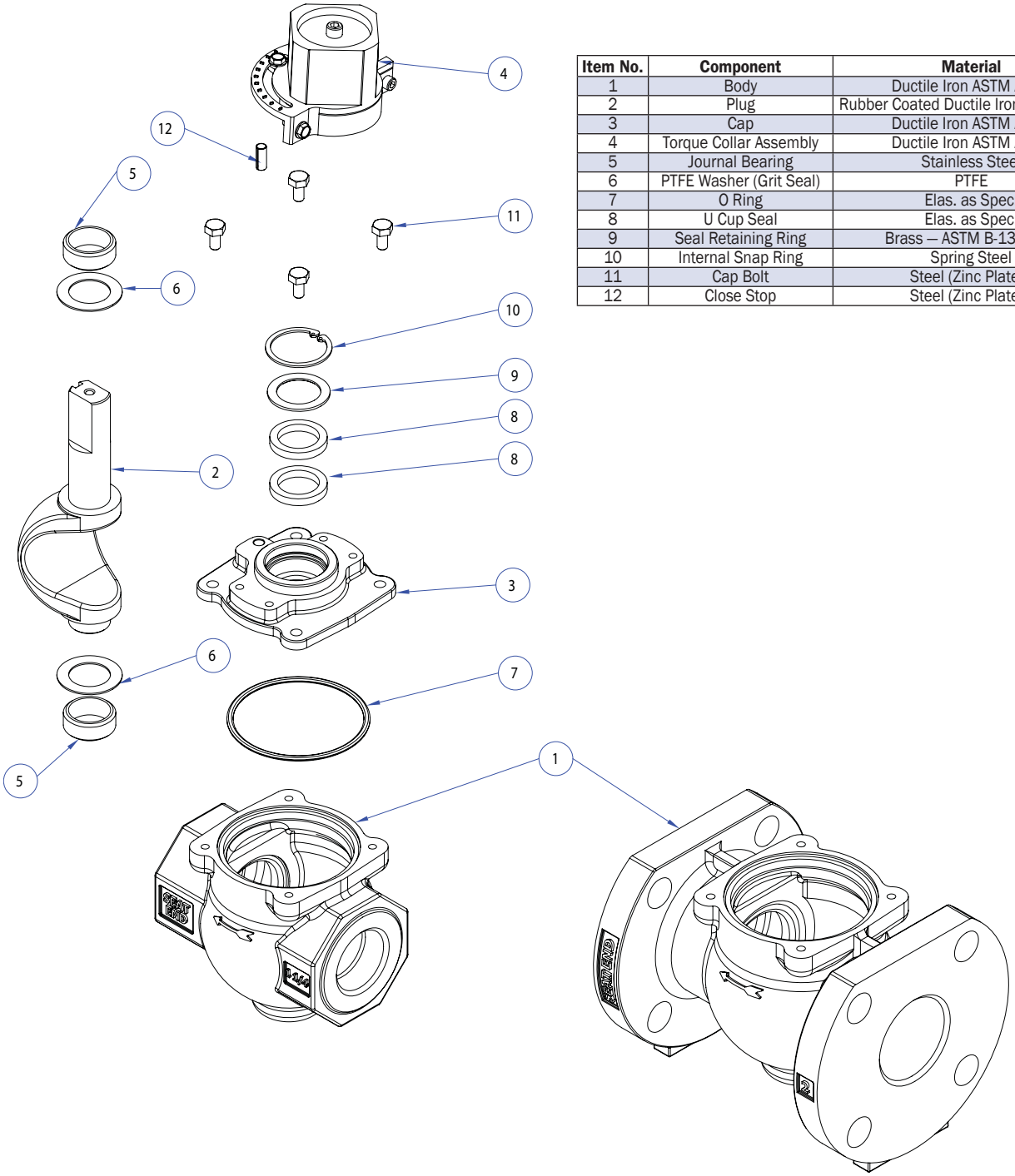
Design of the bonnet and stem allows for on-site adaption of gear operators, power actuators, or extension devices on to standard valves. Conversion can be easily undertaken without removing the valve bonnet, thereby minimizing downtime.

Power Operation

Pneumatic, electric or hydraulic operation is available, complete with accessories such as limit switches, solenoid valves and positioners when required.



Standard Materials of Construction, Fig. 613A/611A, 1/2" - 2"



Item No.	Component	Material	Qty.
1	Body	Ductile Iron ASTM A536	1
2	Plug	Rubber Coated Ductile Iron ASTM A536	1
3	Cap	Ductile Iron ASTM A536	1
4	Torque Collar Assembly	Ductile Iron ASTM A536	1
5	Journal Bearing	Stainless Steel	2
6	PTFE Washer (Grit Seal)	PTFE	2
7	O Ring	Elas. as Spec.	1
8	U Cup Seal	Elas. as Spec.	2
9	Seal Retaining Ring	Brass – ASTM B-138-675	1
10	Internal Snap Ring	Spring Steel	1
11	Cap Bolt	Steel (Zinc Plated)	AR
12	Close Stop	Steel (Zinc Plated)	1

Technical Data

ORDERING INFORMATION

Valve Types	Designation
Threaded NPT Ductile Iron	613A
ANSI 125 Flanged Ductile Iron (2" only)	611A
Threaded NPT 316 SS	603AS
ANSI 150 Flanged 316SS (2" only)	601AS

SEAT

Epoxy	E
316SS (on stainless steel valve only)	S

ELASTOMER TRIM

EPDM	0
Buna-Nitrile	1
Viton*	2
Neoprene*	3

* Consult factory for availability

MANUAL OPERATORS

Lever/Wrench	L
Direct Nut	TC
Above Ground Gear & Handwheel	AGHW
Above Ground Gear & 2" Nut	AGNUT
Buried Gear with 2" Nut	BG
Memory Stop Gear & Handwheel	MGHW
Above Ground Gear & Chainwheel	AGCW

Valves are only tested for bi-directional shut-off if specified at time of order. Contact Milliken for bi-directional ratings.

PRESSURE RATING

613A	NPT	400 PSI
611A	ANSI 125	175 PSI
603AS	NPT	400 PSI
601AS	ANSI 150	275 PSI

Body Hydrotest = 150% of rated pressure
Seat Test = 100% of rated pressure
Testing per AWWA C517

ELASTOMERS AVAILABLE FOR MILLCENTRIC VALVE

Nitrile

A general purpose material sometimes referred to as BUNA-N or HYCAR with a -20°F to 212°F temperature range. Used on sewage, water, hydrocarbon and mineral oils.

EPDM

An excellent polymer for use on chilled water through to LP steam applications having a temperature range of -35°F to 250F. Resistance to many acids, alkalies, detergents, phosphate esters, alcohols and glycols is an added benefit.

Neoprene

This versatile material shows outstanding resistance to abrasion and ozone. Chemical resistance to a wide range of petroleum base products and dilute acids and alkalies. Temperature range -20°F to 225°F.

Viton

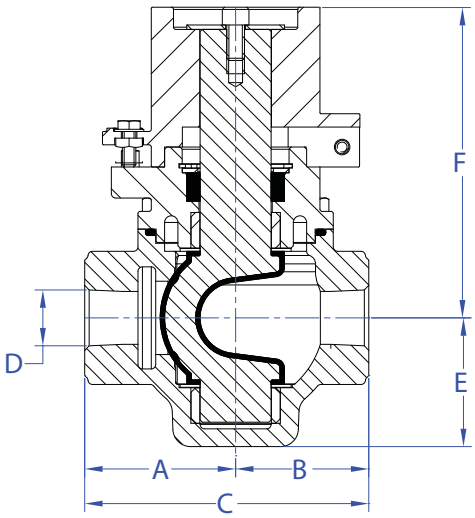
Retention of mechanical properties at high temperature is an important feature of this elastomer: temperature range is -10°F to 300°F. It also has excellent resistance to oils, fuels, lubricants and most mineral acids and aromatic hydrocarbons. Note: Viton not for water or steam applications.

Elastomer Selection Chart

Service	Elastomer	Average Useful Temperature Range	Service	Elastomer	Average Useful Temperature Range	Service	Elastomer	Average Useful Temperature Range
Acetone	EPDM	-35˚F to 250˚F	Caustic Soda	EPDM	-35˚F to 250˚F	Oil Animal	Nitrile	-20˚F to 212˚F
Air	EPDM	-35˚F to 250˚F	Cement Slurry	EPDM	-35˚F to 250˚F	Oil Mobil Therm Light	Viton	10˚F to 250˚F
Air w/Oil	Nitrile	0˚F to 212˚F	Copper Sulphate	EPDM	-35˚F to 250˚F	Oil Mobil Therm 600	Viton	10˚F to 250˚F
Alcohol, Amyl	EPDM	0˚F to 212˚F	Creosote (Coal)	Nitrile	-20˚F to 212˚F	Oil Mobil Therm 603	Nitrile	-20˚F to 212˚F
Alcohol, Aromatic	Viton	10˚F to 250˚F	Coal Slurry	Nitrile	-20˚F to 212˚F	Oil Lubricating	Nitrile	-20˚F to 212˚F
Alcohol, Butyl	Neoprene	-20˚F to 225˚F	Diesel Fuel No. 3	Nitrile	-20˚F to 212˚F	Oil Vegetable	Nitrile	-20˚F to 212˚F
Alcohol, Denatured	Nitrile	-20˚F to 212˚F	Diethylene Glycol	EPDM	-35˚F to 250˚F	Paint Latex	Nitrile	-20˚F to 212˚F
Alcohol, Ethyl	EPDM	-20˚F to 250˚F	Ethylene Glycol	EPDM	-35˚F to 250˚F	Phosphate Ester	EPDM	-35˚F to 250˚F
Alcohol, Grain	Nitrile	-20˚F to 212˚F	Fatty Acid	Nitrile	-20˚F to 212˚F	Propane	Nitrile	-20˚F to 212˚F
Alcohol, Isosproply	Neoprene	-20˚F to 225˚F	Fuel Oil No. 2	Nitrile	-20˚F to 212˚F	Rape Seed Oil	EPDM	-35˚F to 250˚F
Alcohol, Methyl	EPDM	-20˚F to 250˚F	Fertilizer Liquid ($H_4N_2O_2$)	EPDM	-35˚F to 250˚F	Sewage with Oil	Nitrile	-20˚F to 212˚F
Ammonia, Anhydrous	Neoprene	-20˚F to 225˚F	Gasoline Keg	Nitrile	-20˚F to 212˚F	Sodium Hydroxide 20%	EPDM	-35˚F to 250˚F
Ammonia, Nitrate	EPDM	-20˚F to 250˚F	Gas Natural	Nitrile	-20˚F to 212˚F	Starch	EPDM	-35˚F to 250˚F
Ammonia, Water	EPDM	-20˚F to 250˚F	Glue Animal	Nitrile	-20˚F to 212˚F	Steam 250˚F	EPDM	-35˚F to 250˚F
Animal Fats	Nitrile	-20˚F to 212˚F	Green Liquor	EPDM	-20˚F to 212˚F	Stoffard Solvent	Nitrile	-20˚F to 80˚F
Black Liquor	EPDM	-20˚F to 250˚F	Hydraulic oil	Nitrile	-20˚F to 212˚F	Sulphuric Acid 10% 50%	Neoprene	-20˚F to 158˚F
Blast Furnace Gas	Neoprene	-20˚F to 225˚F	Hydrogen	Nitrile	-20˚F to 212˚F	Sulphuric Acid 100%	Viton	10˚F to 300˚F
Butane	Nitrile	-20˚F to 212˚F	JP4 JP5	Viton	-20˚F to 212˚F	Trichlorethylene Dry	Viton	10˚F to 300˚F
Bunker Oil “C”	Nitrile	-20˚F to 212˚F	Kerosene	Nitrile	0˚F to 212˚F	Triethanol Amine	EPDM	-35˚F to 250˚F
Calcium Chloride	EPDM	-20˚F to 250˚F	Ketone	EPDM	-35˚F to 250˚F	Varnish	Viton	10˚F to 300˚F
Carbon Dioxide	EPDM	-20˚F to 250˚F	Lime Slurry	EPDM	-35˚F to 250˚F	Water, Fresh	EPDM	-35˚F to 250˚F
Carbon Monoxide (Cold)	Neoprene	-20˚F to 150˚F	Methane	Nitrile	-20˚F to 212˚F	Water, Salt	EPDM	-35˚F to 250˚F
Carbon Monoxide (Hot)	Viton	10˚F to 300˚F	Methyl Ethyl Ketone	EPDM	-35˚F to 250˚F	Xylene	Viton	10˚F to 300˚F
Carbon Tetrachloride	Viton	10˚F to 300˚F	Naptha (Berzin)	Nitrile	-20˚F to 212˚F			

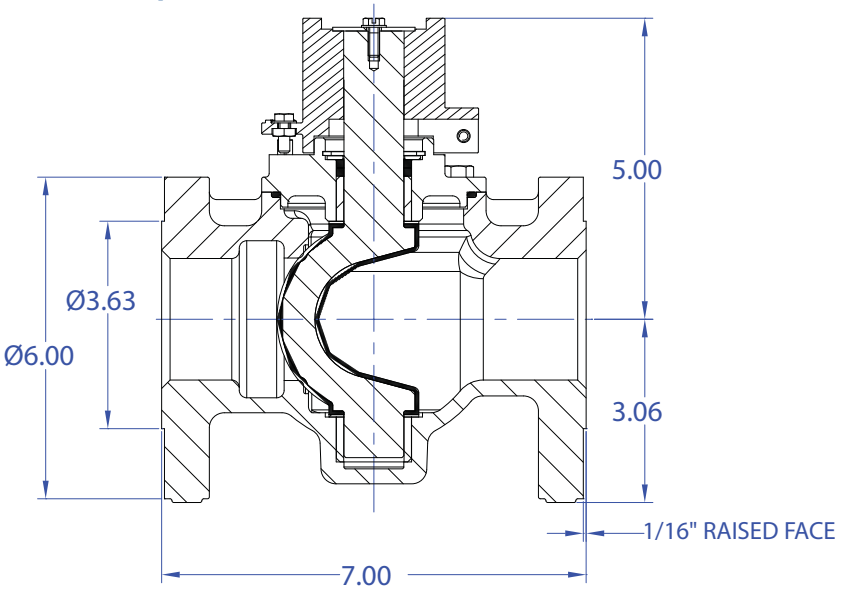
NOTE: Above elastomer/temperature chart are guidelines only. See Milliken Compatibility Chart for specific applications.

Threaded End:
Fig. 613A Ductile Iron/603AS Stainless Steel 1/2" - 2"



THREADED ENDS						
SIZE	1/2	3/4	1	1-1/4	1-1/2	2
A	2.13	2.13	2.13	3.00	3.00	3.00
B	1.88	1.88	1.88	2.50	2.50	2.50
C	4.00	4.00	4.00	5.50	5.50	5.50
D	½ " NPT	¾" NPT	1" NPT	1¼" NPT	1½" NPT	2" NPT
E	1.81	1.81	1.81	2.50	2.50	2.50
F	4.38	4.38	4.38	5.00	5.00	5.00
WEIGHT (approx.)	7.50	7.25	7.00	13.00	11.75	10.00

Flanged End:
Fig. 611A Ductile Iron/601AS Stainless Steel 2"



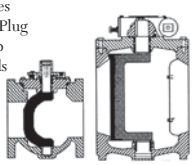
FLANGED ENDS	
SIZE	2
WEIGHT (approx.)	18.00

Note: RAISED FACE IS ONLY ON THE 2" FIG. 601AS STAINLESS STEEL.

Series 600/601
Eccentric Plug Valve

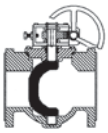
Flanged and MJ

Welded Nickel Seat
Stainless Steel Bearings
ANSI-B16.1 Flanges
Solid Ductile Iron Plug
Low Pressure Drop
Flanged & MJ Ends
Sizes 2"-72" FL
Sizes 3"-48" MJ



Series 601S
Eccentric Plug Valve

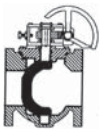
All Stainless Steel Construction
ANSI B16.5 Class 150 Flanges
Low Pressure Drop
Size: 1/2"-24"



Series 601RL
Eccentric Plug Valve

Rubber Lined

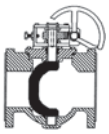
Soft Rubber Lining
Stainless Steel Bearings
ANSI B16.1 Flanges
Solid Ductile Iron Plug
Low Pressure Drop
Sizes 3"-54"



Series 602
Eccentric Plug Valve

High Pressure

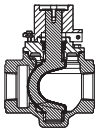
Welded Nickel Seat
Stainless Steel Bearings
ANSI B16.1 Class 250 Flanges
Solid Ductile Iron Plug
Low Pressure Drop
Sizes 2-1/2"-54"



Series 613A
Eccentric Plug Valve

Threaded End

Ductile Iron Construction
Round Port
Stainless Steel Bearings
Low Pressure Drop
Memory Stop
NPT End Connections
Sizes 1/2"-2"



Series 604
100% Port 3 Way Plug Valve

Three Way Valve

Solid Ductile Iron Plug
Stainless Steel Bearings
Low Pressure Drop
Lift & Turn NOT Required
High Solids & Flow Capacity
Sizes 3"-16"

Series 606
Eccentric Plug Valve

Grooved End

Welded Nickel Seat
Stainless Steel Bearings
AWWA C-606 Grooved
Solid Ductile Iron Plug
Low Pressure Drop
Ductile or Steel Pipe
Sizes 3"-24"

Series 611/610
Eccentric Plug Valve

Flanged and MJ

Ductile Iron Body
ANSI B16.1 Flanges
MJ AWWA C111
Welded Nickel Seat
Solid Ductile Iron Plug
Low Pressure Drop
Sizes 2"-72" FL
Sizes 3"-48" MJ

Model 625
Eccentric Plug Valve

Available in Threaded and Flanged Ends
Rated for 175 psi
Sizes 1/2"-4"
UL/CGA Listed

Series 600FP/601FP
Eccentric Plug Valve

Full/100% Port
Welded Nickel Seat
Stainless Steel Bearings
ANSI-B16.1 Flanges
Solid Ductile Iron Plug
Low Pressure Drop
Flanged & MJ Ends
Sizes 2"-48" FL
Sizes 3"-48" MJ

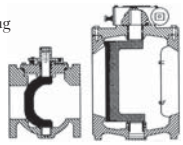


Figure 396/397
General Service Butterfly Valve

Complies with MSS SP 67
Ductile Iron Body
DI-NP Disc
Other Materials Upon Request
Wrench or Gear Operated Available
2"-48" Size Range

Figure 510A/511A
AWWA Butterfly Valve

Complies with AWWA C-504
Class 150B Flanged or MJ
Cast iron body and disc
Seat in body
Flow through disc on 24" and larger
Epoxy Paint on all sizes standard
3" -72"

Series 8500
AWWA Swing Check

Full waterway
Ductile Iron Construction
Weight or Spring
Air Cushion
SS body seat ring
Buna disc insert
Sizes 3"-24"

Series 8000
AWWA Swing Check

Full waterway
Weight or Spring
Bronze/SS Body Seat Ring
Bronze/Buna/EPDM disc insert
Sizes 2"-36"

Series 9000
AWWA Swing Check

Clear waterway
Weight or Spring
Air or Oil Cushion
Bronze/SS Body seat ring
Bronze/Buna/EPDM disc insert
Sizes 3"-72"

Model 720A
Wafer Check Valve

Center Guided
Check Valve
Rated for 250 psi
SS Disc/EPDM Seat
Sizes 2"-12"

Series 700
Wafer Check Valve

Wafer Check Valve

ANSI Class 125/150
High Flow Capacity
Narrow Face-to-Face
Sizes 3"-12"
316 SS Internals
Disc Position Indicator

Figure 851
Flex Check

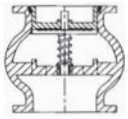
Million Cycle Certification
Complete Ductile Iron Construction
250 psi Pressure Rating
Fully Epoxy Lined Interior
No Internal Shafts, Bearings or Bushings
No External Levers, Weights or Springs
Mechanical Indicator (3"-16")
2"-24" Size Range
Backflush Devices
Proximity Switches

Figure 740A
Double Disc Check Valve

Wafer pattern check valve rated for 250 psi. Available in sizes 2"-48" with a SS Disc/EPDM Seat

Figure 821A
Globe Style Check Valve

Center guided check valve. SS Disc/EPDM Seat and is available in sizes 2"-36".



MILLIKEN VALVE

www.millikenvalve.com

190 Brodhead Road • Suite 100
Bethlehem, PA 18017
Phone (610) 861-8803 Fax (610) 861-8094

CS-312-200 : Identification sheet

VWTC PROJECT NUMBER:	5000218009	REV:	1
PROJECT NAME:	AEM AMARUQ	SUBMITTED TO (COMPANY):	AGNICO EAGLE MINES
ENGINEER:	Gabriel Hébert	SUBMITTED TO (RESPONSIBLE)	
PROJECT MANAGER:	Clément B	PROJECT NUM REFERENCE.:	
PHONE NUMBER:		LOT NUMBER:	

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
PRATT	ST-312-112	P2-011-V001	DIA: 100 mm (4")	ISOLATION VALVE	TYPE: PLUG | 175 PSI//MANUFACTURER : PRATT//MODEL : 601N1-L/4''/CONNECTION TYPE : FLANGED | DIA. 100 mm (4")//BODY : CAST IRON// ELASTOMER TRIM: BUNA-N | SEAT :| NICKEL// STEM : N/A			ACTIFLO RECIRCULATION LINE MODIFICATION		
PRATT	ST-312-112	P2-012-V001	DIA: 100 mm (4")	ISOLATION VALVE	TYPE: PLUG | 175 PSI//MANUFACTURER : PRATT//MODEL : 601N1-L/4''/CONNECTION TYPE : FLANGED | DIA. 100 mm (4")//BODY : CAST IRON// ELASTOMER TRIM: BUNA-N | SEAT :| NICKEL// STEM : N/A			ACTIFLO RECIRCULATION LINE MODIFICATION		
PRATT	ST-312-112	P2-014-V001	DIA: 100 mm (4")	ISOLATION VALVE	TYPE: PLUG | 175 PSI//MANUFACTURER : PRATT//MODEL : 601N1-L/4''/CONNECTION TYPE : FLANGED | DIA. 100 mm (4")//BODY : CAST IRON// ELASTOMER TRIM: BUNA-N | SEAT :| NICKEL// STEM : N/A			ACTIFLO RECIRCULATION LINE MODIFICATION		

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
PRATT	ST-312-112	P2-021-V001	DIA: 100 mm (4")	ISOLATION VALVE	TYPE: PLUG | 175 PSI//MANUFACTURER : PRATT//MODEL : 601N1-L/4''/CONNECTION TYPE : FLANGED | DIA. 100 mm (4")//BODY : CAST IRON// ELASTOMER TRIM: BUNA-N | SEAT :| NICKEL// STEM : N/A			ACTIFLO RECIRCULATION LINE MODIFICATION		
PRATT	ST-312-112	P2-022-V001	DIA: 100 mm (4")	ISOLATION VALVE	TYPE: PLUG | 175 PSI//MANUFACTURER : PRATT//MODEL : 601N1-L/4''/CONNECTION TYPE : FLANGED | DIA. 100 mm (4")//BODY : CAST IRON// ELASTOMER TRIM: BUNA-N | SEAT :| NICKEL// STEM : N/A			ACTIFLO RECIRCULATION LINE MODIFICATION		
PRATT	ST-312-112	P2-023-V001	DIA: 100 mm (4")	ISOLATION VALVE	TYPE: PLUG | 175 PSI//MANUFACTURER : PRATT//MODEL : 601N1-L/4''/CONNECTION TYPE : FLANGED | DIA. 100 mm (4")//BODY : CAST IRON// ELASTOMER TRIM: BUNA-N | SEAT :| NICKEL// STEM : N/A			ACTIFLO RECIRCULATION LINE MODIFICATION		

PRATT

Henry Pratt Company

Ballcentric® Plug Valve

Engineering Creative Solutions
for Fluid Systems Since 1901

A Tradition of Excellence

With the development of the first rubber seated butterfly valve more than 70 years ago, the Henry Pratt Company became a trusted name in the flow control industry, setting the standard for product quality and customer service. Today Pratt provides the following range of superior products to the water, wastewater and power generation industries.

Butterfly Valves: from 3" to 162"

Rectangular Valves: 1' x 1' to 14' x 16'

Ball Valves –
Rubber Seated: from 4" to 60"
Metal Seated: from 6" to 48"

Plug Valves: from 1/2" to 72", 100% port available up to 48", 3 ways

Air Valves for Water and Wastewater: from 1/2" to 20"

Hydraulic Control Systems

Valve Controls

Energy Dissipating Valves and Fixed Energy Dissipaters

Cone Valves

Check Valves

Plunger Valves

A Commitment to Meeting The Customers' Needs

Henry Pratt valves represent a long-term commitment to both the customer and to a tradition of product excellence. This commitment is evident in the number of innovations we have brought to the industries we serve. In fact, the Henry Pratt Company was the first to introduce many of the flow control products in use today, including the first rubber seated butterfly valve, one of the first nuclear N-Stamp valves, and the bonded seat butterfly valve.

Innovative Products For Unique Applications

Though many of the standard valves we produce are used in water filtration and distribution applications, Pratt has built a reputation on the ability to develop specialized products that help customers to meet their individual operational challenges.

Creative Engineering for Fluid Systems

Pratt's ability to provide practical solutions to complex issues is demonstrated by the following case histories.

Earthquake Proof Valves

Pratt designed and manufactured hydraulically actuated valves for a water storage application so that the valves would automatically operate in the event of earthquakes. This led to the development of a valve that will withstand acceleration forces of up to 6gs.

Custom Actuation/Isolation Valves

Pratt has designed and manufactured nuclear quality quarter-turn valves and parts since the first nuclear-powered generating plants were built. Our custom valves are able to close in a millisecond, using specially designed Pratt electro-pneumatic actuators.

Valves Designed for Harsh Environments

Pratt designed and manufactured a 144" diameter butterfly valve for the emergency cooling system at a jet engine test facility. The valve was designed to supply water to help dissipate the tremendous heat generated by the engines during testing.

PRATT
Henry Pratt Company

Through experience, commitment and creative engineering, Pratt is uniquely suited to provide superior products for our customers' special needs.
For more information, contact our corporate headquarters in Aurora, Illinois.

PRATT
Henry Pratt Company

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fax: 630.844.4160

Table of Contents

Ballcentric® Plug Valve

Scope of Line

The Henry Pratt criteria of quality, reliability, safety and value are embodied in the Ballcentric® plug valve, setting higher standards for dependable performance with excellent features achieved by the utilization of the very latest design and manufacturing techniques.

- Computer Aided Design
- High Integrity Casting
- CNC manufacturing delivers consistent sizes on all components

All complemented by rigorous Quality Control System

Body

Conforming to AWWA C504 wall thickness, the Ballcentric® plug valve body casting is in ASTM A126 CL B cast iron using high pressure molding techniques. Alternative flanged, grooved or mechanical joint ends are available.

Flange diameter, thickness and drilling conform to ANSI B16.1 Class 125 or 250.

Grooved ends meet AWWA C-606 for ductile or steel pipe. Mechanical joints to AWWA C111 (ANSI A21.11).

Seat

The Ballcentric® plug valve incorporates as standard, on 3" and larger, a 1/8" thick welded 99% nickel seat for corrosion and erosion resistance specifically profiled for low torque and extended seat life.

Stem Seal

High integrity sealing by combining the advantages of a resilient and abrasion resistant U-Cup seal. From vacuum to high pressure, the self-adjusting sealing system (per AWWA C504) gives positive, trouble-free service and is retained independently of the plug stem or external torque device, thereby eliminating periodic maintenance.

Bearings

The plug rotates in permanently lubricated 316 grade stainless steel bearings, located in the body and bonnet, along with upper and lower PTFE thrust washers, which ensure consistently low operating torque.

Plug

Supported on integral trunnions, the plug is totally encapsulated with an elastomer that is molded on 2 1/2" – 48" and vulcanized on 54" and larger to the casting providing tight shut off even under vacuum conditions. High integrity corrosion-free sealing is achieved by a variety of abrasion resistant elastomers which protect the plug right up to the trunnions. When assembled, the light compression of the elastomers onto PTFE thrust washers, prevents entry of abrasive materials into the bearings.

Bonnet Seal

Superior "O" ring sealing with metal/metal contact means lower bolting stresses compared with compression gaskets.

Flow

The port design (round on 2 1/2" – 12" and rectangular on 14" and larger) with streamlined internal contours gives the highest industry capacity straight through flow in the full open position, reducing turbulence and pressure drop and the effect of erosive media. Handling of sludges and slurries is therefore enhanced.

Interchangeable

Because of the common face to face dimension with wedge gate valves (3" – 12"), fitting the tight shut-off rotary Ballcentric® plug valve into existing systems is accomplished without pipeline modifications.

Travel Stops

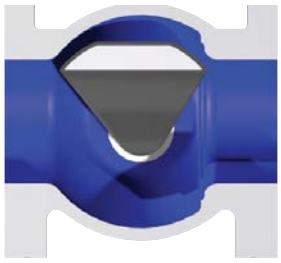
Adjustable open and closed travel stops are fitted as standard on both wrench and gear operated Ballcentric® plug valves.

Features and Benefits

- Valve in closed position for bubble tight shut-off
- Normal flow direction gives pressure assisted sealing
- Torques are low even in reverse flow

- Plug rotates away from the seat for instant opening
- Seat wear and operating torque reduced
- No further seat contact until valve is closed again

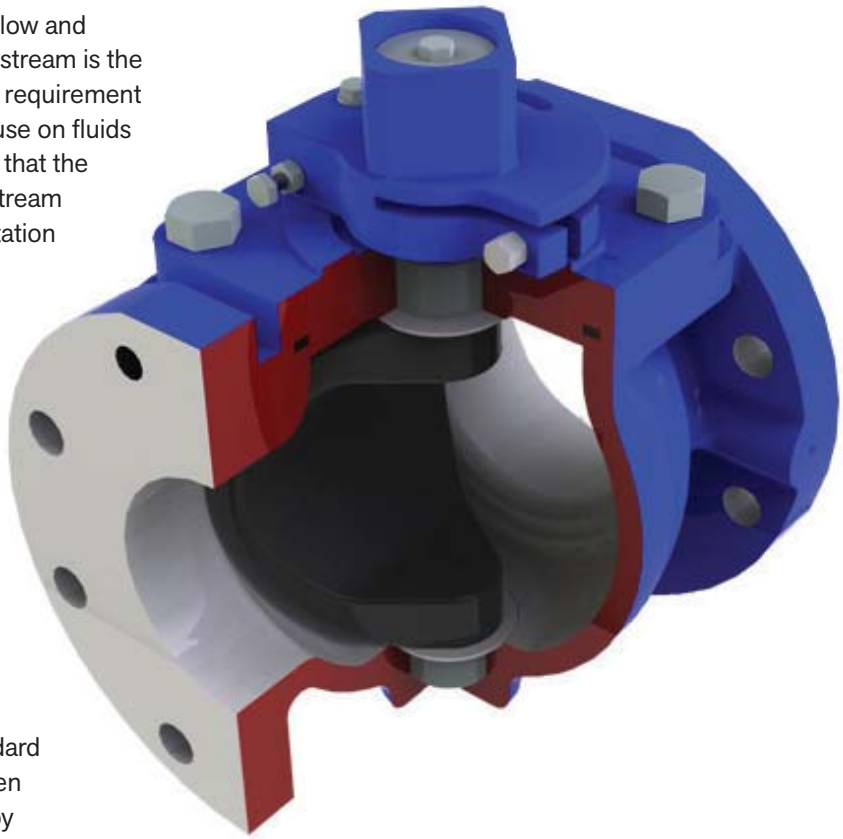
- Design of Ballcentric® plug valve allows modulating control over the full 90˚ travel
- Ideally suited for balancing service
- Standard rotary valve provides control and tight shut off in one valve



- Plug is out of flow path when fully open
- Straight through, uninterrupted smooth flow
- Round port reduces turbulence and erosion, lowers pumping costs and can be "pigged" to clean the pipeline

Installation

The Ballcentric® plug valve is suitable for flow and shut-off in either direction. Seat end downstream is the preferred orientation and any reverse flow requirement should be stated at the time of order. For use on fluids with suspended solids, it is recommended that the valve should be installed with the seat upstream and the valve stem horizontal with plug rotation to the top of the valve ensuring smooth operation.



In-Line Maintenance

In the unlikely event of stem leakage, the stem seals can be easily replaced without removing the bonnet. Access to the body for cleaning or inspection does not require removal from the line.

Modular Construction

Design of the bonnet and stem allows for on-site adaption of gear operators, power actuators, or extension devices on to standard valves. Conversion can be easily undertaken without removing the valve bonnet, thereby minimizing downtime.

Power Operation

Pneumatic, electric or hydraulic operation is available, complete with accessories such as limit switches, solenoid valves and positioners when required.

Dimensional Data

ORDERING INFORMATION

Valve Types	Designation
Mechanical Joint Cast Iron	600
Mechanical Joint Ductile Iron	610
ANSI 125 Flanged Cast Iron	601
ANSI 125 Flanged Ductile Iron	611
ANSI 150 Flanged Ductile Iron	621
ANSI 250 Flanged Ductile Iron	602
ANSI 125 Grooved for Steel Pipe	606S
ANSI 125 Grooved for Ductile Pipe	606D
ANSI 150 Flanged 316SS	601S
SEAT	
Nickel (3" & Larger)	N
Epoxy (2½" ONLY)	E
316SS (on stainless steel valve only)	S
Rubberlined	RL
Glasslined	GL
ELASTOMER TRIM	
EPDM	0
Buna-Nitrile	1
Viton	2
Neoprene	3
Natural	4
MANUAL OPERATORS	
Above Ground Gear and Handwheel	AGHW
Above Ground Gear with 2" Nut	AGNUT
Buried Gear with 2" Nut	BG
Memory Stop Gear with Handwheel	MGHW
Lever / Wrench (8" & smaller)	L
Direct Nut (8" & smaller)	TC

Example: 4" 601N3AGHW = 4" ANSI 125 Flanged, Nickel Seat, Neoprene plug with Above Ground Gear and Handwheel

Valves are only tested for bi-directional shut-off if specified at time of order. Contact Henry Pratt for bi-directional ratings.

NOTE: We recommend mechanical joint or buried flanged valves to have gear operators

NOTE: We recommend valves for bi-directional service to have gear operators

PRESSURE RATING

12" and smaller	ANSI 125	175 psi
14" and larger	ANSI 125	150 psi
20" and smaller	ANSI 150	285 psi
12" and smaller	ANSI 250	400 psi
14" and larger	ANSI 250	300 psi

Body Hydrotest = 150% of rated pressure / Seat Test = 100% of rated pressure Testing per AWWA C517

ELASTOMERS AVAILABLE FOR BALLCENTRIC® PLUG VALVE

Natural rubber is also available.

Nitrile

A general purpose material sometimes referred to as BUNA-N or HYCAR with a –20°F to 212°F temperature range. Used on sewage, water, hydrocarbon and mineral oils.

EPDM

An excellent polymer for use on chilled water through to LP steam applications having a temperature range of –35°F to 250°F. Resistance to many acids, alkalies, detergents, phosphate esters, alcohols and glycols is an added benefit.

Neoprene

This versatile material shows outstanding resistance to abrasion and ozone. Chemical resistance to a wide range of petroleum base products and dilute acids and alkalies. Temperature range –20°F to 225°F.

Viton

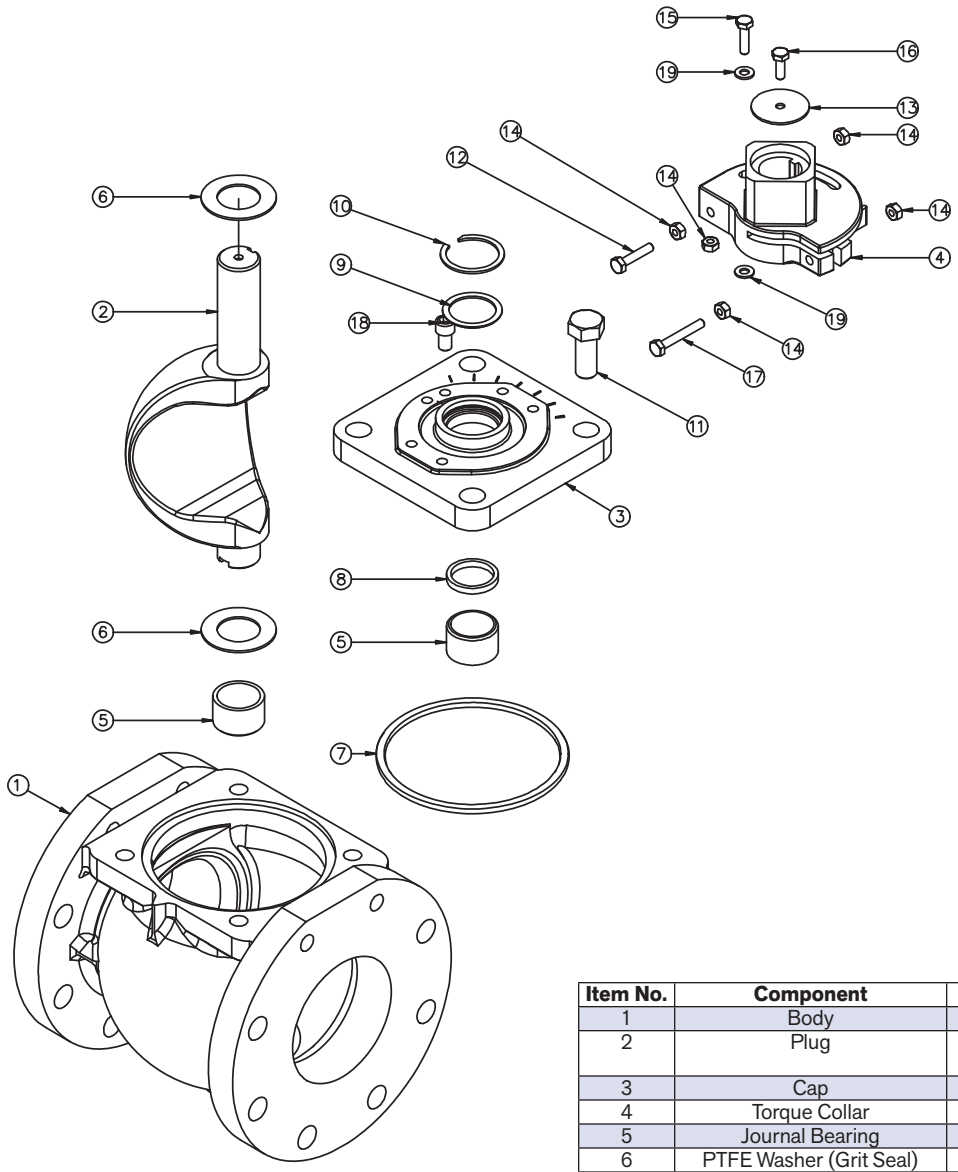
Retention of mechanical properties at high temperature is an important feature of this elastomer: temperature range is –10°F to 300°F. It also has excellent resistance to oils, fuels, lubricants and most mineral acids and aromatic hydrocarbons.
Note: Not for water or steam applications.

Elastomer Selection Chart

Service	Elastomer	Average Useful Temp. Range	Service	Elastomer	Average Useful Temp. Range	Service	Elastomer	Average Useful Temp. Range
Acetone	EPDM	–35°F to 250°F	Caustic Soda	EPDM	–35°F to 250°F	Oil, Animal	Nitrile	–20°F to 212°F
Air	EPDM	–35°F to 250°F	Cement Slurry	EPDM	–35°F to 250°F	Oil, Mobil Therm Light	Viton	10°F to 250°F
Air w/Oil	Nitrile	0°F to 212°F	Copper Sulphate	EPDM	–35°F to 250°F	Oil, Mobil Therm 600	Viton	10°F to 250°F
Alcohol AMYL	EPDM	0°F to 212°F	Creosote (Coal)	Nitrile	–20°F to 212°F	Oil, Mobil Therm 603	Nitrile	–20°F to 212°F
Alcohol Aromatic	Viton	10°F to 250°F	Coal Slurry	Nitrile	–20°F to 212°F	Oil, Lubricating	Nitrile	–20°F to 212°F
Alcohol Butyl	Neoprene	–20°F to 225°F	Diesel Fuel No. 3	Nitrile	–20°F to 212°F	Oil, Vegetable	Nitrile	–20°F to 212°F
Alcohol Denatured	Nitrile	–20°F to 212°F	Diethylene Glycol	EPDM	–35°F to 250°F	Paint, Latex	Nitrile	–20°F to 212°F
Alcohol Ethyl	EPDM	–20°F to 250°F	Ethylene Glycol	EPDM	–35°F to 250°F	Phosphate Ester	EPDM	–35°F to 250°F
Alcohol Grain	Nitrile	–20°F to 212°F	Fatty Acid	Nitrile	–20°F to 212°F	Propane	Nitrile	–20°F to 212°F
Alcohol Isopropyl	Neoprene	–20°F to 225°F	Fuel Oil No. 2	Nitrile	–20°F to 212°F	Rape Seed Oil	EPDM	–35°F to 250°F
Alcohol Methyl	EPDM	–20°F to 250°F	Fertilizer Liquid H4N2O2	EPDM	–35°F to 250°F	Sewage with Oils	Nitrile	–20°F to 212°F
Ammonia Anhydrous	Neoprene	–20°F to 225°F	Gasoline Keg	Nitrile	–20°F to 212°F	Sodium Hydroxide 20%	EPDM	–35°F to 250°F
Ammonium Nitrate	EPDM	–20°F to 250°F	Gas Natural	Nitrile	–20°F to 212°F	Starch	EPDM	–35°F to 250°F
Ammonia, water	EPDM	–20°F to 250°F	Glue, Animal	Nitrile	–20°F to 212°F	Steam to 250°F	EPDM	–35°F to 250°F
Animal Fats	Nitrile	–20°F to 212°F	Green Liquor	EPDM	–20°F to 212°F	Stoddard, Solvent	Nitrile	–20°F to 80°F
Black Liquor	EPDM	–20°F to 250°F	Hydraulic Oil (Petro)	Nitrile	–20°F to 212°F	Sulphuric Acid 10% 50%	Neoprene	–20°F to 158°F
Blast Furnace Gas	Neoprene	–20°F to 225°F	Hydrogen	Nitrile	–20°F to 212°F	Sulphuric Acid 100%	Viton	10°F to 300°F
Butane	Nitrile	–20°F to 212°F	JF4, JP5	Viton	–20°F to 212°F	Trichloroethylene Dry	Viton	10°F to 300°F
Bunker Oil "C"	Nitrile	–20°F to 212°F	Kerosene	Nitrile	0°F to 212°F	Triethanol Amine	EPDM	–35°F to 250°F
Calcium Chloride	EPDM	–20°F to 250°F	Ketone	EPDM	–35°F to 250°F	Varnish	Viton	10°F to 300°F
Carbon Dioxide	EPDM	–20°F to 250°F	Lime Slurry	EPDM	–35°F to 250°F	Water, Fresh	EPDM	–35°F to 250°F
Carbon Monoxide (Cold)	Neoprene	–20°F to 150°F	Methane	Nitrile	–20°F to 212°F	Water, Salt	EPDM	–35°F to 250°F
Carbon Monoxide (Hot)	Viton	10°F to 300°F	Methyl Ethyl Ketone	EPDM	–35°F to 250°F	Xylene	Viton	10°F to 300°F
Carbon Tetrachloride	Viton	10°F to 300°F	Naptha (Berzin)	Nitrile	–20°F to 212°F			

NOTE: Above elastomer/temperature chart are guidelines only. See Henry Pratt Compatibility Chart for specific applications.

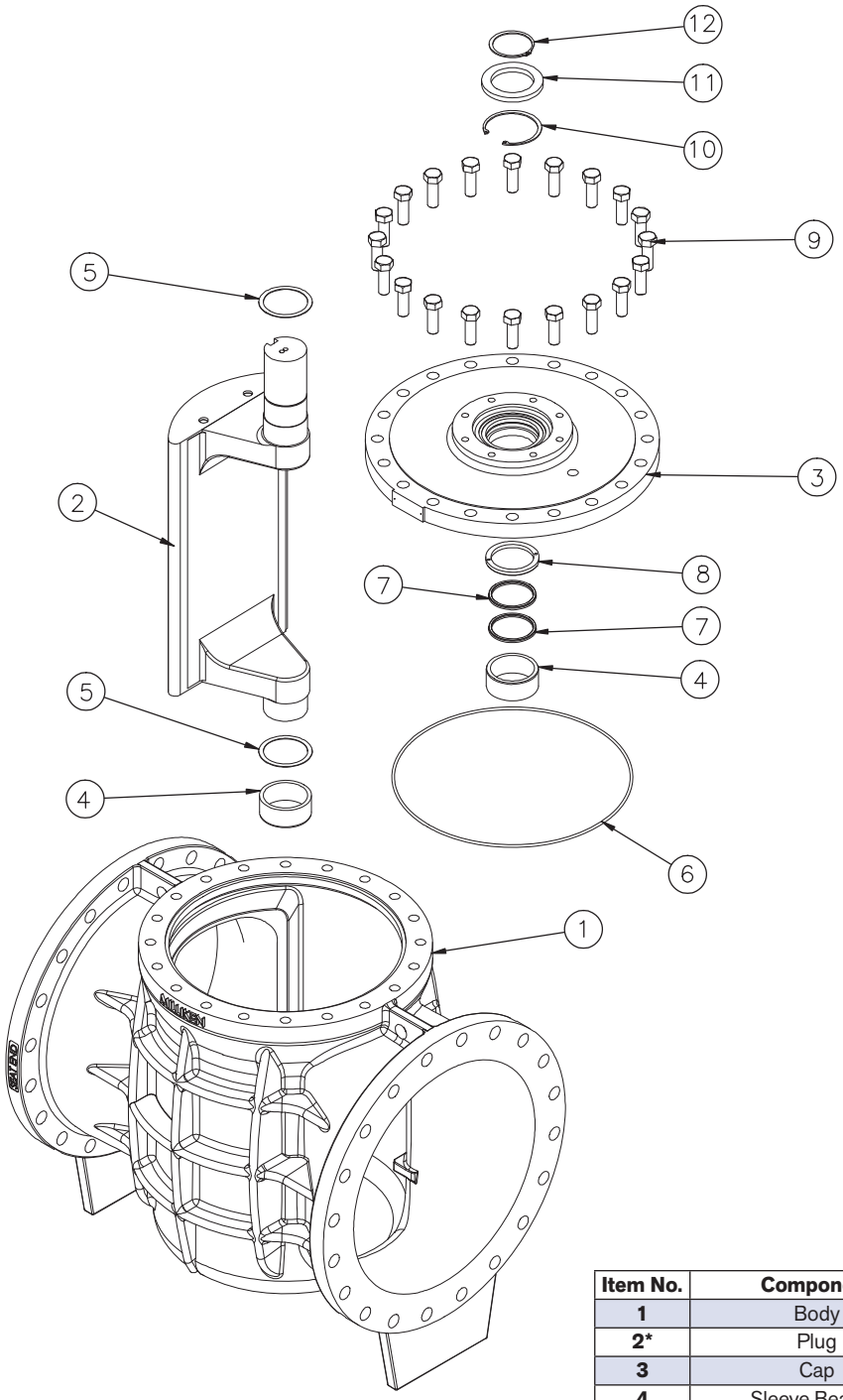
Standard Materials of Construction, Fig. 601/600, 12" & Smaller



Item No.	Component	Material
1	Body	Cast Iron A126 Class B
2	Plug	Rubber Coated Ductile Iron ASTM A536
3	Cap	Cast Iron A126 Class B
4	Torque Collar	Ductile Iron ASTM A536
5	Journal Bearing	St.Steel – ANSI 316
6	PTFE Washer (Grit Seal)	PTFE
7	O Ring	Elas. as Spec.
8	U Cup Seal	Elas. as Spec.
9	Washer	Brass – ASTM B-138-675
10	Internal Snap Ring	Spring Steel
11	Setscrew	Steel (Zinc Plated)
12*	Closed Stop	Steel (Zinc Plated)
13*	Locking Washer	Steel
14*	Nut	Steel (Zinc Plated)
15*	Open Stop	Steel (Zinc Plated)
16*	Setscrew	Steel (Zinc Plated)
17*	Torque Bolt	Steel (Zinc Plated)
18*	Travel Stop	Steel
19*	Washer	Steel

***NOTE:** Torque Collar Assembly on 8" and Smaller

Standard Materials of Construction, Fig. 601/600, 14" & Larger



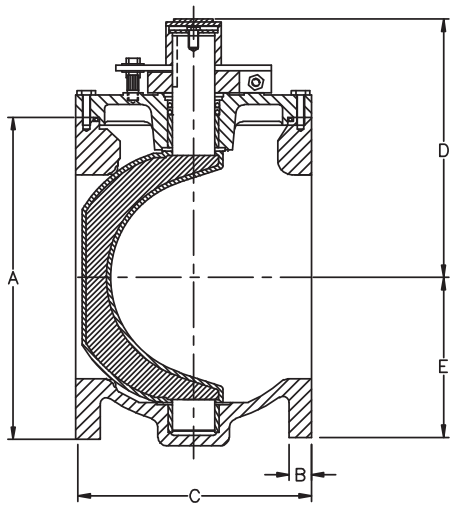
Item No.	Component	Material	Qty.
1	Body	Cast Iron A126 Class B	1
2*	Plug	Rubber Coated See Note 1	1
3	Cap	Cast Iron A126 Class B	1
4	Sleeve Bearing	Stainless Steel/Bronze	2
5	PTFE Washer (Grit Seal)	PTFE	2
6	Cap "O" Ring	Elas. as Spec.	1
7	U Cup Seal	Elas. as Spec.	2
8*	Seal Retaining Ring	See Note 2	1
9	Cap Screw	Steel (Zinc Plated)	A/R
10	Internal Snap Ring	Spring Steel	1
11	Support Collar	Steel	1
12	External Snap Ring	Spring Seal	1

***NOTE 1:** Plugs: Ductile Iron – ASTM A536 on 14" – 20"
Cast Iron – A126 Class B on 24" and larger

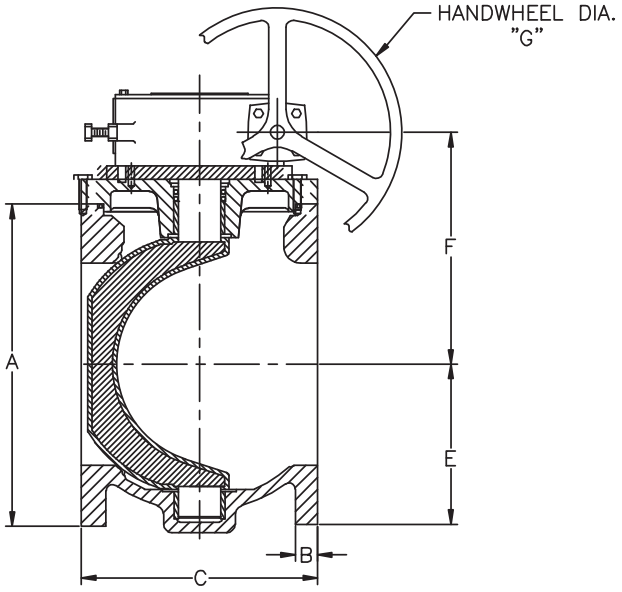
***NOTE 2:** Seal Retaining Ring: Brass – ASTM B-138-675 on 14" – 20" Steel on 24" and larger

Fig. 601 Cast Iron / 611 Ductile Iron – Flanged End 2 1/2" – 12", 175 PSI

2½" – 8" VALVES ONLY



2½" – 12" VALVES



FLANGED END – ANSI 125								
SIZE	**2.50**	**3**	**4**	**5**	**6**	**8**	**10***	**12***
A	7.00	7.50	9.00	10.00	11.00	13.50	16.00	19.00
B	.69	.75	.94	.94	1.00	1.13	1.19	1.25
C	7.50	8.00	9.00	10.00	10.50	11.50	13.00	14.00
D	6.19	6.19	7.25	8.38	8.38	10.69	–	–
E	3.50	3.75	4.50	5.75	5.75	7.63	8.88	10.00
F	5.16	5.16	6.31	7.56	7.56	9.63	11.13	12.81
G	6.00	6.00	6.00	6.00	6.00	12.00	12.00	12.00
WEIGHT (approx.)	30	40	70	105	115	190	345**	440**

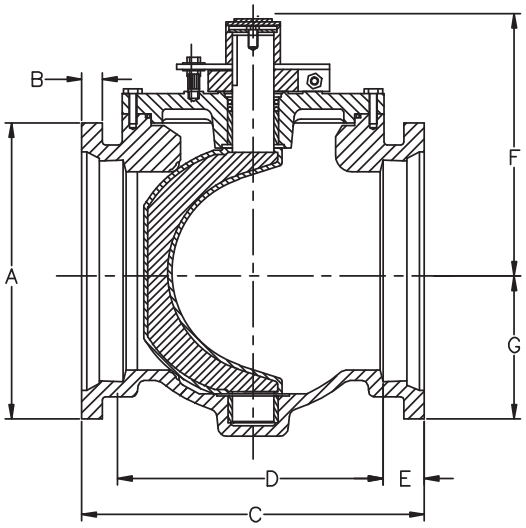
*10" & above have gear operators as standard

**Weight includes gear operator

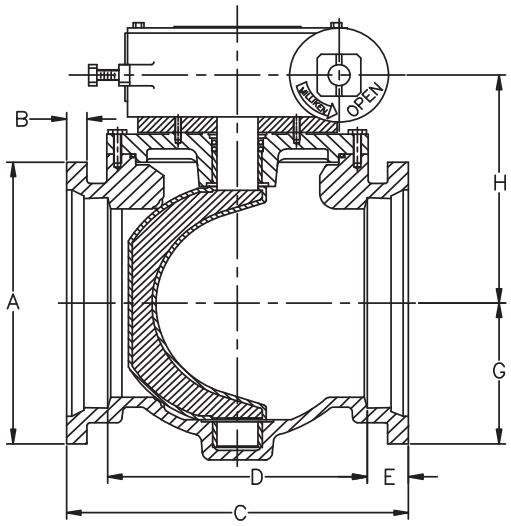
NOTE: Drawings are for information purposes only; please request certified drawings before preparing piping diagrams

Fig. 600 Cast Iron / 610 Ductile Iron – Mechanical Joint 3" – 12", 175 PSI

3" – 8" VALVES ONLY



3" – 12" VALVES



MECHANICAL JOINT END						
SIZE	**3**	**4**	**6**	**8**	**10***	**12***
A	7.69	9.00	11.13	13.38	15.63	17.94
B	.94	1.00	1.06	1.13	1.19	1.25
C	11.50	14.25	15.75	17.38	15.63	20.75
D	6.00	9.25	10.75	12.39	14.39	15.75
E	2.75	2.50	2.50	2.50	2.50	2.50
F	6.19	7.25	8.38	10.69	–	–
G	3.84	4.50	5.56	6.69	7.81	8.97
H	5.16	6.31	7.56	9.63	11.13	12.81
WEIGHT (approx.)	50	80	125	200	360**	480**

*10" & above have gear operators as standard

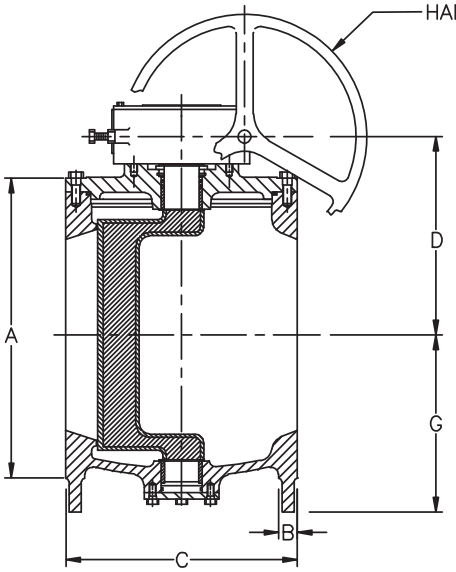
**Weight includes gear operator

We recommend gears on all Mechanical Joint Valves

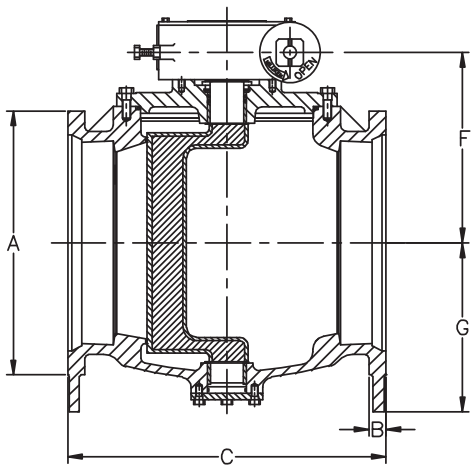
NOTE: Drawings are for information purposes only; please request certified drawings before preparing piping diagrams

Fig. 601 Cast Iron / 611 Ductile Iron Flanged End
Fig. 600/610 Ductile Iron Mechanical Joint End
14" & Larger, 150 PSI

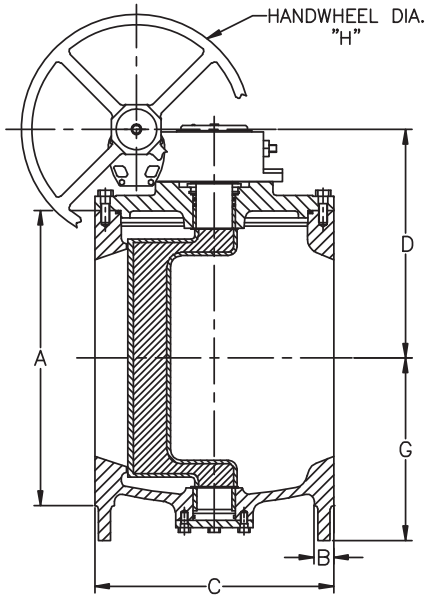
14" –20" VALVES



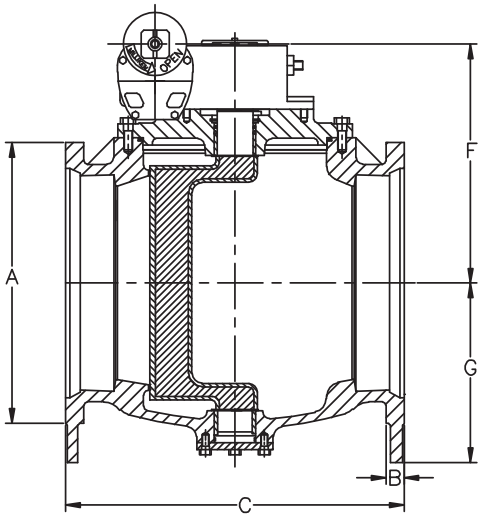
14" –20" VALVES



24" VALVES AND LARGER



24" VALVES AND LARGER



FLANGED END – ANSI 125										
SIZE	**14**	**16**	**18**	**20**	**24**	**30**	**36**	**42**	**48**	**54**
A	21.00	23.50	25.00	27.50	32.00	38.75	46.00	53.00	59.00	66.25
B	1.38	1.44	1.56	1.69	1.88	2.13	2.38	2.63	2.75	3.00
C	17.00	17.75	21.50	23.50	42.00	51.00	60.00	72.00	84.00	96.00
D	14.56	15.81	16.36	17.63	25.13	29.00	33.51	33.88	39.57	50.86
G	13.00	14.00	15.00	16.00	21.62	24.43	29.00	29.00	36.00	36.00
H	18.00	18.00	18.00	18.00	24.00	24.00	24.00	30.33	30.00	30.00
WEIGHT (approx.)	905	1030	1355	1880	3800	5200	6950	10160	13350	15100

Flanged Valves Meet ANSI B16.1

MECHANICAL JOINT END									
SIZE	**14**	**16**	**18**	**20**	**24**	**30**	**36**	**42**	**48**
A	20.13	22.56	24.84	27.06	31.50	39.13	46.00	53.13	60.00
B	1.31	1.38	1.43	1.50	1.62	1.68	2.00	2.00	2.00
C	24.50	27.25	29.25	31.00	42.00	51.00	60.00	72.00	84.00
F	14.56	15.81	16.36	17.63	25.13	29.00	33.51	33.88	39.57
G	13.00	14.00	15.00	16.00	21.62	24.75	29.00	29.00	36.00
WEIGHT (approx.)	905	1030	1355	1880	3800	5200	6950	10160	13350

Mechanical Joint Valves Meet ANSI 21.11 & AWWA C-111

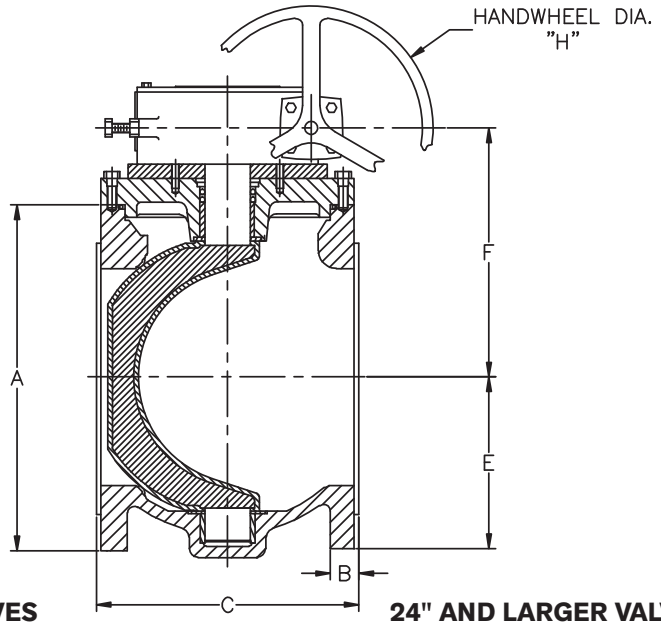
Weight includes gear operator

NOTE: Drawings are for information purposes only; please request certified drawings before preparing piping diagrams.

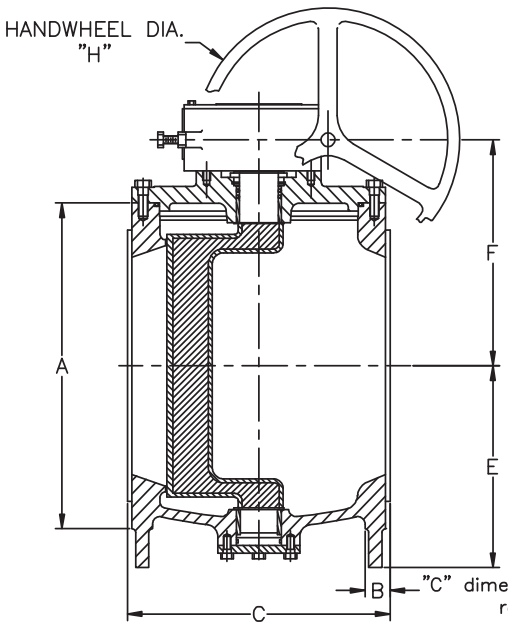
NOTE: Dimensions on 60" and larger available upon request.

Fig. 602 Class 250 Flanged End
2 1/2" – 12", 400 PSI, 14" – 36", 300 PSI

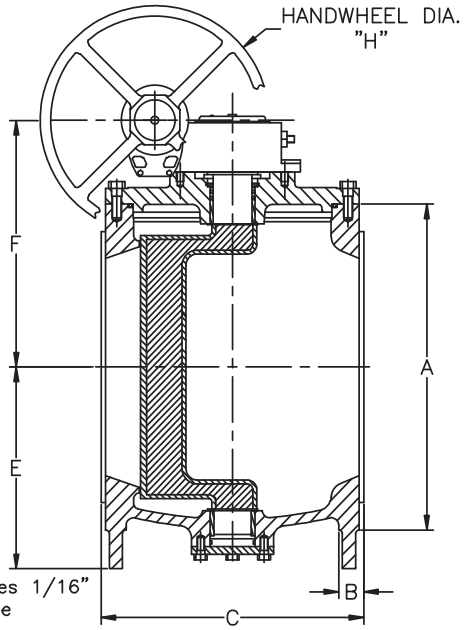
2½" – 12" VALVES



14" – 20" VALVES



24" AND LARGER VALVES



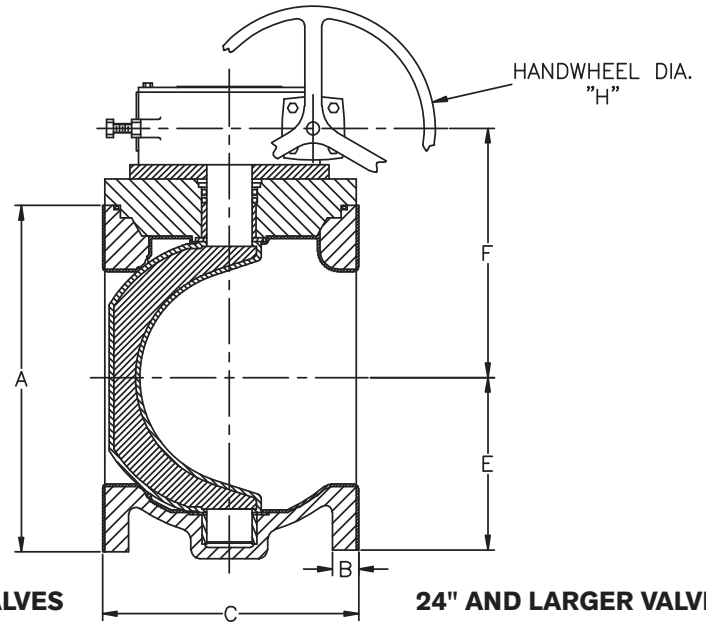
"C" dimen. includes 1/16" raised face

FLANGED END – ANSI 250															
SIZE	**2.50**	**3**	**4**	**5**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**24**	**30**	**36**
A	7.50	8.25	10.00	11.00	12.50	15.00	17.50	20.50	23.00	25.50	28.00	30.50	36.00	43.00	50.00
B	1.06	1.13	1.25	1.38	1.44	1.63	1.88	2.00	2.12	2.25	2.38	2.50	2.75	3.00	3.38
C	9.50	11.13	12.00	15.00	15.88	16.50	18.00	19.75	18.50	19.38	23.13	25.00	42.88	51.88	61.00
E	3.50	3.75	4.50	5.75	5.75	17.63	8.88	10.00	13.00	14.00	15.00	16.00	21.62	24.75	29.00
F	5.16	5.16	6.31	7.56	7.56	9.63	11.13	12.81	14.56	15.81	16.36	17.63	22.81	27.59	33.00
H	6.00	6.00	6.00	6.00	6.00	12.00	12.00	12.00	18.00	18.00	18.00	18.00	24.00	24.00	24.00
WEIGHT (approx.)	70	80	120	162	170	275	398	590	980	1125	1830	2060	4160	5700	7670

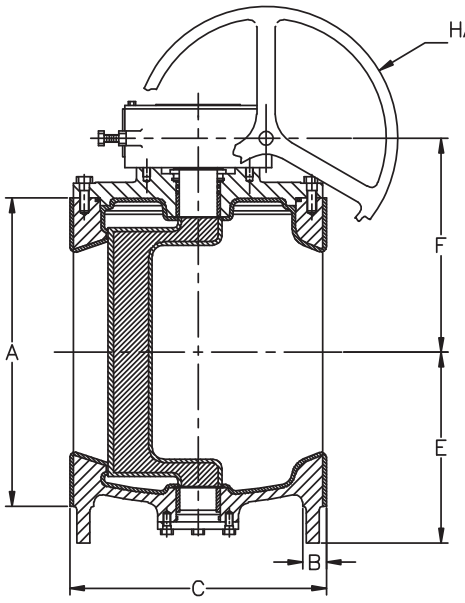
All above have gear operators as standard
Weight includes gear operator
NOTE: Drawings are for information purposes only; please request certified drawings before preparing piping diagrams
NOTE: Dimensions on 42" and larger available upon request

Fig. 601RL Rubberlined – Flanged End
3" – 12", 175 PSI, 14" & Larger, 150 PSI

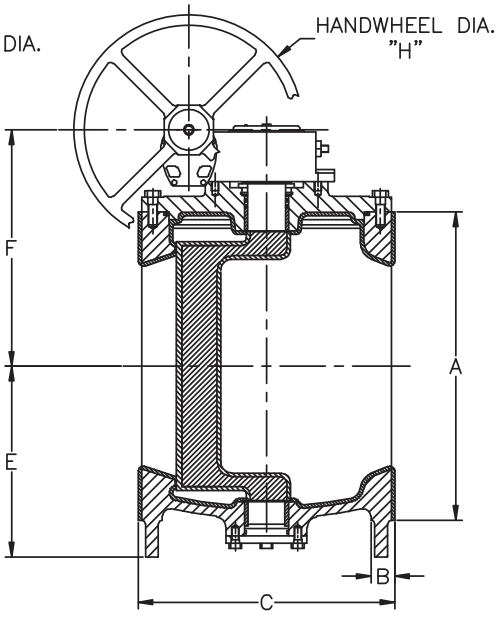
3" – 12" VALVES



14" – 20" VALVES



24" AND LARGER VALVES

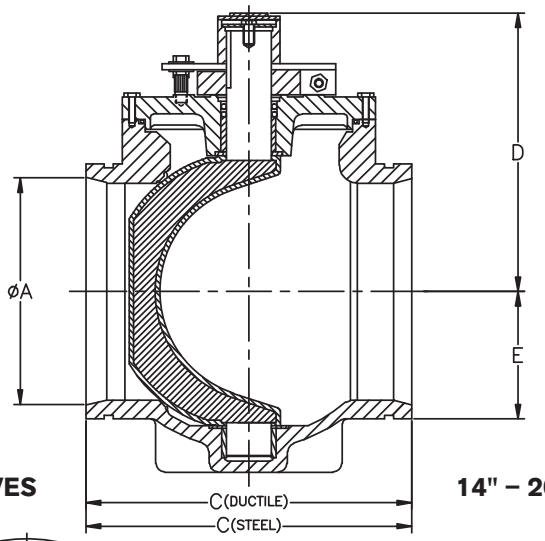


FLANGED END – ANSI 125 RUBBER LINED															
SIZE	**3**	**4**	**5**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**24**	**30**	**36**	**42**
A	7.50	9.00	10.00	11.00	13.50	16.00	19.00	21.00	23.25	25.00	27.50	32	38.75	46.00	53.00
B	.88	1.07	1.07	1.13	1.26	1.32	1.38	1.26	2.25	2.38	2.50	2.75	3.00	3.38	3.38
C	8.25	9.25	10.25	10.75	11.75	13.25	14.25	17.25	18.00	21.75	23.75	42.25	51.25	60.25	72.25
E	3.75	4.50	7.75	7.75	7.63	8.88	10.00	13.00	14.00	15.00	16.00	21.63	24.75	29.00	29.00
F	5.16	6.31	7.56	7.56	9.63	11.13	12.81	14.56	15.81	16.36	17.63	25.13	29.00	33.51	33.88
H	6.00	6.00	6.00	6.00	12.00	12.00	12.00	18.00	18.00	18.00	18.00	24.00	24.00	24.00	24.00
WEIGHT (approx.)	70	100	135	145	240	345	440	905	1030	1355	1880	3800	5200	6940	10160

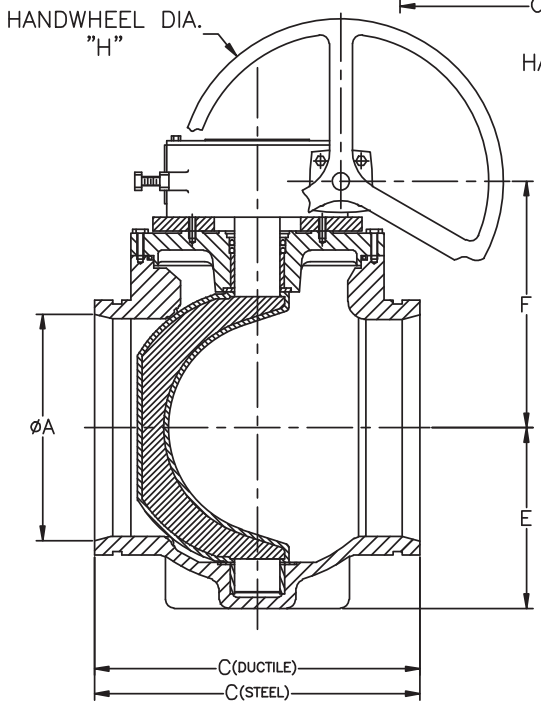
All above have gear operators as standard
Weight includes gear operator
NOTE: Drawings are for information purposes only; please request certified drawings before preparing piping diagrams
NOTE: Dimensions on 48" and larger available upon request

Fig. 606 Grooved End
2 1/2" – 12", 175 PSI, 14" – 20", 150 PSI

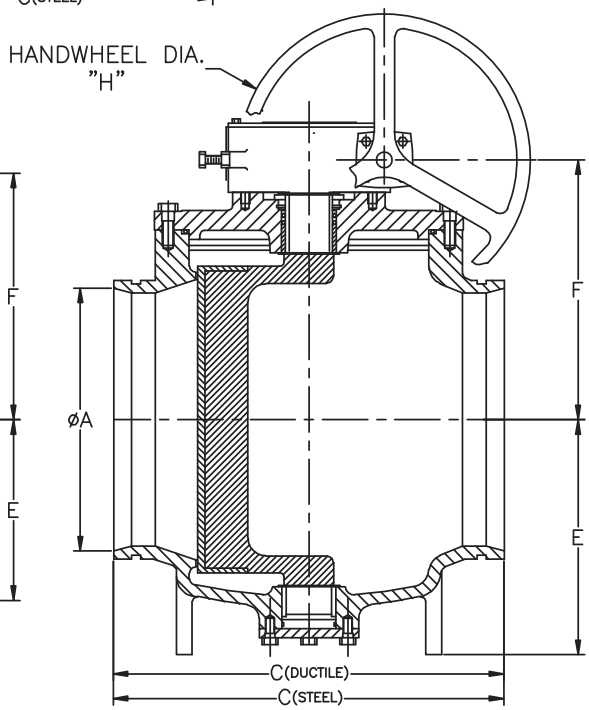
2½" – 8" VALVES



2½" – 12" VALVES



14" – 20" VALVES



GROOVED END – AWWA 606												
SIZE	2.50	3	4	5	6	8	10*	12*	14*	16*	18*	20*
A	2.50	3.00	4.00	5.00	6.00	8.00	10.00	12.00	14.00	15.25	16.19	18.06
C (Duct.)	N/A	9.06	10.25	N/A	12.50	14.00	16.56	18.00	21.63	N/A	27.50	30.00
C (Steel)	7.13	8.50	10.13	12.38	12.38	13.88	16.44	17.88	21.63	22.50	27.50	30.00
D	6.19	6.19	7.25	8.38	8.38	10.69	–	–	–	–	–	–
E	3.50	3.75	4.50	5.75	5.75	7.63	8.88	10.00	10.00	14.00	15.00	16.00
F	5.16	5.16	6.31	7.56	7.56	9.63	11.13	12.86	13.56	15.81	16.35	17.63
H	6.00	6.00	6.00	6.00	6.00	12.00	12.00	12.00	12.00	18.00	18.00	18.00
WEIGHT (approx.)	20	30	50	70	80	145	325**	420**	RTF	RTF	RTF	RTF

*10" & above have gear operators as standard

**Weight includes gear operator

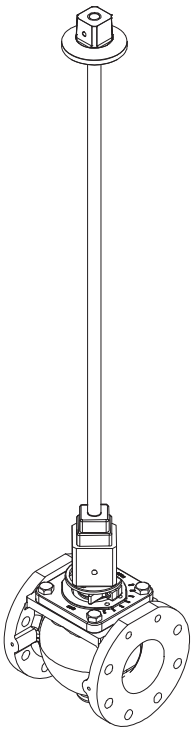
NOTE: Drawings are for information purposes only; please request certified drawings before preparing piping diagrams

NOTE: Larger sizes are available. Contact Henry Pratt Valve for data.

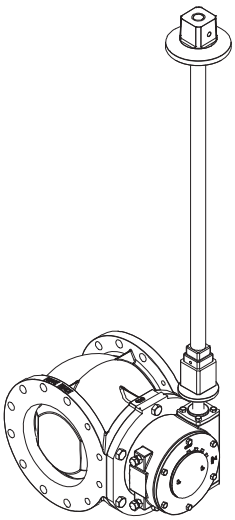
Adaption

**A range of extended stems & floor mounted stands for remote operation, particularly in buried service, are available.
Chainwheels & locking devices are readily incorporated onto the Ballcentric® Plug Valve.**

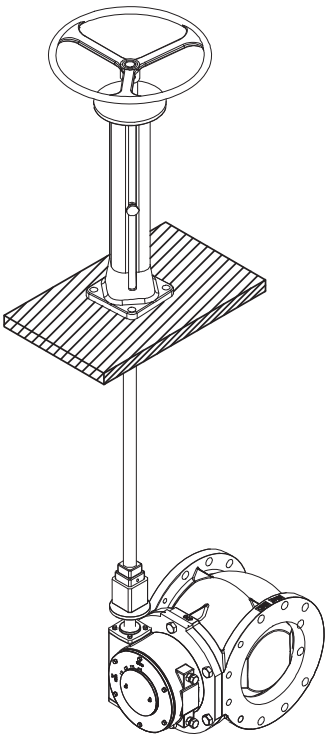
Valve with extended stem & 2" nut (Only for 8" and smaller valves)



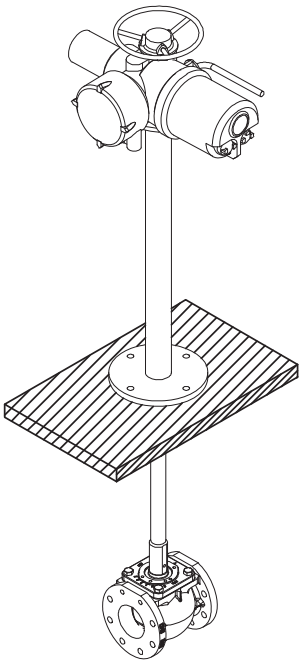
Valve with extended stem, buried gear and 2" nut



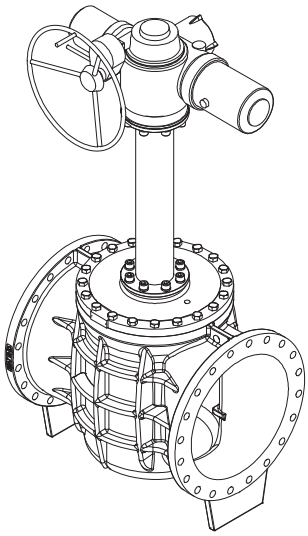
Valve with indicating floorstand



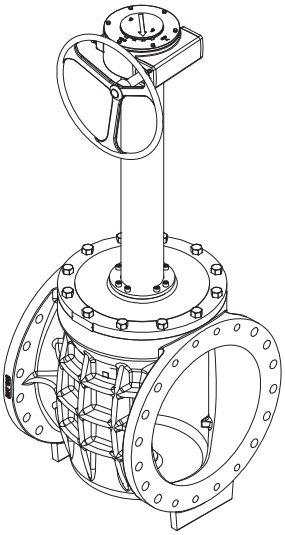
Valve with non-indicating floorstand & motor operator



Valve with extended bonnet & motor operator



Valve with extended bonnet with gear



Technical Specification Ballcentric® Series 601/600 Plug Valves

AWWA C517-09 Standards
Valves shall be of the non-lubricated eccentric type with an elastomer covering all seating surfaces. The elastomer shall be suitable for the service intended. Flanged valves shall be manufactured in accordance with **ANSI B16.1 Class 125/150** including facing, drilling and flange thickness. Mechanical joint ends shall be in compliance with **AWWA/ANSI C-111-92**. Grooved ends shall be manufactured to the dimensions of **ANSI/AWWA C606** for ductile or steel pipe as required. Ports shall be round on sizes 2½"-12" and rectangular port design on valves 14" and larger. All valves shall be capable of being "pigged" with a soft pig when required.
Valve bodies shall be of **ASTM A-126 Class B** cast iron in accordance with **AWWA C-517-09 Section 4.3.3.1**. Valves 3" and larger shall be furnished with a welded-in overlay seat of 1/8" thick of not less than 99% nickel in accordance with **AWWA C-517-09, Section 4.3.3.4**. Sprayed, plated or screwed-in seats are not acceptable.

Plugs shall be of **ASTM A-536-Grade 65-45-12** for sizes 20" and smaller, and **ASTM A126 Class B Cast Iron** for sizes 24" and larger in compliance with **AWWA C-517-09 Sections 4.3.3.1 and 4.3.3.2**. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit from entering the bearing and seal area.

Valves shall be furnished with replaceable sleeve type bearings conforming to **AWWA C-517-09, Section 4.3.3.6**. Bearings shall be of sintered, oil impregnated type 316 stainless steel **ASTM A-743 Grade CF-8M**. Valve shaft seals shall be of the "U" cup type in accordance with **AWWA C-517-09 Section 4.4.7**. Seals shall be self adjusting and repackable without removing the bonnet from the valve.

Wrench operated valves 2½"-8" shall be capable of being converted to worm gear or automated operation without removing the bonnet or plug from the valve. All wrench operated valves shall be equipped with a 2" square nut for use with removeable levers or extended "T" handles.

Worm gear operators, where required, shall be of the heavy duty construction with the ductile iron quadrant supported on the top and bottom by oil impregnated bronze bearings. The worm gear and shaft shall be manufactured of hardened steel and run on high efficiency roller bearings.

Valves shall be designed and manufactured to shut off bubble tight at 175 psi for valves 2½"-12" and 150 psi for valves 14" and larger. Each valve shall be given a hydrostatic and seat test with the test results being certified when required by the customer. Certified copies of Proof-of-Design test reports shall be furnished as outlined in **AWWA C-517-09 Section 5.2.2** when requested.

Plug valves shall be Ballcentric® Plug Valve Series 601/600 as manufactured by Henry Pratt Company of Aurora, Illinois.

Technical Specification Ballcentric® Series 602 ANSI Class 250 Plug Valves

AWWA C517-09 Standards
Valves shall be of the non-lubricated eccentric type with an elastomer covering all seating surfaces. The elastomer shall be suitable for the service intended. Flanged valves shall be manufactured in accordance with **ANSI B16.1 Class 250** including facing, drilling and flange thickness. Ports shall be round on sizes 2½" through 12" to facilitate "pigging" when required. Valves 14" and larger shall be of a rectangular port design.
Valve bodies shall be of **ASTM A-536 Grade 65-45-12** ductile iron in accordance with **AWWA C-517-09 Section 4.3.3.2**. Valves 3" and larger shall be furnished with a welded-in overlay seat of 1/8" thick of not less than 99% nickel in accordance with **AWWA C-517-09 Section 4.3.3.4**. Sprayed, plated or screwed-in seats are not acceptable.

Plugs shall be of **ASTM A-536-Grade 65-45-12** in compliance with **AWWA C-517-09 Section 4.3.3.2**. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit form entering the bearing and seal area.

Valves shall be furnished with replaceable sleeve type bearings conforming to **AWWA C-517- 09 Section 4.3.3.6**. Bearings shall be of sintered, oil impregnated type 316 stainless steel **ASTM A-743 Grade CF-8M**. Valve shaft seals shall be of the "U" cup type in accordance with **AWWA C-517-09 Section 4.4.7**. Seals shall be self adjusting and repackable without removing the bonnet from the valve.

Worm gear operators shall be of the heavy duty construction with the ductile iron quadrant supported on the top and bottom by oil impregnated bronze bearings. The worm gear and shaft shall be manufactured of hardened steel and run on high efficiency roller bearings. All worm gear operators shall be sized for bi-directional shutoff at the valves design pressure rating.

Valves shall be designed and manufactured to shut off bubble tight at 400 psi for valves 2½"-12" and 300 psi for valves 14"-48" with pressure behind the plug.

Each valve shall be given a hydrostatic and seat test with the test results being certified when required by the customer. Certified copies of Proof-of-Design test reports shall be furnished as outlined in **AWWA C-517-09 Section 5.2.2** when requested.

Plug valves shall be Ballcentric® Plug Valve **Series 602** as manufactured by Henry Pratt Company of Aurora, Illinois.

Technical Specification Ballcentric® Series 601RL Rubberlined Plug Valves

AWWA C517-09 Standards
Valves shall be of the non-lubricated eccentric type with an elastomer covering all seating surfaces. The elastomer shall be suitable for the service intended. Flanged valves shall be manufactured in accordance with **ANSI B16.1 Class 125/150** including facing, drilling and flange thickness. Mechanical joint ends shall be in compliance with **AWWA/ ANSI C-111- 92**. Grooved ends shall be manufactured to the dimensions of **ANSI/AWWA C606** for ductile or steel pipe as required. Ports shall be round on sizes 2½"-12" and rectangular port design on valves 14" and larger. All valves shall be capable of being "pigged" with a soft pig when required.
Valve bodies shall be of **ASTM A-126 Class B** cast iron in accordance with **AWWA C- 517-09 Section 4.3.3.1**. The interior of the valve bodies shall be covered with a suitable elastomer with a minimum thickness of 1/8". The elastomer shall extend through the valve flow way and onto the flanges to ensure a positive seal.

Plugs shall be of **ASTM A-536-Grade 65-45-12** for sizes 20" and smaller, and **ASTM A126 Class B Cast Iron** for sizes 24" and larger in compliance with **AWWA C-517-09 Sections 4.3.3.1 and 4.3.3.2**. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit from entering the bearing and seal area.

Valves shall be furnished with replaceable sleeve type bearings conforming to **AWWA C-517-09, Section 4.3.3.6.** Bearings shall be of sintered, oil impregnated type 316 stainless steel **ASTM A-743 Grade CF-8M**. Valve shaft seals shall be of the "U" cup type in accordance with **AWWA C-517-09 Section 4.4.7**. Seals shall be self adjusting and repackable without removing the bonnet from the valve.

Worm gear operators shall be of the heavy duty construction with the ductile iron quadrant supported on the top and bottom by oil impregnated bronze bearings. The worm gear and shaft shall be manufactured of hardened steel and run on high efficiency roller bearings. All worm gear operators shall be sized for bi-directional shutoff at the valves design pressure rating.

Valves shall be designed and manufactured to shut off bubble tight at 175 psi for valves 2½"-12" and 150 psi for valves 14" and larger. Each valve shall be given a hydrostatic and seat test with the test results being certified when required by the customer. Certified copies of Proof-of-Design test reports shall be furnished as outlined in **AWWA C-517-09 Section 5.2.2** when requested.

Plug valves shall be Ballcentric® Plug Valve **Series 601RL** as manufactured by **Henry Pratt Company of Aurora, Illinois.**

Technical Specification Ballcentric® Series 601S – Stainless Steel Plug Valves

AWWA C517-09 Standards
Valves shall be of the non-lubricated eccentric type with an elastomer covering all seating surfaces. The elastomer shall be suitable for the service intended. Flanged valves shall be manufactured in accordance with **ANSI B16.1 Class 125** including facing, drilling and flange thickness. Ports shall be round on sizes 2½"-12" and rectangular port design on valves 14" and larger. All valves shall be capable of being "pigged" with a soft pig when required.
Valve bodies shall be of **CF8M (316 stainless steel)**. Valves shall be furnished with 316 stainless steel seat in accordance with **AWWA C-517-09 Section 4.3.3.4**.

Plugs shall be of **CF8M (316 stainless steel)**. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit from entering the bearing and seal area.

Valves shall be furnished with replaceable sleeve type bearings conforming to **AWWA C-517-09 Section 4.3.3.6**. Bearings shall be of sintered, oil impregnated type 316 stainless steel **ASTM A-743 Grade CF-8M**. Valve shaft seals shall be of the "U" cup type in accordance with **AWWA C-517-09 Section 4.4.7**. Seals shall be self adjusting and repackable without removing the bonnet from the valve.

Wrench operated valves 2½"-8" shall be capable of being converted to worm gear or automated operation without removing the bonnet or plug from the valve. All wrench operated valves shall be equipped with a 2" square nut for use with removable levers or extended "T" handles.

Worm gear operators, where required, shall be of the heavy duty construction with the ductile iron quadrant supported on the top and bottom by oil impregnated bronze bearings. The worm gear and shaft shall be manufactured of hardened steel and run on high efficiency roller bearings. All worm gear operators shall be sized for bi-directional shutoff at the valves design pressure rating.

Valves shall be designed and manufactured to shut off bubble tight at 175 psi for valves 2½"-12" and 150 psi for valves 14" and larger. Each valve shall be given a hydrostatic and seat test with the test results being certified when required by the customer. Certified copies of Proof-of-Design test reports shall be furnished as outlined in **AWWA C-517-09 Section 5.2.2** when requested.

Plug valves shall be Ballcentric® Plug Valve **Series 601S** as manufactured by Henry Pratt Company of Aurora, Illinois.

Technical Specification Ballcentric® Series 611/610 Ductile Iron Plug Valves

AWWA C517-09 Standards
Valves shall be of the non-lubricated eccentric type with an elastomer covering all seating surfaces. The elastomer shall be suitable for the service intended. Flanged valves shall be manufactured in accordance with **ANSI B16.1 Class 125/150** including facing, drilling and flange thickness. Mechanical joint ends shall be in compliance with **AWWA/ ANSI C-111-92**. Grooved ends shall be manufactured to the dimensions of **ANSI/AWWA C606** for ductile or steel pipe as required. Ports shall be round on sizes 2½"-12" and rectangular port design on valves 14" and larger. All valves shall be capable of being "pigged" with a soft pig when required.
Valve bodies shall be of **ASTM A-536 Grade 65-45-12** in accordance with **AWWA C-517-09 Section 4.3.3.2.** Valves 3" and larger shall be furnished with a welded-in overlay seat of 1/8" thick of not less than 99% nickel in accordance with **AWWA C-517-09, Section 4.3.3.4**. Sprayed, plated or screwed-in seats are not acceptable.

Plugs shall be of **ASTM A-536-Grade 65-45-12** for all sizes in accordance with **AWWA C-517-09 Section 4.3.3.2**. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit from entering the bearing and seal area.

Valves shall be furnished with replaceable sleeve type bearings conforming to **AWWA C-517-09, Section 4.3.3.6**. Bearings shall be of sintered, oil impregnated type 316 stainless steel **ASTM A-743 Grade CF-8M**. Valve shaft seals shall be of the "U" cup type in accordance with **AWWA C-517-09 Section 4.4.7**. Seals shall be self adjusting and repackable without removing the bonnet from the valve.

Wrench operated valves 2½"-8" shall be capable of being converted to worm gear or automated operation without removing the bonnet or plug from the valve. All wrench operated valves shall be equipped with a 2" square nut for use with removeable levers or extended "T" handles.

Worm gear operators, where required, shall be of the heavy duty construction with the ductile iron quadrant supported on the top and bottom by oil impregnated bronze bearings. The worm gear and shaft shall be manufactured of hardened steel and run on high efficiency roller bearings. All worm gear operators shall be sized for bi-directional shutoff at the valves design pressure rating.

Valves shall be designed and manufactured to shut off bubble tight at 175 psi for valves 2½"-12" and 150 psi for valves 14" and larger. Each valve shall be given a hydrostatic and seat test with the test results being certified when required by the customer. Certified copies of Proof-of-Design test reports shall be furnished as outlined in **AWWA C-517-09 Section 5.2.2** when requested.

Plug valves shall be Ballcentric® Plug Valve **Series 611/610** as manufactured by Henry Pratt Company of Aurora, Illinois.

Technical Specification Ballcentric® Series 601GL Glass Lined Plug Valves

AWWA C517-09 Standards
Valves shall be of the non-lubricated eccentric type with an elastomer covering all seating surfaces. The elastomer shall be suitable for the service intended. Flanged valves shall be manufactured in accordance with **ANSI B16.1 Class 125/150** including facing, drilling and flange thickness. Mechanical joint ends shall be in compliance with **AWWA/ ANSI C-111-92**. Grooved ends shall be manufactured to the dimensions of **ANSI/AWWA C606** for ductile or steel pipe as required. Ports shall be round on sizes 3"-12" and rectangular port design on valves 14" and larger. All valves shall be capable of being "pigged" with a soft pig when required.
Valve bodies shall be of **ASTM A-126 Class B** cast iron in accordance with A**WWA C-517-09 Section 4.3.3.1**. Interior of valves shall be glass lined at .008-.012 mils thickness, covering the entire interior of valve bodies and stopping at the flange faces.

Plugs shall be of **ASTM A-536-Grade 65-45-12** for sizes 20" and smaller, and **ASTM A126 Class B Cast Iron** for sizes 24" and larger in compliance with **AWWA C-517-09 Sections 4.3.3.1 and 4.3.3.2**. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit from entering the bearing and seal area.

Valves shall be furnished with replaceable sleeve type bearings conforming to **AWWA C-517-09, Section 4.3.3.6**. Bearings shall be of sintered, oil impregnated type 316 stainless steel **ASTM A-743 Grade CF-8M**. Valve shaft seals shall be of the "U" cup type in accordance with **AWWA C-517-09 Section 4.4.7**. Seals shall be self adjusting and repackable without removing the bonnet from the valve.

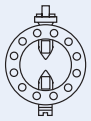
Wrench operated valves 2½"-8" shall be capable of being converted to worm gear or automated operation without removing the bonnet or plug from the valve. All wrench operated valves shall be equipped with a 2" square nut for use with removeable levers or extended "T" handles.

Worm gear operators, where required, shall be of the heavy duty construction with the ductile iron quadrant supported on the top and bottom by oil impregnated bronze bearings. The worm gear and shaft shall be manufactured of hardened steel and run on high efficiency roller bearings. All worm gear operators shall be sized for bi-directional shutoff at the valves design pressure rating.

Valves shall be designed and manufactured to shut off bubble tight at 175 psi for valves 2½"-12" and 150 psi for valves 14" and larger. Each valve shall be given a hydrostatic and seat test with the test results being certified when required by the customer. Certified copies of Proof-of-Design test reports shall be furnished as outlined in **AWWA C-517-09 Section 5.2.2** when requested.

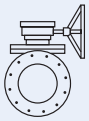
Plug valves shall be Ballcentric® Plug Valve Series **601GL/600GL** as manufactured by Henry Pratt Company of Aurora, Illinois.

PRATT PRODUCT GUIDE

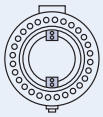


Model
2FII

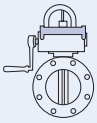
Monoflange
MKII



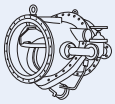
Plug
Valve



Triton®
XR70

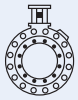


Indicating Butterfly Valve
UL & FM approved

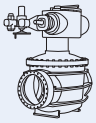


Tilting Disc
Check Valve

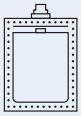
Triton®
XL



N-Stamp Nuclear
Butterfly Valve

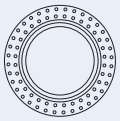


Cone
Valve

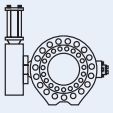


Rectangular

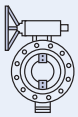
PIVA Post Indicating Valve Assembly
UL & FM approved



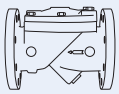
Sleeve
Valve



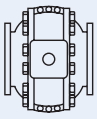
Rubber Seated
Ball Valve



Triton®
HP250

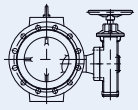


Check
Valve



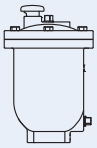
Metal Seated
Ball Valve

Control
Systems



Plunger Valve

PRATT



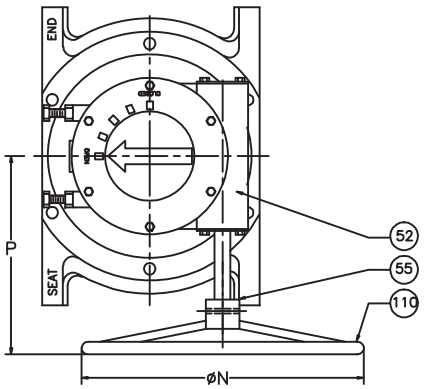
Air Valve

Henry Pratt Company
401 South Highland Avenue
Aurora, Illinois 60506-5563 - US
P: 630-844-4000 F: 630-844-4160
www.henrypratt.com
ISO 9001: 2000 Certified

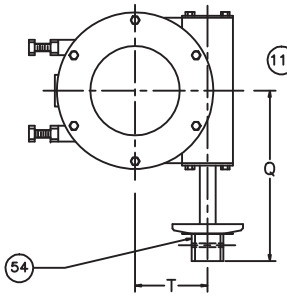
VALVE SIZE	GEAR SIZE & RATIO	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	S	T
2.5	M2 (20:1)	7.5	3.41	3.50	2.5	5.50	7.00	0.75	4	--	–	0.69	2.5	6	4.75	4.75	1.75	2.00
3	M2 (20:1)	8	3.41	3.75	3	6.00	7.50	0.75	4	--	–	0.75	2.5	6	4.75	4.75	1.75	2.00
4	M3 (30:1)	9	4.38	4.50	4	7.50	9	0.75	6	0.63	2	0.94	3	6	9.50	8	2.00	2.56
5	M3 (30:1)	10	5.63	5.75	5	8.50	10	0.88	6	0.75	2	0.94	3	6	9.50	8	2.00	2.56
6	M3 (30:1)	10.50	5.63	5.75	6	9.50	11	0.88	6	0.75	2	1	3	6	9.50	8	2.00	2.56
8	M5 (50:1)	11.50	7.56	7.63	8	11.75	13.50	0.88	6	0.75	2	1.13	6	12	11.25	8	2.25	3.16
10	M8 (80:1)	13	9.25	8.88	10	14.25	16	1	8	0.88	4	1.19	6	12	11.63	10	2.00	4.63
12	M8 (80:1)	14	10.88	10	12	17.00	19	1	8	0.88	4	1.25	6	12	11.63	10	2.00	4.63

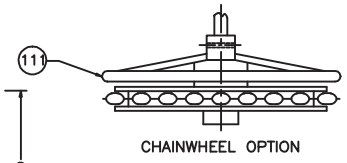
△5 △6 REFERENCE ONLY △6

ABOVE GROUND GEAR W/ HANDWHEEL OPTION



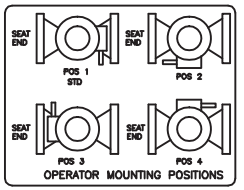
BURIED GEAR W/ 2" NUT OPTION

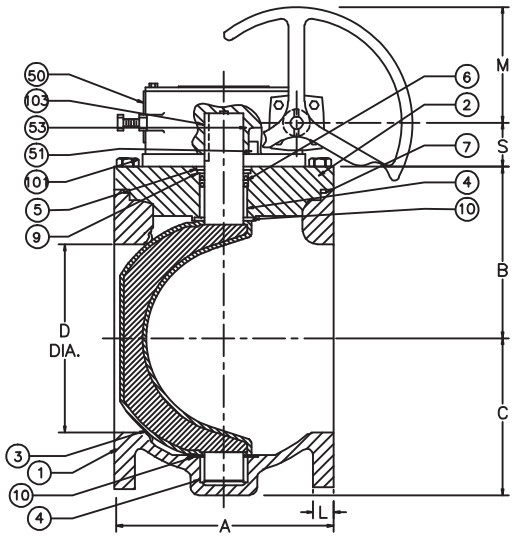


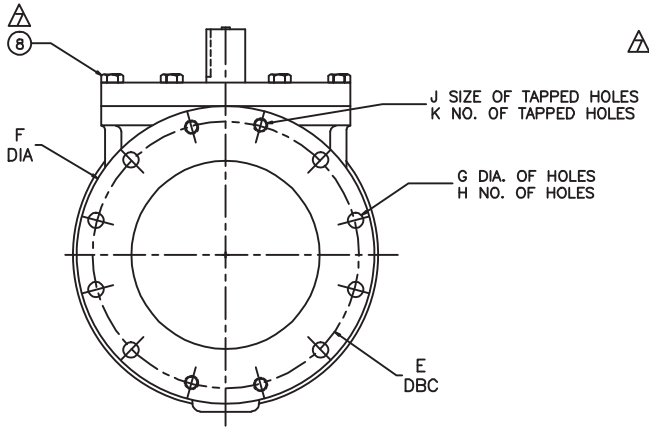


CHAINWHEEL OPTION

SIZE	GEAR	# OF TURNS
2.5"	20:1	5
3"	20:1	5
4"	30:1	7 1/2
5"	30:1	7 1/2
6"	30:1	7 1/2
8"	50:1	12 1/2
10"	80:1	20
12"	80:1	20







*RISER RING IS ONLY ON 2-1/2" TO 8" VALVE

ITEM	QTY	DESCRIPTION	MATERIAL
111	1	CHAINWHEEL	DUCTILE IRON
110	1	SPRING PIN	STEEL
103	1	KEY	STEEL
*101	1	RISER RING	STEEL
55	1	HANDWHEEL	DUCTILE IRON
54	1	2" NUT	DUCTILE IRON
53	2	SLEEVE BEARING	BRONZE
52	1	WORM GEAR	STEEL
51	1	QUAD GEAR	DUCTILE IRON
△4 50	1	HOUSING	
10	2	GRIT SEAL	PTFE
9	1	SEAL RETAINING RING	BRASS
△7 8	AR	H.H. CAP SCREW	☐STEEL ☐STN. STEEL
7	1	O-RING	ELAS AS SPEC.
6	2	U-CUP SEAL	ELAS AS SPEC.
5	1	SNAP RING	SPRING STEEL
4	2	SLEEVE BEARING	STN. STEEL
3	1	PLUG ELASTOMER AS SPEC.	DUCTILE IRON
2	1	CAP	CAST IRON
1	1	BODY	CAST IRON

PRATT®
HENRY PRATT COMPANY
AURORA, ILL.

BY	DATE	SCALE
CR	10/95	NONE
CHK'D: AJ		DIM.: INCHES

ISSUE NUM.	DATE	REVISIONS	BY
1	12/97	REVISED GEAR DIM. FOR 2.5" & 3" WAS M2 NOW ALECTO 232-07	CR
2	11/98	ITEM 8 WAS BRONZE	CR
3	09/07	ADDED MTRL. TYPE	JC
4	02/10	ITEM 50 MATERIAL CHANGED FROM CAST TO DUCTILE IRON [ECR# 252]	JC
5	09/10	REMOVED DATA FOR 14" [ECR # 384]	TF
6	05/12	CORRECTION IN "B" & "S" DIM. [ECN# 584]	AA
7	01/13	ADDED ITEM 10 AND BOM UPDATE	JC
8	01/13	B.O.M. STANDARDIZATION ITEM 10 NOW 8	AA

TITLE:
2-1/2" TO 12"
PLUG VALVE, FLANGED,
GEAR OPERATED,
w/HANDWHEEL, 2" NUT,
OR CHAINWHEEL OPTION

DWG. NO. HP49110

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Project name: AMARUQ

Project#: 5000218009

Document #: SPK_0011_ACP

by: LJ

chkd: GP

appvd: CB

ACTIFLO RECIRCULATION LINE

INSTRUMENTS

OIM manual section: 4.3.11.5

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CS-400-120 : Identification sheet

VWTC PROJECT NUMBER:	5000218009	REV:	1
PROJECT NAME:	AEM AMARUQ	SUBMITTED TO (COMPANY):	AGNICO EAGLE MINES
ENGINEER:	Gabriel Hébert	SUBMITTED TO (RESPONSIBLE)	
PROJECT MANAGER:	Clément B	PROJECT NUM REFERENCE.:	
PHONE NUMBER:		LOT NUMBER:	

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
HACH	IEPOTB200853	AE2-012	Immersion sensor: 60 x 200 mm (2.4 x 7.9	TURBIDIMETER PROBE - ACP	SOLITAX IMMERSION SENSOR FOR TURBIDITY AND INLINE SC sc PVC WITH WIPER 0.001-4000 NTU, 0.001 mg/L - 50 g/L/MANUFACTURER: HACH/ MODEL: LXV423.99.10100	N/A	N/A	ACTIFLO RECIRCULATION LINE MODIFICATION		rev1
HACH	IEPOTB200853	AE2-022	Immersion sensor: 60 x 200 mm (2.4 x 7.9	TURBIDIMETER PROBE - ACP	SOLITAX IMMERSION SENSOR FOR TURBIDITY AND INLINE SC sc PVC WITH WIPER 0.001-4000 NTU, 0.001 mg/L - 50 g/L/MANUFACTURER: HACH/ MODEL: LXV423.99.10100	N/A	N/A	ACTIFLO RECIRCULATION LINE MODIFICATION		rev1

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SOLITAX®sc TURBIDITY & SUSPENDED SOLIDS SENSORS

Applications

- Drinking Water
- Wastewater
- Beverage
- Industrial Water
- Power

PROGNOSYS™ READY

Accurate, color-independent suspended solids and turbidity measurements.

Greater Accuracy, Less Maintenance

Hach SOLITAX sc sensors provide accurate, color-independent measurement of turbidity and suspended solids in drinking water, wastewater and industrial process applications. A self-cleaning device prevents biological growth and interference of gas bubbles. This system's reliable performance and full data communication capability help improve process control and reduce treatment costs associated with polymer use, digester volume, and sludge handling.

Excellent Correlation to Laboratory Analysis

SOLITAX sc sensors show an exceptional correlation to laboratory analysis. On-line measurement not only saves time on manual analysis, but also provides critical real-time measurements that can be used to operate the plant more efficiently.

Fully Serviceable Sensors

Conventional turbidity and suspended solids sensors are potted and are discarded when they no longer function. SOLITAX sc sensors are fully serviceable, which often doubles the useful life of the sensor.

Easy One-point Calibration

Factory calibrated in conformity with DIN EN ISO 7027 for long-term calibration stability. Calibration is easy with a simple correction factor procedure.

Multi-channel, Multi-parameter System

Any two SOLITAX sc sensors can be installed on one Hach sc200 Controller. The same controller can also accommodate any combination of parameters. All of Hach's model sc sensors are "plug and play" with no complicated wiring or set-up procedure necessary.

HACH®
Be Right™

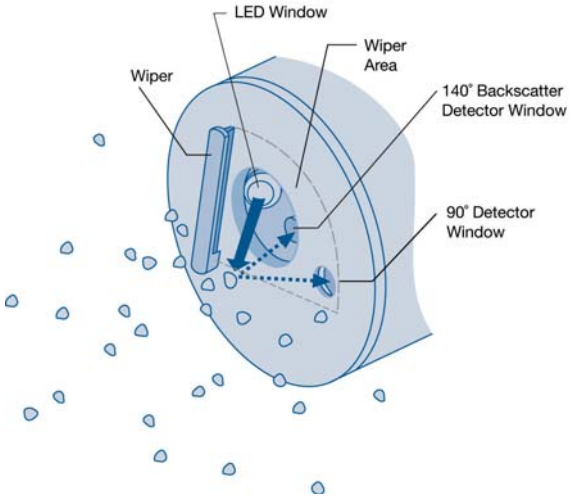
Specifications*

	For insertion in pipes		For immersion in open tanks		
Model	INSERTION inline sc	INSERTION highline sc	IMMERSION t-line sc	IMMERSION ts-line sc	IMMERSION hs-line sc
Parameter	Suspended Solids, Turbidity	Hight Range Suspended Solids, Turbidity	Turbidity	Suspended Solids, Turbidity	Hight Range Suspended Solids, Turbidity
Measuring Range Turbidity	0.001 to 4000 NTU	0.001 to 4000 NTU	0.001 to 4000 NTU	0.001 to 4000 NTU	0.001 to 4000 NTU
Measuring Range TSS-Content	0.001 mg/L to 50 g/L	0.001 mg/L to 500 g/L		0.001 mg/L to 50 g/L	0.001 mg/L to 500 g/L
Unit	Turbidity: User selectable—NTU, FNU, or TE/F Suspended Solids: User selectable—g/L, mg/L, ppm, or % solids				
Accuracy	Turbidity up to 1000 NTU; without calibration < 5% of the measured value ±0.01 NTU; with calibration < 1% of the measured value ±0.01 NTU				
Repeatability	Suspended solids content: < 3 %				
	Turbidity: < 1 %				
Response Time	1 s < T90 < 300 s (adjustable)				
Calibration Method	Turbidity: Formazin or STABLCAL Standard (at 800 NTU). Suspended Solids: Sample specific, based on gravimetric TSS analysis with a correction factor procedure.				
Certifications	CE certified to EN 61326-1, EN 61326/A1, EN 61326/A2, EN 61010-1				
Flow	Max. 3 m/s (the presence of air bubbles affects the measurement)				
Operating Temperature Range	0 to 40 °C (32 to 104°F)				
Pressure Limit	Stainless steel: 6 bar or 60 m (87 psi) PVC: 1 bar or 10 m (14.5 psi) Stainless steel: 6 bar or 60 m (87 psi) PVC: 1 bar or 10 m (14.5 psi)				
Material	Optics Carrier and Sleeve: stainless steel 1.4571 or black PVC Wiper Arm: stainless steel 1.4581; Wiper Blade: silicone (standard) Optional: Viton (LZX578); Wiper Shaft: stainless steel 1.4571 Threaded cable fitting: stainless steel 1.4305 or white PVC		Optics Carrier and Sleeve: stainless steel 1.4571 or black PVC Wiper Arm: stainless steel 1.4581; Wiper Blade: silicone (standard) Optional: Viton (LZX578); Wiper Shaft: stainless steel 1.4571 Threaded cable fitting: stainless steel 1.4305 or white PVC	
Weight Sensor	Insertion stainless steel: 2.4 kg (5.29 lb.)		Immersion stainless steel: 1.38 kg (3.0 lb.) Immersion PVC: 0.52 kg (1.2 lb.)		
Cable Length	10 m (optional extension cables available)				
					Subject to change without notice

Principle of Operation

SOLITAX sc ts-line sensor with dual-beam optics and added backscatter detector

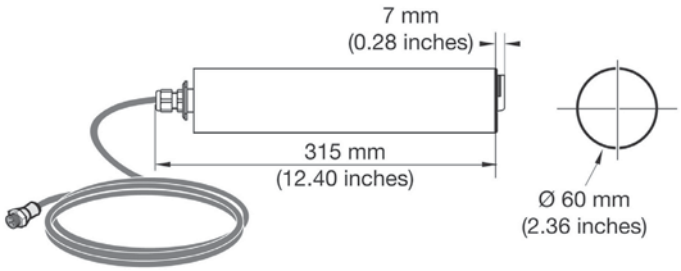
- Dual infrared light beams. LED light source transmits light at 45° to sensor face.
- Nephelometric photoreceptors detect light at 90° to the transmitted light beam.
- Backscatter photoreceptor (included on all models except the SOLITAX sc t-line) detects light at 140° to the transmitted light beam to measure suspended solids in heavily loaded sample streams.
- Self-cleaning wiper, optional.
- T-line probes measure turbidity only. TS, HS, inline, and highline sensors measure either turbidity or suspended solids.



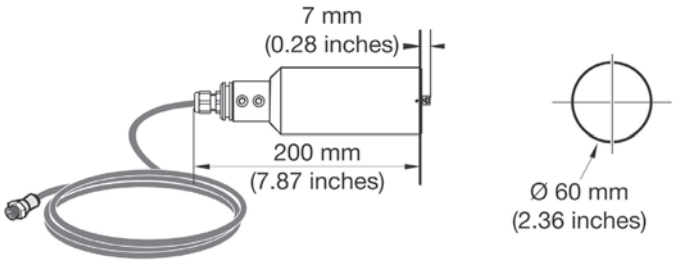
Dimensions

Hach SOLITAX sc sensors can be fixed to the rim of the tank for immersion applications or inserted directly through the sidewall of a pipeline for insertion applications. A variety of installation kits are available.

SOLITAX sc Insertion Probe

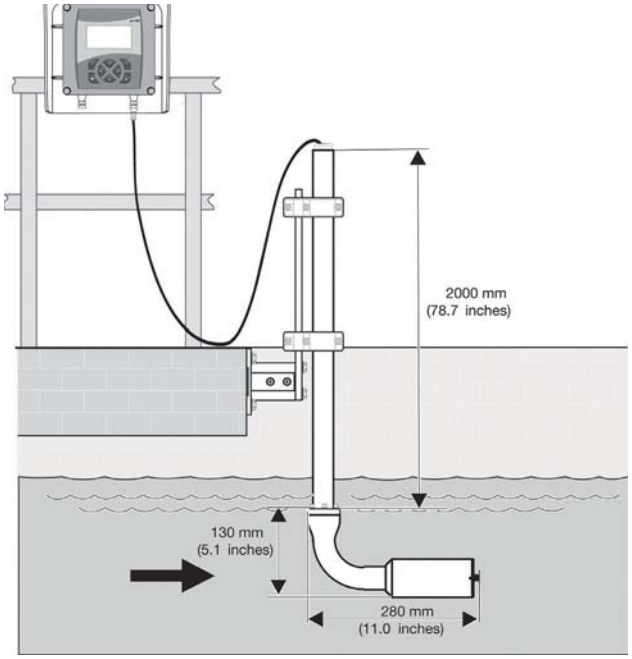


SOLITAX sc Immersion Probe

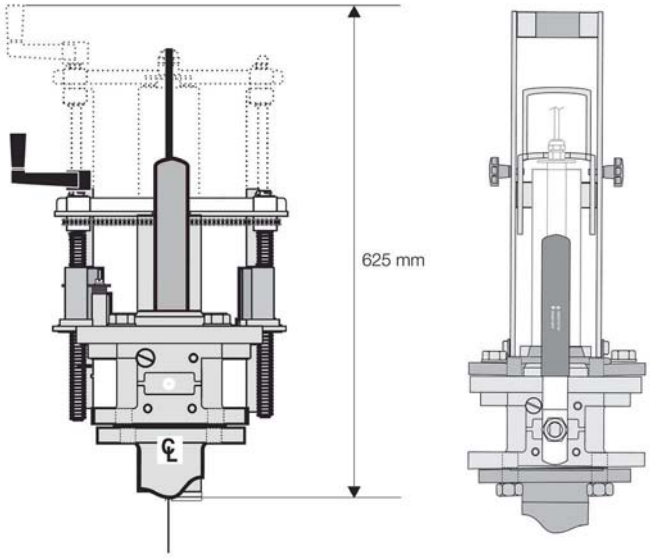


Installation / Mounting

Installation for mounting SOLITAX sc for immersion in open tanks. (Stainless steel pole mount kit, Prod. No. LZY714.99.53120)



Fixture with ball valve for mounting SOLITAX sc models inline and highline sensors in pipes., minimum pipe size 100 mm (4-in.) (Prod. No. LZX337, max pressure 6 bar; Prod. No. 936, max. pressure 1 bar.



Ordering Information

Common Configurations: SOLITAX sc Turbidity and Suspended Solids Analyzers with sc200 controller and sensors shown

Immersion in Open Tanks Applications

2983400 Turbidity Analyzer, t-line sc, stainless steel with wiper (0.001 to 4000 NTU)

2983500 Turbidity and Suspended Solids Analyzer, ts-line sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

2983600 Turbidity and High Range Suspended Solids Analyzer, hs-line sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

Insertion in Pipes Applications (includes insertion mounting kit)

2983700 Turbidity and Suspended Solids Analyzer, inline sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

2983900 Turbidity and High Range Suspended Solids Analyzer, highline sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

NOTE:
1. Power Cords must be ordered separately.
2. Fixed point installation kit or handrail mount kit must be ordered separately for all immersion analyzers.

Individual SOLITAX sc Sensors

Immersion Sensors

LXV423.99.10000 Turbidity, t-line sc, PVC with wiper (0.001 to 4000 NTU)

LXV423.99.12000 Turbidity, t-line sc, PVC without wiper (0.001 to 4000 NTU)

LXV423.99.10100 Turbidity and Suspended Solids, ts-line sc, PVC with wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV423.99.12100 Turbidity and Suspended Solids, ts-line sc, PVC without wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV423.99.00100 Turbidity and Suspended Solids, ts-line sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV423.99.02100 Turbidity and Suspended Solids, ts-line sc, stainless steel without wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV423.99.10200 Turbidity and Suspended Solids, hs-line sc, PVC with wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

LXV423.99.12200 Turbidity and Suspended Solids, hs-line sc, PVC without wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

LXV423.99.00200 Turbidity and Suspended Solids, hs-line sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

LXV423.99.02200 Turbidity and Suspended Solids, hs-line sc, stainless steel without wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

Insertion Sensors

LXV424.99.00100 Turbidity and Suspended Solids, inline sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV424.99.02100 Turbidity and Suspended Solids, inline sc, stainless steel without wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV424.99.00200 Turbidity and Suspended Solids, highline sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

LXV424.99.02200 Turbidity and Suspended Solids, highline sc, stainless steel without wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

Installation Accessories

LZY714.99.53120 Stainless Steel pole mount kit for SOLITAX t-line, ts-line, and hs-line immersion sensors, including 10 cm base and 2 m pole with sensor adapter

5738400 Insertion Mounting Kit for inline and highline insertion sensors (ball valve safety armature and extraction system). Kit includes a 4 inch pre-coped Carbon Steel Flange. Non-coped flanges are available

AHA033NPT Sensor Adapter, straight 1-1/2 FNPT

AHA034NPT Sensor Adapter, elbow 1-1/2 FNPT 90°

MH236B00Z Handrail Mounting Kit (for sensor to be used with either adapter above) includes 1.5-inch diameter by 7.5-ft long CPVC pipe and swivel/pivot/ pipe clamp assembly

LZX337 Stainless steel ball valve safety armature/ extraction fitting for in-line and hi-line probes w/o welding flange, maximum operating pressure 6 bar/87 psi

LZX936 Stainless steel ball valve armature, maximum operation pressure 1 bar/14.5 psi

LZX660 Non-coped stainless steel welding flange for insertion kit

LZX661 Non-coped carbon steel welding flange for insertion kit

HACH COMPANY World Headquarters: Loveland, Colorado USA

United States: 800-227-4224 tel 970-669-2932 fax orders@hach.com
Outside United States: 970-669-3050 tel 970-461-3939 fax int@hach.com
hach.com

LIT2472 Rev 8
C15 Printed in U.S.A.

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CS-403-550 : Identification sheet

VWTC PROJECT NUMBER:	5000218009	REV:	1
PROJECT NAME:	AEM AMARUQ	SUBMITTED TO (COMPANY):	AGNICO EAGLE MINES
ENGINEER:	Gabriel Hébert	SUBMITTED TO (RESPONSIBLE)	
PROJECT MANAGER:	Clément B	PROJECT NUM REFERENCE.:	
PHONE NUMBER:		LOT NUMBER:	

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
HACH	IECNGU340502	AIT2-012	144 mm x 144 mm x 181 mm	TSS TRANSMITTER	MULTIPURPOSE TRANSMITTER /MANUF: HACH/MODEL: SC200 /LXV404.99.00552/120V/ 2 DIGITAL CHANNEL/ HART PROTOCOLE MODULE 9328100	N/A	N/A	ACTIFLO RECIRCUL ATION LINE MODIFICA TION		rev1
HACH	IECNGU340502	AIT2-022	144 mm x 144 mm x 181 mm	TSS TRANSMITTER	MULTIPURPOSE TRANSMITTER /MANUF: HACH/MODEL: SC200 /LXV404.99.00552/120V/ 2 DIGITAL CHANNEL/ HART PROTOCOLE MODULE 9328100	N/A	N/A	ACTIFLO RECIRCUL ATION LINE MODIFICA TION		rev1

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sc200™ UNIVERSAL CONTROLLER

Applications
- Drinking Water
- Wastewater
- Industrial Water
- Power

One Controller for the Broadest Range of Sensors.

Choose from 30 digital and analog sensor families for up to 17 different parameters.

Maximum Versatility

The sc200 controller allows the use of digital and analog sensors, either alone or in combination, to provide compatibility with Hach's broad range of sensors, eliminating the need for dedicated, parameter-specific controllers.

Ease of Use and Confidence in Results

Large, high-resolution, transreflective display provides optimal viewing resolution in any lighting condition. Guided calibration procedures in 19 languages minimize complexity and reduce operator error. Password-protected SD card reader offers a simple solution for data download and transfer. Visual warning system provides critical alerts.

Wide Variety of Communication Options

Utilize two to five analog outputs to transmit primary and secondary values for each sensor, or integrate Hach sensors and analyzers into MODBUS RS232/RS485, Profibus® DP, and HART networks.

Password protected SD card reader offers a simple solution for data download and transfer, and sc200 and digital sensor configuration file duplication and backup.

HACH®
Be Right™

Controller Comparison

Features	Previous Models sc100™ Controller	Previous Models GLI53 Controller	sc200™ Controller	Benefits
Display	64 x 128 pixels 33 x 66 mm (1.3 x 2.6 in.)	64 x 128 pixels 33 x 66 mm (1.3 x 2.6 in.)	160 x 240 pixels 48 x 68 mm (1.89 x 2.67 in.) Transreflective	• Improved user interface—50% bigger • Easier to read in daylight and sunlight
Data Management	irDA Port/PDA Service Cable	N/A	SD Card Service Cable	• Simplifies data transfer • Standardized accessories/max compatibility
Sensor Inputs	2 Max Direct Digital Analog via External Gateway	2 Max Analog Depending on Parameter	2 Max Digital and/or Analog with Sensor Card	• Simplifies analog sensor connections • Works with analog and digital sensors
Analog Inputs	N/A	N/A	1 Analog Input Signal Analog 4-20mA Card	• Enables non-sc analyzer monitoring • Accepts mA signals from other analyzers for local display • Consolidates analog mA signals to a digital output
4-20 mA Outputs	2 Standard	2 Standard	2 Standard Optional 3 Additional	• Total of five (5) 4-20 mA outputs allows multiple mA outputs per sensor input
Digital Communication	MODBUS RS232/RS485 Profibus DP V1.0	HART	MODBUS RS232/RS485 Profibus DP V1.0 HART 7.2	• Unprecedented combination of sensor breadth and digital communication options

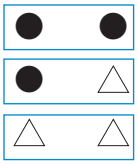
Choose from Hach's Broad Range of Digital and Analog Sensors

Parameter	Sensor	Digital or Analog
Ammonia	AMTAX™ sc, NH4D sc, AISE sc, AN-ISE sc	●
Chlorine	CLF10 sc, CLT10 sc, 9184 sc	●
Chlorine Dioxide	9185 sc	●
Conductivity	GLI 3400 Contacting, GLI 3700 Inductive	△
Dissolved Oxygen	LDO® Model 2, 5740 sc	●
Dissolved Oxygen	5500	△
Flow	U53, F53 Sensors	△
Nitrate	NITRATAX™ sc, NO3D sc, NISE sc, AN-ISE sc	●
Oil in Water	FP360 sc	●
Organics	UVAS sc	●
Ozone	9187 sc	●
pH/ORP	pHD	●
pH/ORP	pHD, pH Combination, LCP	△
Phosphate	PHOSPHAX™ sc	●
Sludge Level	SONATAX™ sc	●
Suspended Solids	SOLITAX™ sc, TSS sc	●
Turbidity	1720E, FT660 sc, SS7 sc, ULTRATURB sc, SOLITAX sc, TSS sc	●
Ultra Pure Conductivity	8310, 8311, 8312, 8315, 8316, 8317 Contacting	△
Ultra Pure pH/ORP	8362	△

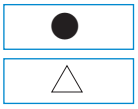
● = Digital △ = Analog

Connect up to two of any of the sensors listed above, in any combination, to meet your application needs. The diagrams below demonstrate the potential configurations. Operation of analog sensors requires the controller to be equipped with the appropriate sensor module. Contact Hach Technical Support for help with selecting the appropriate module.

2 Channel Configurations



1 Channel Configurations



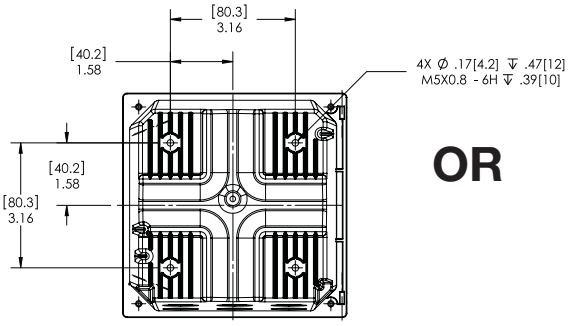
Specifications*

Dimensions (H x W x D)	5.7 in x 5.7 in x 7.1 in (144 mm x 144 mm x 181 mm)
Display	Graphic dot matrix LCD with LED backlighting, transreflective
Display Size	1.9 x 2.7 in. (48 mm x 68 mm)
Display Resolution	240 x 160 pixels
Weight	3.75 lbs. (1.70 kg)
Power Requirements (Voltage)	100 - 240 V AC, 24 V DC
Power Requirements (Hz)	50/60 Hz
Operating Temperature Range	-20 to 60 °C , 0 to 95% RH non-condensing
Analog Outputs	Two (Five with optional expansion module) to isolated current outputs, max 550 Ω , Accuracy: ± 0.1% of FS (20mA) at 25 °C, ± 0.5% of FS over -20 °C to 60 °C range Operational Mode: measurement or calculated value
Analog Output Functional Mode	Linear, Logarithmic, Bi-linear, PID
Security Levels	2 password-protected levels
Mounting Configurations	Wall, pole, and panel mounting
Enclosure Rating	NEMA 4X/IP66
Conduit Openings	1/2 in NPT Conduit
Relay: Operational Mode	Primary or secondary measurement, calculated value (dual channel only) or timer
Relay Functions	Scheduler (Timer), Alarm, Feeder Control, Event Control, Pulse Width Modulation, Frequency Control, and Warning
Relays	Four electromechanical SPDT (Form C) contacts, 1200 W, 5 A
Communication	MODBUS RS232/RS485, PROFIBUS DPV1, or HART 7.2 optional
Memory Backup	Flash memory
Electrical Certifications	EMC CE compliant for conducted and radiated emissions: - CISPR 11 (Class A limits) - EMC Immunity EN 61326-1 (Industrial limits) Safety cETLus safety mark for: - General Locations per ANSI/UL 61010-1 & CAN/CSA C22.2. No. 61010-1 - Hazardous Location Class I, Division 2, Groups A,B,C & D (Zone 2, Group IIC) per FM 3600 / FM 3611 & CSA C22.2 No. 213 M1987 with approved options and appropriately rated Class I, Division 2 or Zone 2 sensors cULus safety mark - General Locations per UL 61010-1 & CAN/CSA C22.2. No. 61010-1

**Subject to change without notice.*

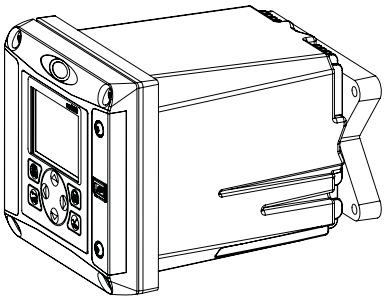
Dimensions

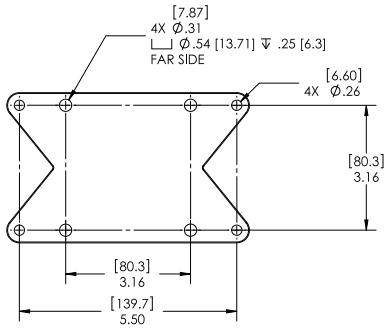
Surface Mounting Dimensions



Mounting Dimensions
(Rear View)

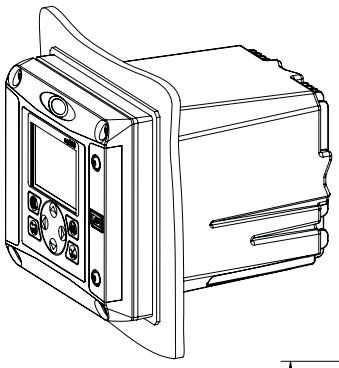
OR

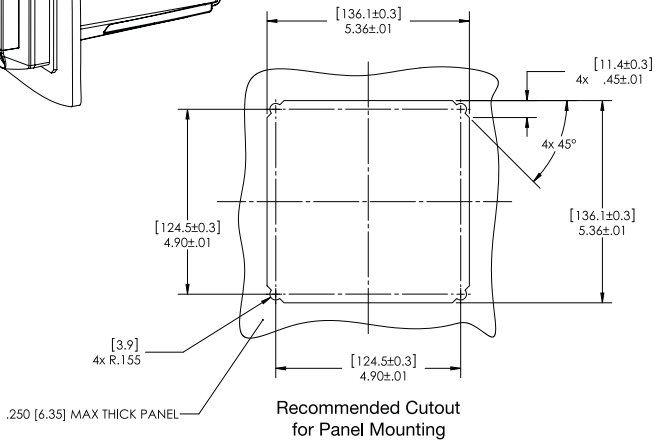




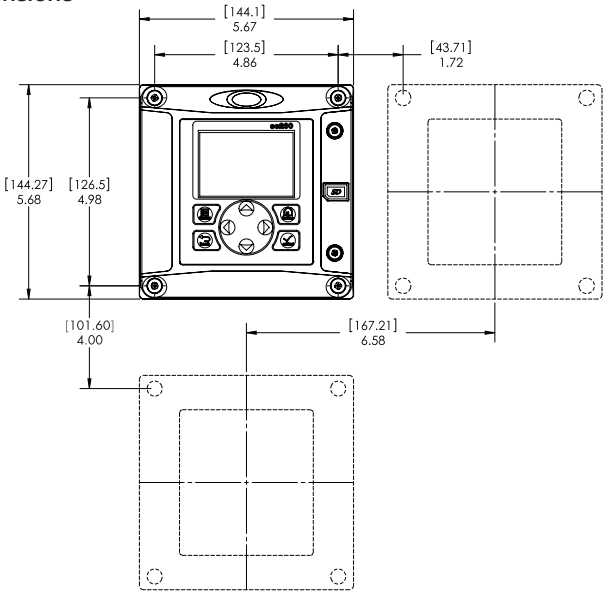
Bracket (supplied) for Surface Mounting
(Not compatible with Weather and Sun Shield p/n 9220600 when surface mounting.)

Panel Mounting Dimensions



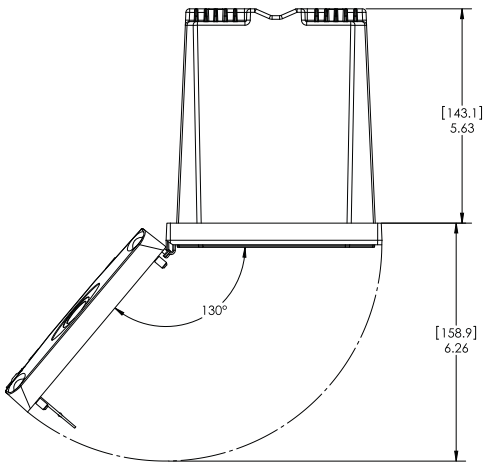


Recommended Cutout
for Panel Mounting

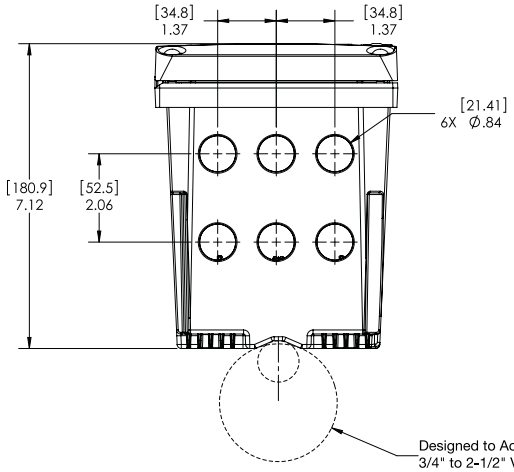


Minimum Spacing Dimensions
for Group Mounting

Top and Bottom Views



Door Opening Details



Ordering Information

sc200 for Hach Digital and Analog Sensors

LXV404.99.00552	sc200 controller, 2 channels, digital
LXV404.99.00502	sc200 controller, 1 channel, digital
LXV404.99.00102	sc200 controller, 1 channel, pH/DO
LXV404.99.00202	sc200 controller, 1 channel, Conductivity
LXV404.99.01552	sc200 controller, 2 channels, digital, Modbus RS232/RS485
LXV404.99.00112	sc200 controller, 2 channel, pH/DO

Note: Other Sensor combinations are available. Please contact Hach Technical Support or your Hach representative.

Note: Communication options (MODBUS, Profibus DPV1, and HART) are available. Please contact Hach Technical Support or your Hach representative.

sc200 for Ultrapure Sensors

9500.99.00602	sc200 controller, 1 channel, ultrapure conductivity
9500.99.00702	sc200 controller, 1 channel, ultrapure pH
9500.99.00662	sc200 controller, 2 channel, ultrapure conductivity
9500.99.00772	sc200 controller, 2 channel, ultrapure pH

Sensor and Communication Modules

9012900	Analog pH/ORP and DO module for GLI Sensors
9013000	Analog Conductivity module for GLI Sensors
9012700	Flow module
9012800	4-20 mA Input Module
9525700	Analog pH/ORP Module for Polymetron Sensors
9525800	Analog Conductivity Module for Polymetron Sensors
9013200	Modbus 232/485 Module
9173900	Profibus DP Module
9328100	HART Module
9334600	4-20 mA Output Module (Provides 3 additional mA Outputs)

Accessories

9220600	sc200 Weather and Sun Shield with UV Protection Screen
8809200	sc200 UV Protection Screen
9218200	SD card reader (USB) for connection to PC
9218100	4 GB SD card

HACH COMPANY World Headquarters: Loveland, Colorado USA

United States: 800-227-4224 tel 970-669-2932 fax orders@hach.com
Outside United States: 970-669-3050 tel 970-461-3939 fax int@hach.com
hach.com

LIT2665 Rev 7
K13 Printed in U.S.A.

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CS-403-603 : Identification sheet

VWTC PROJECT NUMBER:	5000218009	REV:	1
PROJECT NAME:	AEM AMARUQ	SUBMITTED TO (COMPANY):	AGNICO EAGLE MINES
ENGINEER:	Gabriel Hébert	SUBMITTED TO (RESPONSIBLE)	
PROJECT MANAGER:	Clément B	PROJECT NUM REFERENCE.:	
PHONE NUMBER:		LOT NUMBER:	

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
HACH	ST-403-303	AE2-011	N/A	PH METER PROBE - ACP	pH SENSOR/MANUFACTURER: HACH/MODEL: DPD1R1	N/A	N/A	ACTIFLO RECIRCULATION LINE MODIFICATION		rev1
HACH	ST-403-303	AE2-021	N/A	PH METER PROBE - ACP	pH SENSOR/MANUFACTURER: HACH/MODEL: DPD1R1	N/A	N/A	ACTIFLO RECIRCULATION LINE MODIFICATION		rev1

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DIFFERENTIAL pH AND ORP SENSORS

Applications

- Drinking Water
- Wastewater
- Industrial Water
- Power

Wide range pH glass
(HF resistant glass also available)

The smart choice for accurate, reliable, and dependable pH/ORP measurement.

Hach Digital pHD sc sensors are available in convertible (PEEK® or Ryton®), insertion, and sanitary body styles. Three electrodes are used in these sensors to increase measurement accuracy and eliminate sensor ground loops.

Differential Electrode Measurement Technique

This field-proven technique uses three electrodes instead of the two normally used in conventional pH sensors. Process and reference electrodes measure the pH differentially with respect to a third ground electrode. The end result is unsurpassed measurement accuracy, reduced reference junction potential, and elimination of sensor ground loops. These sensors provide greater reliability, resulting in less downtime and maintenance.

Patented Technology

The former GLI, now a Hach Company brand, invented the Differential Electrode Technique for pH measurement in 1970. The pHD™ sensor series (U.S. Patent Number 6395158B1, May 28, 2002) takes this field-proven technology to a new level.

Replaceable Salt Bridge/Protector

The unique, replaceable salt bridge holds an extraordinary volume of buffer to extend the working life of the sensor by protecting the reference electrode from harsh process conditions.

Built-in Encapsulated Preamp

Encapsulated construction protects the sensor's built-in preamp from moisture and humidity, ensuring reliable sensor operation. The preamp in the pHD analog sensor produces a strong signal, enabling the sensor to be located up to 1000 m (3280 ft.) from the analyzer.

Durable Body Materials

Both the digital and analog pH and ORP differential sensors feature a durable PEEK® body for chemical compatibility with most process solutions. For less aggressive solutions, Hach offers a Ryton® sensor in a convertible style for pH and ORP measurement. A sensor with a stainless steel body is available for immersion applications.

Versatile Mounting Styles

Sensors are available in four mounting styles—convertible, insertion, immersion, and sanitary.

Differential Sensor Warranty

Hach Company offers an outstanding warranty on its differential sensors. We will replace any differential sensor that fails due to defects in materials or workmanship within one year from the date of shipment, and up to 30 months on a prorated basis for any failure.

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Specifications*

pH Sensors

Some industrial applications require accurate measurement and control below 2 or above 12 pH. In these special cases, please contact Hach Technical Support for further details.

Measuring Range	-2 to 14 pH
Sensitivity	±0.01 pH
Stability	0.03 pH per 24 hours, non-cumulative
Operating Temperature	Digital Sensor: -5 to 70ºC (23 to 158ºF) Analog Sensor with Digital Gateway: 5 to 105ºC (23 to 221ºF) Immersion Sensor: 0 to 50ºC (32 to 122ºF)
Flow Rate	3 m (10 ft.) per second, maximum
Sensor Pressure/ Temperature Limits	Digital: 6.9 bar at 70ºC (100 psi at 158ºF) Analog: 6.9 bar at 105ºC (100 psi at 221ºF)
Built-in Temperature Element	NTC 300 ohm thermistor for automatic temperature compensation and analyzer temperature readout
Transmission Distance	100 m (328 ft.), maximum 1000 m (3280 ft.), maximum when used with a termination box
Sensor Cable (integral)	4 conductor cable with one shield and polyurethane jacket; rated to 105ºC (221ºF); 10 m (33 ft.) standard length
Wetted Materials	PEEK® or Ryton® (PVDF), salt bridge of matching material with Kynar® junction, glass process electrode, titanium ground electrode, and Viton® O-ring seals (Please contact Hach Technical Support for available wetted O-ring materials.)

ORP (Redox) Sensors

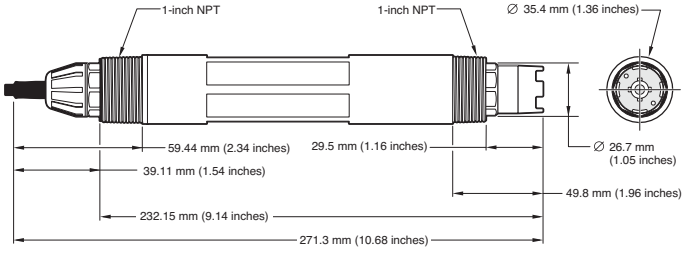
For best ORP measuring results in solutions containing zinc, cyanide, cadmium or nickel, Hach recommends using the pHD sc ORP sensor equipped with an optional gold electrode.

Measuring Range	-1500 to +1500 mV
Sensitivity	±0.5 mV
Stability	2 mV per 24 hours, non-cumulative
Operating Temperature	Digital Sensor: -5 to 70ºC (23 to 158ºF) Analog Sensor with Digital Gateway: -5 to 105ºC (23 to 221ºF) Immersion Sensor: 0 to 50ºC (32 to 122ºF)
Flow Rate	3 m (10 ft.) per second, maximum
Sensor Pressure/ Temperature Limits	Digital: 6.9 bar at 70ºC (100 psi at 158ºF) Analog: 6.9 bar at 105ºC (100 psi at 221ºF)
Built-in Temperature Element	NTC 300 ohm thermistor for analyzer temperature readout only—no automatic temperature compensation necessary for ORP measurement
Transmission Distance	100 m (328 ft.), maximum 1000 m (3280 ft.), maximum when used with a termination box
Sensor Cable (integral)	4 conductor cable with one shield and polyurethane jacket; rated to 105ºC (221ºF); 10 m (33 ft.) standard length
Wetted Materials	PEEK® or Ryton® (PVDF), salt bridge of matching material with Kynar® junction, glass and platinum (or plastic and gold) process electrode, titanium ground electrode, and Viton® O-ring seals

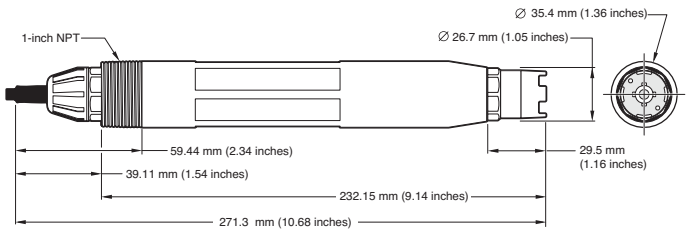
**Subject to change without notice.*

Dimensions

Convertible Style



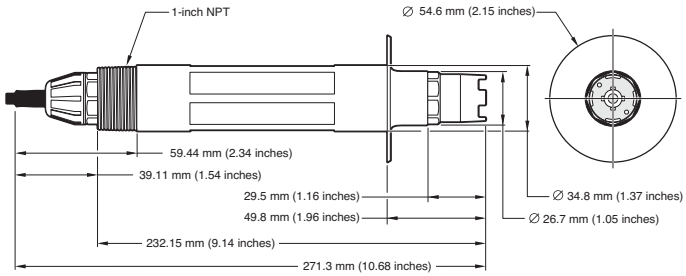
Insertion Style



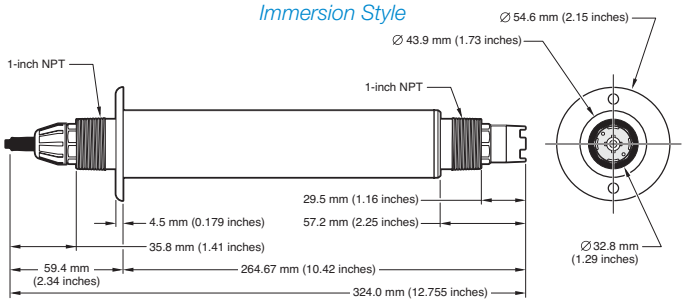
Continued on next page.

Dimensions *continued*

SanitaryStyle



Immersion Style



Ordering Information

pHD sc Digital Differential pH/ORP Sensors

All digital sensors include built-in digital electronics and integral 10 m (33 ft.) cable terminated with connector for the Hach sc Digital Controllers.

pH Sensors

Prod. No.	Body Material	Body Style*	Electrode Material	Max Temp
DPD1P1	PEEK[1]	Convertible	Glass, General Purpose	70ºC (158ºF)
DPD1P3	PEEK[1]	Convertible	Glass, HF-resistant	70ºC (158ºF)
DPD2P1	PEEK[1]	Insertion	Glass, General Purpose	70ºC (158ºF)
DPD3P1	PEEK[1]	Sanitary	Glass, General Purpose	70ºC (158ºF)
DPD1R1	Ryton[2]	Convertible	Glass, General Purpose	70ºC (158ºF)
DPD1R3	Ryton[2]	Convertible	Glass, HF-resistant	70ºC (158ºF)
DPS1	Stainless Steel	Immersion	Glass, General Purpose	50ºC (122ºF)

[1]Polyetheretherketone [2]Polyphenelene Sulfide

ORP Sensors

Prod. No.	Body Material	Body Style*	Electrode Material	Max Temp
DRD1P5	PEEK[1]	Convertible	Platinum	70ºC (158ºF)
DRD1P6	PEEK[1]	Convertible	Gold	70ºC (158ºF)
DRD2P5	PEEK[1]	Insertion	Platinum	70ºC (158ºF)
DRD1R5	Ryton[2]	Convertible	Platinum	70ºC (158ºF)
DRD1R6	Ryton[2]	Convertible	Gold	70ºC (158ºF)
DRS5	Stainless Steel	Immersion	Platinum	50ºC (122ºF)

[1]Polyetheretherketone [2]Polyphenelene Sulfide

Digitl Gateway

6120500 Digital Gateway, convert pHD analog sensors to digital output for connecting to sc1000 digital controller

pHD Analog Sensors

All analog sensors include built-in preamplifier and integral 4.5 m (15 ft.) cable terminated with stripped and tinned wires.

pH Sensors

Prod. No.	Body Material	Body Style*	Electrode Material	Max Temp
PD1P1	PEEK[1]	Convertible	Glass, General Purpose	95ºC (203ºF)
PD1P3	PEEK[1]	Convertible	Glass, HF-resistant	95ºC (203ºF)
PD2P1	PEEK[1]	Insertion	Glass, General Purpose	95ºC (203ºF)
PD3P1	PEEK[1]	Sanitary	Glass, General Purpose	95ºC (203ºF)
PD1R1	Ryton[2]	Convertible	Glass, General Purpose	95ºC (203ºF)
PD1R3	Ryton[2]	Convertible	Glass, HF-resistant	95ºC (203ºF)

[1]Polyetheretherketone [2]Polyphenelene Sulfide

ORP Sensors

Prod. No.	Body Material	Body Style*	Electrode Material	Max Temp
RD1P5	PEEK[1]	Convertible	Platinum	95ºC (203ºF)
RD1P6	PEEK[1]	Convertible	Gold	95ºC (203ºF)
RD2P5	PEEK[1]	Insertion	Platinum	95ºC (203ºF)
RD1R5	Ryton[2]	Convertible	Platinum	95ºC (203ºF)
RD1R6	Ryton[2]	Convertible	Gold	95ºC (203ºF)

[1]Polyetheretherketone [2]Polyphenelene Sulfide

**Definitions of body styles:*

- *Convertible – 1-inch NPT threads at both ends, designed for tee-mounting or other flow through mountings, and pipe mounting for immersion*
- *Insertion – no threads on the electrode end, designed for use with insertion valve assembly*
- *Sanitary – 2-inch flange for a tri-clover style fitting*
- *Immersion – used with chain mounting or pipe mounting*

Continued on next page.

Ordering Information *continued*

pHD sc Digital and pHD Analog Sensor Accessories

Cables

Extension cables are used only with digital sensors or digital gateways when connecting to an sc Digital Controller.

6122400	Digital Extension Cable, 1 m (3.2 ft.)
5796000	Digital Extension Cable, 7.7 m (25 ft.)
5796100	Digital Extension Cable, 15 m (50 ft.)
5796200	Digital Extension Cable, 31 m (100 ft.)

Interconnect cables are used only with analog sensors, junction box, and controller.

1W1100	Analog Interconnect Cable, order per foot

Digital Termination Box

Required when the cable between the sensor/gateway and sc Digital Controller is 100 m (328 ft.) to 1000 m (3280 ft.)

5867000	Digital Termination Box

Analog Junction Box

Required when the cable between the analog sensor and controller is greater than standard sensor cable. Includes terminal strip and gasket.

60A2053	Junction Box, Surface-mount, aluminum (includes mounting hardware)
60A9944	Junction Box, Pipe-mount, PVC (for 1/2-inch diameter pipe, includes mounting hardware)
60G2052	Junction Box, Pipe-mount, PVC (for 1-inch diameter pipe, includes mounting hardware)
76A4010-001	Junction Box, NEMA 4X (no mounting hardware included)

Salt Bridges

The double junction salt bridge on the standard cell of all Hach pHD sensors is field-replaceable.

SB-P1SV	PEEK Sensor and Salt Bridge Body, Kynar (PVDF) Outer Junction
SB-P2SV	PEEK Sensor and Salt Bridge Body, Ceramic Outer Junction
SB-P1SP[1]	PEEK Sensor and Salt Bridge Body, Kynar (PVDF) Outer Junction
SB-R1SV	RytonSensor and Salt Bridge Body Kynar (PVDF) Outer Junction

[1]*Special perfluoroelastomer O-ring in place of the Viton® O-ring*

pHD Sensor Reagents and Standards

25M1A1025-115	Standard Cell Solution, 500 mL
25M8A1002-101	Gel Powder, for high temperature applications, 2 g

pH Buffers

2283549	pH 7, 500 mL (1 pint)
2283449	pH 4, 500 mL (1 pint)
2283649	pH 10, 500 mL (1 pint)

ORP Reference Solutions (in resealable plastic bottles)

25M2A1001-115	200 mV	500 mL (1 pint)
25M2A1002-115	600 mV	500 mL (1 pint)

Mounting Hardware for pHD sc Differential Sensors

Sanitary Mount

MH018S8SZ 316 SS

Includes 2-inch sanitary tee and heavy-duty clamp. Cap and EPDM compound gasket supplied with sensor; can be ordered separately.

Union Mount

6131300	CPVC
6131400	316 SS

Includes standard 1-1/2 inch tee, union pipe with adapter, sealing hub, and lock ring and Viton® O-ring.

Flow-through Mount

MH334N4NZ	CPVC
MH314N4MZ	316 SS

Includes a standard 1-inch tee in respective material.

Insertion Mount

Digital		*Analog*	
5646300	CPVC	**5646400**	CPVC
5646350	316 SS	**5646450**	316 SS

Includes a 1-1/2 inch ball valve, 1-1/2 inch NPT close nipple, sensor adapter with two Viton® O-rings and wiper, extension pipe, pipe adapter, back tube, and lock ring.

Immersion Mount

Standard Hardware

Digital		*Analog*	
6136400	CPVC	**MH434A00B**	CPVC
6136500	316 SS	**MH414A00B**	316 SS

Includes 1-inch by 4 ft. pipe and 1-inch x 1-inch NPT coupling. (Pipe-mount junction box with terminal strip included in analog hardware.)

Handrail Hardware

MH236B00Z CPVC

Includes 1-1/2 inch by 7.5 ft. CPVC pipe, and swivel/pivot/ pipe clamp assembly.

Chain Mount Hardware

2881900 316 ss

Includes stainless steel bail, nuts, and washers. Does not include chain. To be used with stainless steel immersion sensor only.

Ball Float Hardware

6131000 CPVC

Includes 1-1/2 inch by 7.5 ft. CPVC pipe, ball float assembly, and swivel/pivot/ pipe clamp assembly.

HACH COMPANY World Headquarters: Loveland, Colorado USA

United States:	800-227-4224 tel	970-669-2932 fax	orders@hach.com
Outside United States:	970-669-3050 tel	970-461-3939 fax	int@hach.com

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LIT2467 Rev 2
A13 Printed in U.S.A.

HACH® Be Right™

CS-413-310 : Identification sheet

VWTC PROJECT NUMBER:	5000218009	REV:	1
PROJECT NAME:	AEM AMARUQ	SUBMITTED TO (COMPANY):	AGNICO EAGLE MINES
ENGINEER:	Gabriel Hébert	SUBMITTED TO (RESPONSIBLE)	
PROJECT MANAGER:	Clément B	PROJECT NUM REFERENCE.:	
PHONE NUMBER:		LOT NUMBER:	

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
TECKNO VALVE	ST-413-359	PI2-011	4.5"	DIAPHRAGM PRESSURE GAUGE	PRESSURE GAUGE C/W ISOLATOR // MANUFACTURER : ASHCROFT // MODEL 45-1009SL-04L-60#-XAJ C/W SEAL 50-101SS-04T-XCG	N/A	N/A	ACTIFLO RECIRCULATION LINE MODIFICATION		rev1
TECKNO VALVE	ST-413-359	PI2-012	4.5"	DIAPHRAGM PRESSURE GAUGE	PRESSURE GAUGE C/W ISOLATOR // MANUFACTURER : ASHCROFT // MODEL 45-1009SL-04L-60#-XAJ C/W SEAL 50-101SS-04T-XCG	N/A	N/A	ACTIFLO RECIRCULATION LINE MODIFICATION		rev1
TECKNO VALVE	ST-413-359	PI2-021	4.5"	DIAPHRAGM PRESSURE GAUGE	PRESSURE GAUGE C/W ISOLATOR // MANUFACTURER : ASHCROFT // MODEL 45-1009SL-04L-60#-XAJ C/W SEAL 50-101SS-04T-XCG	N/A	N/A	ACTIFLO RECIRCULATION LINE MODIFICATION		rev1
TECKNO VALVE	ST-413-359	PI2-022	4.5"	DIAPHRAGM PRESSURE GAUGE	PRESSURE GAUGE C/W ISOLATOR // MANUFACTURER : ASHCROFT // MODEL 45-1009SL-04L-60#-XAJ C/W SEAL 50-101SS-04T-XCG	N/A	N/A	ACTIFLO RECIRCULATION LINE MODIFICATION		rev1

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ASHCROFT®
Trust the shield.®

Type 1009 4½″ & 6″ Stainless Steel Gauge

PLUS! Performance

- *4½″ and 6″ SS gauges*
- *Dry and liquid-filled versions*
- *Micrometer adjustable pointer*
- *Variety of Bourdon tube materials*
- *ASME Grade 1A, ±1% of span accuracy*
- *New PLUS!™ Performance Option:*
  - *Liquid-filled performance in a dry gauge*
  - *Fights vibration and pulsations with out liquid-fill headaches*
  - *Order as option XLL*

The 4½″ and 6″ Ashcroft® Type 1009 gauges are suitable where ambient corrosion is a major concern. Its attractive stainless steel case and ring provides excellent resistance to chemical, weather and corrosion attack. This 1009 has many optional features that allow a user to develop a basic or special product specification. The 1009 is part of the extensive line of Ashcroft stainless steel pressure gauges.

The gauge is available dry, liquid-filled weatherproof or hermetically sealed and now with ***PLUS!***™ Performance option.

TEMPERATURE LIMITS

	Ambient	Process	Storage
Dry	–20°F/200°F[1] (–29°C/93°C)	–20°F/250°F[1] (–29°C/121°C)	–40°F/250°F (–40°C/121°C)
PLUS!™	–40°F/150°F (–40°C/66°C)	–40°F/200°F (–40°C/93°C)	–40°F/150°F (–40°C/66°C)
LF (glycerin)	20°F/150°F (7°C/66°C)	20°F/150°F (7°C/93°C)	0°F/150°F (–18°C/66°C)
(silicone)	–40°F/150°F (–40°C/66°C)	–40°F/200°F (–40°C/93°C)	–40°F/150°F (–40°C/66°C)
(Halocarbon®)	–40°F/150°F (–40°C/66°C)	–40°F/200°F (–40°C/93°C)	–40°F/150°F (–40°C/66°C)

Note: Other than discoloration of the dial and hardening of the gasketing that may occur as ambient or process temperatures exceeds 150°F, non-liquid-filled gauges with standard glass windows, can withstand continuous operating temperatures up to 250°F (121°C). Liquid-filled gauges can withstand 200°F (93°C) but glycerin fill and acrylic window will tend to yellow. Accuracy at temperatures above or below the reference ambient temperature of 68°F will be affected by approximately .4% per 25°F. Gauges with welded joints will withstand 750°F (450°F (232°C) with silver brazed joints) for short times without rupture, although other parts of the gauge will be destroyed and calibration will be lost. For continuous use and for process or ambient temperatures above 250°F (121°C), a diaphragm seal or capillary or siphon is recommended.

PRODUCT SPECIFICATIONS

Model Number: 1009
Accuracy: 1% full scale (Grade A, ASME B40.100)
Ranges: Vacuum – 30,000 psi
Dial Size: 4½″ and 6″ diameter
Case: Open front
Case Material: 304 SS
Weather Protection: Dry Case: IP54
Liquid filled or hermetically sealed case: IP 65
Ring Type: 304 SS, bayonet
Window: Glass
Dial: Aluminum, white background, black figures and graduations.
Pointer: Micrometer adjustable
Movement: 400 SS (conventional)
Bourdon Tube and Socket: Bronze/Brass (A)[1]
316L SS/316L SS (S)[2]
Monel®/Monel® (P)[2]
Connection Size: ¼, ½ NPT
Connection Location: Lower and back

PRODUCT OPTIONS

***PLUS!* Performance:** XLL
Fill: L-Glycerin-Standard
XGV-Silicone-Optional
XGX-Halocarbon®-Optional
Weatherproof Hermetic Seal: XLJ
Panel Mount Front Flange: XFF
Panel Mount U-Clamp: XUC
Surface Mount: XBF
Oxygen Clean: X6B
Window
Acrylic: XPD
Shatterproof Glass: XSG

(1) Joints silver brazed
(2) Joints welded

45/60 1009 GAUGE PRODUCT CODING

Typical Code:

45	1009	S	L	04	L	XSG	100#	
SIZE	TYPE NUMBER	SYSTEM (Tube & Socket)	CASE DESIGN	PROCESS CONN. SIZE	CONNECTION LOCATION	VARIATIONS	RANGE	ENGINEERING UNITS[1]
(45) 4½″ (60) 6″	1009	Code Bourdon Tube Socket (A) Phos Brz[1] Brass (S) AISI 316SS[2] AISI 316SS (P) K Monel[2] Monel 400 (1) To 1000 psi (2) To 30,000 psi	Code Description (L) Liquid Filled (glycerin std.)	Code NPT (02) ¼ Male[1] (04) ½ Male[1] (09) 9/16-18 UNF-2B Aminco (standard for high pressure >20,000 psi (1) Max Pressure 20,000 psi	Code Description (L) Lower (B) Back (D) Side Conn. 3 o'clock (E) Side Conn. 9 o'clock (T) Top	(GV) Silicone Case Fill (GX) Halocarbon Case Fill (NH) SS Wired Tag (TS) Throttle Screw[1] (6B) Oxygen Service (PD) Acrylic Window[1] (SG) Safety Glass (LJ) Hermetically Sealed Liquid Fillable (IP65) (EP) Maximum Pointer, Adjustable (SH) Red Set Hand, Stationary (LL) ***PLUS!***™ Performance (FF) Flush Mounting Ring (C4) Individual Calibration Chart (1) Standard with hermetically sealed or liquid filled gauge.	15 30 60 100 160 200 300 400 600 1000 1500 2000 3000 5000 6000 10,000 20,000 30,000	(#) PSI (BR) Bar (KG) Kilograms/CM² (KP) Kilopascal (IMV) Inches of Mercury Vacuum (1) See website for more units of measure

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ASHCROFT®
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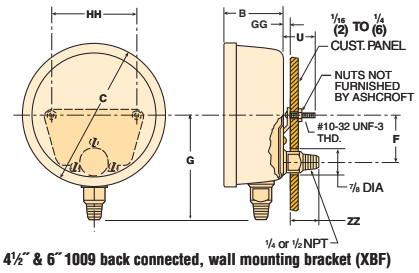
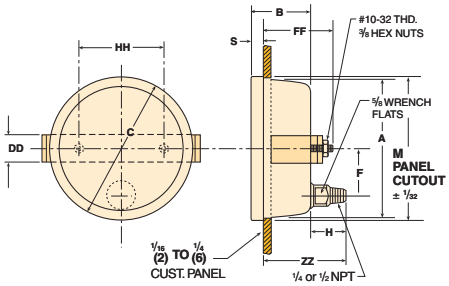
Type 1009 4½˝ & 6˝ Stainless Steel Gauge

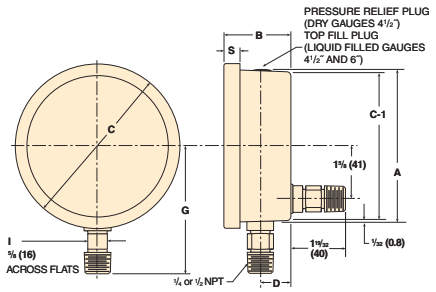
DIMENSIONS



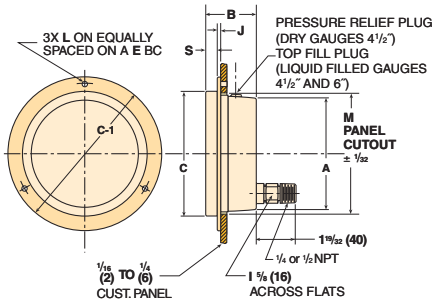
4½˝ & 6˝ 1009 back connected, wall mounting bracket (XBF)



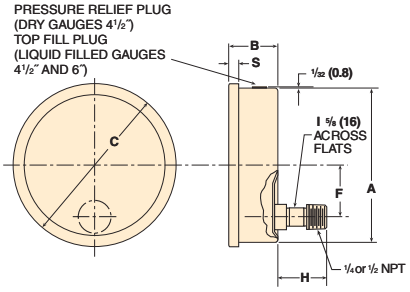
4½˝ & 6˝ 1009 back connected U-clamp (XUC)



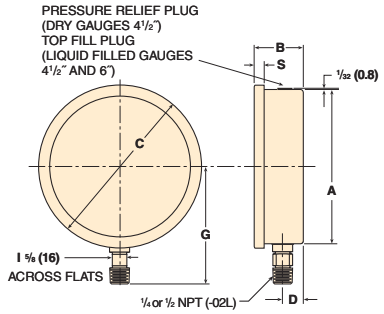
4½˝ 1009 lower or lower back connected



4½˝ & 6˝ 1009 back connected, front flange (XFF)



6˝ 1009 back connected



6˝ 1009 lower connected

Gauge Size	A	B	C	C-1	D	DD	E	F	FF	G	GG	H	HH	I	J	L	M	S	U	ZZ	Weight Dry	Weight LF
4½ (100)	4 23/32 (120)	2 1/16 (52)	5 3/32 (129)	6 1/4 (159)	15/16 (24)	1 (25)	5 11/16 (144)	1 5/8 (41)	2 5/16 (59)	3 15/16 (100)	3/16 (5)	1 5/8 (41)	3 (76)	5/8 (16)	5/32 (4)	7/32 (6)	4 13/16 (122)	15/32 (12)	1 7/16 (37)	3 9/32 (83)	1.75# .79kg	2.40# 1.1kg
6 (160)	6 5/16 (160)	2 (51)	6 21/32 (169)	7 41/64 (194)	27/32 (22)	1 (25)	7 1/32 (179)	1 5/8 (41)	2 5/8 (67)	4 13/16 (122)	3/16 (5)	1 5/8 (41)	4 1/2 (114)	5/8 (16)	1/16 (2)	1/4 (7)	6 7/16 (163)	13/32 (10)	1 7/16 (37)	3 3/16 (81)	2.25# 1kg	4.12# 1.85k

Note: Dimensions in brackets ( ) are millimeters.

Standard Ranges (Metric equivalents available)

Pressure – psi

Range	Figure interval	Minor Graduation
0/15	1	0.2
0/30	5	0.5
0/60	5	0.5
0/100	10	1
0/160	20	2
0/200	20	2
0/300	50	5
0/400	50	5
0/600	50	10
0/800	100	10
0/1000	100	10
0/1500	200	20
0/2000	200	20
0/3000	500	20
0/5000	500	50
0/6000	500	50
0/10,000	1000	100
0/20,000	2000	250
0/30,000	5000	200

Compound

Range	Figure Interval		Minor Grads	
	in Hg	psi	in Hg	psi
30˝ Hg/15 psi	5	3	0.5	0.2
30˝ Hg/30 psi	10	5	1	0.5
30˝ Hg/60 psi	10	10	1	1
30˝ Hg/100 psi	10	10	2	1
30˝ Hg/150 psi	10	20	5	2
30˝ Hg/200 psi	30	20	5	2
30˝ Hg/300 psi	30	50	5	2

Vacuum

Range	Figure Interval	Minor Grads
30/0 in. Hg	5 in	0.2 in
34/0 ft H_2O	5 ft	0.5 ft

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Type 100 Series Threaded Capsule Diaphragm Seal

TYPE 100 SHOWN

When isolation of the process from an instrument is required, Ashcroft® offers a comprehensive line of diaphragm seals. Seal types include threaded, flanged, in-line threaded, in-line flanged, in-line socket weld, in-line butt weld, saddle and sanitary seals. Also available is a complete offering of isolation or iso-rings and isolation or iso-spools.

APPLICATIONS

- Elevated process temperatures
- Corrosive service
- Isolation of the process for safety
- Suspended solids in the process
- Sanitary connections
- Minimize process dead leg
- Ease of cleaning between batches

FEATURES

- The top housing and diaphragm capsule are interchangeable with all Ashcroft bottom housings.
- A fill/bleed connection is standard, which permits filling the seal and instrument simultaneously after evacuation and allows the fill to flow into the completed unit.
- A Viton O-ring, compatible with all standard fill fluids, and a Teflon back-up ring provide a seal between the diaphragm capsule and the top housing.
- A thin Teflon PTFE gasket between the diaphragm and bottom housing ensures a leak-tight corrosion resistant seal even at high pressure.
- Top housing and pressure instrument are removable.
- Continuous-duty design will prevent loss of process fluid if pressure instrument is removed or fails.

SPECIFICATIONS

Model Number:	Type 100, 101, 102, 103, 104, 105, 106, 107, 108
Process Connection Size:	See Table A (Pg. 2)
Instrument Connection Size:	¼, ½ NPT
Diaphragm Material:	See Table B (Pg. 2)
Bottom Housing Materials:	See Table C (Pg. 2)
Filling Fluid:	Glycerin, Halocarbon, Silicone, Stylthern

OPTIONS	**Code**
316 stainless steel top housing	**YT**
Stainless steel clamp rings and flanged ring – includes 300 stainless steel clamping bolts (1500 psi max)	**SE**
300 series stainless steel clamping bolts (max pres is 1500 psi)	**SB**
Pipe plugs for flushing connections – pipe plugs are available in the same materials as bottom housings per Table C (Pg. 2)	**PU**
5000 psi pressure rating Threaded inlet and metal diaphragm only	**HP**
Welded instrument to diaphragm seal	**DU**
Dual flushing connections (½ NPT) (Limited to 2″ thru 3″ flanged seals	**DB**
Ring joint (Flanged seal only)	**RJ**
Flat face (Flanged seal only)	**FF**
Clean for gaseous oxygen or strong oxidizing agent applications	**6B**

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Type 100 Series Threaded Capsule Diaphragm Seal

TYPE 100 SERIES THREADED CAPSULE SEAL TYPES

Type 100 –Threaded
¼, ½, ¾, 1 NPT

Type 101 –Threaded
with flushing connection
¼, ½, ¾, 1 NPT

Type 102 – Raised Face Flanged
½˝, ¾˝, 1˝, 1½˝, 2˝, 3˝

Type 103 – Raised Face Flanged
½˝, ¾˝, 1˝, 1½˝, 2˝, 3
with flushing conection

Type 104 – In-line Threaded
¼, ½, ¾, 1 NPT

Type 105 – Saddle
3˝, 4˝ pipe only

Type 106 – In-line Flanged
½˝, ¾˝, 1˝, 1½˝, 2˝, 3˝, 4˝, 6˝, 8˝

Type 107 – In-line Socket Weld
½˝, ¾˝, 1˝, 1½˝, 2˝

Type 108 – In-line Butt Weld
¼˝, ½˝, ¾˝, 1˝, 1½˝, 2˝

Table A – Process Connection/Type Number

	Process Connection Size/Code—Inches											Type Number
	Size	¼	½	¾	1	1½	2	3	4	6	8	
Process Connection	Code	25	50	75	10	15	20	30	40	60	80	
Threaded–female NPT		•	•	•	•	•						100
Threaded–female NPT (with flushing conn.)		•	•	•	•	•						101
Flanged(1)			•	•	•	•	•	•				102
Flanged (with flushing conn.)			•	•	•	•	•	•				103
In-line—threaded NPT		•	•	•	•							104
Saddle								•	AND LARGER			105
In-line—butt weld		•	•	•	•	•	•					108
In-line—flanged(2)			•	•	•	•	•	•	•	•	•	106
In-line—socket weld		•	•	•	•	•	•					107

Pressure Ratings—All 2500 psi except flanged seals are per ASME B 16.5, temperature limit determined by diaphragm, bottom housing and/or filling fluid.

Table B – Diaphragm Material

Material	Code
316L stainless steel	S
304L stainless steel	C
Monel 400	P
Nickel	N
Carpenter 20	D
Tantalum	U
Hastelloy B	G
Hastelloy C 22(3)	J
Hastelloy C 276(3)	H
Halar Coated Monel	R
Gold Plated 304 SS	W

Table C – Housing Materials

Bottom	Code
Steel	B
304L SS	C
316L SS	S
Hastelloy B	G
Hastelloy C 22(3)	J
Hastelloy C 276(3)	H
Carpenter 20	D
Monel “400”	M
Inconel “600”	W
Nickel	N
PVC(4)(9)	V
Tantalum clad SS(5)	SU
Halar coated SS(6)	BH
Teflon flanged steel(7)	T
Kynar(8)(9)	KY
Titanium	TI

Table D – Instrument Connection

Size – NPT	Code
¼	02T
½	04T

Table E – Filling Fluid

Filling	Service	Connection to Instrument	Temperature Range °F	Code
Glycerin	Pressure	Direct Only	0/400	CG
Silicone	Pressure/Vacuum	Direct or Flexible Line	–40/500	CK, DJ
Halocarbon	Pressure/Vacuum in presence of strong oxidizing agent	Direct or Flexible Line	–70/300	CF
Syltherm	Pressure/Vacuum	Direct or Flexible Line	–40/750	HA

Notes:

(1) 150, 300, 600, 900, 1500 & 2500 class flanges.
(2) 1˝ 150 thru 8˝ 300 class flanges only.
(3) Use on applications where NACE standard MR-01-75/ISO 1516 w/Sept. 2005 corrigendums.
(4) Maximum Press./Temp.
Threaded: 200 psi/74°F, 125 psi/125°F, 80 psi/150°F.
Flanged: 75 psi/100°F.
(5) Type 102 only.
(6) Type 102 only – Temp. Limits: –40/300°F.
(7) Only available in 1˝, 1½˝, & 2˝ 150 class, Types 102. Max. Press./Temp. – 270 psi and 150°F. Consult factory for conditions beyond these limits.
(8) Maximum Pressure/Temp.: 200 psi and 180°F.
(9) Type 100: ¼ or ½ NPT only. Larger sizes offered with solvent weld joint. N/A in 101 or 103 design.

HOW TO ORDER:

1. **From Table A...**select TYPE NUMBER based on process connection, process connection size and diaphragm type/construction. (e.g., Threaded/1˝/capsule–code-10-100)
2. **From Table B...**select DIAPHRAGM MATERIAL. (e.g., 316L stainless steel–code S)
3. **From Table C...**select BOTTOM HOUSING MATERIAL. (e.g., 316 stainless steel–code S)
4. **From Table D...**select INSTRUMENT CONNECTION size. (e.g., 1/4 NPT–code 02T)
5. **From Table E...**select FILLING FLUID, if diaphragm seal will be attached to instrument. (e.g., Glycerin–code CG)

Typical code: 10–100SS–02T–CG

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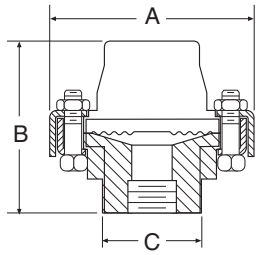
Type 100 Series Threaded Capsule Diaphragm Seal

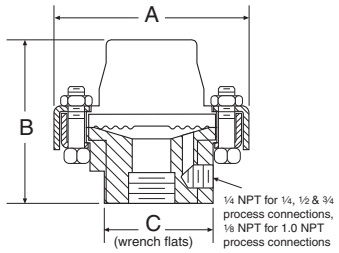
DIMENSIONS

Type 100 – Threaded
¼, ½, ¾, 1 NPT



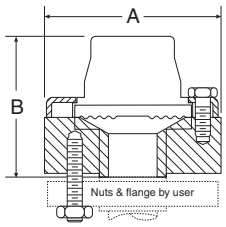
A		B		C	
in	mm	in	mm	in	mm
3¾	(95)	2⅞	(73)	1 13/16	(46)

Type 101 –Threaded
¼, ½, ¾, 1 NPT (with flushing conection)



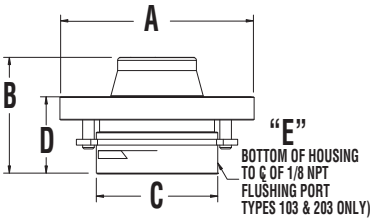
A		B		C	
in	mm	in	mm	in	mm
3¾	(95)	2⅞	(73)	1 13/16	(46)

Type 102 – Flanged
½,″ ¾,″



Flange Size	Rating #	A in	A mm	B in	B mm
	150	3½	(89)	2 15/16	(75)
½″	300 or 600	3¾	(95)	3	(76)
	900 or 1500	4¾	(121)	3 3/16	(81)
	150	3⅞	(98)	2 13/16	(71)
¾″	300 or 600	4⅝	(117)	3	(76)
	900 or 1500	5⅛	(130)	3 3/16	(81)

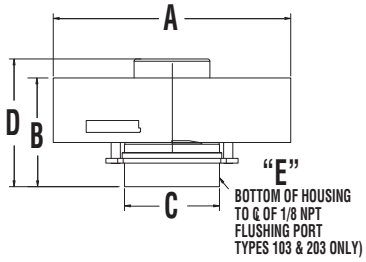
Type 102 – Flanged 1″ (raised face only)
one piece bottom housing, with and without flushing connection



Flange Size	Rating #	A in.	A mm	B in.	B mm	C in.	C mm
1	150	4-1/4	(100)	2-9/16	(65)	1-23/32	(69)
	300 or 600	5	(127)				

Flange Size	Rating #	D in.	D mm	103 & 203 only E in.	E mm
1	150 300 or 600	1-5/8	(41)	3/8	(9)

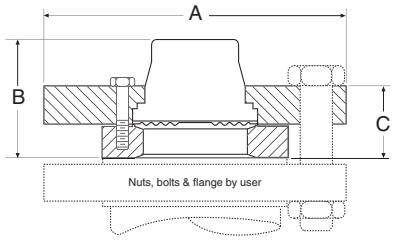
Type 102 – Flanged 1″ (raised face only)
one piece bottom housing, with and without flushing connection



Flange Size	Rating #	A in.	A mm	B in.	B mm	C in.	C mm
1	900 or 1500	5-7/8	(149)	2-7/8	(73)	2-1/4	(57)
	2500	6-1/4	(159)				

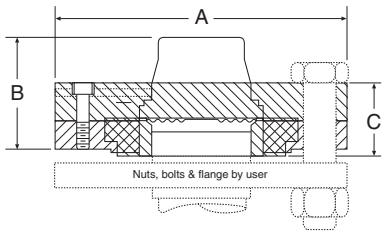
Flange Size	Rating #	D in.	D mm	103 & 203 only E in.	E mm
1	900 or 1500 2500	3-3/8	(86)	3/8	(9)

Type 102 – Flanged (raised face only)
1½,″ 2,″ 3″ one piece bottom housing - all materials except PVC, Teflon and Kynar



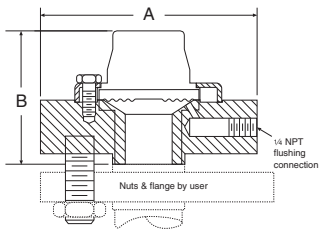
Flange Size	Rating #	A in	A mm	B in	B mm	C in	C mm
	150	5	(127)			1½	(38)
1½″	300 or 600	6¼	(159)	2⅜	(61)	1½	(38)
	900 or 1500	7	(178)			1½	(38)
	150	6	(152)			1⅜	(35)
2″	300 or 600	6½	(165)	1 15/16	(49)	1½	(38)
	900 or 1500	8½	(216)			2⅛	(54)
	150	7½	(191)	2	(51)	1⅝	(41)
3″	300 or 600	8¼	(206)	2 1/16	(52)	1⅞	(47)
	900 or 1500	10½	(267)	2 11/16	(68)	3¼	(82)

Type 102 – Flanged 1″ (raised face only)
two piece bottom housing, 1½,″ 2,″ - PVC, Teflon and Kynar



Flange Size	Rating #	A in	A mm	B in	B mm	C in	C mm
1½″	150	5	(127)	2 5/16	(59)	1 13/32	(39)
2″	150	6	(152)	2⅛	(54)	1 9/16	(40)

Type 103 – Flanged
½,″ ¾″ (with flushing conection)



Flange Size	Rating #	A in	A mm	B in	B mm
	150	3½	(89)	2 15/16	(75)
½″	300 or 600	3¾	(95)	3	(76)
	900 or 1500	4¾	(121)	3 3/16	(81)
	150	3⅞	(98)	2 13/16	(71)
¾″	300 or 600	4⅝	(117)	3	(76)

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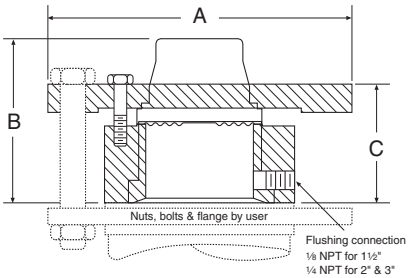
ASHCROFT®
Trust the shield.®

Type 100 Series Threaded Capsule Diaphragm Seal

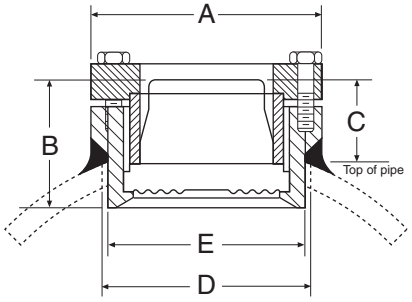
DIMENSIONS

Type 103 – Flanged 1½˝, 2˝, 3˝ (raised face only)
one piece bottom housing with flushing connection



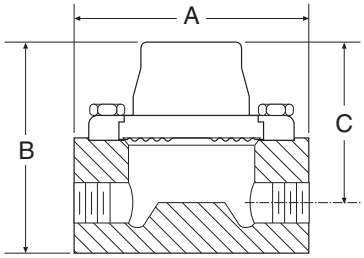
Flange Size	Rating #	A in	A mm	B in	B mm	C in	C mm
1½˝	150	5	(127)	3	(76)	2 1/16	(52)
	300 or 600	6¼	(159)				
	900 or 1500	7	(178)				
2˝	150	6	(152)	3 11/32	(84)	2⅜	(60)
	300 or 600	6½	(165)				
	900 or 1500	8½	(215)				
3˝	150	7½	(191)	3 3/32	(79)	2 7/32	(56)
	300 or 600	8¼	(210)	3 3/16	(81)	2 7/32	(57)
	900	9½	(241)	3 23/32	(94)	2¾	(70)
	1500	10½	(267)				

Type 105 – Saddle
4˝ Pipe only



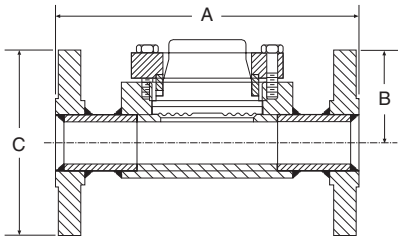
A in	A mm	B in	B mm	C in	C mm	D in	D mm	E in	E mm
3½	(89)	1 15/16	(50)	1 3/16	(31)	3	(76)	2 31/32	(75)

Type 104 – In-Line Threaded
¼, ½, ¾, 1 NPT



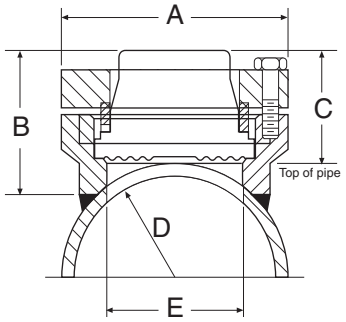
Process Connection	A in	A mm	B in	B mm	C in	C mm
¼ NPT	4	(102)	2 5/8	(67)	2 1/8	(54)
½ NPT			3 5/8	(92)	2¾	(70)
¾ NPT			3 7/8	(98)	3	(76)
1 NPT			3 7/8	(98)	3	(76)

Type 106 – In-Line Flanged
½˝, 1˝, 1½˝, 2˝, 3˝



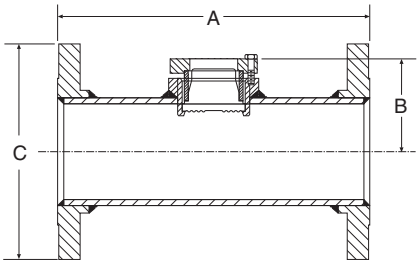
Flange Size	Rating #	A in	A mm	B in	B mm	C in	C mm
½˝	150	7	(178)	2 7/16	(62)	3½	(89)
	300	7	(178)			3⅞	(98)
1˝	150	7	(178)	2 7/16	(62)	4¼	(108)
	300	8	(203)			4⅞	(123)
1½˝	150	8	(203)	2 11/16	(68)	5	(127)
	300	9	(229)			6⅛	(155)
2˝	150	9	(229)	2 15/16	(75)	6	(152)
	300	10	(254)			6½	(165)
3˝	150	11	(279)	3⅝	(92)	7½	(229)
	300	12	(305)			8¼	(254)

Type 105 – Saddle
3˝ Pipe only



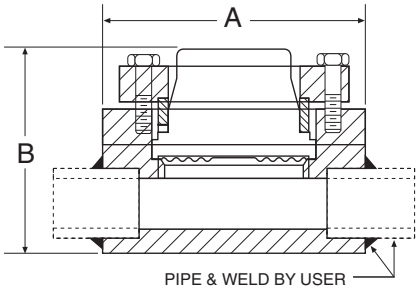
A in	A mm	B in	B mm	C in	C mm	D in	D mm	E in	E mm
3½	(89)	2¼	(57)	1⅞	(48)	1¾	(44)	2⅛	(54)

Type 106 – In-Line Flanged
4˝, 6˝, 8˝



Flange Size	Rating #	A in	A mm	B in	B mm	C in	C mm
4˝	150	13	(330)	3⅜	(86)	9	(229)
	300	14	(356)			10	(254)
6˝	150	16	(406)	4 7/16	(113)	11	(279)
	300	17	(432)			12½	(318)
8˝	150	16	(406)	5 7/16	(138)	13½	(343)

Type 107 – In-Line Welded
¼˝, ½˝, ¾˝, 1˝, 1½˝, 2˝



Pipe Size	A in	A mm	B in	B mm
¼˝	4	(102)	2 11/32	(60)
½˝, ¾˝			2 11/32	(60)
1˝			2 15/32	(63)
1½˝			2 23/32	(69)
2˝			2 31/32	(75)

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4 – DETAILED TECHNICAL DOCUMENTATION

4.3 – SHOP DRAWINGS

4.3.12 – RAW WATER

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Project name:	AMARUQ
Project#:	5000218009
Document #:	SPK_0012_RW
by:	BB
chkd:	GP
appvd:	CB

SUBMITTAL PACKAGE

RAW WATER

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Project name: AMARUQ

Project#: 5000218009

Document #: SPK_0012_RW

by: BB

chkd: GP

appvd: CB

RAW WATER

INSTRUMENTS

OIM manual section: 4.3.12.1

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CS-404-500 : Identification sheet

VWTC PROJECT NUMBER:	5000218009	REV:	1
PROJECT NAME:	AEM AMARUQ	SUBMITTED TO (COMPANY):	AGNICO EAGLE MINES
ENGINEER:	Gabriel Hébert	SUBMITTED TO (RESPONSIBLE)	
PROJECT MANAGER:	Clément B	PROJECT NUM REFERENCE.:	
PHONE NUMBER:		LOT NUMBER:	

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
E&H	ST-404-566	FIT1-011	24"	FLOWMETER	Electromagnetic flowmeter// Manuf: E&H // Model : 50W6H-ULGA1RC2BAAW+1// DN600 (24")// Liner: Polyurethane Process Connection: Cl.150, A105, flange ANSI B16.5 Electrodes: 1.4435/316L, bullet nose Calibration: 0.5% Additional Test, certificate: w/o	Housing: Wall Alu, IP67 NEMA4X Cable, Remote Version: 10m/30ft coil + signal cable Cable Entry: Thread NPT 1/2 Power Supply; Display: A 85-260VAC, WEA, 2-line + pushbuttons,	Adjustment; Software Feature: A Factory setup; basic version Output, Input: W 4-20mA SIL HART Marking: 1 Tagging (TAG), see additional spec.	RAW WATER		rev1

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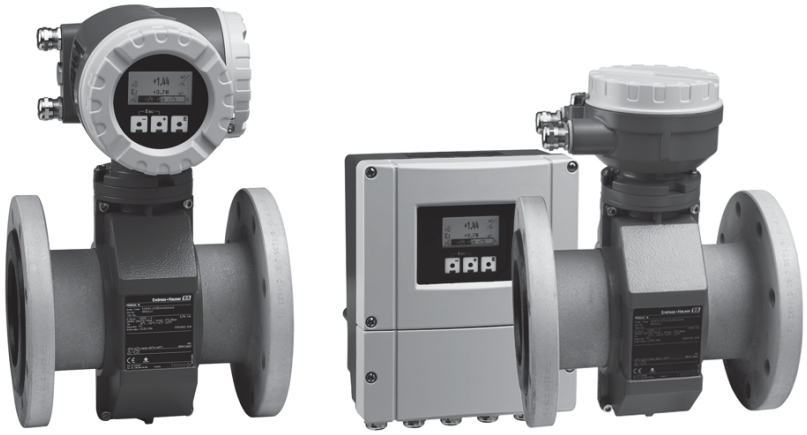
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Proline Promag 50W, 53W

Electromagnetic Flow Measuring System
Flow measurement of liquids in water or wastewater applications



Application

Electromagnetic flowmeter for bidirectional measurement of liquids with a minimum conductivity of ≥ 5 µS/cm:
- Drinking water
- Wastewater
- Sewage sludge

- Flow measurement up to 110000 m³/h (484315 gal/min)
- Fluid temperature up to +80 °C (+176 °F)
- Process pressures up to 40 bar (580 psi)
- Lengths in accordance with DVGW/ISO

Application-specific lining of the measuring pipe from polyurethane or hard rubber with the following drinking water permissions:
- KTW
- WRAS
- NSF
- ACS

Approvals for hazardous area:
- ATEX
- IECEx
- FM
- CSA
- NEPSI

Connection to process control system:
- HART
- PROFIBUS DP/PA
- FOUNDATION Fieldbus
- MODBUS RS485

Your benefits

Promag measuring devices offer you cost-effective flow measurement with a high degree of accuracy for a wide range of process conditions.

The uniform Proline transmitter concept comprises:
- Modular device and operating concept resulting in a higher degree of efficiency
- Software options for batching, electrode cleaning and for measuring pulsating flow
- High degree of reliability and measuring stability
- Uniform operating concept

The tried-and-tested Promag sensors offer:
- No pressure loss
- Not sensitive to vibrations
- Simple installation and commissioning

TI046D/24/en/07.10

Endress+Hauser

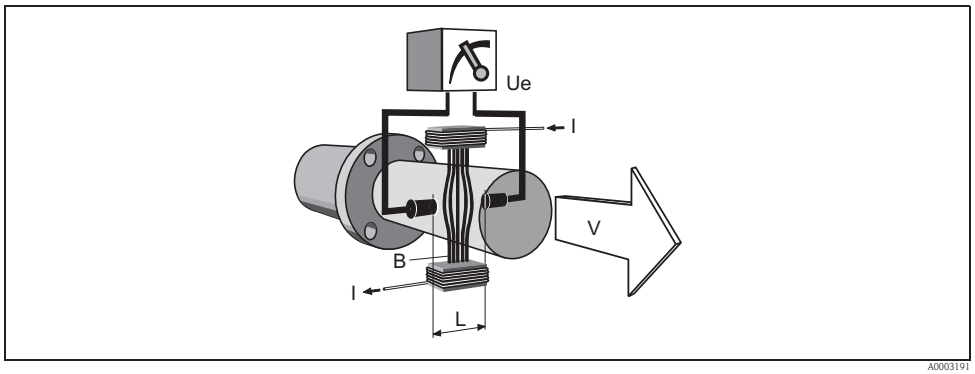
People for Process Automation

Table of contents

Function and system design

Measuring principle

Following Faraday's law of magnetic induction, a voltage is induced in a conductor moving through a magnetic field.
In the electromagnetic measuring principle, the flowing medium is the moving conductor.
The voltage induced is proportional to the flow velocity and is supplied to the amplifier by means of two measuring electrodes. The flow volume is calculated by means of the pipe cross-sectional area.
The DC magnetic field is created through a switched direct current of alternating polarity.



A0003191

$Ue = B \cdot L \cdot v$
$Q = A \cdot v$

Ue	Induced voltage
B	Magnetic induction (magnetic field)
L	Electrode spacing
v	Flow velocity
Q	Volume flow
A	Pipe cross-section
I	Current strength

Measuring system

The measuring system consists of a transmitter and a sensor.
Two versions are available:
- Compact version: Transmitter and sensor form a mechanical unit.
- Remote version: Sensor is mounted separate from the transmitter.

Transmitter:
- Promag 50 (user interface with push buttons for operation, two-line display, illuminated)
- Promag 53 ("Touch Control" without opening the housing, four-line display, unilluminated)

Sensor:
- Promag W (DN 25 to 2000 / 1 to 78")

Input

Measured variable

Flow velocity (proportional to induced voltage)

Measuring ranges

Measuring ranges for liquids
Typically v = 0.01 to 10 m/s (0.03 to 33 ft/s) with the specified accuracy

Operable flow range

Over 1000 : 1

Input signal

Status input (auxiliary input)
- U = 3 to 30 V DC, R_i = 5 kΩ, galvanically isolated
- Configurable for: totalizer(s) reset, measured value suppression, error-message reset

Status input (auxiliary input) with PROFIBUS DP and MODBUS RS485
- U = 3 to 30 V DC, R_i = 3 kΩ, galvanically isolated
- Switching level: 3 to 30 V DC, independent of polarity
- Configurable for: totalizer(s) reset, measured value suppression, error-message reset, batching start/stop (optional), batch totalizer reset (optional)

Current input (only Promag 53)
- active/passive selectable, galvanically isolated, full scale value selectable, resolution: 3 µA, temperature coefficient: typ. 0.005% o.r./°C (o.r. = of reading)
- active: 4 to 20 mA, $R_i \leq 150$ Ω, max. 24 V DC, short-circuit-proof
- passive: 0/4 to 20 mA, $R_i < 150$ Ω, max. 30 V DC

Output

Output signal

Promag 50

Current output
active/passive selectable, galvanically isolated, time constant selectable (0.01 to 100 s), full scale value selectable, temperature coefficient: typ. 0.005% o.r./°C (o.r. = of reading), resolution: 0.5 µA
- active: 0/4 to 20 mA, $R_L < 700$ Ω (HART: $R_L \geq 250$ Ω)
- passive: 4 to 20 mA, operating voltage V_S: 18 to 30 V DC, $R_i \geq 150$ Ω

Pulse/frequency output
passive, open collector, 30 V DC, 250 mA, galvanically isolated
- Frequency output: full scale frequency 2 to 1000 Hz (f_{max} = 1250 Hz), on/off ratio 1:1, pulse width max. 10s
- Pulse output: pulse value and pulse polarity selectable, max. pulse width configurable (0.5 to 2000 ms)

PROFIBUS DP interface
- Transmission technology (Physical Layer): RS485 in accordance with ANSI/TIA/EIA-485-A: 1998, galvanically isolated
- Profil version 3.0
- Data transmission rate: 9,6 kBaud to 12 MBaud
- Automatic data transmission rate recognition
- Function blocks: 1 × analog Input, 1 × totalizer
- Output data: volume flow, totalizer
- Input data: positive zero return (ON/OFF), totalizer control, value for local display
- Cyclic data transmission compatible with previous model Promag 33
- Bus address adjustable via miniature switches or local display (optional) at the measuring device

PROFIBUS PA interface
- Transmission technology (Physical Layer): IEC 61158-2 (MBP), galvanically isolated
- Profil version 3.0
- Current consumption: 11 mA
- Permissible supply voltage: 9 to 32 V
- Bus connection with integrated reverse polarity protection
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Function blocks: 1 × analog input, 2 × totalizer
- Output data: volume flow, totalizer
- Input data: positive zero return (ON/OFF), control totalizer, value for local display
- Cyclic data transmission compatible with previous model Promag 33
- Bus address adjustable via miniature switches or local display (optional) at the measuring device

Promag 53

Current output
active/passive selectable, galvanically isolated, time constant selectable (0.01 to 100 s),
full scale value selectable, temperature coefficient: typ. 0.005% o.r./°C (o.r. = of reading), resolution: 0.5 µA
- active: 0/4 to 20 mA, $R_L < 700\ \Omega$ (HART: $R_L \geq 250\ \Omega$)
- passive: 4 to 20 mA, operating voltage V_S: 18 to 30 V DC, $R_i \geq 150\ \Omega$

Pulse/frequency output
active/passive selectable, galvanically isolated (Ex i version: only passive)
- active: 24 V DC, 25 mA (max. 250 mA during 20 ms), $R_L > 100\ \Omega$
- passive: open collector, 30 V DC, 250 mA
- Frequency output: full scale frequency 2 to 10000 Hz (f_{max} = 12500 Hz), EEx-ia: 2 to 5000 Hz; on/off ratio 1:1, pulse width max. 10 s
- Pulse output: pulse value and pulse polarity selectable, max. pulse width configurable (0.05 to 2000 ms)

PROFIBUS DP interface
- Transmission technology (Physical Layer): RS485 in accordance with ANSI/TIA/EIA-485-A: 1998, galvanically isolated
- Profil version 3.0
- Data transmission rate: 9,6 kBaud to 12 MBaud
- Automatic data transmission rate recognition
- Function blocks: 2 × analog Input, 3 × totalizer
- Output data: volume flow, calculated mass flow, totalizer 1 to 3
- Input data: positive zero return (ON/OFF), totalizer control, value for local display
- Cyclic data transmission compatible with previous model Promag 33
- Bus address adjustable via miniature switches or local display (optional) at the measuring device
- Available output combination → 8

PROFIBUS PA interface
- Transmission technology (Physical Layer): IEC 61158-2 (MBP), galvanically isolated
- Profil version 3.0
- Current consumption: 11 mA
- Permissible supply voltage: 9 to 32 V
- Bus connection with integrated reverse polarity protection
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Function blocks: 2 × analog input, 3 × totalizer
- Output data: volume flow, calculated mass flow, totalizer 1 to 3
- Input data: positive zero return (ON/OFF), totalizer control, value for local display
- Cyclic data transmission compatible with previous model Promag 33
- Bus address adjustable via miniature switches or local display (optional) at the measuring device

MODBUS RS485 interface
- Transmission technology (Physical Layer): RS485 in accordance with ANSI/TIA/EIA-485-A: 1998, galvanically isolated
- MODBUS device type: Slave
- Adress range: 1 to 247
- Bus address adjustable via miniature switches or local display (optional) at the measuring device
- Supported MODBUS function codes: 03, 04, 06, 08, 16, 23
- Broadcast: supported with the function codes 06, 16, 23
- Übertragungsmodus: RTU oder ASCII
- Supported baudrate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud
- Response time:
  - Direct data access = typically 25 to 50 ms
  - Auto-scan buffer (data range) = typically 3 to 5 ms
- Available output combination → 8

FOUNDATION Fieldbus interface
- FOUNDATION Fieldbus H1
- Transmission technology (Physical Layer): IEC 61158-2 (MBP), galvanically isolated
- ITK version 5.01
- Current consumption: 12 mA
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Bus connection with integrated reverse polarity protection
- Function blocks:
  - 5 × Analog Input (execution time: 18 ms each)
  - 1 × PID (25 ms)
  - 1 × Digital Output (18 ms)
  - 1 × Signal Characterizer (20 ms)
  - 1 × Input Selector (20 ms)
  - 1 × Arithmetic (20 ms)
  - 1 × Integrator (18 ms)
- Output data: volume flow, calculated mass flow, temperature, totalizer 1 to 3
- Input data: positive zero return (ON/OFF), reset totalizer
- Link Master (LM) functionality is supported

Signal on alarm
- Current output → failure response selectable (e.g. in accordance with NAMUR recommendation NE 43)
- Pulse/frequency output → failure response selectable
- Status output (Promag 50) → non-conductive by fault or power supply failure
- Relay output (Promag 53) → de-energized by fault or power supply failure

Load

see "Output signal"

Low flow cutoff

Switch points for low flow cutoff are selectable.

Galvanic isolation

All circuits for inputs, outputs and power supply are galvanically isolated from each other.

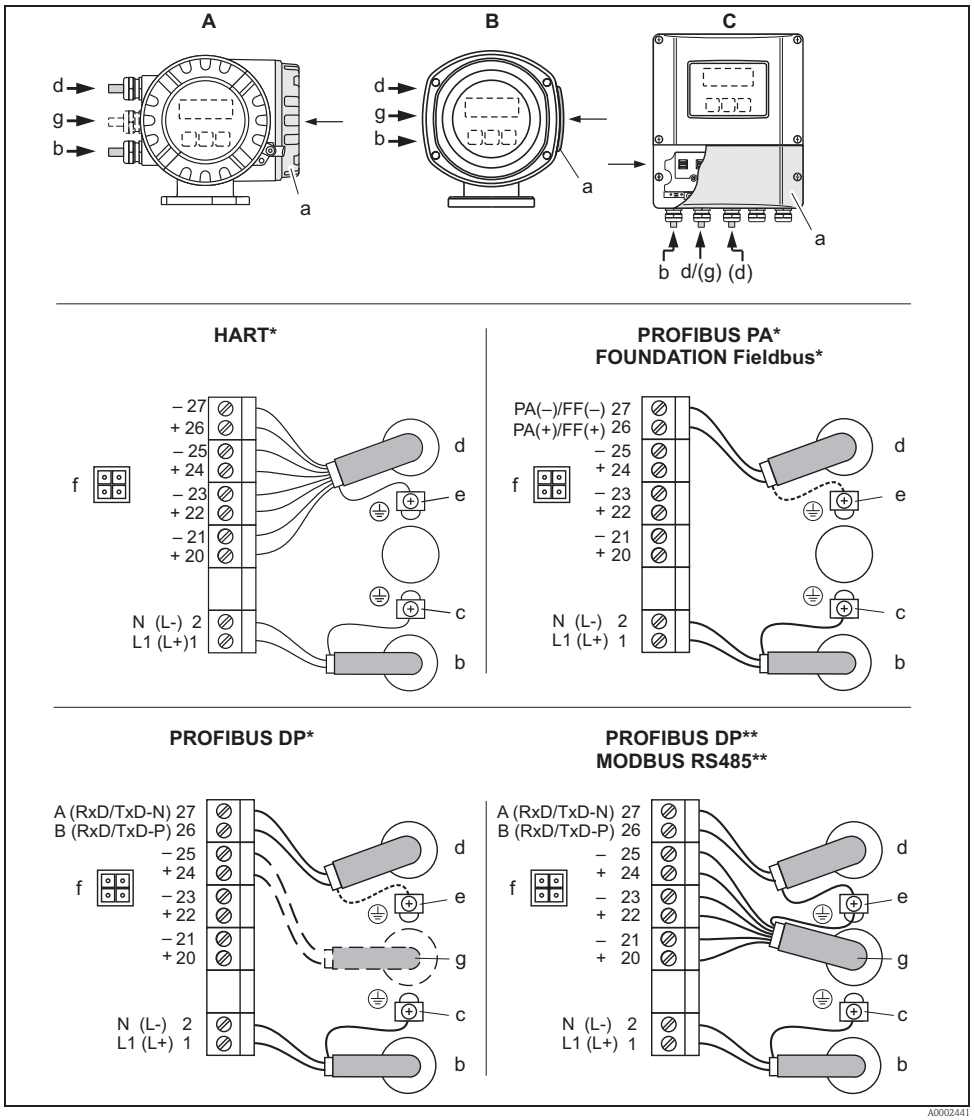
Switching output

Status output (Promag 50, Promag 53)
Open collector, max. 30 V DC / 250 mA, galvanically isolated.
Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values.

Relay outputs (Promag 53)
Normally closed (NC or break) or normally open (NO or make) contacts available
(default: relay 1 = NO, relay 2 = NC), max. 30 V / 0,5 A AC ; 60 V / 0,1 A DC, galvanically isolated.
Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values, batching contacts.

Power supply

Electrical connection, measuring unit



Connecting the transmitter, cable cross-section max. 2.5 mm² (14 AWG)

A View A (field housing)
B View B (stainless steel field housing)
C View C (wall-mount housing)

*) fixed communication boards
**) flexible communication boards
a Connection compartment cover
b Cable for power supply: 85 to 260 V AC / 20 to 55 V AC / 16 to 62 V DC
- Terminal No. 1: L1 for AC, L+ for DC
- Terminal No. 2: N for AC, L– for DC

c Ground terminal for protective conductor
d Signal cable: see "Electrical connection, terminal assignment" → 8
Fieldbus cable:
- Terminal No. 26: DP (B) / PA + / FF + / MODBUS RS485 (B) / (PA, FF: with polarity protection)
- Terminal No. 27: DP (A) / PA – / FF – / MODBUS RS485 (A) / (PA, FF: with polarity protection)

e Ground terminal for signal cable shield / Fieldbus cable / RS485 line
f Service adapter for connecting service interface FXA193 (Fieldcheck, FieldCare)
g Signal cable: see "Electrical connection, terminal assignment" → 8
Cable for external termination (only for PROFIBUS DP with fixed assignment communication board):
- Terminal No. 24: +5 V
- Terminal No. 25: DGND

Electrical connection, terminal assignment

Terminal assignment, Promag 50

Order variant	Terminal No. (inputs/outputs)			
	20 (+) / 21 (–)	22 (+) / 23 (–)	24 (+) / 25 (–)	26 (+) / 27 (–)
50***-**********W	–	–	–	Current output HART
50***-**********A	–	–	Frequency output	Current output HART
50***-**********D	Status input	Status output	Frequency output	Current output HART
50***-**********H	–	–	–	PROFIBUS PA
50***-**********J	–	–	+5 V (external termination)	PROFIBUS DP
50***-**********S	–	–	Frequency output, Ex i, passive	Current output, Ex i, passive, HART
50***-**********T	–	–	Frequency output, Ex i, passive	Current output, Ex i, passive, HART

Ground terminal → 7

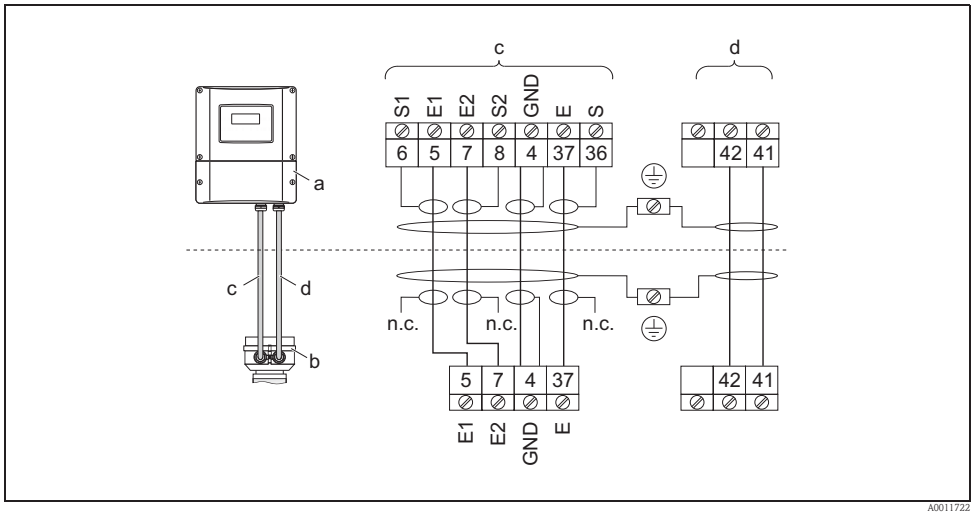
Terminal assignment, Promag 53

The inputs and outputs on the communication board can be either permanently assigned or variable, depending on the version ordered (see table). Replacements for modules which are defective or which have to be replaced can be ordered as accessories.

Order variant	Terminal No. (inputs/outputs)			
	20 (+) / 21 (–)	22 (+) / 23 (–)	24 (+) / 25 (–)	26 (+) / 27 (–)
Fixed communication boards (fixed assignment)				
53***-**********A	–	–	Frequency output	Current output HART
53***-**********B	Relay output 2	Relay output 1	Frequency output	Current output HART
53***-**********F	–	–	–	PROFIBUS PA, Ex i
53***-**********G	–	–	–	FOUNDATION Fieldbus, Ex i
53***-**********H	–	–	–	PROFIBUS PA
53***-**********J	–	–	–	PROFIBUS DP
53***-**********K	–	–	–	FOUNDATION Fieldbus
53***-**********Q	–	–	Status input	MODBUS RS485
53***-**********S	–	–	Frequency output, Ex i	Current output, Ex i, passive, HART
53***-**********T	–	–	Frequency output, Ex i	Current output, Ex i, passive, HART
Flexible communication boards				
53***-**********C	Relay output 2	Relay output 1	Frequency output	Current output HART
53***-**********D	Status input	Relay output	Frequency output	Current output HART
53***-**********L	Status input	Relay output 2	Relay output 1	Current output HART
53***-**********M	Status input	Frequency output	Frequency output	Current output HART
53***-**********N	Current output	Frequency output	Status input	MODBUS RS485
53***-**********P	Current output	Frequency output	Status input	PROFIBUS DP
53***-**********V	Relay output 2	Relay output 1	Status input	PROFIBUS DP
53***-**********2	Relay output	Current output	Frequency output	Current output HART
53***-**********4	Current input	Relay output	Frequency output	Current output HART
53***-**********7	Relay output 2	Relay output 1	Status input	MODBUS RS485

Ground terminal → 7

Electrical connection, remote version



Connecting the remote version

a Wall-mount housing connection compartment
b Sensor connection housing cover
c Signal cable
d Coil current cable
n.c. Not connected, insulated cable shields
Terminal no. and cable colors: 6/5 = brown; 7/8 = white; 4 = green; 36/37 = yellow

Supply voltage (power supply)

- 85 to 260 V AC, 45 to 65 Hz
- 20 to 55 V AC, 45 to 65 Hz
- 16 to 62 V DC

PROFIBUS PA and FOUNDATION Fieldbus
- Non-Ex: 9 to 32 V DC
- Ex i: 9 to 24 V DC
- Ex d: 9 to 32 V DC

Cable entry

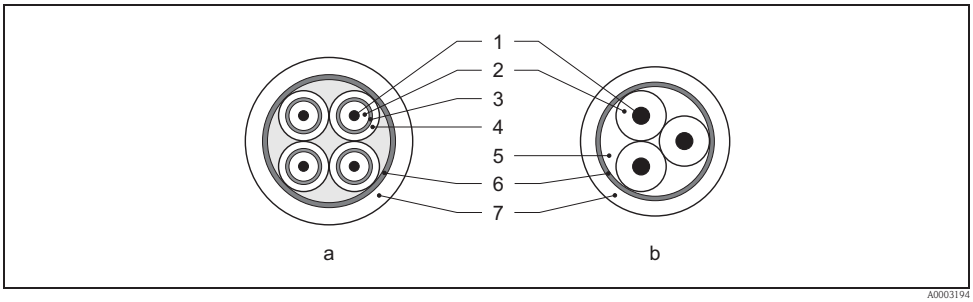
Power supply and signal cables (inputs/ outputs):
- Cable entry M20 × 1.5 (8 to 12 mm / 0.31 to 0.47")
- Sensor cable entry for armoured cables M20 × 1.5 (9.5 to 16 mm / 0.37 to 0.63")
- Thread for cable entries, ½" NPT, G ½"

Connecting cable for remote version:
- Cable entry M20 × 1.5 (8 to 12 mm / 0.31 to 0.47")
- Sensor cable entry for armoured cables M20 × 1.5 (9.5 to 16 mm / 0.37 to 0.63")
- Thread for cable entries, ½" NPT, G ½"

Remote version cable specifications

Coil cable
- 2 × 0.75 mm² (18 AWG) PVC cable with common, braided copper shield (∅ ~ 7 mm / 0.28")
- Conductor resistance: ≤ 37 Ω/km (≤ 0.011 Ω/ft)
- Capacitance core/core, shield grounded: ≤ 120 pF/m (≤ 37 pF/ft)
- Operating temperature: –20 to +80 °C (–68 to +176 °F)
- Cable cross-section: max. 2.5 mm² (14 AWG)
- Test voltage for cable insulation: ≤ 1433 AC r.m.s. 50/60 Hz or ≥ 2026 V DC

Signal cable
- 3 × 0.38 mm² (20 AWG) PVC cable with common, braided copper shield (∅ ~ 7 mm / 0.28") and individual shielded cores
- With empty pipe detection (EPD): 4 × 0.38 mm² (20 AWG) PVC cable with common, braided copper shield (∅ ~ 7 mm / 0.28") and individual shielded cores
- Conductor resistance: ≤ 50 Ω/km (≤ 0.015 Ω/ft)
- Capacitance core/shield: ≤ 420 pF/m (≤ 128 pF/ft)
- Operating temperature: –20 to +80 °C (–68 to +176 °F)
- Cable cross-section: max. 2.5 mm² (14 AWG)



a Signal cable
b Coil current cable

1 Core
2 Core insulation
3 Core shield
4 Core jacket
5 Core reinforcement
6 Cable shield
7 Outer jacket

Operation in zones of severe electrical interference
The measuring device complies with the general safety requirements in accordance with EN 61010 and the EMC requirements of IEC/EN 61326 and NAMUR recommendation NE 21.

Caution!
Grounding is by means of the ground terminals provided for the purpose inside the connection housing. Ensure that the stripped and twisted lengths of cable shield to the ground terminal are as short as possible.

Power consumption

- AC: < 15 VA (incl. sensor)
- DC: < 15 W (incl. sensor)

Switch-on current:
- Max. 3 A (< 5 ms) for 260 V AC
- Max. 13.5 A (< 50 ms) for 24 V DC

Power supply failure

Lasting min. ½ cycle frequency: EEPROM saves measuring system data
- EEPROM or T-DAT (Promag 53 only) retain the measuring system data in the event of a power supply failure
- S-DAT: exchangeable data storage chip which stores the data of the sensor (nominal diameter, serial number, calibration factor, zero point etc.)

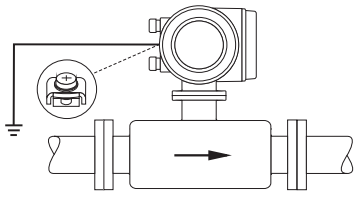
Potential equalization

Warning!
The measuring system must be included in the potential equalization.

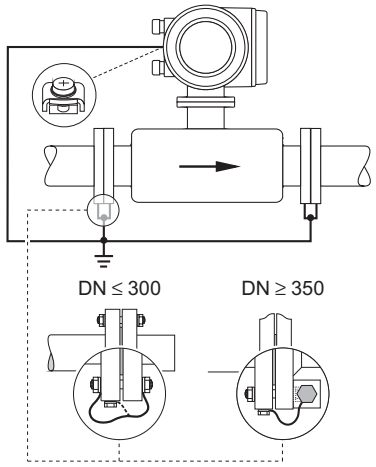
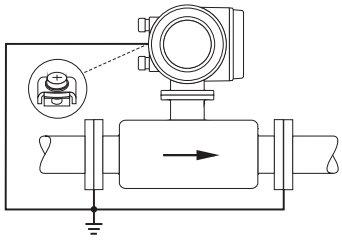
Perfect measurement is only ensured when the fluid and the sensor have the same electrical potential. This is ensured by the reference electrode integrated in the sensor as standard.

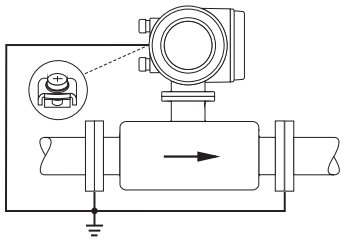
The following should also be taken into consideration for potential equalization:
- Internal grounding concepts in the company
- Operating conditions, such as the material/ grounding of the pipes (see table)

Standard situation

Operating conditions	Potential equalization
When using the measuring device in a: ■ Metal, grounded pipe Potential equalization takes place via the ground terminal of the transmitter. Note! When installing in metal pipes, we recommend you connect the ground terminal of the transmitter housing with the piping.	 A0011892 Via the ground terminal of the transmitter

Special situations

Operating conditions	Potential equalization
When using the measuring device in a: ■ Metal pipe that is not grounded This connection method also applies in situations where: ■ Customary potential equalization cannot be ensured. ■ Excessively high equalizing currents can be expected. Both sensor flanges are connected to the pipe flange by means of a ground cable (copper wire, at least 6 mm² / 0.0093 in²) and grounded. Connect the transmitter or sensor connection housing, as applicable, to ground potential by means of the ground terminal provided for the purpose. ■ DN ≤ 300 (12"): the ground cable is mounted directly on the conductive flange coating with the flange screws. ■ DN ≥ 350 (14"): the ground cable is mounted directly on the transportation metal support. Note! The ground cable for flange-to-flange connections can be ordered separately as an accessory from Endress+Hauser.	 A0011893 Via the ground terminal of the transmitter and the flanges of the pipe
When using the measuring device in a: ■ Plastic pipe ■ Pipe with insulating lining This connection method also applies in situations where: ■ Customary potential equalization cannot be ensured. ■ Excessively high equalizing currents can be expected. Potential equalization takes place using additional ground disks, which are connected to the ground terminal via a ground cable (copper wire, at least 6 mm² / 0.0093 in²). When installing the ground disks, please comply with the enclosed Installation Instructions.	 A0011895 Via the ground terminal of the transmitter and the optionally available ground disks

Operating conditions	Potential equalization
When using the measuring device in a: ■ Pipe with a cathodic protection unit The device is installed potential-free in the pipe. Only the two flanges of the pipe are connected with a ground cable (copper wire, at least 6 mm² / 0.0093 in²). Here, the ground cable is mounted directly on the conductive flange coating with flange screws. Note the following when installing: ■ The applicable regulations regarding potential-free installation must be observed. ■ There should be **no** electrically conductive connection between the pipe and the device. ■ The mounting material must withstand the applicable torques.	 A0011896 Potential equalization and cathodic protection 1 Power supply isolation transformer 2 Electrically isolated

Performance characteristics

Reference operating conditions

As per DIN EN 29104 and VDI/VDE 2641:
- Fluid temperature: +28 °C ± 2 K (+82 °F ± 2 K)
- Ambient temperature: +22 °C ±2 K (+72 °F ± 2 K)
- Warm-up period: 30 minutes

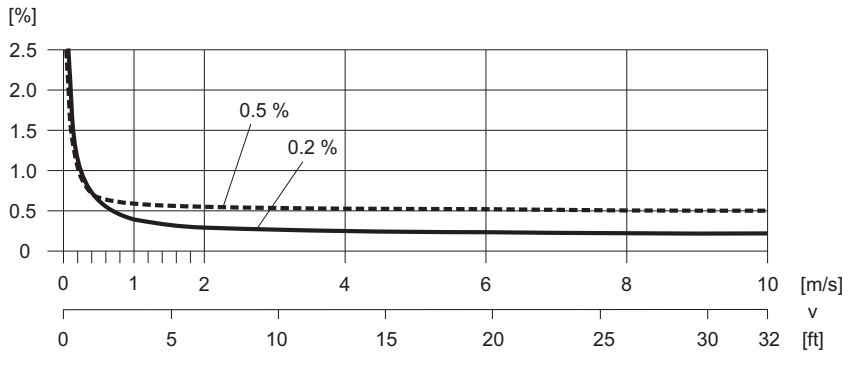
Installation conditions:
- Inlet run > 10 × DN
- Outlet run > 5 × DN
- Sensor and transmitter grounded.
- The sensor is centered in the pipe.

Maximum measured error

Promag 50:
- Current output: also typically ± 5 µA
- Pulse output: ±0.5% o.r. ± 1 mm/s (±0.5% o.r. ± 0.04 in/s)
  optional: ±0.2% o.r. ± 2 mm/s (±0.2% o.r. ± 0.08 in/s) (o.r. = of reading)

Promag 53:
- Current output: also typically ± 5 µA
- Pulse output: ±0.2% o.r. ± 2 mm/s (±0.2% o.r. ± 0.08 in/s) (o.r. = of reading)

Fluctuations in the supply voltage do not have any effect within the specified range.



Max. measured error in % of reading

Repeatability

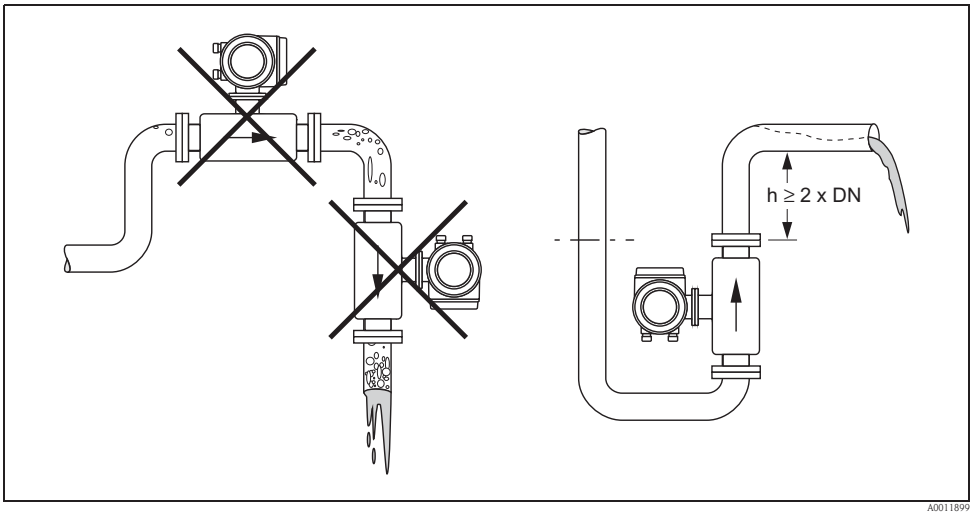
Max. ±0.1% o.r. ± 0.5 mm/s (±0.1% o.r. ± 0.02 in/s) (o.r. = of reading)

Operating conditions: Installations

Installation instructions

Mounting location

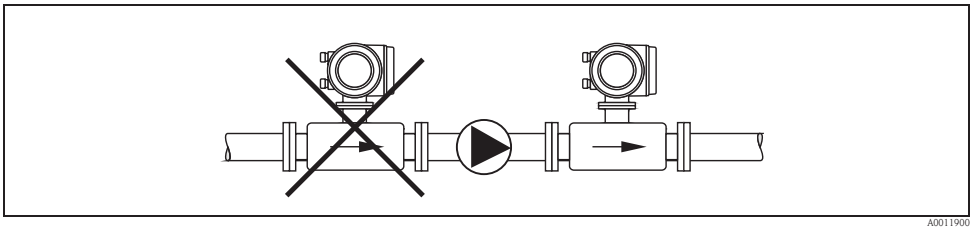
Entrained air or gas bubble formation in the measuring tube can result in an increase in measuring errors.
Avoid the following installation locations in the pipe:
- Highest point of a pipeline. Risk of air accumulating!
- Directly upstream from a free pipe outlet in a vertical pipeline.



Mounting location

Installation of pumps

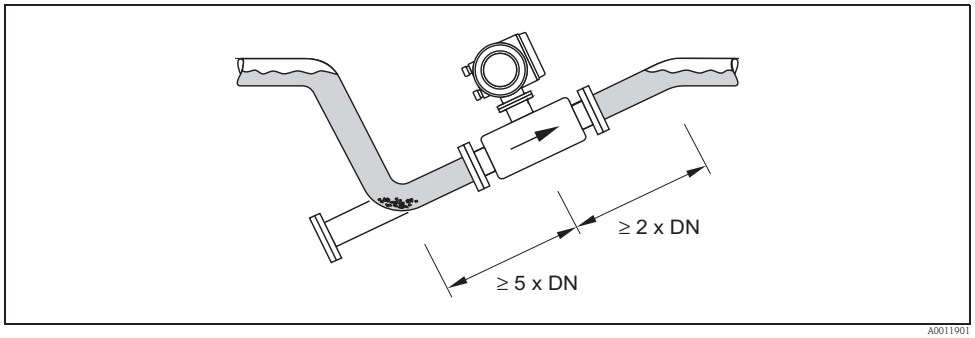
Sensors may not be installed on the pump suction side. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. Information on the pressure tightness of the measuring tube lining → 21, Section "Pressure tightness".
Pulsation dampers may be needed when using piston pumps, piston diaphragm pumps or hose pumps. Information on the shock and vibration resistance of the measuring system → 20, Section "Shock and vibration resistance".



Installation of pumps

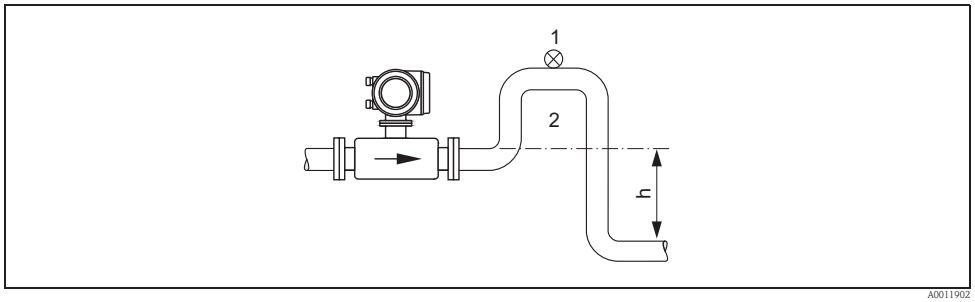
Partially filled pipes
Partially filled pipes with gradients necessitate a drain-type configuration.
The empty pipe detection function (EPD) provides additional security in detecting empty or partially filled pipes.

Caution!
Risk of solids accumulating. Do not install the sensor at the lowest point in the drain. It is advisable to install a cleaning valve.



Installation with partially filled pipes

Down pipes
Install a siphon or a vent valve downstream of the sensor in down pipes h ≥ 5 m (16.4 ft). This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. This measure also prevents the liquid current stopping in the pipe which could cause air locks. Information on the pressure tightness of the measuring tube lining → 21, Section "Pressure tightness".



Installation measures for vertical pipes

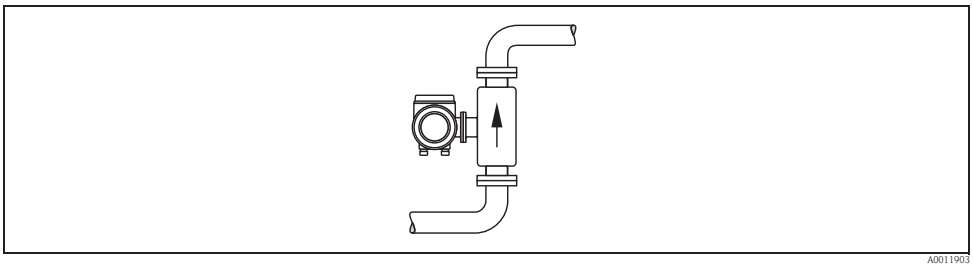
1 Vent valve
2 Pipe siphon
h Length of the down pipe

Orientation

An optimum orientation helps avoid gas and air accumulations and deposits in the measuring tube. However, the measuring device also offers the additional function of empty pipe detection (EPD) for detecting partially filled measuring tubes or if outgassing fluids or fluctuating operating pressures are present.

Vertical orientation

This is the ideal orientation for self-emptying piping systems and for use in conjunction with empty pipe detection.



A0011903

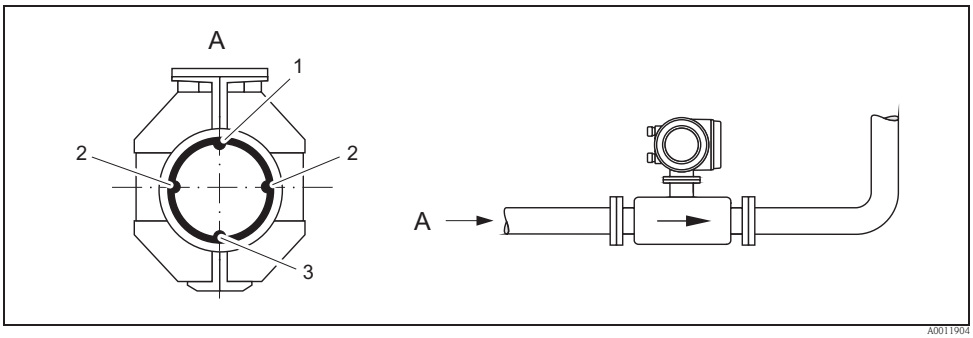
Vertical orientation

Horizontal orientation

The measuring electrode axis should be horizontal. This prevents brief insulation of the two measuring electrodes by entrained air bubbles.

Caution!

Empty pipe detection only works correctly with horizontal orientation if the transmitter housing is facing upwards. Otherwise there is no guarantee that empty pipe detection will respond if the measuring tube is only partially filled or empty.



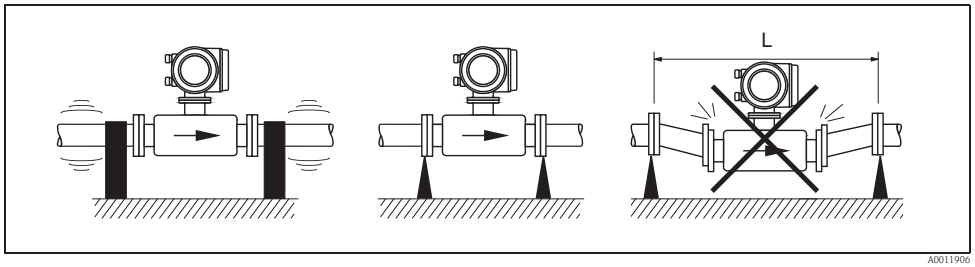
A0011904

Horizontal orientation

1 EPD electrode for empty pipe detection
2 Measuring electrodes for signal detection
3 Reference electrode for potential equalization

Vibrations
Secure the piping and the sensor if vibration is severe.

Caution!
If vibrations are too severe, we recommend the sensor and transmitter be mounted separately. Information on the permitted shock and vibration resistance → 20, Section "Shock and vibration resistance".

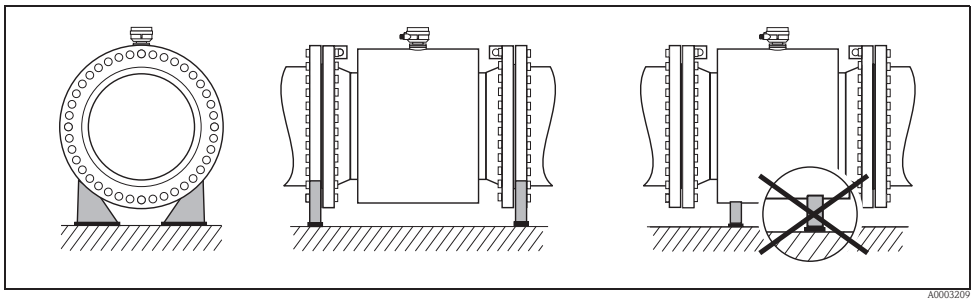


Measures to prevent vibration of the measuring device

L > 10 m (33 ft)

Foundations, supports
If the nominal diameter is DN ≥ 350, mount the transmitter on a foundation of adequate load-bearing strength.

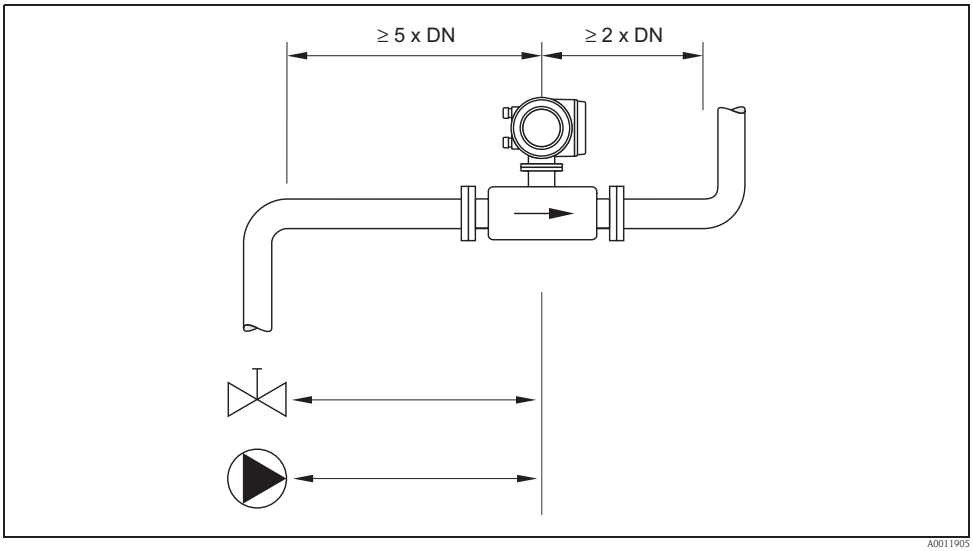
Caution!
Do not allow the casing to take the weight of the sensor. This would buckle the casing and damage the internal magnetic coils.



Inlet and outlet run

If possible, install the sensor well clear of assemblies such as valves, T-pieces, elbows etc.

Note the following inlet and outlet runs to comply with measuring accuracy specifications:
- Inlet run: ≥ 5 × DN
- Outlet run: ≥ 2 × DN



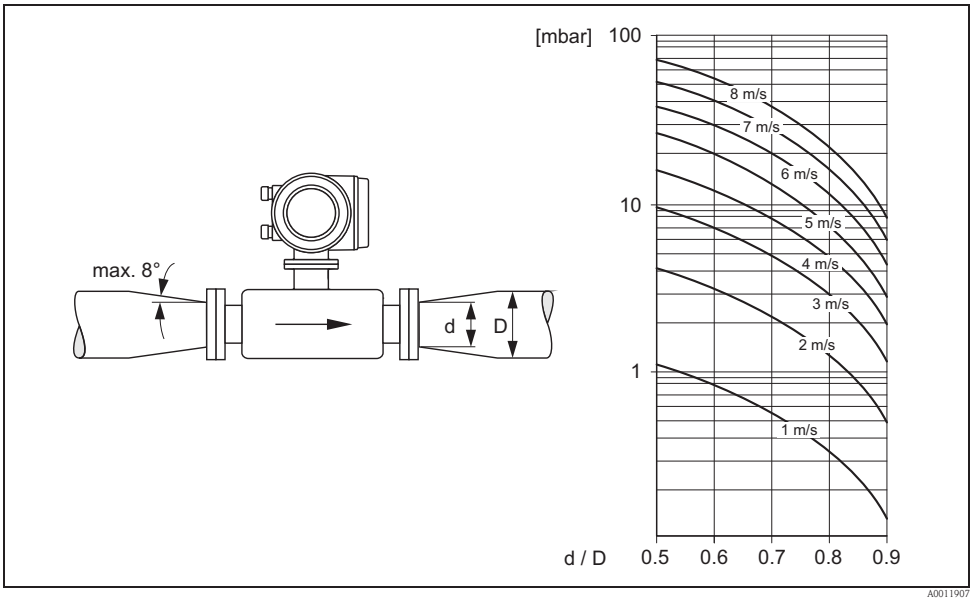
Inlet and outlet run

Adapters

Suitable adapters to DIN EN 545 (double-flange reducers) can be used to install the sensor in larger-diameter pipes. The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids. The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders.

Note!
The nomogram only applies to liquids of viscosity similar to water.

1. Calculate the ratio of the diameters d/D.
2. From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the d/D ratio.

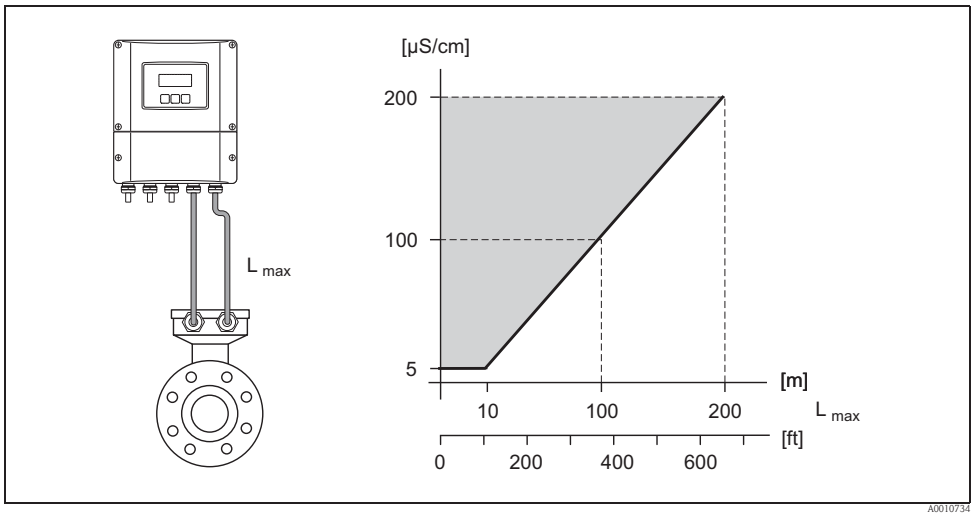


Pressure loss due to adapters

Length of connecting cable

When mounting the remote version, please note the following to achieve correct measuring results:

- Fix cable run or lay in armored conduit. Cable movements can falsify the measuring signal especially in the case of low fluid conductivities.
- Route the cable well clear of electrical machines and switching elements.
- If necessary, ensure potential equalization between sensor and transmitter.
- The permitted cable length L_{max} is determined by the fluid conductivity. A minimum conductivity of 20 µS/cm is required for measuring demineralized water.
- When the empty pipe detection function is switched on (EPD), the maximum connecting cable length is 10 m (33 ft).



Permitted length of connecting cable for remote version
Area marked in gray = permitted range; L_{max} = length of connecting cable in [m] ([ft]); fluid conductivity in [µS/cm]

Operating conditions: Environment

Ambient temperature range

Transmitter
- Standard: –20 to +60 °C (–4 to +140 °F)
- Optional: –40 to +60 °C (–40 to +140 °F)

Note!
At ambient temperatures below –20 °C (–4 °F)the readability of the display may be impaired.

Sensor
- Flange material carbon steel: –10 to +60 °C (14 to +140 °F)
- Flange material stainless steel: –40 to +60 °C (–40 to +140 °F)

Caution!
The permitted temperature range of the measuring tube lining may not be undershot or overshot
→ 21, Section "Medium temperature range".

Please note the following points:
- Install the device in a shady location. Avoid direct sunlight, particularly in warm climatic regions.
- The transmitter must be mounted separate from the sensor if both the ambient and fluid temperatures are high.

Storage temperature

The storage temperature corresponds to the operating temperature range of the measuring transmitter and the appropriate measuring sensors.

Caution!
- The measuring device must be protected against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- A storage location must be selected where moisture does not collect in the measuring device. This will help prevent fungus and bacteria infestation which can damage the liner.
- Do not remove the protective plates or caps on the process connections until the device is ready to install.

Degree of protection
- Standard: IP 67 (NEMA 4X) for transmitter and sensor.
- Optional: IP 68 (NEMA 6P) for sensor for remote version.
- For information regarding applications where the device is buried directly in the soil or is installed in a flooded wastewater basin please contact your local Endress+Hauser Sales Center.

Shock and vibration resistance

Acceleration up to 2 g following IEC 600 68-2-6

Electromagnetic compatibility (EMC)
- As per IEC/EN 61326 and NAMUR recommendation NE 21.

Operating conditions: Process

Medium temperature range

The permitted temperature depends on the lining of the measuring tube:
- Polyurethane: –20 to +50 °C (–4 to +122 °F) (DN 25 to 1200 / 1 to 48")
- Hard rubber: ±0 to +80 °C (+32 to +176 °F) (DN 50 to 2000 / 2 to 78")

Conductivity

The minimum conductivity is:
- ≥ 5 µS/cm for fluids generally
- ≥ 20 µS/cm for demineralized water

Note!
In the remote version, the necessary minimum conductivity also depends on the cable length (→ 19, Section "Length of connecting cable").

Medium pressure range (nominal pressure)

- EN 1092-1 (DIN 2501)
  - PN 6 (DN 350 to 2000 / 14 to 78")
  - PN 10 (DN 200 to 2000 / 8 to 78")
  - PN 16 (DN 65 to 2000 / 3 to 78")
  - PN 25 (DN 200 to 1000 / 8 to 40")
  - PN 40 (DN 25 to 150 / 1 to 6")
- ANSI B 16.5
  - Class 150 (DN 1 to 24")
  - Class 300 (DN 1 to 6")
- AWWA
  - Class D (DN 28 to 78")
- JIS B2220
  - 10 K (DN 50 to 300 / 2 to 12")
  - 20 K (DN 25 to 300 / 1 to 12")
- AS 2129
  - Table E (DN 80, 100, 150 to 400, 500, 600 / 3", 4", 6 to 16", 20", 24")
- AS 4087
  - PN 16 (DN 80, 100, 150 to 400, 500, 600 / 3", 4", 6 to 16", 20", 24")

Pressure tightness

Measuring tube lining: Polyurethane

Nominal diameter		Limit values for abs. pressure [mbar] ([psi]) at fluid temperatures:			
		25 °C (77 °F)		50 °C (122 °F)	
[mm]	[inch]	[mbar]	[psi]	[mbar]	[psi]
25 to 1200	1 to 48"	0	0	0	0

Measuring tube lining: Hard rubber

Nominal diameter		Limit values for abs. pressure [mbar] ([psi]) at fluid temperatures:					
		25 °C (77 °F)		50 °C (122 °F)		80 °C (176 °F)	
[mm]	[inch]	[mbar]	[psi]	[mbar]	[psi]	[mbar]	[psi]
50 to 2000	2 to 78"	0	0	0	0	0	0

Limiting flow

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor.
The optimum flow velocity is between 2 to 3 m/s (6.5 to 9.8 ft/s). The velocity of flow (v), moreover, has to be matched to the physical properties of the fluid:

- v < 2 m/s (6.5 ft/s): for abrasive fluids such as potter's clay, lime milk, ore slurry etc.
- v > 2 m/s (6.5 ft/s): for fluids causing build-up such as wastewater sludges etc.

Flow characteristic values (SI units)

Diameter		Recommended flow	Factory settings		
		Min./max. full scale value	Full scale value Current output	Pulse value	Low flow
[mm]	[inch]	(v ~ 0.3 or 10 m/s)	(v ~ 2.5 m/s)	(~ 2 pulses/s)	(v ~ 0.04 m/s)
25	1"	9 to 300 dm³/min	75 dm³/min	0.50 dm³	1 dm³/min
32	–	15 to 500 dm³/min	125 dm³/min	1.00 dm³	2 dm³/min
40	1½"	25 to 700 dm³/min	200 dm³/min	1.50 dm³	3 dm³/min
50	2"	35 to 1100 dm³/min	300 dm³/min	2.50 dm³	5 dm³/min
65	–	60 to 2000 dm³/min	500 dm³/min	5.00 dm³	8 dm³/min
80	3"	90 to 3000 dm³/min	750 dm³/min	5.00 dm³	12 dm³/min
100	4"	145 to 4700 dm³/min	1200 dm³/min	10.00 dm³	20 dm³/min
125	–	220 to 7500 dm³/min	1850 dm³/min	15.00 dm³	30 dm³/min
150	6"	20 to 600 m³/h	150 m³/h	0.025 m³	2.5 m³/h
200	8"	35 to 1100 m³/h	300 m³/h	0.05 m³	5.0 m³/h
250	10"	55 to 1700 m³/h	500 m³/h	0.05 m³	7.5 m³/h
300	12"	80 to 2400 m³/h	750 m³/h	0.10 m³	10 m³/h
350	14"	110 to 3300 m³/h	1000 m³/h	0.10 m³	15 m³/h
375	15"	140 to 4200 m³/h	1200 m³/h	0.15 m³	20 m³/h
400	16"	140 to 4200 m³/h	1200 m³/h	0.15 m³	20 m³/h
450	18"	180 to 5400 m³/h	1500 m³/h	0.25 m³	25 m³/h
500	20"	220 to 6600 m³/h	2000 m³/h	0.25 m³	30 m³/h
600	24"	310 to 9600 m³/h	2500 m³/h	0.30 m³	40 m³/h
700	28"	420 to 13500 m³/h	3500 m³/h	0.50 m³	50 m³/h
–	30"	480 to 15000 m³/h	4000 m³/h	0.50 m³	60 m³/h
800	32"	550 to 18000 m³/h	4500 m³/h	0.75 m³	75 m³/h
900	36"	690 to 22500 m³/h	6000 m³/h	0.75 m³	100 m³/h
1000	40"	850 to 28000 m³/h	7000 m³/h	1.00 m³	125 m³/h
–	42"	950 to 30000 m³/h	8000 m³/h	1.00 m³	125 m³/h
1200	48"	1250 to 40000 m³/h	10000 m³/h	1.50 m³	150 m³/h
–	54"	1550 to 50000 m³/h	13000 m³/h	1.50 m³	200 m³/h
1400	–	1700 to 55000 m³/h	14000 m³/h	2.00 m³	225 m³/h
–	60"	1950 to 60000 m³/h	16000 m³/h	2.00 m³	250 m³/h
1600	–	2200 to 70000 m³/h	18000 m³/h	2.50 m³	300 m³/h
–	66"	2500 to 80000 m³/h	20500 m³/h	2.50 m³	325 m³/h
1800	72"	2800 to 90000 m³/h	23000 m³/h	3.00 m³	350 m³/h
–	78"	3300 to 100000 m³/h	28500 m³/h	3.50 m³	450 m³/h
2000	–	3400 to 110000 m³/h	28500 m³/h	3.50 m³	450 m³/h

Flow characteristic values (US units)					
Diameter		**Recommended flow rate**	**Factory settings**		
[inch]	[mm]	Min./max. full scale value (v ~ 0.3 or 10 m/s)	Full scale value Current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulses/s)	Low flow (v ~ 0.04 m/s)
1"	25	2.5 to 80 gal/min	18 gal/min	0.20 gal	0.25 gal/min
–	32	4 to 130 gal/min	30 gal/min	0.20 gal	0.50 gal/min
1½"	40	7 to 190 gal/min	50 gal/min	0.50 gal	0.75 gal/min
2"	50	10 to 300 gal/min	75 gal/min	0.50 gal	1.25 gal/min
–	65	16 to 500 gal/min	130 gal/min	1 gal	2.0 gal/min
3"	80	24 to 800 gal/min	200 gal/min	2 gal	2.5 gal/min
4"	100	40 to 1250 gal/min	300 gal/min	2 gal	4.0 gal/min
–	125	60 to 1950 gal/min	450 gal/min	5 gal	7.0 gal/min
6"	150	90 to 2650 gal/min	600 gal/min	5 gal	12 gal/min
8"	200	155 to 4850 gal/min	1200 gal/min	10 gal	15 gal/min
10"	250	250 to 7500 gal/min	1500 gal/min	15 gal	30 gal/min
12"	300	350 to 10600 gal/min	2400 gal/min	25 gal	45 gal/min
14"	350	500 to 15000 gal/min	3600 gal/min	30 gal	60 gal/min
15"	375	600 to 19000 gal/min	4800 gal/min	50 gal	60 gal/min
16"	400	600 to 19000 gal/min	4800 gal/min	50 gal	60 gal/min
18"	450	800 to 24000 gal/min	6000 gal/min	50 gal	90 gal/min
20"	500	1000 to 30000 gal/min	7500 gal/min	75 gal	120 gal/min
24"	600	1400 to 44000 gal/min	10500 gal/min	100 gal	180 gal/min
28"	700	1900 to 60000 gal/min	13500 gal/min	125 gal	210 gal/min
30"	–	2150 to 67000 gal/min	16500 gal/min	150 gal	270 gal/min
32"	800	2450 to 80000 gal/min	19500 gal/min	200 gal	300 gal/min
36"	900	3100 to 100000 gal/min	24000 gal/min	225 gal	360 gal/min
40"	1000	3800 to 125000 gal/min	30000 gal/min	250 gal	480 gal/min
42"	–	4200 to 135000 gal/min	33000 gal/min	250 gal	600 gal/min
48"	1200	5500 to 175000 gal/min	42000 gal/min	400 gal	600 gal/min
54"	–	9 to 300 Mgal/min	75 Mgal/min	0.0005 Mgal	1.3 Mgal/min
–	1400	10 to 340 Mgal/min	85 Mgal/min	0.0005 Mgal	1.3 Mgal/min
60"	–	12 to 380 Mgal/min	95 Mgal/min	0.0005 Mgal	1.3 Mgal/min
–	1600	13 to 450 Mgal/min	110 Mgal/min	0.0008 Mgal	1.7 Mgal/min
66"	–	14 to 500 Mgal/min	120 Mgal/min	0.0008 Mgal	2.2 Mgal/min
72"	1800	16 to 570 Mgal/min	140 Mgal/min	0.0008 Mgal	2.6 Mgal/min
78"	–	18 to 650 Mgal/min	175 Mgal/min	0.001 Mgal	3.0 Mgal/min
–	2000	20 to 700 Mgal/min	175 Mgal/min	0.001 Mgal	3.0 Mgal/min

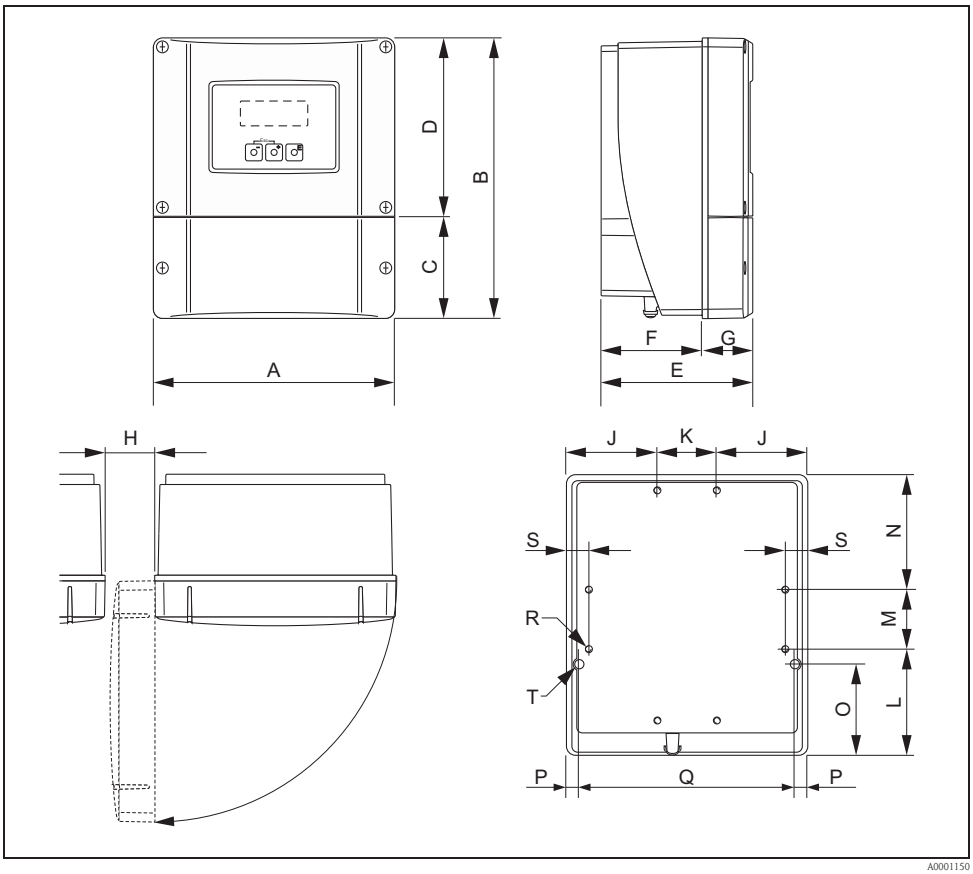
Pressure loss

- No pressure loss if the sensor is installed in a pipe with the same nominal diameter.
- Pressure losses for configurations incorporating adapters according to DIN EN 545 (→ 18, Section "Adapters").

Mechanical construction

Design, dimensions

Transmitter remote version, wall-mount housing (non Ex-zone and II3G/Zone 2)



Dimensions (SI units)

A	B	C	D	E	F	G	H	J
215	250	90.5	159.5	135	90	45	> 50	81
K	L	M	N	O	P	Q	R	S
53	95	53	102	81.5	11.5	192	8 × M5	20

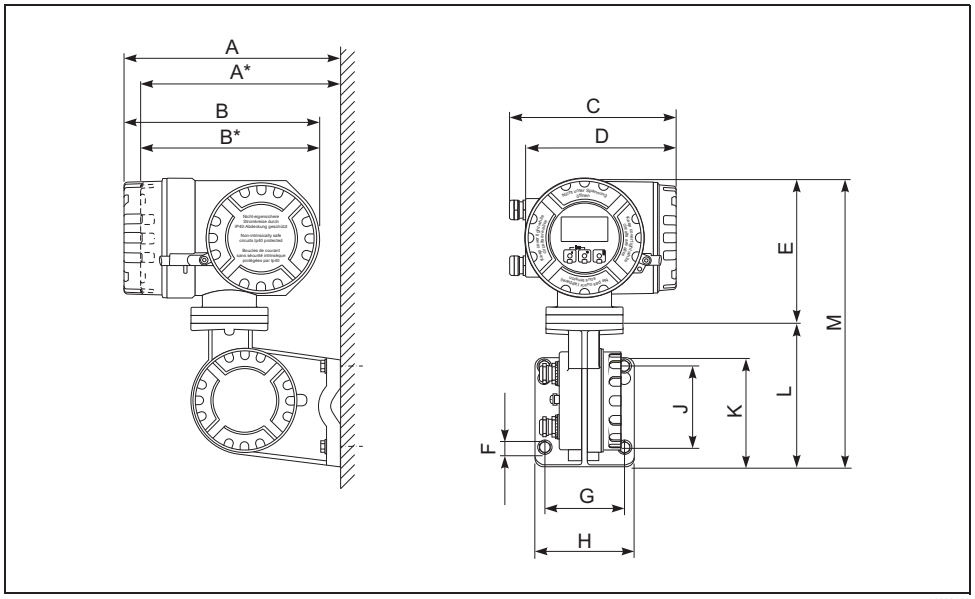
All dimensions in [mm]

Dimensions (US units)

A	B	C	D	E	F	G	H	J
8.46	9.84	3.56	6.27	5.31	3.54	1.77	> 1.97	3.18
K	L	M	N	O	P	Q	R	S
2.08	3.74	2.08	4.01	3.20	0.45	7.55	8 × M5	0.79

All dimensions in [inch]

Transmitter remote version, connection housing (II2GD/Zone 1)



Dimensions (SI units)

A	A*	B	B*	C	D	E	Ø F	G	H	J	K	L	M
265	242	240	217	206	186	178	8.6 (M8)	100	130	100	144	170	355

All dimensions in [mm]

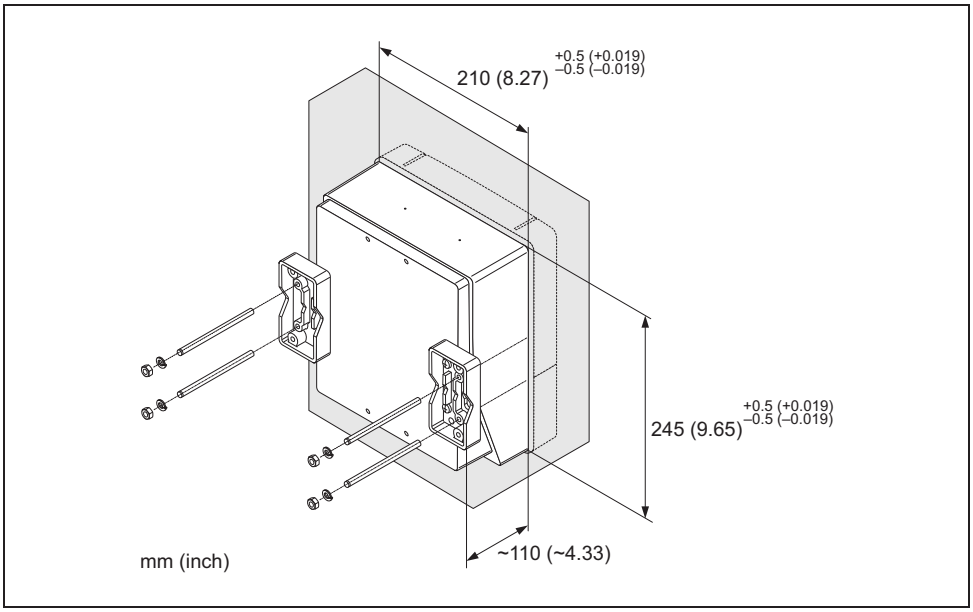
Dimensions (US units)

A	A*	B	B*	C	D	E	Ø F	G	H	J	K	L	M
10.4	9.53	9.45	8.54	8.11	7.32	7.01	0.34 (M8)	3.94	5.12	3.94	5.67	6.69	14.0

All dimensions in [inch]

There is a separate mounting kit for the wall-mounted housing. It can be ordered from Endress+Hauser as an accessory. The following installation variants are possible:
- Panel-mounted installation
- Pipe mounting

Installation in control panel



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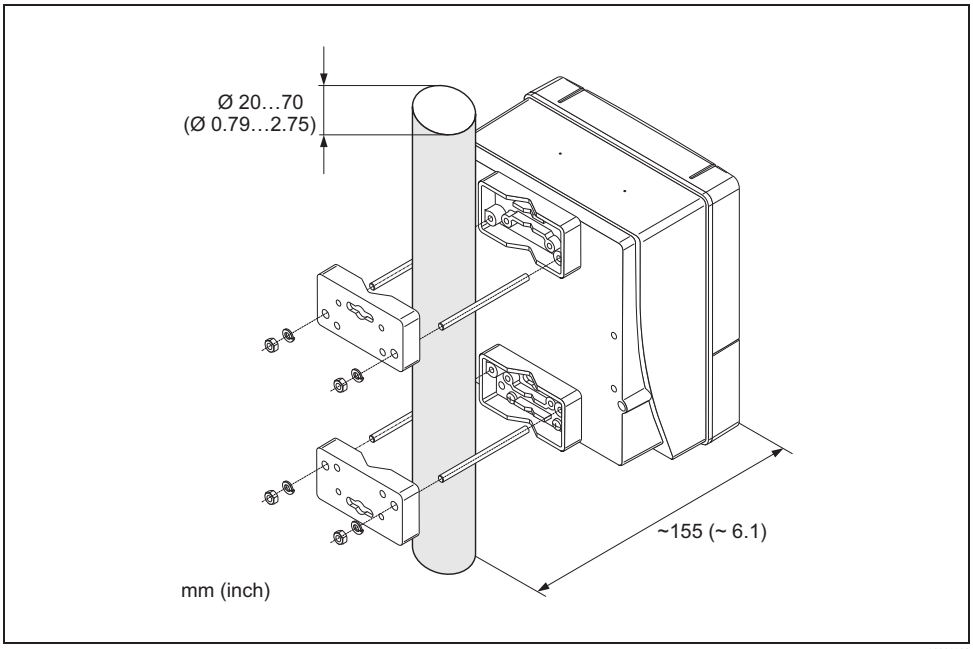
Pipe mounting



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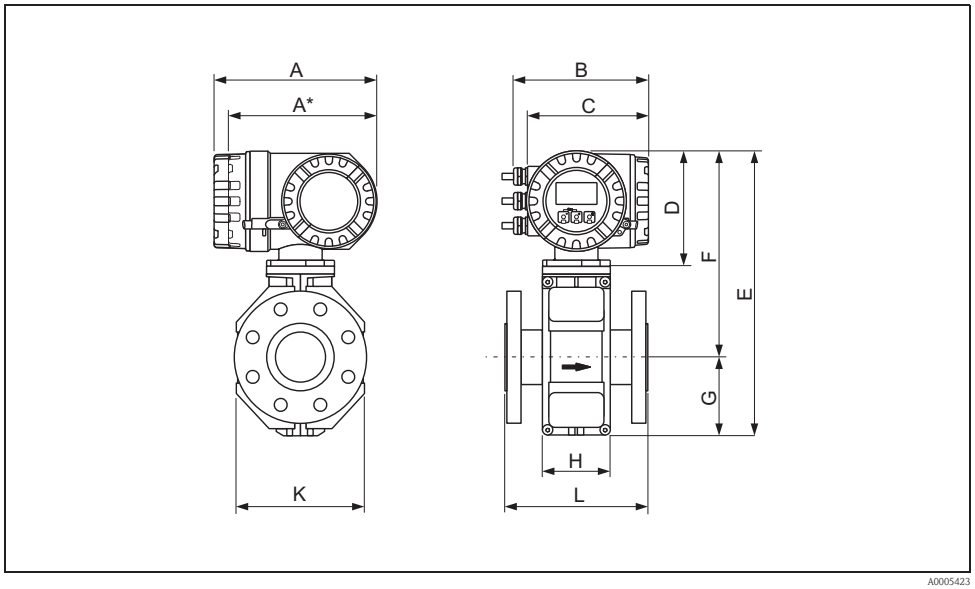
Compact version DN ≤ 300 (12")



Dimensions (SI units)

DN EN (DIN) / JIS / AS [2]	L [1]	A	A*	B	C	D	E	F	G	H	K
25	200	227	207	187	168	160	341	257	84	94	120
32	200						341	257	84	94	120
40	200						341	257	84	94	120
50	200						341	257	84	94	120
65	200						391	282	109	94	180
80	200						391	282	109	94	180
100	250						391	282	109	94	180
125	250						472	322	150	140	260
150	300						472	322	150	140	260
200	350						527	347	180	156	324
250	450						577	372	205	166	400
300	500						627	397	230	166	460

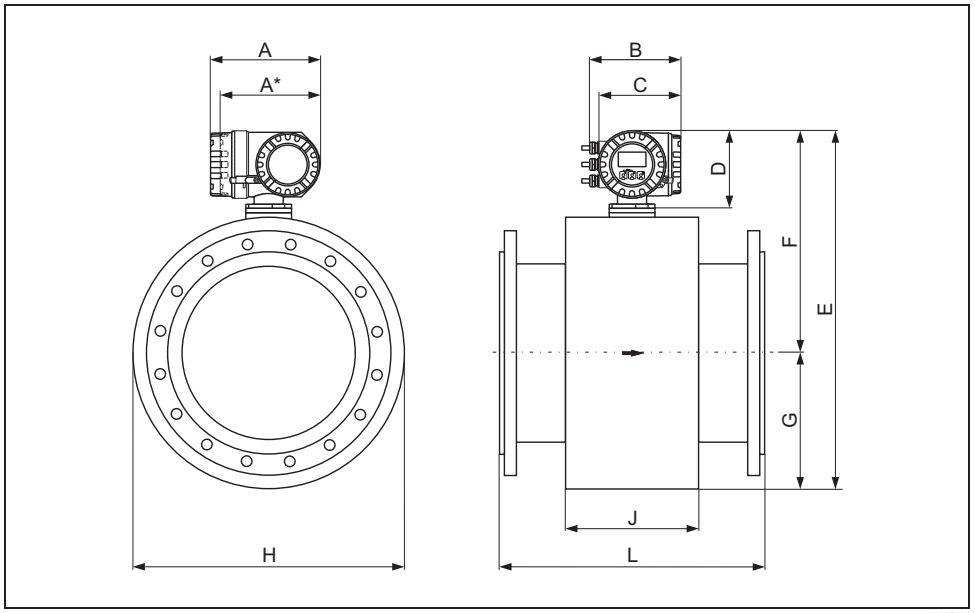
[1] The length is regardless of the pressure rating selected. Fitting length to DVGW.
[2] For flanges to AS, only the nominal diameters DN 80, 100 and 150 to 300 are available.
All dimensions in [mm]

Dimensions (US units)

DN ANSI	L [1]	A	A*	B	C	D	E	F	G	H	K
1"	7.87						13.4	10.1	3.31	3.70	4.72
1½"	7.87						13.4	10.1	3.31	3.70	4.72
2"	7.87						13.4	10.1	3.31	3.70	4.72
3"	7.87						15.4	11.1	4.29	3.70	7.09
4"	9.84	8.94	8.15	7.36	6.61	6.30	15.4	11.1	4.29	3.70	7.09
6"	11.8						18.6	12.7	5.91	5.51	10.2
8"	13.8						20.8	13.7	7.09	6.14	12.8
10"	17.7						22.7	14.7	8.07	6.14	15.8
12"	19.7						24.7	15.6	9.06	6.54	18.1

[1] The length is regardless of the pressure rating selected. Fitting length to DVGW.
All dimensions in [inch]

Compact version DN ≥ 350 (14")



Dimensions (SI units)

DN EN (DIN) / AS [2]	L [1]	A	A*	B	C	D	E	F	G	H	J
350	550	227	207	187	168	160	738.5	456.5	282.0	276	564
375	600						790.5	482.5	308.0	276	616
400	600						790.5	482.5	308.0	276	616
450	650						840.5	507.5	333.0	292	666
500	650						891.5	533.0	358.5	292	717
600	780						995.5	585.0	410.5	402	821
700	910						1198.5	686.5	512.0	589	1024
750	975						1198.5	686.5	512.0	626	1024
800	1040						1241.5	708.5	533.5	647	1067
900	1170						1394.5	784.5	610.0	785	1220
1000	1300						1546.5	860.5	686.0	862	1372
1050	1365						1598.5	886.5	712.0	912	1424
1200	1560						1796.5	985.5	811.0	992	1622
1350	1755						1998.5	1086.5	912.0	1252	1824
1400	1820						2148.5	1161.5	987.0	1252	1974
1500	1950						2196.5	1185.5	1011.0	1392	2022
1600	2080						2286.5	1230.5	1056.0	1482	2112
1650	2145						2360.5	1267.5	1093.0	1482	2186
1800	2340						2550.5	1362.5	1188.0	1632	2376
2000	2600						2650.5	1412.5	1238.0	1732	2476

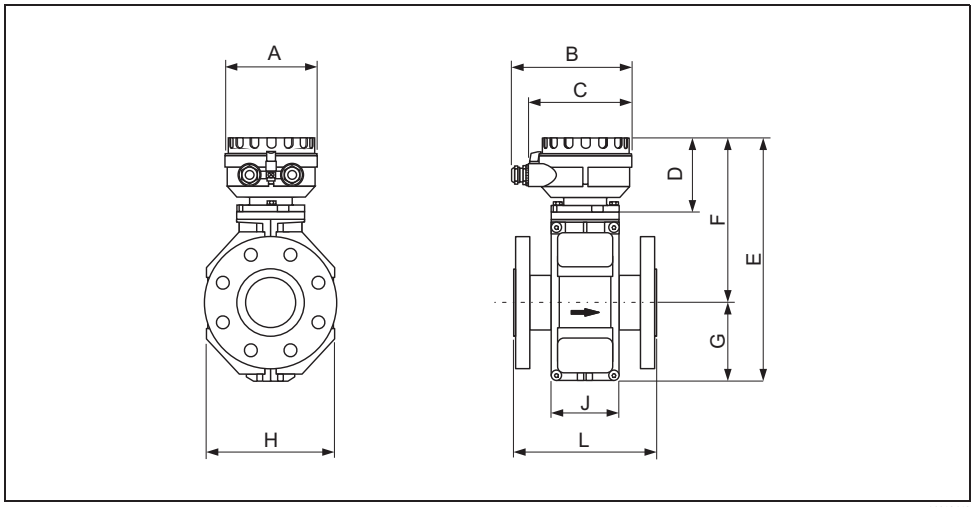
[1] The length is regardless of the pressure rating selected. Fitting length to DVGW.
[2] For flanges to AS, only DN 350, 400, 500 and 600 are available.
All dimensions in [mm]

Dimensions (US units)

DN ANSI / AWWA [2]	L [1]	A	A*	B	C	D	E	F	G	H	J
14"	21.6	8.94	8.15	7.36	6.61	6.30	29.1	17.9	11.1	10.9	22.2
15"	23.6						31.1	18.9	12.1	10.9	24.2
16"	23.6						31.1	18.9	12.1	10.9	24.2
18"	25.6						33.1	19.9	13.1	11.5	26.2
20"	25.6						35.1	20.9	14.1	11.5	28.2
24"	30.7						39.2	23.0	16.2	15.8	32.3
28"	35.8						47.2	27.0	20.1	23.2	40.3
30"	38.4						47.2	27.0	20.1	24.6	40.3
32"	40.9						48.9	27.9	21.0	25.5	42.0
36"	46.0						54.9	30.9	24.0	30.9	48.0
40"	51.2						60.9	33.9	27.0	33.9	54.0
42"	53.7						62.9	34.9	28.0	35.9	56.0
48"	61.4						71.7	38.8	31.9	39.0	63.8
54"	69.1						78.7	42.8	35.9	42.3	71.8
56"	71.7						84.6	45.7	38.9	49.3	77.7
60"	76.8						86.5	46.7	39.8	54.8	79.6
64"	81.9						90.0	48.4	41.6	58.4	83.2
66"	84.4						92.9	49.9	43.0	58.4	86.0
72"	92.1						100.4	53.6	46.8	64.2	93.5
78"	102.3						104.3	55.6	48.7	68.2	97.5

[1] The length is regardless of the pressure rating selected. Fitting length to DVGW.
[2] Flanges ≤ 24" only to ANSI available, ≥ 28" only to AWWA available.
All dimensions in [inch]

Sensor, remote version DN ≤ 300 (12")



Dimensions (SI units)

DN EN (DIN) / JIS / AS [2]	L [1]	A	B	C	D	E	F	G	H	J
25	200	129	163	143	102	286	202	84	120	94
32	200	129	163	143	102	286	202	84	120	94
40	200	129	163	143	102	286	202	84	120	94
50	200	129	163	143	102	286	202	84	120	94
65	200	129	163	143	102	336	227	109	180	94
80	200	129	163	143	102	336	227	109	180	94
100	250	129	163	143	102	336	227	109	180	94
125	250	129	163	143	102	417	267	150	260	140
150	300	129	163	143	102	417	267	150	260	140
200	350	129	163	143	102	472	292	180	324	156
250	450	129	163	143	102	522	317	205	400	166
300	500	129	163	143	102	572	342	230	460	166

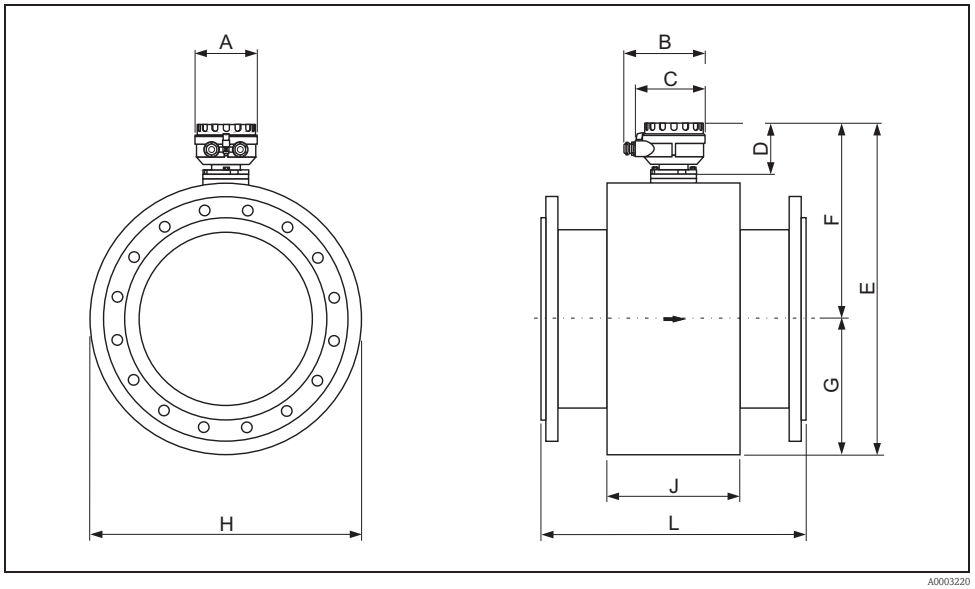
[1] The length is regardless of the pressure rating selected. Fitting length to DVGW.
[2] For flanges to AS, only the nominal diameters DN 80, 100 and 150 to 300 are available.
All dimensions in [mm]

Dimensions (US units)

DN ANSI	L [1]	A	B	C	D	E	F	G	H	J
1"	7.87	5.08	6.42	5.63	4.02	11.3	7.95	3.32	4.72	3.70
1½"	7.87	5.08	6.42	5.63	4.02	11.3	7.95	3.32	4.72	3.70
2"	7.87	5.08	6.42	5.63	4.02	11.3	7.95	3.32	4.72	3.70
3"	7.87	5.08	6.42	5.63	4.02	13.2	8.94	4.30	7.10	3.70
4"	9.84	5.08	6.42	5.63	4.02	13.2	8.94	4.30	7.10	3.70
6"	11.8	5.08	6.42	5.63	4.02	16.4	10.5	5.91	10.2	5.51
8"	13.8	5.08	6.42	5.63	4.02	18.6	11.5	7.10	12.8	6.14
10"	17.7	5.08	6.42	5.63	4.02	20.6	12.5	8.08	15.8	6.14
12"	19.7	5.08	6.42	5.63	4.02	22.5	13.5	9.06	18.1	6.54

[1] The length is regardless of the pressure rating selected. Fitting length to DVGW.
All dimensions in [inch]

Sensor, remote version DN ≥ 350 (14")



Dimensions (SI units)

DN EN (DIN) / AS [2]	L [1]	A	B	C	D	E	F	G	H	J
350	550	129	163	143	102	683.5	401.5	282.0	564	276
375	600					735.5	427.5	308.0	616	276
400	600					735.5	427.5	308.0	616	276
450	650					785.5	452.5	333.0	666	292
500	650					836.5	478.0	358.5	717	292
600	780					940.5	530.0	410.5	821	402
700	910					1143.5	631.5	512.0	1024	589
750	975					1143.5	631.5	512.0	1024	626
800	1040					1186.5	653.0	533.5	1067	647
900	1170					1339.5	729.5	610.0	1220	785
1000	1300					1491.5	805.5	686.0	1372	862
1050	1365					1543.5	831.5	712.0	1424	912
1200	1560					1741.5	930.5	811.0	1622	992
1350	1755					1943.5	1031.5	912.0	1824	1252
1400	1820					2093.5	1106.5	987.0	1974	1252
1500	1950					2141.5	1130.5	1011.0	2022	1392
1600	2080					2231.5	1175.5	1056.0	2112	1482
1650	2145					2305.5	1212.5	1093.0	2186	1482
1800	2340					2495.5	1307.5	1188.0	2376	1632
2000	2600					2595.5	1357.5	1238.0	2476	1732

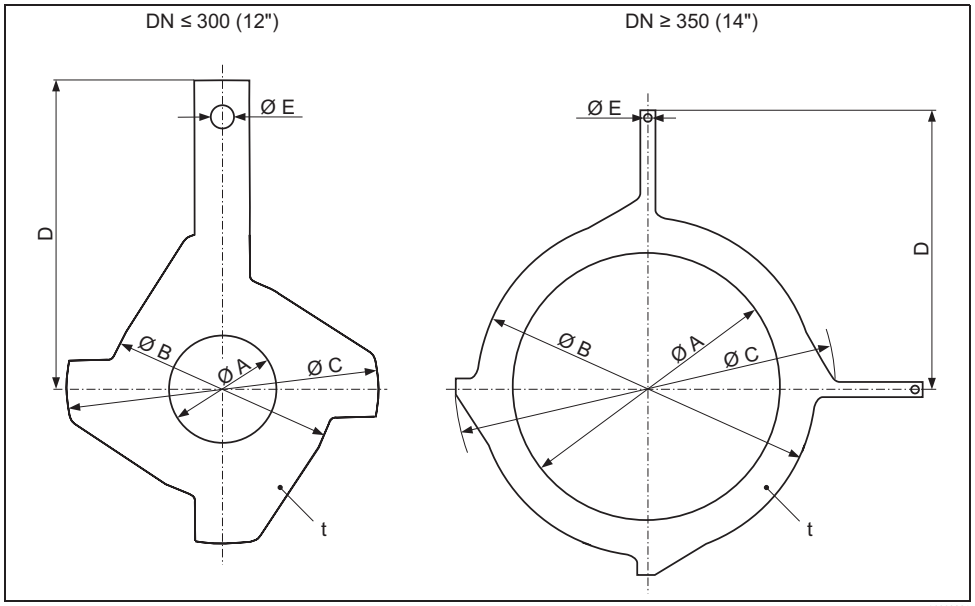
[1] The length is regardless of the pressure rating selected. Fitting length to DVGW.
[2] For flanges to AS, only DN 350, 400, 500 and 600 are available.
All dimensions in [mm]

Dimensions (US units)

DN ANSI / AWWA [2]	L [1]	A	B	C	D	E	F	G	H	J
14"	21.6	5.08	6.42	5.63	4.02	29.1	15.8	11.1	22.2	10.9
15"	23.6					31.1	16.8	12.1	24.2	10.9
16"	23.6					31.1	16.8	12.1	24.2	10.9
18"	25.6					33.1	17.8	13.1	26.2	11.5
20"	25.6					35.1	18.8	14.1	28.2	11.5
24"	30.7					39.2	20.9	16.2	32.3	15.8
28"	35.8					45.0	24.9	20.1	40.3	23.2
30"	38.4					45.0	24.9	20.1	40.3	24.6
32"	40.9					46.7	25.7	21.0	42.0	25.5
36"	46.0					52.7	28.7	24.0	48.0	30.9
40"	51.2					58.7	31.7	27.0	54.0	33.9
42"	53.7					60.7	32.7	28.0	56.0	35.9
48"	61.4					68.5	36.6	31.9	63.8	39.0
54"	69.1					76.5	40.6	35.9	71.8	42.3
56"	71.7					82.4	43.6	38.9	77.7	49.3
60"	76.8					84.3	44.5	39.8	79.6	54.8
64"	81.9					87.9	46.3	41.6	83.2	58.4
66"	84.4					90.8	47.7	43.0	86.0	58.4
72"	92.1					98.2	51.5	46.8	93.5	64.2
78"	102.3					102.2	53.4	48.7	97.5	68.2

[1] The length is regardless of the pressure rating selected. Fitting length to DVGW.
[2] Flanges ≤ 24" only to ANSI available, ≥ 28" only to AWWA available.
All dimensions in [inch]

Ground disk for flange connections



Dimensions (SI units)

DN [1] EN (DIN) / JIS / AS [2]	A	B	C	D	E	t
25	26	62	77.5	87.5	6.5	2
32	35	80	87.5	94.5		
40	41	82	101	103		
50	52	101	115.5	108		
65	68	121	131.5	118		
80	80	131	154.5	135		
100	104	156	186.5	153		
125	130	187	206.5	160		
150	158	217	256	184		
200	206	267	288	205		
250	260	328	359	240		
300 [3]	312	375	413	273		
300 [4]	310	375	404	268		
350 [3]	343	433	479	365	9.0	
375 [3]	393	480	542	395		
400 [3]	393	480	542	395		
450 [3]	439	538	583	417		
500 [3]	493	592	650	460		
600 [3]	593	693	766	522		

[1] Ground disks can be used for all flange standards/pressure ratings that can be delivered, except for DN ≥ 300.
[2] Only DN 32, 40, 65 and 125 are available for flanges according to AS.
[3] PN 10/16
[4] PN 25, JIS 10K/20K
All dimensions in [mm]

Dimensions (US units)

DN [1] ANSI	A	B	C	D	E	t
1"	1.02	2.44	3.05	3.44	0.26	0.08
1½"	1.61	3.23	3.98	4.06		
2"	2.05	3.98	4.55	4.25		
3"	3.15	5.16	6.08	5.31		
4"	4.09	6.14	7.34	6.02		
6"	6.22	8.54	10.08	7.24		
8"	8.11	10.5	11.3	8.07		
10"	10.2	12.9	14.1	9.45		
12"	12.3	14.8	16.3	10.8		
14"	13.5	17.1	18.9	14.4	0.35	
15"	15.45	18.9	21.3	15.6		
16"	15.45	18.9	21.3	15.6		
18"	17.3	21.2	23.0	16.4		
20"	19.4	23.3	25.6	18.1		
24"	23.4	27.3	30.1	20.6		

[1] Ground disks can be used for all flange standards/pressure ratings.
All dimensions in [inch]

Weight

Weight in SI units

Weight data in kg

Nominal diameter		Compact version						Remote version (without cable)						
								Sensor						Transmitter
[mm]	[inch]	EN (DIN) / AS [1]		JIS		ANSI / AWWA		EN (DIN) / AS [1]		JIS		ANSI / AWWA		Wall-mount housing
25	1"	PN 40	7.3	10K	7.3	Class 150	7.3	PN 40	5.3	10K	5.3	Class 150	5.3	6.0
32	–		8.0		7.3		–		6.0		5.3		–	
40	1½"		9.4		8.3		9.4		7.4		6.3		7.4	
50	2"		10.6		9.3		10.6		8.6		7.3		8.6	
65	–	PN 16	12		11.1		–	PN 16	10.0		9.1		–	
80	3"		14		112.5		14.0		12.0		10.5		12.0	
100	4"		16		14.7		16.0		14.0		12.7		14.0	
125	–		21.5		21.0		–		19.5		19.0		–	
150	6"		25.5		24.5		25.5		23.5		22.5		23.5	
200	8"	PN 10	45		41.9		45	PN 10	43		39.9		43	
250	10"		65		69.4		75		63		67.4		73	
300	12"		70		72.3		110		68		70.3		108	
350	14"	PN 6	105				175	PN 6	103				173	
375	15"		120				–		118				–	
400	16"		120				205		118				203	
450	18"		161				255		159				253	
500	20"		156				285		154				283	
600	24"		208				405		206				403	
700	28"		304			Class D	400		302			Class D	398	
–	30"		–				460		–				458	
800	32"		357				550		355				548	
900	36"		485				800		483				798	
1000	40"		589				900		587				898	
–	42"		–				1100		–				1098	
1200	48"		850				1400		848				1398	
–	54"		–				2200		–				2198	
1400	–		1300				–		1298				–	
–	60"		–				2700		–				2698	
1600	–		1700				–		1698				–	
–	66"		–				3700		–				3698	
1800	72"		2200				4100		2198				4098	
–	78"		–				4600		–				4598	
2000	–		2800				–		2798				–	

[1] For flanges to AS, only DN 80, 100, 150 to 400, 500 and 600 are available.

- Transmitter (compact version): 3.4 kg
- Weight data valid for standard pressure ratings and without packaging material.

Weight in US units (only ANSI / AWWA)

Weight data in lbs						
Nominal diameter		Compact version		Remote version (without cable)		
					Sensor	Transmitter
[mm]	[inch]		ANSI /AWWA		ANSI / AWWA	Wall-mount housing
25	1"	Class 150	16.1	Class 150	11.7	13.2
40	1½"		20.7		16.3	
50	2"		23.4		19.0	
80	3"		30.9		26.5	
100	4"		35.3		30.9	
150	6"		56.2		51.8	
200	8"		99.2		94.8	
250	10"		165.4		161.0	
300	12"		242.6		238.1	
350	14"		385.9		381.5	
400	16"		452.0		447.6	
450	18"		562.3		557.9	
500	20"		628.4		624.0	
600	24"		893.0		888.6	
700	28"	Class D	882.0	Class D	877.6	
–	30"		1014.3		1009.9	
800	32"		1212.8		1208.3	
900	36"		1764.0		1759.6	
1000	40"		1984.5		1980.1	
–	42"		2425.5		2421.1	
1200	48"		3087.0		3082.6	
–	54"		4851.0		4846.6	
–	60"		5953.5		5949.1	
–	66"		8158.5		8154.1	
1800	72"		9040.5		9036.1	
–	78"		10143.0		10138.6	

- Transmitter (compact version): 7.5 lbs
- Weight data valid for standard pressure ratings and without packaging material.

Measuring tube specifications

Diameter		Pressure rating						Internal diameter			
		EN (DIN)	AS 2129	AS 4087	ANSI	AWWA	JIS	Hard rubber		Polyurethane	
[mm]	[inch]	[bar]			[lbs]			[mm]	[inch]	[mm]	[inch]
25	1"	PN 40	–	–	Cl. 150	–	20 K	–	–	24	0.94
32	–	PN 40	–	–	–	–	20 K	–	–	32	1.26
40	1½"	PN 40	–	–	Cl. 150	–	20 K	–	–	38	1.50
50	2"	PN 40	Table E	PN 16	Cl. 150	–	10 K	50	1.97	50	1.97
65	–	PN 16	–	–	–	–	10 K	66	2.60	66	2.60
80	3"	PN 16	Table E	PN 16	Cl. 150	–	10 K	79	3.11	79	3.11
100	4"	PN 16	Table E	PN 16	Cl. 150	–	10 K	102	4.02	102	4.02
125	–	PN 16	–	–	–	–	10 K	127	5.00	127	5.00
150	6"	PN 16	Table E	PN 16	Cl. 150	–	10 K	156	6.14	156	6.14
200	8"	PN 10	Table E	PN 16	Cl. 150	–	10 K	204	8.03	204	8.03
250	10"	PN 10	Table E	PN 16	Cl. 150	–	10 K	258	10.2	258	10.2
300	12"	PN 10	Table E	PN 16	Cl. 150	–	10 K	309	12.2	309	12.2
350	14"	PN 6	Table E	PN 16	Cl. 150	–	–	342	13.5	342	13.5
375	15"	–	–	PN 16	–	–	–	392	15.4	–	–
400	16"	PN 6	Table E	PN 16	Cl. 150	–	–	392	15.4	392	15.4
450	18"	PN 6	–	–	Cl. 150	–	–	437	17.2	437	17.2
500	20"	PN 6	Table E	PN 16	Cl. 150	–	–	492	19.4	492	19.4
600	24"	PN 6	Table E	PN 16	Cl. 150	–	–	594	23.4	594	23.4
700	28"	PN 6	–	–	–	Class D	–	692	27.2	692	27.2
–	30"	–	–	–	–	Class D	–	742	29.2	742	29.2
800	32"	PN 6	–	–	–	Class D	–	794	31.3	794	31.3
900	36"	PN 6	–	–	–	Class D	–	891	35.1	891	35.1
1000	40"	PN 6	–	–	–	Class D	–	994	39.1	994	39.1
–	42"	–	–	–	–	Class D	–	1043	41.1	1043	41.1
1200	48"	PN 6	–	–	–	Class D	–	1197	47.1	1197	47.1
–	54"		–	–	–	Class D	–	1339	52.7	–	–
1400	–	PN 6	–	–	–	–	–	1402	55.2	–	–
–	60"	–	–	–	–	Class D	–	1492	58.7	–	–
1600	–	PN 6	–	–	–	–	–	1600	63.0	–	–
–	66"	–	–	–	–	Class D	–	1638	64.5	–	–
1800	72"	PN 6	–	–	–	Class D	–	1786	70.3	–	–
2000	78"	PN 6	–	–	–	Class D	–	1989	78.3	–	–

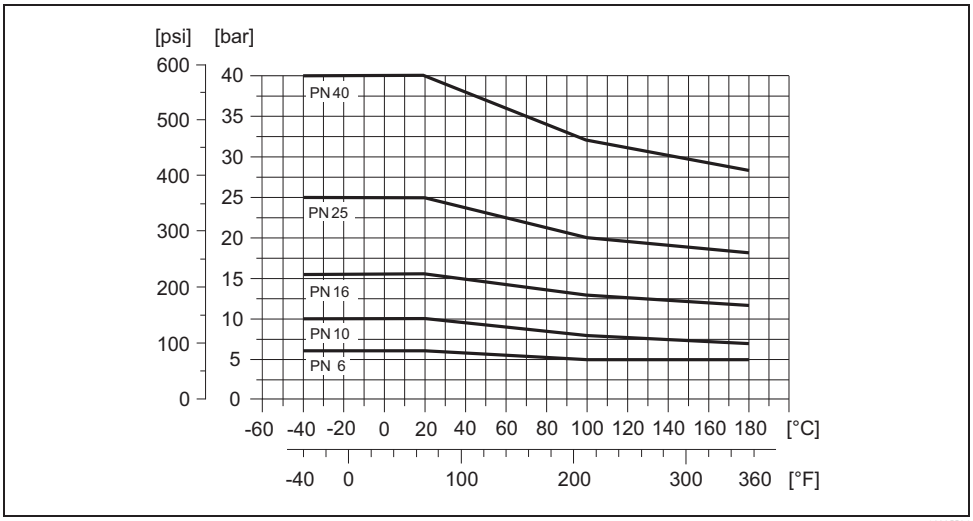
Material

- Transmitter housing
  - Compact housing: powder-coated die-cast aluminum
  - Wall-mount housing: powder-coated die-cast aluminum
- Sensor housing
  - DN 25 to 300 (1 to 12"): powder-coated die-cast aluminum
  - DN 350 to 2000 (14 to 78"): with protective lacquering
- Measuring tube
  - DN ≤ 300 (12"): stainless steel 1.4301 or 1.4306/304L; (for flanges made of carbon steel with Al/Zn protective coating)
  - DN ≥ 350 (14"): stainless steel 1.4301 or 1.4306/304L; (for flanges made of carbon steel with Al/Zn protective coating)
- Electrodes: 1.4435, Alloy C-22, Tantalum
- Flanges
  - EN 1092-1 (DIN 2501): 1.4571/316L; RSt37-2 (S235JRG2); C22; FE 410W B (DN ≤ 300 (12"): with Al/Zn protective coating; DN ≥ 350 (14") with protective lacquering)
  - ANSI: A105; F316L (DN ≤ 300 (12"): with Al/Zn protective coating; DN ≥ 350 (14") with protective lacquering)
  - AWWA: 1.0425
  - JIS: RSt37-2 (S235JRG2); HII; 1.0425/316L (DN ≤ 300 (12"): with Al/Zn protective coating; DN ≥ 350 (14") with protective lacquering)
  - AS 2129
    - DN 150 to 300, 600 (6 to 12", 24"): A105 or RSt37-2 (S235JRG2)
    - DN 50, 80, 100, 350, 400, 500 (2", 3", 4", 14", 16", 20"): A105 or St44-2 (S275JR)
  - AS 4087: A105 or St44-2 (S275JR)
- Seals: to DIN EN 1514-1
- Ground disks: 1.4435/316L, Alloy C-22, Tantalum

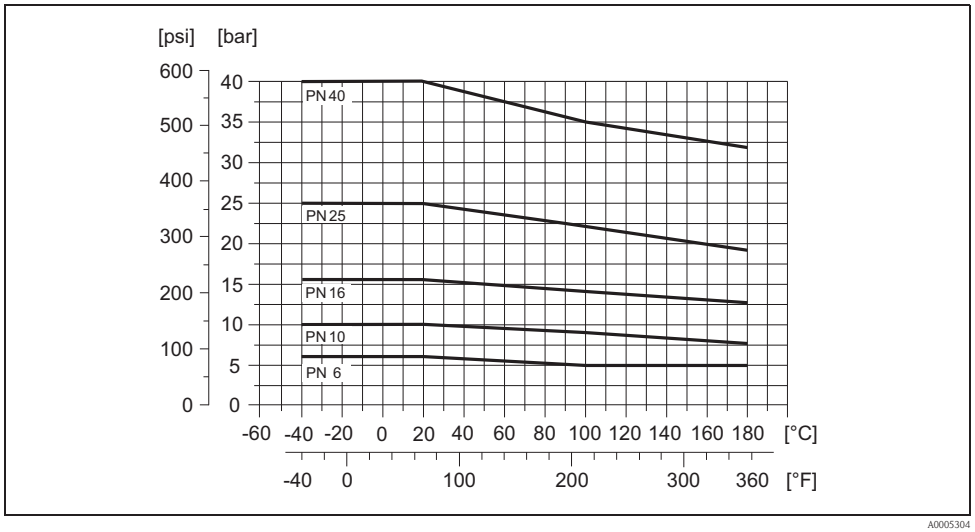
Material load diagram

Caution!
The following diagrams contain material load diagrams (reference curves) for flange materials with regard to the medium temperature. However, the maximum medium temperatures permitted always depend on the lining material of the sensor and/or the sealing material (→ 21).

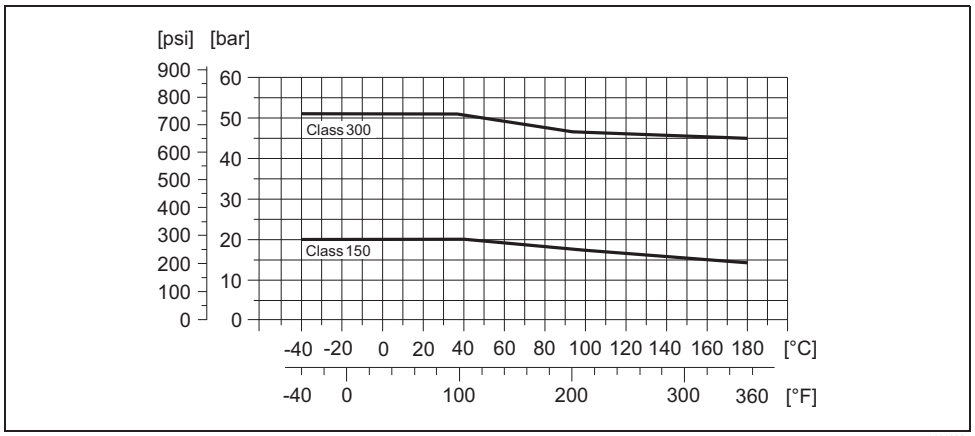
Flange connection to EN 1092-1 (DIN 2501)
Material: RSt37-2 (S235JRG2) / C22 / Fe 410W B



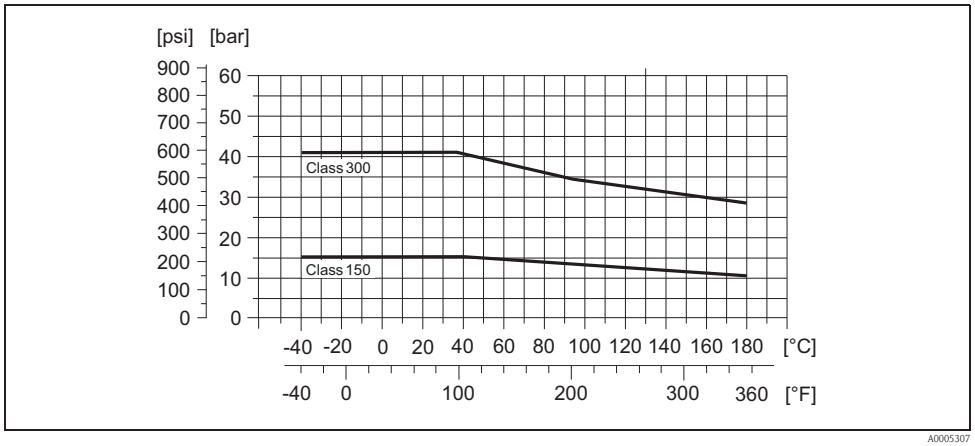
Flange connection to EN 1092-1 (DIN 2501)
Material: 316L / 1.4571



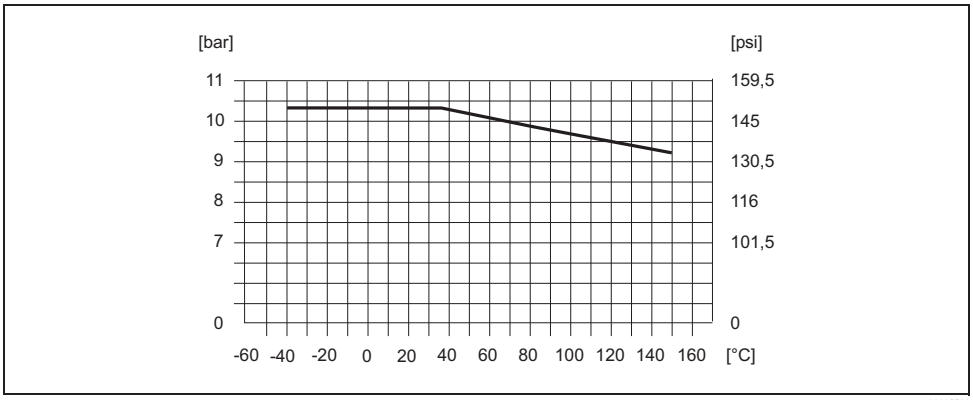
Flange connection to ANSI B16.5
Material: A 105



Flange connection to ANSI B16.5
Material: F316L

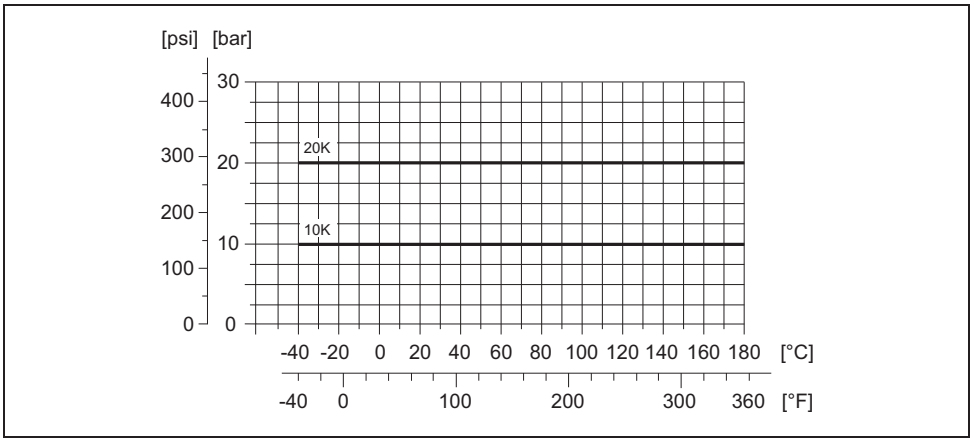


Flange connection to AWWA C 207, Class D
Material: 1.0425



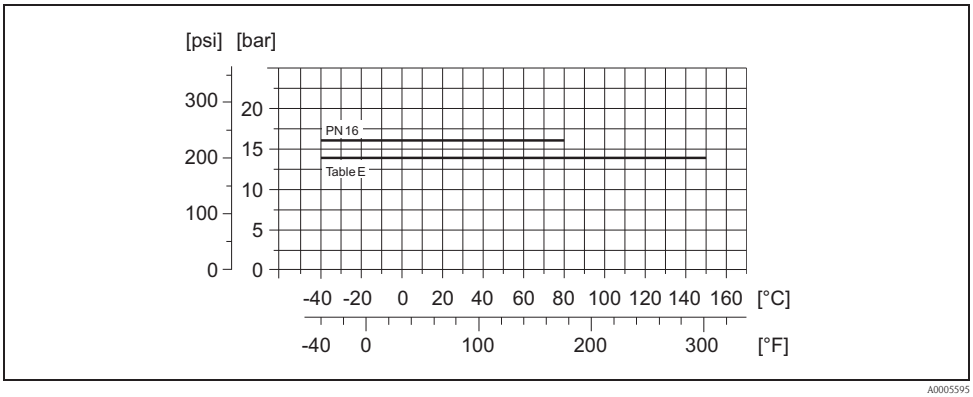
A0005592

Flange connection to JIS B2220
Material: RSt37-2 (S235JRG2) / HII / 1.0425 / 316L



A0003228

Flange connection to AS 2129 Table E or AS 4087 PN 16
Material: A105 / RSt37-2 (S235JRG2) / St44-2 (S275JR)



A0005595

Fitted electrodes

Measuring electrodes, reference electrodes and empty pipe detection electrodes:
- Standard available with 1.4435, Alloy C-22, tantalum
- Optional: exchangeable measuring electrodes made of 1.4435 (DN 350 to 2000 / 14 to 78")

Process connections

Flange connection:
- EN 1092-1 (DIN 2501), DN ≤ 300 (12") form A, DN ≥ 350 (14") form B
  (Dimensions to DIN 2501, DN 65 PN 16 and DN 600 (24") PN 16 exclusively to EN 1092-1)
- ANSI B16.5
- AWWA C 207, Class D
- JIS B2220
- AS 2129 Table E
- AS 4087 PN 16

Surface roughness

- Electrodes
  – 1.4435, Alloy C-22, tantal: ≤ 0.3 to 0.5 µm (≤ 11.8 to 19.7 µin)

(all data refer to parts in contact with medium)

Human interface

Display elements

- Liquid crystal display: backlit, two lines (Promag 50) or four lines (Promag 53) with 16 characters per line
- Custom configurations for presenting different measured-value and status variables
- Totalizer
  – Promag 50: 2 totalizers
  – Promag 53: 3 totalizers

Operating elements

Unified operation concept for both types of transmitter:

Promag 50:
- Local operation via three keys (−, +, E)
- Quick Setup menus for straightforward commissioning

Promag 53:
- Local operation via three keys (−, +, E)
- Application-specific Quick Setup menus for straightforward commissioning

Language groups

Language groups available for operation in different countries:

Promag 50, Promag 53:
- Western Europe and America (WEA):
  English, German, Spanish, Italian, French, Dutch, Portuguese
- Eastern Europe and Scandinavia (EES):
  English, Russian, Polish, Norwegian, Finnish, Swedish, Czech
- South and east Asia (SEA):
  English, Japanese, Indonesian

Promag 53:
- China (CN):
  English, Chinese

You can change the language group via the operating program "FieldCare".

Remote operation

- Promag 50: Remote control via HART, PROFIBUS DP/PA
- Promag 53: Remote control via HART, PROFIBUS DP/PA, MODBUS RS485, FOUNDATION Fieldbus

Certificates and approvals

CE mark

The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

C-tick mark

The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

Pressure measuring device approval

Measuring devices with a nominal diameter smaller than or equal to DN 25 correspond to Article 3(3) of the EC Directive 97/23/EC (Pressure Equipment Directive) and have been designed and manufactured according to good engineering practice. Where necessary (depending on the medium and process pressure), there are additional optional approvals to Category II/III for larger nominal diameters.

Ex approval

Information about currently available Ex versions (ATEX, IECEx, FM, CSA, NEPSI) can be supplied by your Endress+Hauser Sales Center on request. All explosion protection data are given in a separate documentation which is available upon request.

Other standards and guidelines

- EN 60529
  Degrees of protection by housing (IP code)
- EN 61010
  Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.
- IEC/EN 61326
  “Emission in accordance with requirements for Class A”.
  Electromagnetic compatibility (EMC requirements)
- NAMUR NE 21:
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.
- NAMUR NE 43:
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53:
  Software of field devices and signal-processing devices with digital electronics.
- ANSI/ISA-S82.01
  Safety Standard for Electrical and Electronic Test, Measuring, Controlling and related Equipment - General Requirements Pollution degree 2, Installation Category II.
- CAN/CSA-C22.2 No. 1010.1-92
  Safety requirements for Electrical Equipment for Measurement and Control and Laboratory Use. Pollution degree 2, Installation Category II

FOUNDATION Fieldbus certification

The flow device has successfully passed all the test procedures carried out and is certified and registered by the Fieldbus Foundation. The device thus meets all the requirements of the following specifications:

- Certified to FOUNDATION Fieldbus Specification
- The device meets all the specifications of the FOUNDATION Fieldbus H1.
- Interoperability Test Kit (ITK), revision status 5.01 (device certification number: on request)
- The device can also be operated with certified devices of other manufacturers
- Physical Layer Conformance Test of the Fieldbus Foundation

MODBUS RS485 certification

The measuring device meets all the requirements of the MODBUS/TCP conformity test and has the “MODBUS/TCP Conformance Test Policy, Version 2.0”. The measuring device has successfully passed all the test procedures carried out and is certified by the “MODBUS/TCP Conformance Test Laboratory” of the University of Michigan.

PROFIBUS DP/PA certification

The flow device has successfully passed all the test procedures carried out and is certified and registered by the PNO (PROFIBUS User Organisation). The device thus meets all the requirements of the following specifications:

- Certified to PROFIBUS PA, profile version 3.0 (device certification number: on request)
- The device can also be operated with certified devices of other manufacturers (interoperability)

Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor. Your Endress+Hauser service organization can provide detailed information on the order codes in question.

Documentation

- Flow Measurement (FA005D/06)
- Operating Instructions Promag Promag 50 (BA046D/06 and BA049D/06)
- Operating Instructions Promag Promag 50 PROFIBUS PA (BA055D/06 and BA056D/06)
- Operating Instructions Promag Promag 53 (BA047D/06 and BA048D/06)
- Operating Instructions Promag Promag 53 FOUNDATION Fieldbus (BA051D/06 and BA052D/06)
- Operating Instructions Promag Promag 53 MODBUS RS485 (BA117D/06 and BA118D/06)
- Operating Instructions Promag Promag 53 PROFIBUS DP/PA (BA053D/06 and BA054D/06)
- Supplementary documentation on Ex-ratings: ATEX, IECEx, FM, CSA, NEPSI

Registered trademarks

HART®
Registered trademark of the HART Communication Foundation, Austin, USA

PROFIBUS®
Registered trademark of the PROFIBUS Nutzerorganisation e.V., Karlsruhe, D

FOUNDATION™ Fieldbus
Registered trademark of the Fieldbus Foundation, Austin, USA

MODBUS®
Registered trademark of the MODBUS Organisation

HistoROM™, S-DAT®, T-DAT™, F-CHIP®, FieldCare®, Fieldcheck®, FieldXpert™, Applicator®
Registered or registration-pending trademarks of Endress+Hauser Flowtec AG, Reinach, CH

Order Codes

NOTE: Endress+Hauser reserves the right to change or modify product, specifications, and ordering information at any time without notice.
Please consult Endress+Hauser or your local representative for the most recent information.

Please note that the Promag 50W/53W is also available with:
- Hard rubber and Polyurethane liners; ACS, KTW/W270 and WRAS B59620 approvals
- PED Cat. II / III material certificates
- ATEX and NEPSI hazardous area approvals
- DIN2501 and JIS B2220 process connections

Consult factory for information.

Promag 50W, 1" to 24"

Promag 50W [ ][ ] - [ ] 010 [ ] 020 [ ] 030 [ ] 040 [ ] 050 [ ] 060 [ ] 070 [ ] 080 [ ] 090 [ ] 100 [ ] 110 [ ] 120

Nominal Diameter
- 25 1"
- 40 1-1/2"
- 50 2"
- 80 3"
- 1H 4"
- 1F 6"
- 2H 8"
- 2F 10"
- 3H 12"
- 3F 14"
- 4H 16"
- 4F 18"
- 5H 20"
- 6H 24"

010 Liner
- D Hard rubber, NSF61 drinking water approval (not available for 1", 1-1/2" or 2" sensors)
- H Hard rubber (not available for 1", 1-1/2" or 2" sensors)
- P Polyurethane, NSF61 drinking water approval
- S Hard rubber HR (not available for 1", 1-1/2" or 2" sensors)
- U Polyurethane
- 9 Special version, to be specified

020 Process connection
- L Class 150 ANSI B16.5 CS steel A105 flanges
- M Class 300 ANSI B16.5 CS steel A105 flanges (not for 8" and larger)
- R Class 150 ANSI B16.5 316L SS flanges
- S Class 300 ANSI B16.5 316L SS flanges (not for 8" and larger)
- 9 Special version, to be specified

030 Electrodes / material
- 0 Measuring, reference and EPD electrodes / 316L SS
- 1 Measuring, reference and EPD electrodes / Alloy C22
- 2 Measuring, reference and EPD electrodes / tantalum
- 7 Measuring electrode, exchangeable / 316L SS (for hard rubber liner only, 14" and larger sensors, no EPD or reference electrodes, for safe areas only)
- G Measuring, reference and EPD electrodes, bullet nose / 316L SS
- H Measuring, reference and EPD electrodes, bullet nose / Alloy C-22
- 9 Special version, to be specified

040 Calibration
- A 3-point calibration, 0.5%
- B 3-point calibration, 0.2%
- D SCS/A2LA 3-point 0.5% calibration (ISO/IEC 17025) with certificate traceable according to ISO 9000 (specify range)
- E SCS/A2LA 3-point 0.2% calibration (ISO/IEC 17025) with certificate traceable according to ISO 9000 (specify range)
- 9 Special version, to be specified

050 Certificates
- 1 Standard, no certificate
- 2 3.1B material certificate for pipe and flanges
- 3 2.3 pressure test certificate (1.5 x PN, 3 minutes) for sensors up to 12" only
- 4 3.1B material and 2.3 pressure test certificate for sensors up to 12" only
- 5 CRN approval
- 8 CRN approval + material certificate + pressure test
- 9 Special version, to be specified

060 Approvals
- A For use in non-hazardous areas
- N FM explosion proof Class I, Div. 1 / CSA Class I, Div. 1 (only for aluminum field housing, compact version, not for 14" and larger sensors)
- R FM non-incendive Class I, Div. 2 / CSA Class I, Div. 2

070 Housing
- A NEMA 4X (IP 67) compact aluminum housing
- C NEMA 4X (IP 67) remote wall-mounted (only for approvals A or R)
- G NEMA 4X (IP 67) remote aluminum field housing for non-hazardous areas
- K NEMA 6P sensor, wall-mounted housing (only for approvals A or R)
- N NEMA 6P sensor, aluminum field housing, non-hazardous
- P NEMA 4X (IP 67) compact aluminum housing, HE (harsh environment), compact and remote sensor sizes up to 12" only *
- S NEMA 4X (IP 67) remote wall-mounted housing, HE (harsh environment), remote sensor sizes 14" to 78" (only for approvals A and R) *
- 1 -40°F (-40°C) ambient temperature, NEMA 4X (IP 67), compact, aluminum field housing (only for approvals A and R)
- 3 -40°F (-40°C) ambient temperature, NEMA 4X (IP 67), compact (only for approvals A and R)
- 5 -40°F (-40°C) ambient temperature, NEMA 4X (IP 67) wall mount housing, for NEMA 6P sensor (only for approvals A and R)
- 9 Special version, to be specified

080 Cable for remote
- 0 Without cable
- 1 15 foot coil and signal cable
- 2 30 foot coil and signal cable
- 5 Coil and signal cable, specify length (maximum 650 ft depending on conductivity of process material)
- 7 Coil and signal cable, flexible conduit, specify length (maximum 650 ft depending on conductivity of process material)
- 9 Special version, to be specified

090 Cable entries
- B 1/2" NPT
- L 1/2" NPT fieldbus connector (only for approval A and R)
- 9 Special version, to be specified

100 Power supply / display
- 7 85 to 260 VAC, without display, remote configuration only (not for wall mount or SS housing)
- 8 20 to 55 VAC / 16 to 62 VDC, without display, remote configuration only (not for wall mount or SS housing)
- A 85 to 260 VAC, with display, push button operation (language: EN, ES, FR, IT, NL, PT, DE)
- B 20 to 55 VAC / 16 to 62 VDC, with display, push button operation (language: EN, ES, FR, IT, NL, PT, DE)
- X Sensor only (without transmitter, only available up to 8")
- 9 Special version, to be specified

110 Software
- A Standard software
- X Sensor only (up to 8" only)
- 9 Special version, to be specified

120 Outputs / Inputs
- A Current HART, SIL, frequency
- D Current HART, SIL, frequency, status output, status input
- H PROFIBUS-PA (approvals A and R only)
- J PROFIBUS-DP (approvals A and R only)
- S Current HART, SIL, frequency; active I.S. (not for approvals A and R)
- T Current HART, SIL, frequency; passive I.S. (not for approvals A and R)
- W Current HART, SIL
- X Sensor only
- 9 Special version, to be specified

* Harsh environment (HE) option is available for process conditions where cool process temperatures in tropical (high humidity) environments or process fluids which undergo large cyclical temperature variations which can cause high amounts of moisture that could condense onto the measurement tube.

Promag 50W, 28” to 78”

Promag 50W | | - | 010 | 020 | 030 | 040 | 050 | 060 | 070 | 080 | 090 | 100 | 110 | 120 |

Nominal Diameter
- 7H 28”
- 7F 30”, AWWA
- 8H 32”
- 9H 36”
- TO 40”
- VO 42”, AWWA
- T2 48”
- V3 54”, AWWA
- V5 60”, AWWA
- V6 66”, AWWA
- T8 72”
- V9 78”, AWWA

010 Liner
- D Hard rubber, NSF61 drinking water approval
- H Hard rubber
- P Polyurethane, NSF61 drinking water approval (not available for 42” up to 78”)
- S Hard rubber HR
- U Polyurethane (not available for 42” up to 78”)
- 9 Special version, to be specified

020 Process connection
- P Class D AWWA carbon steel A105 flanges
- 9 Special version, to be specified

030 Electrodes / material
- 0 Measuring, reference and EPD electrodes / 316L SS
- 1 Measuring, reference and EPD electrodes / Alloy C22
- 2 Measuring, reference and EPD electrodes / tantalum
- 7 Measuring electrode, exchangeable / 316L SS (for hard rubber liner only, 14” and larger sensors, no EPD or reference electrodes, for safe areas only)
- G Measuring, reference and EPD electrodes, bullet nose / 316L SS
- H Measuring, reference and EPD electrodes, bullet nose / Alloy C-22
- 9 Special version, to be specified

040 Calibration
- A 3-point calibration, 0.5%
- B 3-point calibration, 0.2%
- D SCS/A2LA 3-point 0.5% calibration (ISO/IEC 17025) with certificate traceable according to ISO 9000 (specify range)
- E SCS/A2LA 3-point 0.2% calibration (ISO/IEC 17025) with certificate traceable according to ISO 9000 (specify range)
- 9 Special version, to be specified

050 Certificates
- 1 Standard, no certificate
- 2 3.1B material certificate for pipe and flanges
- 9 Special version, to be specified

060 Approvals
- A For use in non-hazardous areas
- R FM non-incendive Class I, Div. 2 / CSA Class I, Div. 2

070 Housing
- A NEMA 4X (IP 67) compact aluminum housing
- C NEMA 4X (IP 67) remote wall-mounted (only for approvals A or R)
- G NEMA 4X (IP 67) remote aluminum field housing for non-hazardous areas
- K NEMA 6P sensor, wall-mounted housing (only for approvals A or R)
- S NEMA 4X (IP 67) remote wall-mounted housing, HE (harsh environment), remote sensor sizes 14” to 78” (only for approvals A and R) *
- 1 –40°F (–40°C) ambient temperature, NEMA 4X (IP 67), compact, aluminum field housing (only for approvals A and R)
- 3 –40°F (–40°C) ambient temperature, NEMA 4X (IP 67), compact (only for approvals A and R)
- 5 –40°F (–40°C) ambient temperature, NEMA 4X (IP 67) wall mount housing, for NEMA 6P sensor (only for approvals A and R)
- 9 Special version, to be specified

080 Cable for remote
- 0 Without cable
- 1 15 foot coil and signal cable
- 2 30 foot coil and signal cable
- 5 Coil and signal cable, specify length (maximum 650 ft depending on conductivity of process material)
- 7 Coil and signal cable, flexible conduit, specify length (maximum 650 ft depending on conductivity of process material)
- 9 Special version, to be specified

090 Cable entries
- B 1/2” NPT
- L 1/2” NPT fieldbus connector (only for approval A and R)
- 9 Special version, to be specified

100 Power supply / display
- 7 85 to 260 VAC, without display, remote configuration only (not for wall mount or SS housing)
- 8 20 to 55 VAC / 16 to 62 VDC, without display, remote configuration only (not for wall mount or SS housing)
- A 85 to 260 VAC, with display, push button operation (language: EN, ES, FR, IT, NL, PT, DE)
- B 20 to 55 VAC / 16 to 62 VDC, with display, push button operation (language: EN, ES, FR, IT, NL, PT, DE)
- X Sensor only (without transmitter, only available up to 8”)
- 9 Special version, to be specified

110 Software
- A Standard software
- 9 Special version, to be specified

120 Outputs / Inputs
- A Current HART, SIL, frequency
- D Current HART, SIL, frequency, status output, status input
- H PROFIBUS-PA (approvals A and R only)
- J PROFIBUS-DP (approvals A and R only)
- S Current HART, SIL, frequency; active I.S. (not for approvals A and R)
- T Current HART, SIL, frequency; passive I.S. (not for approvals A and R)
- W Current HART, SIL
- X Sensor only
- 9 Special version, to be specified

* Harsh environment (HE) option is available for process conditions where cool process temperatures in tropical (high humidity) environments or process fluids which undergo large cyclical temperature variations which can cause high amounts of moisture that could condense onto the measurement tube.

Promag 53W, 1" to 24"

Promag 53W [ ] - [010] [020] [030] [040] [050] [060] [070] [080] [090] [100] [110] [120]

Nominal Diameter
- 25 1"
- 40 1-1/2"
- 50 2"
- 80 3"
- 1H 4"
- 1F 6"
- 2H 8"
- 2F 10"
- 3H 12"
- 3F 14"
- 4H 16"
- 4F 18"
- 5H 20"
- 6H 24"

010 Liner
- D Hard rubber, NFS61 drinking water approval (not available for 1", 1-1/2" or 2" sensors)
- H Hard rubber (not available for 1", 1-1/2" or 2" sensors)
- P Polyurethane, NSF61 drinking water approval
- S Hard rubber HR (not available for 1", 1-1/2" or 2" sensors)
- U Polyurethane
- 9 Special version, to be specified

020 Process connection
- L Class 150 ANSI B16.5 CS steel A105 flanges
- M Class 300 ANSI B16.5 CS steel A105 flanges (not for 8" and larger)
- R Class 150 ANSI B16.5 316L SS flanges
- S Class 300 ANSI B16.5 316L SS flanges (not for 8" and larger)
- 9 Special version, to be specified

030 Electrodes / material
- 0 Measuring, reference and EPD electrodes / 316L SS
- 1 Measuring, reference and EPD electrodes / Alloy C22
- 2 Measuring, reference and EPD electrodes / tantalum
- 7 Measuring electrode, exchangeable / 316L SS (for hard rubber liner only, 14" and larger sensors, no EPD or reference electrodes, for safe areas only)
- G Measuring, reference and EPD electrodes, bullet nose / 316L SS
- H Measuring, reference and EPD electrodes, bullet nose / Alloy C-22
- 9 Special version, to be specified

040 Calibration
- B 3-point calibration, 0.2%
- E SCS/A2LA 3-point, 0.2% calibration (ISO/IEC 17025) with certificate traceable according to ISO 9000 (specify range)
- 9 Special version, to be specified

050 Certificates
- 1 Standard, no certificate
- 2 3.1B material certificate for pipe and flanges
- 3 2.3 pressure test certificate (1.5 x PN, 3 minutes) for sensors up to 12" only
- 4 3.1B material and 2.3 pressure test certificate for sensors up to 12" only
- 5 CRN approval
- 8 CRN approval + material certificate + pressure test
- 9 Special version, to be specified

060 Approvals
- A For use in non-hazardous areas
- N FM explosion proof Class I, Div. 1 / CSA Class I, Div. 1 (only for aluminum field housing, compact version, not for 14" and larger sensors)
- R FM non-incendive Class I, Div. 2 / CSA Class I, Div. 2

070 Housing
- A NEMA 4X (IP 67) compact aluminum housing
- C NEMA 4X (IP 67) remote wall-mounted (only for approvals A or R)
- G NEMA 4X (IP 67) remote aluminum field housing for non-hazardous areas
- K NEMA 6P sensor, wall-mounted housing (only for approvals A or R)
- N NEMA 6P sensor, aluminum field housing, non-hazardous
- P NEMA 4X (IP 67) compact aluminum housing, HE (harsh environment), compact and remote sensor sizes up to 12" only *
- S NEMA 4X (IP 67) remote wall-mounted housing, HE (harsh environment), remote sensor sizes 14" to 78" (only for approvals A and R) *
- 1 -40°F (-40°C) ambient temperature, NEMA 4X (IP 67), compact, aluminum field housing (only for approvals A and R)
- 3 -40°F (-40°C) ambient temperature, NEMA 4X (IP 67), compact (only for approvals A and R)
- 5 -40°F (-40°C) ambient temperature, NEMA 4X (IP 67) wall mount housing, for NEMA 6P sensor (only for approvals A and R)
- 9 Special version, to be specified

080 Cable for remote
- 0 Without cable
- 1 15 foot coil and signal cable
- 2 30 foot coil and signal cable
- 5 Coil and signal cable, specify length (maximum 650 ft depending on conductivity of process material)
- 7 Coil and signal cable, flexible conduit, specify length (maximum 650 ft depending on conductivity of process material)
- 9 Special version, to be specified

090 Cable entries
- B 1/2" NPT
- L 1/2" NPT Fieldbus connector (only for approval A and R)
- 9 Special version, to be specified

100 Power supply / display
- 7 85 to 260 VAC, without display, remote configuration only (not for wall mount or SS housing)
- 8 20 to 55 VAC / 16 to 62 VDC, without display, remote configuration only (not for wall mount or SS housing)
- A 85 to 260 VAC, with display, push button operation (language: EN, ES, FR, IT, NL, PT, DE)
- B 20 to 55 VAC / 16 to 62 VDC, with display, push button operation (language: EN, ES, FR, IT, NL, PT, DE)
- X Sensor only (without transmitter, only available up to 8")
- 9 Special version, to be specified

110 Software
- A Standard software
- C ECC electrode cleaning circuit (only for approvals A and R)
- 9 Special version, to be specified

120 Outputs / Inputs

Fixed communication boards
- A Current HART, SIL, frequency
- B Current HART, SIL, frequency, 2 relays
- F PROFIBUS-PA, IS
- G Foundation Fieldbus, IS
- H PROFIBUS-PA
- J PROFIBUS-DP
- K Foundation Fieldbus
- Q Modbus RS485, status input
- S Current HART, SIL, frequency; active I.S
- T Current HART, SIL, frequency; passive I.S

Flexible communication boards
- C Current HART, SIL, frequency, 2 relays, flexible module
- D Current HART, SIL, frequency, relay, and status input, flexible module
- L Current HART, SIL, 2 relays and status input/output
- M Current HART, SIL, 2 frequency output, status input
- N Modbus RS 485, current and frequency output, status input
- P PROFIBUS-DP, current and frequency output, status input
- V PROFIBUS-DP, two relay outputs, status input
- 2 Current HART, SIL, relay, current, frequency ouputs
- 4 Current HART, SIL, relay, frequency outputs, current input
- 7 Modbus RS485, two relay outputs, status input
- X Sensor only
- 9 Special version, to be specified

* Harsh environment (HE) option is available for process conditions where cool process temperatures in tropical (high humidity) environments or process fluids which undergo large cyclical temperature variations which can cause high amounts of moisture that could condense onto the measurement tube.

Promag 53W, 28” to 78”

Promag 53W [ ] - [010] [020] [030] [040] [050] [060] [070] [080] [090] [100] [110] [120]

Nominal Diameter
- 7H 28”
- 7F 30”, AWWA
- 8H 32”
- 9H 36”
- TO 40”
- VO 42”, AWWA
- T2 48”
- V3 54”, AWWA
- V5 60”, AWWA
- V6 66”, AWWA
- T8 72”
- V9 78”, AWWA

010 Liner
- D Hard rubber, NSF61 drinking water approval
- H Hard rubber
- P Polyurethane, NSF61 drinking water approval (not available for 42” to 78” sensors)
- S Hard rubber HR
- U Polyurethane (not available for 42” to 78” sensors)
- 9 Special version, to be specified

020 Process connection
- P Class D AWWA carbon steel A105 flanges
- 9 Special version, to be specified

030 Electrodes / material
- 0 Measuring, reference and EPD electrodes / 316L SS
- 1 Measuring, reference and EPD electrodes / Alloy C22
- 2 Measuring, reference and EPD electrodes / tantalum
- 7 Measuring electrode, exchangeable / 316L SS (for hard rubber liner only, 14” and larger sensors, no EPD or reference electrodes, for safe areas only)
- G Measuring, reference and EPD electrodes, bullet nose / 316L SS
- H Measuring, reference and EPD electrodes, bullet nose / Alloy C-22
- 9 Special version, to be specified

040 Calibration
- B 3-point calibration, 0.2%
- E SCS/A2LA 3-point 0.2% calibration (ISO/IEC 17025) with certificate traceable according to ISO 9000 (specify range)
- 9 Special version, to be specified

050 Certificates
- 1 Standard, no certificate
- 2 3.1B material certificate for pipe and flanges
- 9 Special version, to be specified

060 Approvals
- A For use in non-hazardous areas
- R FM non-incendive Class I, Div. 2 / CSA Class I, Div. 2

070 Housing
- A NEMA 4X (IP 67) compact aluminum housing
- C NEMA 4X (IP 67) remote wall-mounted (only for approvals A or R)
- G NEMA 4X (IP 67) remote aluminum field housing for non-hazardous areas
- K NEMA 6P sensor, wall-mounted housing (only for approvals A or R)
- S NEMA 4X (IP 67) remote wall-mounted housing, HE (harsh environment), remote sensor sizes 14” to 78” (only for approvals A and R) *
- 1 -40°F (-40°C) ambient temperature, NEMA 4X (IP 67), compact, aluminum field housing (only for approvals A and R)
- 3 -40°F (-40°C) ambient temperature, NEMA 4X (IP 67), compact (only for approvals A and R)
- 5 -40°F (-40°C) ambient temperature, NEMA 4X (IP 67) wall mount housing, for NEMA 6P sensor (only for approvals A and R)
- 9 Special version, to be specified

* Harsh environment (HE) option is available for process conditions where cool process temperatures in tropical (high humidity) environments or process fluids which undergo large cyclical temperature variations which can cause high amounts of moisture that could condense onto the measurement tube.

080 Cable for remote
- 0 Without cable
- 1 15 foot coil and signal cable
- 2 30 foot coil and signal cable
- 5 Coil and signal cable, specify length (maximum 650 ft depending on conductivity of process material)
- 7 Coil and signal cable, flexible conduit, specify length (maximum 650 ft depending on conductivity of process material)
- 9 Special version, to be specified

090 Cable entries
- B 1/2” NPT
- L 1/2” NPT Fieldbus connector (only for approval A and R)
- 9 Special version, to be specified

100 Power supply / display
- 7 85 to 260 VAC, without display, remote configuration only (not for wall mount or SS housing)
- 8 20 to 55 VAC / 16 to 62 VDC, without display, remote configuration only (not for wall mount or SS housing)
- A 85 to 260 VAC, with display, push button operation (language: EN, ES, FR, IT, NL, PT, DE)
- B 20 to 55 VAC / 16 to 62 VDC, with display, push button operation (language: EN, ES, FR, IT, NL, PT, DE)
- 9 Special version, to be specified

110 Software
- A Standard software
- C ECC electrode cleaning circuit (only for approvals A and R)
- 9 Special version, to be specified

120 Outputs / Inputs
Fixed communication boards
- A Current HART, SIL, frequency
- B Current HART, SIL, frequency, 2 relays
- F PROFIBUS-PA, IS
- G Foundation Fieldbus, IS
- H PROFIBUS-PA
- J PROFIBUS-DP
- K Foundation Fieldbus
- Q Modbus RS485, status input
- S Current HART, SIL, frequency; active I.S
- T Current HART, SIL, frequency; passive I.S

Flexible communication boards
- C Current HART, SIL, frequency, 2 relays, flexible module
- D Current HART, SIL, frequency, relay, and status input, flexible module
- L Current HART, SIL, 2 relays and status input/output
- M Current HART, SIL, 2 frequency output, status input
- N Modbus RS 485, current and frequency output, status input
- P PROFIBUS-DP, current and frequency output, status input
- V PROFIBUS-DP, two relay outputs, status input
- 2 Current HART, SIL, relay, current, frequency outputs
- 4 Current HART, SIL, relay, frequency outputs, current input
- 7 Modbus RS485, two relay outputs, status input
- X Sensor only
- 9 Special version, to be specified

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TI046D/24/en/07.10

Endress+Hauser

People for Process Automation

4 – DETAILED TECHNICAL DOCUMENTATION

4.3 – SHOP DRAWINGS

4.3.13 – SLUDGE TANKS

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Project name:	AMARUQ
Project#:	5000218009
Document #:	SPK_0013_SLG
by:	BB
chkd:	GP
appvd:	CB

SUBMITTAL PACKAGE

SLUDGE TANKS

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Project name: AMARUQ

Project#: 5000218009

Document #: SPK_0013_SLG

by: BB

chkd: GP

appvd: CB

SLUDGE TANKS

VALVES

OIM manual section: 4.3.13.1

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CS-301-1110 : Identification sheet

VWTC PROJECT NUMBER:	5000218009	REV:	1
PROJECT NAME:	AEM AMARUQ	SUBMITTED TO (COMPANY):	AGNICO EAGLE MINES
ENGINEER:	Gabriel Hébert	SUBMITTED TO (RESPONSIBLE)	
PROJECT MANAGER:	Clément B	PROJECT NUM REFERENCE.:	
PHONE NUMBER:		LOT NUMBER:	

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
CFF	VABLSS200267	PI4-011-V001	DIA: 13 mm (1/2")	ISOLATION VALVE	TYPE: TWO PIECE BALL VALVE | 1000 psi W.O.G.//MANUFACTURER : CFF//MODEL : SS-2 (1/2")//CONNECTION TYPE : THREADED | 13 mm (1/2")//BODY : 316 SS// SEAL | SEAT :PTFE | TEFLON// STEM : 316 SS | C/W MANUAL LEVER			SLUDGE TANK		
CFF	VABLSS200267	PI4-011-V002	DIA: 13 mm (1/2")	ISOLATION VALVE	TYPE: TWO PIECE BALL VALVE | 1000 psi W.O.G.//MANUFACTURER : CFF//MODEL : SS-2 (1/2")//CONNECTION TYPE : THREADED | 13 mm (1/2")//BODY : 316 SS// SEAL | SEAT :PTFE | TEFLON// STEM : 316 SS | C/W MANUAL LEVER			SLUDGE TANK		

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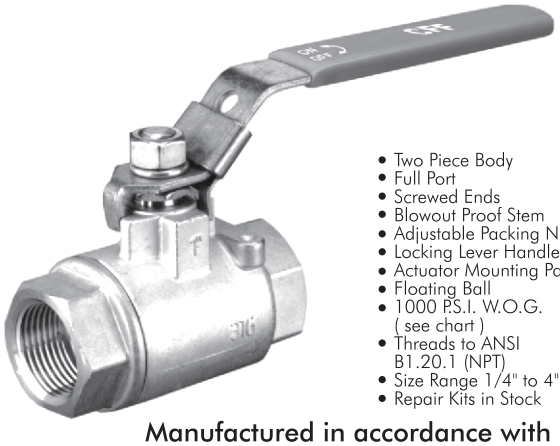
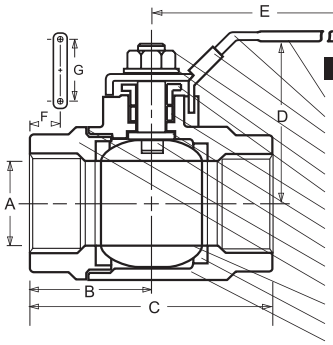
C.F.F. SS · SERIES
316 STAINLESS STEEL VALVES

SS·2 BALL



- Two Piece Body
- Full Port
- Screwed Ends
- Blowout Proof Stem
- Adjustable Packing Nut
- Locking Lever Handle
- Actuator Mounting Pad
- Floating Ball
- 1000 P.S.I. W.O.G. (see chart)
- Threads to ANSI B1.20.1 (NPT)
- Size Range 1/4" to 4"
- Repair Kits in Stock

Manufactured in accordance with ISO 9002 quality standards.



	NAME/MATERIAL
1	Plastic Cover/ Plastic
2	Handle/ Stainless Steel 304
3	Lock Device/ Stainless Steel 304
4	Stem Nut/ Stainless Steel 304
5	Stem Washer/ Stainless Steel 304
6	Gland Nut/ Stainless Steel 304
7	Stem Packing/ Teflon
8	Thrust Washer/ Rein. Teflon 15% GFT
9	Stem/ Stainless Steel 316
10	Joint Gasket/ Teflon
11	Cap/ Stainless Steel 316; CF 8M
12	Ball/ Stainless Steel 316
13	Seat/ Rein. Teflon 15% GFT
14	Body/ Stainless Steel 316; CF 8M

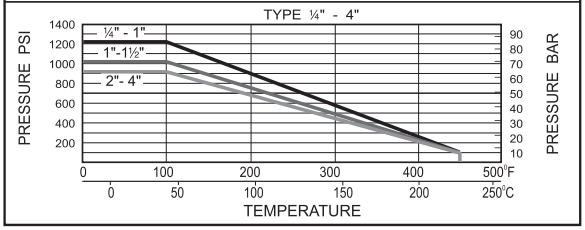
Visit us on-line at:
www.cffstainless.com

SS · 2 BALL VALVE

DIMENSIONS								
	Nominal Size	(mm/in) A	(mm/in) B	(mm/in) C	(mm/in) D	(mm/in) E	(mm/in) F	(mm/in) G
8	¼	11.6	30	60	45	110	12.7	28.45
		0.457	1.181	2.362	1.772	433.1	0.50	1.120
10	⅜	12.7	30	60	45	110	12.7	28.45
		0.50	1.181	2.362	1.772	433.1	0.50	1.120
15	½	15	32	64	45	130	12.7	28.45
		0.591	1.260	2.520	1.772	5.118	0.50	1.120
20	¾	20	38.5	77	50	130	22.10	34.80
		0.787	1.516	3.032	1.969	5.118	0.87	1.37
25	1	25.4	45	90	65	155	22.10	38.10
		1.00	1.772	3.543	2.559	6.102	0.87	1.37
32	1¼	32	50	100	70	155	23.62	38.10
		1.260	1.967	3.937	2.756	6.102	0.93	1.50
40	1½	38.1	59	118	75	185	23.62	38.10
		1.50	2.323	4.646	2.953	7.283	0.93	1.50
50	2	50.8	68.5	137	85	185	23.62	38.10
		2.00	2.697	5.398	3.346	7.283	0.93	1.50
65	2½	65	82.5	165	136	250	—	70
		2.561	3.248	6.496	5.364	9.843	—	2.756
80	3	80	97.5	195	149	250	—	70
		3.152	3.839	7.677	5.866	9.843	—	2.756

Design and materials are subject to change without notice.

PRESSURE/TEMP. RATING



FLOW COEFFICIENT CV										
Size (in.)	¼	⅜	½	¾	1	1¼	1½	2	2½	3
Cv	6	7	10	25	35	46	80	110	310	360
Operating Torques (lbs.)	36	36	43	65	101	158	187	230	430	1380

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CS-313-200 : Identification sheet

VWTC PROJECT NUMBER:	5000218009	REV:	1
PROJECT NAME:	AEM AMARUQ	SUBMITTED TO (COMPANY):	AGNICO EAGLE MINES
ENGINEER:	Gabriel Hébert	SUBMITTED TO (RESPONSIBLE)	
PROJECT MANAGER:	Clément B	PROJECT NUM REFERENCE.:	
PHONE NUMBER:		LOT NUMBER:	

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
DM VALVE	ST-313-501	FCV4-011	75 mm (3")	PINCH VALVE	TYPE: PINCH VALVE | 150 PSI//MANUFACTURER : FLOWROX//MODEL : PVE3AK150-601L-SBRT//CONNECTION TYPE : FLANGED | 75 mm (3")//BODY : CAST IRON// SEAL | SEAT :N/A// SLEAVE : SBRT	ACTUATOR TYPE : MANUAL// MANUFACTURER : N/A// MODEL # :N/A//	w/ el. Pneum. Positioner	SLUDGE TANK		

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FLOWROX

Proven Performance

Valve Solutions

- Heavy Duty Pinch Valves
- General Line Pinch Valves
- Slurry Knife Gate Valves
- Smart Features
- Spares & Services

Valve solutions

For demanding shut-off and control applications

We deliver flow control solutions for the most demanding process conditions. Our story has started over 40 years ago making us the industry benchmark and experts on valve technology. Our robust full bore design enables effortless process flow. We provide services ranging from sizing, materials selection, installation, spare parts and maintenance to optimize the up- and downstreams flow.

1977:
Company Larox is established

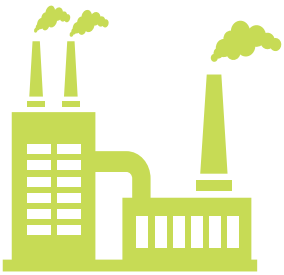
1993:
Company Larox Flowsys Oy is established

2000:
Product portfolio expanded to plastic body PVEG valves

2009:
Product portfolio expanded to Slurry Knife Gate Valves

2011 -
Name changed

FLOWROX



4 DECADES: KNOW-HOW & INDUSTRY EXPERTISE

- Mining, metallurgy & minerals
- Construction
- Energy
- Environment
- Water & wastewater
- Chemical process industry
- Oil & offshore
- Pulp & paper
- Food & pharma

2014:
Flowrox biggest DN1200 knife gate valves delivered for mining application

2016:
Launch of Smart Solutions™

OVER 100 000 products delivered Globally

WE PROVIDE THE OPTIMAL SOLUTION:

Ball valve

Flowrox valve solution

The shown comparison of cost over a period of 5 years on a DN100 pinch valve feeding abrasive slurry. The valve operates 4-6 times/hour. The conventional valve is a stainless ball valve with PTFE seats.

YOUR BENEFITS

- Low Total Cost of Ownership
- Low operating costs
- Improved process performance
- Long service intervals
- Minimized downtime
- Heavy duty design

Flowrox Valve Product Portfolio

Pinch Valves

Heavy duty pinch valves

- Pressure rating up to 100 bar
- Size DN25 - 800
- High cycling applications
- For isolation & control purposes

General line pinch valves

- Pressure rating 10 bar
- Size DN50 - 250
- Low cycling applications
- For isolation duty

Slurry Knife Gate Valves

SKW

- Without flange
- Pressure rating 10 bar
- Size DN50 - 600
- Isolation duties only

SKF

- With flange
- Pressure rating 10 bar
- Size DN80 - 1200
- Isolation duties only

SKH

- Without flange
- Pressure rating 20 bar
- Size DN80 - 600
- Isolation duties only

Smart Solutions™

Enhance your performance with Smart Solutions™

- Smart valve series provide online information about the process, valve operations and condition of the valve.
- Enables advanced reporting and data analytics, making your process more reliable and transparent
- Fast analysis of faults and planning of maintenance

Services

Comprehensive Valve Installation, Maintenance and Spare Services

- Site survey services
- Spare parts and component services
- Installation and maintenance services, repairing services
- Analysis services / commissioning / training

Expansion project: Saving time during start-up with 330 Flowrox valves

Customer:
Trafigura Mining Group, MATSA mine, Spain
Products:
330 PVE enclosed body & PVG shut-off valves
Application: Ore & water treatment & process water supply in copper, zinc and lead mining
Benefits: Increased safety, easy installation & maintenance, process reliability, light-weight products.

Long-term benefits in ownership

The Tranfigura Mining Group ordered 330 Flowrox PVE enclosed body pinch valves and PVG shut-off pinch valves for various demanding flow control and shut-off duties, from ore treatment to water treatment plant and process water supply.

"When the project was engineered, we constantly had in mind that the choice of appropriate instrumentation for each application is fundamental to the process performance. We decided that all control valves and also some of the shut-off valves would be pinch valves, which finally ended up saving us a lot of time in the start-up of the plant," says Ms. **Luisa Montes**, a Project Team Member from MATSA mine.

All installed Flowrox Pinch Valves delivered were an enclosed body type and include an SBRT valve sleeve to meet the requirements of various mediums in different process areas and to achieve the longest sleeve life time.

As the valves are self-cleaning, even if any solids are accumulated in the sleeve wall, it breaks away when the valve is operated. This is due to the flexibility of the sleeve, making the valve lifetime longer than many other competing products on the market.

The Flowrox Pinch Valves were chosen to gain long-term benefits based on low total cost of ownership. The PVE control valves at the plant are actuated by pneumatic double acting actuators with positioners. Also, all of the on/off PVG valves include limit switches for position indication.

"In the future, we are definitely expecting cost savings," Ms. Montes states.

OUR CUSTOMER: TRAFIGURA MINING GROUP

Trafigura Mining is a market leader in copper, lead and zinc concentrates trading. The flagship mine, Aguas Teñidas (MATSA),is located in Andalucia, Spain. In the year 2015 the production of concentrates nearly doubled to 4.4 Mt per year.

Flowrox Valve References

Customer: HUSAB Uranium Mine, Namibia
Products: Pinch valves
Application: Tailings Transfer
Benefits:
- Increased process reliability
- Cost efficiency with remote valve control
- Low total cost of ownership

Customer: Wastewater treatment plant, Warsaw, Poland
Products: DN500 control pinch valves
Application: Flow control of biological sludge
Benefits:
- Gentle handling due to living bacteria in sludge
- Wide and accurate flow control range
- Extended maintenance interval

Customer: LKAB, Sweden
Products: PV and PVE pinch valves
Application: Thickener underflow
Benefits:
- Reliability with abrasive slurry
- Wide and accurate flow control range
- Extended maintenance interval

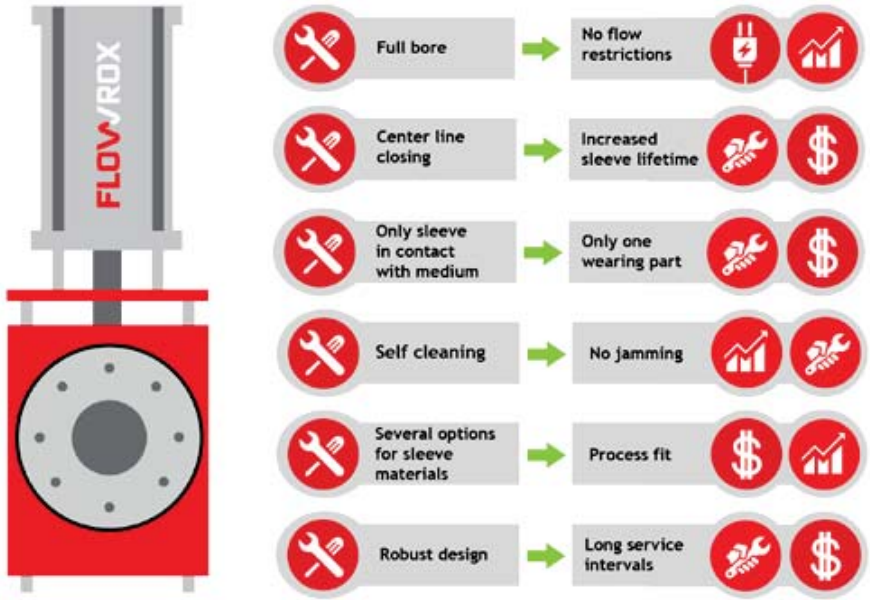
Heavy Duty Pinch Valves

Flowrox heavy duty pinch valves are “The pinch valves”. They are made to last and are ideal where shut-off and control applications involve abrasive or corrosive slurries, powders or coarse substances.

Made to Last

The operating principle of Flowrox pinch valves is simple. In the open position, the valve is at full bore with no flow restrictions. During closing, two pinch bars squeeze the valve sleeve shut on the centerline. The sleeve is naturally wear resistant and when particles hit the sleeve´s rubber surface, the collision energy is absorbed and released when the rubber bounces back.

Heavy duty pinch valves provide bubble tight shut-off even if solids have built up on the sleeve wall. When compressed, any crystallized particles flake off the sleeve surface. The full bore structure ensures free flow of the medium. The construction and materials of the three main components (sleeve, body and actuator) can be tailored to suit your process conditions.



Benefits: This Is How We Flow!

- Long service intervals
- Only one wearing part
- Excellent also for dry powders
- Low maintenance cost

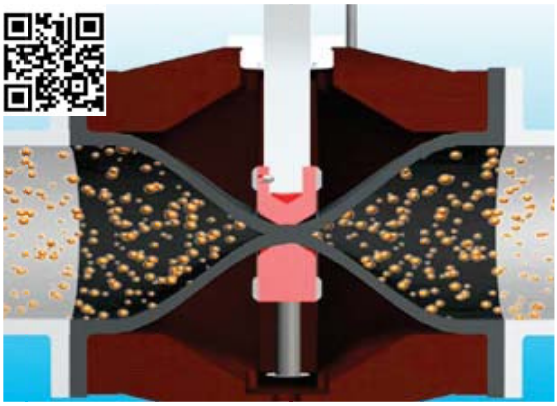


Image: *During closing, two pinch bars squeeze the valve sleeve shut on the centerline. See the Pinch Valve in action by scanning the QR code.*

Valve Model Selection Guide

Type	Size (DN)	Actuator	Pressure class	Flange drilling	Body material	Shape of flange	Opening tags	Auxiliaries	Sleeve material
PV = open PVE = enclosed PVE/S = enclosed / sealed PVS = sealed	25 -1000	M = manual MG = manual with gear A = pneumatic AB = w/ manual override AK = w/ el.pneum. positioner AKU = w/ el.pneum. positioner & pneum. spring AKV = w/ el.pneum. positioner & mech. spring AKF = w/ integrated Festo positioner AN = w/ pneum. postioner AU = w/ pneum. spring AV = with mech. spring E = electric EO = with electrical positioner H = hydraulic HP =hydraulic w/ positioner	1 = 1 bar 6 = 6 bar 10 = 10 bar 16 = 16 bar 25 = 25 bar 40 = 40 bar 64 = 64 bar 100 = 100 bar	1 = – 2 = DIN PN10 3 = DIN PN16 4 = DIN PN25 5 = DIN PN40 6 = ANSI150 7 = ANSI300 8 = BS TABLE D 9A = AS TABLE D 9B = AS TABLE E 9C = JIS 10 9D = JIS 16 9 = OTHER	0 = GRS/Fe 2 = AISI 316 3 = aluminium 4 = other 5 = polyurethane/ polyamide	type 1 type 3 type 4 Determined by Flowrox	L= opening tags	R = readiness for ind. limit switches R1 = AC/DC R2 = DC, PNP R3 = DC, NPN S = magnetic limit switches T = mechan. limit switches Q = quick exhaust valve Z1 = solenoid valve, 24VDC Z2 = solenoid valve, 230V, 50/60 Hz Z3 = solenoid valve, 110V, 50/60 Hz F = Filter regulator + Gauge J1 = Junction box small J2 = Junction box large X = must be specified	SBRT = Styrene butadiene EPDM = Ethylene propylene NR = Natural rubber NBR = Nitrile CSM = Hypalon EPDMB = Green liquor sleeve CR = Chloroprene IIR = Butyl NRF = Foodstuff natural rubber NBRF = Foodstuff nitrile HNBR = Hydrogenated nitrile FPM = Fluorine rubber /M = SensoMate sleeve /PU = PU-coating inside the sleeve /VAC = Sleeve for suction

Example: PVE 150A10-203LR1Z2, SBRT

Control Valves

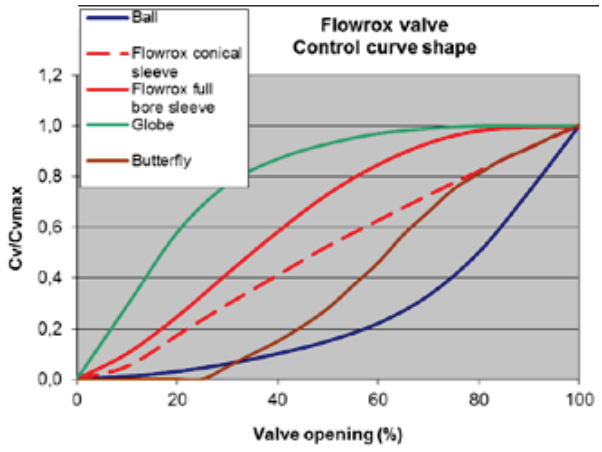
The Flowrox control valves are designed for demanding control applications in which conventional valves encounter problems with wear due to increased turbulence.

When the controlled flow is abrasive, it is a big advantage to have only one, wear resistant, valve part in contact with the medium. The need for maintenance and spare parts is reduced.

Controllability can be further improved with conical sleeves or smart positioners.

Flowrox control valve sizing is based on international IEC60534 standard (harmonized with ANSI/ISA S75).

Flowrox Control Valve Sizing Program is available to ease your work.

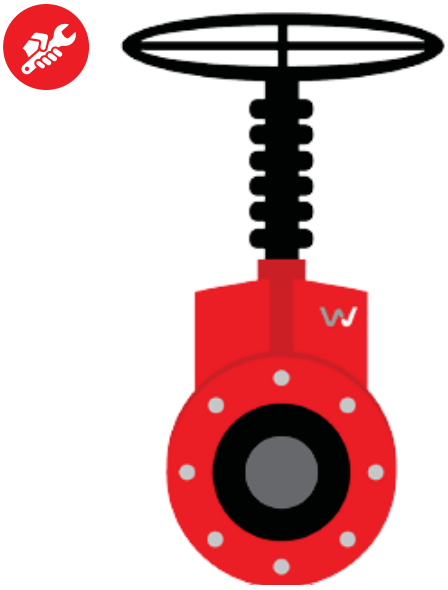


General Line Pinch Valves

PVG and PVEG valves

Flowrox general line pinch valves are robust and cost-effective valves with simple, single-sided closing mechanism. PVG valves have a strong valve body and opening tags in the sleeve as standard. PVEG valves have a corrosion resistant and light-weight plastic body.

They both are ideal for low cycle applications involving abrasion, corrosion and aggressive slurries. Through the reliability and structure, they offer substantial savings based on improved performance, long service lifetime and low total cost of ownership.



Benefits: This Is How We Flow!

- Long service intervals
- Only one wearing part
- Excellent also for dry powders
- Simple sleeve replacement

Image: *The closing element squeezes the sleeve shut against the lower body half, providing a 100 % tight shut-off. See the PVG in action by scanning the QR code.*

PVG Valve Model Selection Guide

Type	Size (DN)	Actuator	Pressure class	Flange drilling	Body material	Sleeve material	Auxiliaries
PVG = Flowrox Pinch valve	50 - 250	M = manual A = pneumatic E = electric	4 = 4 bar 6 = 6 bar 10 = 10 bar	2 = DIN PN 10 6 = ANSI 150 9 = other	0 = cast iron	SBRT = Styrene butadiene rubber EPDM = Ethylene propylene diene monomer	Z1 = solenoid valve, 24V DC Z2 = solenoid valve, 230V 50/60 Hz Z3 = solenoid valve, 110V DC S = Magnetic limit switches

Example: PVG 50M10, SBRT

PVEG Valve Model Selection Guide

Type	Size (DN)	Actuator	Pressure class	Flange drilling	Body material	Sleeve material	Auxiliaries
PVEG = Flowrox Pinch valve	50 - 150	M = manual A = pneumatic	6 = 6 bar 10 = 10 bar	2 = DIN PN 10 6 = ANSI 150 9 = other	5 = Polyamide	SBRT = Styrene butadiene rubber	Z1 = Solenoid valve, 24V DC Z2 = Solenoid valve, 230V 50/60 Hz
PVEG/C = Flowrox Pinch valve	50 - 150	M = manual A = pneumatic	6 = 6 bar 10 = 10 bar	2 = DIN PN 10 6 = ANSI 150	5 = Polyamide	EPDM = Ethylene propylene diene monomer	Z3 = Solenoid valve, 110V DC S = Magnetic limit switches

Example: PVEG 150M10-25

Image: *PVEG50M manual polyamide body pinch valves in a hydrocyclone at Kara Mine, TMM, Tasmania, Australia.*

Knife Gate Valves

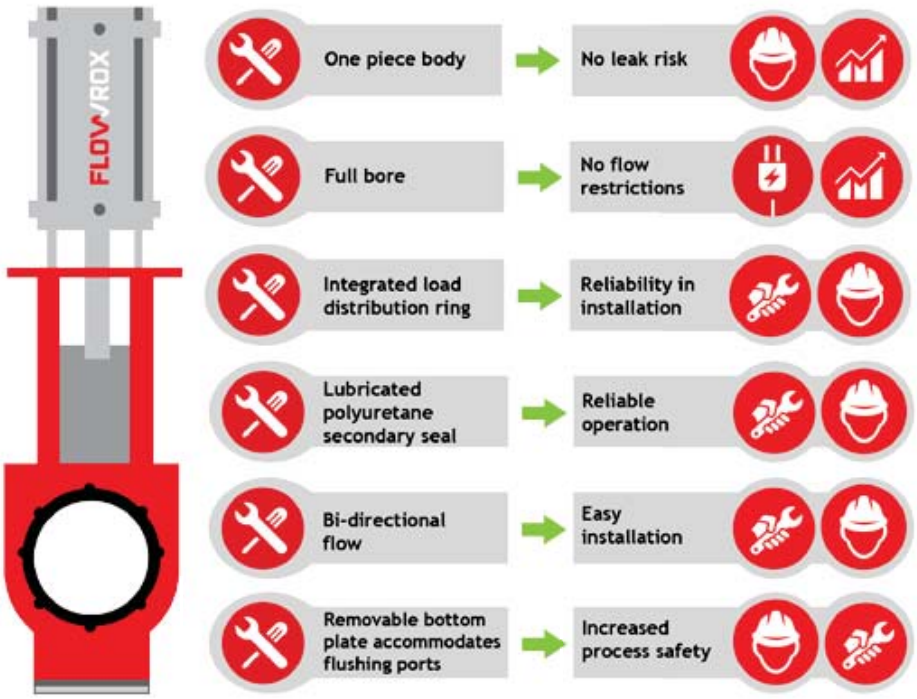
Heavy Duty Slurry Knife Gate Valves isolate flow, even in the most demanding process conditions. The complete valve is built around an ease-of-maintenance concept.

Slurry Knife Gate Valves

The designs of Flowrox Slurry Knife Gate Valves are based on the years of experience Flowrox has gained, providing reliable solutions for abrasive and corrosive process applications.
They feature a load distribution ring that prevents over compression and ensures tight sealing between the ring sleeve and the valve gate. To add to the ease of maintenance, the load distribution ring has been integrated into the ring sleeves of the valve.

The universal tower design of the valve accommodates most actuator types, allowing for actuator interchangeability. The tower also ensures that the top plate, body and actuator are always aligned and that the gate is in the right position.

The valve body itself is a one-piece casting, eliminating the need for sealing between the body halves.



Benefits: This Is How We Flow!

- Small face-to-face dimension
- Easy installation
- Available in large size scale
- Low maintenance cost

Image: *Elastomer ring sleeves on both sides of the gate provide a tight shut off. See the Flowrox knife gate valve in action by scanning the QR code.*

SKW / SKF Valve Model Selection Guide

Type	Size (DN)	Actuator	Pressure class (PN)	Flange drilling	Body material	Gate material	Ring sleeve material	Auxiliaries
SKW SKF	50 - 600	M = manual MG = manual with gearbox A = pneumatic AU = pneumatic with pneumatic spring H = hydraulic E = electric	10 = 10 bar standard	2 = DIN PN10 3 = DIN PN16 4 = DIN PN25 5 = DIN PN40 6 = ANSI150 7 = ANSI300 9 = other	0 = Cast iron/ Welded steel 2 = AISI 316 4 = other	S = stainless steel Other on request COATING: 0 = nothing	NR = natural rubber +75°C max NBR = nitrile +100°C max EPDM = ethylene propylene +120°C max	R = readiness for inductive limits R1 = AC/DC R2 = DC, PNP R3 = DC, NPN Z1 = solenoid valve, 24V DC Z2 = solenoid valve, 230V, 50/60 Hz Z3 = solenoid valve, 110V, 50/60 Hz G = guard

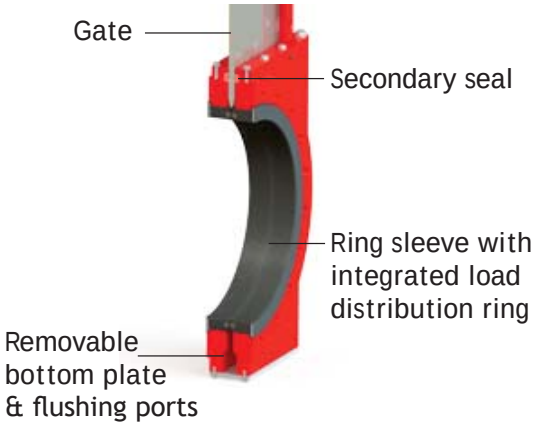
Example:SKW 100M10-20S0-NR-G

SKH Valve Model Selection Guide

Type	Size (DN)	Actuator	Pressure class (PN)	Flange drilling	Body material	Gate material	Ring sleeve material	Auxiliaries
SKH = High pressure slurry knife gate valve	80 - 600	MG = manual with gearbox A = pneumatic AU = pneumatic with pneumatic spring H = hydraulic E = electric	20 = 20 bar standard	2 = DIN PN10 3 = DIN PN16 4 = DIN PN25 5 = DIN PN40 6 = ANSI150 7 = ANSI300 9 = other	0 = Cast iron/ Welded steel 2 = AISI 316 4 = other	S = Stainless steel Other on request COATING: 0 = nothing	NR = natural rubber +75°C max NBR = nitrile +100°C max EPDM = ethylene propylene +120°C max	R = readiness for inductive limits R1 = AC/DC R2 = DC, PNP R3 = DC, NPN Z1 = solenoid valve, 24V DC Z2 = solenoid valve, 230V, 50/60 Hz Z3 = solenoid valve, 110V, 50/60 Hz G = guard

Example:SKH 200E20-30S0-NR

Slurry Knife Gate Design



Flowrox Knife Gate Valves are suitable for large-scale project deliveries with a selection of Flowrox pumps and valves.

Smart Features

Enhance your performance with Smart Solutions™. Flowrox Smart features can be included into any old or new delivery. The Smart valves are next generation solutions delivering data and information in order to provide reliable and cost-efficient production. Real time information from site results in optimised production with maximised output and minimised unplanned shutdowns.

Smart Solutions™

Flowrox Smart valves provide you with online information about their condition, process and operations.

Flowrox Smart PVE is based on the reliable PVE valve and is equipped with a new smart positioner for detailed information about valve operations. The SPVE includes a leak sensor and various embedded instruments for additional information.

Optional SensoMate Smart sleeve detects the wearing before actual sleeve failure.

The Flowrox Smart Valve combined with the Malibu™ IIoT user interface enables advanced reporting and data analytics, making your process more reliable and transparent. Malibu™ is accessible on any device with an Internet browser.

Technical Features

- Pre-fail indications
- Real time data in Malibu™
- Pressure measurement at the valve inlet/outlet
- Medium temperature measurement
- Leak sensor
- Connectivity with 3G/4G, WIFI or LAN

From Features to Benefits

- **Online valve performance monitoring**
  - → Detect issues before they become a problem
- **Automatic pre-fail indications**
  - → Savings in maintenance & unexpected shutdown costs
- **Analytics tools**
  - → Help you make the correct decisions fast
- **Advanced reporting tools**
  - → Access to detailed asset performance information
- **Easy accessibility via Internet**
  - → Access where ever you are

The Flowrox smart instrumentation can be retrofitted to automatic pinch valves.

Flowrox Smart Valves:

The SPVE series provides online information about the process performance and condition of the valve.

The Flowrox Smart Valve combined with Malibu™ enables advanced reporting and data analytics, making your process more reliable and transparent.

Spares & Services

Sleeves: The core of our valves

Our technologically advanced Flowrox sleeves guarantee high resistance to wear and corrosion, trouble-free operation and extended lifetime.

Robust Heart of the Pinch Valve

The handmade sleeve has a reinforced construction, making it the pressure-containing part of the valve.

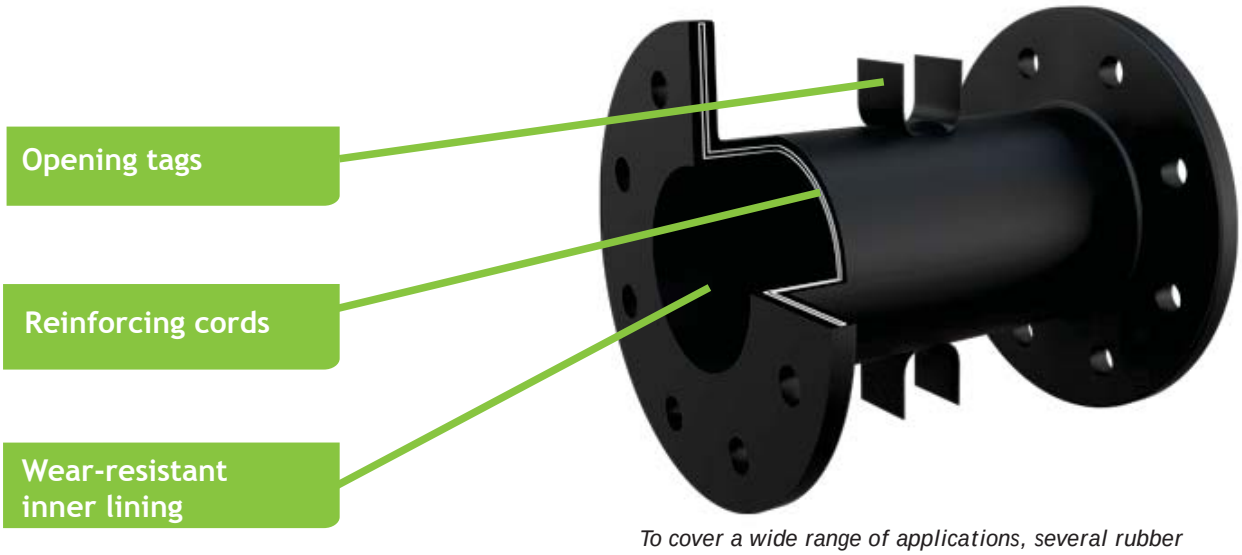
Standard Flowrox PV, PVE and PVG sleeves are equipped with opening tags to ensure full valve opening in all process conditions.

Ring Sleeves for Knife Gate Valves

The ring sleeve is a moulded part with a reinforcement steel ring integrated near the sealing area. The flange of the ring sleeve is reinforced with a load distribution ring to ensure even compression.

Special Sleeve Features

- Conical sleeve for control valves
- Suction sleeve for negative pressure applications
- SensoMate sleeve detecting and signalling critical wear
- Polyurethane lined sleeve with improved protection against wear in abrasive control applications
- Foodgrade rubber for FDA requirements



To cover a wide range of applications, several rubber compounds are available.

Flowrox valves are available in various sizes and models for various applications.
Flowrox Services supports you throughout the entire life cycle.

Services

We offer prompt support, spare parts and services in order to maximise your performance.

We manufacture and deliver original spare parts and components for all Flowrox products (valves, hose pumps, PC pumps).

- On-time trouble-free delivery of spares and services
- Cost savings through optimised service cycles and reduced downtime of equipment
- Longer life cycles for equipment

This is how we flow!

Check out the **Flowrox Pinch Valves** in action by scanning this QR code.

Open your gates!

Check out the **Flowrox Knife Gate Valves** in action by scanning this QR code.

Get Smarter!

Check out the **Flowrox Smart Solutions™** by scanning this QR code.

We are recognised as a reliable industrial solutions provider for demanding process conditions. Our 40 years of experience in flow control and elastomer technology are obvious benefits we can offer. Formerly known as Larox Flowsys, our heritage forms the foundation of what we are today; the benchmark for heavy duty valves, pumps and systems. We know that all processes are different, all customers unique and process conditions vary, but we are happy to adapt.

We operate on 6 continents and support our customers through a network of over 200 representatives.

Contact your local Flowrox representative

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Finland
Tel. +358 201 113 311

www.flowrox.com
info@flowrox.com

04/18 EN

Project name: AMARUQ

Project#: 5000218009

Document #: SPK_0013_SLG

by: BB

chkd: GP

appvd: CB

SLUDGE TANKS

INSTRUMENTS

OIM manual section: 4.3.13.2

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CS-400-140z : Identification sheet

VWTC PROJECT NUMBER:	5000218009	REV:	1
PROJECT NAME:	AEM AMARUQ	SUBMITTED TO (COMPANY):	AGNICO EAGLE MINES
ENGINEER:	Gabriel Hébert	SUBMITTED TO (RESPONSIBLE)	
PROJECT MANAGER:	Clément B	PROJECT NUM REFERENCE.:	
PHONE NUMBER:		LOT NUMBER:	

SUPPLIER	EQPT CODE	EQPT TAG NO	DIA	DESCRIPTION	INFO 1	INFO 2	INFO 3	APPLIC.	NOTE	REV
HACH	ST-400-140zz1	AE4-011	144 mm x 144 mm x 181 mm (contr oller) ? Insert ion	TURBIDIMETER PROBE	SOLITAX INSERTION SENSOR FOR TURBIDITY AND SS t-line sc STAINLESS STEEL WITH WIPER 0.001-4000 NTU, 0.001 mg/L - 50 g/L/MANUFACTURER: HACH/ MODEL: LXV424.99.00100/LZX661/5738 400 C/W CONTROLLER SC200 2 CHANNELS DIGITAL LXV404.99.00552/ 9328100 HART MODULE	N/A	N/A	SLUDGE TANK		rev1

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SOLITAX® sc Turbidity and Suspended Solids Sensors

Hach SOLITAX sc sensors provide accurate, color-independent measurement of turbidity and suspended solids in drinking water, wastewater, and industrial process applications. A self-cleaning wiper prevents measurement error due to fouling. These sensors demonstrate excellent correlation with laboratory analysis so it's an exceptional tool for process control.

Features and Benefits

Accurate, Color-independent Measurement

Hach's SOLITAX sc Turbidity and Suspended Solids Sensors are immune to shifts in color of activated sludge caused by variations in through-flow volume, climatic fluctuations, or other unexpected events. Unlike conventional systems, that need to be continually calibrated to compensate for color variation, the proven measurement technique used in the SOLITAX sc sensor is the only technology that provides measurement completely independent of color.

Self-cleaning Wiper Prevents Erroneous Values

The SOLITAX sc sensor's self-cleaning wiper prevents erroneous values and maintenance problems by preventing biological growth. Gas bubbles in the sample do not interfere with the measurement.

Excellent Correlation to Laboratory Analysis

Comparisons between laboratory analysis and continuous suspended solids measurement using SOLITAX sc sensors show an exceptional correlation to mixed liquor, settled and thickened sludge. Online measurement not only saves time on manual analysis but also provides critical real time TSS measurements that can be used to operate the plant more efficiently. *(See Correlation Chart on page 2.)*

Fully Serviceable Sensors

Conventional Turbidity and Suspended Solids sensors are potted and are discarded when they no longer function. SOLITAX sc sensors are serviceable so that the useful life of the sensor, in many cases, is doubled.

Easy One-point Calibration

Calibration of SOLITAX sc sensors is easy with a simple correction factor procedure to measure turbidity or suspended solids. Multipoint calibration is available for nonlinear samples.

Versatile Mounting Styles

SOLITAX sc sensors can easily be configured for many applications. Models designed for immersion into a tank are available in PVC plastic or stainless steel. An insertion style sensor for pipes is available in stainless steel. Installation kits for either style sensor are also available.

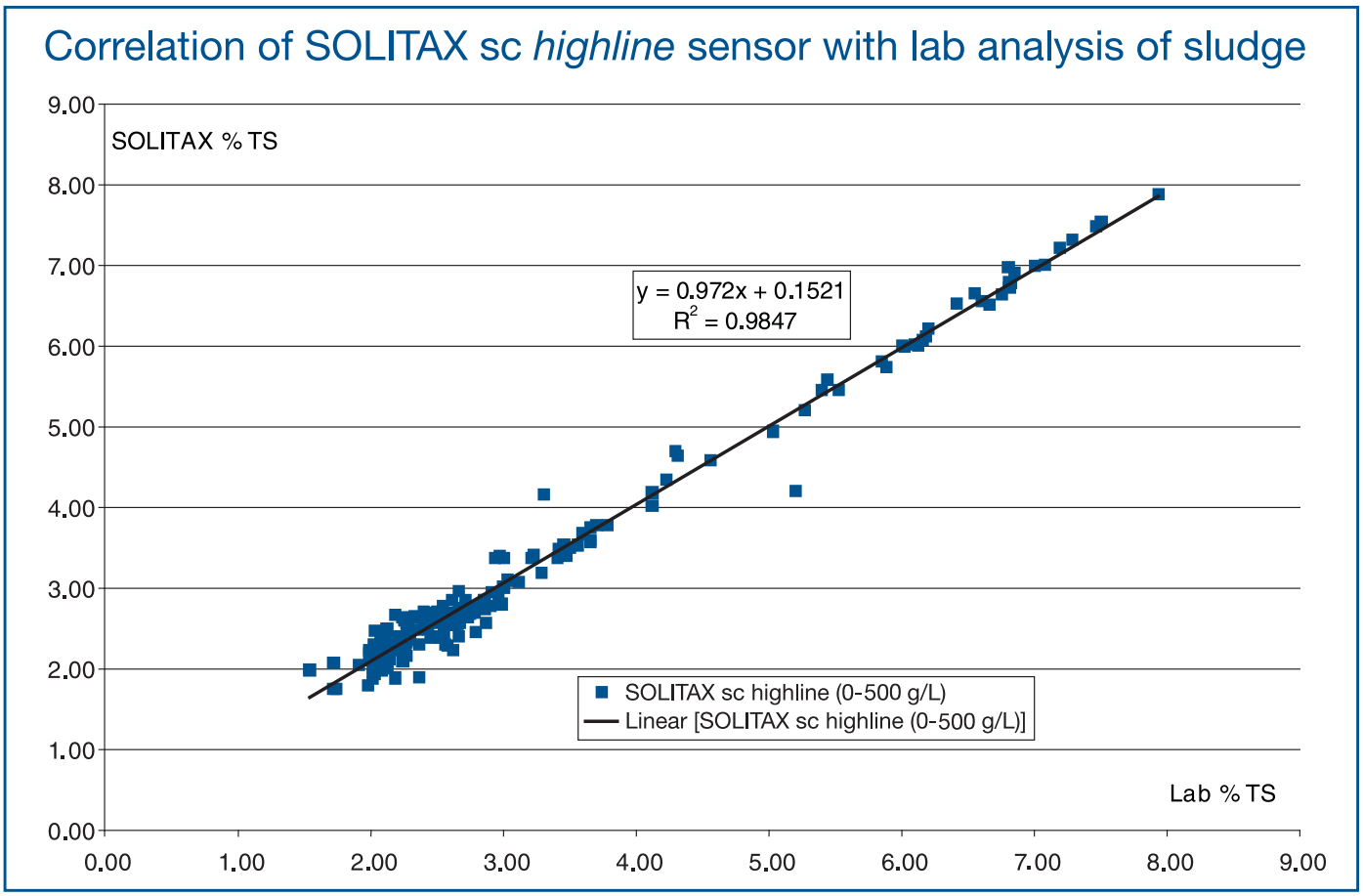
Multi-channel, Multi-parameter System

Any combination of two SOLITAX sc sensors can be installed using one Hach sc200 Controller. The same controller can also accommodate any combination of parameters, including suspended solids, turbidity, pH/ORP, dissolved oxygen, conductivity, and nitrate. All of Hach's model sc sensors are "plug and play" with no complicated wiring or set-up procedure necessary.

Communications—Multiple alarm/control schemes are available using four relays and two PID control outputs. Communications use analog 4-20 mA and digital MODBUS®/RS485, MODBUS®/RS232 protocols. (Other digital protocols are available. Contact your Hach representative for details.)

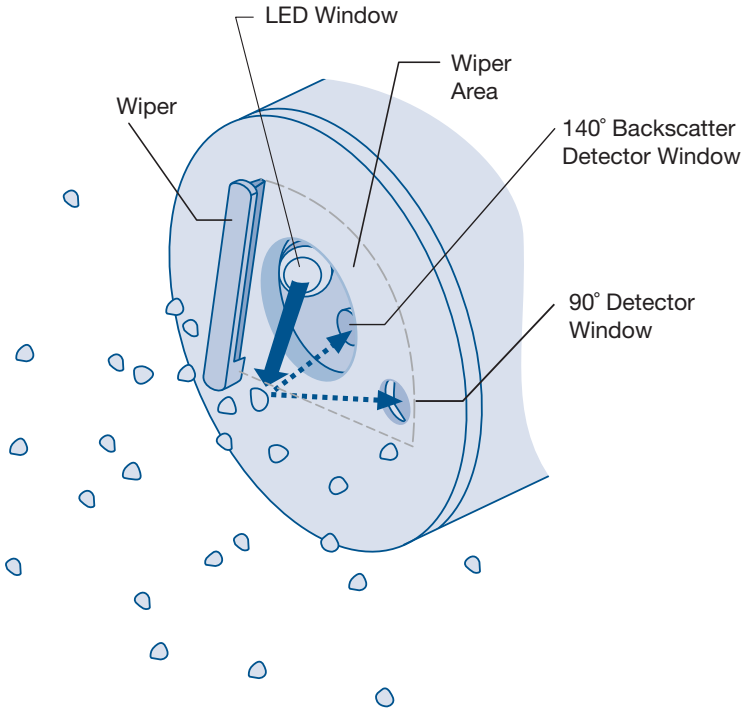
Data logger—A built-in data logger collects measurement data, calibration, verification points, and alarm history for up to 6 months. The embedded SD card reader ensures simple download of the logged data.

Correlation of SOLITAX sc *highline* sensor with lab analysis of sludge



Principal of Operation:
SOLITAX sc ts-line sensor with dual-beam optics and added back-scatter detector

- *Dual infrared light beams. LED light source transmits light at 45° to sensor face.*
- *Nephelometric photoreceptors detect light at 90° to the transmitted light beam.*
- *Backscatter photoreceptor (included on all models except the SOLITAX sc t-line) detects light at 140° to the transmitted light beam to measure suspended solids in heavily loaded sample streams.*
- *Self-cleaning wiper, optional.*
- *T-line probes measure turbidity only.*
- *TS, HS, inline, and highline sensors measure either turbidity or suspended solids. The parameter to be measured is user selectable and can be changed at any time.*



Specifications*

	For insertion in pipes		For immersion in open tanks		
	Model inline sc	*Model highline sc*	*Model t-line sc*	*Model ts-line sc*	*Model hs-line sc*
Parameter					
	Turbidity Suspended Solids	Turbidity Suspended Solids	Turbidity	Turbidity Suspended Solids	Turbidity Suspended Solids
Measuring Range					
Turbidity *Suspended Solids*	0.001 to 4000 NTU 0.001 mg/L to 50 g/L	0.001 to 4000 NTU 0.001 mg/L to 500 g/L	0.001 to 4000 NTU n/a	0.001 to 4000 NTU 0.001 mg/L to 50 g/L	0.001 to 4000 NTU 0.001 mg/L to 500 g/L
Units of Measure					
Turbidity *Suspended Solids*	User selectable—NTU, FNU, or TE/F User selectable—g/L, mg/L, ppm, or % solids				
Accuracy	*Turbidity up to 1000 FNU/NTU*				
Without Calibration *With Calibration*	<5% of the measured value ±0.01 FNU/NTU <1% of the measured value ±0.01 FNU/NTU				
Repeatability	*Defined according to ISO/WD 13530.*				
Turbidity *Suspended Solids*	Less than 1% of reading Less than 3% of reading (depends on the homogeneity of municipal activated sludge)				
Response Time	1 s < T90 < 300 s (adjustable)				
Calibration					
Turbidity *Suspended Solids*	Formazin or StablCal® Standard Based on gravimetric TSS analysis with a correction factor procedure				
Certifications	CE certified to EN 61326-1, EN 61326/A1, EN 61326/A2, EN 61010-1				
Mounting					
	Through sidewall of a pipeline using a ball valve; minimum pipe size 100 mm (4 in.) in carbon or stainless steel		Fixed to the rim of the tank		
Flow Velocity	3 m/s (9.8 ft./s) maximum				
Operating Temperature	>0 to 40°C (>32 to 104°F)				
Sample Temperature	>0 to 40°C (>32 to 104°F)				
Sample Pressure					
	Stainless steel: 6 bar or 60 m (87 psi) PVC: 1 bar or 10 m (14.5 psi)				
Sensor Construction					
Wiper *Sensor body*	Silicon Stainless steel		Silicon Stainless steel or PVC		
Dimensions	*(diameter x length)*				
	Insertion sensor: 60 x 315 mm (2.4 x 12.4 in.); Ball valve from flange: 185 x 625 mm (7.3 x 24.6 in.)		Immersion sensor: 60 x 200 mm (2.4 x 7.9 in.)		
Weight					
	Insertion stainless steel: 2.4 kg (5.3 lb.)		Immersion, stainless steel: 1.38 kg (3.0 lb.) Immersion, PVC: 0.52 kg (1.2 lb.)		
Cable Length					
	10 m (33 ft.) standard. Optional extension cables available in 7.6 m (25 ft.), 15.2 m (50 ft.), 30.5 m (100 ft.). Maximum total length: 100 m (328 ft.).				

**Specifications subject to change without notice.*

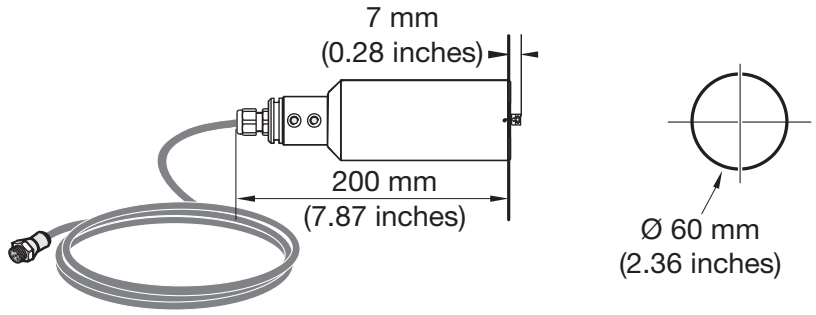
Engineering Specifications

1. The suspended solids and/or turbidity sensor shall consist of a digital sensor designed to connect to a universal controller.
2. The suspended solids and/or turbidity sensor shall use dual infrared light beam technique design utilizing an LED light source in the sensor to transmit an infrared/scattered dual beam into the sample stream at an angle of 45 degrees to the sensor face.
3. A photoreceptor located in the sensor face shall detect scattered light (turbidity) at 90 degrees to the transmitted beam.
4. A backscatter photoreceptor (included on all models except the SOLITAX sc t-line), positioned at 140 degrees to the transmitted beam, shall detect light scattered for suspended solids readings.
5. The sensor shall analyze the dual-beam data and provides a color independent measurement.
6. The sensor shall have a self-cleaning wiper to prevent erroneous values and maintenance problems caused by biological activity, scum build-up, and gas bubbles.
7. The self-cleaning wiper shall ensure that measurements are accurate, continuous, and completely color independent.
8. The sensor shall have an operating range of 0.001 mg/L to 50 g/L or 0.001 mg/L to 500 g/L and/or 0.001 to 4000 NTU suspended solids and turbidity depending on the model.
9. The sensor shall be capable of immersion in a tank or insertion into a pipe.
10. The materials of construction shall be PVC or polished stainless steel, depending on the sensor selection.
11. The sensor shall have an operating temperature of >0 to 40°C (32 to 104°F).
12. The initial response time shall be 1 second and user-adjustable up to 300 seconds.
13. The accuracy shall be less than 1% of reading or 0.01 NTU, whichever is greater for turbidity and less than 5% of reading for suspended solids.
14. The suspended solids and turbidity sensor shall be Hach Company Model t-line sc for turbidity measurement or ts-line sc, hs-line sc, inline sc, or highline sc for suspended solids and turbidity measurement.

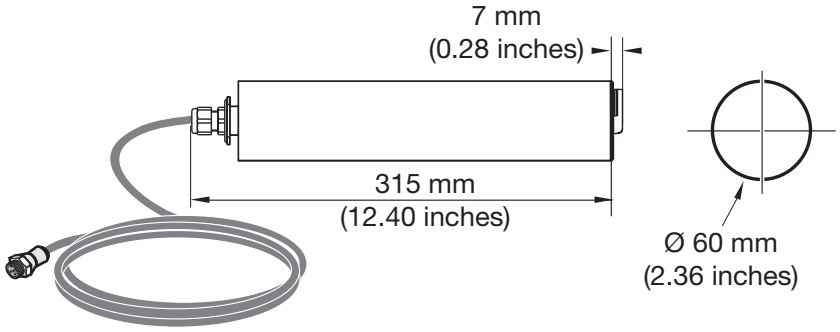
Dimensions

Hach SOLITAX sc sensors can be fixed to the rim of the tank for immersion applications or inserted directly through the sidewall of a pipeline for insertion applications. The optical unit of the sensor should be installed facing downstream in the direction of the flow to minimize the impact of debris against the measurement system. A variety of installation kits are available.

SOLITAX sc models t-line, ts-line, and hs-line sensors for immersion in open tanks

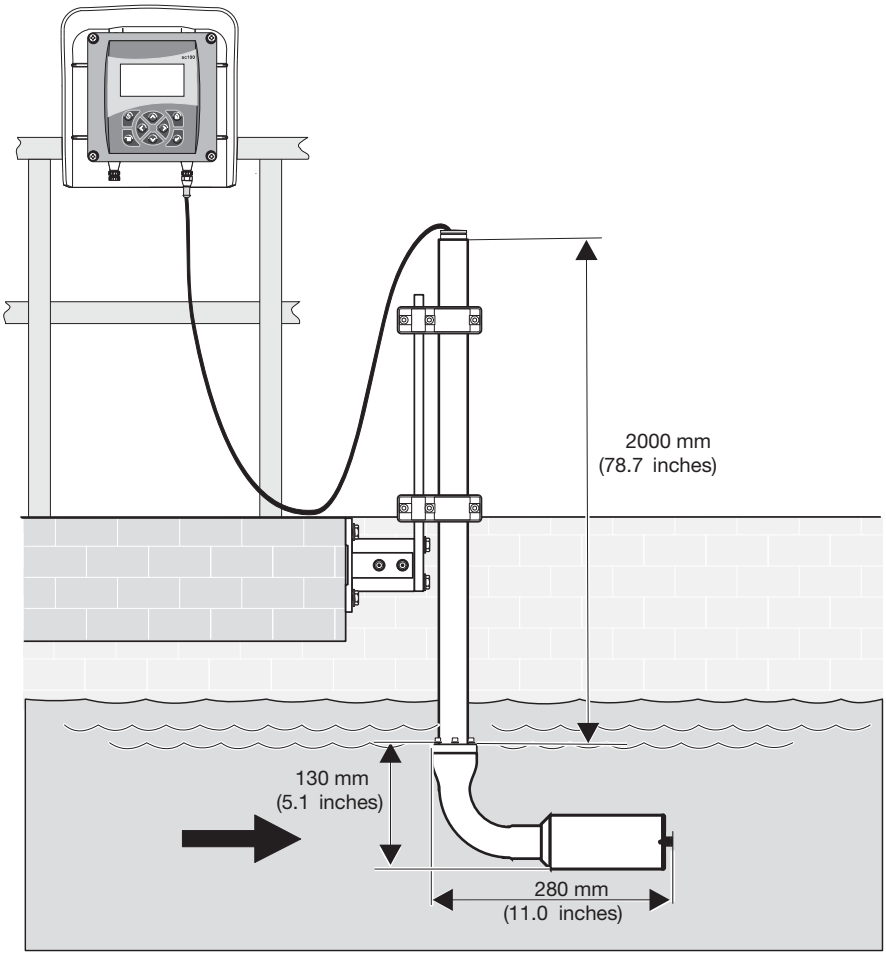


SOLITAX sc models inline and highline sensors for insertion in pipes

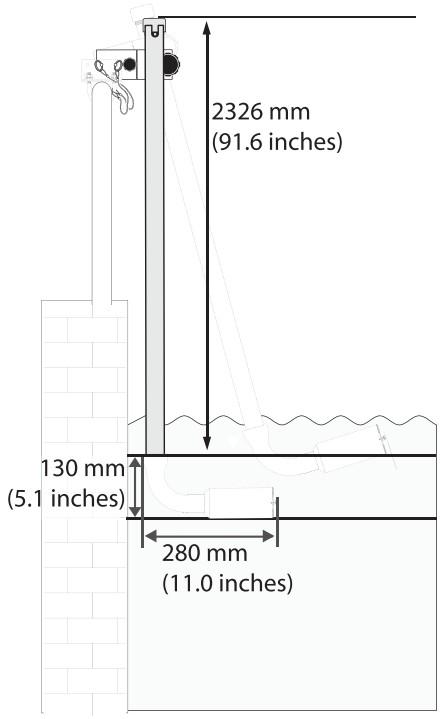


Dimensions *continued*

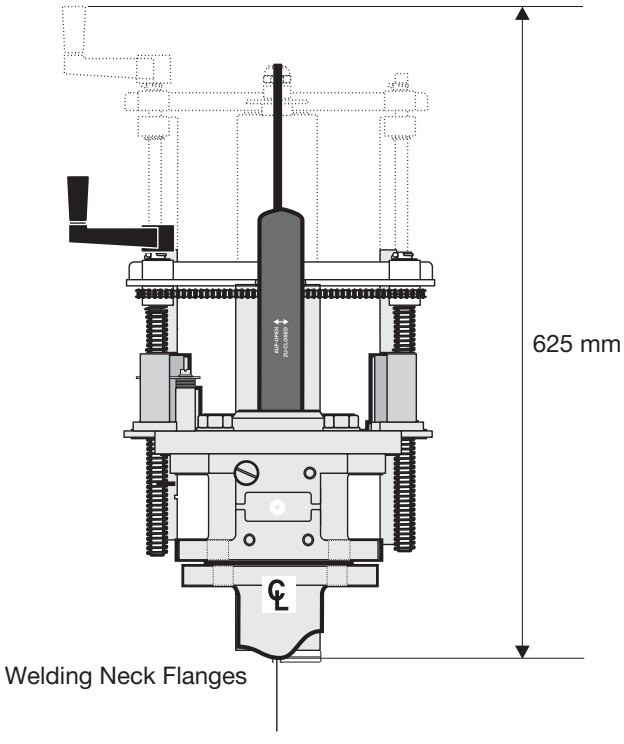
Installation for mounting SOLITAX sc models t-line, ts-line, and hs-line sensors for immersion in open tanks. (Fixed point Installation Kit, P/N 5734400)

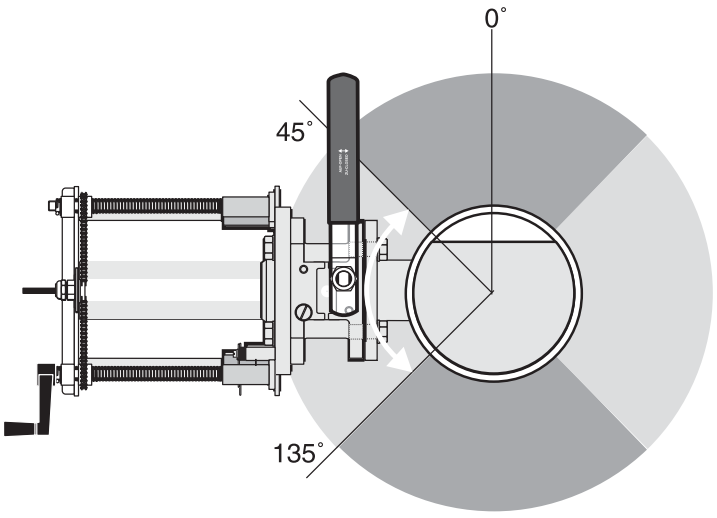


Handrail Mounting Kit includes 1.5-inch diameter by 7.5-ft long CPVC pipe and swivel/pivot/ pipe clamp assembly (P/N MH236B00Z)



Fixture with ball valve for mounting SOLITAX sc models inline and highline sensors in pipes





Ordering Information

Sensor Selection

		For insertion in pipes		For immersion in open tanks		
	Range	*inline*	*highline*	*t-line*	*ts-line*	*hs-line*
Wastewater						
Final effluent	0 to 0.1 g/L or 0 to 1000 NTU	●		●	●	
Influent suspended solids	0 to 1.5 g/L	●			●	●
Filtrate/centrate	0 to 2 g/L	●			●	●
Mixed liquor suspended solids	0 to 5 g/L	●			●	
Return activated sludge	0 to 25 g/L	●			●	
Waste activated sludge	0 to 2% or 0 to 20 g/L	●			●	
Primary sludge (settled sludge)	0.5 to 10% or 5 to 100 g/L		●			●
Anaerobic digested sludge	1.5 to 7% or 15 to 70 g/L		●			●
Gravity thickened sludge	2 to 10% or 20 to 100 g/L		●			●
Mechanically thickened sludge	3 to 8% or 30 to 80 g/L		●			●
Drinking Water						
Source water monitoring	0 to 500 NTU	●		●	●	
Influent pressurized raw water	0 to 500 NTU	●			●	●
Clarifier efficiency	0 to 20 NTU	●		●	●	
Filter backwash	0 to 20 NTU	●		●	●	
De-watering	0.5 to 10% or 5 to 100 g/L	●	●			●
Industrial Water						
Make-up water—Power, Pulp & Paper, Petrochemical, Food & Beverage		●		●	●	
Boiler and cooling water—Petrochemical, Pulp & Paper				●	●	
Lime addition—Petrochemical, Mining, Pulp & Paper			●			●
Wastewater (activated sludge process)—Power, Pulp & Paper, Petrochemical, Food & Beverage		●	●	●	●	●
White liquid applications—Pulp & Paper			●			●
Stormwater—Pulp & Paper, Petrochemical		●		●	●	

Ordering Information *continued*

SOLITAX sc Turbidity and Suspended Solids Analyzers

(common controller and sensor configurations)

Immersion in Open Tanks Applications

2983400 Turbidity Analyzer includes sc200 controller and PVC t-line sc sensor (0.001 to 4000 NTU) with wiper

2983500 Turbidity and Suspended Solids Analyzer includes sc200 controller and stainless steel ts-line sc sensor (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L) with wiper

2983600 Turbidity and High Range Suspended Solids Analyzer includes sc200 controller and stainless steel hs-line sc sensor (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L) with wiper

Insertion in Pipes Applications

2983700 Turbidity and Suspended Solids Analyzer includes sc200 controller, stainless steel inline sc sensor (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L) with wiper, and insertion mounting kit

2983900 Turbidity and High Range Suspended Solids Analyzer includes sc200 controller, stainless steel highline sc sensor (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L) with wiper, and insertion mounting kit

Both 2983700 and 2983900 include the insertion mounting kit which includes a 4 inch pre-coped Carbon Steel Flange. Non-coped flanges are available. See below.

NOTE

1. Power cords must be ordered separately.
2. Fixed point installation kit or handrail mount kit must be ordered separately for all immersion analyzers.

Individual SOLITAX sc Sensors

Immersion Sensors

LXV423.99.10000 Turbidity, t-line sc, PVC with wiper (0.001 to 4000 NTU)

LXV423.99.12000 Turbidity, t-line sc, PVC without wiper (0.001 to 4000 NTU)

LXV423.99.10100 Turbidity and Suspended Solids, ts-line sc, PVC with wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV423.99.12100 Turbidity and Suspended Solids, ts-line sc, PVC without wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV423.99.00100 Turbidity and Suspended Solids, ts-line sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV423.99.02100 Turbidity and Suspended Solids, ts-line sc, stainless steel without wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV423.99.10200 Turbidity and Suspended Solids, hs-line sc, PVC with wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

LXV423.99.12200 Turbidity and Suspended Solids, hs-line sc, PVC without wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

LXV423.99.00200 Turbidity and Suspended Solids, hs-line sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

LXV423.99.02200 Turbidity and Suspended Solids, hs-line sc, stainless steel without wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

Insertion Sensors

LXV424.99.00100 Turbidity and Suspended Solids, inline sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV424.99.02100 Turbidity and Suspended Solids, inline sc, stainless steel without wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV424.99.00200 Turbidity and Suspended Solids, highline sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

LXV424.99.02200 Turbidity and Suspended Solids, highline sc, stainless steel without wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

Accessories

5733000 Calibration Kit, includes calibration cylinder, two 500-mL 800 NTU StablCal®, and a sensor bracket

2660549 800 NTU StablCal®, 500-mL (two required per calibration)

LZX050 Wiper Blades, replacement only, pkg. of 5

9220600 Sun Shield for sc200 controller

Cable Accessories

5796000 7.6 m (25 ft.) Extension Cable

5796100 15.2 m (50 ft.) Extension Cable

5796200 30.5 m (100 ft.) Extension Cable

Maximum total length 100 m (328 ft.)

Installation Accessories

5734400 Fixed Point Installation Kit for t-line, ts-line, and hs-line immersion sensors, includes stand and sun shield for controller and pipe for sensor cable

5738400 Insertion Mounting Kit for inline and highline insertion sensors (ball valve and extraction system). Kit includes a 4 inch pre-coped Carbon Steel Flange. Non-coped flanges are available. See below.

AHA033NPT Sensor Adapter, straight 1-1/2 FNPT

AHA034NPT Sensor Adapter, elbow 1-1/2 FNPT, 90°

MH236B00Z Handrail Mounting Kit (for sensor to be used with either adapter above) includes 1.5-inch diameter by 7.5-ft long CPVC pipe and swivel/pivot/ pipe clamp assembly

LZX337 Stainless steel ball valve/extraction fitting for in-line and hi-line probes w/o welding flange

LZX660 Non-coped stainless steel welding flange for insertion kit

LZX661 Non-coped carbon steel welding flange for insertion kit

To complete your turbidity and suspended solids measurement system, choose from these Hach controllers...

Model sc200 Controller

(see Lit. #2665)

The sc200 Universal Controller is the most versatile controller on the market. The new sc200 controller is the only controller that allows the use of digital and analog sensors, either alone or in combination, to provide compatibility with the broadest range of sensors. It replaces the Hach sc100 digital and GLI53 analog controllers with advanced features for easier operator use.

Model sc1000 Controller

(see Lit. #2403)

Get the same great features as the sc200 Controller above—"plug and play", all digital operation and communication—but with the Hach sc1000 Controller, up to eight Hach sensors can be used with one controller in any combination. The sc1000 Controller is also expandable and upgradeable to easily adapt to your needs.

At Hach, it's about learning from our customers and providing the right answers. It's more than ensuring the quality of water—it's about ensuring the quality of life. When it comes to the things that touch our lives...

Keep it pure.

Make it simple.

Be right.

For current price information, technical support, and ordering assistance, contact the Hach office or distributor serving your area.

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HACH®
Be Right™

sc200™ UNIVERSAL CONTROLLER

Applications
- Drinking Water
- Wastewater
- Industrial Water
- Power

One Controller for the Broadest Range of Sensors.

Choose from 30 digital and analog sensor families for up to 17 different parameters.

Maximum Versatility

The sc200 controller allows the use of digital and analog sensors, either alone or in combination, to provide compatibility with Hach's broad range of sensors, eliminating the need for dedicated, parameter-specific controllers.

Ease of Use and Confidence in Results

Large, high-resolution, transreflective display provides optimal viewing resolution in any lighting condition. Guided calibration procedures in 19 languages minimize complexity and reduce operator error. Password-protected SD card reader offers a simple solution for data download and transfer. Visual warning system provides critical alerts.

Wide Variety of Communication Options

Utilize two to five analog outputs to transmit primary and secondary values for each sensor, or integrate Hach sensors and analyzers into MODBUS RS232/RS485, Profibus® DP, and HART networks.

Password protected SD card reader offers a simple solution for data download and transfer, and sc200 and digital sensor configuration file duplication and backup.

HACH®
Be Right™

Controller Comparison

Features	Previous Models sc100™ Controller	Previous Models GLI53 Controller	sc200™ Controller	Benefits
Display	64 x 128 pixels 33 x 66 mm (1.3 x 2.6 in.)	64 x 128 pixels 33 x 66 mm (1.3 x 2.6 in.)	160 x 240 pixels 48 x 68 mm (1.89 x 2.67 in.) Transreflective	• Improved user interface—50% bigger • Easier to read in daylight and sunlight
Data Management	irDA Port/PDA Service Cable	N/A	SD Card Service Cable	• Simplifies data transfer • Standardized accessories/max compatibility
Sensor Inputs	2 Max Direct Digital Analog via External Gateway	2 Max Analog Depending on Parameter	2 Max Digital and/or Analog with Sensor Card	• Simplifies analog sensor connections • Works with analog and digital sensors
Analog Inputs	N/A	N/A	1 Analog Input Signal Analog 4-20mA Card	• Enables non-sc analyzer monitoring • Accepts mA signals from other analyzers for local display • Consolidates analog mA signals to a digital output
4-20 mA Outputs	2 Standard	2 Standard	2 Standard Optional 3 Additional	• Total of five (5) 4-20 mA outputs allows multiple mA outputs per sensor input
Digital Communication	MODBUS RS232/RS485 Profibus DP V1.0	HART	MODBUS RS232/RS485 Profibus DP V1.0 HART 7.2	• Unprecedented combination of sensor breadth and digital communication options

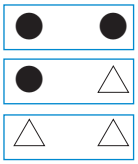
Choose from Hach's Broad Range of Digital and Analog Sensors

Parameter	Sensor	Digital or Analog
Ammonia	AMTAX™ sc, NH4D sc, AISE sc, AN-ISE sc	●
Chlorine	CLF10 sc, CLT10 sc, 9184 sc	●
Chlorine Dioxide	9185 sc	●
Conductivity	GLI 3400 Contacting, GLI 3700 Inductive	△
Dissolved Oxygen	LDO® Model 2, 5740 sc	●
Dissolved Oxygen	5500	△
Flow	U53, F53 Sensors	△
Nitrate	NITRATAX™ sc, NO3D sc, NISE sc, AN-ISE sc	●
Oil in Water	FP360 sc	●
Organics	UVAS sc	●
Ozone	9187 sc	●
pH/ORP	pHD	●
pH/ORP	pHD, pH Combination, LCP	△
Phosphate	PHOSPHAX™ sc	●
Sludge Level	SONATAX™ sc	●
Suspended Solids	SOLITAX™ sc, TSS sc	●
Turbidity	1720E, FT660 sc, SS7 sc, ULTRATURB sc, SOLITAX sc, TSS sc	●
Ultra Pure Conductivity	8310, 8311, 8312, 8315, 8316, 8317 Contacting	△
Ultra Pure pH/ORP	8362	△

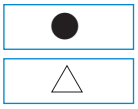
● = Digital △ = Analog

Connect up to two of any of the sensors listed above, in any combination, to meet your application needs. The diagrams below demonstrate the potential configurations. Operation of analog sensors requires the controller to be equipped with the appropriate sensor module. Contact Hach Technical Support for help with selecting the appropriate module.

2 Channel Configurations



1 Channel Configurations



Specifications*

Dimensions (H x W x D)	5.7 in x 5.7 in x 7.1 in (144 mm x 144 mm x 181 mm)
Display	Graphic dot matrix LCD with LED backlighting, transreflective
Display Size	1.9 x 2.7 in. (48 mm x 68 mm)
Display Resolution	240 x 160 pixels
Weight	3.75 lbs. (1.70 kg)
Power Requirements (Voltage)	100 - 240 V AC, 24 V DC
Power Requirements (Hz)	50/60 Hz
Operating Temperature Range	-20 to 60 °C , 0 to 95% RH non-condensing
Analog Outputs	Two (Five with optional expansion module) to isolated current outputs, max 550 Ω , Accuracy: ± 0.1% of FS (20mA) at 25 °C, ± 0.5% of FS over -20 °C to 60 °C range Operational Mode: measurement or calculated value
Analog Output Functional Mode	Linear, Logarithmic, Bi-linear, PID
Security Levels	2 password-protected levels
Mounting Configurations	Wall, pole, and panel mounting
Enclosure Rating	NEMA 4X/IP66
Conduit Openings	1/2 in NPT Conduit
Relay: Operational Mode	Primary or secondary measurement, calculated value (dual channel only) or timer
Relay Functions	Scheduler (Timer), Alarm, Feeder Control, Event Control, Pulse Width Modulation, Frequency Control, and Warning
Relays	Four electromechanical SPDT (Form C) contacts, 1200 W, 5 A
Communication	MODBUS RS232/RS485, PROFIBUS DPV1, or HART 7.2 optional
Memory Backup	Flash memory
Electrical Certifications	EMC CE compliant for conducted and radiated emissions: - CISPR 11 (Class A limits) - EMC Immunity EN 61326-1 (Industrial limits) Safety cETLus safety mark for: - General Locations per ANSI/UL 61010-1 & CAN/CSA C22.2. No. 61010-1 - Hazardous Location Class I, Division 2, Groups A,B,C & D (Zone 2, Group IIC) per FM 3600 / FM 3611 & CSA C22.2 No. 213 M1987 with approved options and appropriately rated Class I, Division 2 or Zone 2 sensors cULus safety mark - General Locations per UL 61010-1 & CAN/CSA C22.2. No. 61010-1

**Subject to change without notice.*