HUNGERFORD & TERRY, INC.

Manufacturers of Water Treating Equipment
226 Atlantic Avenue
Clayton, NJ 08312-0650
Phone (856) 881-3200 Fax (856) 881-6859

DOCUMENT TRANSMITTAL

URGENT ATTENTION REQUIRED!

File No.: SUB_M345-02

To: Steckbeck Engineering & Surveying, Inc.
279 N. Zinns Mill Road
Lebanon, PA 17042

Date: March 18, 2024
Page: 1 of 1
H&T Contract No.: M-345

Attention: Paul Lutzkanin, PE, CSE
Email: plutzkanin@steckbeck.net

Job: Fredericksburg Sewer & Water Auth.
Fredericksburg, PA

We are:

[✓] Submitting for approval
[ ] Resubmitting for approval
[ ] Sending for your information
[ ] Sending as requested
[ ] _____

The following [✓] enclosed [ ] under separate cover

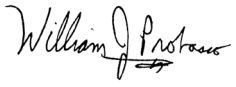
Format	Dwg. No.	Rev.	Title or Description
PDF	33552-A01	0	Piping & Instrument Diagram
	-C01	0	Valve & Equipment List
			Catalog Cutsheets

Remarks:

[✓] Please return to us, as soon as possible, one copy of each drawing with your approval and or comments noted.
[ ] Fabrication is proceeding in accordance with these drawings.
[✓] Fabrication is being held pending return of approved prints. Delay in returning drawings will extend the delivery schedule.
[ ] Fabrication of major equipment is proceeding in accordance with these drawings.
[ ] Minor Equipment is being held pending return of approved prints.

REPRESENTATIVE:

HUNGERFORD & TERRY, INC.



William J. Probasco
Chief Engineer

Contract\M-345\Eng.\SUB_M345-02

MECHANICAL DRAWINGS

FOR: Fredericksburg Sewer & Water Authority
Fredericksburg, PA

☒ REVIEWED ☐ REVISE AND RESUBMIT

☐ REJECTED ☐ FURNISH AS CORRECTED

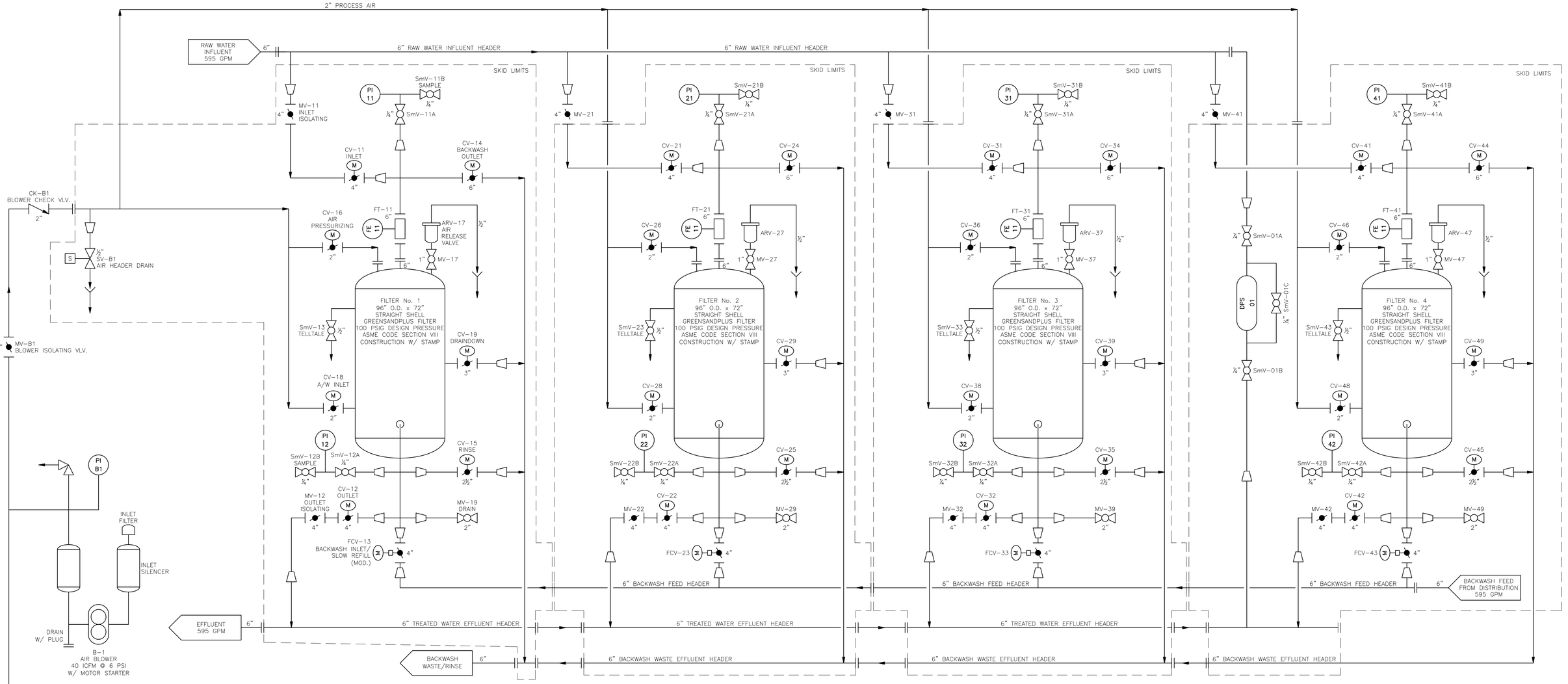
Corrections or comments on shop drawings during this review do not relieve the Contractor from compliance with the drawings and/or specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. The contractor is responsible for: confirming and correlating all dimensions and quantities; selecting fabrication processes and techniques of construction; coordinating his work with that or all other trades; and performing his work in a safe and satisfactory manner.

Date: March 21, 2023 **By:** Paul Lutzkanin, P.E.

STECKBECK ENGINEERING & SURVEYING, INC.

HUNGERFORD & TERRY, INC.
226 Atlantic Avenue
Clayton, New Jersey

Contract No.: **M-345**
Drawing Series No.: **33552**
Submitted: **March 18, 2024**



NO.	REVISIONS	DATE	CK'D

HUNGERFORD & TERRY, INC.

MANUFACTURERS OF WATER TREATING EQUIPMENT

CLAYTON, NEW JERSEY

FREDERICKSBURG SEWER & WATER AUTHORITY
FREDERICKSBURG, PA

96" O.D. GREENSANDPLUS FILTERS
PIPING AND INSTRUMENT DIAGRAM

DATE		
STARTED	12/11/23	GRV
FINISHED	3/12/24	GRV
CHECKED		
APPROVED		

SCALE NONE
FORM NO.
CONT NO. M-345

DRAWING NO.	REV.
33552-A01	0

Dwg. 33552-C01.1
Contract M-345

VALVE & EQUIPMENT LIST

DWG. No. 33552-C01

CONTRACT M-345

FREDERICKSBURG SEWER & WATER AUTHORITY
FREDERICKSBURG, PA

NOTES

Tagging: ALL EQUIPMENT TO HAVE DOUBLE SIDED CLEAR PLASTIC LAMINATED TAGS WITH LETTERS AND NUMBERS FOR ITEM DESCRIPTION & TAG.

REVISION HISTORY

No.	PAGE(S)	DATE	CHECKED
0		02/22/24	WJP & BMC

TAG No.	REV.	DESCRIPTION	REV.	MAKE & MODEL

AUTOMATIC BUTTERFLY VALVES-MODULATING

FCV-13		FILTER No. 1 BACKWASH INLET/SLOW REFILL VALVE	4 INCH BRAY SERIES 3W-0600-119 BUTTERFLY VALVES RATED FOR 175 PSI BI-DIRECTIONAL FLOW WITH WAFER STYLE CAST IRON BODY NYLON 11 COATED DUCTILE IRON DISC, 416 STN. STL. STEM, EPDM (FOOD GRADE) SEAT, SUPPLIED WITH BRAY SERIES 70-0031SVH MODULATING ACTUATOR WITH (4-20 mA) POSITION FEEDBACK TRANSMITTER, 120 VAC ELECTRIC WITH NEMA 4/4X ENCLOSURES, MANUAL HANDWHEEL OVERRIDE. EXTERNAL BI-DIRECTIONAL TRAVEL STOPS, VISUAL OPEN/CLOSE INDICATOR, REVERSIBLE MOTOR, (2) SPDT LIMIT SWITCHES, **SET OF AUXILIARY LIMIT SWITCHES,** THERMAL OVERLOAD PROTECTION, SERIES 70 INTEGRAL HEATER. **MODULATING SERVICE.** NORMAL MAXIMUM OPERATING CONDITION: 100 PSI WATER.
FCV-23		FILTER No. 2 BACKWASH INLET/SLOW REFILL VALVE	
FCV-33		FILTER No. 3 BACKWASH INLET/SLOW REFILL VALVE	
FCV-43		FILTER No. 4 BACKWASH INLET/SLOW REFILL VALVE	

TAG No.	REV.	DESCRIPTION	REV.	MAKE & MODEL
		AUTOMATIC BUTTERFLY VALVES		
CV-14 CV-24 CV-34 CV-44		FILTER No. 1 BACKWASH OUTLET VALVE FILTER No. 2 BACKWASH OUTLET VALVE FILTER No. 3 BACKWASH OUTLET VALVE FILTER No. 4 BACKWASH OUTLET VALVE		6 INCH BRAY SERIES 3W-0400-119 BUTTERFLY VALVES RATED FOR 175 PSI BI-DIRECTIONAL FLOW WITH WAFER STYLE CAST IRON BODY NYLON 11 COATED DUCTILE IRON DISC, 416 STN. STL. STEM, EPDM (FOOD GRADE) SEAT, SUPPLIED WITH BRAY SERIES 70-0201H 120 VAC ELECTRIC ACTUATOR WITH NEMA 4/4X ENCLOSURE, TWO POSITION, HEATER, MANUAL HANDWHEEL OVERRIDE, EXTERNAL BI-DIRECTIONAL, TRAVEL STOPS, VISUAL OPEN/CLOSE INDICATOR, REVERSIBLE MOTOR, (2) SPDT LIMIT SWITCHES, **SET OF AUXILIARY LIMIT SWITCHES**, THERMAL OVERLOAD PROTECTION, AND SUPPLIED WITH IRB BOARD. **TWO-POSITION (ON/OFF) SERVICE.** NORMAL MAXIMUM OPERATING CONDITION: 100 PSI WATER.
CV-11 CV-12 CV-21 CV-22 CV-31 CV-32 CV-41 CV-42		FILTER No. 1 INLET VALVE FILTER No. 1 OUTLET VALVE FILTER No. 2 INLET VALVE FILTER No. 2 OUTLET VALVE FILTER No. 3 INLET VALVE FILTER No. 3 OUTLET VALVE FILTER No. 4 INLET VALVE FILTER No. 4 OUTLET VALVE		4 INCH BRAY SERIES 3W-0400-119 BUTTERFLY VALVES RATED FOR 175 PSI BI-DIRECTIONAL FLOW WITH WAFER STYLE CAST IRON BODY NYLON 11 COATED DUCTILE IRON DISC, 416 STN. STL. STEM, EPDM (FOOD GRADE) SEAT, SUPPLIED WITH BRAY SERIES 70-0031H 120 VAC ELECTRIC ACTUATOR WITH NEMA 4/4X ENCLOSURE, TWO POSITION, HEATER, MANUAL HANDWHEEL OVERRIDE, EXTERNAL BI-DIRECTIONAL, TRAVEL STOPS, VISUAL OPEN/CLOSE INDICATOR, REVERSIBLE MOTOR, (2) SPDT LIMIT SWITCHES, **SET OF AUXILIARY LIMIT SWITCHES**, THERMAL OVERLOAD PROTECTION, AND SUPPLIED WITH IRB BOARD. **TWO-POSITION (ON/OFF) SERVICE.** NORMAL MAXIMUM OPERATING CONDITION: 100 PSI WATER.
CV-19 CV-29 CV-39 CV-49		FILTER No. 1 DRAINDOWN VALVE FILTER No. 2 DRAINDOWN VALVE FILTER No. 3 DRAINDOWN VALVE FILTER No. 4 DRAINDOWN VALVE		3 INCH BRAY SERIES 3W-0300-119 BUTTERFLY VALVES RATED FOR 175 PSI BI-DIRECTIONAL FLOW WITH WAFER STYLE CAST IRON BODY NYLON 11 COATED DUCTILE IRON DISC, 416 STN. STL. STEM, EPDM (FOOD GRADE) SEAT, SUPPLIED WITH BRAY SERIES 70-0031H 120 VAC ELECTRIC ACTUATOR WITH NEMA 4/4X ENCLOSURE, TWO POSITION, HEATER, MANUAL HANDWHEEL OVERRIDE, EXTERNAL BI-DIRECTIONAL, TRAVEL STOPS, VISUAL OPEN/CLOSE INDICATOR, REVERSIBLE MOTOR, (2) SPDT LIMIT SWITCHES, **SET OF AUXILIARY LIMIT SWITCHES**, THERMAL OVERLOAD PROTECTION, AND SUPPLIED WITH IRB BOARD. **TWO-POSITION (ON/OFF) SERVICE.** NORMAL MAXIMUM OPERATING CONDITION: 100 PSI WATER.

TAG No.	REV.	DESCRIPTION	REV.	MAKE & MODEL
		AUTOMATIC BUTTERFLY VALVES (CONT)		
CV-15 CV-25 CV-35 CV-45		FILTER No. 1 RINSE VALVE FILTER No. 2 RINSE VALVE FILTER No. 3 RINSE VALVE FILTER No. 4 RINSE VALVE		2-1/2 INCH BRAY SERIES 3W-0250-119 BUTTERFLY VALVES RATED FOR 175 PSI BI-DIRECTIONAL FLOW WITH WAFER STYLE CAST IRON BODY NYLON 11 COATED DUCTILE IRON DISC, 416 STN. STL. STEM, EPDM (FOOD GRADE) SEAT, SUPPLIED WITH BRAY SERIES 70-0031H 120 VAC ELECTRIC ACTUATOR WITH NEMA 4/4X ENCLOSURE, TWO POSITION, HEATER, MANUAL HANDWHEEL OVERRIDE, EXTERNAL BI-DIRECTIONAL, TRAVEL STOPS, VISUAL OPEN/CLOSE INDICATOR, REVERSIBLE MOTOR, (2) SPDT LIMIT SWITCHES, **SET OF AUXILIARY LIMIT SWITCHES**, THERMAL OVERLOAD PROTECTION, AND SUPPLIED WITH IRB BOARD. **TWO-POSITION (ON/OFF) SERVICE.** NORMAL MAXIMUM OPERATING CONDITION: 100 PSI WATER.
CV-16 CV-18 CV-26 CV-28 CV-36 CV-38 CV-46 CV-48		FILTER No. 1 AIR PRESSURIZING VALVE FILTER No. 1 AIR WASH INLET VALVE FILTER No. 2 AIR PRESSURIZING VALVE FILTER No. 2 AIR WASH INLET VALVE FILTER No. 3 AIR PRESSURIZING VALVE FILTER No. 3 AIR WASH INLET VALVE FILTER No. 4 AIR PRESSURIZING VALVE FILTER No. 4 AIR WASH INLET VALVE		2 INCH BRAY SERIES 3W-0200-119 BUTTERFLY VALVES RATED FOR 175 PSI BI-DIRECTIONAL FLOW WITH WAFER STYLE CAST IRON BODY NYLON 11 COATED DUCTILE IRON DISC, 416 STN. STL. STEM, EPDM (FOOD GRADE) SEAT, SUPPLIED WITH BRAY SERIES 70-0031H 120 VAC ELECTRIC ACTUATUOR WITH NEMA 4/4X ENCLOSURE, TWO POSITION, HEATER, MANUAL HANDWHEEL OVERRIDE, EXTERNAL BI-DIRECTIONAL, TRAVEL SWTICHES, **SET OF AUXILIARY LIMIT SWITCHES**, THERMAL OVERLOAD PROTECTION, AND SUPPLIED WITH IRB BOARD. **TWO-POSITION (ON/OFF) SERVICE.** NORMAL MAXIMUM OPERATING CONDITION: 100 PSI WATER.
		SOLENOID VALVE		
SV-B1		AIR BLOWER AB-1 DRAIN VALVE		1/2 INCH ASCO #JKF8210G034 GENERAL SERVICE SOLENOID VALVE WITH BRASS BODY, 120 V/60 Hz., NBR SEATING. NORMALLY OPEN - ENERGIZE TO CLOSE VALVE

TAG No.	REV.	DESCRIPTION	REV.	MAKE & MODEL
		MANUAL BUTTERFLY VALVES		
MV-11		FILTER No. 1 INLET ISOLATING VALVE		4 INCH BRAY SERIES 3W-0400-119 BUTTERFLY VALVES RATED FOR 175 PSI BI-DIRECTIONAL FLOW WITH WAFER STYLE CAST IRON BODY NYLON 11 COATED DUCTILE IRON DISC, 416 STN. STL. STEM, EPDM (FOOD GRADE) SEAT, SUPPLIED WITH BRAY SERIES 01 LEVER HANDLE AND 10-POSITION NOTCH PLATE. NORMAL MAXIMUM OPERATING CONDITION: 100 PSI WATER.
MV-12		FILTER No. 1 OUTLET ISOLATING VALVE		
MV-21		FILTER No. 2 INLET ISOLATING VALVE		
MV-22		FILTER No. 2 OUTLET ISOLATING VALVE		
MV-31		FILTER No. 3 INLET ISOLATING VALVE		
MV-32		FILTER No. 3 OUTLET ISOLATING VALVE		
MV-41		FILTER No. 4 INLET ISOLATING VALVE		
MV-42		FILTER No. 4 OUTLET ISOLATING VALVE		
MV-B1		AIR BLOWER ISOLATING VALVE		2 INCH BRAY SERIES 3W-0200-119 BUTTERFLY VALVES RATED FOR 175 PSI BI-DIRECTIONAL FLOW WITH WAFER STYLE CAST IRON BODY NYLON 11 COATED DUCTILE IRON DISC, 416 STN. STL. STEM, EPDM (FOOD GRADE) SEAT, SUPPLIED WITH BRAY SERIES 01 LEVER HANDLE AND 10-POSITION NOTCH PLATE. NORMAL MAXIMUM OPERATING CONDITION: 100 PSI WATER.

TAG No.	REV.	DESCRIPTION	REV.	MAKE & MODEL
		MANUAL VALVES		
MV-19		FILTER NO. 1 TANK DRAIN VALVE		2 INCH SIMTECH TBB SERIES TRU UNION BALL VALVE, PVC BODY,
MV-29		FILTER NO. 2 TANK DRAIN VALVE		PVC BALL AND STEM, EPDM SEALS,
MV-39		FILTER NO. 3 TANK DRAIN VALVE		UNION ENDS, WITH MANUAL LEVER OPERATOR.
MV-49		FILTER NO. 4 TANK DRAIN VALVE		
MV-17		FILTER No. 1 AIR VENT VALVE		1 INCH FLOW-TEK SERIES S80 STAINLESS STEEL BALL VALVE
MV-27		FILTER No. 2 AIR VENT VALVE		THREADED, WITH MANUAL LEVER OPERATOR.
MV-37		FILTER No. 3 AIR VENT VALVE		
MV-47		FILTER No. 4 AIR VENT VALVE		
SmV-13		FILTER No. 1 BACKWASH TELL-TALE VALVE		1/2 INCH FLOW-TEK SERIES S80 STAINLESS STEEL BALL VALVE
SmV-23		FILTER No. 2 BACKWASH TELL-TALE VALVE		THREADED, WITH MANUAL LEVER OPERATOR.
SmV-33		FILTER No. 3 BACKWASH TELL-TALE VALVE		
SmV-43		FILTER No. 4 BACKWASH TELL-TALE VALVE		
SmV-01A		DIFF PRESSURE HIGH ISOLATING VALVE		1/4 INCH FLOW-TEK SERIES S80 STAINLESS STEEL BALL VALVE
SmV-01B		DIFF PRESSURE LOW ISOLATING VALVE		THREADED, WITH MANUAL LEVER OPERATOR.
SmV-01C		DIFF PRESSURE BALANCING VALVE		
SmV-11A		PRESSURE GAUGE ISOLATING VALVE		
SmV-11B		PRESSURE GAUGE SAMPLING VALVE		
SmV-12A		PRESSURE GAUGE ISOLATING VALVE		
SmV-12B		PRESSURE GAUGE SAMPLING VALVE		
SmV-21A		PRESSURE GAUGE ISOLATING VALVE		
SmV-21B		PRESSURE GAUGE SAMPLING VALVE		
SmV-22A		PRESSURE GAUGE ISOLATING VALVE		
SmV-22B		PRESSURE GAUGE SAMPLING VALVE		
SmV-31A		PRESSURE GAUGE ISOLATING VALVE		
SmV-31B		PRESSURE GAUGE SAMPLING VALVE		
SmV-32A		PRESSURE GAUGE ISOLATING VALVE		
SmV-32B		PRESSURE GAUGE SAMPLING VALVE		
SmV-41A		PRESSURE GAUGE ISOLATING VALVE		
SmV-41B		PRESSURE GAUGE SAMPLING VALVE		
SmV-42A		PRESSURE GAUGE ISOLATING VALVE		
SmV-42B		PRESSURE GAUGE SAMPLING VALVE		

TAG No.	REV.	DESCRIPTION	REV.	MAKE & MODEL
		AIR RELEASE VALVE		
ARV-17		FILTER No. 1 AIR RELEASE VALVE		APCO MODEL 200A AIR RELEASE VALVE WITH THREADED,
ARV-27		FILTER No. 2 AIR RELEASE VALVE		CAST IRON BODY, STAINLESS STEEL FLOAT, BUNA-N
ARV-37		FILTER No. 3 AIR RELEASE VALVE		SEAT, 1 INCH NPT INLET, 1/2 INCH NPT OUTLET CONNECTIONS
ARV-47		FILTER No. 4 AIR RELEASE VALVE		AND 3/16 INCH ORIFICE (100 PSI.)
		CHECK VALVE		
CK-B1		AIR BLOWER CHECK VALVE		2 INCH BRAY/RITE MODEL 210 ANSI CHECK VALVE, CODE # V015-15-XBT WITH 150 LB. WAFER STYLE STAINLESS STEEL BODY, BUNA-N SEAT, AND TEFLON SPACER.(UNASSEMBLED)

TAG No.	REV.	DESCRIPTION	REV.	MAKE & MODEL
		PRESSURE EQUIPMENT		
PI-11		FILTER No. 1 INLET PRESSURE GAUGE		ASHCROFT MODEL 45-1279SS-02L-0/160 PSI DURAGAGE PRESSURE
PI-12		FILTER No. 1 OUTLET PRESSURE GAUGE		GAUGE WITH #316 STAINLESS STEEL BOURDON AND SOCKET
PI-21		FILTER No. 2 INLET PRESSURE GAUGE		4.5 IN. DIAL, 1/4 INCH NPT LOWER CONNECTION, AND
PI-22		FILTER No. 2 OUTLET PRESSURE GAUGE		0-160 PSIG PRESSURE RANGE.
PI-31		FILTER No. 3 INLET PRESSURE GAUGE		
PI-32		FILTER No. 3 OUTLET PRESSURE GAUGE		
PI-41		FILTER No. 4 INLET PRESSURE GAUGE		
PI-42		FILTER No. 4 OUTLET PRESSURE GAUGE		
		DIFFERENTIAL PRESSURE EQUIPMENT		
DPS-01		DIFFERENTIAL PRESSURE SWITCH		ASHCROFT MODEL D420B-XUD-30PSI SNAP ACTING DIFFERENTIAL PRESSURE SWITCH WITH BUNA-N ACTUATOR SEAL, STAINLESS STEEL PRESSURE CONNECTION, AND 1/4 INCH NPT CONNECTIONS. NEMA 4 ENCLOSURE. 0-30 PSI DIFFERENTIAL PRESSURE RANGE. **SWITCH TO BE SET FOR 10 PSID INCREASING PRESSURE.**
		FLOW EQUIPMENT		
FE/FT-11		FILTER No. 1 FLOW METER		4 INCH ROSEMOUNT MAGNETIC FLOWTUBE MODEL 8750WDMT1A4FTSA040CA1M4G1AX WITH PTFE LINING, 316 STN STL TWO MEASUREMENT ELECTRODES, ANSI 150# CARBON STEEL FLANGE, DIRECT MOUNT TRANSMITTER WITH 120 VAC POWER SUPPLY, 4-20 mA OUTPUT (HART PROTOCOL.) OPERATOR INTERFACE LOCAL DISPLAY, DIGITAL INPUT & OUTPUT. **(SET UP FOR BI-DIRECTIONAL FLOW).** **RANGE: 4 mA= 0 GPM AND 20 mA=600 GPM.** FURNISHED WITH: TWO (2) 4 INCH GROUNDING DISCS CL 150, 316L STN. STL. MATERIAL.
FE/FT-21		FILTER No. 2 FLOW METER		
FE/FT-31		FILTER No. 3 FLOW METER		
FE/FT-41		FILTER No. 4 FLOW METER		

TAG No.	REV.	DESCRIPTION	REV.	MAKE & MODEL
		AIR BLOWER EQUIPMENT		
B-1		AIR BLOWER		ROOTS MODEL 22 URAI AIR BLOWER RATED 40 SCFM @ 5 PSI
B-2		AIR BLOWER		COMPLETE WITH SERIES 300 FLEXIBLE CONNECTORS, V-BELT DRIVE WITH ENCLOSED OSHA STYLE GUARD, UNIVERSAL 2 INCH INLET FILTER WITH PAPER FILTER, 2 INCH INLET SILENCER WITH SUPPORTS, 2 INCH DISCHARGE SILENCER WITH SUPPORTS, WEIGHTED STYLE 1 INCH FNPT RELIEF VALVE SET FOR 6 PSIG, 1/4 INCH MPT DISCHARGE DRAIN, AND 2 HP, 1800 RPM 3/60/230-460 TEFC MOTOR.
				EQUIPMENT INCLUDED AS PART OF BLOWER PACKAGE:
PI-B1		AIR BLOWER B-1 PRESSURE GAUGE		OUTLET PRESSURE GAUGE: PRECISION INSTRUMENT MODEL 201L WITH 2-1/2 INCH DIAL. RANGE 0-15 PSI.
PI-B2		AIR BLOWER B-2 PRESSURE GAUGE		

TAG No.	REV.	DESCRIPTION	REV.	MAKE & MODEL
		SPARE PARTS		
		FILTER MANWAY GASKET (ONE PER MANWAY)		14" X 18" ELLIPTICAL MANWAY GASKET, 1/4 INCH THICK EPDM 70 DUROMETER (SHORE A) PER MANWAY. SEE NOTE ON DWG 33552-A02.

MECHANICAL
CATALOG CUTSHEETS

FOR: Fredericksburg Sewer & Water Authority
Fredericksburg, PA

☒ REVIEWED ☐ REVISE AND RESUBMIT

☐ REJECTED ☐ FURNISH AS CORRECTED

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Date: March 21, 2023 **By:** Paul Lutzkanin, P.E.

STECKBECK ENGINEERING & SURVEYING, INC.

HUNGERFORD & TERRY, INC.
226 Atlantic Avenue
Clayton, New Jersey

Contract No.: **M-345**
Drawing Series No.: **33552**
Submitted: **March 18, 2024**

SERIES 3W/3L

RESILIENT SEATED BUTTERFLY VALVES

TECHNICAL SALES MANUAL

Bray®

BRAY.COM

THE HIGH PERFORMANCE COMPANY

CONTENTS

OVERVIEW

The Bray Series 3W/3L features an optimized molded-in seat, a profiled disc sealing edge, and stem bearings. These features provide optimized performance and efficient automation solutions for a long cycle life without compromising bubble tight sealing.

SPECIFICATIONS

Size Range	NPS 2 to 24	
	DN 50 to 600	
Temperature Range	-20°F to 250°F	
	-29°C to 121°C	
Maximum Operating Pressure	High Pressure Disc	250 psi 17.2 bar
	Standard Disc	NPS 2-12 (DN 50-300) 175 psi (12 bar)
		NPS 14-24 (DN 350-600) 150 psi (10.3 bar)
	Low Pressure Disc	50 psi 3.4 bar
Body Style	3W - One-piece wafer	
	3L - One-piece lug	
Leakage Rate	Bubble tight	
Vacuum Rating	1 to 0.001 micron	

DESIGN STANDARDS

Valve Design	API 609 Category A
	EN 593
	MSS SP-67
Top Flange	ISO 5211
Flange Drilling	ASME B16.5 Class 125/150
	EN 1092-1 PN 6 | 10 | 16
	JIS 10K
	AS 2129 Table D & E
Seat Tightness Test	API 598
	EN 12266-1
	ISO 5208
	MSS SP-61
Face-to-Face	API 609
	EN 558 Series 20

MATERIAL OPTIONS[1]

Body	Cast Iron
	Ductile Iron
Disc	Nylon 11 Coated Ductile Iron
	316 Stainless Steel
	Aluminum Bronze
	Duplex Stainless Steel 4A
Stem	416 Stainless Steel
	Stainless Steel (EN 1.4057)
Seat	EPDM
	BUNA-N
	HT-EPDM

NOTES
[1]Materials available in ASME and EN grades

CERTIFICATIONS AND APPROVALS

Certifications	CE/PED
	ANSI/NSF 61 & 372
Approvals	EC 1935
	FDA Food Contact Approved
	ABS Type
	Bureau Veritas Type

DESIGN FEATURES

1. **MOLDED-IN SEAT:** Tightly controlled molding process produces accurate and repeatable dimensions, which leads to consistently lower torques over the valve's lifetime.
2. **PRECISION PROFILED DISC SEALING EDGE:** Extends the valve life by reducing seat wear.
3. **ROBUST FLANGE SEALING:** Tear-dropped shaped seat face enables tight sealing with a wide variety of industrial flanges.
4. **ISO 5211 TOP FLANGE:** Direct mounting capability between the valve and Bray actuation reduces package height and complexity.
5. **UPPER AND LOWER STEM BEARINGS:** Reduce operating torque and increase reliability in high cycle applications.
6. **END OF LINE CAPABILITY:** Lug style valve allows for sealing at full rated pressure even when the downstream flange is removed.

VALVE PART NUMBERING SYSTEM (ASME)

Select one code from each category to build a complete valve order number.

3X-XXXX-1XXXX-XXX

SERIES
3X

Code	Body Style
3W	Wafer
3L	Lug

SIZE
XXXX

Code	NPS	DN
0200	2	50
0250	2½	65
0300	3	80
0400	4	100
0500	5	125
0600	6	150
0800	8	200
1000	10	250
1200	12	300
1400	14	350
1600	16	400
1800	18	450
2000	20	500
2400	24	600

BASE NUMBER
1XXXX

Code	Description
11010	NPS 2-12 rated to 175 psi (12 bar) NPS 14-24 rated to 150 psi (10.3 bar)
11011	NPS 2-24 rated to 50 psi (3.4 bar)
13000	NPS 2-24 rated to 250 psi (17.2 bar)

TRIM[1]
XXX

Code	Item	Material
119	Body	Cast Iron, A126 Class B
	Disc	Nylon Coated Ductile Iron, A536 Gr. 65-45-12
	Stem	416 Stainless Steel, A582
	Seat	EPDM
169	Body	Cast Iron, A126 Class B
	Disc	316 Stainless Steel, A351 CF8M
	Stem	416 Stainless Steel, A582
	Seat	EPDM
390	Body	Ductile Iron, A536 Gr. 65-45-12
	Disc	Nylon Coated Ductile Iron, A536 Gr. 65-45-12
	Stem	416 Stainless Steel, A582
	Seat	EPDM
375	Body	Ductile Iron, A536 Gr. 65-45-12
	Disc	316 Stainless Steel, A351 CF8M
	Stem	416 Stainless Steel, A582
	Seat	EPDM

NOTES:

1 For a complete list of standard materials and descriptions, refer to MATERIALS OF CONSTRUCTION.Other materials are available, please contact Bray for additional information.

EXAMPLE

3L-1200-11010-390

> Lug body
> 12 inch (300 mm)
> 175 psi (12 bar) rated valve
> Trim 390

VALVE PART NUMBERING SYSTEM (EN)

Select one code from each category to build a complete valve order number.

3X-XXXX-1XXXX-XXX

SERIES
3X

Code	Body Style
3W	Wafer
3L	Lug

SIZE
XXXX

Code	DN
M050	50
M065	65
M080	80
M100	100
M125	125
M150	150
M200	200
M250	250
M300	300
M350	350
M400	400
M450	450
M500	500
M600	600

BASE NUMBER
1XXXX

Code	Description
1100U	DN50 - 300 rated to 12 bar DN350 - 600 rated to 10.3 bar Multi-drilled flanges
11034	DN50 - 300 rated to 12 bar DN350 - 600 rated to 10.3 bar ISO PN10 flanges
13035	DN50 - 600 rated to 17.2 bar, ISO PN16 flanges

TRIM[1]
XXX

Code	Item	Material
D61	Body	Ductile Iron, EN 5.3106 (GGG 40) & A536 Gr. 65-45-12
	Disc	Stainless Steel, Type 316 EN 1.4408 / A351 CF8M
	Stem	Stainless Steel, EN 1.4057
	Seat	EPDM
D62	Body	Ductile Iron, EN 5.3106 (GGG 40) & A536 Gr. 65-45-12
	Disc	Nylon Coated Ductile Iron
	Stem	Stainless Steel, EN 1.4057
	Seat	EPDM
D63	Body	Ductile Iron, EN 5.3106 (GGG 40) & A536 Gr. 65-45-12
	Disc	Stainless Steel, Type 316 EN 1.4408 / A351 CF8M
	Stem	Stainless Steel, EN 1.4057
	Seat	BUNA-N
D64	Body	Ductile Iron, EN 5.3106 (GGG 40) & A536 Gr. 65-45-12
	Disc	Nylon Coated Ductile Iron
	Stem	Stainless Steel, EN 1.4057
	Seat	BUNA-N
1JN	Body	Cast Iron, EN GJL-250 – EN 5.1301 (GG 25)
	Disc	Stainless Steel, Type 316 EN 1.4408 / A351 CF8M
	Stem	Stainless Steel, EN 1.4057
	Seat	EPDM
1JM	Body	Cast Iron, EN GJL-250 – EN 5.1301 (GG 25)
	Disc	Nylon Coated Ductile Iron
	Stem	Stainless Steel, EN 1.4057
	Seat	EPDM
1JR	Body	Cast Iron, EN GJL-250 – EN 5.1301 (GG 25)
	Disc	Stainless Steel, Type 316 EN 1.4408 / A351 CF8M
	Stem	Stainless Steel, EN 1.4057
	Seat	BUNA-N
1JQ	Body	Cast Iron, EN GJL-250 – EN 5.1301 (GG 25)
	Disc	Nylon Coated Ductile Iron
	Stem	Stainless Steel, EN 1.4057
	Seat	BUNA-N

NOTES:

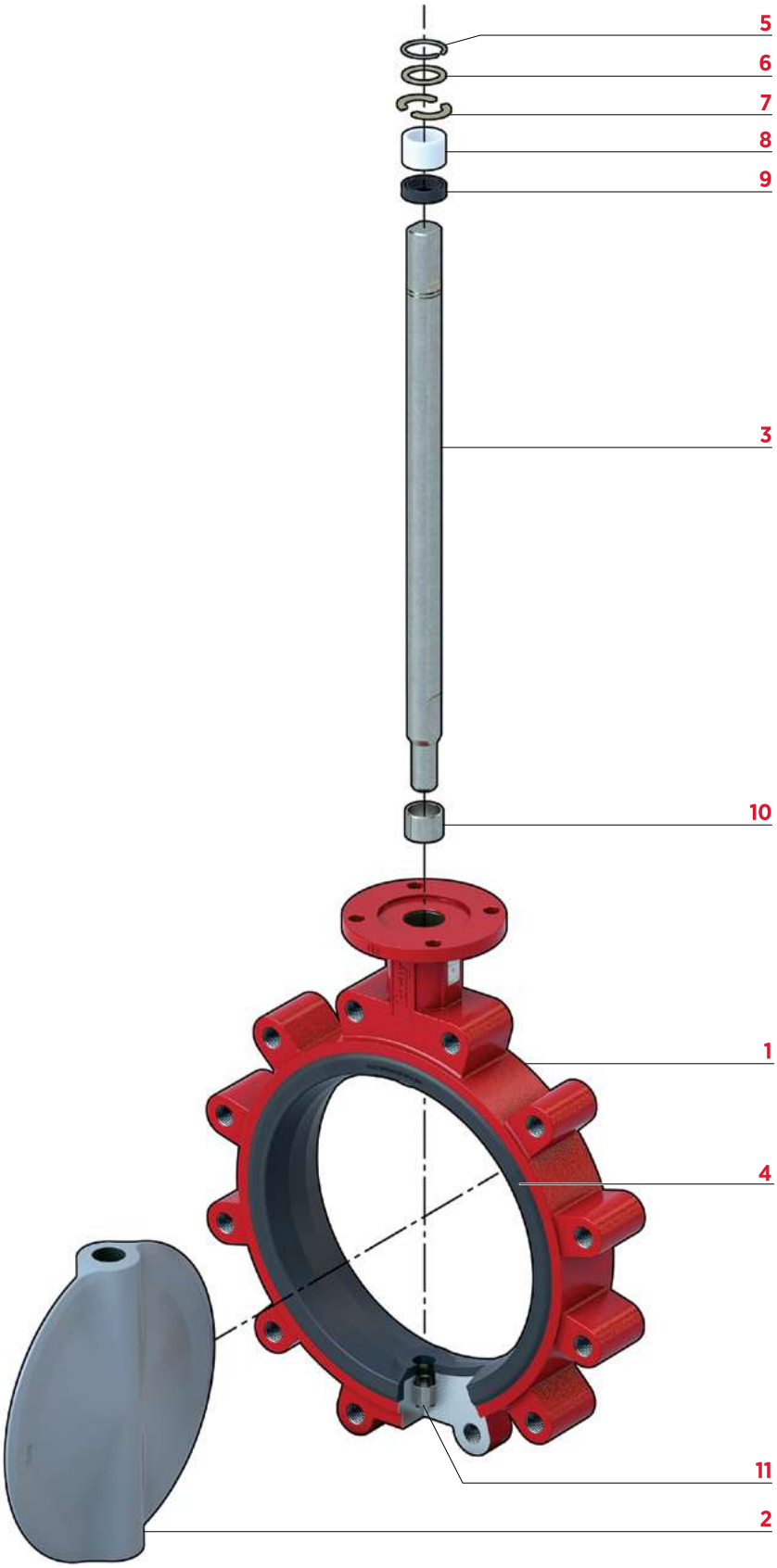
1 For a complete list of standard materials and descriptions, refer to MATERIALS OF CONSTRUCTION.Other materials are available, please contact Bray for additional information.

EXAMPLE

3L-M050-11034-D61

- Lug body
- DN 50
- PN10 flange drilling
- Trim D61

PARTS CALLOUT

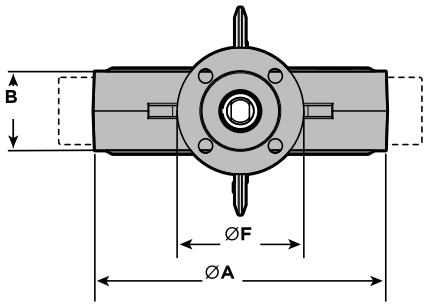


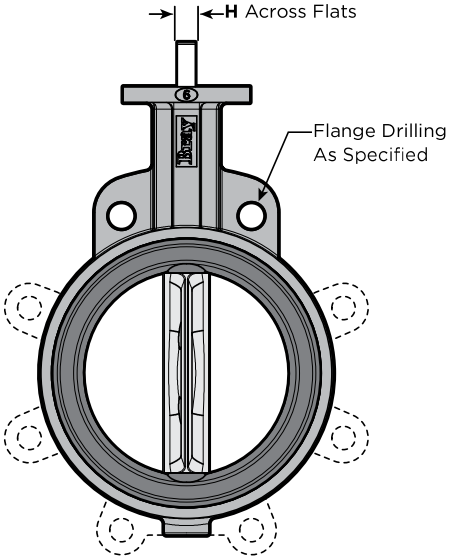
PARTS LIST AND MATERIAL SPECIFICATIONS

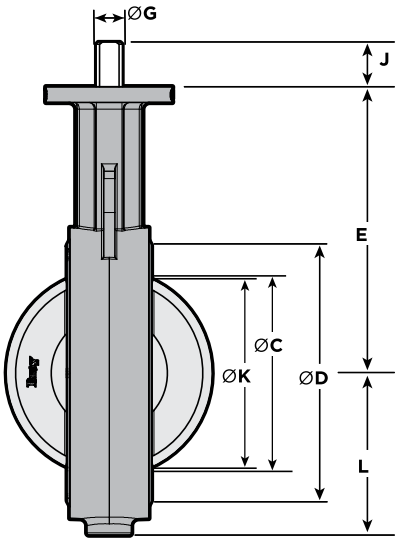
ITEM	DESCRIPTION	MATERIAL	
		ASME	EN Grade
1	Body	Cast Iron, A126 Class B Ductile Iron, A536 GR. 65-45-12	Cast Iron – EN 5.1301 Ductile Iron – EN 5.3106
2	Disc	Nylon Coated Ductile Iron, A536 Gr. 65-45-12 316 Stainless Steel, A351 CF8M	Stainless Steel – EN 1.4408
3	Stem	416 Stainless Steel, A582	Stainless Steel – EN 1.4057
4	Seat	EPDM BUNA-N HT-EPDM	–
5	Retaining Ring	Stainless Steel	–
6	Thrust Washer	Brass, Stainless Steel	–
7	Split Ring	Brass	–
8	Stem Bushing	Acetal	–
9	Stem Seal	BUNA-N	–
10	Upper Stem Bearing[3]	Steel/Bronze + PTFE Self-lubricating	–
11	Lower Stem Bearing[3]	Steel/Bronze + PTFE Self-lubricating	–
12	Key (14" and up)	Stainless Steel	–

NOTES
1 Material specifications provided for reference only, and are subject to change without notice.
2 Additional materials available upon request.
3 Stainless Steel/TFE available.

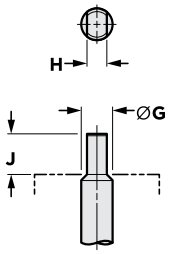
SERIES 3W/3L



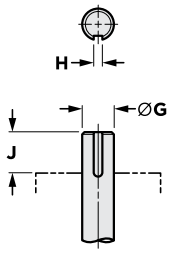




STEM DETAILS



Stem With Flats
≤ NPS 12

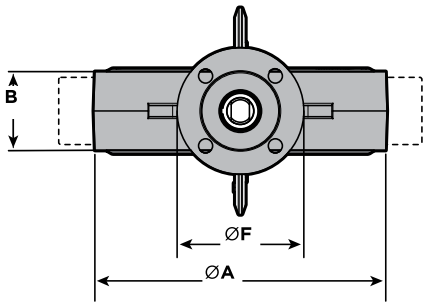


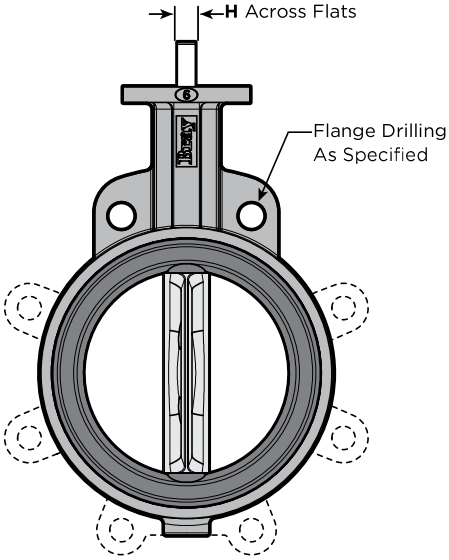
Stem With Keyway
≥ NPS 14

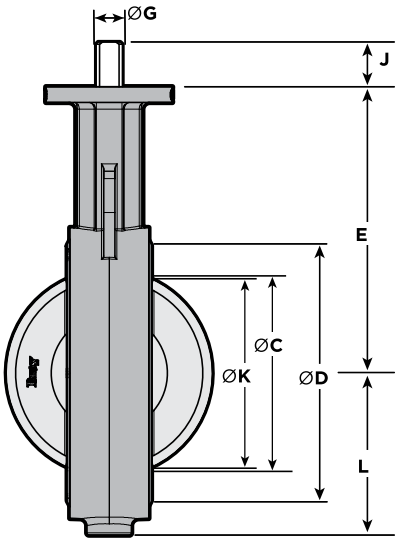
DIMENSIONS (inch)

NPS	A	B	C	D	E	F	Top Plate Drilling			G	H	J	K*	L		Adp. Code	Weight (lb)	
							Bolt Circle	Hole Qty	Hole Dia.					Wafer	Lug		Wafer	Lug
2	3.69	1.69	2.00	2.81	5.50	3.54	2.76	4	0.39	0.55	0.39	1.25	1.25	2.22	2.30	A	6	7
2.5	4.19	1.81	2.50	3.32	6.00	3.54	2.76	4	0.39	0.55	0.39	1.25	1.87	2.47	2.57	A	7	8
3	4.88	1.81	3.00	3.95	6.25	3.54	2.76	4	0.39	0.55	0.39	1.25	2.52	2.81	2.81	A	8	9
4	6.06	2.05	4.06	5.09	7.00	3.54	2.76	4	0.39	0.63	0.43	1.25	3.57	3.41	4.09	B	12	16
5	7.13	2.21	5.04	6.16	7.50	3.54	2.76	4	0.39	0.75	0.51	1.25	4.60	4.03	4.61	C	15	21
6	8.13	2.21	5.75	7.10	8.00	3.54	2.76	4	0.39	0.75	0.51	1.25	5.38	4.53	5.06	C	19	25
8	10.50	2.36	7.75	9.34	9.50	5.91	4.92	4	0.57	0.87	0.63	1.25	7.48	5.75	6.05	D	34	40
10	12.75	2.68	9.79	11.44	10.75	5.91	4.92	4	0.57	1.18	0.87	2.00	9.53	7.12	7.69	E	51	62
12	14.88	3.07	11.75	13.45	12.25	5.91	4.92	4	0.57	1.18	0.87	2.00	11.47	8.12	9.02	E	68	91
14	17.05	3.07	13.25	15.28	13.62	5.91	4.92	4	0.57	1.38	.39x.39	2.00	13.04	9.38	9.93	F	105	122
16	19.21	4.00	15.25	17.41	14.75	5.91	4.92	4	0.57	1.38	.39x.39	2.00	14.85	10.75	11.30	F	150	166
18	21.12	4.49	17.25	19.47	16.00	8.27	6.50	4	0.81	1.97	.47x.39	2.50	16.81	12.00	12.16	G	212	233
20	23.25	5.00	19.25	21.59	17.25	8.27	6.50	4	0.81	1.97	.47x.39	2.50	18.75	14.00	14.00	G	285	340
24	27.94	6.06	23.27	25.60	19.50	8.27	6.50	4	0.81	2.50	.62x.62	4.00	22.65	17.56	17.56	H	410	490

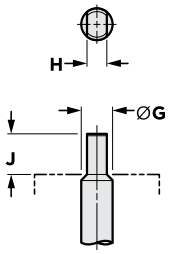
SERIES 3W/3L



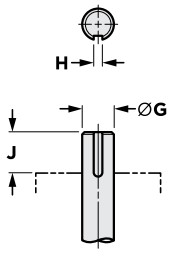




STEM DETAILS



Stem With Flats
≤ DN 300



Stem With Keyway
≥ DN 350

DIMENSIONS (mm)

DN	A	B	C	D	E	F	Top Plate Drilling			G	H	J	K*	L		Adp. Code	Weight (Kg)	
							Bolt Circle	Hole Qty	Hole Dia.					Wafer	Lug		Wafer	Lug
50	94	43	51	71	140	90	70	4	10	14	10	32	32	56	58	A	2.5	3
65	106	46	64	84	152	90	70	4	10	14	10	32	48	63	65	A	3.0	4
80	124	46	76	100	159	90	70	4	10	14	10	32	64	71	71	A	3.5	4
100	154	52	103	129	178	90	70	4	10	16	11	32	91	87	104	B	5.4	6
125	179	56	128	157	191	90	70	4	10	19	13	32	117	102	117	C	6.6	9
150	206	56	146	180	203	90	70	4	10	19	13	32	137	115	129	C	8.7	11
200	267	60	197	237	241	150	125	4	15	22	16	32	190	146	154	D	15.3	18
250	324	68	249	291	273	150	125	4	15	30	22	51	242	181	195	E	23	26
300	378	78	299	342	311	150	125	4	15	30	22	51	291	206	229	E	31	41
350	433	78	337	388	346	150	125	4	14	35	10x10	51	331	238	252	F	48	55
400	488	102	387	442	375	150	125	4	14	35	10x10	51	377	273	287	F	68	75
450	536	114	438	495	406	210	165	4	21	50	12x10	64	427	305	309	G	96	106
500	591	127	489	548	438	210	165	4	21	50	12x10	64	476	356	356	G	129	154
600	710	154	591	650	495	210	165	4	21	64	16x16	102	575	446	446	H	186	222

Bray offers a low pressure disc for NPS 2-24 (DN 50-600) Series 3W/3L valves. The purpose of reducing the disc diameter is to decrease the seating/unseating torque and extend the seat life in low pressure applications.

By reducing the disc diameter, the interference between the disc outside diameter and seat inside diameter is decreased and the valve pressure rating, which is a function of this interference, is reduced to 50 psi (3.4 bar). Less interference between the disc and seat results in reduced seating/unseating torque. Lower seating/unseating torque may allow for the use of a smaller actuator on the valve. In other applications where abrasive dry bulk materials such as cement, sugar, plastic, pellets, flour, etc., are generally pneumatically conveyed at 50 psi (3.4 bar) or less, the reduced disc diameter not only reduces the seating/unseating torque but, increases the service life of the seat as well.

Bray does the following to differentiate low pressure discs from full diameter discs:

- Metal discs: An “R” is stamped above the part number to indicate a reduced diameter, low pressure disc.
- Nylon 11 coated discs: Discs are differentiated by the color of the Nylon 11:
  - Gray: Standard pressure
  - White: Low pressure

Gray Nylon 11 (standard pressure) | White Nylon 11 (low pressure) | Metal Disc “R” stamp (low pressure)

Bray has developed seating/unseating torque charts for three classes of service for its valves with standard discs (rated for full pressure), for valves with low pressure discs (rated for 50 psi / 3.4 bar) and for valves with high pressure discs (rated for 250 psi / 17.2 bar).

The guidelines for selecting a class to be used for determining a valve's seating/unseating torque are given below. Each valve application should comply with all five class characteristics in order to be qualified for that class.

Characteristics of Application	Class A Non-Corrosive, Lubricating Service	Class B General Service	Class C Severe Service
Media Type	Lubricating hydrocarbons; aqueous processes and water **(See Note 1)**	Water; aqueous processes; all other aqueous liquids including salt water; lubricating gases	Dry, non-lubricating such as air, dry gas, cement, pneumatic conveying mediums
Corrosion by Media	Insignificant if any	No major corrosion or deposits from media	Can incur significant corrosion such as ductile iron disc in water
Chemical Reactions of Media with Seat	Insignificant if any	Only minor or insignificant in nature	Reactions causing swelling and hardness occur
Media Temperature	40°F to 160°F (4°C to 71°C)	Within seat temperature limits, not near limits	Near or at seat temperature limits
Frequency of Valve Cycling	Once weekly or more frequently	Minimum once every 3-6 weeks, or more frequently	Infrequently, sometimes not cycled for long periods

NOTES:

1. For aqueous processes and water, Class A torques may be used only if a Nylon 11 coated disc is selected and all other Class A characteristics apply. Otherwise, Class B torques should be used.

2. If a valve is used strictly in a throttling application, that is, it is never put in the closed position but throttled between 20° and 80°, then Class A torques may be used provided you have checked to see that dynamic torques do not exceed the Class A torque values.

3. With the exception of dry, non-lubricating medias, one is usually safe electing to use Class B torques for sizing actuators for all other valve service applications. Seating/Unseating Torque values shown include friction bearing torques for stated differential pressure.

4. Dynamic torque values are not considered. See the Dynamic Torque chart in this manual for determination of dynamic torque.

5. Do not apply a safety factor to torque values when determining actuator output torque requirement.

6. For 3-way assemblies where one valve is opening and another is closing, multiply torque by a 1.25 factor.

TORQUE VALUES (lb-In)

		Valve Differential Pressure (psi)									
		Low Pressure Disc	Standard Disc				High Pressure Disc				
	NPS	50	50	100	150	175	50	100	150	200	250
Class B General Service	2	93	106	115	124	133	124	133	142	150	159
	2.5	124	124	133	150	159	142	159	186	212	239
	3	159	168	186	204	212	186	221	257	292	327
	4	177	204	239	274	310	239	292	354	434	513
	5	255	283	319	363	407	354	460	566	664	761
	6	381	434	487	531	566	531	664	797	929	1062
	8	620	708	867	1027	1133	1044	1266	1478	1690	1903
	10	1018	1283	1505	1726	1859	1708	2089	2469	2867	3283
	12	1549	1699	2053	2407	2611	2283	2912	3540	4160	4779
	14	2390	3142	3823	4514		3947	4735	5558	6381	7202
	16	3186	4337	5381	6505		5514	6602	7717	8815	9921
	18	3983	5726	7284	8695	N/A	7425	8797	10222	11664	13116
	20	5000	7177	9071	10886		9673	11549	13443	15372	17319
	24	7540	11408	15080	18656		16594	20355	24116	27966	31860
Class C Severe Service	2	116	133	144	155	166	155	166	177	188	199
	2.5	155	155	166	188	199	177	199	232	266	299
	3	199	210	232	254	266	232	277	321	365	409
	4	221	254	299	343	387	299	365	443	542	642
	5	319	354	398	454	509	443	575	708	830	951
	6	476	542	608	664	708	664	830	996	1162	1328
	8	774	885	1084	1283	1416	1305	1582	1847	2113	2378
	10	1272	1604	1881	2157	2323	2135	2611	3086	3584	4104
	12	1936	2124	2567	3009	3263	2854	3640	4425	5199	5974
	14	2987	3927	4779	5642		4934	5918	6947	7976	9003
	16	3983	5421	6726	8131		6892	8253	9647	11018	12401
	18	4978	7157	9104	10869	N/A	9281	10996	12777	14580	16395
	20	6250	8972	11339	13607		12091	14437	16804	19216	21649
	24	9425	14260	18851	23320		20742	25444	30145	34958	39825

TORQUE VALUES (N m)

		Valve Differential Pressure (bar)									
		Low Pressure Disc	Standard Disc				High Pressure Disc				
	DN	3.4	3.4	7	10.3	12	3.4	7	10.3	14	17.2
Class B General Service	50	11	12	13	14	15	14	15	16	17	18
	65	14	14	15	17	18	16	18	21	24	27
	80	18	19	21	23	24	21	25	29	33	37
	100	20	23	27	31	35	27	33	40	49	58
	125	29	32	36	41	46	40	52	64	75	86
	150	43	49	55	60	64	60	75	90	105	120
	200	70	80	98	116	128	118	143	167	191	215
	250	115	145	170	195	210	193	236	279	324	371
	300	175	192	232	272	295	258	329	400	470	540
	350	270	355	432	510		446	535	628	721	814
	400	360	490	608	735		623	746	872	996	1121
	450	450	647	823	983	N/A	839	994	1155	1318	1482
	500	565	811	1025	1230		1093	1305	1519	1737	1957
	600	852	1289	1704	2108		1875	2300	2725	3160	3600
Class C Severe Service	50	13	15	16	18	19	18	19	20	21	23
	65	18	18	19	21	23	20	23	26	30	34
	80	23	24	26	29	30	26	31	36	41	46
	100	25	29	34	39	44	34	41	50	61	73
	125	36	40	45	51	58	50	65	80	94	108
	150	54	61	69	75	80	75	94	113	131	150
	200	88	100	123	145	160	148	179	209	239	269
	250	144	181	213	244	263	241	295	349	405	464
	300	219	240	290	340	369	323	411	500	588	675
	350	338	444	540	638		558	669	785	901	1017
	400	450	613	760	919		779	933	1090	1245	1401
	450	563	809	1029	1228	N/A	1049	1243	1444	1648	1853
	500	706	1014	1281	1538		1366	1631	1899	2171	2446
	600	1065	1611	2130	2635		2344	2875	3406	3950	4500

MAXIMUM ALLOWABLE STEM TORQUE VALUES

Valve Size		416 Stainless Steel		Stainless Steel (EN 1.4057)	
NPS	DN	lb-in	N m	lb-in	N m
2	50	1005	114	1020	115
2 1/2	65	1005	114	1020	115
3	80	1005	114	1020	115
4	100	1639	185	1664	188
5	125	2484	281	2522	285
6	150	2484	281	2522	285
8	200	4229	478	4293	485
10	250	12525	1415	12716	1437
12	300	12525	1415	12716	1437
14	350	17960	2029	18234	2060
16	400	25708	2905	26101	2949
18	450	49062	5543	49811	5628
20	500	49062	5543	49811	5628
24	600	158365	17893	160782	18166

FIGURE 1 - PRESSURE DISTRIBUTION

In most applications for butterfly valves, especially NPS 20 (DN 500) or smaller, the maximum torque required to operate the valve will be seating/unseating torque. However, dynamic torque should be considered particularly in:

> Control applications using larger valves (NPS 24 [DN 600] and above) where the disc is maintained in the open position
> Applications using larger valves (NPS 24 [DN 600] and above) where the velocity is high (16 ft./sec [4.9m/sec]).

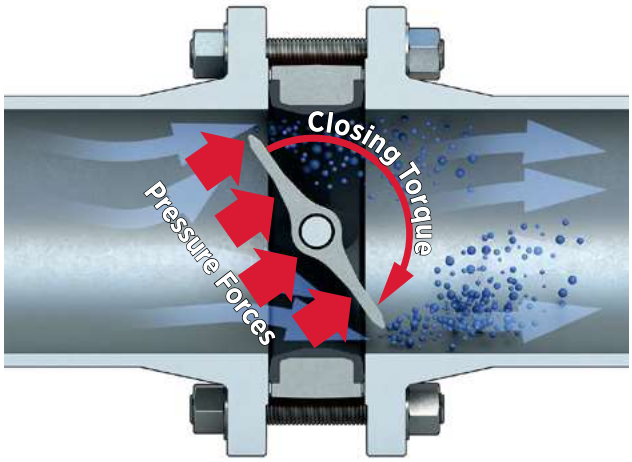
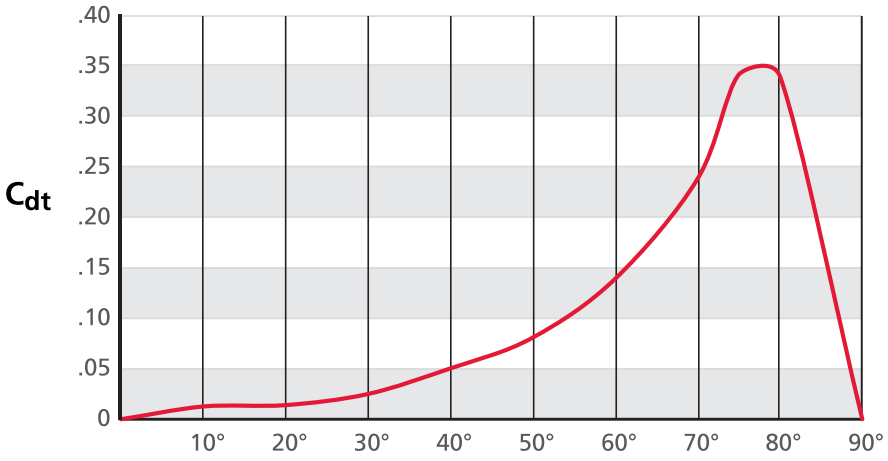


FIGURE 2 - ANGLE OF OPENING

The C_{dt} value for Bray symmetrical disc valves are approximately:

Angle of Opening	0°	10°	20°	30°	40°	50°	60°	70°	75°	80°	90°
C_{dt}	0	0.0126	0.0140	0.0251	0.0505	0.0809	0.1394	0.2384	0.3419	0.3400	0



To use the Dynamic Torque Chart, note the following:

1. Dynamic torque values include all bearing friction and stem-seal friction torques.
2. Dynamic torque values are per 1 psi ΔP (1 bar ΔP). To determine dynamic torque (lb-in) (N m) at a desired angle of opening, multiply the pressure drop ΔP at this angle by the appropriate dynamic torque factor in the charts below.
3. Bray recommends sizing control valves between 20° and 70°, with 60° the preferred angle.
4. Dynamic torque will tend to close all Bray valves whose disc are symmetrical to the stem.

DYNAMIC TORQUE FACTORS (lb-in/psi)

	Angle of Opening									
NPS	**10°**	**20°**	**30°**	**40°**	**50°**	**60°**	**70°**	**75°**	**80°**	**90°**
2	0.11	0.13	0.23	0.45	0.73	1.25	2.14	3.07	3.05	0.00
2.5	0.22	0.24	0.43	0.87	1.39	2.39	4.09	5.86	5.83	0.00
3	0.37	0.41	0.73	1.47	2.36	4.07	6.95	9.97	9.92	0.00
4	0.86	0.95	1.70	3.43	5.49	9.45	16.17	23.19	23.07	0.00
5	1.65	1.83	3.29	6.61	10.59	18.25	31.22	44.77	44.53	0.00
6	2.49	2.77	4.97	10.00	16.01	27.59	47.19	67.68	67.32	0.00
8	6.60	6.74	12.08	24.30	38.93	67.07	114.71	164.51	163.64	0.00
10	11.99	13.32	23.89	48.06	76.99	132.65	226.86	325.35	323.64	0.00
12	20.89	23.21	41.62	83.74	134.14	231.14	395.30	566.91	563.93	0.00
14	30.04	33.38	59.84	120.40	192.87	332.34	568.37	815.12	810.83	0.00
16	45.65	50.72	90.94	182.97	293.12	505.07	863.76	1238.76	1232.24	0.00
18	65.91	73.23	131.30	264.16	423.18	729.18	1247.04	1788.44	1779.02	0.00
20	91.42	101.57	182.11	366.39	586.95	1011.37	1729.64	2480.55	2467.50	0.00
24	158.36	175.95	315.46	634.69	1016.76	1751.99	2996.23	4297.03	4274.40	0.00

Example: NPS 4 Valve; 60° Open with a 10 psi pressure drop: [Td = (9.45)(10) = 94.50 lb-in]

DYNAMIC TORQUE FACTORS (N m/bar)

	Angle of Opening									
DN	**10°**	**20°**	**30°**	**40°**	**50°**	**60°**	**70°**	**75°**	**80°**	**90°**
50	0.19	0.21	0.37	0.74	1.19	2.05	3.51	5.03	5.00	0.00
65	0.35	0.39	0.70	1.42	2.27	3.91	6.69	9.60	9.55	0.00
80	0.60	0.67	1.20	2.41	3.87	6.66	11.39	16.34	16.25	0.00
100	1.40	1.56	2.79	5.61	8.99	15.49	26.49	38.00	37.80	0.00
125	2.70	3.00	5.39	10.84	17.36	29.91	51.16	73.36	72.98	0.00
150	4.09	4.54	8.14	16.38	26.24	45.22	77.33	110.91	110.32	0.00
200	10.82	11.04	19.79	39.82	63.79	109.91	187.97	269.58	268.16	0.00
250	19.65	21.83	39.14	78.75	126.16	217.38	371.76	533.16	530.35	0.00
300	34.24	38.04	68.20	137.22	219.82	378.77	647.77	929.00	924.11	0.00
350	49.23	54.70	98.06	197.29	316.06	544.61	931.38	1335.74	1328.71	0.00
400	74.81	83.12	149.03	299.83	480.33	827.66	1415.46	2029.97	2019.28	0.00
450	108.01	120.01	215.15	432.88	693.46	1194.92	2043.53	2930.72	2915.29	0.00
500	149.80	166.45	298.42	600.40	961.83	1657.34	2834.37	4064.89	4043.50	0.00
600	259.50	288.34	516.94	1040.07	1666.17	2871.00	4909.94	7041.56	7004.49	0.00

Example: DN 100 Valve; 60° Open with a 2 bar pressure drop: [Td = (15.49)(2) = 30.98 N m]

Cv stands for **Valve Sizing Coefficient**, sometimes called the **Flow Rate Coefficient**. **Cv** varies with the valve size, angle of opening and the manufacturer's valve style.

> Cv is defined as the volume of water in USGPM that will flow through a given restriction or valve opening with a pressure drop of one (1) psi at room temperature.

Cv VALUES

	Disc Position (Degrees)								
NPS	**10°**	**20°**	**30°**	**40°**	**50°**	**60°**	**70°**	**80°**	**90°**
2	1	4	15	29	46	66	73	86	87
2.5	1	8	26	44	66	98	141	177	185
3	2	22	43	71	112	171	256	338	360
4	8	37	78	118	192	310	505	689	740
5	9	53	98	170	288	470	759	1131	1218
6	13	86	175	297	479	757	1190	1715	1900
8	19	121	254	429	754	1247	2096	3376	3765
10	37	178	365	728	1215	2005	3342	5814	6661
12	69	240	492	1008	1696	2868	4961	8455	10066
14	110	287	609	1141	1975	3328	5571	9269	11598
16	147	421	844	1547	2651	4440	7412	12214	15395
18	190	470	968	1807	3238	5509	9382	18231	20120
20	230	675	1341	2455	4210	7056	11803	19637	25329
24	317	952	1957	3592	6128	10267	17226	29061	39396

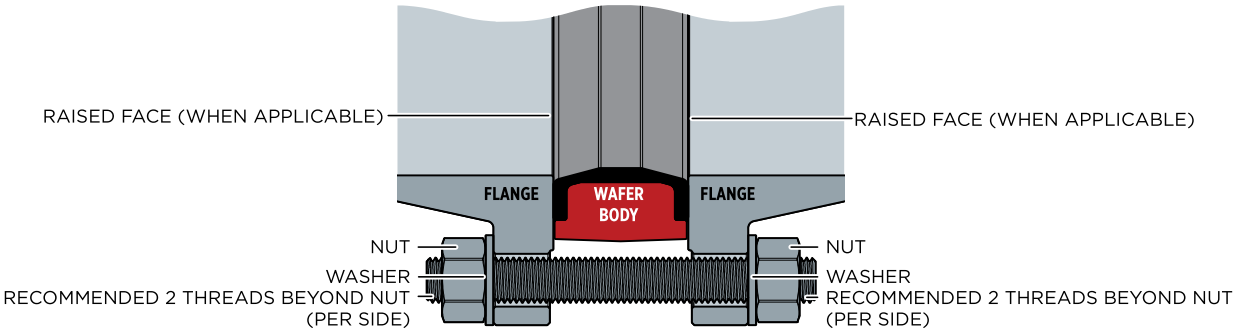
Kv stands for **Valve Sizing Coefficient**, sometimes called the **Flow Rate Coefficient**. **Kv** varies with the valve size, angle of opening and the manufacturer's valve style.

> Kv is defined as the volume of water in cubic meters/hour (m^3/hr) that will flow through a given restriction or valve opening with a pressure drop of one (1) bar at room temperature.

Kv VALUES

	Disc Position (Degrees)								
DN	**10°**	**20°**	**30°**	**40°**	**50°**	**60°**	**70°**	**80°**	**90°**
50	1	3	13	25	40	57	63	74	75
65	1	7	22	38	57	85	122	153	160
80	2	19	37	61	97	148	221	292	311
100	7	32	67	102	166	268	437	596	640
125	8	46	85	147	249	407	657	978	1054
150	11	74	151	257	414	655	1029	1483	1644
200	16	105	220	371	652	1079	1813	2920	3257
250	32	154	316	630	1051	1734	2891	5029	5762
300	60	208	426	872	1467	2481	4291	7314	8707
350	95	248	527	987	1708	2879	4819	8018	10032
400	127	364	730	1338	2293	3841	6411	10565	13317
450	164	407	837	1563	2800	4766	8115	15770	17404
500	199	584	1160	2124	3642	6103	10210	16986	21910
600	274	823	1693	3107	5301	8881	14900	25138	34078

WAFER VALVE WITH THROUGH-STUDS



Refer to appropriate Bray dimensional drawings for specific valve drilling information.

- Pipe flange thickness may vary, therefore no stud/bolt lengths are stated.
- Lug threads may be tapped from both sides, and therefore tap may not be continuous.
- Minimum bolt engagement must be equal to the diameter of the bolt.
- When bolting the valve into the line, use standard bolting torque as recommended by applicable piping standards. Additional force from the flange bolts is not required.

SERIES 3W | THROUGH-STUD

Valve Size		Fastener Size	Through Stud	Front Blind Stud	Back Blind Stud	Washer	Nut
NPS	DN	Ø-Thread	Qty	Qty	Qty	Qty	Qty
2	50	⅝-11 UNC	4	—	—	8	8
2½	65	⅝-11 UNC	4	—	—	8	8
3	80	⅝-11 UNC	4	—	—	8	8
4	100	⅝-11 UNC	8	—	—	16	16
5	125	¾-10 UNC	8	—	—	16	16
6	150	¾-10 UNC	8	—	—	16	16
8	200	¾-10 UNC	8	—	—	16	16
10	250	⅞-9 UNC	12	—	—	24	24
12	300	⅞-9 UNC	12	—	—	24	24
14	350	1-8 UN	12	—	—	24	24
16	400	1-8 UN	16	—	—	32	32
18	450	1⅛-8 UN	16	—	—	32	32
20	500	1⅛-8 UN	20	—	—	40	40
24	600	1¼-8 UN	20	—	—	40	40

PN10 | SERIES 3W | THROUGH-STUD

Valve Size	Fastener Size	Through Stud	Washer	Nut
DN	Ø-Thread	Qty	Qty	Qty
50	M16	4	8	8
65	M16	4	8	8
80	M16	8	16	16
100	M16	8	16	16
125	M16	8	16	16
150	M20	8	16	16
200	M20	8	16	16
250	M20	12	24	24
300	M20	12	24	24
350	M20	16	32	32
400	M24	16	32	32
450	M24	20	40	40
500	M24	20	40	40
600	M27	20	40	40

PN10 | SERIES 3L | STUDS

Valve Size	Fastener Size	Front Side Stud	Back Side Stud	Front Blind Stud	Back Blind Stud	Washer	Nut
DN	Ø-Thread	Qty	Qty	Qty	Qty	Qty	Qty
50	M16	4	4	—	—	8	8
65	M16	4	4	—	—	8	8
80	M16	8	8	—	—	16	16
100	M16	8	8	—	—	16	16
125	M16	8	8	—	—	16	16
150	M20	8	8	—	—	16	16
200	M20	8	8	—	—	16	16
250	M20	12	12	—	—	24	24
300	M20	12	12	—	—	24	24
350	M20	16	16	—	—	32	32
400	M24	16	16	—	—	32	32
450	M24	20	20	—	—	40	40
500	M24	20	20	—	—	40	40
600	M27	20	20	—	—	40	40

PN10 | SERIES 3L | BOLTS

Valve Size	Fastener Size	Front Side Hex Head Bolt	Back Side Hex Head Bolt	Front Blind Hex Head Bolt	Back Blind Hex Head Bolt	Washer	Nut
DN	Ø-Thread	Qty	Qty	Qty	Qty	Qty	Qty
50	M16	4	4	—	—	8	—
65	M16	4	4	—	—	8	—
80	M16	8	8	—	—	16	—
100	M16	8	8	—	—	16	—
125	M16	8	8	—	—	16	—
150	M20	8	8	—	—	16	—
200	M20	8	8	—	—	16	—
250	M20	12	12	—	—	24	—
300	M20	12	12	—	—	24	—
350	M20	16	16	—	—	24	—
400	M24	16	16	—	—	32	—
450	M24	20	20	—	—	32	—
500	M24	20	20	—	—	40	—
600	M27	20	20	—	—	40	—

PN16 | SERIES 3W | THROUGH-STUD

Valve Size	Fastener Size	Through Stud	Washer	Nut
DN	Ø-Thread	Qty	Qty	Qty
50	M16	4	8	8
65	M16	4	8	8
80	M16	8	16	16
100	M16	8	16	16
125	M16	8	16	16
150	M20	8	16	16
200	M20	12	24	24
250	M20	12	24	24
300	M20	12	24	24
350	M20	16	32	32
400	M24	16	32	32
450	M24	20	40	40
500	M24	20	40	40
600	M27	20	40	40

PN16 | SERIES 3L | STUDS

Valve Size	Fastener Size	Front Side Stud	Back Side Stud	Front Blind Stud	Back Blind Stud	Washer	Nut
DN	Ø-Thread	Qty	Qty	Qty	Qty	Qty	Qty
50	M16	4	4	—	—	8	8
65	M16	4	4	—	—	8	8
80	M16	8	8	—	—	16	16
100	M16	8	8	—	—	16	16
125	M16	8	8	—	—	16	16
150	M20	8	8	—	—	16	16
200	M20	12	12	—	—	24	24
250	M20	12	12	—	—	24	24
300	M20	12	12	—	—	24	24
350	M20	16	16	—	—	32	32
400	M24	16	16	—	—	32	32
450	M24	20	20	—	—	40	40
500	M24	20	20	—	—	40	40
600	M27	20	20	—	—	40	40

PN16 | SERIES 3L | BOLTS

Valve Size	Fastener Size	Front Side Hex Head Bolt	Back Side Hex Head Bolt	Front Blind Hex Head Bolt	Back Blind Hex Head Bolt	Washer	Nut
DN	Ø-Thread	Qty	Qty	Qty	Qty	Qty	Qty
50	M16	4	4	—	—	8	—
65	M16	4	4	—	—	8	—
80	M16	8	8	—	—	16	—
100	M16	8	8	—	—	16	—
125	M16	8	8	—	—	16	—
150	M20	8	8	—	—	16	—
200	M20	12	12	—	—	24	—
250	M20	12	12	—	—	24	—
300	M20	12	12	—	—	24	—
350	M20	16	16	—	—	32	—
400	M24	16	16	—	—	32	—
450	M24	20	20	—	—	40	—
500	M24	20	20	—	—	40	—
600	M27	20	20	—	—	40	—

Bray Butterfly Valves with Metal Mating Flanges

A frequently asked question at Bray is "What torque do I apply to the flange bolts to insure the valve is properly installed?". Initially this seems to be a simple request until all of the factors are analyzed. The installation of a valve requires several components: the valve, mating flanges, nuts, bolts and studs. Each is supplied by different manufacturers and each has different characteristics. The proper torque for one combination may be too much or too little for a second combination. The following is a list of information which needs to be known in order to start calculating the torque requirements.

Valve
- Type
- Size
- Materials of construction (body)
- Surface finishes / surface conditions

Flange
- Type
- Size
- Finish / both sides
- Condition of flange / surface contamination

Bolt (or Stud)
- Type
- Materials of construction
- Surface conditions

Nut
- Type
- Materials of construction
- Surface conditions

Lubrication
- Type
- Coverage

General Factors
- Temperature and relative humidity at the time of installation
- Speed at which bolts are turned

Note: The elastomer valve seat manufactured by Bray also acts as the flange gasket. No additional gaskets are required or recommended. Other valve styles which do not have integral gaskets will need to have this component supplied. The characteristics of this component will also need to be considered.

Complete knowledge of all relevant conditions is almost impossible to obtain. As a result, the computation of the exact torque requirement is not practical. No reputable manufacturer can provide accurate information when so many outside factors are present.

The International Fasteners Institute covers some of the details required to "compute" a torque value. Even with this information the use of a torque wrench is only considered to be 25% accurate. Based on the difficulty and inaccuracy of using this method, Bray recommends the use of the "Turn of the Nut" method.

"Turn of the Nut" Tightening
(For Standard Iron and Steel Flanges)

**For Non-Metallic or non-standard flanges, follow the manufacturers installation procedures.

1. The valve and flange faces must be aligned parallel to each other. For rubber seated butterfly valves manufactured by Bray, it is required that the valve be fully opened prior to the tightening of the flange bolts.

2. After aligning the holes in a joint, sufficient bolts shall be placed and brought to a "snug-tight" condition to ensure that the parts of the joint are brought into full contact with each other. "Snug-tight" is the tightness attained by the full effort of a man using a wrench.

3. Following the initial snugging operation, bolts shall be placed in any remaining holes and brought to snug-tightness. Re-snugging may be necessary in large joints.

4. Tighten opposite bolts in sequence to insure even pressure around the entire flange.

5. When all bolts are snug-tight, each bolt in the joint then shall be tightened additionally by the applicable amount of nut rotation given in **Note 1**. During tightening there shall be no rotation of the valve or flange.

Note 1

For bolt lengths **not exceeding**
8 diameters or 8 inches (203.2 mm) = **1/4 turn**

For bolt lengths **exceeding**
8 diameters or 8 inches (203.2 mm) = **1/2 turn**

Disclaimer:

Bray is issuing these recommendations only as a guide to installation. This recommendation is based on the full compliance of all materials supplied to their appropriate specifications. Since many of the components are not manufactured by Bray we can take no responsibility for any damage caused during installation.

SERIES 3W/3L - FLANGE BOLT TORQUE CHART

Valve Size		Normal Torque Range	
NPS	DN	lb-ft	N m
2	50	30	40
2.5	65	30	40
3	80	35	50
4	100	35 - 40	50 - 55
5	125	35 - 45	50 - 60
6	150	35 - 50	50 - 65
8	200	45 - 55	60 - 75
10	250	55 - 75	75 - 100
12	300	65 - 110	90 - 150
14	350	75 - 120	100 - 165
16	400	75 - 120	100 - 165
18	450	85 - 130	115 - 175
20	500	85 - 130	115 - 175
24	600	100 - 150	135 - 205

Please note that the N m and ft-lbs values are based on bolt size in respective EN and ANSI flanges, i.e. these values are not a direct conversion between N m and ft-lbs.

The values represent average torques needed to ensure full compression of the resilient valves' seats into the valves' bodies when installed in pipeline flanges. The face of both flanges must come into full contact with the valves' metal bodies.

No additional torque is required for proper functioning of the Bray resilient seated valves.

The torque values are based on using new, coarse-threaded, lubricated fasteners. Up to 25% may be added to the normal torque range values when using non-lubricated fasteners.

Torque values specified by flange manufacturers must not be exceeded.

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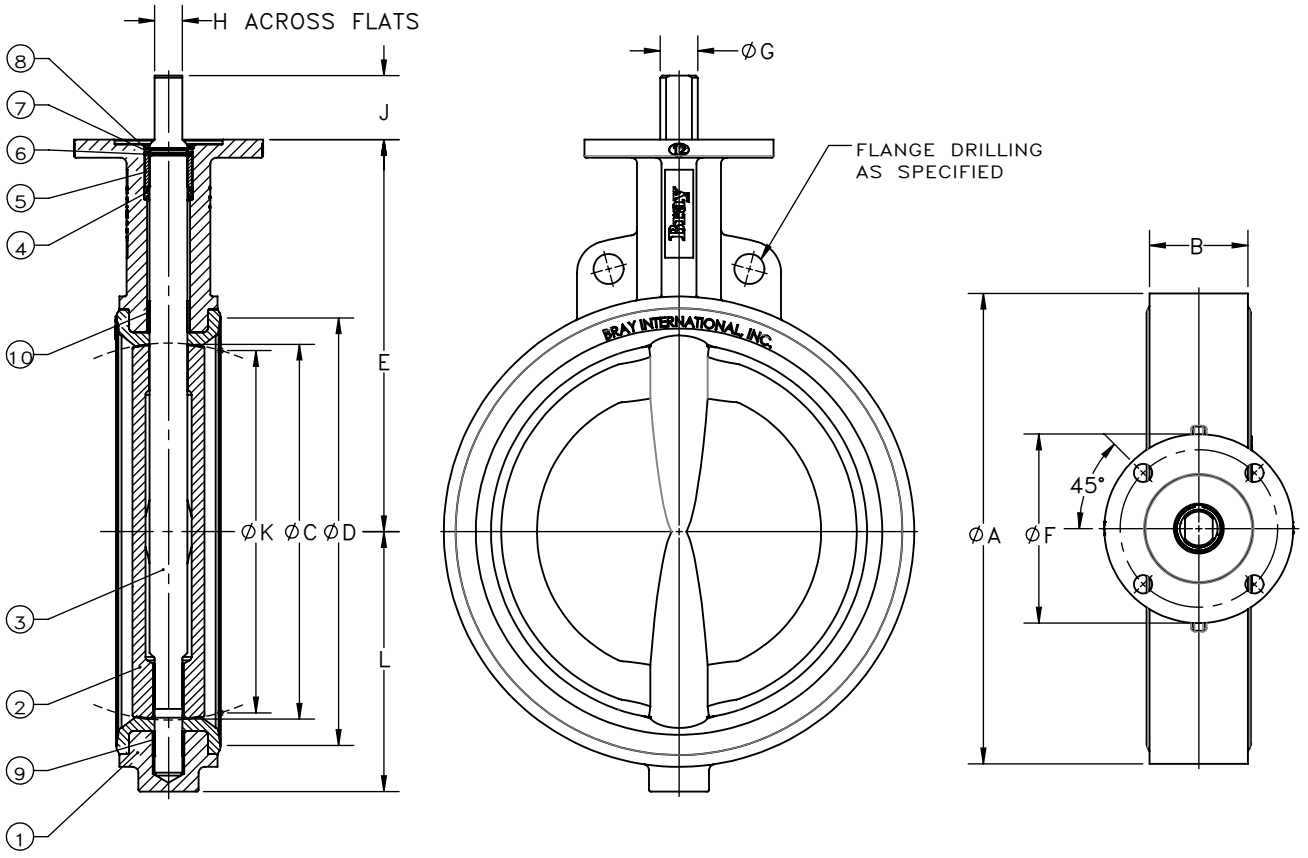
DIVISION	THIRD ANGLE	CUSTOMER	ERN	DRAWING NO.
BCCH			197951	ES-00619
PRIMARY UNITS			RELEASED BCCH Grace Li	SHEET / REV.
DECIMAL INCH			05/13/2020	1 OF 1 / 2

CUSTOMER SPECIFICATIONS (PROJECT, PROJECT NUMBER, FLANGE DRILLING, PRESSURE RATING, ETC

PARTS LIST AND DIMENSIONS (INCHES)
BUTTERFLY VALVE, SERIES 3W, SIZE 2"–12"
50/175/250 PSI RATED

Valve Size	A	B	C	D	E	F	Top Plate Drilling BC	Top Plate Drilling No. of Holes	Top Plate Drilling Hole Diameter	G	H	J	K	L	Adapter Code	Weight (lbs.)
2	3.69	1.69	2.00	2.81	5.50	3.54	2.76	4	.39	.55	.39	1.25	1.25	2.22	A	5.5
2.5	4.19	1.81	2.50	3.32	6.00	3.54	2.76	4	.39	.55	.39	1.25	1.87	2.47	A	6.7
3	4.88	1.81	3.00	3.95	6.25	3.54	2.76	4	.39	.55	.39	1.25	2.52	2.81	A	7.8
4	6.06	2.05	4.06	5.09	7.00	3.54	2.76	4	.39	.63	.43	1.25	3.57	3.41	B	11.9
5	7.06	2.21	5.04	6.16	7.50	3.54	2.76	4	.39	.75	.51	1.25	4.60	4.03	C	14.5
6	8.12	2.21	5.75	7.10	8.00	3.54	2.76	4	.39	.75	.51	1.25	5.38	4.53	C	19.2
8	10.50	2.36	7.75	9.34	9.50	5.91	4.92	4	.57	.87	.63	1.25	7.48	5.75	D	33.8
10	12.75	2.68	9.79	11.44	10.75	5.91	4.92	4	.57	1.18	.87	2.00	9.53	7.12	E	50.8
12	14.88	3.07	11.75	13.45	12.25	5.91	4.92	4	.57	1.18	.87	2.00	11.47	8.12	E	68.2

Note: K dimension is disc chordal dimension at valve face



ITEM	NAME	QTY	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
10	BEARING	1			
9	BEARING	1			
8	RETAINING RING	1			
7	THRUST WASHER	1			
6	SPLIT RING	2			
5	BUSHING	1			
4	STEM SEAL	1			
3	STEM	1			
2	DISC	1			
1	BODY & MOLDED IN SEAT	1			

SERIES 70

ELECTRIC ACTUATORS

TECHNICAL SALES MANUAL

Bray®

CONTENTS

OVERVIEW

Decades of Bray's proven success in electric actuation, combined with innovative engineering, has produced the Series 70 electric actuator. The Series 70 features on/off, modulating control or network controls and offers many advantages over other actuators including:

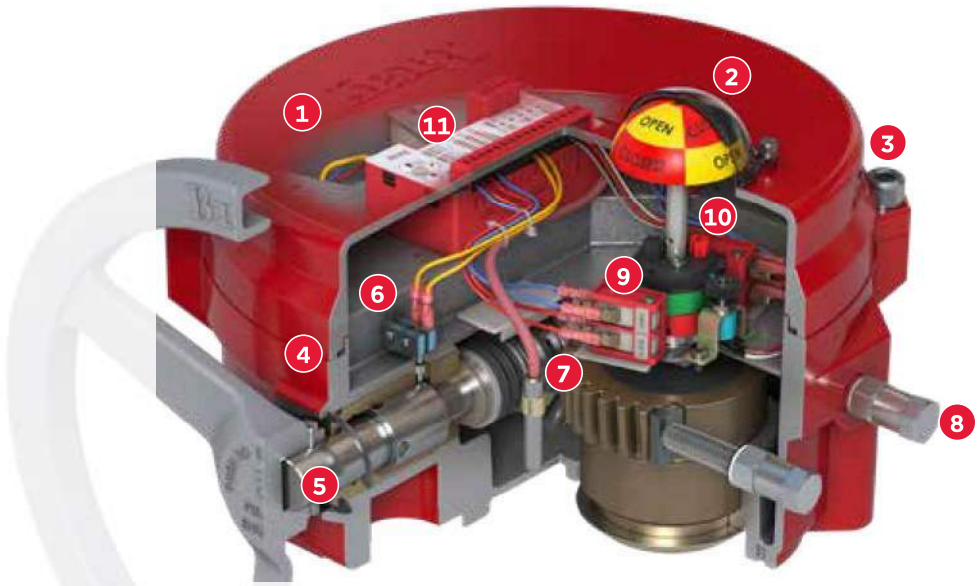
- Lowest profile and lightest weight actuator on the market.
- Simple finger or screwdriver adjustment of travel limit cams without interference from other components.
- Highly visible valve status display on most units.
- Design allows for ease of field startup, maintenance and upgrades.

CERTIFICATIONS & APPROVALS

UL, CSA and CE approved (most 120V models)
UL approved (USA & Canadian Std) for hazardous location
70-24V: CE approved
S70-708 to S70-720: 120VAC Class I, DIV 1 & 2, Group C, D Class II, DIV 1 & 2, Group E, F, G

NOTES
A complete listing of certifications and approvals can be found at BRAY.COM

FEATURES



1 **Enclosure:** The low profile weatherproof enclosure is UL listed Type 4, 4x and IP65, IP67 (S70-130/180 are not IP67). Polyester powder coated die-cast aluminum cover and base, for exceptional corrosion, wear, impact and ultraviolet resistance.

2 **High Visibility Position Indicator:** Prominently labeled and color coded yellow for open, red for close – the display indicates valve position through the full range of travel. The O-ring sealed dome is made of high impact, heat, chemical and ultraviolet resistant clear polycarbonate and designed to withstand caustic wash down ensuring excellent corrosion protection.

3 **Captive Cover Bolts:** The cover is attached to the base by captive stainless steel bolts placed outside the sealing area.

4 **O-Ring Seal For Watertight Enclosure:** The O-ring seal between the cover and base provides a weatherproof seal preventing internal corrosion.

5 **Manual Override:** Standard on all models. The declutchable manual override prevents handwheel movement during motor operation. When manual operation is desired, pull the handwheel out to expose the yellow stripe around the handwheel shaft, which indicates the handwheel is engaged and manual operation is available.

6 **Manual Override Switch:** Interrupts power to the motor when handwheel operation is engaged.

7 **Output Drive:** Self-locking worm shaft and worm gear assembly holds the valve in desired position.

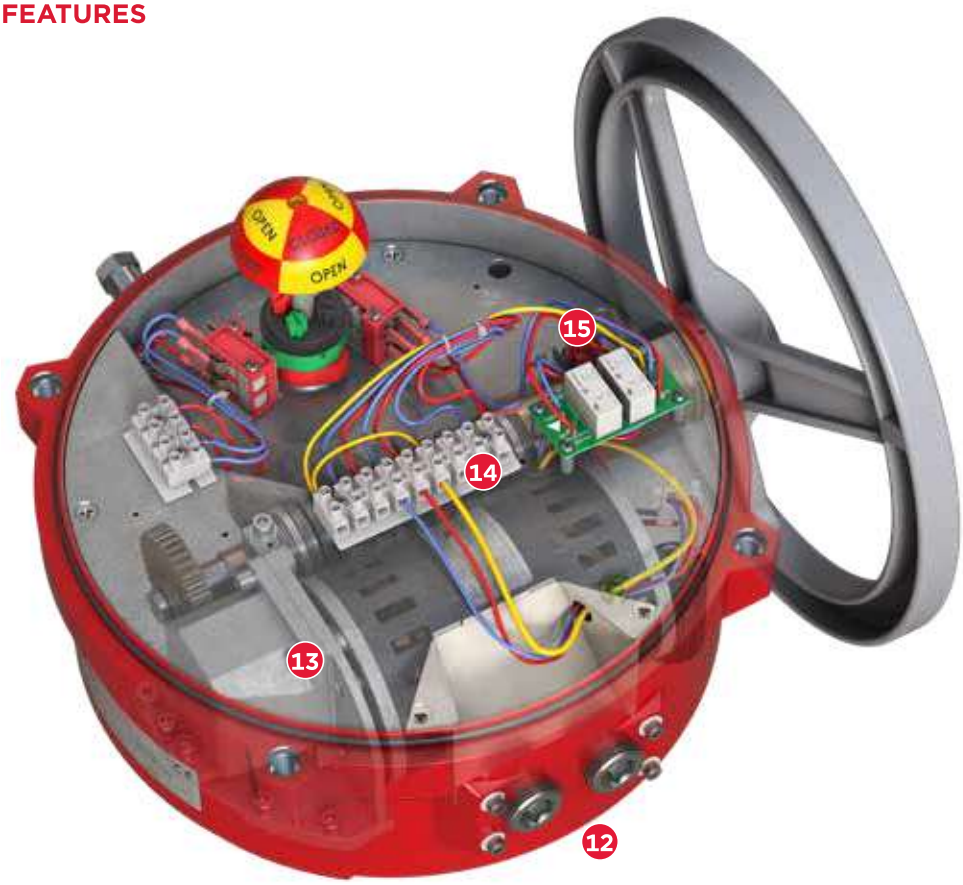
8 **Mechanical Travel Stop Bolts:** Designed to prevent over-travel in the open or close direction during manual operation. Travel stop bolts include a locknut to prevent loosening, seals to prevent water ingress, and spacers to prevent adjustment between 0° and 90° limit switch settings. Travel stop bolts permit 5° of over travel.

9 **Limit Switch Bracket:** Simple and secure design to firmly hold limit switch assemblies for accurate and repeatable valve position feedback.

10 **Limit Switch CAMs:** Bray's patented CAM design includes standard green (open) and red (close) CAMs which are adjustable with finger touch or screwdriver. No additional tools necessary. Standard factory setting allows 90° travel between open and close positions.

11 **Optional Actuator Controls**
Servo NXT Modulating Controller: 120, 220, 24 VAC 50/60 Hz, 1 phase 24 VDC
24V On/Off Controller: (not shown)

FEATURES



12 **Conduit Entries:** Two connections in either NPT or metric threads. One entry is for power, the other for control wiring.

13 **Motor Gear:** High torque start motor assembly, designed for fast inspection and maintenance.

14 **Terminal Strip:** Actuator limit switches are pre-wired to an easily accessible and clearly marked terminal block for customer wiring. The terminal strip has been placed near the two conduit entries with ample room for running wire leads. An easily accessible green plated ground screw is provided. A wiring diagram is included inside the cover for easy reference.

15 **Standard Actuator Control Interposing Relay Board (I.R.B.):** 120/220 VAC 50/60Hz On/Off control

16 **Roller Bearing:** Provides low friction while securely aligning actuator indicator shaft and CAMs for reliable valve position feedback.

17 **Oldham Coupler:** Corrects any misalignment between the valve and actuator without introducing side load to the position indicator shaft assembly.

Series
70

Torque	
E03	300 lb-in
E06	600 lb-in
E08	800 lb-in
E12	1200 lb-in
E20	2000 lb-in
E30	3000 lb-in
050	5000 lb-in
065	6500 lb-in
13W	13000 lb-in
18W	18000 lb-in

X - Speed	
0	60 sec
1	30 sec
6	110 sec

Product	
113	Actuator

Y - Style	
G	Imperial, Servo NXT
R	Metric, Servo NXT
D	Imperial, IRB
N	Metric, IRB

Z - Voltage	
A	120VAC
B	220VAC
C	24VAC/VDC
D	24VDC
0	120VAC
3	24VAC/VDC
4	220VAC

TTT - Trim	
536	Standard Bray Red
5F5	Bray Seacorr Coating

W - Designates The Output Bore Diameter	
0	2.5 Inches (63.5mm)
1	1.97 Inches (50 mm)

Actuator Size	Part Number	Torque	
		lb-in	N m
S70-E03	70-E03X-113YZ-TTT	300	34
S70-E06	70-E06X-113YZ-TTT	600	68
S70-E08	70-E08X-113YZ-TTT	800	90
S70-E12	70-E12X-113YZ-TTT	1,200	136
S70-E20	70-E20X-113YZ-TTT	2,000	226
S70-E30	70-E30X-113YZ-TTT	3,000	339
S70-050	70-050X-113YZ-TTT	5,000	565
S70-065	70-065X-113YZ-TTT	6,500	734
S70-130	70-13WX-113YZ-TTT	13,000	1469
S70-180	70-18WX-113YZ-TTT	18,000	2034

Style / Voltage		Voltage	Speed 1/4 Turn Seconds (60 Hz)	Controller
Imperial	Metric			
DA	NA	120VAC	30*	Interposing Relay Board (IRB)
DB	NB	220VAC	30*	Interposing Relay Board (IRB)
DC	NC	24VAC/VDC[1]	60	On/Off with Controller
DD	ND	24VDC	60	No Controller
G0	R0	120VAC	30*	Modulating with Servo NXT
G3	R3	24VAC/VDC	60	Modulating with Servo NXT
G4	R4	220VAC	30*	Modulating with Servo NXT
F3	Q3	24VAC/VDC	60	On/Off NXT Controller

[1]S70-050 is only 24VAC
*S70-130, 131 and 180, 181 are 110 seconds
Note: 220VAC units are 230VAC compatable

SPECIFICATIONS

Output Torque	120/230 V	300 to 18,000 lb-in (34-2034 N m)
	24 V	600, 800, 2,000, 5,000 lb-in (68, 90, 226, 565 N m)
Control Options	On/Off	Interposing Relay Board (I.R.B) 120/230 VAC
		On/Off NXT Controller 24VAC/DC
	Modulating	Servo NXT Controller 120/230 VAC/24 VAC/DC 4-20 Ma, 0-10 V, 0-5 V, 2-10 V
	Communication Protocol	EtherNet/IP
Voltages	120/230 VAC 50/60 Hz, 1-phase	
	24 VAC/VDC	
Enclosure Ratings	NEMA 4, 4x, and IP65, I1P67 (IP67 does not include S70-130/131 and 180/181)	
Mounting	ISO5211	
Motor	120/230 VAC: 1-phase, reversable, permanent split capacitor induction motor	
	24 V: Permanent magnet brushed DC Motor	
Temperature Range	-22°F to +150°F -29°C to +65°C	
Switch Options	2 SPDT mechanical switches standard	
	Additional auxiliary switches available (up tp 6 total)	
	Optional torque switches available	
Duty Rating	On/Off Application	Per EN15714-2 Class 4
	Modulating Applications	Per EN15714-2 Class 6

CONSTRUCTION

Housing	ASTM B85 pressure die cast aluminum Polyester powder coated Nylon 11 coated (optional)
Exposed Fasteners	Stainless Steel
Travel Stops	Externally adjustable at both 0 and 90 degrees
Conduit Entries	S70-E03 to S70-E08: 2 x 1/2" NPT or 2 x M20 S70-E12 to S70-180: 2 x 3/4" NPT or 2 x M25
Worm Gearing	Worm: Chromoly, self locking Worm gear: Aluminum bronze
Spur Gearing	AGMA class 9, nitride hardened alloy steel
Bearings	Indicator shaft and motor gear: Permanently sealed ball bearing Worm shaft: Sintered bronze bushing with heavy duty thrust bearing
Lubrication	High temperature synthetic grease
Motor	120/230 VAC: Single phase, reversible, permanent split capacitor induction motor 24V: Permanent magnet-brushed DC motor
Capacitor	110/230 VAC: Metalized polyester
Heater	Optional, 5 watt PTC style
Terminal Strip	Switch Plate: 12 - 22 AWG (2.0 - 0.65mm) Servo: 14 - 24 AWG (1.63 - 0.51mm)
Torque Limiting	Optional, open and close preset at factory
Limit Switches	SPDT: 120VAC -10A-1/3 HP 220VAC -10A-1/2 HP 250VDC - 1/4A 12VDC - 2A

PERFORMANCE

Output Torque	See Torque Chart
Voltages	See Motor Chart
Ambient Temperature	-20°F to 150°F -29°C to 65°C
Motor Insulation	120/220 VAC: Class F, 311°F (155°C) thermal trip at 275°F (135°C) 24V: Class B Fast blow fuse 5A@250VAC
On/Off Applications	Per EN15714-2 Class A
Modulating Applications	Per EN15714-2 Class C
Manual Operation	Pull to engage, push to disengage
Enclosure	Designed to meet NEMA Type 4, 4x and IP65/67 specifications

SERVO NXT

The Servo NXT offers precise modulating service for accurate position control.

- One touch automatic calibration
- User-friendly interface
- Advanced control of proportional band and dead band
- Automatic pulsing mode for precise positioning
- Self diagnostics
- Action on loss of command signal
- Go to position commands

SERVO NXT FEATURES / SPECIFICATIONS

Actuator Voltage	120, 220, 24 VAC 50/60 Hz, 1 phase
	24 VDC
Input Signal	Configurable
	4-20 mA, 0-10, 2-10, 0-5 VDC
Retransmission Signal	Configurable
	4-20 mA, 0-10, 0-5 VDC
Independent Isolation	Control signal input and output
	Control signals and power
Display	Menu driven auto dimming LED
Menu Navigation	Up/Down arrows with select (3) buttons
Configuration	Menu selectable to non-volatile memory
Calibration	Auto calibration sequence for travel lim-its
Deadband	Configurable 1% - 6%
Reverse Acting	Configurable for inverted input signal
Speed Control	Independent for open and close direction
Fail Position (loss of input signal)	Configurable close, open, last
Manual Mode	Local operation via Servo NXT user inter-face
Fault Indications	Loss of command signal
	Limit switch
	Handwheel engaged
	Feedback pot
	Torque switch
	Jammed valve / motor stalled
Health Monitor	Heartbeat - Backlit blinking Bray logo

"Configurable" means the customer, or the factory, can modify the Servo NXT.

BATTERY BACKUP UNIT (BBU)

Designed for use with 24V actuators, the optional BBU provides power to permit the actuator to reach its fail-open or fail-close position in the event of a main power failure. Upon reaching the fail position, the BBU turns off until external power is restored. After main power has been restored, the actuator returns to normal operation.

CONSTRUCTION AND PERFORMANCE

Housing	ASTM B85 pressure die cast aluminum Polyester powder coated Nylon 11 coated (optional)
Exposed Fasteners	Stainless steel
Batteries	Two 12V 1.4AH sealed lead acid batteries wired in series
Battery Monitoring	Local LED indicator and voltage free 2-wire normally open contact for remote monitoring
Battery Charging	Automatic smart charge
Battery Conservation	Shut-off batteries after one minute or when actuator stops
Operating Temperature	-4ºF (-20ºC) to 122ºF (50ºC) LED light may not function below -20ºF (-29°C)
Power Protection	Two 5 amp fuses, one for the external power output circuit and the other for the battery output circuit
Current Draw @ 24 VAC	BBU only maximum 10mA standby (0.25 VA) Max. 420mA charging (10 VA)
Current Draw of Actuator with BBU	600 lb-in - 1.9A (with load) 2,000 lb-in - 2.7A (with load) 5,000 lb-in - 4.1A (with load)
Power Requirements	24-27VAC or 30-38VDC (the minimum voltage is required to provide proper battery charging) Use dedicated Class 2 non-bonded transformer rated 100VA per BBU
Power Output	BBU output with 24VAC supply is 30-38 VDC On failure of AC supply, battery output is 24-25.5 VDC BBU will provide fail open or fail close operation

BATTERY SPECIFICATIONS

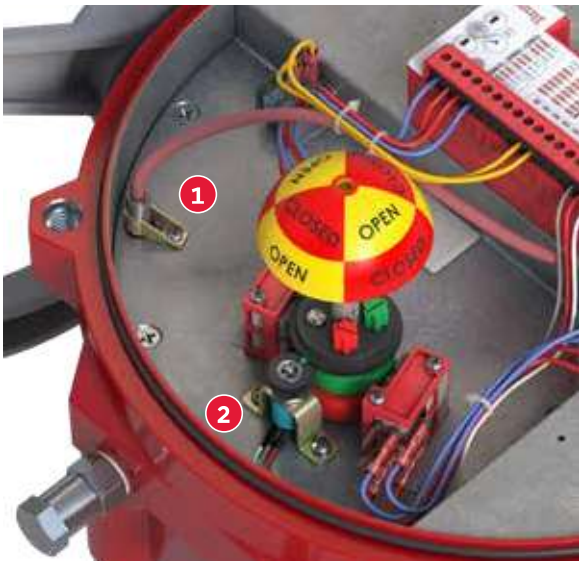
Batteries	Two 12 volt 1.4 ampere-hour (AH) rechargeable sealed lead acid battery wired in series
Features	Valve regulated, spill proof construction allows safe operation in any position Rugged impact resistant ABS case and cover (UL94-HB) U.L. Recognized under file number MH 20845
Specifications	Battery case: ABS plastic Maximum discharge current (7 minutes): 4.2 amperes Shelf Life (% of nominal capacity at 68ºF (20ºC) 1 month = 97% 3 months = 91% 6 months = 83%
Operating Temperature	Charge: -4°F to 122°F (-20°C to 50°C) Discharge: -40°F to 140°F (-40°C to 60°C) The BBU should be powered up for a minimum of 12 hours

1 - HEATER

Mounted on the actuator switch plate, a self-regulating heater can be added to prevent potential electrical component damage due to condensation build-up inside the actuator.

2 - POTENTIOMETER

Optional gear driven 10k ohm potentiometer provides continuous position feedback for a customer control system. Potentiometer is standard with the Servo NXT controller.



AUXILLARY SWITCHES

Up to four additional dry-contact (voltage free) SPDT mechanical switches can be added to indicate travel position for remote customer control systems.

TORQUE SWITCH

Optional torque switches provide protection for the automated valve assembly in the event of an over-torque event.

CONTROL STATION

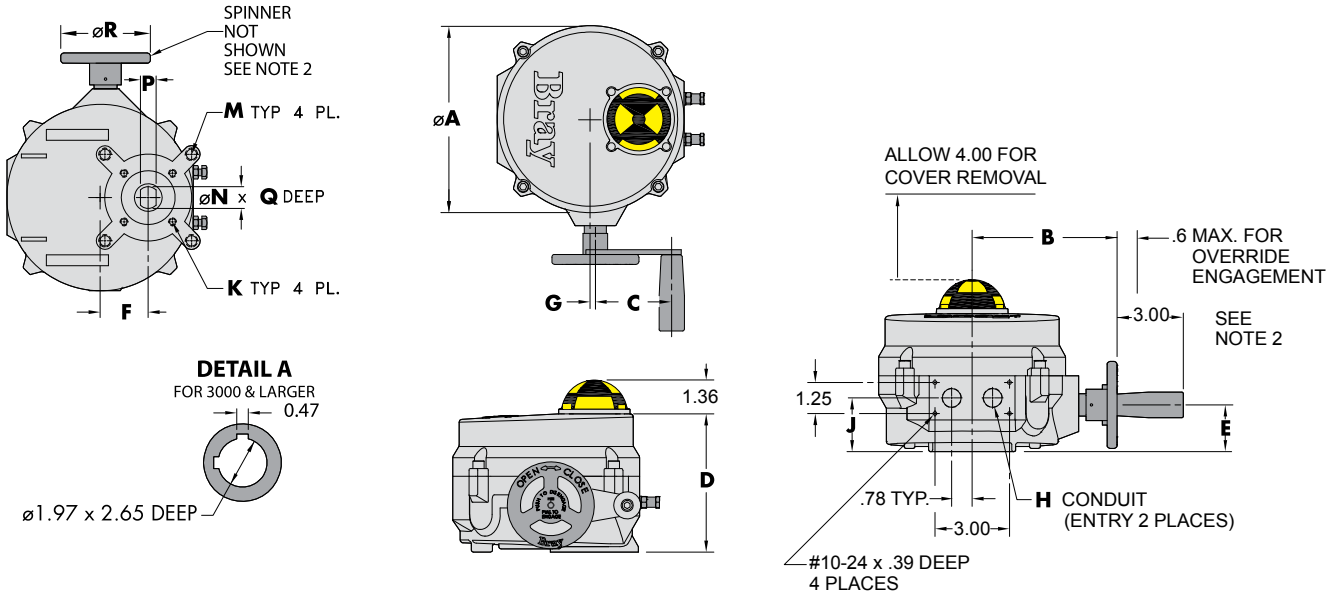
The optional control station features a local-off-remote control switch, an open-stop-close switch, and two lights which locally indicate open and close valve position. This weatherproof aluminum enclosure is easily bolted to the four mounting holes located on the S70 conduit entry panel. The Control Station cover includes captive bolts and may be rotated in 90° increments allowing the customer to easily operate and view the control station. Two ¾" NPT cable entries are available in the control station base. Two different multi-pin, weatherproof electrical cable connections are also available.

ELECTRICAL CABLE CONNECTIONS

Pre-wired multi-pin weatherproof cable receptacles allow quick-connect field installation and prevent internal cabling errors which could occur during commissioning. Cord sets can be supplied with connection/flying leads or connection/connection on cord set ends to plug directly into the actuator receptacle.

Optional Seacorr® Coating

WEATHERPROOF NEMA TYPE 4, 4X & IP65, IP67 - E03 TO 065



IMPERIAL DIMENSIONS - Inches

Actuator Size	Torque (lb-ins)	A	B	C	D	E	F	G	H NPT	J	K (UNC) x B.C.	M (UNC) x B.C.	N	P	Q	øR	Wt. lbs
S70-E03 S70-E06 S70-E08	300 600 800	7.5	5.8	3.0	5.6	1.9	1.94	.19	1/2	2.2	5/16-18 x ø2.76	—	.75	.51	1.75	3.5	13
S70-E12 S70-E20 S70-E30	1,200 2,000 3,000	10.1	7.8	3.7	6.6	2.4	2.69	.56	3/4	2.6	5/16-18 x ø2.76	1/2-13 x ø4.92	1.18	.87	2.22	8.0	28
S70-050 S70-065	5,000 6,500	12.1	9.5	5.5	7.2	2.9	3.19	.56	3/4	3.1	1/2-13 x ø4.92	3/4-10 x ø6.50	See Detail A			12.0	48

Notes:

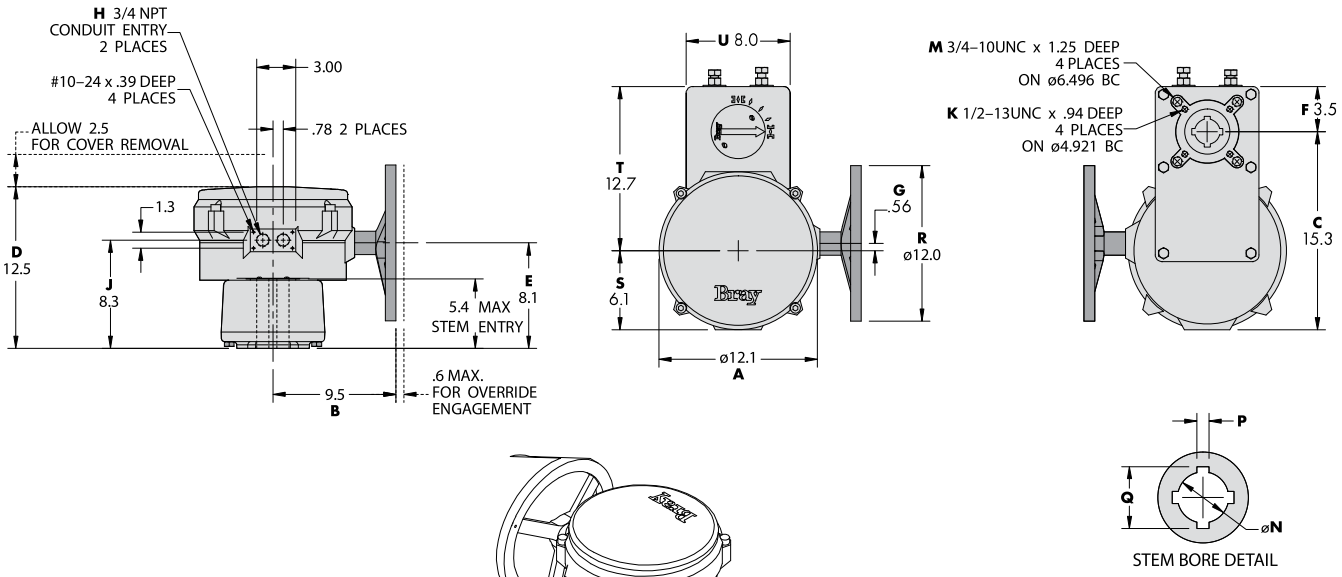
1. On/Off Applications - Per EN15714-2 Class A
2. Modulating Applications - Per EN15714-2 Class C
3. Handwheel Spinner shown in drawing is available as an option.
4. Dimension (N) is also available with Double Square (Star) drive.

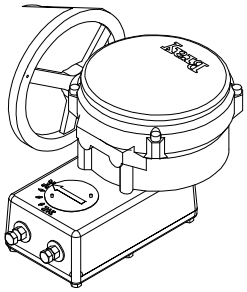
Drawings are for reference only.

Please refer to Bray ES and GA drawings on the Bray website, www.bray.com.

Bray reserves the right to change product dimensions without notice.

WEATHERPROOF NEMA TYPE 4, 4X & IP65 - S70-130/131 AND S70-180/181





STEM BORE DETAIL

Size	Torque lb-ins.	Speed sec.	N	P	Q	Wt. lbs
70-1306	13,000	110	2.51	0.63	3.05	118
70-1316	13,000	110	1.97	0.47	2.38	118
70-1806	18,000	110	2.51	0.63	3.05	118
70-1816	18,000	110	1.97	0.47	2.38	118

IMPERIAL DIMENSIONS - Inches

Actuator Size	A	B	C	D	E	F	G	H NPT	J	K (UNC) x B.C.	M (UNC) x B.C.	N	P	Q	øR	S	T	U	Wt. lbs
S70-130/131 S70-180/181	12.1	9.5	15.3	12.5	8.1	3.5	.56	3/4	8.3	1/2-13 x ø4.921 F12	3/4-10 x ø6.496 F16	See Stem Bore Detail			12.0	6.1	12.7	8.0	118

Notes:
1. On/Off Applications - Per EN15714-2 Class A
2. Modulating Applications - Per EN15714-2 Class C
3. Dimension (N) is also available with Double Square (Star) drive.

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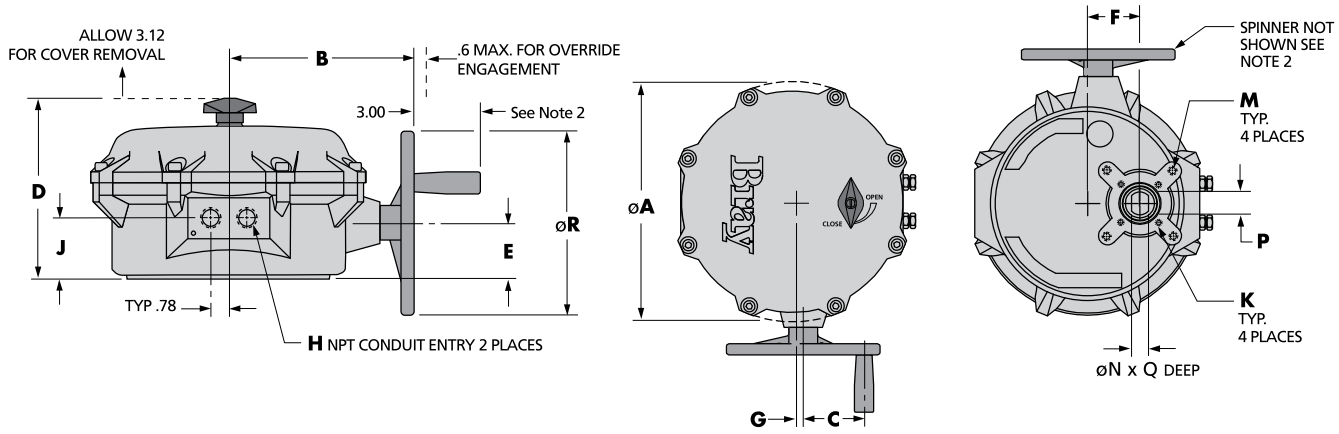
HAZARDOUS LOCATION, WEATHERPROOF NEMA TYPE 4, 4X & IP65 - S70-708 TO S70-720



IMPERIAL DIMENSIONS - Inches

Actuator Size	Torque (lb-ins)	A	B	C	D	E	F	G	H	J	K (UNC) x B.C.	M (UNC) x B.C.	N	P	Q	øR	Wt. lbs
S70-708	800																
S70-712	1200	12.5	8.0	3.7	7.7	2.4	2.69	.56	3/4	2.6	5/16-18 x ø2.76 F07	1/2-13 x ø4.92 F12	1.18	.87	2.01	8.0	34
S70-720	2000																

Notes:
1. On/Off Applications - Per EN15714-2 Class A
2. Modulating Applications - Per EN15714-2 Class C
3. Handwheel Spinner shown in drawing is available as an option.

Drawings are for reference only. Please refer to Bray ES and GA drawings on the Bray website, www.bray.com.

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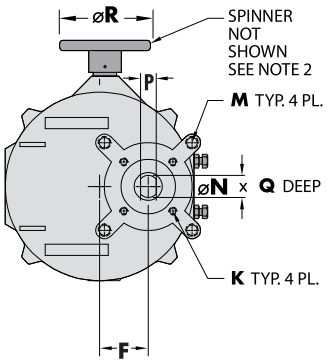
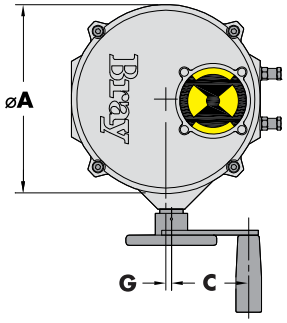
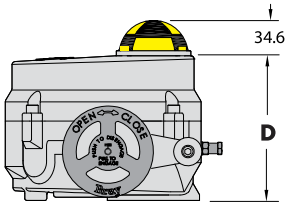
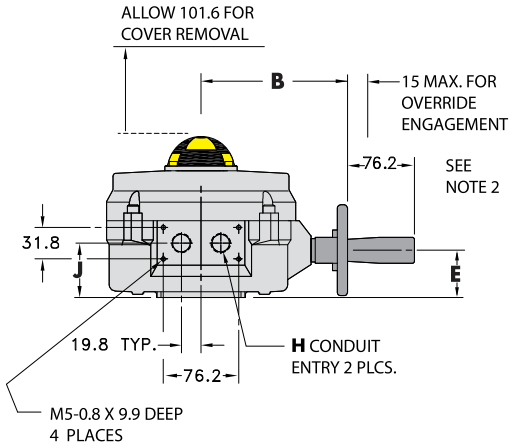
WEATHERPROOF NEMA TYPE 4, 4X & IP65/IP67 - E03 TO 065

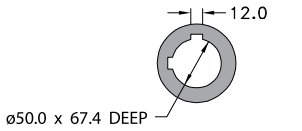








DETAIL A
FOR 338.95 Nm & LARGER



METRIC DIMENSIONS - Millimeters

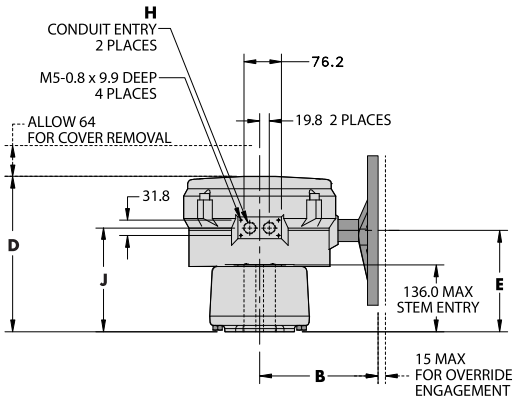
Actuator Size	Torque (Nm)	øA	B	C	D	E	F	G	H	J	K x B.C.	M x B.C.	N	P	Q	øR	Wt. kgs
S70-E03 S70-E06 S70-E08	34 68 90	191	147	76	141	48	49.2	4.7	M20 x 1.5	55	M8 x 1.25 x ø70	—	19.0	13.0	44.5	89	6
S70-E12 S70-E20 S70-E30	136 226 339	256	198	93	168	62	68.3	14.3	M25 x 1.5	66	M8 x 1.25 x ø70	M12 x 1.75 x ø125	30.0	22.0	56.3	203	13
S70-050 S70-065	565 734	308	241	139	183	73	80.9	14.3	M25 x 1.5	78	M12 x 1.75 x ø125	M20 x 2.5 x ø165	See Detail A			305	22

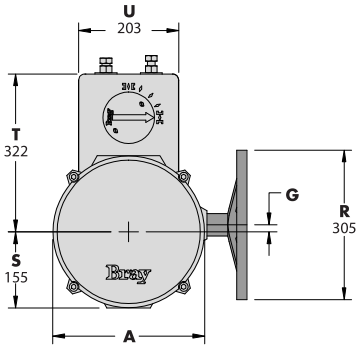
Notes:
1. On/Off Applications - Per EN15714-2 Class A
2. Modulating Applications - Per EN15714-2 Class C
3. Handwheel Spinner shown in drawing is available as an option.
4. Dimension (N) is also available with Double Square (Star) drive.

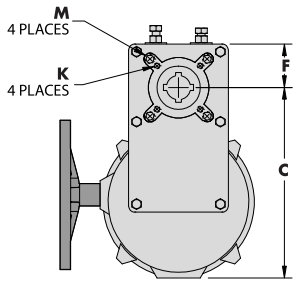
Drawings are for reference only. Please refer to Bray ES and GA drawings on the Bray website, www.bray.com.

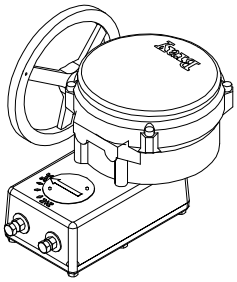
Bray reserves the right to change product dimensions without notice.

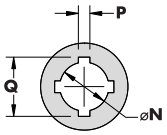
WEATHERPROOF NEMA TYPE 4, 4X & IP65 - 70-130/131 AND S70-180/181











STEM BORE DETAIL

Size	Torque (Nm)	Speed (sec.)	N	P	Q	Wt. kgs
70-1301	1,469	110	63.6	15.9	77.5	54
70-1311	1,469	110	50.0	12.0	60.6	54
70-1801	2,034	110	63.6	15.9	77.5	54
70-1811	2,034	110	50.0	12.0	60.6	54

METRIC DIMENSIONS - Millimeters

Actuator Size	A	B	C	D	E	F	G	H	J	K (MM) x B.C.	M (MM) x B.C.	N	P	Q	øR	S	T	U	Wt. kgs
S70-130/131 S70-180/181	308	241	389	316	206	89	14.3	1.5	212	12 x 125 BC x 23.9	20 x 165 BC x 31.8	See Stem Bore Detail			305	155	322	203	54

Notes:
1. Modulating Applications - Per EN15714-2 Class C
2. Dimension (N) is also available with Double Square (Star) drive.

Drawings are for reference only. Please refer to Bray ES and GA drawings on the Bray website, www.bray.com.

Bray reserves the right to change product dimensions without notice.

		S70-E03	S70-E06	S70-E08	S70-E12	S70-E20	S70-E30	S70-050	S70-065	S70-130	S70-180	S70-708*	S70-712*	S70-720*
Torque	**lb-in**	300	600	800	1200	2000	3000	5000	6500	13000	18000	800	1200	2000
	N m	34	68	90	136	226	339	565	734	1469	2034	90	136	226
Actuator Approx. Wt.	**lb**	11	11	11	25	25	25	45	45	118	118	25	25	25
	kg	5	5	5	11	11	11	20	20	54	54	11	11	11

MANUAL OVERRIDE

Handwheel Diameter	**in**	3.5	3.5	3.5	8	8	8	12	12	12	12	8	8	8
	mm	89	89	89	203	203	203	305	305	305	305	203	203	203
Gear Ratio		30:1	30:1	30:1	30:1	30:1	30:1	30:1	30:1	90:1	90:1	30:1	30:1	30:1
Rim Pull	**lb**	16	32	43	28	46	70	62	80	80	80	18	28	46
	kg	7.3	14.5	19.5	12.7	20.9	31.8	28.1	36.3	36.3	36.3	8.2	12.7	20.9

* Hazardous Location Units

120VAC

Travel Time 90° sec.		**S70-E03**		**S70-E06**		**S70-E08**		**S70-E12**		**S70-E20**		**S70-E30**		**S70-050**		**S70-065**		**S70-130**		**S70-180**		**S70-708***		**S70-712***		**S70-720***	
		Current Draw in Amps																									
60 Hz	**50 Hz**	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA
30	**36**	0.70	1.00	0.75	1.00	0.80	1.00	0.75	2.10	0.85	2.10	1.00	2.10	1.60	3.00	2.30	3.10					0.60	2.10	0.78	2.10	1.00	2.10
110	**132**																	2.30	3.10	2.50	3.10						

220VAC

Travel Time 90° sec.		**S70-E03**		**S70-E06**		**S70-E08**		**S70-E12**		**S70-E20**		**S70-E30**		**S70-050**		**S70-065**		**S70-130**		**S70-180**		**S70-708***		**S70-712***		**S70-720***	
		Current Draw in Amps																									
60 Hz	**50 Hz**	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA
30	**36**	0.40	0.75	0.42	0.75	0.44	0.75	0.35	0.90	0.40	0.90	0.45	0.90	0.90	1.40	1.10	1.40					0.38	0.90	0.45	0.90	0.50	0.90
110	**132**																	1.30	2.70	1.50	2.70						

* Hazardous Location Units
FLA - Full Load Amps
LRA - Locked Rotor Amps

24VAC	**S70-E06**	**S70-E08**	**S70-E20**	**S70-050**
Current	FLA	FLA	FLA	FLA
	2.40	2.90	3.50	4.00
Operating Speed	35	40	60	85

24VDC	**S70-E06**	**S70-E08**	**S70-E20**	**S70-050**
Current	FLA	FLA	FLA	FLA
	1.90	2.40	2.70	3.10
Operating Speed	50	60	80	90

Hazardous Location Units
FLA - Full Load Amps
LRA - Locked Rotor Amps

For all other information such as dimensional drawings, wiring diagrams, and EDS files please visit bray.com or contact your local Bray representative.

IMPERIAL (in.)

Actuator Size	Inner Bolt Circle				Outer Bolt Circle				Stem Hole			
	Bolt Circle		No. Holes	Bolt Size	Bolt Circle		No Holes	Bolt Size	Dia.	Across Flats	Depth	Keyway Width
S70-E03	F07	2.76	4	5/16-18	-	-	-	-	0.75	0.51	1.75	-
S70-E06	F07	2.76	4	5/16-18	-	-	-	-	0.75	0.51	1.75	-
S70-E08	F07	2.76	4	5/16-18	-	-	-	-	0.75	0.51	1.75	-
S70-E12	F07	2.76	4	5/16-18	F12	4.92	4	1/2-13	1.18	0.87	2.20	-
S70-E20	F07	2.76	4	5/16-18	F12	4.92	4	1/2-13	1.18	0.87	2.20	-
S70-E30	F07	2.76	4	5/16-18	F12	4.92	4	1/2-13	1.18	0.87	2.20	-
S70-050	F12	4.92	4	1/2-13 18	F16	6.50	4	3/4-10	1.97	-	2.60	2 x 7/16
S70-065	F12	4.92	4	1/2-13 18	F16	6.50	4	3/4-10	1.97	-	2.60	2 x 7/16
S70-130	F12	4.92	4	1/2-13 18	F16	6.50	4	3/4-10	1.97	-	5.40	4 x 7/16
S70-131	F12	4.92	4	1/2-13 18	F16	6.50	4	3/4-10	1.97	-	5.40	4 x 5/8
S70-180	F12	4.92	4	1/2-13 18	F16	6.50	4	3/4-10	1.97	-	5.40	4 x 7/16
S70-181	F12	4.92	4	1/2-13 18	F16	6.50	4	3/4-10	1.97	-	5.40	4 x 5/8
S70-708	F07	2.76	4	5/16-18	F12	4.92	4	1/2-13	1.18	0.87	2.20	-
S70-712	F07	2.76	4	5/16-18	F12	4.92	4	1/2-13	1.18	0.87	2.20	-
S70-720	F07	2.76	4	5/16-18	F12	4.92	4	1/2-13	1.18	0.87	2.20	-

METRIC (mm)

Actuator Size	Inner Bolt Circle				Outer Bolt Circle				Stem Hole			
	Bolt Circle		No, Holes	Bolt Size	Bolt Circle		No. Holes	Bolt Size	Dia.	Across Flats	Depth	Keyway Width
S70-E03	F07	70	4	M8 x 1.25	-	-	-	-	19	13	44.5	-
S70-E06	F07	70	4	M8 x 1.25	-	-	-	-	19	13	44.5	-
S70-E08	F07	70	4	M8 x 1.25	-	-	-	-	19	13	44.5	-
S70-E12	F07	70	4	M8 x 1.25	F12		4	M12 x 1.25	30	22	55.9	-
S70-E20	F07	70	4	M8 x 1.25	F12	125	4	M12 x 1.25	30	22	55.9	-
S70-E30	F07	70	4	M8 x 1.25	F12	125	4	M12 x 1.25	30	22	55.9	-
S70-050	F12	125	4	M12 x 1.25	F16	165	4	M20 x 1.75	50.04	-	66	12.0
S70-065	F12	125	4	M12 x 1.25	F16	165	4	M20 x 1.75	50.04	-	66	12.0
S70-130	F12	125	4	M12 x 1.25	F16	165	4	M20 x 1.75	50.04	-	137.2	12.0
S70-131	F12	125	4	M12 x 1.25	F16	165	4	M20 x 1.75	63.5	-	137.2	16.0
S70-180	F12	125	4	M12 x 1.25	F16	165	4	M20 x 1.75	50.04	-	137.2	12.0
S70-181	F12	125	4	M12 x 1.25	F16	165	4	M20 x 1.75	63.5	-	137.2	16.0
S70-708	F07	70	4	M8 x 1.25	F12	125	4	M12 x 1.25	30	22	55.9	-
S70-712	F07	70	4	M8 x 1.25	F12	125	4	M12 x 1.25	30	22	55.9	-
S70-720	F07	70	4	M8 x 1.25	F12	125	4	M12 x 1.25	30	22	55.9	-

Standard Dimensional Drawings	
Imperial Standard	GA-53561
Metric Standard	GA-53560
Imperial Hazardous Location	ES11A-0526
Imperial 13,000-18,000 lb-in	ES11A-0708
Metric 13,000-18,000 lb-in	ES12A-0708

Standard Wiring Diagrams

Voltage	Duty	Controller	Aux Limit Switches	Diagram Number
120/220 VAC	On/Off	IRB	NO	WD-000044
120/220 VAC	On/Off	IRB	YES	WD-000045
120/220 VAC	Modulating	Servo NXT	NO	WD-000338
120/220 VAC	Modulating	Servo NXT	YES	WD-000339
24 VAC/VDC	On/Off	ON/OFF NXT	YES	WD-000528
24 VAC/VDC	On/Off	ON/OFF NXT	NO	WD-000560
24 VAC/VDC	Modulating	Servo NXT	YES	WD-000561
24 VAC/VDC	BBU On/off	ON/OFF NXT	YES	WD-000581

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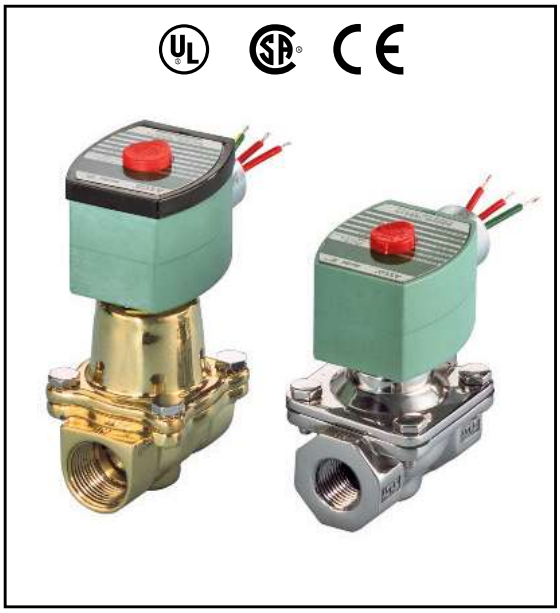
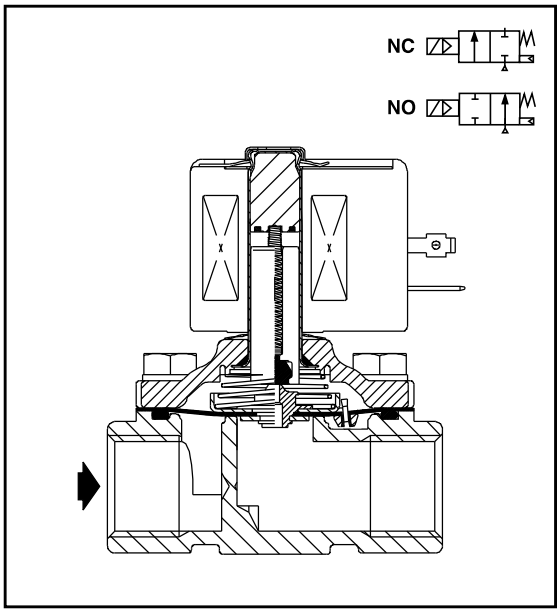
- High flow valves for liquid, corrosive, and air/inert gas service
- Lead-free versions available for Safe Drinking Water Act Compliance
- Industrial applications include:
  - Car wash
  - Laundry equipment
  - Air compressors
  - Industrial water control
  - Pumps





Construction

Valve Parts in Contact with Fluids		
Body	~~Brass~~	304 Stainless Steel*
Seals and Discs	NBR or PTFE	
Disc-Holder	PA	
Core Tube	305 Stainless Steel	
Core and Plugnut	430F Stainless Steel	
Springs	302 Stainless Steel	
Shading Coil	~~Copper~~	Silver

*Catalog Numbers 8210G127, 8210G129, 8210G132, 8210G133 have 316L Stainless Steel bodies.

Electrical

Standard Coil and Class of Insulation	Watt Rating and Power Consumption				Spare Coil Part Number			
		AC			General Purpose		Explosionproof	
	DC Watts	Watts	VA Holding	VA Inrush	AC	DC	AC	DC
F	-	6.1	16	40	238210	-	238214	-
F	11.6	10.1	25	70	238610	238710	238614	238714
F	16.8	16.1	35	180	272610	97617	272614	97617
F	-	17.1	40	93	238610	-	238614	-
F	-	20	43	240	99257	-	99257	-
F	-	20.1	48	240	272610	-	272614	-
F	30.8	-	-	-	-	501695	-	501696
H	11.6	-	-	-	-	238910	-	238914
H	40.6	-	-	-	-	238910	-	238914

Standard Voltages: 24, 120, 240, 480 volts AC, 60 Hz (or 110, 220 volts AC, 50 Hz). 6, 12, 24, 120, 240 volts DC. Must be specified when ordering.
Other voltages available when required.

Solenoid Enclosures

Standard: RedHat II - Watertight, Types 1, 2, 3, 3S, 4, and 4X; RedHat - Type I.

Optional: RedHat II - Explosionproof and Watertight, Types 3, 3S, 4, 4X, 6, 6P, 7, and 9; Red-Hat - Explosionproof and Watertight, Types 3, 4, 4X, 7, and 9.

(To order, add prefix "EF" to catalog number, except Catalog Numbers 8210B057, 8210B058, and 8210B059, which are not available with Explosionproof enclosures.)
See Optional Features Section for other available options.

Nominal Ambient Temp. Ranges

RedHat II/RedHat AC: 32˚F to 125˚F (0˚C to 52˚C)
RedHat II DC: 32˚F to 104˚F (0˚C to 40˚C)
RedHat DC: 32˚F to 77˚F (0˚C to 25˚C)
(104˚F/40˚C occasionally)
8210G227 AC: 32˚F to 130˚F (0˚C to 54˚C)
DC: 32˚F to 90˚F (0˚C to 32˚C)

Refer to Engineering Section for details.

Approvals

UL listed as indicated. CSA certified.
RedHat II meets applicable CE directives.
Refer to Engineering Section for details.

ATEX/IECEx certified with prefix "EV" as listed. *Refer to Optional Features Electrical Section for details.*

Specifications (English units)

Pipe Size (in)	Orifice Size (in)	Cv Flow Factor	Operating Pressure Differential (psi)							Max. Fluid Temp. °F		Brass Body			Stainless Steel Body			Watt Rating/ Class of Coil Insulation ⑦	
			Min.	Max. AC			Max. DC												
				Air-Inert Gas	Water	Light Oil @ 300 SSU	Air-Inert Gas	Water	Light Oil @ 300 SSU	AC	DC	Catalog Number	Const. Ref. ④	UL ⑤ Listing	Catalog Number	Const. Ref. ④	UL ⑤ Listing	AC	DC
NORMALLY CLOSED (Closed when de-energized), NBR or PTFE ② Seating																			
3/8	3/8	1.5	①	150	125	-	40	40	-	180	150	8210G073 ③	1P	●	8210G036 ③	1P	●	6.1/F	11.6/F
3/8	5/8	3	0	150	150	-	40	40	-	180	150	8210G093	5D	❍	-	-	-	10.1/F	11.6/F
3/8	5/8	3	5	200	150	135	125	100	100	180	150	8210G001 ▼	6D	❍	-	-	-	6.1/F	11.6/F
3/8	5/8	3	5	300	300	300	-	-	-	175	-	8210G006 ✓	5D	❍	-	-	-	17.1/F	-
1/2	7/16	2.2	①	150	125	-	40	40	-	180	150	8210G015 ③	2P	●	8210G037 ③	2P	●	6.1/F	11.6/F
1/2	5/8	4	0	150	150	-	40	40	-	180	150	8210G094 ✓♦	5D	❍	-	-	-	10.1/F	11.6/F
1/2	5/8	4	0	150	150	125	40	40	-	175	150	-	-	-	8210G087 ✓	7D	●	17.1/F	11.6/F
1/2	5/8	4	5	200	150	135	125	100	100	180	150	8210G002 ▼♦	6D	❍	-	-	-	6.1/F	11.6/F
1/2	5/8	4	5	300	300	300	-	-	-	175	-	8210G007	5D	❍	-	-	-	17.1/F	-
1/2	3/4	4	5	-	300	-	-	300	-	130	90	8210G227	5D	❍ †	-	-	-	17.1/F	40.6/H
3/4	5/8	4.5	0	150	150	125	40	40	-	175	150	-	-	-	8210G088 ✓	7D	●	17.1/F	11.6/F
3/4	3/4	5	5	125	125	125	100	90	75	180	150	8210G009 ▼♦	9D	❍	-	-	-	6.1/F	11.6/F
3/4	3/4	5	0	150	150	-	40	40	-	180	150	8210G095 ✓♦	8D	❍	-	-	-	10.1/F	11.6/F
3/4	3/4	6.5	5	250	150	100	125	125	125	180	150	8210G003 ▼	11D	❍	-	-	-	6.1/F	11.6/F
3/4	3/4	6	0	350	300	200	200	200	200	200	180	8210G026 ② ‡ ◆	40P/10D	●	-	-	-	16.1F	30.8/F
1	1	13	0	150	125	125	135	120	120	180	180	8210G054 ‡ ◆	41D/31D	●	8210G089 ‡ ◆	45D/15D	●	16.1/F	30.8/F
1	1	13	5	150	150	100	125	125	125	180	150	8210G004 ▼♦	12D	❍	-	-	-	6.1/F	11.6/F
1	1	13.5	0	300	225	115	-	-	-	200	-	8210G027 ‡	42P	●	-	-	-	20.1/F	-
1	1	13.5	10	300	300	300	-	-	-	175	-	8210G078 ②	13P	-	-	-	-	17.1/F	-
1 1/4	1 1/8	15	0	150	125	125	135	120	120	180	180	8210G055 ‡ ◆	43D/32D	●	-	-	-	16.1/F	30.8/F
1 1/4	1 1/8	15	5	150	150	100	125	125	125	180	150	8210G008 ▼	16D	❍	-	-	-	6.1/F	11.6/F
1 1/2	1 1/4	22.5	0	150	125	125	135	120	120	180	180	8210G056 ‡ ◆	44D/33D	●	-	-	-	16.1/F	30.8/F
1 1/2	1 1/4	22.5	5	150	150	100	125	125	125	180	150	8210G022 ▼	18D	❍	8210G127	-	-	6.1/F	11.6/H
2	1 3/4	43	5	150	125	90	50	50	50	180	150	8210G100	20P	●	8210G129	-	-	6.1/F	11.6/H
2 1/2	1 3/4	45	5	150	125	90	50	50	50	180	150	8210G101	21P	●	-	-	-	6.1/F	11.6/F
NORMALLY OPEN (Open when de-energized), NBR Seating (PA Disc-Holder, except as noted)																			
3/8	5/8	3	0	150	150	125	125	125	80	180	150	8210G033	23D	●	-	-	-	10.1/F	11.6/F
3/8	5/8	3	5	250	200	200	250	200	200	180	180	8210G011 ⑧ ⑨	39D	●	-	-	-	10.1/F	11.6/F
~~1/2~~	~~5/8~~	~~4~~	~~0~~	~~150~~	~~150~~	~~125~~	~~125~~	~~125~~	~~80~~	~~180~~	~~150~~	~~8210G034 ✓~~	~~23D~~	~~●~~				~~10.1/F~~	~~11.6/F~~
1/2	5/8	3	0	150	150	100	125	125	80	180	150	-	-	-	8210G030 ✓	37D	●	10.1/F	11.6/F
~~1/2~~	~~5/8~~	~~4~~	~~5~~	~~250~~	~~200~~	~~200~~	~~250~~	~~200~~	~~200~~	~~180~~	~~180~~	~~8210G012 ⑧ ⑨~~	~~39D~~	~~●~~	-	-	-	~~10.1/F~~	~~11.6/F~~
3/4	3/4	5.5	0	150	150	125	125	125	80	180	150	8210G035 ✓	25D	●	-	-	-	10.1/F	11.6/F
3/4	5/8	3	0	150	150	100	125	125	80	180	150	-	-	-	8210G038 ✓	38D	●	10.1/F	11.6/F
3/4	3/4	6.5	5	-	-	-	250	200	200	-	180	8210C013	24D	●	-	-	-	-	16.8/F
3/4	3/4	6.5	5	250	200	200	-	-	-	180	-	8210G013	46D	●	-	-	●	16.1/F	-
1	1	13	0	125	125	125	-	-	-	180	-	8210B057 ⑥ ⑩	34D	●	-	-	-	20/F	-
1	1	13	5	-	-	-	125	125	125	-	180	8210D014	26D	●	-	-	●	-	16.8/F
1	1	13	5	150	150	125	-	-	-	180	-	8210G014	47D	●	-	-	-	16.1/F	-
1 1/4	1 1/8	15	0	125	125	125	-	-	-	180	-	8210B058 ⑥ ⑩	35D	●	-	-	-	20/F	-
1 1/4	1 1/8	15	5	-	-	-	125	125	125	-	180	8210D018	28D	●	-	-	-	-	16.8/F
1 1/4	1 1/8	15	5	150	150	125	-	-	-	180	-	8210G018	48D	●	-	-	●	16.1/F	-
1 1/2	1 1/4	22.5	0	125	125	125	-	-	-	180	-	8210B059 ⑥ ⑩	36D	●	-	-	-	20/F	-
1 1/2	1 1/4	22.5	5	-	-	-	125	125	125	-	180	8210D032	29D	●	-	-	●	-	16.8/F
1 1/2	1 1/4	22.5	5	150	150	125	-	-	-	180	-	8210G032	49D	●	8210G132	-	-	16.1/F	-
2	1 3/4	43	5	-	-	-	125	125	125	-	150	8210 103	30P	●	-	-	●	-	16.8/F
2	1 3/4	43	5	125	125	125	-	-	-	180	-	8210G103	50P	●	8210G133	-	-	16.1/F	-
2 1/2	1 3/4	45	5	-	-	-	125	125	125	-	150	8210 104	27P	●	-	-	-	-	16.8/F
2 1/2	1 3/4	45	5	125	125	125	-	-	-	180	-	8210G104	51P	●	-	-	●	16.1/F	-

① 5 psi on Air; 1 psi on Water.
② Valve provided with PTFE main disc.
③ Valve includes Ultem (G.E. trademark) piston.
④ Letter "D" = diaphragm construction; "P"= piston construction.
⑤ ❍ Safety Shutoff Valve; ● General Purpose Valve. *Refer to Engineering Section (Approvals) for details.*
⑥ Valves not available with Explosionproof enclosures.
⑦ On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts.
⑧ AC construction also has PA seating.
⑨ No disc-holder.
⑩ Stainless steel disc-holder.
† UL listed for fire protection systems per UL429A 120/60, 110/5024VDC, no prefix and voltage options offered.
‡ DC constructions must have solenoid mounted vertical and upright.
✓ ATEX/IECEx certified with prefix "EV".
▼ ATEX/IECEx certified for DC only with prefix "EV".
◆ Not available in 6 Volt DC. EF and HB prefix only.
♦ Valve available with lead-free brass body and bonnet using suffix "LF". The term "Lead-Free" for brass materials is defined by SDWA 1417 as having a maximum weighted average lead content of 0.25% on the wetted surface area.

Specifications (Metric units)

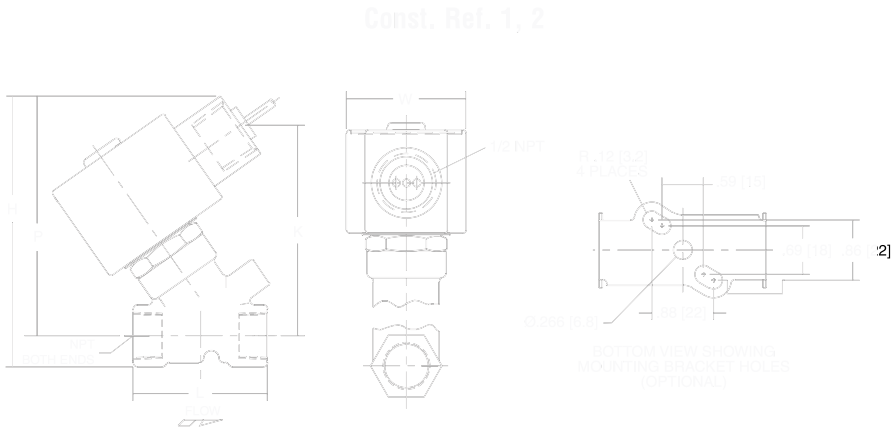
Pipe Size (in)	Orifice Size (mm)	Kv Flow Factor (m^3/hr)	Operating Pressure Differential (bar)							Max. Fluid Temp. °C		Brass Body			Stainless Steel Body			Watt Rating/ Class of Coil Insulation ⑦	
				Max. AC			Max. DC												
			Min.	Air-Inert Gas	Water	Light Oil @ 300 SSU	Air-Inert Gas	Water	Light Oil @ 300 SSU	AC	DC	Catalog Number	Const. Ref. ④	UL ⑤ Listing	Catalog Number	Const. Ref. ④	UL ⑤ Listing	AC	DC
NORMALLY CLOSED (Closed when de-energized), NBR or PTFE ② Seating																			
3/8	10	1.3	①	10	9	-	3	3	-	82	65	8210G073 ③	1P	●	8210G036 ③	1P	●	6.1/F	11.6/F
3/8	16	2.6	0	10	10	-	3	3	-	82	65	8210G093	5D	❍	-	-	-	10.1/F	11.6/F
3/8	16	2.6	0.3	14	10	9	9	7	7	82	65	8210G001 ▼	6D	❍	-	-	-	6.1/F	11.6/F
3/8	16	2.6	0.3	21	21	21	-	-	-	79	-	8210G006 ✓	5D	❍	-	-	-	17.1/F	-
1/2	11	1.9	①	10	9	-	3	3	-	82	65	8210G015 ③	2P	●	8210G037 ③	2P	●	6.1/F	11.6/F
1/2	16	3.4	0	10	10	-	3	3	-	82	65	8210G094 ✓💧	5D	❍	-	-	-	10.1/F	11.6/F
1/2	16	3.4	0	10	10	9	3	3	-	79	65	-	-	-	8210G087 ✓	7D	●	17.1/F	11.6/F
1/2	16	3.4	0.3	14	10	9	9	7	7	82	65	8210G002 ▼💧	6D	❍	-	-	-	6.1/F	11.6/F
1/2	16	3.4	0.3	21	21	21	-	-	-	79	-	8210G007	5D	❍	-	-	-	17.1/F	-
1/2	19	3.4	0.3	-	21	-	-	21	-	54	32	8210G227	5D	❍ †	-	-	-	17.1/F	40.6H
3/4	16	3.9	0	10	10	9	3	3	-	79	65	-	-	-	8210G088 ✓	7D	●	17.1/F	11.6/F
3/4	19	4.3	0.3	9	9	9	7	6	5	82	65	8210G009 ▼💧	9D	❍	-	-	-	6.1/F	11.6/F
3/4	19	4.3	0	10	10	-	3	3	-	82	65	8210G095 ✓💧	8D	❍	-	-	-	10.1/F	11.6/F
3/4	19	5.6	0.3	17	10	7	9	9	9	82	65	8210G003 ▼	11D	❍	-	-	-	6.1/F	11.6/F
3/4	19	5.1	0	24	21	14	14	14	14	93	82	8210G026 ② ‡ ◆	40P/10D	●	-	-	-	16.1F	30.8/F
1	25	11	0	10	9	9	9	8	8	82	82	8210G054 ‡ ◆	41D/31D	●	8210G089 ‡ ◆	45D/15D	●	16.1/F	30.8/F
1	25	11	0.3	10	10	7	9	9	9	82	65	8210G004 ▼💧	12D	❍	-	-	-	6.1/F	11.6/F
1	25	11.5	0	21	16	8	-	-	-	93	-	8210G027 ‡	42P	●	-	-	-	20.1/F	-
1	25	11.5	0.7	21	21	21	-	-	-	79	-	8210G078 ②	13P	-	-	-	-	17.1/F	-
1 1/4	29	13	0	10	9	9	9	8	8	82	82	8210G055 ‡ ◆	43D/32D	●	-	-	-	16.1/F	30.8/F
1 1/4	29	13	0.3	10	10	7	9	9	9	82	65	8210G008 ▼	16D	❍	-	-	-	6.1/F	11.6/F
1 1/2	32	19.5	0	10	9	9	9	8	8	82	82	8210G056 ‡ ◆	44D/33D	●	-	-	-	16.1/F	30.8/F
1 1/2	32	19.5	0.3	10	10	7	9	9	9	82	65	8210G022 ▼	18D	❍	8210G127	-	-	6.1/F	11.6/H
2	44	37	0.3	10	9	6	3	3	3	82	65	8210G100	20P	●	8210G129	-	-	6.1/F	11.6H
2 1/2	44	39	0.3	10	9	6	3	3	3	82	65	8210G101	21P	●	-	-	-	6.1/F	11.6/F
NORMALLY OPEN (Open when de-energized), NBR Seating (PA Disc-Holder, except as noted)																			
3/8	16	2.6	0.0	10	10	9	9	9	6	82	65	8210G033	23D	●	-	-	-	10.1/F	11.6/F
3/8	16	2.6	0.3	17	14	14	17	14	14	82	82	8210G011 ⑧ ⑨	39D	●	-	-	-	10.1/F	11.6/F
~~1/2~~	~~16~~	~~3.4~~	~~0~~	~~10~~	~~10~~	~~9~~	~~9~~	~~9~~	~~6~~	~~82~~	~~65~~	~~8210G034 ✓~~	~~23D~~	~~●~~	~~-~~	~~-~~	~~-~~	~~10.1/F~~	~~11.6/F~~
1/2	16	2.6	0	10	10	7	9	9	6	82	65	-	-	-	8210G030 ✓	37D	●	10.1/F	11.6/F
~~1/2~~	~~16~~	~~3.4~~	~~0.3~~	~~17~~	~~14~~	~~14~~	~~17~~	~~14~~	~~14~~	~~82~~	~~82~~	~~8210G012 ⑧ ⑨~~	~~39D~~	~~●~~	~~-~~	~~-~~	~~-~~	~~10.1/F~~	~~11.6/F~~
3/4	19	4.7	0	10	10	9	9	9	6	82	65	8210G035 ✓	25D	●	-	-	-	10.1/F	11.6/F
3/4	16	2.6	0	10	10	7	9	9	6	82	65	-	-	-	8210G038 ✓	38D	●	10.1/F	11.6/F
3/4	19	5.6	0.3	-	-	-	17	14	14	-	82	8210C013	24D	●	-	-	-	-	16.8/F
3/4	19	5.6	0.3	17	14	14	-	-	-	82	-	8210G013	46D	●	-	-	●	16.1/F	-
1	25	11	0	9	9	9	-	-	-	82	-	8210B057 ⑥ ⑩	34D	●	-	-	-	20/F	-
1	25	11	0.3	-	-	-	9	9	9	-	82	8210D014	26D	●	-	-	●	-	16.8/F
1	25	11	0.3	10	10	9	-	-	-	82	-	8210G014	47D	●	-	-	-	16.1/F	-
1 1/4	29	13	0	9	9	9	-	-	-	82	-	8210B058 ⑥ ⑩	35D	●	-	-	-	20/F	-
1 1/4	29	13	0.3	-	-	-	9	9	9	-	82	8210D018	28D	●	-	-	-	-	16.8/F
1 1/4	29	13	0.3	10	10	9	-	-	-	82	-	8210G018	48D	●	-	-	●	16.1/F	-
1 1/2	32	19.5	0	9	9	9	-	-	-	82	-	8210B059 ⑥ ⑩	36D	●	-	-	-	20/F	-
1 1/2	32	19.5	0.3	-	-	-	9	9	9	-	82	8210D032	29D	●	-	-	●	-	16.8/F
1 1/2	32	19.5	0.3	10	10	9	-	-	-	82	-	8210G032	49D	●	8210G132	-	-	16.1/F	-
2	44	37	0.3	-	-	-	9	9	9	-	65	8210 103	30P	●	-	-	●	-	16.8/F
2	44	37	0.3	9	9	9	-	-	-	82	-	8210G103	50P	●	8210G133	-	-	16.1/F	-
2 1/2	44	39	0.3	-	-	-	9	9	9	-	65	8210 104	27P	●	-	-	-	-	16.8/F
2 1/2	44	39	0.3	9	9	9	-	-	-	82	-	8210G104	51P	●	-	-	●	16.1/F	-

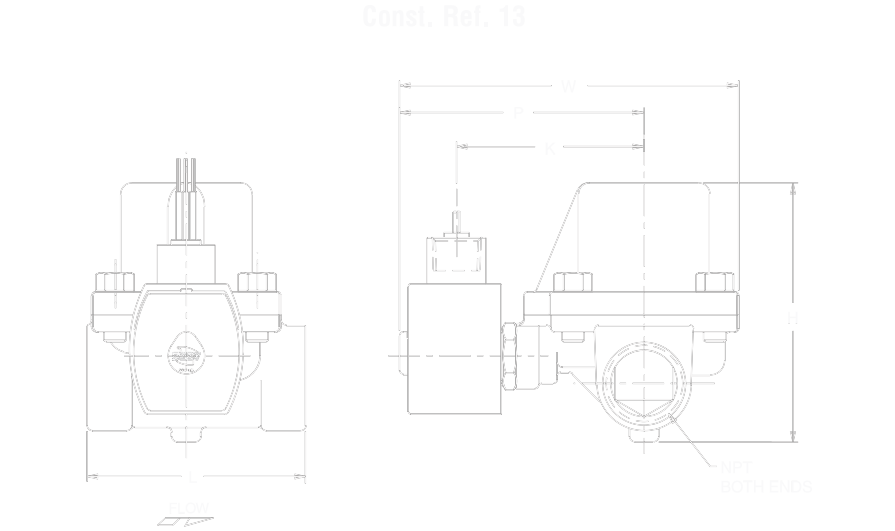
① 0.3 bar on Air; 0.0 bar on Water.
② Valve provided with PTFE main disc.
③ Valve includes Ultem (G.E. trademark) piston.
④ Letter "D" = diaphragm construction; "P"= piston construction.
⑤ ❍ Safety Shutoff Valve; ● General Purpose Valve.
Refer to Engineering Section (Approvals) for details.
⑥ Valves not available with Explosionproof enclosures.
⑦ On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts.
⑧ AC construction also has PA seating.
⑨ No disc-holder.
⑩ Stainless steel disc-holder.
† UL listed for fire protection systems per UL429A 120/60, 110/5024VDC, no prefix and voltage options offered.
‡ DC constructions must have solenoid mounted vertical and upright.
✓ ATEX/IECEx certified with prefix "EV".
▼ ATEX/IECEx certified for DC only with prefix "EV".
◆ Not available in 6 Volt DC. EF and HB prefix only.
💧 Valve available with lead-free brass body and bonnet using suffix "LF". The term "Lead-Free" for brass materials is defined by SDWA 1417 as having a maximum weighted average lead content of 0.25% on the wetted surface area.

Dimensions: inches (mm)

Const. Ref.		H	K	L	P	W
1*	in	3.85	3.00	1.91	3.41	1.69
	mm	98	76	49	87	43
2*	in	4.17	3.25	2.28	3.63	1.69
	mm	106	83	58	92	43
5	in	3.84	2.31	2.75	3.28	2.28
	mm	98	59	70	83	58
6*	in	3.38	1.94	2.75	2.80	2.28
	mm	86	49	70	71	58
7	in	4.19	2.50	2.81	3.47	2.39
	mm	106	64	71	88	61
8	in	4.13	2.47	2.81	3.44	2.29
	mm	105	63	71	87	58
9*	in	3.66	2.10	2.81	2.96	2.28
	mm	93	53	71	75	58
10*	in	5.20	3.40	2.80	4.50	2.50
	mm	131	86	71	114	62
11*	in	4.16	2.66	3.84	3.52	2.75
	mm	106	68	98	89	70
12	in	5.64	3.15	3.75	4.01	3.36
	mm	143	80	95	102	85
13	in	4.44	3.22	3.75	4.19	5.81
	mm	113	82	95	106	147
15*	in	5.20	3.30	3.80	4.40	3.80
	mm	133	83	98	111	98
16	in	5.64	3.15	3.66	4.01	3.56
	mm	143	80	93	102	90
18*	in	6.11	3.30	4.38	4.16	3.92
	mm	155	84	111	106	100
20*	in	7.33	3.71	5.06	4.57	4.87
	mm	186	94	129	116	124
21*	in	7.33	3.71	5.50	4.57	4.87
	mm	186	94	140	116	124
23	in	4.35	2.65	2.75	3.79	2.28
	mm	110	67	70	96	58
24	in	5.06	X	3.78	4.44	2.75
	mm	129	X	96	113	70
25	in	4.64	2.81	2.81	3.94	2.28
	mm	118	71	71	100	58
26	in	6.53	X	3.75	4.91	3.19
	mm	166	X	95	125	81
27	in	8.22	X	5.50	5.47	4.87
	mm	209	X	140	139	124
28	in	6.53	X	3.66	4.91	3.19
	mm	166	X	93	125	81
29	in	7.03	X	4.38	5.06	4.40
	mm	179	X	111	129	112

* DC dimensions slightly larger.
IMPORTANT: Valves may be mounted in any position, except as noted in specifications table.





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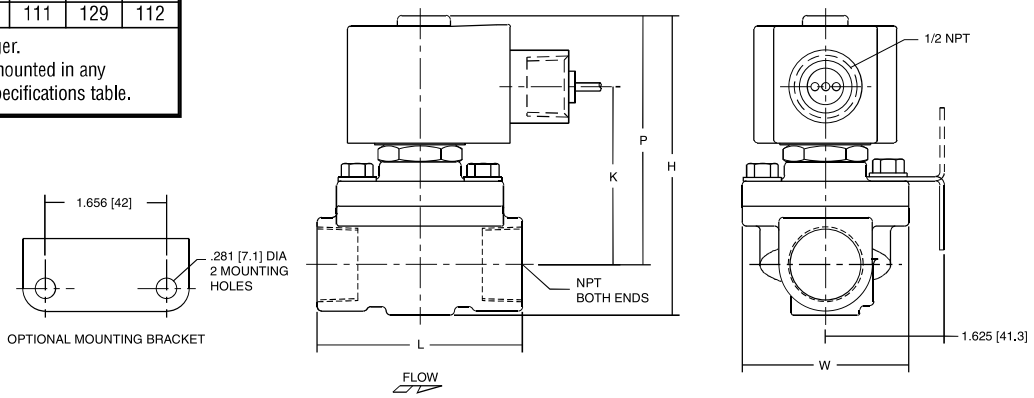
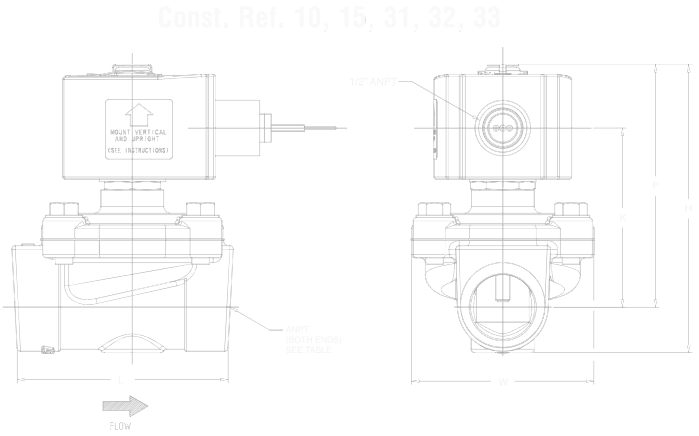
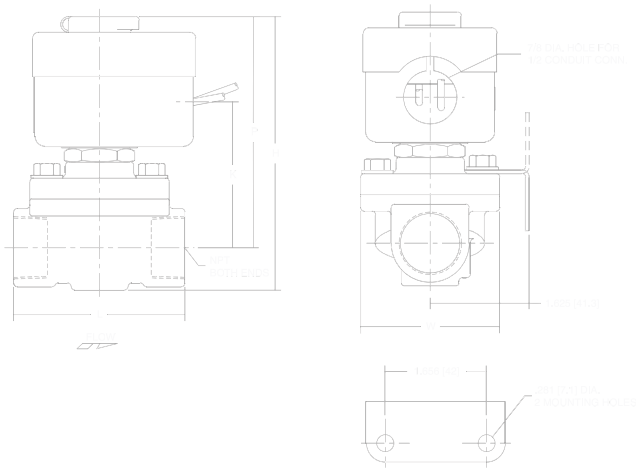


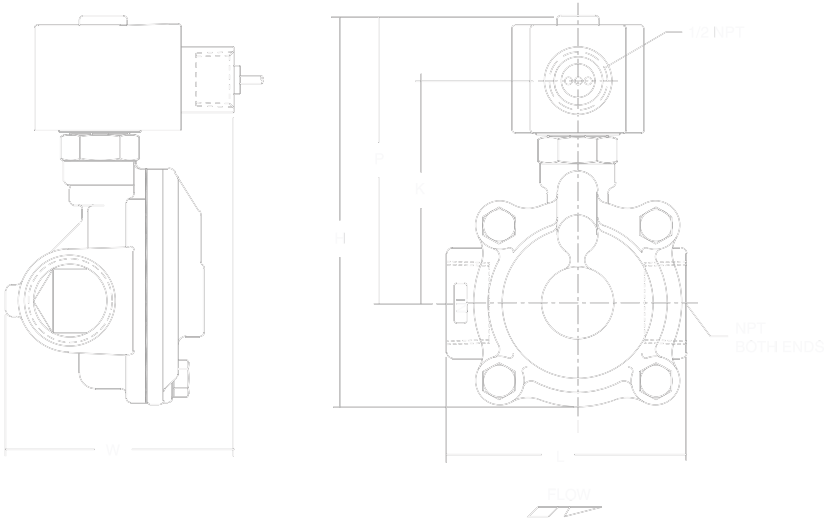
Dimensions: inches (mm)

Const. Ref.		H	K	L	P	W
30	in	8.22	X	5.06	5.47	4.87
	mm	209	X	129	139	124
31	in	5.13	3.19	3.76	4.32	3.27
	mm	130	81	95	110	83
32	in	5.60	3.44	3.66	4.57	3.27
	mm	142	87	93	116	83
33	in	5.92	3.66	4.51	4.80	3.89
	mm	150	93	115	122	99
34	in	6.91	X	3.75	6.09	3.25
	mm	176	X	95	155	83
35	in	7.34	X	3.66	6.34	3.25
	mm	186	X	93	161	83
36	in	7.66	X	4.38	6.56	3.91
	mm	1.95	X	111	167	99
37	in	4.61	2.75	2.81	3.89	2.39
	mm	117	70	71	99	61
38	in	4.61	2.75	2.81	3.89	2.39
	mm	117	70	71	99	61
39	in	5.42	2.31	2.75	4.86	3.80
	mm	138	59	70	123	97
40	in	5.20	3.29	2.81	4.50	2.28
	mm	132	83	71	114	58
41	in	5.13	3.10	3.75	4.32	3.25
	mm	130	79	95	110	83
42	in	6.43	4.40	3.93	5.62	3.25
	mm	163	112	100	143	83
43	in	5.57	3.35	3.66	4.57	3.25
	mm	142	85	93	116	83
44	in	5.90	3.57	4.38	4.79	3.91
	mm	150	91	111	122	99
45	in	5.26	3.17	3.75	4.38	3.84
	mm	134	81	95	111	98
46	in	4.95	3.10	3.84	4.31	2.75
	mm	126	79	98	110	70
47	in	6.43	3.59	3.75	4.81	3.52
	mm	163	91	95	122	90
48	in	6.43	3.59	3.66	4.81	3.73
	mm	163	91	93	122	95
49	in	6.91	3.75	4.38	4.96	4.40
	mm	176	95	111	126	112
50	in	8.13	4.15	5.06	5.37	4.87
	mm	207	105	129	136	124
51	in	8.13	4.15	5.50	5.37	5.18
	mm	207	105	140	136	132

IMPORTANT: Valves may be mounted in any position, except as noted in specifications table.

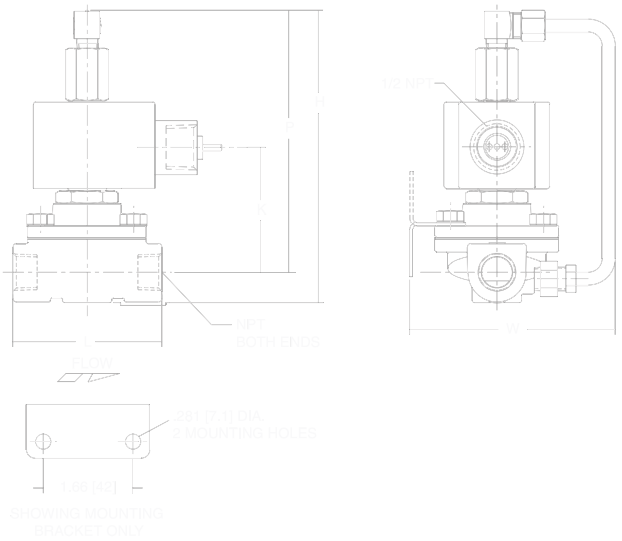






Dimensions: inches (mm)

Const. Ref. 39



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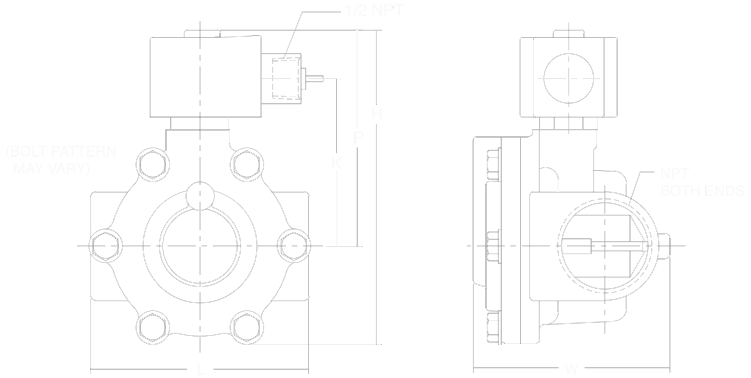

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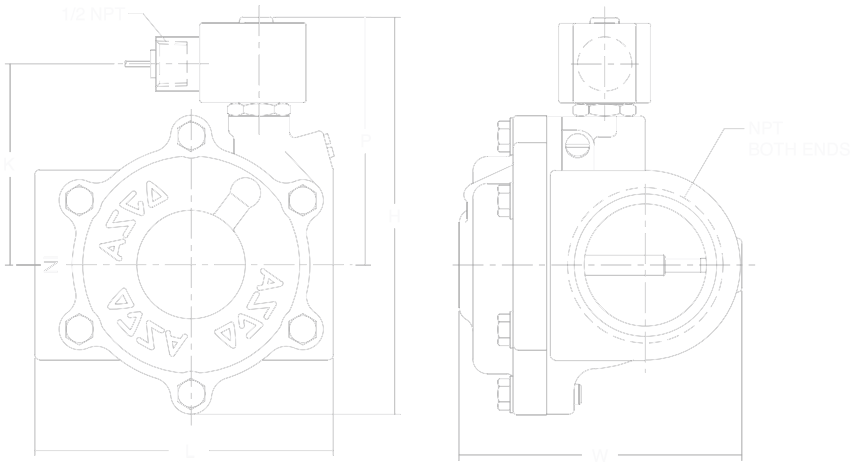


VB Series

True Union Blocking Ball Valve

Material: PVC, CPVC, PP, PVDF
Size: ½″ - 4″
Pressure Rating: 230 psi ½″ - 2″; 150 psi 2 ½″ - 4″
Seats: PTFE
Seals: EPDM or VITON
Connections: IPS Socket
Metric Socket
NPT Threaded
ANSI 150 Flanged
Metric Butt Fusion

ISO 9002 CERTIFIED

Engineering Guide Specification

Materials of Construction:

PVC: Type 1, Class 12454B per ASTM D1784
CPVC: Type 4, Class 23447 per ASTM D1970
PP: Class PP 110B76383 per ASTM D4101
PVDF: Type 1 per ASTM D3222
Seals: EPDM or Viton
Seats: PTFE

Guide Specification: All ball valves constructed of the materials indicated. Valves shall be manufactured with an adjustable carrier, threaded into the body to ensure the valve is blocking in both directions. Valve stem shall be a safety shear stem with double O-ring seals. Body shall have unions on both ends and handle shall incorporate a spanner for adjusting and removing the carrier, teflon seat shall be energized by O-ring, ball shall be machined and tumbled to ensure roundness, as manufactured by SIMTECH.

Special Features

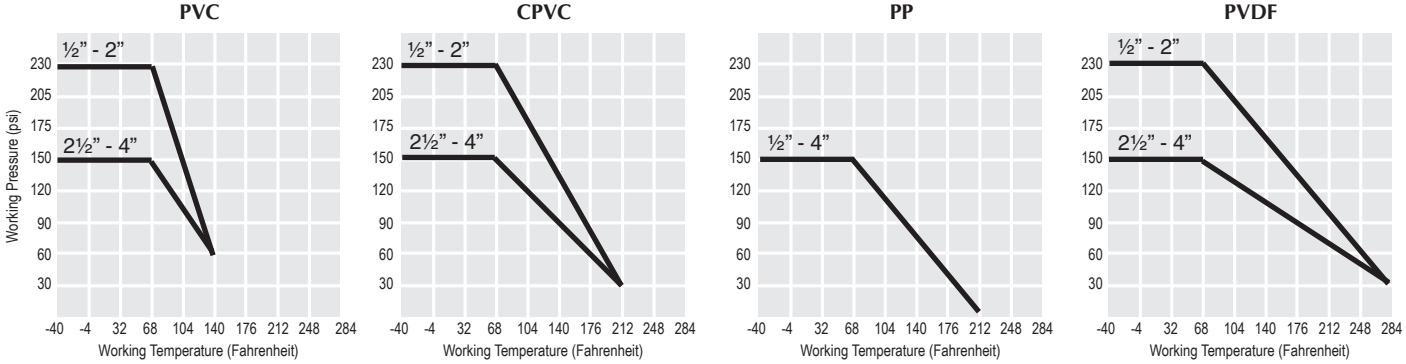
- Full port
- Bidirectional flow
- Low maintenance and extended operational life
- Handle equipped as a spanner device to adjust carrier
- Teflon seat energized by O-ring
- Ball machined and tumbled to ensure roundness
- Special mounting pads are molded on body for actuator mounting or valve anchoring
- Blowout proof stem
- Safety shear stem design
- Double O-Ring Seal on Stem

Flow Rate in Gallons Per Minute

ND	½	¾	1	1¼	1½	2	2½	3	4
Bore Size	.512	.709	.910	1.18	1.50	1.89	2.36	2.72	3.94
C_v	12.5	28	50.9	81	150	230	360	485	768

Cv is the number of gallons per minute of water at a temperature of 68°F that will flow through a valve with a 1 psi pressure differential at a specified travel.

Pressure/Temperature Graph: Working PSI/Fahrenheit



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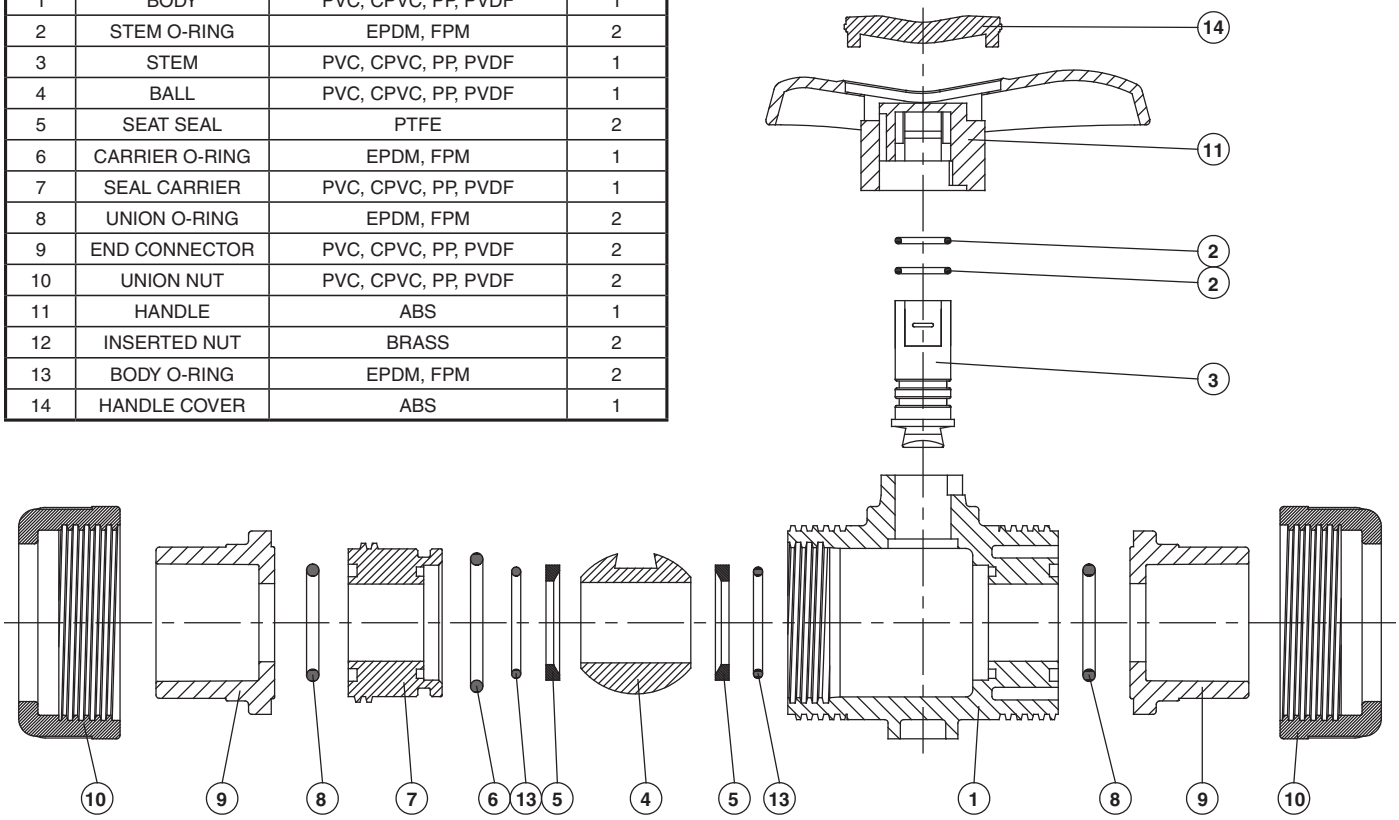
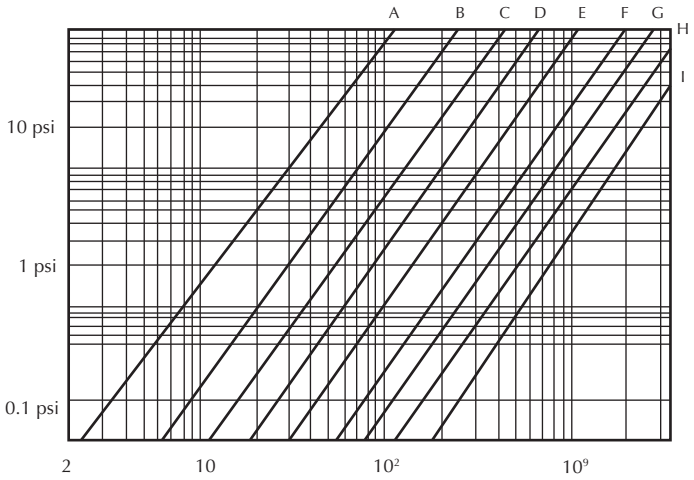
VB Series

Parts Listing

NO.	PART	MATERIAL	QTY
1	BODY	PVC, CPVC, PP, PVDF	1
2	STEM O-RING	EPDM, FPM	2
3	STEM	PVC, CPVC, PP, PVDF	1
4	BALL	PVC, CPVC, PP, PVDF	1
5	SEAT SEAL	PTFE	2
6	CARRIER O-RING	EPDM, FPM	1
7	SEAL CARRIER	PVC, CPVC, PP, PVDF	1
8	UNION O-RING	EPDM, FPM	2
9	END CONNECTOR	PVC, CPVC, PP, PVDF	2
10	UNION NUT	PVC, CPVC, PP, PVDF	2
11	HANDLE	ABS	1
12	INSERTED NUT	BRASS	2
13	BODY O-RING	EPDM, FPM	2
14	HANDLE COVER	ABS	1



Pressure Loss—Flow Diagram



A = 1/2″
B = 3/4″
C = 1″
D = 1 1/4″
E = 1 1/2″
F = 2″
G = 2 1/2″
H = 3″
I = 4″

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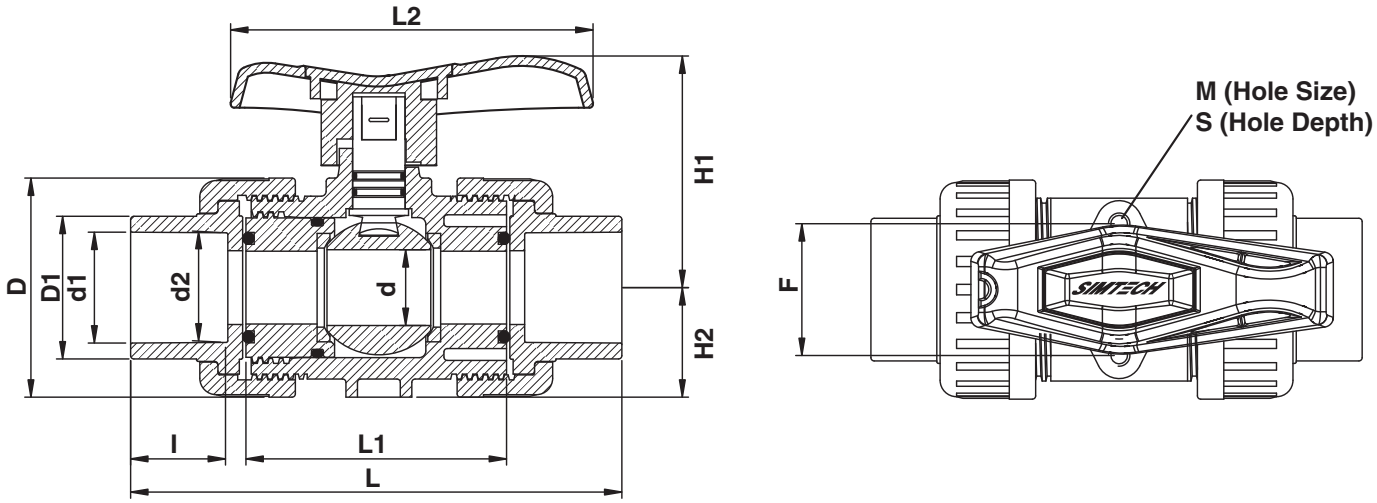
VB Series

Dimensional Data - True Union

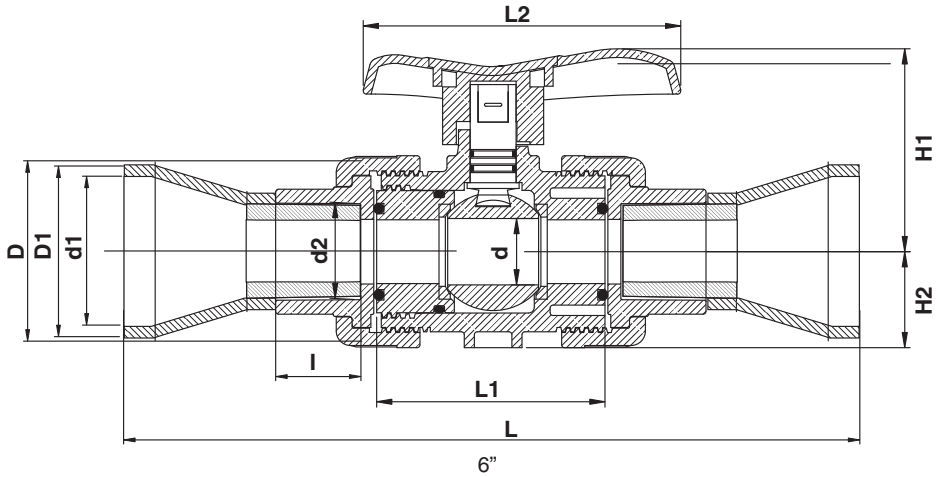
Nom.	PVC & CPVC				PP & PVDF												
Size	I	d1	d2	L	I	d1	d2	L	D	D1	L1	L2	H1	H2	F	M	S
½"	0.87	0.85	0.84	4.49	0.58	0.76	0.75	4.27	1.82	1.19	2.36	3.03	1.81	0.83	1.18	0.20	0.28
¾"	1.00	1.06	1.05	5.31	0.64	0.94	0.94	4.87	2.19	1.43	2.87	3.74	2.24	1.02	1.30	0.24	0.31
1"	1.13	1.32	1.31	5.87	0.74	1.23	1.22	5.45	2.62	1.70	3.11	4.33	2.76	1.30	1.57	0.24	0.43
1¼"	1.25	1.67	1.66	6.69	0.85	1.53	1.53	6.10	3.23	2.08	3.46	5.00	2.95	1.54	1.85	0.31	0.43
1½"	1.38	1.91	1.89	6.93	0.96	1.92	1.91	6.10	3.88	2.46	3.74	5.63	3.58	1.61	2.05	0.31	0.43
2"	1.50	2.39	2.37	8.15	1.12	2.44	2.43	7.20	4.72	3.01	4.49	6.46	4.45	2.05	2.76	0.31	0.59
2½"	1.75	2.89	2.87	10.83	1.22	2.90	2.90	9.57	5.51	3.62	5.35	7.09	4.57	2.56	-	-	-
3"	1.88	3.52	3.49	11.97	1.41	3.50	3.50	10.59	6.42	4.25	6.22	8.82	5.12	2.95	-	-	-
4"	2.25	4.52	4.49	13.07	1.63	4.29	4.28	11.30	8.86	5.75	6.93	10.94	7.01	4.06	-	-	-
6" *	2.25	6.63	4.49	26.59	-	-	-	-	8.86	7.63	6.93	10.94	7.01	4.06	-	-	-

*4" Valve Ventured to 6"

* For metric spigot dimensions, contact factory



½" Through 4"



6"

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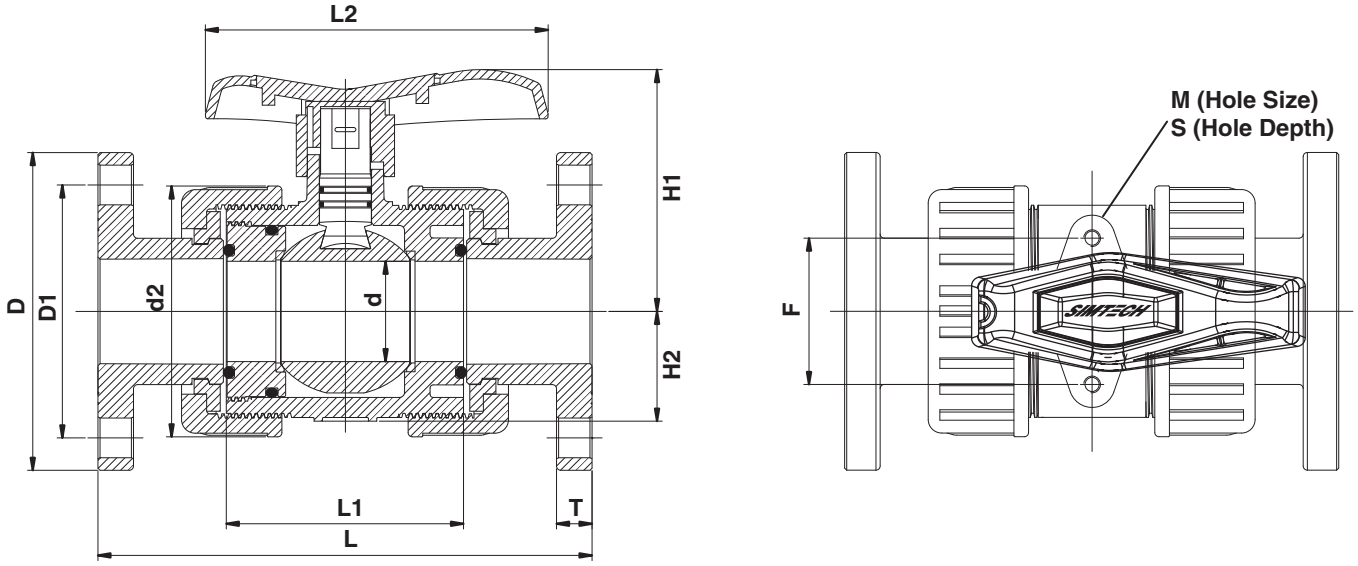
www.SimtechUSA.com

VB Series

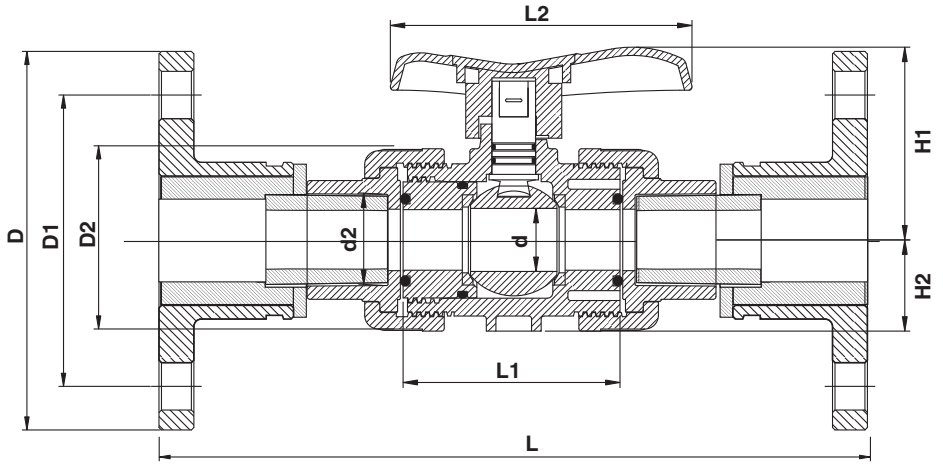
Dimensional Data - Flanged

Nom. Size	PVC & CPVC L	PP & PVDF L	d2	d	D	D1	L1	L2	H1	H2	F	M	S	T	# Holes	Hole Size
½"	5.63	6.20	1.82	0.51	3.50	2.40	2.36	3.03	1.81	0.83	1.18	0.20	0.28	0.51	4	0.63
¾"	6.77	6.82	2.19	0.71	3.86	2.76	2.87	3.74	2.24	1.02	1.30	0.24	0.31	0.59	4	0.63
1"	7.36	7.64	2.62	0.91	4.25	3.11	3.11	4.33	2.76	1.30	1.57	0.24	0.43	0.59	4	0.63
1¼"	7.48	8.54	3.23	1.18	4.61	3.50	3.46	5.00	2.95	1.54	1.85	0.31	0.43	0.63	4	0.63
1½"	8.35	8.90	3.88	1.50	5.00	3.90	3.74	5.63	3.58	1.61	2.05	0.31	0.43	0.67	4	0.63
2"	9.21	10.33	4.72	1.89	5.98	4.76	4.49	6.46	4.45	2.09	2.76	0.31	0.59	0.67	4	0.75
2½"	10.20	12.58	5.51	2.40	7.01	5.51	5.31	7.09	4.57	2.56	-	-	-	0.71	4	0.75
3"	11.97	14.27	6.30	2.72	7.52	5.98	6.14	8.82	5.12	2.95	-	-	-	0.71	4	0.75
4"	14.65	15.20	8.86	3.90	9.02	7.52	6.93	10.94	7.01	4.06	-	-	-	0.71	8	0.75
6"*	22.02	-	8.86	3.90	11.00	9.50	6.93	10.94	7.01	4.06	-	-	-	1.09	8	0.75

*4" Valve Ventured to 6"



½" Through 4"



6"

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www.SimtechUSA.com

SERIES 80

2 PIECE THREADED FULL PORT BALL VALVES

Flow-Tek's Series S80 ball valves have been designed to meet the needs of the chemical, textile and process industries. Standard 2-piece valve bodies are available in stainless steel. Stainless steel bodies are investment cast and solution annealed for the highest quality and added strength. All body castings are marked with a foundry heat number for full traceability.

These quarter turn valves feature a full port design that minimizes pressure drops with smooth flow characteristics.

Other features include low operating torque, adjustable stem packing, blowout proof stems, stainless steel safety latch handles, and optional oval handle.

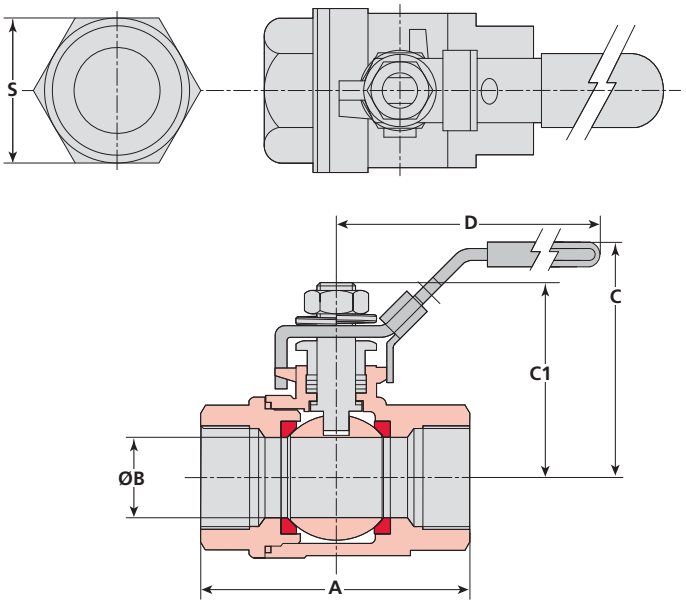
Size	Pressure Rating	Steam Rating	Temperature Range	End Connections	Body Material
¼" to 4" 8mm to 100mm	1000 psi WOG 69 bar	150 psi WSP 10.3 bar	-50°F to +450°F -46°C to +232°C	Threaded - NPT Threaded - BSPT Threaded - BSPP	Stainless Steel

BRAY.COM/FLOW-TEK

Flow-Tek®
Subsidiary of BRAY INTERNATIONAL, Inc.

Dimensions

Size ins mm	A	øB Port	C	C1	D	S	Cv	Weight lbs kg
1/4	2.01	0.46	2.01	1.47	4.13	.83	10	0.507
8	51	11.6	51	37.3	105	21		0.23
3/8	2.01	0.50	1.01	1.48	4.13	.83	12	0.463
10	51	12.7	51	37.5	105	21		0.21
1/2	2.52	0.59	2.09	1.66	4.13	1.00	38	0.617
15	64	15	53	42.2	105	25.5		0.28
3/4	2.91	0.79	2.32	1.95	4.92	1.24	66	1.08
20	74	20	59	49.5	125	31.5		0.49
1	3.37	0.98	2.87	2.26	6.30	1.53	105	1.786
25	85.5	25	73	57.5	160	39		0.81
1¼	3.85	1.26	3.07	2.54	6.30	1.85	190	2.557
32	97.7	32	78	64.5	160	47		1.16
1½	4.13	1.50	3.58	2.75	7.48	2.12	275	4.034
40	105	38	91	70	190	54		1.83
2	4.82	1.97	3.90	3.09	7.48	2.68	480	6.085
50	122.5	50	99	78.5	190	68		2.76
2½	6.30	2.56	5.12	4.53	9.64	3.23	797	11.023
65	160	65	130	115	245	82		5.00
3	7.36	3.15	5.60	4.92	9.64	3.84	1210	16.535
80	187	80	142	125	245	97.5		7.5
4	9.45	3.70	6.89	6.30	12.48	5.12	1400	39.242
100	240	94	175	160	317	130		17.8

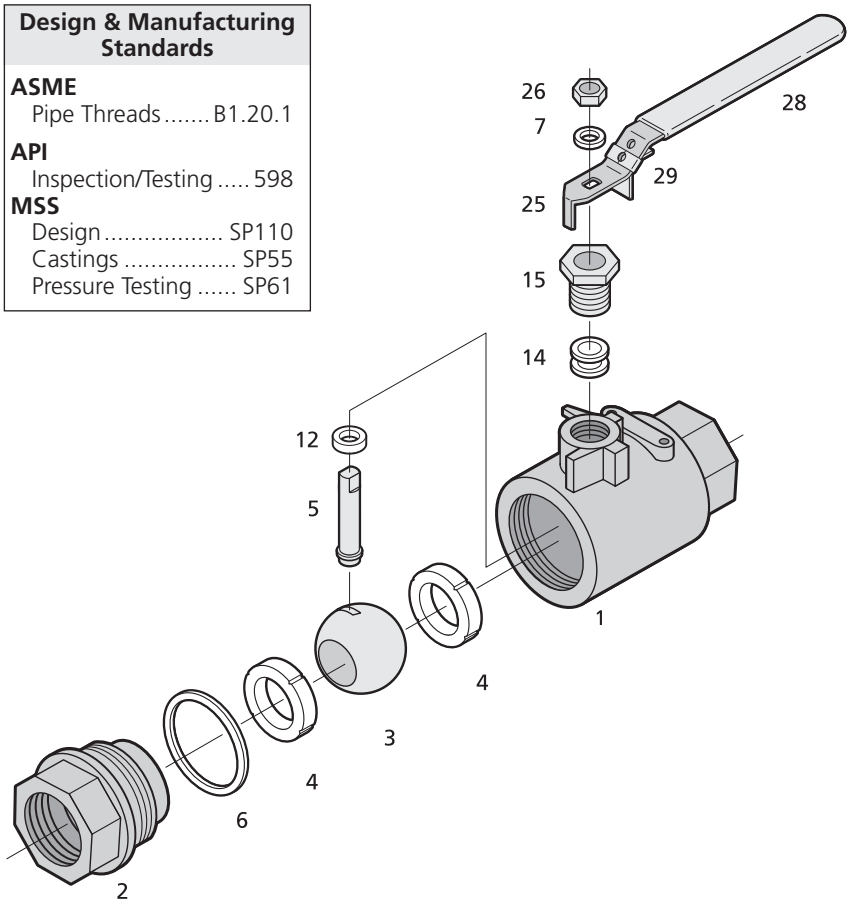


Design & Manufacturing Standards

ASME
Pipe Threads B1.20.1

API
Inspection/Testing 598

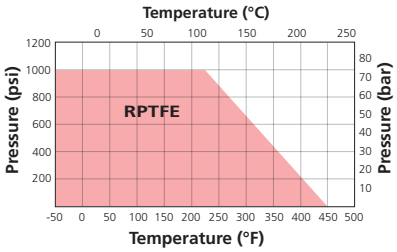
MSS
Design SP110
Castings SP55
Pressure Testing SP61



Components & Materials

Item	Name	Material	Qty.
1	Body	ASTM A351 Gr CF8M	1
2	End Cap	ASTM A351 Gr CF8M	1
3	Ball	SS304/316	1
4	Seat	RPTFE	2
5	Stem	SS304/316	1
6	Body Seal	RPTFE	1
7	Spring Washer	SS304	1
12	Thrust Washer	RPTFE	1
14	Stem Packing	RPTFE	2
15	Gland Nut	SS304	1
25	Handle	SS304	1
26	Handle Nut	SS304	1
28	Handle Sleeve	Vinyl	1
29	Locking Device	SS304	1

Pressure / Temperature



STEAM RATING: 150 psi WSP

Flow-Tek®
Subsidiary of BRAY INTERNATIONAL, Inc.

8323 N. Eldridge Pkwy. #100
Houston, Texas 77041
Tel: 832.912.2300
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BULLETIN 600
FEBRUARY 2014

DeZURIK
APCO | HILTON

APCO CLEAN WATER AIR RELEASE VALVES

Model 50

Model 55

Model 200A

Air Release Valves

Why and Where to Use

An Air Release Valve has a small venting orifice and is used wherever air is entrained in water under pressure. These pockets of air increase the resistance to the flow of water. In critical installations, air can reduce the capacity of a line down to zero. More common is an increased resistance of 10 to 15%. The increased resistance must be overcome by the pump using more power than necessary to move the required amount of water. Such a loss can continue unnoticed for years creating excessive power consumption costs. This is a major reason why all points where air can collect should be equipped with an APCO Air Release Valve.

How to Operate

These valves have much smaller orifices than the Air/Vacuum Valves. Their function is to release small pockets of air which gather at the high points of a system after it is filled and under pressure. The Air Release Valve has the ability to open against internal pressure because it has a small orifice and a leverage mechanism which multiplies the force of the float. This force must be greater than the internal pressure across the orifice in order to open it when a pocket of air needs to be vented. This explains why, as the internal pressure increases, the orifice decreases in size to facilitate the valve opening.

Simple Lever

#50

.5, .75, 1" (15, 20, 25 mm) Inlet

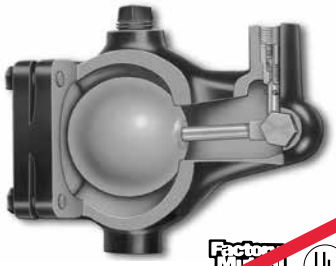
Physical Dimensions

Height - 5.875" (149 mm)

Width - 3.75" (95 mm)

Weight - 6 lbs (3 kg)

Standard pressures up to 175 psi (1207 kpa) and up to 300 psi (2068 kpa) with special orifice.
Specify if operating pressure is below 20 psi (138 kpa).



#55

.5" (15 mm) Inlet

Physical Dimensions

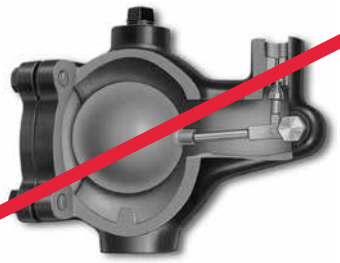
Height - 5" (127 mm)

Length - 6.375" (162 mm)

Width - 3.313" (84 mm)

Weight - 5.5 lbs (2.5 kg)

Standard pressures up to 175 psi (1207 kpa).



#65

.75" (20mm) Inlet

Physical Dimensions

Height - 7" (178 mm)

Length - 8.5" (216 mm)

Width - 4.5" (114 mm)

Weight - 9 lbs (4 kg)

Standard pressures up to 150 psi (1034 kpa).

All APCO Air Release Valves are 100% Hydrostatically factory tested to ANSI/AWWA C512 standards.

APCO Uses Stainless Steel Floats Exclusively

Examine these quality features provided at no extra cost:

1. ASTM quality materials guaranteed throughout
2. Stainless steel floats
3. Conserve pumping power – eliminate restricted high points
4. Create maximum pipeline efficiency

Materials of Construction

Body and Cover - Cast Iron or Ductile Iron

Float - Stainless Steel

Seat - Bronze-Stainless or Buna-N

Needle - Bronze or Stainless Steel

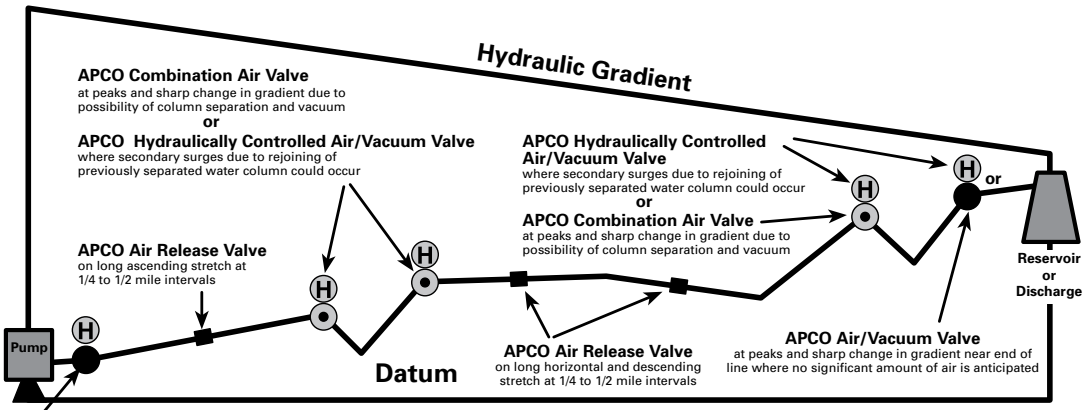
Linkage - Delrin, Bronze or Stainless Steel

Other internal parts – Lever Pins, Retaining Rings, and Screws are Stainless Steel or Bronze.

Note: Great care is taken in the choice of materials to avoid galvanic action. Bronze components meet current lead-free requirments

Where to Install

Typical pipeline and position of necessary APCO air valves



Also install on:
1. **Centrifugal pumps**
2. **Hydropneumatic tanks**
3. **Enclosed systems**
4. **Sewage lines**

- **Air/Vacuum Valve**
- **Air Release Valve**
- **Combination Air Valve**
- **Hydraulically Controlled Air/Vacuum Valve**

Compound Lever

#200A

1", 2" (25, 50 mm) Inlet

Physical Dimensions

Height - 10" (254 mm)

Width - 7" (179 mm)

Weight - 20 lbs (9 kg)

Inlet - 1" or 2" (25, 51mm) pipe thread

Standard pressures up to 150 psi (1034 kpa) and up to 300 psi (2068 kpa) or higher with special orifice.

Concave float is patented.

#200

2" (50 mm) Inlet

Physical Dimensions

Height - 12.5" (318 mm)

Width - 9.5" (241 mm)

Weight - 45 lbs (20 kg)

Inlet - 2" (51mm) pipe thread

Standard pressures up to 150 psi (1034 kpa) and up to 300 psi (2068 kpa) or higher with special orifice.

#205

2" (50 mm) Inlet

Physical Dimensions

Height - 13" (330 mm)

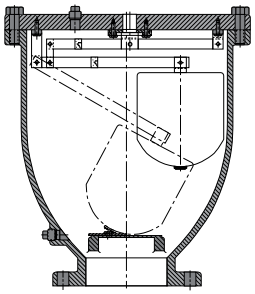
Width - 12" (305 mm)

Weight - 75 lbs (34 kg)

Inlet - 2" (51mm) pipe thread

Flanged inlet available 150 or 300 lb. class

Standard pressures up to 500 psi (3447 kpa) and up to 1500 psi (10342 kpa) with special orifice.



#207

6" (150 mm) Inlet

Physical Dimensions

Height - 28" (711 mm)

Width - 13.5" (343 mm)

Weight - 200 lbs (91 kg)

Inlet - 6" (152 mm) 125# flange

Discharge orifice - 1" (25mm) diameter

HIGH VENTING CAPACITY
Standard pressures up to 150 psi (1034 kpa) and up to 300 psi (2068 kpa) with special orifice.

Higher pressure classes available.

For selection and sizing of all the above air valves, see the Venting Capacity Graph for Air Release Valves on the back page of this bulletin or ask for APCO Air Valve Sizing Software.

Manufactured to AWWA C-512

ISO connections available

Selection

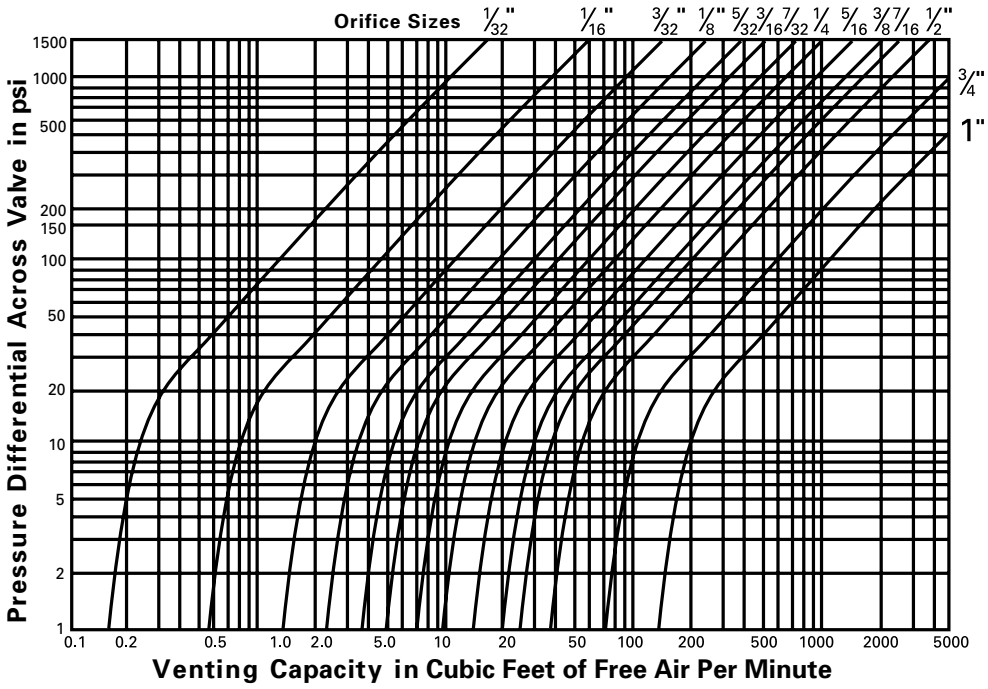
How to select and size an air release valve when a specific venting capacity is required:

A. Enter graph with pressure in system and venting capacity required.

B. Read off nearest orifice diameter to intersection of pressure and capacity lines on graph.

C. Enter table below with orifice diameter and select valve which can use this orifice diameter at the pressure involved.

Venting Capacity Graph for Air Release Valves



Standard orifices on chart are shaded gray

Model	Inlet size	Maximum orifice sizes which can be used with the following pressures - psi/kpa												
		10 69	25 172	50 345	75 517	100 689	125 862	150 1034	200 1379	250 1724	300 2068	500 3447	800 5516	1500 10342
50	.5", .75", 1" 15, 20, 25	.094" 2	.094" 2	.094" 2	.094" 2	.094" 2	.094" 2	.094" 2				—	—	—
55	.5" 15	.094" 2	.094" 2	.094" 2	.094" 2	.094" 2	.094" 2	.094" 2	—	—	—	—	—	—
65	.75"	.219"	.219"	.219"	.219"	.125"	.125"	.125"	—	—	—	—	—	—
200A	1", 2" 25, 50	.313" 8	.313" 8	.313" 8	.25" 6	.188" 5	.188" 5	.188" 5	.156" 4	.156" 4	.156" 4	—	—	—
200	— 50	— 13	— 13	— 13	— 13	— 10	— 10	— 10	— 6	— 6	— 6	—	—	—
205	2" 50	—	—	—	—	.5" 13	.375" 10	.375" 10	.219" 6	.219" 6	.219" 6	.219" 6	.125" 3	—
206	2" 50	—	—	—	—	—	—	—	—	—	—	—	—	.094" 2
207	6" 150	1" 25	1" 25	1" 25	1" 25	1" 25	1" 25	1" 25	.75" 19	.75" 19	.75" 19	—	—	—
400	2", 3", 4" 50, 80, 100	.313" 8	.313" 8	.313" 8	.25" 6	.25" 6	.25" 6	.25" 6	.188" 5	.156" 4	.156" 4	—	—	—
450	2", 3", 4" 50, 80, 100	.5" 13	.5" 13	.5" 13	.5" 13	.5" 13	.5" 13	.5" 13	.438" 11	.438" 11	.438" 11	—	—	—

Inch
Millimeter

Sewage Air Release Valves

Please see Bulletin 400, "APCO Sewage Air Valves Generation II"

Sales and Service

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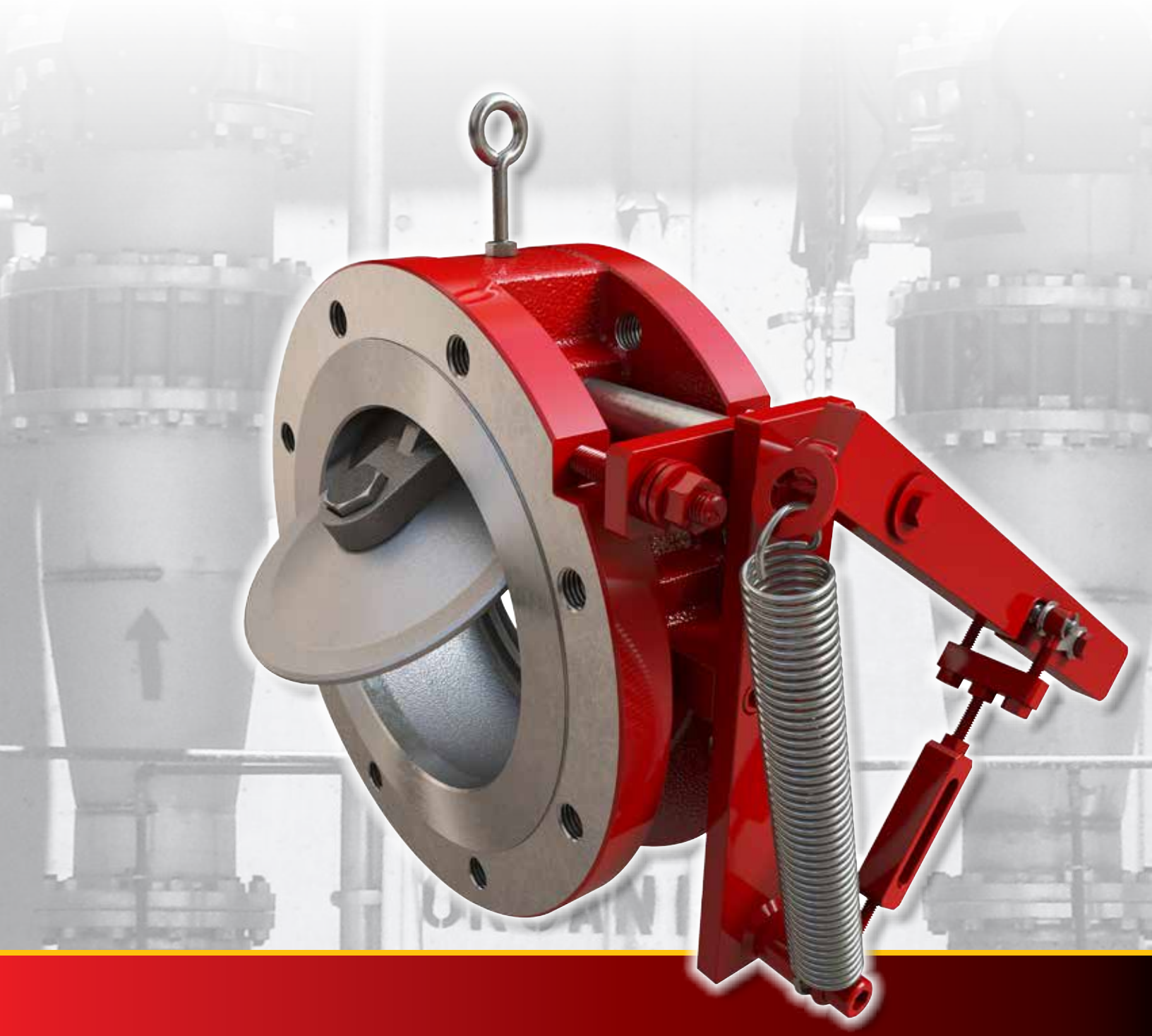
Printed in the U.S.A.

Bray/Rite® Check Valves

1" (25mm) - 60" (1500mm)
ASME Class 125 - 2500



Bray®

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YOUR GLOBAL FLOW CONTROL PARTNER™

Rite Corporation, headquartered in Quebec, Canada and founded in 1963, designs and manufactures exceptional Bray/Rite check valves, cam and groove quick couplings, and fluid handling loading and unloading equipment. For over 40 years, Rite has earned a reputation for reliability. This reputation is based on our highest quality manufacturing standards, premium components and thorough control procedures. With a worldwide sales and distribution network, we offer our customers full support wherever the project location.

Our engineers specialize in innovative, individual solutions to industry needs and will assist you with your project requirements. Our knowledgeable sales and support staff are committed to outstanding service and, above all, customer satisfaction. We look forward to recommending a practical and economical solution to your fluid control applications.

Bray/Rite Valves continue to be the premier wafer combination swing check valve. Designed in 1970, their performance remains unsurpassed. The line offers a wide range of valves and accessories, all fully stocked and readily available. Their successful, long term use in applications worldwide has made the Bray/Rite the industry standard for economy, durability and reliability.

State of the Art Check Valves, Bray/Rite is Rite Sized.

Rite's Bray/Rite wafer combination swing check valves are flow–activated and *Rite Sized*. Bray/Rite inlet ports and disc have been shape optimized to achieve a fully open position at low flow rates (3 ft/s on average). Therefore, the Bray/Rite operates exceptionally well in the flow rates typically found in pipelines containing control valves and lines with varying media flows.

Compare the Bray/Rite to typical full-sized swing check valves. Due in part to their oversized, heavier discs, these valves only fully open at an average flow rate of 11 ft/s. When activated at a lower flow rate, these valves loose true controllability and do not fully open. A partially open disc creates an obstruction that produces a higher pressure drop and fluttering of the valve disc – disturbing the flow and increasing the chance of water hammer.

Bray/Rite is *Rite Sized* to eliminate these problems. It has been engineered to accelerate line media through the valve and achieve a virtually unobstructed full opening in low pressure. *Rite Sized*, combined with the limited movement of internal parts during operation, reduces wear – enhancing the long service life of a Bray/Rite valve.

SIZE RANGE
1" (25mm) – 60" (1500mm)
ASME CLASS: 125 - 2500
API, DIN, BS, JIS
Classes Available

CSA B51, N285.0

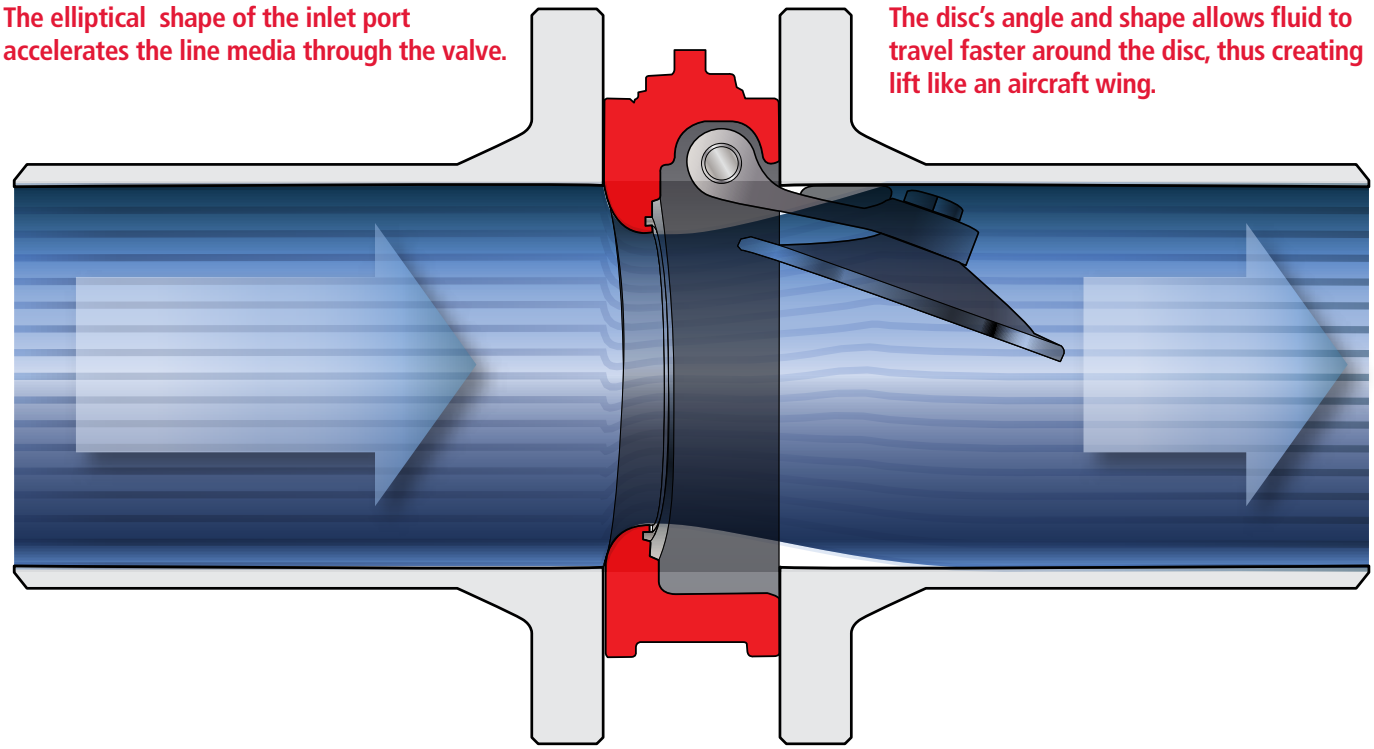
Drinking Water
NSF / ANSI 61

ZERO LEAKAGE Bray/Rite valves, either resilient or metal seated, offer zero leakage in all pressure classifications. Each valve is hydrostatically tested at the factory and shipped with a certificate of compliance to MSS SP61. Rite has achieved zero leakage metal-to-metal sealing by a proven, engineered design backed by high quality manufacturing craftsmanship. As the disc closes toward the seat, the increased velocity of the line media and the unique shape of our seat remove all particles from the sealing surfaces – ensuring zero leakage.

LOW PRESSURE DROPS The low pressure drop of the Bray/Rite valve was achieved by Rite's many years of research and development in combination with universities and federal research agencies. Several theses and papers were published including *Minimizing the pressure loss of wafer type swing check valve ASME 79/MA-NE-5*. These results – primarily the optimum valve diameter and elliptical inlet shape – have been incorporated into the Bray/Rite design. Like a venturi, the aerodynamic shape accelerates the line media through the valve with the lowest possible pressure drop. Pressure drops at the full open position are between 0.5 to 0.7 psi for all size valves. Additionally, the disc shape and mass have been optimized to use the pipeline media flow as a lifting force on the disc, thus allowing a full open valve position in low line velocity.

HIGH FLOW CAPACITY Bray/Rite's valve inlet elliptical shape and optimum diameter, plus its virtually unobstructed opening combine to produce a substantially higher flow capacity (C_V) than other wafer combination swing check valves.

REDUCED WATER HAMMER An additional focus of Rite's R&D program was linked to Water Hammer Prediction. Findings were applied in the design of the valve to largely reduce or eliminate water hammer by closing the valve at the right moment (before reverse flow occurs). The Bray/Rite uses gravity, assisted by an internal spring, to pull the disc toward the closed position on decelerating line media flow. Rite has developed proprietary predictive software to select the best solution for your specific application.



THE RITE ADVANTAGES

Bray/Rite SEATS Zero leakage shut off, even at 0 psi, is achieved through lapped metal seating surfaces. The seat and the disc edges are precisely machined then hand polished for a perfect fit. The disc hinge provides an even force at the disc to seat contact point, ensuring a uniform seal. Controlled tolerances maintain the proper disc to seat alignment. The spring assisted closure tension holds the disc in place when line pressure is removed.

RESILIENT SEATS A dynamic, O-ring seat is contained in a specially designed body groove. As line pressure is applied, the valve disc uniformly compresses the seat into the groove ensuring a zero leakage seal. The seat is easily replaced, simplifying maintenance.

METAL-TO-METAL SEATS Integral metal seats feature an engineered and precision machined angle that minimizes the metal-to-metal contact point between the disc and seat for a perfect seal. Pressure is applied evenly over the disc, eliminating galling and reducing wear.

METAL SEAT INSERT Carbon steel and ductile iron bodies have a stainless steel seat inserted into the body seal area, offering the same precision design as the integral metal-to-metal seat. These bodies are also available with a Resilient Seat Insert.

INHERENTLY FIRE SAFE All Bray/Rite valves are inherently fire safe due to the valve design, materials and construction. In the event of a pipeline fire, both resilient seated and metal seated valves provide metal-to-metal contact between the seat and disc and surpass all leak test standards.

Pressure Drop with Water

Valve Size	Cv	Min Flow to Fully Open Valve		Approx Pressure Drop w/ Water
Inch/ mm		GPM	Ft/ sec.	PSI @ 10 ft/sec.
1 / 25	30	28	10.4	0.78
1.5 / 40	38	68	10.7	2.1
2 / 50	84	46	4.4	1.7
2.5 / 65	137	76	5.1	1.4
3 / 75	221	197	8.5	1.1
4 / 100	373	157	4	1.4
5 / 125	679	352	5.6	1.1
6 / 150	931	367	4.1	1.5
8 / 200	1,440	428	2.7	1.6
10 / 250	2,623	837	3.4	1.1
12 / 300	3,531	1,229	3.5	1.2
14 / 350	3,226	1,180	2.7	2
16 / 400	3, 911	1,447	2.5	2.6
18 / 450	5,799	3,376	4.8	1.7
20 / 500	7,769	6,500	6.3	1.5
24 / 600	10,105	8,321	5.9	1.6
26 / 650	13,350	9,200	5.5	1.5
28 / 700	15,000	9,520	5.6	1.5
30 / 750	18,041	10,303	5.1	0.9
32 / 800	20,900	12,150	5	1.4
36 / 900	25,675	15,850	5.2	2
40 / 1,000	39,340	25,310	6.1	2.4
42 / 1,050	47,914	31,304	7.5	2.7
48 / 1,200	44,983	33,095	5.9	1.6
54 / 1,350	63,000	45,000	6	0.9
60 / 1,500	70,500	62,800	6.2	1.1

Notice the full open stable minimum velocity and the efficiency calculated at a normal velocity of 10 f/sec.

Resilient Seat

Metal-To-Metal Seat

Metal Seat Insert

The convex profile of the disc reacts to line flow like an airfoil. The velocity above the disc is higher than the velocity below, thus effectively creating lift.

PUMPING COST SAVINGS Pumping costs have been often overlooked but are now gaining in importance due to the increasing cost of energy. With Bray/Rite's long service life, its cost is actually insignificant to the end user compared to the energy lost pumping the fluid through the valve. Below is a comparison between different valve styles, assuming all valves are 100% open.

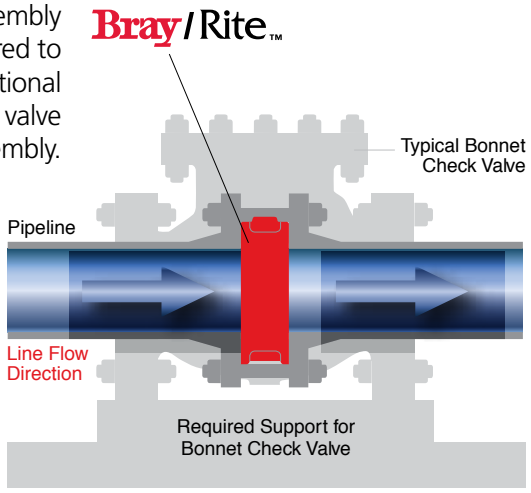
Yearly Energy Costs Comparison At 10 F/S - $0.10/kWh

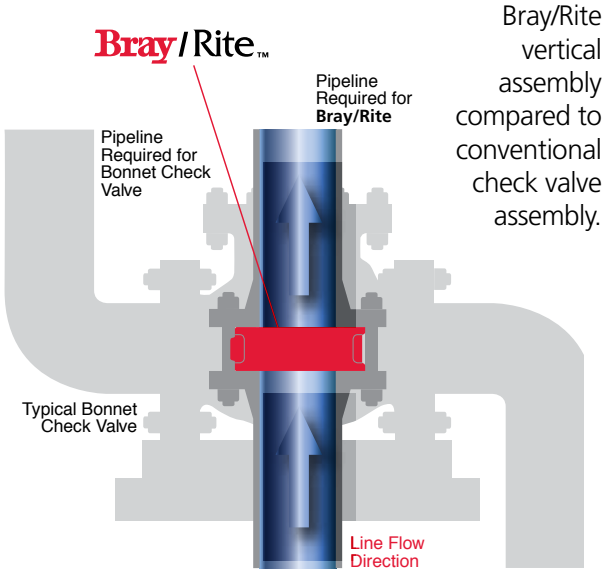
VALVE SIZE / INCHES	2	2.5	3	4	5	6	8	10	12
Bray/Rite	$42	$66	$99	$174	$250	$254	$635	$872	$1,113
Tilting Disc	$50	$66	$102	$161	$250	$272	$425	$606	$739
Center Guided "Silent"	$115	$214	$339	$608	$1,002	$1,409	$2,541	$4,006	$3,447
Full Size Swing Check	$57	$66	$99	$191	$250	$415	$680	$1,002	$1,347
Dual Door	$218	$209	$314	$441	$491	$707	$979	$1,118	$1,282

HORIZONTAL / VERTICAL INSTALLATION

Unlike most conventional check valves, Bray/Rite wafer combination swing check valves are ideal for both horizontal and vertical pipeline installation – requiring only a single line for operation. This greatly increases pipeline layout flexibility and significantly reduces costs. In vertical installations, typical swing check valves must have an offset pipe section installed since these valves only function in a horizontal position. **See factory for vertical down applications.**

Bray/Rite horizontal assembly compared to conventional check valve assembly.

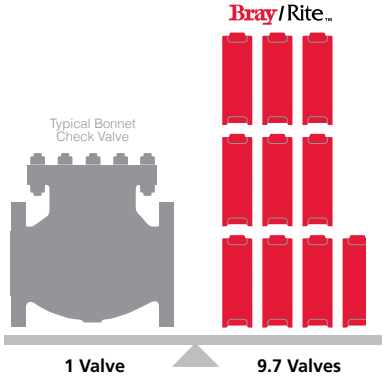




Bray/Rite vertical assembly compared to conventional check valve assembly.

LIGHT WEIGHT & REDUCED SIZE Installation costs are greatly reduced by Bray/Rite's light weight and minimal space requirements. Their compact design minimizes the distance between faces and are easily installed between all flanges.

Bray/Rite valves do not require added support to maintain pipeline integrity and need only 30% of the space of typical full size swing check valves.



THE RITE ACCESSORIES

Bray/Rite has designed and manufactured an extensive range of accessories for specific applications.
Some commonly used accessories and a PVC body uniquely designed for a specific application are shown below. Bray/Rite valves can be fitted with any one or a combination of accessories, including safety caging.

EXTERNAL LEVER & SPRINGS (SA-01)

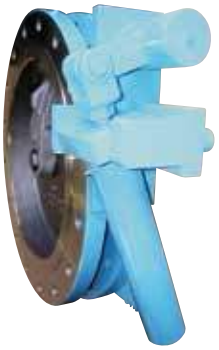
Provide additional external force to anticipate closure in applications where rapid media flow reversal requires the valve to close faster than standard.

Applications: Pump protection when pumping in parallel into a common header.

DUAL WEIGHTS (SA-10)

Two opposing weights, one to adjust cracking pressure and one to counter balance the disc.

Applications: Insures valve is fully open on very low flows.



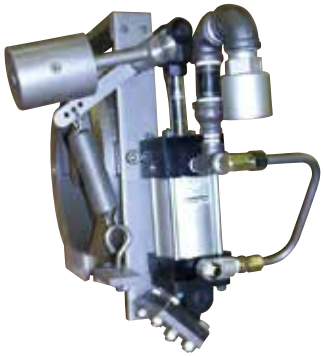
EXTERNAL LEVER & COMPRESSION SPRING (SA-40)

Provide additional force to anticipate valve closure, using an enclosed compression spring, in applications where rapid media flow reversal requires the valve to close faster than standard.

Applications: Pump protection when pumping in parallel into a common header, where spring force required is higher than a SA-01 or if an enclosed spring is preferred.

HYDRAULIC PNEUMATIC SPEED CONTROLS (H-100, SA-50)

Slow the opening of the valve to protect the disc assembly in the last few degrees of travel. These units offer adjustable speed control and are ideal in fluctuating flow applications. The H-100 uses the SA-01 spring. The SA-50 uses the SA-40 compression spring.



EXTERNAL LEVER & WEIGHT (SA-16)

Provide additional external mass to increase the cracking pressure (pressure required to open the disc) and increase the closing force of the moving disc.

Applications: Where increased cracking pressure is required. Waste Water service or where suspended solids are present in the process (the weight will insure inertia induced positive closure). Relief valve with adjustable cracking pressure.

LIMIT SWITCH (SA-2)

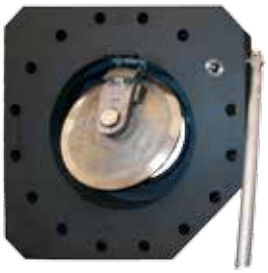
Provides remote indication of valve position and a positive indication of flow. If two are installed the first shows the closed position, the second the fully opened valve. (A partially opened valve is subject to premature wear.)

Applications: Automated control systems.

EXTERNAL LEVER, SPRING & WEIGHT (SA-1)

These units use the combination of a weight and spring to add cracking pressure and closing force to the disc.

Applications: Where performing both functions of faster closure and solid handling are required, primarily in waste water



PVC (PEZ SA-4AX)

PVC Body with passivated stainless steel or titanium internals and position indication lever. Eliminates internal body corrosion.

Applications: Used for Salt water, marine life support systems, desalination applications..

SELECTION PROCESS

A **Gather Process Information**
Line Fluid / Pressure / Temperature /Flow Rate / Location / Function

B **Gather Pipe Information**
Size / Material /
Flange Rating / Schedule

C **Select Valve Size** – Based on:
- Full open valve at minimum flow
- or Pipe size

D **Select Design Standard**
- ASME: 125 / 150 / 300
- API 594: 150 / 300 / 400 / 600 / 900 / 1500 / 2500
- PN: 10 / 16 / 25 / 40

E **Verify Conditions**
- Valve full open at minimum flow
- Max velocity 15 f/sec for Liquid
- Max velocity Mach 0.33 for Gas
- Non-reciprocating service
- No accessories required
- Installed with a minimum of 5 pipe diameters upstream and 3 downstream from a disturbance
- Not installed on close coupled multiple pump header

F **Select Model**
If answer is YES to All conditions:
- Select Model 210 (ASME, DIN) Models 201 - 205 (API 594)
- or if ULC FM* approved required select 212 (ASME), 312 (DIN) 2"-12" ONLY

If answer is NO to Any condition:

Select Model 260 (ASME, DIN) Models 201 - 205 (API 594)

G **Select Pressure Class and Body, Seat & Spacers Materials, and specific application accessories as required**

ORDERING EXAMPLE

A 6" heavy duty, Class 150 wafer combination swing check valve, carbon steel body with stainless steel inserted seat, stainless steel spacers and an external spring accessory would be written as follows:

06 15 SMZ SA01

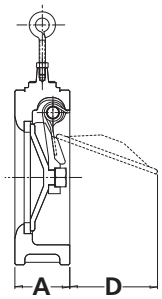
SELECTION INFORMATION

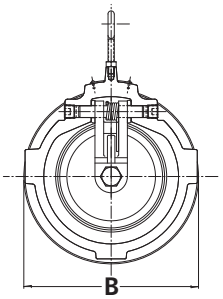
Description			Color
1 Size	01-60	1"- 60" ASME 25mm-1500mm DIN	
2 Model	201	API 594 #400/600	Grey
	203	API 594 #900/1500	Grey
	205	API 594 #150/300	Grey
	210	Standard ASME / DIN	
	212	ULC FM Approved ASME *	Red
	312	ULC FM Approved DIN *	Red
	260	Heavy Duty ASME / DIN	
	211	Flanged Body	
3 Pressure Class	10	PN 10	
	12	ASME 125 lb	
	15	ASME 150 lb	
	16	PN 16	
	25	PN 25	
	30	ASME 300 lb	
	40	PN 40	
	–	Other	
4 Body	C	ASTM A 126 CLB	Black
	D	ASTM A 395	Green
	S	ASTM A 216 WCB	Yellow (Class 300) Blue (Class 150)
	X	ASTM A 351 CF8M	None
	T	Titanium	None
	–	Other **	
5 Seat	B	BUNA -N	
	E	EPDM	
	M	A240 - 304 (Inserted or Integral) ***	
	T	PTFE	
	V	Viton	
6 Spacer	T	PTFE (Standard on 1"-12" Cast Iron Bodies)	
	Z	A479 - 316	
	–	Other **	
7 Special Application Assessories	SA-01	External Spring	
	SA-1	External Spring & Weight	
	SA-3	Backflush Lever and External Spring	
	SA-2	Limit Switch	
	SA-4	External Position Indicator	
	SA-4A	Backflush Lever	
	SA-7	Emergency Shut-off, Fusible Link	
	SA-10	Dual Balanced Weights	
	SA-40	External Compression Spring	
	SA-16	External Weight	
	SA-40A	External Compression Spring and Weight	
	H-100	External Spring, Weight, Hydraulic Damper	
	SA-50	External Compression Spring, Weight, & Hydraulic Damper	
	–	Other	

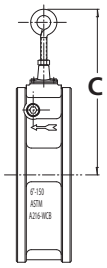
* ULC Approved under NFPA No. 11,13,14,15,20,22,24. FM Approved.
** Available in most exotic materials, please consult factory.
*** Inserted pressed-in interference seat at a minimum of 304 SS for carbon steel and ductile iron bodies, or seat is intergral to body.

Note: Spacers are located on both sides of the disc hinge, ensuring a uniform seal.
Note: The standard Bray/Rite is a wafer body style. Flanged Ends, RTJ style and other connections are available, please consult factory.

THE RITE DIMENSIONS







Models 210 (ANSI), 205 (API 594), Class 125/150

Nominal Pipe Size		A		A		B		C		D		Weight		Weight	
		210		205		210/205						210 SS		205 SS	
Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	lbs	kg	lbs	kg
1	25	2	50.8			2 5/8	66.7	3.4	86.3					1.9	0.85
1½	40	2¼	57.2			3 3/4	95.2	4 1/8	104.7			3.8	1.8		
2	50	1¾ 2⅛*	44.5	2 3/8	60.3	4 1/8	104.8	4 1/4	107.9	1 3/16	30.1	4.2	1.9	6.0	2.7
2½	65	1 7/8 2⅜	47.6	2 5/8	66.7	4 7/8	123.8	4½	114.3	1 5/8	34.9	6.1	2.8	9.0	4.1
3	80	2 2⅝*	50.8	2 7/8	73.0	5 3/8	136.5	5	127.0	1 5/8	41.2	8.4	3.8	13.0	5.9
4	100	2¼	57.2	2 7/8	73.0	6 7/8	174.6	5 3/4	146.0	2 3/4	69.8	13.5	6.2	19.3	8.75
5	125	2½	63.5	3 1/4	82.5	7 3/4	196.9	6½	165.1	3 5/8	92.0	18.1	8.2	23.0	10.4
6	150	2¾	69.9	3 7/8	98.4	8 3/4	222.3	7 1/4	184.5	4½	114.3	22.5	10.2	34.0	15.4
8	200	2⅞	73.0	5	127.0	11	279.4	8 1/4	209.5	5 3/4	146.0	34.5	15.7	65.0	29.5
10	250	3⅛	79.4	5 3/4	146.0	13 3/8	339.7	9 5/8	244.4	7½	190.5	50.9	23.1	88.1	40
12	300	3⅜	85.7	7 1/8	181.0	16 1/8	409.6	10 3/4	273.0	8 3/4	222.2	83.7	38.0	154.2	70
14	350	4¼	108.0	7 1/4	184.0	17 5/8	447.7	13	330.2	7 1/4	184.1	115.0	53.0	200	90.8
16	400	4¼	108.0	7½	191.0	20 1/8	511.2	14½	368.3	8 1/4	209.5	130.0	59.0	230	104.4
18	450	4¼	108.0	8	203.0	21½	546.1	15 1/4	387.3	10½	266.7	170.0	77.2	320	145.3
20	500	5½	139.7	8 5/8	219.0	23 3/4	603.3	18 3/4	476.2	11	279.4	230.0	104.4	360	163.4
24	600	6	152.4	8 3/4	222.0	28 3/16	716.0	20½	520.7	15	381.0	385.0	175.0	560	254.2
26	650			12.5	318	29.25	749.3	20.88	530.4	17	432.0			965	438.1
28	700	6½	165.1			32 5/8	828.7	26	660.4	17 3/4	450.8	580.0	263.3		
30	750	9	228.6	12	305.0	34 5/8	879.5	27½	698.5	16 1/4	412.7	965.0	438.1	1300	590.2
32	800	9	228.6			36 13/16	936.8	29	736.6	16 3/4	425.4	1235.0	560.7		
36	900	11½	292.1	14½	368.0	41 1/8	1044.6	30	762.0	18 1/4	463.5	1525.0	692.4	2000	908.0
40	1000	11½	292.1			45 5/8	1158.9	35 1/4	895.3	21½	546.1	2200.0	998.8		
42	1050	12	304.8	17	432.0	48	1219.2	33 1/4	844.5	28	711.2	2235.0	1014.7	3200	1452.8
48	1200	14	355.6	20 5/8	523.9	54½	1384.3	38 1/4	971.5	24½	622.3	3250.0	1475.5	3910	1775
54	1350	23	584.2			61	1549.4	43	1092.2	19 3/8	492.1	5500.0	2497.0		
60	1500	23	584.2			67 3/8	1711.3	38 1/4	971.5	33	838.2	7000.0	3178.0		

* For Cast Iron

Models 210 (ANSI), 205 (API 594), Class 300

Nominal Pipe Size		A		A		B		C		D		Weight		Weight	
		210		205		210/205						210 SS		205 SS	
Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	lbs	kg	lbs	kg
1	25	2	50.8			2⅞	73.0	3 2/5	86.4			1.9	0.85		
1½	40	2½	63.5			3¾	95.2	4 1/8	104.8			4.4	2.0		
2	50	1¾	44.5	2⅜	60.3	4⅜	111.1	4 1/4	108.0	1 3/16	30.0	4.0	1.8	8.4	3.8
2½	65	1⅞	47.6	2⅝	66.7	5⅛	130.2	4½	114.0	1½	38.0	5.9	2.7	13.2	6.0
3	80	2	50.8	2⅞	73.0	5⅞	149.2	5	127.0	1 11/16	43.0	7.9	3.6	15.4	7.0
4	100	2¼	57.2	2⅞	73.0	7⅛	181.0	5 3/4	146.0	2 7/16	62.0	11.9	5.4	22.5	10.2
5	125	2½	63.5	3¼	82.5	8½	215.9	6½	165.0	3⅜	86.0	18.9	8.6	27.5	12.5
6	150	2¾	69.9	3⅞	98.4	9⅞	250.8	7 1/4	184.0	4¼	108.0	26.9	12.2	43.0	19.5
8	200	2⅞	73.0	5	127.0	12⅛	308.0	8 1/4	210.0	5⅜	136.0	41.9	19.0	76.0	34.5
10	250	3⅛	79.4	5¾	146.0	14¼	362.0	9 5/8	244.0	7	178.0	61.7	28.0	109.0	49.5
12	300	3⅜	85.7	7⅛	181.0	16⅝	422.3	10 3/4	273.0	8⅛	206.0	94.7	43.0	198.2	90.0
14	350	3¾	222.3	8¾	222.0	19⅛	486.0	13	330.0	7¼	184.0	286.3	130.0	286.3	130.0
16	400	9⅛	231.8	9⅛	232.0	21¼	540.0	14½	368.0	8¼	210.0	352.4	160.0	352.4	160.0
18	450	10⅜	263.5	10⅜	264.0	23½	597.0	15 1/4	387.0	10½	267.0	440.5	200.0	440.5	200.0
20	500	11½	292.1	11½	292.0	25¾	654.0	18 3/4	476.0	11	280.0	572.7	260.0	572.7	260.0
24	600	12½	317.5	12½	318.0	30½	774.0	20½	520.0	15	381.0	925.1	420.0	925.1	420.0

Model 201 (API 594), Class 600

Nominal Pipe Size		A		B		B		C		D		Weight	
				400lbs		600lbs							
Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	lbs	kg
2	50	2⅜	60.3	4⅜	111.1	4⅜	111.1	4⅝	117	½	13	7	3
2½	65	2⅝	66.7	5⅛	130.2	5⅛	130.2	5⅛	130	⅝	16	10	4.5
3	80	2⅞	73	5⅞	149.2	5⅞	149.2	6	152	¾	19	14.5	6.6
4	100	3⅛	79.4	7	177.8	7⅝	193.7	6¾	171	1½	38	24	11
6	150	5⅜	136.5	9¾	247.6	10½	266.7	9½	241	2⅛	54	54	25
8	200	6½	165.1	12	304.8	12⅝	320.7	10¾	273	2¾	70	96	44
10	250	8⅜	212.7	14⅛	358.8	15¾	400	12	305	3	76	171	78
12	300	9	228.6	16½	419.1	18	457.2	14¾	375	4⅛	105	250	114

Rite Corporation
A Subsidiary of Bray International, Inc.
10250 Parkway, Montreal, Quebec, Canada H1J 2K4
Tél 514.324.8900 Fax 514.324.9525

R-3001_EN_V31_2016-10

ASHCROFT®
Trust the shield.®

1279 Duragauge® Pressure Gauge

FEATURES

- Custom dial printing options
- Micrometer adjustable pointer
- ***PLUS!***™ Performance option dampens vibration, shock and pulsation effects
- Pressure range from vacuum to 30,000 psi

TYPICAL USES

- Refineries
- Chemical and petrochemical plants
- Offshore oil rigs
- Water and wastewater pressure control
- Pulp and water
- Mining and metals
- Equipment skids
- Specialized OEM equipment
- Cryogenics

1279
4½″ dial size

SPECIFICATIONS

Accuracy:	±0.5% of span (ASME B40.100 Grade 2A)		
Size:	4½″		
Range:	Vacuum, compound to 30,000 psi		
Process Connection Location:	Lower, back, side, top		
Process Connection:	¼ NPT, ½ NPT, 9⁄16 -18 UNF-2B Aminco® (high pressure connection)		
Case Style:	Solid front with pressure relief back		
Window:	Glass (STD.), acrylic, shatter proof glass, non-glare glass (OPT.)		
Movement:	Rotary, adjustable, 400 SS, Teflon™ coated		
Movement Materials:	400 SS, Teflon™ coated pinion gear and segment		
Dial:	Aluminum, white background, black scale		
Pointer:	Micrometer, adjustable, aluminum		
Weather Protection:	Case	IP Rating	Ordering Code
	Dry	Case not sealed, recommended for weather protected environment only	S
	Dry, not field fillable	IP65	PH
	Dry, field fillable	IP66	SH
	Liquid filled	IP66	SL
Dampening Options:	Liquid: glycerin, silicone, Halocarbon®, ***PLUS!***™ Performance		
Mounting:	Stem, surface, flush (STD.), pipe, remote (OPT.)		
Approvals:	CRN		

WETTED COMPONENTS

Bourdon Tube	Process Connection	Joints
316L SS	316L SS	Welded
316L SS	Steel	Welded
K-Monel® 500	Monel® 400, Steel	Welded
C510 Pho. Bronze	Brass	Silver Brazed

KEY BENEFITS

- **Available with a wide variety of accessory and diaphragm seal assemblies**
- **Available with high process temperature dissipation siphons**

MIN/MAX TEMPERATURE LIMITS

Version	Ambient	Process	Storage
Dry	-20 °F to 200 °F (-29 °C to 93 °C)	-20 °F to 250 °F (-29 °C to 121 °C)	-40 °F to 250 °F (-40 °C to 121 °C)
PLUS!™	-40 °F to 150 °F (-40 °C to 66 °C)	-40 °F to 200 °F (-40 °C to 93 °C)	-40 °F to 150 °F (-40 °C to 66 °C)
Glycerin fill	20 °F to 150 °F (-7 °C to 66 °C)	20 °F to 150 °F (-7 °C to 66 °C)	0 °F to 150 °F (-18 °C to 66 °C)
Silicone fill	-40 °F to 150 °F (-40 °C to 66 °C)	-40 °F to 200 °F (-40 °C to 93 °C)	-40 °F to 150 °F (-40 °C to 66 °C)
Halocarbon® fill	-40 °F to 150 °F (-40 °C to 66°C)	-40 °F to 200 °F (-40 °C to 93 °C)	-40 °F to 150 °F (-40 °C to 66 °C)

NON-WETTED COMPONENTS

Case	Ring	Pressure Relief Back
Phenolic	Threaded, Polycarbonate (meets UL 94 V-0)	Polycarbonate (Meets UL 94 V-0)

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 (20 °C) will be affected by approximately .4% per 25 °F. Gauges with welded joints will withstand 750 °F (400 °C), 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.

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1279 Duragauge® Pressure Gauge

ORDERING CODE Example:	451279	S	SH	04	L	XLL	15#
Dial Size/Model Code							
451279 - 4½″ solid front	451279						
System (tube and process connection)							
A - Bronze tube, brass process connection, Max. pressure connection 1,000 psi							
P - K-Monel® 500 tube, Monel® 400 process connection, Max. pressure 30,000 psi							
R - 316L SS tube, steel process connection, Max. pressure 30,000 psi							
S - 316 SS tube, 316L SS process connection, Max. pressure 30,000 psi		S					
Case Design							
S - Solid front case, dry							
SH - Solid front case, dry (IP66 NEMA 4X)			SH				
PH - Solid front case, dry (IP65, cannot be liquid filled)							
SL - Solid front case, liquid filled (glycerin STD.)							
Process Connection Sizes							
02 - ¼ NPT Male, N/A for ranges over 20,000 psi							
04 - ½ NPT Male, N/A for ranges over 20,000 psi				04			
09 - 9/16 18 UNF-2B, Aminco® high pressure fitting, pressures over 20,000 psi (STD.)							
AM - AND 10050-4 (¼ tubing connection)							
RW - SAE 7/16 & 20 Straight thread							
Process Connection Location							
L - Lower					L		
B - Back							
D - Side (3 o'clock)							
E - Side connection (9 o'clock)							
T - Top connection							
Options (If choosing an option(s) must include a "X") (See Table 1 on page 3 for more options)						–X__	
GV - Silicone case fill							
GX - Halocarbon® case fill							
LL - ***PLUS!***™ Performance						LL	
ND - PLUS! Performance, silicone free (glycerin and silicone filled gauges)							
NZ - ***PLUS!***™ Performance, silicone free dry gauges							
NH - SS tag wired to case							
PD - Acrylic window (STD. with liquid filled or hermetically sealed cases)							
SG - Safety Glass							
C4 - Traceable calibration certificate							
6B - Cleaned for oxygen service							
5G - Attach one accessory to gauge. Applicable to PL02 pressure limiting valve, V01,V02,V03 valves, 1098, 1100, 1198, 2198 siphons, 7001, 7004 needle valves, 1115 capillary, 1106 pulsation dampner, 1112, PD02 pressure snubbers, MDV swivel adapter, 2265 electric warning contact							
Range (coding examples only, see range table on page 3 for all standard ranges)							
Single Scales							
15# - 15 psi							15#
1BR - 1 bar							
1KG - 1 kg/cm²							
100KP - 100 kPa							
Dual Scales							
15#/BR - 15 psi inner scale, 1 bar outer scale							
1BR/# - 1 bar inner scale, 15 psi outer scale							

When selecting a diaphragm seal or isolation ring, refer to the Min/Max Guide for compatibility with this gauge or scan the QR code to the right.

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1279 Duragauge® Pressure Gauge

TABLE 1

CODE	OPTION
AB	Gauges calibrated to compensate for absolute pressure
DA	Dial marking (text marking on the dial)
EP	Maximum pointer (adjustable, N/A with liquid filled or hermetically sealed cases)
HY	Hydrostatic/pneumatic testing (system pressurized to 150% of rated system pressure for 5 minutes. Overload stop STD.)
NG	Non-glare glass (N/A with liquid fill or hermetically sealed cases)
OS	Overload stop
SH	Red set hand, stationary
SG	Safety glass
TS	Throttle screw (STD. with liquid filled, hermetically sealed or ***PLUS!***™ Performance)
VS	Underload stop
56	Flush mounting ring
D3	DuraVis™ retroreflective dial
TM	2″ pipe mounting bracket

STANDARD PRESSURE RANGES

	psi	bar	kPa	mPa	kg/cm²
Vacuum	30IMV	N1BR	N100KP	N1MP	N1KG
	–	N1/0.6BR	N100/60KP	0.1/0.06MP	N1/0.6KG
Compound	V/15#	–	–	–	–
	–	N1/1.5BR	N100/150KP	N0.1/0.15MP	N1/1.5KG
	V/30#	–	–	–	–
	–	N1/3BR	N100/300KP	N0.1/0.3MP	N1/3KG
	V/60#	–	–	–	–
	–	N1/5BR	N100/500KP	N0.1/0.5MP	N1/5KG
	V/100#	–	–	–	–
	–	N1/9BR	N100/900KP	N0.1/0.9MP	N1/9KG
Positive Pressure	15#	1BR	100KP	0.1MP	1KG
	20#	–	–	–	–
	–	1.6BR	160KP	0.16MP	1.6KG
	30#	–	–	–	–
	–	2.5BR	250KP	0.25MP	2.5KG
	60#	4BR	400KP	0.4MP	4KG
	–	6BR	600KP	0.6MP	6KG
	100#	–	–	–	–
	120#	–	–	–	–
	–	10BR	1000KP	1MP	10KG
	160#	–	–	–	–
	200#	–	–	–	–
	–	16BR	1600KP	1.6MP	16KG
	300#	–	–	–	–
	–	25BR	2500KP	2.5MP	25KG
	400#	–	–	–	–
	500#	–	–	–	–
	600#	40BR	4000KP	4MP	40KG
	800#	–	–	–	–
	–	60BR	6000KP	6MP	60KG
	1000#	–	–	–	–
	1500#	100BR	10000KP	10MP	100KG
	2000#	–	–	–	–
	–	160BR	16000KP	16MP	160KG
	3000#	–	–	–	–
	–	250BR	25000KP	25MP	250KG
	4000#	–	–	–	–
	5000#	–	–	–	–
	6000#	400BR	40000KP	40MP	400KG
	8000#	–	–	–	–
	–	600BR	60000KP	60MP	600KG
	10000#	–	–	–	–
	15000#	1000BR	100000KP	100MP	1000KG
	20000#	-	-	-	-
	-	1600BR	-	160MP	1600KG
	30000#	-	-	-	-

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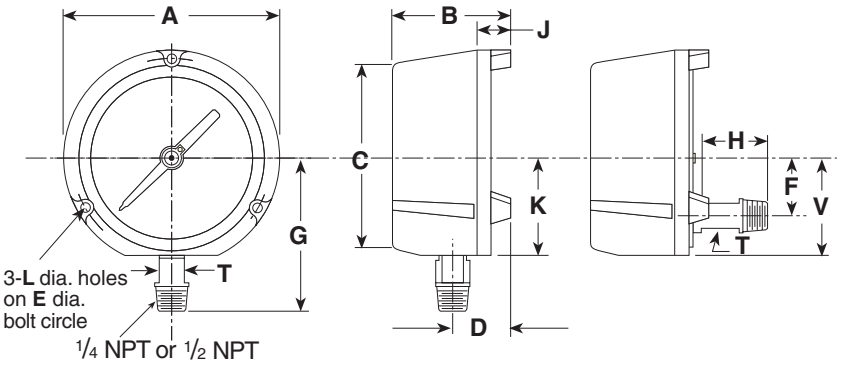
1279 Duragauge® Pressure Gauge

DIMENSIONS in [ ] are millimeters

For reference only, consult Ashcroft for specific dimensional drawings

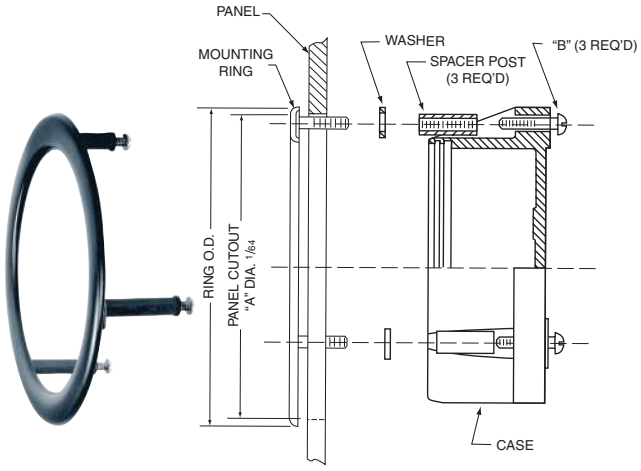
Dial Size Inches	A	B	C	D	E	F	G	H	J	K	L	T	V	Weight oz/kg
4½	5.81 [147.6]	3.36 [85.3]	5.07 [128.7]	1.60 [40.6]	5.375 [137]	1.62 [41.2]	3.92 [99.6]	0.73 [18.4]	0.94 [23.9]	2.62 [66.7]	0.218 [5.5]	0.62 [15.7]	2.62 [66.7]	2.5 (Dry) 3.5 (L.F.)



1278M Series Flush Mounting Ring

1278M Series Flush Mounting Ring. Used to flush mount gauge case 1279(*)S. Black finish (STD.); Polished SS finish (OPT.)

Gauge Size Inches	Ring O.D.	"A" DIA.	"B" Size of 3 Screws	"C" Size of Washers
4½	6 [152]	5.625 [148]	#10-24 x 1⅝	7/16 x 17/64 x 5/8



ASHCROFT®
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B-Series Switches – Pressure, Differential Pressure & Hydraulic

FEATURES

- Adjustable setpoints 15-100% of range
- Fixed or limited adjustable deadband
- Wide selection of switch elements
- Explosion proof enclosure provides uncompromising protection
- Special designs for NACE & fire applications
- SIL 3 Capable (B and D series only)

TYPICAL USES

- Offshore oil rigs
- Chemical and petrochemical plants
- Pulp and papermills
- Steel mills
- Power plants
- Water and sewage-treatment plants
- Other corrosive environments

SIL 3 CAPABLE

- **Highly reliable**
- **Designed for use in wide range of applications**
- **Pressure ranges from vacuum to 7500 psi**

FACTORY SEALED
CLASS I DIV 1 GROUPS B, C, & D
CLASS II DIV 1 GROUPS E, F, & G

Sira 02ATEX1391X IECEx SIR 14.0077X
II 2GD
Ex d IIC T6 Gb
Ex tb IIIC T85°C Db
Ta = -20 °C to +60°C

SPECIFICATIONS

Setpoint:	Factory set or field adjustable
Setpoint Repeatability:	±1% of full range (Additional setpoint shift of ±1% of range per 50 °F from initial setpoint set at 70 °F typical)
Enclosure Rating:	B4/Hydraulic: NEMA 4X, IP66 B7: NEMA 7/9, IP66
Enclosure Material:	Epoxy coated aluminum (standard) Optional: 316 stainless steel (NEMA 7/9 only)
Diaphragm Material:	Buna N, Viton, Teflon, SS, Monel
Pressure Connection:	¼ NPT Female (standard) Optional: ½ NPT Female , ¼ NPT Female & ½ NPT Male combo
Electrical Output:	SPDT or DPDT
Electrical Termination:	¾ NPT Female (standard) Optional: ½ NPT Female
Ambient Temperature Range:	–20°F to 150°F (–19 °C to 65 °C) All units calibrated at 70 °F
Process Temperature:	0 °F to 150 °F (Buna N or Teflon diaphragm) 20 °F to 300 °F (Viton diaphragm) 0°F to 300°F (SS or Monel diaphragm)
Pressure Ranges:	Pressure: Vac-3000# Differential: 0-600#D Hydraulic: 1000-7500#
Approvals:	UL E34743 (B4/D4) E38812 (B7/D7) CSA: 55541 ATEX: Sira 02ATEX1391X (B7/D7 with XCN) IECEx SIR 14.0077X FM: Limit Contol and Steam Limit Control

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info@ashcroft.com
1.800.328.8258

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B-Series Switches – Pressure, Differential Pressure & Hydraulic

PRESSURE, DIFFERENTIAL PRESSURE & HYDRAULIC RANGES

PRESSURE/VACUUM RANGES[1]			Overpressure Ratings		Approximate Deadband Switch Element[2] [4] Buna-N Diaphragm				
Nominal Pressure			Proof psi	Burst psi	20, 26, 27	21, 24, 31	50	22	32, 42
Vacuum									
30IMV	–760mm Hg	-100 kPa	250	400	0.3-0.7	1.5-3.0	0.5-2.2	0.4-1.5	2.1-4.2
Compound									
15IWV/15IW	–375mm H_2O/375mm H_2O	–3.7 kPa/ 3.7 kPa	20	35	0.15-.75/0.15-.75	1.5-2.5/1.5-2.5	0.45-2.0/0.45-2.0	0.5-1.2/0.5-1.2	2.1-3.5/2.1-3.5
30IWV/30IW	–760mm H_2O/760mm H_2O	–7.5 kPa/ 7.5 kPa	20	35	0.30-.60/0.30-.60	1.5-2.5/1.5-2.5	0.45-2.0/0.45-2.0	0.5-1.5/0.5-1.5	2.1-3.5/ 2.1-3.5
30IMV/15#	–760mm Hg/ 1.0 kg/cm²	–100 kPa/100 kPa	250	400	0.5-1.0/0.3-0.7	2.0-3.0/0.3-0.7	0.75-2.5/0 .5-1.0	0.7-1.8/0.7-1.4	2.8-4.2/0.7-2.1
30IMV/30#	–760mm Hg/1.0 kg/cm²	–100 kPa/ 200 kPa	250	400	1.0-1.5/0.3-0.8	3.0-6.0/0.3-0.8	1.2-4.5/0.7-1.5	1.4-2.4/0.4-1.3	4.2-8.4/1.4-2.8
30 IMV/60#	–760mm Hg/4.0 kg/cm²	–100 kPa/ 400 kPa	250	400	2.0-3.0/0.7-1.5	5.0-9.0/3.0-5.0	2.5-7.0/3.0-5.0	2.8-4.5/3.0-5.0	7.0-12.0/4.2-7.0
Pressure									
10IW	250mm H_2O	2.5 kPa	20	35	0.2-0.5	1.0-2.0	0.35-1.5	0.4-1.0	1.4-2.8
30IW	750mm H_2O	7.5 kPa	20	35	0.3-0.6	1.5-2.5	0.45-2.0	0.5-2.0	2.1-3.5
60IW	1500mm H_2O	15 kPa	20	35	0.5-1.3	1.5-3.5	0.9-2.5	0.7-3.0	2.1-5.0
100IW	2500mm H_2O	25 kPa	20	35	0.6-1.6	2.5-5.5	1.1-4.0	1.0-4.0	3.5-7.7
15IW	3750mm H_2O	37 kPa	20	35	1.0-2.5	4.5-8.5	1.7-6.5	2.0-6.0	6.0-12.0
15#	1.0 kg/cm²	100 kPa	500	1500	0.1-0.35	0.5-1.5	0.2-1.0	0.4-1.0	0.7-2.1
30#	2.0 kg/cm²	200 kPa	500	1500	0.1-0.50	0.5-1.5	0.3-1.0	0.4-1.0	0.7-2.1
60#	4.0 kg/cm²	400 kPa	500	1500	0.3-1.0	1.0-3.5	0.7-2.5	0.6-2.0	1.4-5.0
100#	7.0 kg/cm²	700 kPa	1000	3000	0.5-1.7	1.5-5.0	1.1-3.5	1.0-4.5	2.1-7.0
200#	14 kg/cm²	1400 kPa	1000	3000	1-3	5-13	2-9	3.0-7.5	7.0-18.2
400#	28 kg/cm²	2800 kPa	2400	3000	4-7.5	5-24	5.5-15	4.0-11.0	7.0-33.6
600#	42 kg/cm²	4200 kPa	2400	3000	4-11	9-30	7-20	5.0-23.0	12.6-42
1000#[(5)]	70 kg/cm²	7000 kPa	12000[5]	18000	7-30	30-110	18-70	15-80	42-154
3000#	210 kg/cm²	21000 kPa	12000	18000	15-60	80-235	37-160	30.0-230	112-329

DIFFERENTIAL PRESSURE RANGES			Pressure Ratings		Approximate Deadband Switch Element[2] [3] [4] Buna-N Diaphragm				
Nominal Pressure			Static Working Pressure	Proof psi	20, 26, 27	21, 24, 31	50	22	32, 42
30IWD	750mm H_2O	7.5 kPa	5.4	21.6	0.3-0.6	1.5-2.5	0.45-2.0	0.5-2.0	2.1-3.5
60IWD	1500mm H_2O	15 kPa	5.4	21.6	0.5-1.3	1.5-3.5	0.9-2.5	0.7-3.0	2.1-5.0
100IWD	2500mm H_2O	25 kPa	5.4	21.6	0.6-1.6	2.5-5.5	1.1-4.0	1.0-4.0	3.5-7.7
150IWD	3750mm H_2O	37 kPa	5.4	21.6	1.0-2.5	4.5-8.5	1.8-6.5	2.0-6.0	6.3-12.0
15#D	1.0 kg/cm²	100 kPa	500	2000	0.5-1.0	2.0-5.0	0.7-3.5	0.7-1.4	2.8-7.0
30#D	2.0 kg/cm²	200 kPa	500	2000	1.0-2.0	2.0-5.0	1.5-3.5	1.4-2.8	2.8-7.0
60#D	4.0 kg/cm²	400 kPa	500	2000	2.0-4.0	3.0-6.0	3.0-4.5	2.8-5.6	4.2-8.5
100#D	7.0 kg/cm²	700 kPa	1000	4000	4.0-10.0	11.0-20.0	7.0-15.0	6.0-14.0	16.0-28.0
200#D	14.0 kg/cm²	1400 kPa	1000	4000	5.0-15.0	12.0-40.0	10.0-26.0	7.0-21.0	17.0-56.0
400#D	28.0 kg/cm²	2800 kPa	1000	8000	10.0-20.0	20.0-60.0	15.0-40.0	14.0-28.0	28.0-84.0
600#D	42.0 kg/cm²	4200 kPa	1000	8000	20.0-40.0	80.0-150.0	30.0-115.0	30.0-56.0	12.0-210.0

NOTES:

1. Switches may generally be set between 15% and 100% of nominal range on increasing pressure. Consult factory for applications where setpoints must be lower.
2. All deadbands are given in English units as shown in the nominal range column. Deadbands shown are for switches with Buna N diaphragm.

Approximate deadbands for optional diaphragms:

Viton:	Multiply Buna N value by 1.4
Teflon:	Multiply Buna N value by 1.2
Stainless Steel:	Multiply Buna N value by 1.7
Monel:	Multiply Buna N value by 1.7

3. Deadbands given are for zero static working pressure.
4. For approximate deadbands for dual switch elements, multiply the single switch element by 1.6.
5. Proof pressure is 4000 psi with stainless steel and monel welded diaphragms.

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B-Series Switches – Pressure, Differential Pressure

ORDERING CODE

Example: **B4 20 B XPK 600#**

Enclosure
B4 - Pressure switch, Type 400, watertight enclosure meets NEMA 3, 4, 4X, 13 and IP66 requirements.
B7 - Pressure switch, Type 700, explosion-proof enclosure meets Div. 1 & 2, NEMA 7, 9 and IP66 requirements. Standard housing epoxy coated aluminum. Use variation code XYW for 316SS housing.
D4 - Differential pressure switch, Type 400, water-tight enclosure meets NEMA 3, 4, 4X, 13 and IP66 requirements.
D7 - Differential pressure switch, Type 700, explosion- proof enclosure meets Div. 1 & 2, NEMA 7, 9 and IP66 requirements. Standard housing epoxy coated aluminum. Use variation code XYW for 316SS housing.

Switch Element Selection - UL/CSA Listed SPDT
20 - Narrow deadband ac, 15A - 125/250 Vac. Estimated dc rating, 0.4A, 120 Vdc (not UL listed).
21 - Ammonia service, 5A - 125/250 Vac
22 - Hermetically sealed switch, narrow deadband, 5A - 125/250 Vac. Estimated dc. rating, 2.5A, 28 Vdc (not UL listed).
23 - Heavy duty ac, 22A - 125/250 Vac
24 - General purpose, 15A - 125/250/480 Vac, ½A - 125 Vdc, ¼A - 250 Vdc; 6A, 30 Vdc. (Standard switch)
25 - Heavy duty dc, 10A - 125 Vac or dc, ⅛ HP - 125 Vac or dc. Not available with psid ranges.
26 - Sealed environment proof, 15A - 125/250 Vac. Estimated dc rating, 0.4A, 120 Vdc (not UL listed).
27 - High temperature 300°F, 15A - 125/250 Vac
28 - Manual reset trip on, increasing 15A - 125/250 Vac. Not available with type 700 enclosure.
29 - **Manual reset trip on decreasing, 15A - 125/250 Vac.** Not available with type 700 enclosure.
31 - Low level (gold) contacts, 1A - 125 Vac
32 - Hermetically sealed switch, general purpose, 11A - 125/250 Vac, 5A - 30 Vdc
42 - Hermetically sealed switch, gold contacts, 1A - 125 Vac
50 - Variable deadband, 15A - 125/250 Vac

Switch Element Selection - UL/CSA Listed Dual (2 SPDT)
61 - Dual narrow deadband, 15A - 125/250 Vac. Estimated dc rating, 0.4A, 120 Vdc (not UL listed).
62 - Dual sealed environment proof, 15A - 125/250 Vac. Estimated dc rating, 0.4A, 120 Vdc (not UL listed).
63 - Dual high temp. 300°F, 15A - 125/250 Vac
64 - Dual general purpose, 15A - 125/250/480 Vac, ½A- 125 Vdc, ¼A - 250 Vdc
65 - Dual ammonia service, 5A - 125/250 Vac
67 - Dual hermetically sealed switch, narrow deadband, 5A - 125/250 Vac. Wires cannot be terminated inside B400 switch enclosure. Estimated dc. rating, 2.5A, 28 Vdc (not UL listed).
68 - Dual hermetically sealed switch, general purpose, 11A - 125/250 Vac 5A, 30 Vdc. Wires cannot be terminated inside B400 switch enclosure.
70 - Dual low level gold contacts, 1A - 125 Vac
71 - Dual hermetically sealed switch, gold contacts, 1A - 125 Vac. Wires cannot be terminated inside B400 switch enclosure.

Actuator Seal	Process Temp.	Range				
Material	Limits °F(10)	Vac. H_2O	0-600 psi	0-1000 psi	0-3000 psi	Ambient operating temperature limits –20 to 150 °F, all styles, setpoint shift of ±1% of range per 50 °F temperature change is normal. Switches are calibrated at 70 °F reference
B - Buna N	0 to 150	•	•	•	•	
V - Viton	20 to 300	•	•	•	•	
T - Teflon	0 to 150	•	•	•	•	
S - 316L	0 to 300		•	•		Available on pressure only.
P - Monel	0 to 300		•	•		Available on pressure only.

Options - Use table from page 5

Range - Select from table page 2

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B-Series Switches – Pressure, Differential Pressure & Hydraulic

OPTIONAL FEATURES AND ACCESSORIES

B-SERIES SWITCH OPTIONS

Appicable Switch Series

		Pressure		Differential Pressure		H	
Code	**Description**	(psi)	(in. H_2O)	(psi)	(in. H_2O)		**Notes**
XBP	Wall Mounting Bracket in. H_2O		•		•		
XCH	Chained Cover	•	•	•	•	•	
XC8	CSA Approval	•	•	•	•		Standard on 400 Series
XCN	ATEX Directive 94/9/EC/IECEx Rating	•	•	•	•		700 Series only.
XD2	Dual Seal Rating (700 Series only)	•			•		
XFM	FM Approval – Single Element	•	•	•	•		N/A on all combinations.
	FM Approval – Dual Element	•	•	•	•		N/A on all combinations.
XFP	Fungus Proofing	•	•	•	•	•	
XFS	Factory Adjusted Setpoint	•	•	•	•	•	Advise static or working pressure for differential pressure switches.
XG3	Belleville Actuator	•					64 or 68 element only. N/A on all combinations.
XG5	UL Limit Control to 150˝ H_2O				•		Buna N and Viton diaphragm. N/A on all combinations.
XG6	UL Limit Control to 600 psi	•					Buna N and Viton diaphragm.N/A on all combinations.
XG7	Secondary Chamber with Vent	•					SS diaphragm required. Teflon diaphragm is the backup. NEMA 7 only.
XG8	Steam Limit Control to 300 psi	•					
XG9	Fire Safe Welded Actuator	•					Stainless steel diaphragm only.
XHS	High Static Differential Pressure			•			12 Buna N and Viton diaphragm – 15#D & 30#D only.
XHX	High Pressure, 40 psi, (static) d/p only 160 psi (proof) d/p only 100 psi (proof) pressure only (˝ H_2O)		•		•		
XJK	Left Conduit Connection	•	•	•	•	•	Standard on 700 Series. N/A with DPDT element on 400 Series.
XJL	¾˝ to ½˝ Reducing Bushing	•	•	•	•	•	
XJM	Metric Electrical Conduit Conn. M20 x 1.5	•	•	•	•	•	
XK3	Terminal Block (700 Series only)	•	•	•	•		Terminal Blocks standard with 700 dual switches.
XLE	6 foot Leads on the Micro Switch	•	•	•	•	•	
XNH	Tagging Stainless Steel	•	•	•	•	•	
XNN	Paper Tag	•	•	•	•	•	
XPK	Pilot Light(s) Top Mounted	•	•	•	•	•	N/A on 700 Series.
XPM	¾˝ Sealed Conduit Connection w/16˝ Lead Wires	•	•	•	•	•	
XTA	316 Stainless Steel Pressure Connection for in. H_2O Range		•		•		
XTM	2˝ Pipe Mounting Bracket	•	•	•	•		
XUD	316 Stainless Steel Pressure Conn.			•			
X06	Pressure Connection: ½ NPT Male, ¼ NPT Female 316 Stainless Steel (Combination)	•	•	•	•		Standard with 1000 and 3000 psi ranges. Bottom connection only on DP in H_2O ranges.
X07	½ NPTF Press. Conn., 316 SS	•	•	•	•		N/A with Monel diaphragm.
X6B	Cleaned for Oxygen Service	•		•			Buna N cannot be cleaned for oxygen service.
X9F	Inches of Water Housing for Outdoor Use		•				
XYW	316SS Housing	•	•	•	•		
XMD	Metric Range on Label	•	•	•	•	•	

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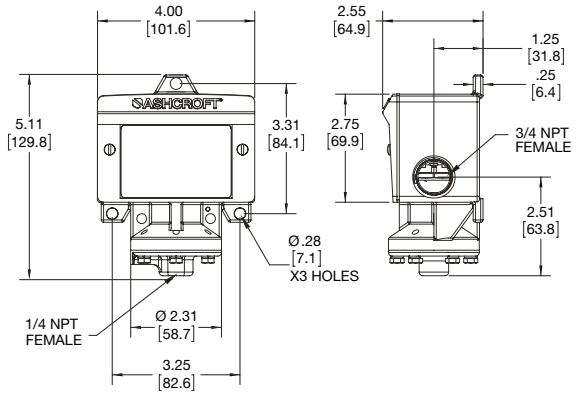
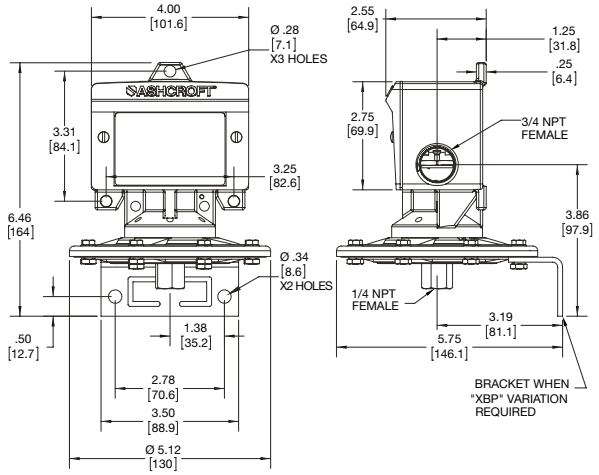
B-Series Switches – Pressure, Differential Pressure & Hydraulic

B 400 DIMENSIONS

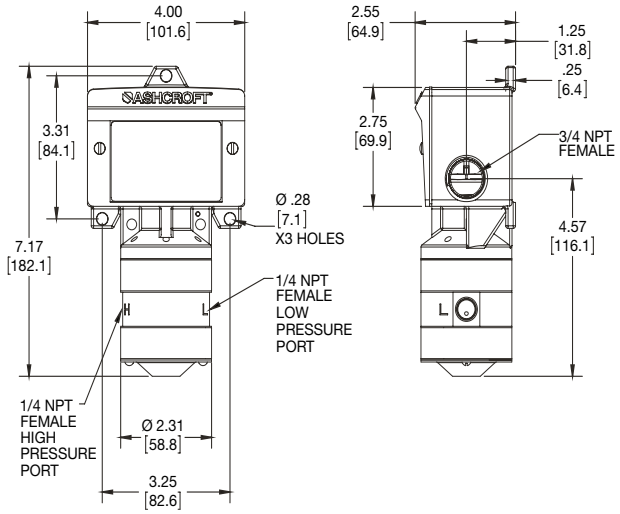
Pressure switch – psi ranges



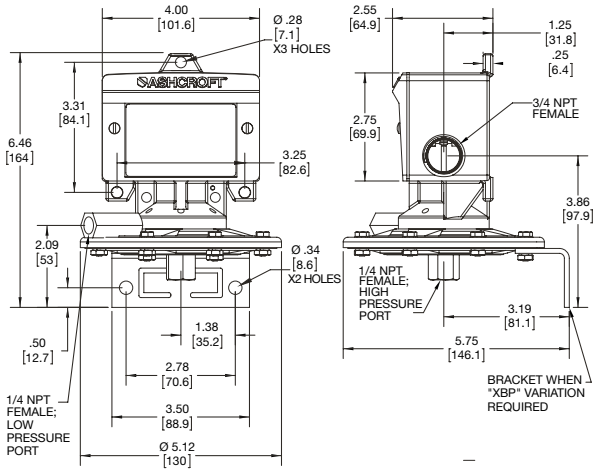
Pressure switch – inches of water ranges



Differential pressure switch – psi differential ranges



Differential pressure switch – inches of water ranges



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B-Series Switches – Pressure, Differential Pressure & Hydraulic

Ashcroft Inc. supplies highly reliable Ashcroft® switches and controls for industrial and process applications. We begin with rock-solid designs, matching the most appropriate technology with the safety and reliability requirements of the applications. The materials of construction are specified to Ashcroft's exacting standards, and product is built to last in the toughest applications. Our modern, responsive manufacturing facility is supported by an extensive network of stocking distributors and factory sales offices located in virtually every part of the world. Special application assistance is always just a telephone call away.

The Ashcroft B-Series switch line is designed to satisfy most switch requirements. Materials of construction have been selected for long life. A wide variety of precision switch elements are available to meet every application requirement, including hermetically sealed contacts for added reliability and safety. The actuators we use have been proven in more than 20 years of service in the world's plants and mills. Special designs are available for fire safety, NACE, limit control and other more stringent requirements. Simplicity and ease of use are stressed to improve reliability of the installation.

Applications include: pumps, compressors, washers, filters, degreasers, evaporators, recovery systems, food processing, ground support equipment, reverse osmosis systems, heat exchangers, hydraulic systems, lubrication systems, marine equipment, textile machinery, heating and air conditioning equipment.

Pressure & Differential Pressure Switches

B-Series pressure, differential pressure and vacuum switches use two different actuators depending on setpoint requirements. For setpoints between 2 and 3000 psi, the simple, rugged diaphragm-sealed piston actuator is used. This design features high reliability and choice of actuator seal materials for virtually every application. An optional welded design is also available for setpoints up to 1000 psi for maximum reliability. This design is available in 316 SS or Monel. Differential pressure models use a unique, dual diaphragm-sealed piston design that features very high static operating pressures and small size.

For setpoints between 4.5 and 150 inches of H_2O, a large diaphragm is used for increased sensitivity in both pressure and differential pressure designs with good choice of materials of construction.

All standard models feature ±1 percent of range setpoint repeatability and a minimum of 400 percent of range proof pressures.

These standard designs perform well in applications where shock and vibration could be a problem and may be used in conjunction with Ashcroft diaphragm seals in extreme services such as slurries or abrasive process fluids.

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info@ashcroft.com
1.800.328.8258

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Product Data Sheet
00813-0300-4750, Rev CB
May 2019

Rosemount® 8750W Magnetic Flowmeter System

for Utility, Water, and Wastewater Applications

- Best in class value with performance, reliability, and diagnostics suited for monitoring applications
- Reliable all welded coil housing and lightweight sensor design rated to IP68
- Available in 4–20mA with HART®, FOUNDATION™ Fieldbus, Modbus® RS-485, Process Diagnostics, and SMART™ Meter Verification to improve reliability and performance
- Available with drinking water certifications

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Product Selection Guide

The Rosemount 8750W Magnetic Flowmetersensor is available in a flanged style and transmitter is available in remote and integral transmitter configurations to ensure compatibility with all utility, water, and wastewater applications.

Transmitter selection

Transmitter	General characteristics
Field mount 	■ Integral and remote configurations available ■ HART/Analog and Pulse outputs available ■ FOUNDATION™ Fieldbus and pulse output available ■ Modbus RS-485 and Pulse output available ■ Advanced Diagnostics available ■ LCD display (optional) — With optional optical switch local operator interface(1) ■ Two discrete channels (optional)

(1) HART or Modbus protocol only.

Contents

Sensor selection

Table 1: Sensor Selection

Sensor	General characteristics
Flanged 	■ Flanged process connections Welded coil housing ■ ½-in. (15 mm) to 48-in. (1200 mm) ■ Standard, reference, and bullet-nose electrodes available

Selecting materials

For guidance on selecting materials, refer to the *Rosemount™ Magnetic Flowmeter Material Selection Guide (00816-0100-3033)* , available at www.emerson.com/rosemount.

Magmeter Diagnostics

Rosemount diagnostics reduce cost & improve output by enabling new practices

Rosemount Magnetic Flowmeters provide device diagnostics that detect and warn of abnormal situations throughout the life of the meter - from installation to maintenance and meter verification. With Rosemount Magnetic Flowmeter diagnostics enabled, plant availability and throughput can be improved, and costs through simplified installation, maintenance and troubleshooting can be reduced.

Table 2: Magnetic flowmeter diagnostics

Diagnostic name	Diagnostic category	Product capability
Basic diagnostics		
Tunable Empty Pipe	Process	Standard
Electronics Temperature	Meter Health	Standard
Coil Fault	Meter Health	Standard
Transmitter Fault	Meter Health	Standard
Reverse Flow	Process	Standard
Coil current	Maintenance	Standard
Electrode saturation	Process/Maintenance	Standard
Advanced diagnostics		
High Process Noise	Process	Suite 1 (DA1)
Grounding and Wiring Fault	Installation	Suite 1 (DA1)
Coated Electrode Detection	Process	Suite 1 (DA1)
Commanded Smart Meter Verification	Meter Health	Suite 2 (DA2)
Continuous Smart Meter Verification	Meter Health	Suite 2 (DA2)

Table 2: Magnetic flowmeter diagnostics *(continued)*

Diagnostic name	Diagnostic category	Product capability
4-20 mA Loop Verification(1)	Installation	Suite 2 (DA2)

(1) Available with HART output only.

Options for accessing diagnostics

Rosemount Magmeter Diagnostics can be accessed through the Local Operator Interface (LOI), ProLink® III v3.1, a HART Field Communicator(1), and AMS® Suite: Intelligent Device Manager(1). Contact your local Rosemount representative to activate diagnostics or for diagnostic availability on existing transmitters.

Access diagnostics through the LOI for quicker installation, maintenance, and meter verification

Rosemount Magnetic Flowmeter Diagnostics are available through the LOI to simplify maintenance.

Access diagnostics through ProLink III v. 3.0 (HART)/ProLink III v. 3.1 (HART, Modbus)

Simplify maintenance and troubleshooting practices by utilizing ProLink III v3.0/v3.1 to access diagnostics and troubleshooting information, log variable data, run SMART Meter Verification, and print verification reports.

Access diagnostics through AMS Intelligent Device Manager(1) for the ultimate value

The value of the diagnostics increases significantly when AMS Intelligent Device Manager is used. AMS Intelligent Device Manager provides a simplified screen flow and procedures for how to respond to the diagnostic messages.

Magnetic Flowmeter Sizing

Selecting the appropriate sensor size is an important step when considering a magnetic flowmeter. The physical properties of the process fluid, as well as the fluid velocity should be considered. It may be necessary to select a flow sensor that is larger or smaller than the adjacent piping to ensure the fluid velocity is in the recommended flow range for the application.

- Operation outside these guidelines may also give acceptable performance.

Table 3: Sizing guidelines

Application	Velocity range (ft/s)	Velocity range (m/s)
Normal Service	0–39	0–12
Preferred Service	2–20	0.6–6.1

Note
Operation outside these guidelines may also give acceptable performance.

To convert flow rate to velocity, use the appropriate factor listed in Table 4 and the following equation:

$$\text{Velocity} = \frac{\text{Flow Rate}}{\text{Factor}}$$

(1) Available with HART output only.

Example: English units	Example: SI units
Magmeter Size: 4 in. (factor from Table 4 = 39.679) Normal Flow Rate: 300 GPM $\text{Velocity} = \frac{300\ (\text{gpm})}{39.679}$ **Velocity = 7.56 ft/s**	Magmeter Size: 100 mm (factor from Table 4 = 492.78)Normal Flow Rate: 800 L/min $\text{Velocity} = \frac{800\ (\text{L/min})}{492.78}$ **Velocity = 1.62 m/s**

Table 4: Line size vs. conversion factor

Nominal line size—Inches (mm)	Gallons per minute factor	Liters per minute factor
½ (15)	0.947	11.762
1 (25)	2.694	33.455
1½ (40)	6.345	78.806
2 (50)	10.459	129.89
2 ½ (65)	14.923	185.33
3 (80)	23.042	286.17
4 (100)	39.679	492.78
5 (125)	62.356	774.42
6 (150)	90.048	1,118.3
8 (200)	155.93	1,936.5
10 (250)	245.78	3,052.4
12 (300)	352.51	4,378.0
14 (350)	421.70	5,237.3
16 (400)	550.80	6,840.6
18 (450)	697.19	8,658.6
20 (500)	866.51	10,761
24 (600)	1,253.2	15,564
30 (750)	2006.0	24,913
36 (900)	2,935.0	36,451
40 (1000)	3,652.1	45,357
42 (1050)	4,115.1	51,107
48 (1200)	5,407.6	67,159

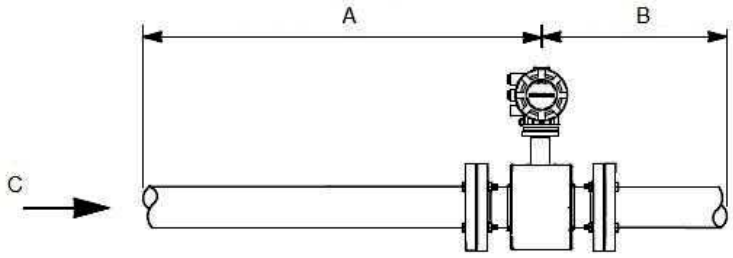
Table 5: Line size vs. velocity/rate

Nominal line size in inches (mm)	Minimum/maximum flow rate							
	Gallons per minute				Liters per minute			
	at 0.04 ft/s (low-flow cutoff)	at 1 ft/s (min range setting)	at 3 ft/s	at 39.37 ft/s (max range setting)	at 0.012 m/s (low-flow cutoff)	at 0.3 m/s (min range setting)	at 1 m/s	at 12 m/s (max range setting)
½ (15)	0.038	0.947	2.841	37.287	0.141	3.529	11.76	141.15
1 (25)	0.108	2.694	8.081	106.05	0.401	10.04	33.45	401.46
1½ (40)	0.254	6.345	19.04	249.82	0.946	23.64	78.81	945.67
2 (50)	0.418	10.459	31.38	411.77	1.559	38.97	129.89	1,558.7
2½ (65)	0.597	14.923	44.77	587.51	2.224	55.60	185.33	2,224.0
3 (80)	0.922	23.042	69.13	907.17	3.434	85.85	286.17	3,434.0
4 (100)	1.587	39.679	119.04	1,562.2	5.913	147.84	492.78	5,913.4
5 (125)	2.494	62.356	187.07	2,454.9	9.293	232.33	774.42	9,293.0
6 (150)	3.602	90.048	270.14	3,545.2	13.42	335.50	1,118.3	13,420
8 (200)	6.237	155.93	467.79	6,138.9	23.24	580.96	1,936.5	23,238
10 (250)	9.831	245.78	737.34	9,676.3	36.63	915.73	3,052.4	36,629
12 (300)	14.10	352.51	1,057.5	13,878	52.54	1,313.4	4,378.0	52,535
14 (350)	16.87	421.71	1,265.1	16,603	62.85	1,571.2	5,237.3	62,848
16 (400)	22.03	550.80	1,652.4	21,685	82.09	2,052.2	6,840.6	82,087
18 (450)	27.89	697.19	2,091.6	27,448	103.90	2,597.6	8,658.6	103,903
20 (500)	34.66	866.51	2,599.5	34,114	129.14	3,228.4	10,761	129,137
24 (600)	50.13	1,253.2	3,759.6	49,339	186.77	4,669.2	15,564	186,769
30 (750)	80.24	2,006.0	6,018.0	78,976	298.96	7,474.0	24,913	298,959
36 (900)	117.40	2,935.0	8,805.1	115,553	437.42	10,935	36,451	437,416
40 (1000)	146.09	3,652.1	10,956	143,785	544.29	13,607	45,357	544,286
42 (1050)	164.60	4,115.1	12,345	162,011	613.28	15,332	51,107	613,278
48 (1200)	216.30	5,407.6	16,223	212.898	805.91	20,148	67,159	805,908

Upstream and downstream piping

To ensure specified accuracy over widely varying process conditions, install the sensor with a minimum of five straight pipe diameters upstream and two pipe diameters downstream from the electrode plane.

Figure 1: Upstream and downstream straight pipe diameters



A. Five pipe diameters (upstream)
B. Two pipe diameters (downstream)
C. Flow direction

Installations with reduced upstream and downstream straight runs are possible. In reduced straight run installations, the meter may not meet accuracy specifications. Reported flow rates will still be highly repeatable.

Sensor grounding

A reliable ground path is required between the sensor and the process fluid. Optional grounding rings or process reference electrodes are available with the sensor to ensure proper grounding. See Table 5 and Table 6.

Ordering Information

Rosemount 8750W Magnetic Flowmeter Platform

The Rosemount 8750W Magnetic Flowmeter is available in a flanged sensor design. The sensors are fabricated from stainless and carbon steel and welded to provide a sealed coil housing that protects against moisture or other contaminants. Sizes range from 1/2-in. (15 mm) to 48-in. (1200 mm). The field mount transmitter has a die cast aluminum housing for excellent reliability. The wall mount transmitter features an easy to use operator interface. Both transmitter styles are available with advanced diagnostics to provide the best insight into the process and the meter's health.

Note
The starred (★) offerings represent the most common options, and should be selected for best delivery.

Model code structure

Example model code with one selection out of each category:
`8750W D M T 1 A 1 F P S A 010 C A1 Z5 DA2 AX M4 BD G5 B6 R15 V1 Q4 HR7 WG YF`

Table 6: Requirements - select one from each available choice

Example code	Category
8750W	Base model—Magnetic Flowmeter System (utility, water, and wastewater)
D	Sensor design revision—Revision "D"
M	Transmitter class (Table 8)
T	Transmitter mount (Table 9)
1	Transmitter power (Table 10)

Table 6: Requirements - select one from each available choice *(continued)*

Example code	Category
A	Transmitter outputs (Table 11)
1	Conduit entries (Table 12)
F	Sensor style (Table 13)
P	Lining material (Table 14)
S	Electrode material (Table 15)
A	Electrode type (Table 16)
010	Line size (Table 17)
C	Flange type and material (Table 18)
A1	Flange rating (Table 19)

Table 7: Options - select only as needed

Example code	Category
Z5	Hazardous area certifications (Table 20)
DA2	Advanced diagnostics (Table 21)
AX	Discrete input/output (Table 22)
M4	Display (Table 23)
BD	Certifications (Table 24)
G5	Grounding rings (Table 25)
B6	Miscellaneous (Table 26)
R15	Submergence protection (Table 27)
V1	Special paint (Table 28)
Q4	Quality certificates (Table 29)
HR7	Revision configuration (Table 30)
WG	Witness inspection (Table 31)
Yx	Quick Start Guide language (Table 32)

Requirements

Table 8: Rosemount 8750W transmitter class

Code	Description	
M	Revision 4 electronics	★
0	Spare sensor, no transmitter	

Table 9: Rosemount 8750W transmitter mount

Code	Description	
T	Integral field mount	★
R	Remote field mount	★

Table 9: Rosemount 8750W transmitter mount *(continued)*

Code	Description	
W	Remote wall mount	★

Table 10: Rosemount 8750W transmitter power

Code	Description	
1	AC Power Supply (90 -250VAC, 50/60Hz)	★
2	DC Power Supply (12 - 42VDC)	★
0	Spare sensor, no transmitter	

Table 11: Rosemount 8750W transmitter outputs

Code	Description	
A	4-20mA output with digital HART protocol & scalable pulse output	★
F	FOUNDATION™ Fieldbus & scalable pulse output	★
M	Modbus RS-485 electronics, scalable pulse	★
0	Spare sensor, no transmitter	

Table 12: Rosemount 8750W conduit entries

Code	Description	Integral mount quantity	Remote mount quantity	
1	½–14 NPT	2	4	★
2	M20–1.5 adapters	2	4	★
4(1)	½–14 NPT, additional entry	3	5	
5(1)	M20–1.5, additional entry	3	5	
0	Spare sensor, integral mount only, no transmitter	N/A	N/A	

(1) Not available with the wall mount transmitter.

Table 13: Rosemount 8750W sensor style

Code	Description	
F	Flanged	★
0	Spare transmitter, no sensor	

Table 14: Rosemount 8750W lining material

Code	Description	
T(1)	PTFE	★
P(2)	Polyurethane	★
N(3)	Neoprene	★
0	Spare transmitter, no sensor	

(1) Available in ½ - to 36-in. (15 mm to 900 mm) line sizes.
(2) Available in line sizes 1- to 36-in., 42-in., and 48-in. (25 mm to 900 mm, 1050 mm, and 1200 mm) line sizes.
(3) Available in line sizes 1- to 48-in. (25 mm to 1200 mm) line sizes.

Table 15: Rosemount 8750W electrode material

Code	Description	
S	316L stainless steel	★
H	Nickel alloy 276 (UNS N 10276)	★
0	Spare transmitter, no sensor	

Table 16: Rosemount 8750W electrode type

Code	Description	
A	2 Measurement electrodes – standard	★
B(1)	2 Measurement electrodes – bulletnose	★
E	2 Measurement electrodes plus 1 reference electrode – standard	★
F(1)	2 Measurment electrodes plus 1 reference electrode – bulletnose	★
0	Spare transmitter, no sensor	

(1) Not available in ½-in. (15mm).

Table 17: Rosemount 8750W line size

Code	Line size	Liner availability In this table, the starred (★) offerings represent available liner based on line size. Consult factory for additional Flange Type/Rating sensor availability		
		PTFE code T	Poly code P	Neoprene code N
005	½-in. (15 mm)	★		
010	1-in. (25 mm)	★	★	★
015	1½-in. (40 mm)	★	★	★
020	2-in. (50 mm)	★	★	★
025	2½-in. (65 mm)	★		★
030	3-in. (80 mm)	★	★	★
040	4-in. (100 mm)	★	★	★
050	5-in. (125 mm)	★		★
060	6-in. (150 mm)	★	★	★
080	8-in. (200 mm)	★	★	★
100	10-in. (250 mm)	★	★	★
120	12-in. (300 mm)	★	★	★
140	14-in. (350 mm)	★	★	★
160	16-in. (400 mm)	★	★	★
180	18-in. (450 mm)	★	★	★
200	20-in. (500 mm)	★	★	★
240	24-in. (600 mm)	★	★	★
300	30-in. (750 mm)	★	★	★

Table 17: Rosemount 8750W line size *(continued)*

Code	Line size	Liner availability In this table, the starred (★) offerings represent available liner based on line size. Consult factory for additional Flange Type/Rating sensor availability		
		PTFE code T	Poly code P	Neoprene code N
360	36-in. (900 mm)	★	★	★
400	40-in. (1000 mm)			★
420	42-in. (1050 mm)		★	★
480	48-in. (1200 mm)		★	★
000	Spare transmitter, no sensor			

Table 18: Rosemount 8750W flange type and material

Code	Description (see Table 33 for line size vs. flange type and rating)	
C	Slip-on,raised-face, carbon steel	★
S	Slip-on,raised-face, 304/304L SST	★
F	Slip-on, flat-face, carbon steel	
G	Slip-on,flat-face, 304/304L SST	
0	Spare transmitter, no sensor	

Table 19: Rosemount 8750W flange rating

Code	Description (see Table 33 for line size vs. flange type and rating)
A1	ASME B16.5, Class 150
A3	ASME B16.5, Class 300
AD	AWWA C207Class D; line size 30-in. and above; flat face flange only
AE	AWWA C207Class E; line size 30-in. and above; flat face flange only
DD	EN1092-1,PN10
DE	EN1092-1,PN16
DF	EN 1092-1, PN25
DH	EN 1092-1, PN40
GD	GB/T9119,PN10
GE	GB/T9119,PN16
GH	GB/T9119,PN40
JP	JISB2220, 10K
JR	JISB2220, 20K
KU	AS4087, PN16
KW	AS4087, PN21
KY	AS4087, PN35
TK	AS2129, Table D

Table 19: Rosemount 8750W flange rating *(continued)*

Code	Description (see Table 33 for line size vs. flange type and rating)
TL	AS2129, Table E
00	Spare transmitter, no sensor

Options

Note
These are not required, but they must be included in the model number if desired.

Table 20: Rosemount 8750W hazardous area certifications

Code	Description	
-(1)	Ordinary Locations - (no code required)	★
Z5	US Approvals, Class I Div 2, Non-Incendive and Dust for Non-Flammable Fluids	★
Z6	Canadian Approvals, Class I Div 2, Non-Incendive and Dust for Non-Flammable Fluids	★
ND	ATEX Dust	★
Z1	ATEX Non-Sparking and Dust for Non-Flammable Fluids	★
NF	IECEx Dust	★
Z7	IECEx Non-Sparking and Dust for Non-Flammable Fluids	★
Z2	INMETRO Non-Sparking and Dust for Non-Flammable Fluids	★
Z3	NEPSI Non-Sparking and Dust for Non-Flammable Fluids	★

(1) CSA (C/US) marked, CE marked, EAC marked and C-tick marked.

Table 21: Rosemount 8750W advanced diagnostics

Code	Description	
DA1	Process Diagnostics, High Process Noise Detection, Ground/Wiring Fault Detection, and Electrode Coating	★
DA2	Smart Meter Verification	★

Table 22: Rosemount 8750W discrete input/discrete output

Code	Description	
AX(1)(2)	Two Discrete Channels (DI/DO 1, DO 2)	★

(1) Requires Conduit Entry code 4 or 5 when ordered with field mount transmitter.
(2) Not available with FOUNDATION Fieldbus (output code F).

Table 23: Rosemount 8750W display

Code	Description	
M4(1)	LCD with Local Operator Interface	★
M5	LCD display only	

(1) Not available with FOUNDATION Fieldbus (output code F).

Table 24: Rosemount 8750W certifications

Code	Description	
PD	European Pressure Equipment Directive Certification (PED)	★
CR	Canadian Registration Number (CRN) Certification	
BD	ASME B31.3 Process Piping Standard	
DW(1)	NSF DrinkingWater Certification	

(1) NSF drinking water certification is available with the PTFE liner in line sizes 0.5- to 36-in (15 mm to 900 mm) and the polyurethane liner in line sizes 4-to 36-in., 42-in., and 48-in. (80 mm to 900 mm, 1050 mm, and 1200 mm).

Table 25: Rosemount 8750W grounding rings

Code	Description	
G1	316L stainless steel (Qty 2)	★
G2	Nickel alloy C-276; UNS N 10276 (Qty 2)	
G5	316L stainless steel (Qty 1)	★
G6	Nickel alloy C-276; UNS N 10276 (Qty 1)	

Table 26: Rosemount 8750W miscellaneous

Code	Description
C1	Custom Configuration (completed CDS form required with order)
D1	High Accuracy Calibration (base ref accuracy 0.25% of rate)
B6	316 SST Mounting Bracket with U-bolt Kit for 2-in. Pipe Mount
P05(1)	5-point verification
P10(2)	10-point verification

(1) Available for ½ - to 24-in (15 mm to 600 mm) at velocities 1, 3, 5, 7, 10 ft/s; 30-in. (700 mm) at velocities 1, 3, 5, 7, 9.5 ft/s; 36-in. (900 mm) at velocities 1, 2, 3, 5,6.5 ft/s;40- to 48-in.(1000mm to 1200mm).
(2) Available for ½ - to 24-in. (15 mm to 600 mm) at velocities 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 ft/s; 30- to 48-in. (700 mm to 1200 mm) not available.

Table 27: Rosemount 8750W submergence protection

Code	Description
R05	Potted junction box with 50 feet of combo cable/cable gland for use in conduit
R10	Potted junction box with 100 feet of combo cable/cable gland for use in conduit
R15	Potted junction box with 150 feet of combo cable/cable gland for use in conduit
R20	Potted junction box with 200 feet of combo cable/cable gland for use in conduit
R25	Potted junction box with 250 feet of combo cable/cable gland for use in conduit
R30	Potted junction box with 300 feet of combo cable/cable gland for use in conduit
S05	Potted junction box with 50 feet of submersible combo cable/cable gland
S10	Potted junction box with 100 feet of submersible combo cable/cable gland
S15	Potted junction box with 150 feet of submersible combo cable/cable gland
S20	Potted junction box with 200 feet of submersible combo cable/cable gland
S25	Potted junction box with 250 feet of submersible combo cable/cable gland

Table 27: Rosemount 8750W submergence protection *(continued)*

Code	Description
S30	Potted junction box with 300 feet of submersible combo cable/cable gland

Table 28: Rosemount 8750W special paint

Code	Description
V1	Coal tar paint (submersible/direct burial)

Table 29: Rosemount 8750W quality certificates

Code	Description
Q4	Calibration certificate per ISO 10474 3.1B/EN 10204 3.1
Q8	Material traceability per ISO 10474 3.1B/EN 10204 3.1

Table 30: Rosemount 8750W revision configuration

Code	Description
HR7	HART Revision 7

Table 31: Rosemount 8750W witness inspection

Code	Description
WG	Witness Inspection

Table 32: Rosemount 8750W Quick Start Guide language

Code	Description	
YF	French	★
YG	German	★
YI	Italian	★
YM	Chinese (Mandarin)	★
YP	Portuguese (Brazil)	★
YR	Russian	★
YS	Spanish	★

Table 33: Slip on flange options by line size

	Flange code and rating																	
	A1	A3	AD	AE	DD	DE	DF	DH	GD	GE	GH	JP	JR	KU	KW	KY	TK	TL
Size code	ASME Class 150	ASME Class 300	AWWA Class D	AWWA Class E	EN PN10	EN PN16	EN PN25	EN PN40	GB/T PN 10	GB/T PN 16	GB/T PN 40	JIS 10K	JIS 20K	AS4087 PN16	AS4087 PN21	AS4087 PN35	AS2129 Table D	AS2129 Table E
005	★	★						★			★	★	★				★	★
010	★	★						★			★	★	★				★	★

Table 33: Slip on flange options by line size *(continued)*

	Flange code and rating																	
	A1	**A3**	**AD**	**AE**	**DD**	**DE**	**DF**	**DH**	**GD**	**GE**	**GH**	**JP**	**JR**	**KU**	**KW**	**KY**	**TK**	**TL**
Size code	ASME Class 150	ASME Class 300	AWWA Class D	AWWA Class E	EN PN10	EN PN16	EN PN25	EN PN40	GB/T PN 10	GB/T PN 16	GB/T PN 40	JIS 10K	JIS 20K	AS4087 PN16	AS4087 PN21	AS4087 PN35	AS2129 Table D	AS2129 Table E
015	★	★						★			★	★	★				★	★
020	★	★				★		★			★	★	★	★	★	★	★	★
025	★	★				★		★			★	★	★	★	★	★	★	★
030	★	★				★		★			★	★	★	★	★	★	★	★
040	★	★				★		★		★	★	★	★	★	★	★	★	★
050	★	★				★		★		★	★	★	★	★	★	★	★	★
060	★	★				★		★		★	★	★	★	★	★	★	★	★
080	★	★			★	★	★	★	★	★	★	★	★				★	★
100	★	★			★	★	★	★	★	★	★	★	★	★	★	★	★	★
120	★	★			★	★	★	★	★	★	★	★	★	★	★	★	★	★
140	★	★			★	★	★	★	★	★	★	★	★	★	★	★	★	★
160	★	★			★	★	★	★	★	★	★	★	★	★	★	★	★	★
180	★	★			★	★	★	★	★	★	★	★	★	★	★	★	★	★
200	★	★			★	★	★	★	★	★	★	★	★	★	★	★	★	★
240	★	★			★	★	★	★	★	★	★	★	★	★	★	★	★	★
300			★	★										★	★	★	★	★
360			★	★	★	★			★	★				★	★	★	★	★
400			★	★	★	★			★	★				★	★		★	★
420			★	★														
480			★	★	★												★	★

Ordering flowmeter equipment

Ordering procedure

To order, select the desired sensor and/or transmitter by specifying model codes from the ordering table.

For remote transmitter applications, note the cable specification requirements.

Standard configuration

Unless the Configuration Data Sheet is completed, the transmitter will be shipped as follows:

Engineering units:	ft/sec
4mA:	0
20mA:	30
Sensor size:	3-in.
Empty pipe:	On
Sensor calibration number:	1000005010000000

Integrally mounted transmitters are factory configured with the paired sensor size and appropriate calibration number.

Custom configuration (option code C1)

If Option Code C1 is ordered, the Configuration Data Sheet (CDS) must be submitted at the time of order.

Standard tagging

Instrument tags for the transmitter and sensors are as follows:

- 316SST laser etched label, permanently attached
- Main label - Tag name: 1 line 21characters
- Additional 316SST 'wire-on' tag available: 5 lines, 17 characters per line (6mm height)

Interconnecting cable

Interconnecting cables are required to connect a remote mount transmitter to the sensor. When ordering cable, review the hazardous area approval requirements and the installation location requirements for proper cable selection.

- Cables can be ordered as individual component cables or a combination coil drive/electrode cable.
- Cables can be ordered as part of the transmitter model number or as a spare parts kit. Integrally mounted transmitters are factory wired and do not require additional interconnecting cables.
- Individual component cables require equal lengths of coil drive cable and electrode cable and should be limited to less than 500 feet (152 m). Consult Technical Support for lengths between 500-1000 feet (152-304 m).
- Combination coil drive/electrode cable is only available for Ordinary Locations and should be limited to less than 330 feet (100 m).

Component cable kits

Standard temp (-20 °C to 75 °C)				
Cable kit #	Description	Component	Rosemount p/n	Alpha p/n
08732-0065-0001 (feet)	Kit, Component Cables, Std Temp, (includes Coil and Electrode)	Coil	08732-0060-0001	2442C
		Electrode	08732-0061-0001	2413C

Standard temp (-20 °C to 75 °C)				
08732-0065-0002 (meters)	Kit, Component Cables, Std Temp (includes Coil and Electrode)	Coil	08732-0060-0002	2442C
		Electrode	08732-0061-0002	2413C
08732-0065-0003 (feet)	Kit, Component Cables, Std Temp (includes Coil and I. S. Electrode)	Coil	08732-0060-0001	2442C
		I. S. Electrode	08732-0061-0003	Not available
08732-0065-0004 (meters)	Kit, Component Cables, Std Temp (includes Coil and I. S. Electrode)	Coil	08732-0060-0002	2442C
		I.S. Electrode	08732-0061-0004	Not available

Extended temp (-50 °C to 125 °C)				
Cable kit #	Description	Component	Rosemount p/n	Alpha p/n
08732-0065-1001 (feet)	Kit, Component Cables, Ext Temp (includes Coil and Electrode)	Coil	08732-0060-1001	Not available
		Electrode	08732-0061-1001	Not available
08732-0065-1002 (meters)	Kit, Component Cables, Ext Temp (includes Coil and Electrode)	Coil	08732-0060-1002	Not available
		Electrode	08732-0061-1002	Not available
08732-0065-1003 (feet)	Kit, Component Cables, Ext Temp (includes Coil and I. S. Electrode)	Coil	08732-0060-1001	Not available
		I. S. Electrode	08732-0061-1003	Not available
08732-0065-1004 (meters)	Kit, Component Cables, Ext Temp (includes Coil and I. S. Electrode)	Coil	08732-0060-1002	Not available
		I.S. Electrode	08732-0061-1004	Not available

Combo cable kits

Coil/electrode cable (-20 °C to 80 °C)	
Cable Kit #(1)	
08732-0065-2001 (feet)	Kit, Combo Cable, Standard
08732-0065-2002 (meters)	
08732-0065-3001 (feet)	Kit, Combo Cable, Submersible(2)
08732-0065-3002 (meters)	

(1) Only available for Ordinary Locations.
(2) 80 °C dry/60 °C wet/33ft continuous submergence.

Product Specifications

Basic specifications

The tables below outline some of the basic performance, physical, and functional specifications.

Table 35: Field mount transmitter specifications

	Style	Field mount
	Base accuracy(1)	0.5% Standard 0.25% High Accuracy Option
	Mounting	Integral or Remote
	Power supply	Global AC or DC
	User interface	LCD display with 4 Optical Switch LOI (optional) LCD display only (optional) No display (standard)
	Communication protocol	HART FOUNDATION™ fieldbus Modbus RS-485
	Diagnostics	Basic, DA1, DA2
	Sensor compatibility	All Rosemount plus other manufacturers
	Detailed specifications	Transmitter specifications
	Ordering information	Ordering Information

(1) For complete accuracy specifications, please refer to Transmitter functional specifications.

Table 36: Sensor specifications

	Style	Flanged
	Base accuracy(1)	0.5% Standard 0.25% High Accuracy Option
	Line sizes	½-in. to 48-in. (15 mm to 1200 mm)
	Design features	Standard Process Design
	Detailed specifications	Sensor specifications
	Ordering information	Ordering Information

(1) For complete accuracy specifications, refer to the sensor detailed specifications.

Table 37: Lining Material Selection

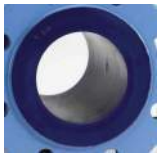
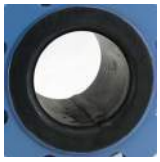
Liner material	General characteristics
PTFE 	Process temperature: 0 to +248 °F (-18 to +120 °C)
Polyurethane 	Process temperature: 0 to +140 °F (-18 to +60 °C)
	Typically applied in clean water
Neoprene 	Typically applied in water with chemicals, and sea water
	Process temperature: 0 to 176 °F (-18 to 80 °C)

Table 38: Electrode Material

Electrode material	General characteristics
316L Stainless Steel	Good corrosion resistance
	Good abrasion resistance
Nickel Alloy 276 (UNS N10276)	Better corrosion resistance
	High strength

Table 39: Electrode Type

Electrode type	General characteristics
Standard Measurement	Lowest cost
	Good for most applications
Measurement + Reference Electrode	Low cost grounding option especially for large line sizes

Table 39: Electrode Type *(continued)*

Electrode type	General characteristics
(Also see Table 40 and Table 41 for grounding options and installation)	Minimum conductivity of 100 microSiemens/cm
	Not recommended for electrolytic or galvanic corrosion applications
Bulletnose	Extended head protrudes into the flow stream for self-cleaning
	Best option for coating processes

Table 40: Process Reference Options

Grounding options	General characteristics
No Grounding Options (grounding straps)	Acceptable for conductive unlined pipe
	Grounding straps provided at no cost
Reference Electrode	Same material as measurement electrodes
	Sufficient grounding option when process fluid conductivity is greater than 100 microSiemens/cm
	Not recommended in electrolysis applications, galvanic corrosion applications, applications where the electrodes may coat, or non-conductive pipe.
Grounding Rings	Low conductivity process fluids
	Cathodic or electrolysis applications that may have stray currents in or around the process
	Variety of materials for process fluid compatibility

Table 41: Process Reference Installation

Type of pipe	Grounding straps	Grounding rings	Reference electrode	Lining protectors
Conductive unlined pipe	Acceptable	Not required	Not required	Not required
Conductive lined pipe	Not acceptable	Acceptable	Acceptable	Acceptable
Non-conductive pipe	Not acceptable	Acceptable	Not recommended	Acceptable

Transmitter specifications

Transmitter functional specifications

Transmitter coil drive current

500mA

Flow rate range

Capable of processing signals from fluids with velocities between 0.04 and 39 ft/s (0.01 to 12 m/s) for both forward and reverse flow in all sensor sizes. Full scale continuously adjustable between –39 and 39 ft/s (–12 to 12 m/s).

Conductivity limits

Process liquid must have a conductivity of 5 microSiemens/cm (5 micromhos/cm) or greater.

Power supply

- 90 - 250VAC @ 50/60Hz

- 12 - 42VDC

Line power fuses

- 90 - 250VAC systems:
  - 2 amp quick acting
  - Bussman AGC2 or equivalent
- 12 - 42VDC systems
  - 3 amp quick acting
  - Bussman AGC3 or equivalent

Power consumption

- 90 - 250VAC: 40VA maximum
- 12 - 42VDC: 15W maximum

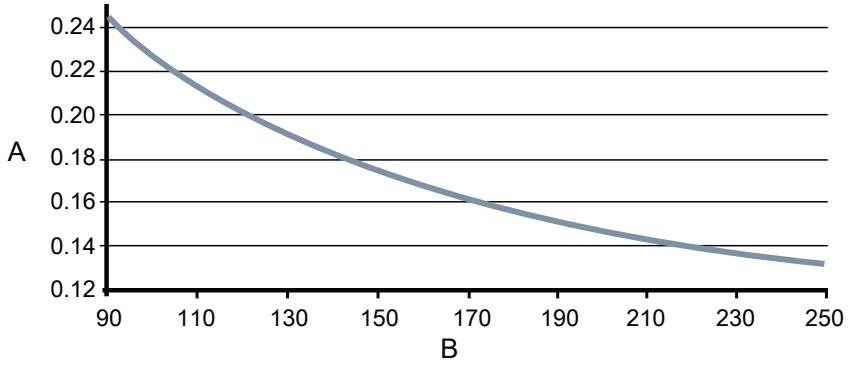
Switch-on current

- At 250VAC: Maximum 35.7A (< 5ms)
- At 42VDC: Maximum 42A (< 5ms)

AC power supply requirements

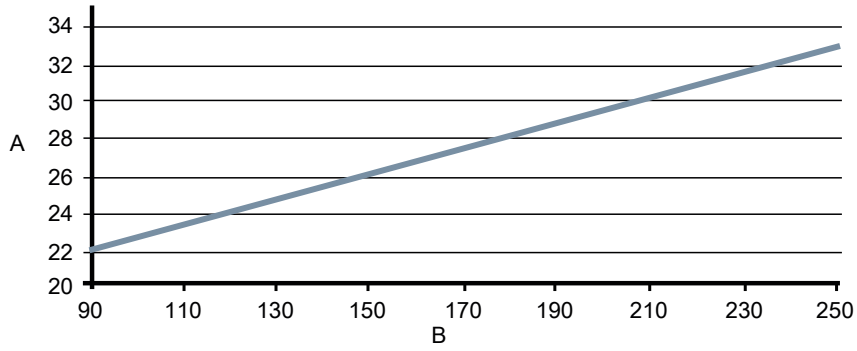
Units powered by 90 - 250VAC have the following power requirements. Peak inrush is 35.7A at 250VAC supply, lasting approximately 1ms. Inrush for other supply voltages can be estimated with: Inrush (Amps) = Supply (Volts) / 7.0

Figure 2: AC current requirements



A. Supply current (amps)
B. Power supply (VAC)

Figure 3: Apparent power

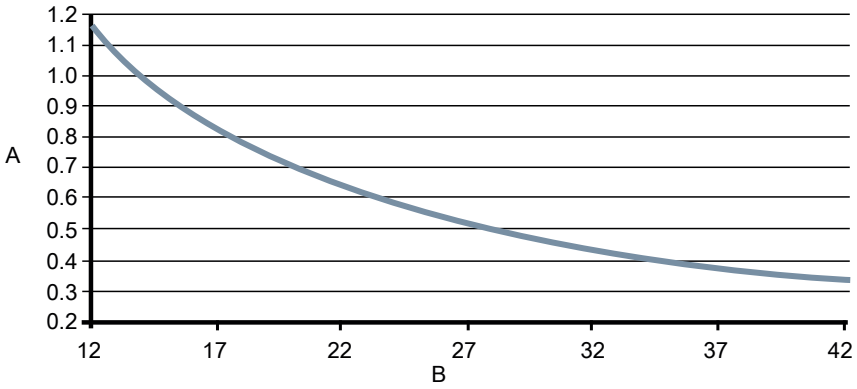


A. Apparent power (VA)
B. Power supply (VAC)

DC power supply requirements

Units powered by 12VDC power supply may draw up to 1.2A of current steady state. Peak inrush is 42A at 42VDC supply, lasting approximately 1ms. Inrush for other supply voltages can be estimated with: Inrush (Amps) = Supply (Volts) / 1.0

Figure 4: DC current requirements



A. Supply current (amps)
B. Power supply (VDC)

Ambient temperature limits

- Operating:
  - –58 to 140 °F (–50 to 60 °C) without LOI/Display
  - –4 to 140 °F (–20 to 60 °C) with LOI/Display
  - The LOI/Display will not be visible at temperatures below -20°C
- Storage:
  - –58 to 185 °F (–50 to 85 °C) without LOI/Display
  - –22 to 176 °F (–30 to 80 °C) with LOI/Display

Humidity limits

0–95% RH to 140 °F (60 °C)

Altitude

2000 meters maximum

Enclosure rating

Type 4X, IEC 60529, IP66 (transmitter)

Transient protection rating

Built in transient protection that conforms to:

- IEC 61000-4-4 for burst currents
- IEC 61000-4-5 for surge currents
- IEC 611185-2.2000, Class 3 up to 2kV and up to 2kA protection

Turn-on time

- 5 minutes to rated accuracy from power up
- 5 seconds from power interruption

Start-up time

50ms from zero flow

Low flow cut-off

Adjustable between 0.01 and 38.37 ft/s (0.003 and 11.7 m/s). Below selected value, output is driven to the zero flow rate signal level.

Overrange capability

Signal output will remain linear until 110% of upper range value or 44 ft/s (13 m/s). The signal output will remain constant above these values. Out of range message displayed on LOI/Display and the Field Communicator.

Damping

Adjustable between 0 and 256 seconds

Advanced diagnostics capabilities

Basic

- Self test
- Transmitter faults
- Analog output test
- Pulse output test
- Tunable empty pipe
- Reverse flow
- Coil circuit fault
- Electronics temperature

Process diagnostics (DA1)

- Ground/wiring fault
- High process noise
- Electrode coating diagnostic

Smart Meter Verification (DA2)

- Smart Meter Verification (continuous or on-demand)

- 4-20mA loop verification(2)

Output signals

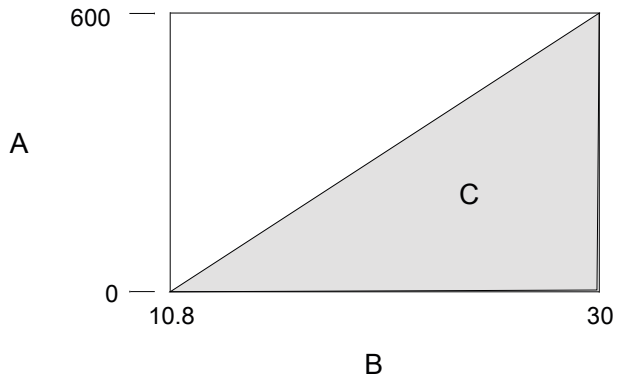
Analog output adjustment (3)

4–20mA, switch-selectable as internally or externally powered.

Analog loop load limitations

- Internally powered 24VDC max, 500 ohms max loop resistance
- Externally powered 10.8 - 30VDC max.
- Loop resistance is determined by the voltage level of the external power supply at the transmitter terminals:

Figure 5: Analog loop load limitations



A. Load (ohms)
B. Power supply (volts)
C. Operating region

- $R_{max} = 31.25 (V_{ps} – 10.8)$
- V_{ps} = power supply voltage (volts)
- Rmax = maximum loop resistance (ohms)

The analog output is automatically scaled to provide 4mA at lower range value and 20mA at upper range value. Full scale continuously adjustable between -39 and 39 ft/s (-12 to 12 m/sec), 1 ft/s (0.3 m/s) minimum span.

HART Communications is a digital flow signal. The digital signal is superimposed on the 4–20mA signal and is available for the control system interface. A minimum of 250 ohms loop resistance is required for HART communications.

Analog alarm mode

High or low alarm signal is user-selectable via the Alarm switch on the front of the electronics. NAMUR-compliant alarm limits are software configurable and can be preset via CDS (C1). Individual diagnostic alarms are also software configurable. Alarms will drive the analog signal to the following mA values. High or low alarm signal is user-selectable via the Alarm switch on the front of the electronics. NAMUR-compliant alarm limits are software configurable and can be preset via CDS (C1). Individual diagnostic alarms are also software configurable. Alarms will drive the analog signal to the following mA values.

Low	3.75 mA	Requires CDS (C1)
High	22.50 mA	Factory default
NAMUR Low	3.5 mA	Requires CDS (C1)

(2) Available with HART output only.
(3) For transmitters with intrinsically safe outputs (option code B), power must be supplied externally.

NAMUR High	22.6 mA	Requires CDS (C1)

FOUNDATION™ Fieldbus output

Output signal	Manchester-encoded digital signal that conforms to IEC 1158-2 and ISA 50.02
Scheduled Entries	Seven (7)
Links	Twenty (20)
Virtual Communications Relationships (VCRs)	One (1) predefined (F6, F7) Nineteen (19) configurable

FOUNDATION™ fieldbus function blocks

Table 42: Function block execution times

Block	Execution time (milliseconds)
Resource (RB)	—
Transducer (TB)	—
Analog Input (AI)	15
Proportional/Integral/Derivative (PID)	20
Integrator (INT)	25
Arithemetic (AR)	25
Discrete Output (DO)	15

Transducer Block	The transducer block calculates flow from the measured induced voltage. The calculation includes information related to the calibration number, line size, and diagnostics.
Resource Block	The resource block contains physical transmitter information, including available memory, manufacturer identification, device type, software tag, and unique identification.
Backup Link Active Scheduler (LAS)	The transmitter is classified as a device link master. A device link master can function as a Link Active Scheduler (LAS) if the current link master device fails or is removed from the segment. The host or other configuration tool is used to download the schedule for the application to the link master device. In the absence of a primary link master, the transmitter will claim the LAS and provide permanent control for the H1 segment.
Diagnostics	The transmitter automatically performs continuous self-diagnostics. The user can perform on-line testing of the transmitter digital signal. Advanced simulation diagnostics are available. This enables remote verification of the electronics via a flow signal generator built into the electronics. The sensor strength value can be used to view the process flow signal and provide information regarding filter settings.
Analog Input	The AI function block processes the measurement and makes it available to other function blocks. The AI function block also allows filtering, alarming, and engineering unit changes.
Arithmetic Block	Provides pre-defined application-based equations including flow with partial density compensation, electronic remote seals, hydrostatic tank gauging, ratio control and others.
Proportional/ Integral/Derivative	The PID function block provides a sophisticated implementation of the universal PID algorithm. The PID function block features input for feed forward control, alarms on the process variable, and control deviation. The PID type (series or Instrument Society of America [ISA]) is user-selectable on the derivative filter.
Integrator	The standard integrator block is available for totalization of flow.
	Reverse Flow Detects and reports reverse flow
	Software Lockout A write-lock switch and software lockout are provided in the resource function block.

	Totalizer	Non-volatile totalizer for net, gross, forward and reverse totals.
Discrete Output	The DO function block processes a discrete setpoint and saves it to a specified channel to produce an output signal. The block supports mode control, output tracking, and simulation.	

Modbus RS-485 output

Transmitters with a Modbus output provide an RS-485 signal to a Modbus host system; data rates can be configured from 1200 baud to 115.2 kilobaud.

Scalable pulse frequency adjustment

- 0-10,000Hz, switch-selectable as internally or externally powered (4)
- Pulse value can be set to equal desired volume in selected engineering units
- Pulse width adjustable from 0.1 to 650 ms
- Internally powered: Outputs up to 12VDC(5)
- Externally powered: Input 5 - 28VDC

Output testing

Analog output test (5)	Transmitter may be commanded to supply a specified current between 3.5 and 23mA.
Pulse output test	Transmitter may be commanded to supply a specified frequency between 1 and 10,000Hz.(4)

Optional discrete output function (AX option)

Externally powered at 5 - 28VDC, 240mA max, solid state switch closure to indicate either:

Reverse flow	Activates switch closure output when reverse flow is detected.
Zero flow	Activates switch closure output when flow goes to 0 ft/s or below low flow cutoff.
Empty pipe	Activates switch closure output when an empty pipe condition is detected.
Transmitter faults	Activates switch closure output when a transmitter fault is detected.
Flow limit 1, flow limit 2	Activates switch closure output when the transmitter measures a flow rate that meets the conditions established for this alert. There are two independent flow limit alerts that can be configured as discrete outputs.
Totalizer limit	Activates switch closure output when the transmitter measures a total flow that meets the conditions established for this alert.
Diagnostic status	Activates switch closure output when the transmitter detects a condition that meets the configured criteria of this output.

Optional discrete input function (AX option)

Externally powered at 5 - 28VDC, 1.4 - 20mA to activate switch closure to indicate either:

Reset Totalizer A (or B or C)	Resets Totalizer A (or B or C) value to zero.
Reset All Totals	Resets all totalizer values to zero.
Positive Zero Return (PZR)	Forces outputs of the transmitter to zero flow.

Security lockout

Security lockout switch on the electronics board can be set to deactivate all LOI and HART-based communicator functions to protect configuration variables from unwanted or accidental change.

(4) For transmitters with intrinsically safe outputs (option code B), frequency range is limited to 0-5000Hz.
(5) For transmitters with intrinsically safe outputs (option code B), power must be supplied externally.

LOI lockout

The display can be manually locked to prevent unintentional configuration changes. The display lock can be activated through a HART communication device, or by holding the UP arrow for 3 seconds and then following the on-screen instructions. When the display lock is activated, a lock symbol will appear in the lower right hand corner of the display. To deactivate the display lock, hold the UP arrow for 3 seconds and follow the on-screen instructions.

Display auto lock can be configured from the LOI with the following settings: OFF, 1 Minute, or 10 Minutes

Sensor compensation

Rosemount sensors are calibrated in a flow lab at the factory and are assigned a calibration number. The calibration number must be entered into the transmitter, enabling interchangeability of sensors without calculations or a compromise in standard accuracy.

Transmitters and other manufacturers' sensors can be calibrated at known process conditions or at the Rosemount NIST-Traceable Flow Facility. Transmitters calibrated on site require a two-step procedure to match a known flow rate. This procedure can be found in the operations manual.

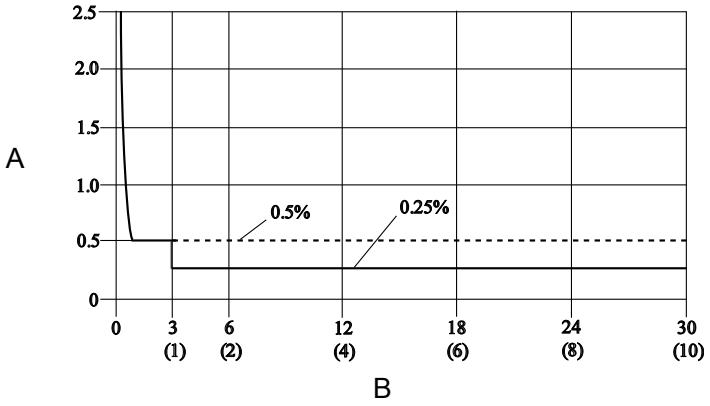
Performance specifications

System specifications are given using the frequency output and with the unit at reference conditions.

Accuracy

Includes the combined effects of linearity, hysteresis, and repeatability.

- Standard system accuracy:
  - ±0.5% of rate from 1 to 39 ft/s (0.3 to 12 m/s)
  - ±0.005 ft/s (0.0015 m/s) from the low flow cutoff to 1 ft/s (0.3 m/s)
- Optional high accuracy:(6)
  - ±0.25% of rate ±1.0 mm/sec from 3 to 39 ft/s (1 to 12 m/s)



A. Percentage of rate
B. Velocity in ft/s (m/s)

Analog output effects

Analog output has the same accuracy as frequency output plus an additional ±4 μ A at room temperature.

Repeatability	±0.1% of reading
Response time (analog output)	20 ms max response time to step change in input
Stability	±0.1% of rate over six months
Ambient temperature effect	±0.25% change over operating temperature range

(6) For sensor sizes greater than 12 in. (300 mm) the high accuracy is ±0.25% of rate from 3 to 39 ft/sec (1 to 12 m/sec).

Wall mount transmitter physical specifications

Materials of construction

Standard housing	Low copper aluminum Type 4X and IEC 60529 IP66
Paint	Polyurethane coat (1.8 to 2.2 mils thick)
Optional housing	Not available
Cover gaskets	Silicone

Electrical connections

Conduit entries	½ inch NPT or M20
Terminal block screws	6-32 (No. 6) suitable for up to 14 AWG wire
Safety grounding screws	External stainless assembly, M5; internal 8-32 (No. 8)

Vibration rating

2G per IEC 61298

Dimensions

See Dimensional drawings.

Weight

Wall mount transmitter	Aluminum	Approximately 9 lbs. (4 kg)

Add 1 pound (0.5 kg) for LOI/Display.

Field mount transmitter physical specifications

Materials of construction

Standard housing	Low copper aluminum Type 4X and IEC 60529 IP66
Paint	Polyurethane coat (1.8 to 2.2 mils thick)
Optional housing	316/316L unpainted, option code SH Type 4X and IEC 60529 IP66
Cover gasket	Aluminum housing: Buna-N

Ingress protection

Consult Emerson for installations requiring IP67/IP68/IP69K.

Electrical connections

Conduit entries	Available in 1/2 inch NPT or M20. See ordering table footnotes for details
Terminal block screws	6-32 (No. 6) suitable for up to 14 AWG wire
Safety grounding screws	External stainless assembly, M5; internal 8-32 (No. 8)

Vibration rating

Integral mount	2G per IEC 61298
Remote mount	5G per IEC 61298

Dimensions

See Dimensional drawings.

Weight

Field mount transmitter only	Aluminum	Approximately 7 lbs. (3.2 kg)
	316 stainless steel	Approximately 23 lbs. (10.5 kg)

Add 1 pound (0.5 kg) for LOI/Display.

Sensor specifications

Functional specifications

Service

Conductive liquids and slurries

Line sizes

½ –in. to 48-in. (15 mm to 1200 mm)

Sensor coil resistance

7 - 16 Ω

Interchangeability

System accuracy is maintained regardless of line size or optional features. Each sensor nameplate has a sixteen-digit calibration number that can be entered into a transmitter during configuration.

Upper range limit

39.37 ft/s (12 m/s)

Ambient temperature limits

- –20 to 140 °F (–29 to 60 °C) standard design

Pressure limits

See Process temperature limits.

Vacuum limits

PTFE lining	Full vacuum to +248 °F (+120 °C) through 4-in. (100 mm) line sizes. Consult Technical Support for vacuum applications with line sizes of 6 inches (150 mm) or larger
All other standard sensor lining materials	Full vacuum to maximum material temperature limits for all available line sizes.

Submergence protection IP68

The remote mount sensor is rated IP68 for submergence to a depth of 33 ft (10 m) for a period of 48 hours. IP68 rating requires that the transmitter must be remote mount. Installer must use IP68 approved cable glands, conduit connections, and/or conduit plugs.

For more details on proper installation techniques for IP68, reference Rosemount Technical Note 00840-0100-4750 available on www.emerson.com.

Conductivity limits

Process liquid must have a minimum conductivity of 5 microSiemens/cm (5 micromhos/cm) or greater.

Process temperature limits

PTFE lining	0 to +248 °F (–18 to +120 °C)
Polyurethane lining	0 to +140 °F (–18 to +60 °C)
Neoprene lining	0 to +176 °F (–18 to +80 °C)

Table 43: Temperature vs. Pressure Limits for ASME B16.5 class flanges (1)

Sensor temperature vs. pressure limits for ASME B16.5 class flanges (½ -in. to 24-in. Line Sizes)(2)					
Flange material	**Flange rating**	**Pressure**			
		@ -20 to 100 °F (-29 to 38 °C)	**@ 200 °F (93 °C)**	**@ 300 °F (149 °C)**	**@ 350 °F (177 °C)**
Carbon Steel	Class 150	285 psi	260 psi	230 psi	215 psi
	Class 300	740 psi	675 psi	655 psi	645 psi
304 Stainless Steel	Class 150	275 psi	235 psi	205 psi	190 psi
	Class 300	720 psi	600 psi	530 psi	500 psi

(1) Liner temperature limits must also be considered.
(2) 30-in. and 36-in. AWWA C207 Class D rated to 150 psi at atmospheric temperature.

Table 44: Temperature vs. Pressure Limits for AS2129 Table D and E flanges (1)

Sensor temperature vs. pressure limits for AS2129 Table D and E flanges (4-in. to 24-in. line sizes)					
Flange Material	**Flange Rating**	**Pressure**			
		@ -29 to 50 °C (-20 to 122 °F)	**@ 100 °C (212 °F)**	**@ 150 °C (302 °F)**	**@ 200 °C (392 °F)**
Carbon Steel	D	101.6 psi	101.6 psi	101.6 psi	94.3 psi
	E	203.1 psi	203.1 psi	203.1 psi	188.6 psi

(1) Liner temperature limits must also be considered.

Table 45: Temperature vs. Pressure Limits for EN 1092-1 flanges (1)

Sensor temperature vs. pressure limits for EN 1092-1 flanges (15 mm to 600 mm Line Sizes)					
Flange material	**Flange rating**	**Pressure**			
		@ -29 to 50 °C (-20 to 122 °F)	**@ 100 °C (212 °F)**	**@ 150°C (302 °F)**	**@ 175°C (347 °F)**
Carbon Steel	PN 10	10 bar	10 bar	9.7 bar	9.5 bar
	PN 16	16 bar	16 bar	15.6 bar	15.3 bar
	PN 40	40 bar	40 bar	39.1 bar	38.5 bar
304 Stainless Steel	PN 10	9.1 bar	7.5 bar	6.8 bar	6.5 bar
	PN 16	14.7 bar	12.1 bar	11.0 bar	10.6 bar
	PN 40	36.8 bar	30.3 bar	27.5 bar	26.5 bar

(1) Liner temperature limits must also be considered.

Table 46: Temperature vs. Pressure Limits for GB/T 9119 Flanges (1)

Temperature vs. Pressure Limits for GB/T 9119 Flanges				
Flange material	**Flange rating**	**Pressure (Mpa)**		
		≤ 20 °C	**@ 100 °C (212 °F)**	**@ 150 °C (302 °F)**
Carbon steel Group 3E0	PN 10	1.00	0.92	0.88
	PN 16	1.60	1.48	1.40
	PN 40	4.00	3.71	3.52
304 SST Group 11E0	PN 10	1.00	0.90	0.81
	PN 16	1.60	1.45	1.31
	PN 40	4.00	3.63	3.27

(1) Liner temperature limits must also be considered.

Table 47: Temperature vs. Pressure Limits for JIS B2220 Flanges (1)

Temperature vs. Pressure Limits for JIS B2220 Flanges			
Flange material	**Flange rating**	**Pressure (Mpa)**	
		≤ 50 °C (122 °F)	**@ 120 °C (248 °F)**
Carbon steel	10K	1.4	1.4
304 stainless steel (15 mm to 65 mm)	10K	1.4	1.4
304 stainless steel (≤ 80 mm)	10K	1.4	1.4

(1) Liner temperature limits must also be considered.

Physical specifications

Non-wetted materials

Sensor Pipe	Type 304/304L SST
Flanges	Carbon steel, Type 304/304L SST

Coil housing	Rolled carbon steel
Paint	Polyurethane coat (2.6 mils or greater)

Process-wetted materials

Lining	PTFE, Polyurethane, Neoprene
Electrodes	316L SST, Nickel Alloy 276 (UNS N10276)

Flat-faced flanges

Flat-faced flanges are manufactured with full-face liners. Available in Neoprene only.

Process connections

ASME B16.5	■ Class 150: ½ -in. to 24-in. (15 mm to 600 mm) ■ Class 300: ½ -in. to 24-in. (15 mm to 600 mm)
AWWA C207	■ Class D: 30-in. to 48-in. (750 mm to 1200 mm) ■ Class E: 30-in. to 48-in. (750 mm to 1200 mm)
EN 1092-1	■ PN10: 200 mm to 900 mm (8-in. to 36-in.) ■ PN16: 50 mm to 900 mm (2 -in. to 36-in.) ■ PN40: 15 mm to 900 mm (½-in. to 36-in.)
AS2129	■ Table D and Table E: 15 mm to 900 mm (½-in. to 36-in.)
AS4087	■ PN16, PN21: 2-in. to 40-in., 48-in. (8-in. excluded) (50 mm to 1000 mm, 1200 mm) ■ PN35: 2-in. to 36-in. (8-in. excluded) (50 mm to 900 mm)
GB/T9119	■ PN10: 8- and 24-, 36-, 40-, 48-in. (200 mm to 600 mm, 900 mm, 1000 mm, 1200 mm) ■ PN16: 4- and 24-, 36-, 40-in. (100 mm to 600 mm, 900 mm, 1000 mm) ■ PN40: ½- to 24-in. (15 mm to 600 mm)
JIS B2220	■ 10K, 20K: ½- to 24-in. (15 mm to 600 mm)

Electrical connections

Conduit entries	Available with 1/2 inch NPT and M20
Terminal block screws	6-32 (No. 6) suitable for up to 14 AWG wire
Safety grounding screws	External stainless assembly, M5; internal 8-32 (No. 8)

Process reference electrode (optional)

A process reference electrode can be installed similarly to the measurement electrodes through the sensor lining. It will be made of the same material as the measurement electrodes.

Grounding rings (optional)

Grounding rings can be installed between the flange and the sensor face on both ends of the sensor. Single ground rings can be installed on either end of the sensor. They have an I.D. slightly larger than the sensor I.D. and an external tab to attach ground wiring. Grounding rings are available in 316L SST, and Nickel Alloy 276 (UNS N10276). See Figure 5.

Dimensions

See Dimensional drawings.

Weight

See Table 48 through Table 55.

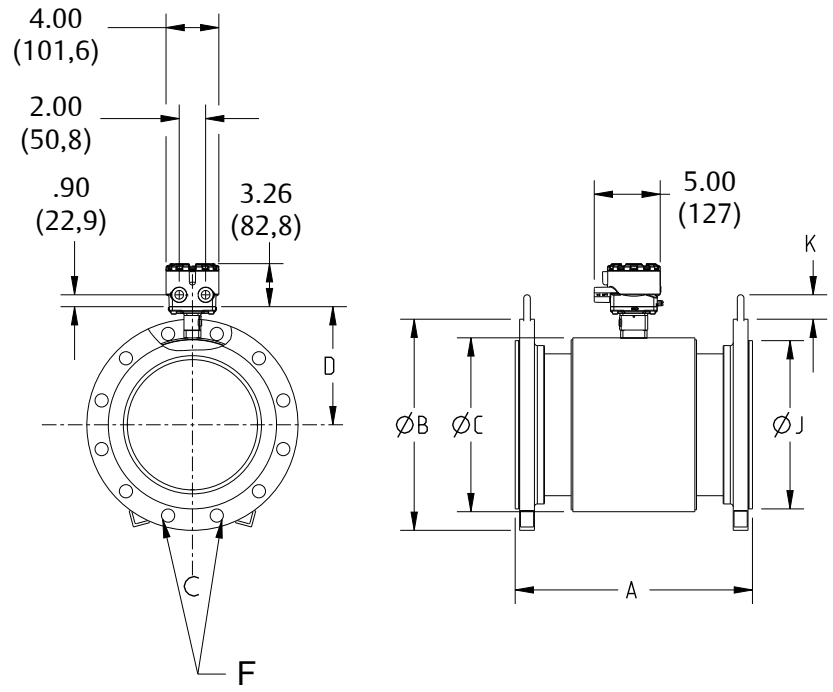
Product Certifications

For detailed approval certification information and installation drawings, please see the appropriate document listed below:

- Document number 00825-MA00-0004: *Rosemount 8750W Approval Document - IECEx and ATEX*
- Document number 00825-MA00-0005: *Rosemount 8750W Approval Document – Class Division*
- Document number 00825-MA00-0006: *Rosemount 8750W Approval Document – North America Zone*

Dimensional drawings

Figure 11: Raised face flanged sensor 3-in to 48-in. (75 mm to 1200 mm)

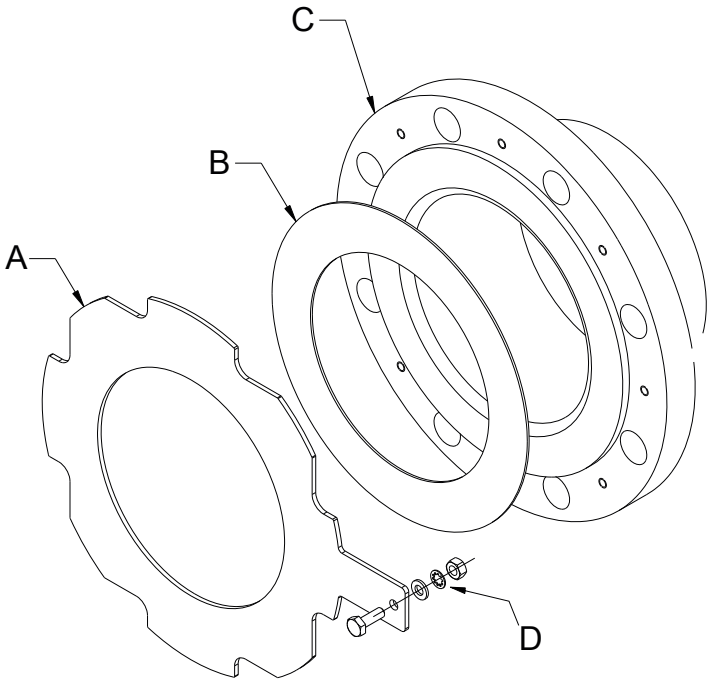


- F – Flange bolts to straddle center line

Table 49: Raised face flanged Sensor 3- to 6-in. (75 mm to 150 mm) dimensions

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
3-in. (80 mm) ASME - 150, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.50 (191)	7.21 (183)	5.82 (148)	5.00 (127)	1.70 (43)	34 (15)
3-in. (80 mm) ASME - 300, SO/RF	8.63 (219)	8.51 (216)	8.63 (219)	8.25 (210)	7.21 (183)	5.82 (148)	5.00 (127)	1.70 (43)	43 (19)
3-in. (80 mm) EN 1092-1 - PN40, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.87 (200)	7.21 (183)	5.82 (148)	5.43 (138)	1.70 (43)	38 (17)
3-in. (80 mm) AS 2129 table D, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.28 (185)	7.21 (183)	5.82 (148)	4.80 (122)	1.70 (43)	24 (11)
3-in. (80 mm) AS 2129 table E, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.28 (185)	7.21 (183)	5.82 (148)	4.80 (122)	1.70 (43)	25 (11)
3-in. (80 mm) JIS - 10K, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.28 (185)	7.21 (183)	5.82 (148)	4.96 (126)	1.70 (43)	28 (13)
3-in. (80 mm) JIS - 20K, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.87 (200)	7.21 (183)	5.82 (148)	5.20 (132)	1.70 (43)	34 (16)
3-in. (80 mm) AS 4087 PN16, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.28 (185)	7.21 (183)	5.82 (148)	4.80 (122)	1.70 (43)	20 (9)
3-in. (80 mm) AS 4087 PN21, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	8.07 (205)	7.21 (183)	5.82 (148)	5.55 (141)	1.70 (43)	56 (25)
3-in. (80 mm) AS 4087 PN35, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	8.07 (205)	7.21 (183)	5.82 (148)	5.55 (141)	1.70 (43)	109 (49)
3-in. (80 mm) GB/T9119 PN40, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.87 (200)	7.21 (183)	5.82 (148)	5.43 (138)	1.70 (43)	37 (17)
4-in. (100 mm) ASME - 150, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	9.00 (229)	7.91 (201)	6.17 (157)	6.19 (157)	1.70 (43)	45 (20)
4-in. (100 mm) ASME - 300, SO/RF	10.88 (276)	10.73 (273)	10.88 (276)	10.00 (254)	7.91 (201)	6.17 (157)	6.19 (157)	1.70 (43)	65 (29)
4-in. (100 mm) EN 1092-1 - PN16, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	8.66 (220)	7.91 (201)	6.17 (157)	6.22 (159)	1.70 (43)	41 (19)
4-in. (100 mm) EN 1092-1 - PN40, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	9.25 (235)	7.91 (201)	6.17 (157)	6.38 (162)	1.70 (43)	49 (22)
4-in. (100 mm) AS 2129 table D, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	8.46 (215)	7.91 (201)	6.17 (157)	6.06 (154)	1.70 (43)	31 (14)
4-in. (100 mm) AS 2129 table E, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	8.46 (215)	7.91 (201)	6.17 (157)	6.06 (154)	1.70 (43)	33 (15)
4-in. (100 mm) JIS - 10K, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	8.27 (210)	7.91 (201)	6.17 (157)	5.95 (151)	1.70 (43)	35 (16)
4-in. (100 mm) JIS - 20K, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	8.86 (225)	7.91 (201)	6.17 (157)	6.30 (160)	1.70 (43)	44 (20)
4-in. (100 mm) AS 4087 PN16, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	8.46 (215)	7.91 (201)	6.17 (157)	6.06 (154)	1.70 (43)	28 (13)

Figure 13: Flanged sensor ½- to 48-in. (15 mm to 1200 mm) grounding ring



A. Grounding ring
B. Customer supplied gasket
C. Flow tube
D. Grounding strap hardware

Table 55: Flanged sensor ½- to 48-in. (15 mm to 1200 mm) grounding ring dimensions

	Single grounding ring thickness		Double grounding ring thickness	
	Min	**Max**	**Min**	**Max**
0.5-in. (15 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
1-in. (25 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
1.5-in. (40 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
2-in. (50 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
2.5-in. (65 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
3-in. (80 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
4-in. (100 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
5-in. (125 mm)	0.059 (1,5)	0.12 (3)	0.12 (3)	0.24 (6,1)

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Emerson Automation Solutions
7070 Winchester Circle
Boulder, Colorado USA 80301
T: +1 800-522-6277
T: +1 303-527-5200
F: +1 303-530-8459
Mexico: 52 55 5809 5300
Argentina: 54 11 4837 7000
Brazil: 55 15 3413 8147
Chile: 56 2 2928 4800

Emerson Automation Solutions
Central Europe: +41 41 7686 111
Eastern Europe: +41 41 7686 111
Dubai: +971 4 811 8100
Abu Dhabi: +971 2 697 2000
France: 0800 917 901
Germany: +49 (0) 2173 3348 0
Italy: 8008 77334
The Netherlands: +31 (0) 70 413 6666
Belgium: +32 2 716 77 11
Spain: +34 913 586 000
U.K.: 0870 240 1978
Russian/CIS: +7 495 981 9811

Emerson Automation Solutions
Australia: (61) 3 9721 0200
China: (86) 21 2892 9000
India: (91) 22 6662 0566
Japan: (81) 3 5769 6803
South Korea: (82) 31 8034 0000
Singapore: (65) 6 363 7766

ROSEMOUNT™

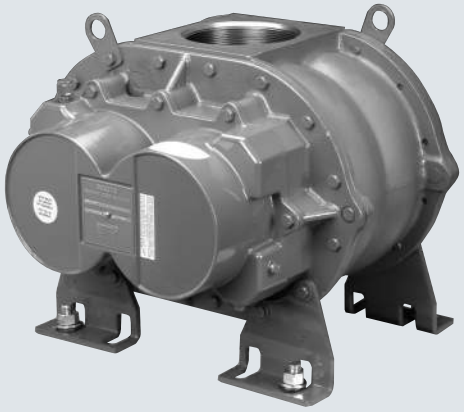
EMERSON™

Frames 22 thru 718

ROOTS™ Universal RAI ® Rotary Positive Blowers

Design and Construction Features

- Detachable steel mounting feet
- Rigid one-piece cast iron casing
- Anti-friction bearings
- Splash oil lubricated spur timing gears
- Connections in standard pipe sizes
- Ground steel shafts
- Straight, precision machined two-lobe impellers



For further information contact

Howden Roots
900 W. Mount St.
Connersville
Indiana
USA
47331
Tel: +1 765 827 9200
Web: www.howden.com

Universal RAI blowers are heavy-duty rotary blowers designed with detachable rugged steel mounting feet that permit easy, in-field adaptability to vertical or horizontal installation requirements.

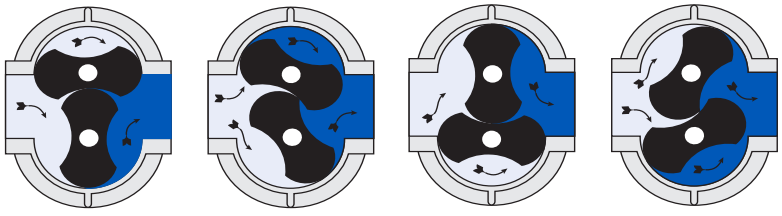
Basic blower description

The detachable mounting feet allow these units to be easily adapted to any of four drive shaft positions: right, left, bottom, or top. The compact, sturdy design is engineered for continuous service when operated in accordance with speed and pressure ratings.

The basic model consists of a cast iron casing, carburized and ground alloy steel spur timing gears secured to steel shafts with a taper mounting and locknut, and cast iron involute impellers. Oversized antifriction bearings are used, with a cylindrical roller bearing at the drive shaft to withstand V-belt pull. The Universal RAI® features splash oil lube on the gear end and grease lube on the drive end. ROOTS' exclusive "figure-eight" gearbox design improves oil distribution to maximize gear and bearing life. After testing, the unit is sprayed with a protective paint, and boxed or skid mounted for delivery.

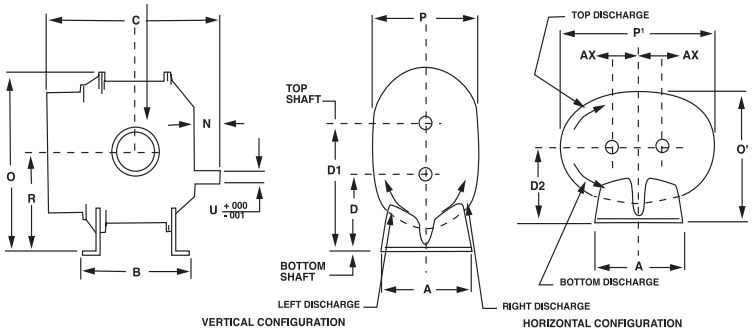
Available accessories include driver, relief valve, inlet and discharge silencers, inlet filter, check valve, extended base, V-belt or flexible coupling and drive guards.

Operating principle



Two figure-eight lobe impellers mounted on parallel shafts rotate in opposite directions. As each impeller passes the blower inlet, it traps a definite volume of air and carries it around the case to the blower outlet, where the air is discharged. With constant speed operation, the displaced volume is essentially the same regardless of pressure or temperature.

Timing gears control the impellers relative positions and maintain small but definite clearances. This allows operation without lubrication requirements inside the unit casing.



Operating principle continued

Frame Size	A	A'	B	C	D	D1	D2	M	O	O'	P	P'	R	U	Inlet Disch.	AX	Wt.
22U	5.13	5.13	5.00	9.75	3.75	6.25	3.75	5.13	9.63	6.88	6.25	9.25	5.00	.625	1.0 NPT	1.25	32
24U	5.13	5.13	7.00	11.75	3.75	6.25	3.75	6.13	9.63	6.88	6.25	9.25	5.00	.625	1.0 NPT	1.25	43
32U	7.25	7.25	6.75	11.25	5.00	8.50	5.00	5.81	12.81	8.88	7.75	12.13	6.75	.750	1.25 NPT	1.75	69
33U	7.25	7.25	7.63	12.13	5.00	8.50	5.00	6.25	12.81	8.88	7.75	12.13	6.75	.750	2.0 NPT	1.75	74
36U	7.25	7.25	10.00	14.63	5.00	8.50	5.00	7.56	12.81	8.88	7.75	12.13	6.75	.750	2.5 NPT	1.75	102
42U	8.00	8.00	7.25	13.00	6.25	10.25	6.25	6.88	15.06	10.63	8.75	13.63	8.25	.875	1.5 NPT	2.00	88
45U	8.00	8.00	10.00	15.50	6.25	10.25	6.25	8.00	15.06	10.63	8.75	13.63	8.25	.875	2.5 NPT	2.00	109
47U	8.00	8.00	11.75	17.63	6.25	10.52	6.25	9.25	15.06	10.50	8.50	13.63	8.25	.875	3.0 NPT	2.00	128
53U	10.50	10.50	8.38	15.38	6.25	11.25	6.75	8.18	17.38	11.88	10.25	17.25	8.75	1.125	2.5 NPT	2.50	143
56U	10.50	10.50	11.00	18.00	6.25	11.25	6.75	9.19	17.38	12.25	11.00	17.25	8.75	1.125	4.0 NPT	2.50	170
59U	10.50	10.50	14.00	21.18	6.25	11.25	6.75	11.19	17.38	12.25	11.00	17.25	8.75	1.125	4.0 NPT	2.50	204
65U	11.00	11.00	10.00	18.38	8.75	14.75	8.75	9.19	21.63	15.13	12.75	19.75	11.75	1.375	3.0 NPT	3.00	245
68U	11.00	11.00	13.00	21.38	8.75	14.75	8.75	10.82	21.63	15.13	12.75	19.75	11.75	1.375	5.0 NPT	3.00	285
615U	11.00	11.00	20.00	28.38	8.75	14.75	8.75	14.32	21.63	16.25	15.00	19.75	11.75	1.375	6.0 FLG	3.00	425
76U	14.00	21.00	11.75	19.94	11.00	18.00	11.00	10.00	26.13	20.69	19.38	23.25	14.50	1.562	4.0 NPT	3.50	400
711U	14.00	21.00	16.75	25.19	11.00	18.00	11.00	12.75	26.13	19.50	17.00	23.25	14.50	1.562	6.0 FLG	3.50	530
718U	14.00	21.00	23.75	32.19	11.00	18.00	11.00	16.25	26.13	19.50	17.00	23.25	14.50	1.562	8.0 FLG	3.50	650

Frame size	Speed RPM	4 PSI		5 PSI		6 PSI		7 PSI		8 PSI		9 PSI		10 PSI		12 PSI		13 PSI		14 PSI		15 PSI		VACUUM DATA		
		CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	INHGV	CFM	BHP
22	2950	31	0.9	29	1.1	27	1.3	26	1.5	24	1.7	23	1.9	21	2.1									13	20	1.3
	3550	40	1.0	39	1.3	37	1.5	35	1.8	34	2.0	32	2.3	31	2.5	28	3.0							14	28	1.7
	5275	68	1.6	66	2.0	64	2.4	63	2.7	61	3.1	60	3.5	59	3.8	56	4.6							15	53	2.8
24	2950	68	1.7	65	2.1	63	2.5	60	2.9															14	48	2.8
	3550	88	2.0	85	2.5	82	3.0	79	3.5															14	67	3.4
	5275	143	3.1	140	3.9	137	4.6	134	5.4															15	119	5.5
32	1750	54	1.4	51	1.7	48	2.1	45	2.4	43	2.8	41	3.1	39	3.5	35	4.1							13	37	2.2
	2950	108	2.4	105	3.0	102	3.6	99	4.2	97	4.7	95	5.3	93	5.9	89	7.1	87	7.6	86	8.2	84	8.8	15	84	4.3
	3550	135	3.0	132	3.7	129	4.4	126	5.1	124	5.8	122	6.5	120	7.2	116	8.6	114	9.3	114	10.0	111	10.6	16	108	5.6
33	1750	75	1.9	71	2.4	67	2.9	64	3.3	61	3.8	58	4.3	56	4.7	51	5.7							13	53	3.0
	2950	149	3.3	145	4.1	141	4.9	138	5.7	135	6.5	132	7.3	130	8.1	125	9.7							15	119	5.9
	3550	186	4.1	182	5.0	178	6.0	175	6.9	172	7.9	169	8.8	167	9.8	162	11.7							15	156	7.2
36	1750	132	3.2	126	3.9	121	4.7	117	5.5															14	95	5.4
	2950	254	5.5	249	6.8	244	8.1	239	9.4															15	212	9.8
	3550	316	6.7	310	8.3	305	9.9	300	11.5															15	273	11.9
42	1750	78	1.9	74	2.4	71	2.8	69	3.3	66	3.7	64	4.2	61	4.7	57	5.6	55	6.0					14	55	3.2
	2950	150	3.3	147	4.1	144	4.9	141	5.7	139	6.5	136	7.2	134	8.0	130	9.6	128	10.3	126	11.1	124	11.9	16	121	6.2
	3550	187	4.1	183	5.1	180	6.0	177	7.0	175	7.9	172	8.8	170	9.8	166	11.6	164	12.6	162	13.5	160	14.4	16	157	7.6
45	1750	161	3.8	155	4.7	150	5.6	145	6.6	140	7.5	136	8.4	132	9.3									14	121	6.4
	2950	306	6.7	300	8.2	295	9.8	290	11.3	285	12.9	281	14.4	277	16.0									16	253	12.5
	3550	379	8.2	373	10.1	368	12.0	363	13.9	358	15.7	354	17.6	349	19.5									16	326	15.2
47	1750	215	5.0	208	6.2	201	7.4	195	8.6															14	165	8.4
	2950	407	8.8	399	10.8	392	12.9	386	14.9															15	348	15.4
	3550	502	10.9	495	13.3	488	15.8	482	18.3															15	444	18.8
53	1170	113	2.7	108	3.4	103	4.1	99	4.8	96	5.4	92	6.1	89	6.8	82	8.1							13	85	4.3
	1750	189	4.2	184	5.2	180	6.2	176	7.2	172	8.2	168	9.2	165	10.3	159	12.3	156	13.3	153	14.3			15	151	7.5
	2850	334	7.4	329	9.0	325	10.7	321	12.3	317	14.0	313	15.6	310	17.2	304	20.5	301	22.1	298	23.8	295	25.4	16	291	13.4
56	1170	196	4.6	188	5.7	182	6.9	175	8.0	170	9.1	164	10.2	159	11.4	150	13.6							14	146	7.8
	1750	324	7.0	316	8.7	310	10.4	304	12.1	298	13.8	292	15.5	287	17.2	278	20.5	273	22.2					15	266	12.6
	2850	567	12.2	560	15.0	553	17.7	547	20.5	541	23.2	536	26.0	530	28.7	521	34.2	517	37.0					16	501	22.4
59	1170	299	6.7	290	8.4	281	10.0	273	11.7															14	237	11.4
	1750	486	10.3	477	12.8	469	15.2	461	17.7															15	414	18.4
	2850	842	18.0	832	22.0	824	26.0	816	30.0															15	770	30.8
65	1170	223	5.2	215	6.4	208	7.7	202	8.6	196	10.2	190	11.5	185	12.7	175	15.2	171	16.5	166	17.7			14	171	8.7
	1750	365	8.0	358	9.9	351	11.8	344	13.7	339	15.6	333	17.4	238	19.3	318	23.1	313	24.9	309	26.8	305	28.7	16	297	15.1
	2350	513	11.4	505	13.9	489	16.4	492	19.0	486	21.5	481	24.0	475	26.5	465	31.6	461	34.1	456	36.6	452	39.1	16	445	20.6
68	1170	358	8.3	345	10.3	334	12.3	324	14.3	314	16.3	305	18.3	297	20.3	281	24.4	274	26.4	267	28.4			14	275	13.9
	1750	587	12.7	574	15.7	563	18.7	553	21.8	544	24.8	535	27.8	526	30.8	510	36.8	503	39.8	496	42.9			16	478	24.0
	2350	824	17.8	811	21.8	800	25.9	790	29.9	781	34.0	772	38.0	763	42.1	747	50.2	740	54.2	733	58.3			16	715	32.8
615	1170	670	15.4	647	19.1	626	22.9	607	26.7															11	581	20.5
	1750	1099	23.4	1076	29.1	1055	34.7	1036	40.4															12	989	33.7
	2350	1543	32.4	1520	40.0	1499	47.6	1480	55.2															12	1433	46.0
76	1170	393	8.6	383	10.6	374	12.7	367	14.8	359	16.8	352	18.9	346	21.0	333	25.1	328	27.2	322	29.2	317	31.3	15	319	15.4
	1750	628	13.4	618	16.5	609	19.6	601	22.7	594	25.8	587	28.9	580	32.0	568	38.1	562	41.2	557	44.3	552	47.4	16	543	24.9
	2050	749	16.2	240	19.8	731	23.4	723	22.0	716	30.6	709	34.3	702	37.9	690	45.1	684	48.7	678	52.4	623	56.0	16	664	29.5
711	1170	738	15.5	723	19.2	710	23.0	679	26.8	686	30.5	675	34.3	665	38.1									15	623	27.9
	1750	1166	23.9	1151	29.5	1138	35.2	1125	40.8	1114	46.4	1103	52.0	1093	57.7									16	1035	45.0
	2050	1387	28.6	1372	35.2	1359	41.8	1347	48.4	1335	55.0	1324	61.6	1314	68.2									16	1256	53.1
718	1170	1224	25.0	1202	31.1	1183	37.2																	12	122	36.3
	1750	1920	38.2	1898	47.4	1879	56.5																	12	1818	54.8
	2050	2280	45.5	2258	56.2	2239	66.9																	12	2178	64.7

Notes: 1. Performance based on inlet air at standard pressure of 14.7 psia, standard temperature of 68° F, and specific gravity of 1.0.
2. Vacuum ratings based on inlet air at standard temperature of 68° F, discharge pressure of 30" Hg and specific gravity of 1.0.