

Wellmark

Chemical Injection Products



Chemical injection pump models

Wellmark E Series (AC and DC)

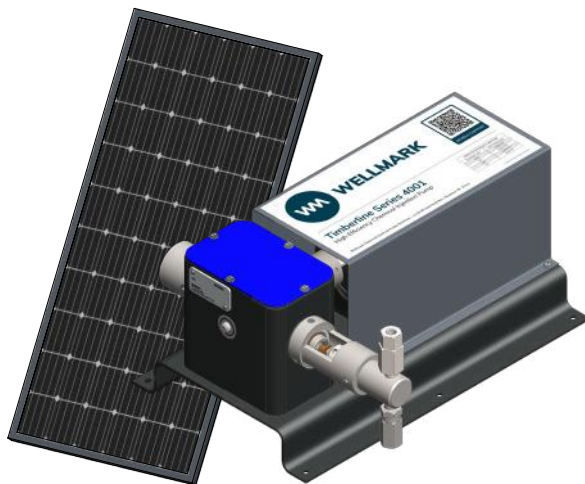
- Solar and AC powered systems available
- Single head or dual head configuration options
- Three position adjustable stroke length for more frequent injection at lower rates
- Built in temperature sensor for enhanced methanol injection control frequent injection at lower rates

Model Description	Max Pressure	Max Injection Rate
Wellmark EIP Series	5,000 psi	162 gpd

AC Model with A-frame support shown



Also available in solar assembly



Model 4001
solar assembly shown

Timberline Series 4000 (AC and DC)

- Solar and AC powered systems available
- Single head or dual head configuration options
- High efficiency motor for longer battery life

Model Description	Max Pressure	Max Injection Rate
Timberline Series 4000XP Brushless Motor	6,000 psi	180 gpd
Timberline Series 4000 High Pressure Motor	6,000 psi	172 gpd
Timberline Series 4001 High Efficiency Motor	5,000 psi	162 gpd

Wellmark TPP Series Pumps

- Three pump sizes on pressures/injection rates
- Pneumatic controller allows for stroke rate adjustment from 4 to 70 strokes per minute
- 17-4 or ceramic coated plunger available

Model Description	Max Pressure	Max Injection Rate
2500 Series	10,750 psi	20 gpd
5000 Series	8,500 psi	64 gpd
1500 Series	1,900 psi	586 gpd



Model 2515
pneumatic pump shown

*Ask your Wellmark sales representative for details on all available options.

Automation DigiUltra controller

Optimize single point injection pumps with the most cost-effective automation solution in the industry. Enable safer operations, enhanced visibility, and LOE savings today on your chemical program.

Applications

- Dynamic wells, requiring dynamic injection rates
- Wells with high chemical program costs, needing added visibility
- High failure wells, requiring remote monitoring and control
- Remote locations that are difficult to access due to distance or local restrictions
- Methanol injection applications with built-in temperature sensor

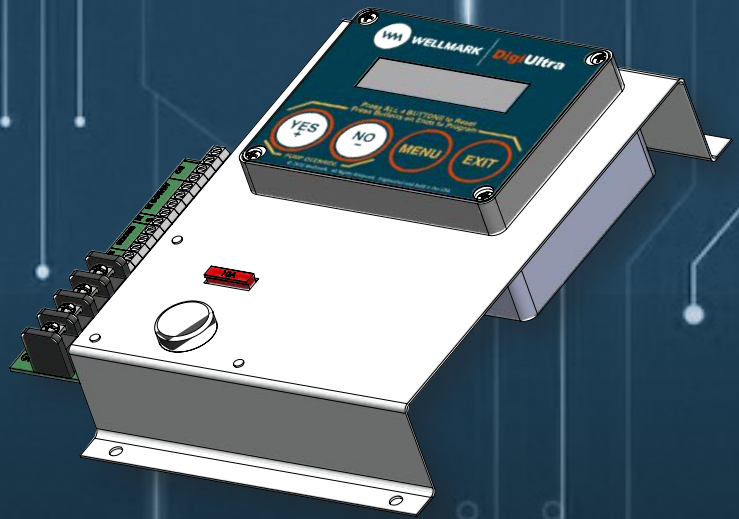
Benefits

Standard Remote monitoring and control offering:

- Monitor tank levels
- Remotely control any DigiUltra register (injection rate setpoints, temperature, etc.)

Standard Proportional Control utilizing process inputs

- Local proportional injection control when tied to flow meter or analyzer
- SCADA-based proportional injection control



Features

I/O	<ul style="list-style-type: none">• Solid State Motor Output• 2x Configurable 0-5VDC Analog Inputs<ul style="list-style-type: none">– 4-20mA option available with adder per input• 1x Dedicated Ambient Temperature Input<ul style="list-style-type: none">– Temperature Thermistor Included Standard• 2x 12VDC Digital Inputs<ul style="list-style-type: none">– 5-12V Stroke Counter / Tachometer / Flow Meter Input– 12V Override Input• 1x Dry Contact Relay Output for External Device Control<ul style="list-style-type: none">– Flush Valve Applications– Backup Pneumatic Pump
TLM	<ul style="list-style-type: none">• 2x Configurable 0-5V Analog Inputs can be Configured as TLM<ul style="list-style-type: none">– 4-20mA option available with (adder)– Inline or Drop in Tank Level Transducer Compatible– TLM Monitoring Algorithm for Inline Transducer Accuracy
Comms	<ul style="list-style-type: none">• Modbus RTU via RS485 2-Wire<ul style="list-style-type: none">– Modbus TCP/IP available with Converter (adder)
User Interface	<ul style="list-style-type: none">• Local 16x2 OLED Display• Large Dome-Switch Membrane Keypad Input

Pump monitoring and control platform

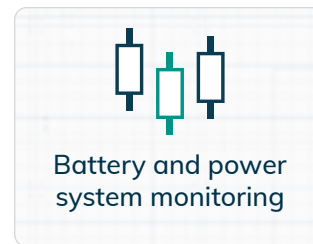
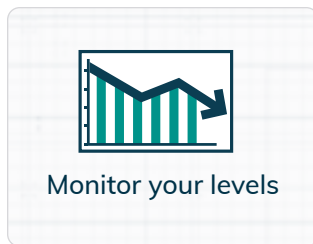
Key Capabilities

- Tank level monitoring
- Pump remote monitoring and control
- Local and host-based proportional control

Package Details

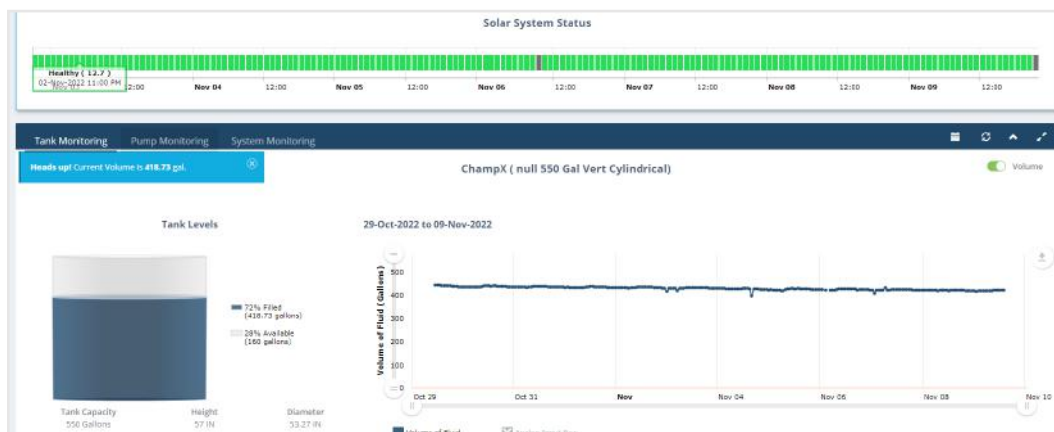
- Fit-for-purpose pump controller
- Low-cost TCPIP cell modem
- Secure Azure-based cloud

Wellmark's cloud platform is built for chemical suppliers or operators choosing not to use SCADA. The software is integrated with the DigiUltra controller enabling plug and play monitoring and control of your chemical pumps.



Common injection pump monitoring and control workflows

Asset Name	Last Comm On	Data Source	System Voltage (V)	Remaining Gallons	Days to Empty	Chemical Product	QPD Setpoint	7 day Setpoint Avg	7 day Actual rate	Variance %	Last Setpoint Change	Change Setpoint
Python 14H - Emulsion	09-Nov-2022 02:58 PM	XSPDC	13.5	384.31	192	Corrosion inhibitor	8.00	8.00	6.96	▼ 13.1	-	🔧
Python 15H - Emulsion	09-Nov-2022 02:58 PM	XSPDC	13.4	368.51	184	Corrosion inhibitor	8.00	8.00	7.02	▼ 12.3	-	🔧
NSWM-Lab-391	09-Nov-2022 02:57 PM	XSPDC	12.0	-	0.0	Corrosion inhibitor	6.00	6.00	-990.00	▲	-	🔧
Ronald McDonald #1	09-Nov-2022 02:57 PM	XSPDC	13.3	151.20	123	Corrosion inhibitor	5.00	5.00	-999.00	▲	-	🔧
Python 13H - Emulsion	09-Nov-2022 02:58 PM	XSPDC	13.4	418.73	209	Corrosion inhibitor	8.00	8.00	7.72	▼ 3.5	-	🔧
Python 15H - SICI	09-Nov-2022 02:56 PM	XSPDC	13.2	825.32	25	Corrosion inhibitor	150.00	150.00	-1.46	▲	-	🔧
Python 13H - SICI	09-Nov-2022 02:58 PM	XSPDC	13.3	796.70	10	Corrosion inhibitor	200.00	200.00	27.98	▼ 8.0	-	🔧
FUWGF 133	09-Nov-2022 02:48 PM	XSPDC	12.5	95.30	96	Corrosion inhibitor	4.00	4.00	4.25	▲ 6.3	-	🔧
Python 14H - SICI	09-Nov-2022 02:48 PM	XSPDC	13.4	840.58	17	Corrosion inhibitor	200.00	200.00	51.19	▼ 74.4	-	🔧



Multipoint chemical injection systems

FlowCore® Raptor Series

The multipoint chemical metering and injection system

The Raptor Series uses one controller, one dual-headed pump (or two pumps for greater output) and a modular manifold to bring intelligence, precision, and reliability to multipoint injection applications.

Using a sophisticated multi-patented technology, the Raptor precisely injects, monitors, and records doses accurate up to a hundredth of an ounce.

Raptor Specifications

- 1 chemistry
- 1 to 8 ports
- 1 or 2 Pumps
- 110VAC or 24VDC
- General Purpose or C1 D2

Raptor and Scorpion Series

Features

- User-friendly color touch screen display
- Precisely compensates injection for changes in temperature, pump performance and port to port pressure differentials

Communication Options

- SCADA (TCP/IP, Modbus, etc.)
- FlowSite (online platform)

Wellmark is an exclusive distributor of the Raptor and Scorpion multipoint injection systems.

FlowCore® Scorpion Series

The dual-chemistry multipoint chemical metering and injection system

The Scorpion Series is a dual chemistry sister product to the Raptor Series. Using a single controller, one dual-headed pump (or two pumps for greater output).

Scorpion Specifications

- 1 or 2 Chemistries
- 1 to 8 Ports
- Manifold A: 1 to 4 Ports
- Manifold B: 1 to 4 Ports
- 1 or 2 Pumps
- 110VAC or 24VDC
- General Purpose or C1D2



Scorpion series dual-chemistry multipoint injection system shown

Ancillary products

Tanks and containments

- Stand mounted tanks
- Stealth series
- Tank vault series

Stainless steel pipe and tube fittings

- SST braided hose
- 1/4" and 3/8" seamless tubing

Atomizers

Coupon holders

Sand probes


Other

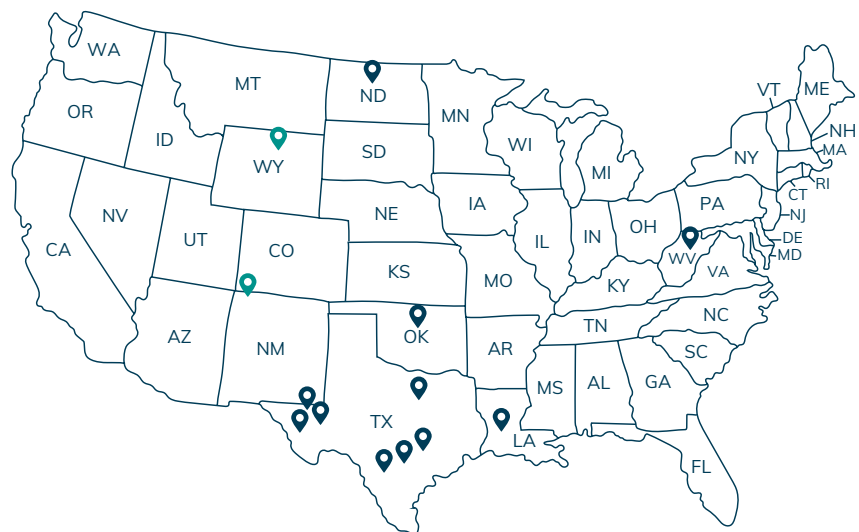
- Inline checks
- Gas scrubbers
- Dividing blocks
- Pulsation dampeners
- Pre-assembled tank manifolds
- Sight glasses
- Strainers/filters
- Regulators
- Gauges
- Injection quills
- Valves



Domestic footprint

 Wellmark
Chemical injection pumps

 Wellmark
Authorized manufacturing representative



wellmarkco.com

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Norriseal Product Overview

Valve and Control Solutions



Liquid Level Controllers



Series EVS Zero-Leak

Environmentally friendly liquid level controllers with patented Enviosave™ snap (on/off) pilot to prevent fugitive emissions and reduce bleeding of valuable gases. Service-enhanced design simplifies installation and inspection.

- Enviosave pilot rated at zero leakage in U.S. EPA Natural Gas STAR Program report (call for details)
- Back-mount design with flush-mount internals for easy access
- Uses proven, force-balance technology for reliability and long service life
- High sensitivity for either top level or interface control
- Weather-resistant sealed enclosure
- Complies with NACE MR0175-2002

Liquid Level Gauges



Series 1001 Pneumatic

Reliable and economical pneumatic liquid level controllers with no-bleed, force-balance operation. Available with patented Envirosave™ snap pilot to prevent fugitive emissions and reduce bleeding of valuable gases.

- Snap (on/off) or throttle (proportional) control
- Right- or left-hand mount
- Field-configurable direct or reverse action
- Removable door
- Various arm lengths and displacer sizes
- Available in various connection types and body materials
- Options include SPDT or DPDT electric switches

Series 1001A Weatherproof

Features weatherproof case/cover with a secure lever latch to protect internals. Options include marine service, snap or throttle pilots, and SPDT or DPDT electric switches.

- O-ring gasket seals internals from outside weather
- Manifold-style pilot assembly
- Harmful exhaust gases are vented to an exhaust manifold
- Optional Envirosave™ snap pilot
- Right- or left-hand mount



Series 1001XL Back Mount

Includes the same features as the Series 1001A with the exception of a back mount connection. The 1001 XL also utilizes a no-bleed force balance operation.

Liquid Level Switches

Series 1005E Electric

Float-actuated electric level switch designed for rugged use 2,000 psig maximum working pressure @ 220°F (104°C) as a high- or low-level alarm.

- Body available in carbon steel or 316 SST
- CSA listed and explosion-proof
- Available with SST or polypropylene float
- SPDT or DPDT options
- Can be mounted in an external chamber



Series 1005P1 Pneumatic

Pneumatic, float-actuated switch used as a high- or low-level switch or to operate a control valve. Features a three-way pilot valve with built-in manual override and optional porting for piped exhaust.

- Rugged carbon steel or 316 SST body with SST float
- Maximum 1,500 psig working pressure @ 220°F (104°C)
- Can be mounted in an external chamber

Series 1100A Pneumatic High/Low No-Bleed

Pneumatic liquid level switch that combines a cast carbon steel external chamber and a liquid level controller. Used in high- and low-level safety applications.

- Pneumatic switch
- Special marine service
- Top-, bottom- or side-mount connections
- Standard 1,480 psig maximum working pressure @ 220°F (104°C) (optional 2,220 psig working pressure)
- Optional Series 1100A incorporates an SPDT or DPDT electrical switch with a carbon steel external chamber



Chambers And Domes



Series 1006 Vertical Chamber

Externally mounted, vertical chambers used with Series 1001 and 1001A liquid level controllers.

- 1.0-in., 1.5-in., or 2.0-in. flanged or NPT process connections
- Side, top or bottom connections
- Accommodates various center-to-center dimensions up to 72-in.
- ANSI 150 to 2500 pressure classes
- 3-in. or 4-in. chamber diameters

Series 1006 Style 4V12 Horizontal Chamber

Externally mounted carbon steel chamber (other materials available) used with Series 1001 and 1001A liquid level controllers.

- 1.0-in. NPT 3,000 psig working pressure @ 220°F (104°C) process connections top and bottom
- Level controller connection can be 2.0-in. NPT or flanged



Series 1006 Style 4V03 Horizontal Chamber

Externally mounted carbon steel or 316 SST chamber used with Series 1002A, 1005E and 1005P1 liquid level switches.

- 1.0-in. NPT process connections
- 1.5-in. and 2.0-in. NPT level switch connections
- 3,000 psig working pressure @ 220°F (104°C)



Control Valves



Series 2023A “No Freeze”

Ideal for use as a high-pressure liquid dump valve for separators and other process vessels. Valve body is designed for constant trim immersion in vessel fluid.

- Threaded end connections
- Replaceable plug and seat
- Ball-type trim design
- Standard 300 Series SST trim Soft Seat (Teflon®) trim option
- Maximum working pressure: 2,220 psig @ 100°F (38°C)

Series 2026/2027A “No Freeze”

“No-Freeze” liquid control valves for highpressure service. The valve body screws directly into the vessel connection, immersing the plug and seat into the process liquid to resist freezing.

- Adjustable or non-adjustable diaphragm actuators
- Carbon steel, hex body
- Hammer-nut closure
- Quick-change replaceable trim
- Series 2026 maximum working pressure: 2,250 psig @ 100°F (38°C)
- Series 2027A maximum working pressure: 3,000 psig @ 100°F (38°C)



Series 2275/2276 Economy Dump Valve

Economical, high-pressure control valve for up to 3,750 psig working pressure. Adjustable tee body configuration can be plugged for either globe or angle flow.

- Screw-in closure
- Quick-change trim
- Non-adjustable actuator, direct or reverse
- Series 2275 Buna diaphragm
- Series 2276 Viton diaphragm

Control Valves



Series 2400/2420 Control Valve

The Series 2400 Control Valve is ideal for oil and gas flow control. It is also a desirable selection where accurate travel indication is needed and positioners or limit switches are required. Temperature rating from -20°F (-29°C) to 400°F (204°C).

The Series 2420 control valve is the close coupled version of the Series 2400. If space and economy are important, or a positioner is not required, this model will give the same dependable service as the Series 2400. Temperature rating from -20°F (-29°C) to 400°F (204°C).

- 3/16-in. through 1 3/4-in. orifice sizes
- Modified percentage, quick opening, and equal percentage (3/16-in. trim only)
- Hammer nut entry
- Yoke-mounted or close-coupled, pressed steel actuators, direct or reverse action
- Teflon packaging

Series 2220 High Pressure / Series 2200 Open Yoke

The Series 2220 is the proven, industry-standard high-pressure control valve. Used to control liquid or gas pressure in separators, scrubbers or other types of pressure vessels.

- Close-coupled design conserves space
- Hammer-nut entry allows quick access for trim inspection or replacement
- Variety of trims, seal materials and end connections
- Patented spherical plug and matching seat for precise seating alignment
- Quick-opening trim or throttling of modified or equal-percentage trim
- Pressure-relief feature of hammernut/body connection improves safety

The Series 2200 open yoke valve allows mounting of positioners, limit switches or other devices, provides exposed stem for accurate travel indication and enables service at elevated temperatures.



SERIES 2220

SERIES 2200

Control Valves

Verto Valve Control Solution

The Verto Valve Control Solution is designed to fit a rotary electric actuator to a linear stem valve, allowing for a simple and efficient method of converting rotary to linear motion. The solution is composed of a rotary electric actuator, a rotary to linear adapter, and our best in class linear stem control valve.

- Trouble free, emissions friendly actuator
- Simple and high-efficiency rotary to linear motion conversion
- Accurate automated valve control
- Rugged and field proven



SERIES 2700A



SERIES 2720

Series 2700A General-Purpose

Globe-bodied, bolted-bonnet control valve designed for a wide range of pressures, temperatures, materials and trims. Single-ported control valves have balanced, unbalanced and restricted-port trims for a variety of flow characteristics.

- Trim material: 17-4 ph SST, 316 SS, Stellite 6, Carbide
- Plug control trim: balanced, unbalanced (mod %, quick open, equal %)
- Cage control trim: balanced (equal %, linear, CAVII, DB II)
- Trim options include erosionresistant, soft seat ring, noise abatement and cavitation control
- Direct or reverse-acting, yoke-mounted pneumatic diaphragm actuators
- Available in 1.0-in. through 12-in. sizes in ANSI 150 to 2500 pressure classes in threaded, raised face or ring joint end connections
- Space saving economical version option Series 2720 with close-coupled actuator (No yoke)

Control Valves



Series 3023 Three-Way

Three-way, two-position high pressure control valves used for diverting or blending applications. Designed to accommodate the high differential and static pressures of system switching by giving positive shut-off while maintaining high flow capabilities.

- Hammer-nut closure with hard, soft and blow case trims available
- Reverse acting, direct acting or pressure balanced
- Teflon® V-ring, spring loaded, non-adjustable packing
- Temperature range from -20°F (-29°C) to 180°F (82°C)
- Optional open yoke for temperatures up to 400°F (204°C)

Check Valves

Series 7100 Flo-Lift® Piston Check Valve

Non-slam piston check valve designed for positive prevention of backflow in gas, air or liquid systems. Optional reduced port trims for low-flow applications.

- Available in 1.0-in. through 12-in. sizes in ANSI 150 to 2500 pressure classes in threaded, raised face or ring joint end connections
- Built-in lifting device for easy piston removal and inspection
- High flow capacity
- Low pressure drop
- Bolted closure



Butterfly Valves

Series R200

Unique, angle-disc butterfly valves available in both resilient-seated and metal-lined designs. Feature bi-directional positive shutoff to 200 psig working pressure. Angle disc provides 360° uninterrupted differential sealing surface.

- Double-shaft seals and body bushings assure smooth, low-torque operation
- Independent flange seals
- Rigid-backed rubber seat easily field-replaced
- Non-wetted body available in lug or wafer designs
- Rigid drive, precision disc-to-shaft connection
- Resilient-seated design (R200) offered in a wide variety of elastomeric seals and metallic materials
- Metal-lined design (M200) provides positive shutoff with minimum sealing material
- Available with a variety of pneumatic, electric and hydraulic actuation



Series M200

Available in a wide range of materials, including Hastelloy®, titanium and other unique alloys.



Series R285

Exclusive, angle-disc butterfly valves provide bidirectional, positive shutoff to ANSI 150 standards (285 psig). Uses a rigid-drive, precision disc-to-shaft connection without load-bearing fasteners in the flow-stream. Available in both resilient-seated and metal-lined configurations.

- Angle disc with 360° uninterrupted differential sealing surface
- Double-shaft seals and shaft bushings assure smooth, low-torque operation
- Non-wetted body available in lug or wafer design
- Offered with a variety of pneumatic, electric and hydraulic actuation

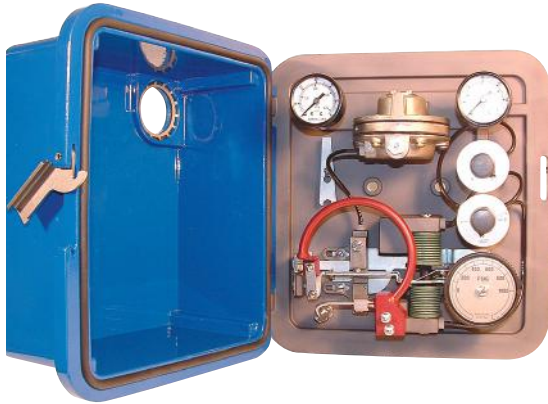


Series M285

Offered in several grades of bronze, SST and high alloys such as Monel†, Inconel† and titanium.

† Monel and Inconel are trademarks of Specialty Metals Corp.

Pressure Controllers



Series 4900 Pneumatic

Combines reliable, low-emission operation with service enhanced design. Provides control in proportional-only (4950), proportional plus integral reset (4960). Standard pressure ratings up to 10,000 psig are available with 316 SST Bourdon tube sensing elements.

- Flush-mounted internals and open design allow easy access and repair
- Removable door
- Easy, field-reversible action
- Reduced leak paths minimize bleeding of valuable gases
- NACE additional options: K Monel Bourdon tube diaphragm seal



Since 1955, the name for quality, reliability, and cost-efficiency has been Norriseal. Norriseal products are field proven, backed by extensive applications engineering, and manufactured with precision. That's why Norriseal products have set the performance standard in oil and gas production, refining, chemical processing, marine, power generation, and many other industrial applications.

Contact Norriseal-Wellmark for more information about our products and services.

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Oklahoma City 405-672-6660

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The safety of our employees, customers, shareholders, and communities is vitally important. From the way we operate, to the products we develop, to how we partner with customers, our goal is zero: zero accidents, zero incidents, and zero environmental releases.

Goal Zero is an ongoing initiative at Norriseal-Wellmark designed to reinforce our safety culture, based on the fundamental belief that all accidents are preventable.

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**Norriseal-Wellmark
Product Brochures
Catalogue**

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Norriseal Product Brochures

▶ **NORRISEAL LEVEL CONTROLS & SWITCHES**

Norriseal Series EVS Liquid Level Controllers

Norriseal Series 1001, 1001A and 1001XL Level Controllers

Norriseal Series 1002A Electric Level Switch

Norriseal Series 1005E Electric Liquid Level Switch

Norriseal Series 1005P1 Pneumatic Liquid Level Switch

Norriseal Series 1100A Liquid Level Switch

Norriseal Series 1200A Magnetic Level Gauges, Transmitters and Switches

▶ **NORRISEAL 2 WAY CONTROL VALVES**

Norriseal Series 2023A No-Freeze Valve

Norriseal Series 2026 and 2027A No-freeze valves

Norriseal Series 2200 and 2220 Control Valves

Norriseal Series 2275 Low Cost Control Valve

Norriseal Series 2400 Control Valve

Norriseal Series 2700A, 2700E and 2720 Control Valves

▶ **NORRISEAL 3 WAY CONTROL VALVES**

Norriseal Series 3023 Three-Way Control Valve

▶ **NORRISEAL PRESSURE CONTROLS**

Norriseal Series 4900 Pressure Controllers and Transmitters

Contact Norriseal-WellMark today for more information about products and services

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Due to the continuous improvement program at Norriseal-WellMark, specifications and/or prices are subject to change without notice or obligation. For the most up to date information, please contact us directly

▶ **NORRISEAL PISTON CHECK VALVES**

Norriseal Series 7100 Flow-Lift® Piston Check Valve

▶ **NORRISEAL ACCESSORIES**

Verto Valve Control Solution

Norriseal Series 8760P & 8760E Valve Positioner

Norriseal Series 8900 SmartPredictor™ Positioner

Norriseal Tritex II™ Electric Actuator

▶ **NORRISEAL BUTTERFLY VALVE GENERAL DATA**

Norris Butterfly Valves

▶ **NORRISEAL 200/285 SERIES BUTTERFLY VALVES**

Norriseal Series 200 Butterfly Valves

Norriseal Series 285 Butterfly Valves

▶ **NORRISEAL ISO MOUNT VALVES**

Norriseal Auto-Mate Butterfly Valves

▶ **NORRISEAL OPERATORS & ACCESSORIES**

Norriseal Butterfly Valve Accessories

Norriseal Series 2G Diaphragm Actuators

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Wellmark Product Brochures

▶ **WELLMARK HYDROSTATIC LIQUID HEAD INDICATOR SWITCH**

Wellmark Series 685 Electro Mechanical Liquid Level Monitor

Wellmark Series 685I Visual Liquid Level Indicator for Atmospheric Vessels

Wellmark Series 685S Single Switch Liquid Level Indicator for Atmospheric Vessels

Wellmark Series 685S Multiswitch Liquid Level Indicator for Atmospheric Vessels

Wellmark Series 685E Electric Liquid Level Indicator for Atmospheric Vessels

Wellmark Series "Snubber" Pulsation Dampener for 685

Wellmark Series 685 Liquid Level Indicator for Atmospheric Vessels

▶ **WELLMARK ELECTRIC CONTROLS**

Wellmark Series 790 Horizontal Level Control Floatswitch

Wellmark Series 683 Floatswitch for Atmospheric Vessels up to 2 psig

Wellmark Series 686 Floatswitch for Pressure Vessels up to 200 psig

Wellmark Series 687 Floatswitch for Pressure Vessels up to 1440 psig

Wellmark Series 688 Level Switch for Pressure Vessels up to 2000 psig

Wellmark Series 710 Flanged Cage Level Control

Wellmark Series 720 Sealed Cage Level Control

Wellmark Series 730 Top Mount Level Control

Wellmark Series 740 Top Mount Displacer Control

Wellmark Series 780 Hermetically Sealed Level Control

▶ **WELLMARK PNEUMATIC CONTROLS**

WellMark Series 2001NB/2001E Pneumatic & Electric Liquid Level Control, High Pressure No-Bleed

WellMark Series 7400 Snaptrol Pneumatic & Electric Liquid Level Control, Low Pressure No-Bleed

WellMark Series 1800 Pneumatic & Electric Liquid Level Control, Low Pressure No-Bleed

WellMark Series 6900 Cantilever Liquid Level Control

WellMark Series PT988 Pneumatic Liquid Level Switch

WellMark Series 9321/9321E Pneumatic & Electric Liquid Level Switch

Contact Norriseal-WellMark today for more information about products and services

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WellMark Series MIZER® No-Bleed Pilot Valve

WellMark Series W1200 DVO Low-Bleed Pneumatic Liquid Level Control

▶ **WELLMARK RELIEF VALVES**

Wellmark Series W9503 3" Threaded Safety Relief Valve

Wellmark Series W2601 and W2602 Safety Relief Valve

Wellmark Series W1392V Vapor Relief Valve

▶ **WELLMARK REGULATORS**

Wellmark Series W7702 Back Pressure Regulator (BPR)

Wellmark Series 2001PR "Top Gun" High Pressure Regulator

Wellmark Series 2002PR "Mighty Gun" High Pressure Regulator

Wellmark Series W67 "Mini Gun II" General Purpose Instrument and Gas Pressure Regulator

Wellmark Series W1301 "Mega Gun II" High Pressure Regulator

▶ **WELLMARK CHEMICAL PUMPS**

Wellmark Series EIP Solar-Powered Chemical Injection Pump with DigiMax ADC Control

Wellmark Series EIP AC-Powered Electric Chemical Injection Pump with DigiMax ADC Control

Wellmark Series EXP Solar and AC-Powered Chemical Injection Pump for Class I, Division 2 Hazardous Locations with DigiMax ADC Control

Wellmark Series ELP Low Pressure Chemical Metering Pump

▶ **WELLMARK DIAPHRAGM TWO-WAY VALVES**

Wellmark Series General Data

Wellmark Series 1010 Fuel Gas Control Valve or Low Pressure Motor Valve

Wellmark Series WDV Pneumatic Diaphragm Actuated Dump Valve

▶ **WELLMARK DIAPHRAGM DOUBLE SEATED (BALANCED) VALVES**

Wellmark Series 5050 Two-Way Double Seated Valve (Balanced)

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▶ **WELLMARK BACK PRESSURE VALVES**

Wellmark Series 3535 Back Pressure Valve, Low Pressure, Single Seat

▶ **WELLMARK DIAPHRAGM DOUBLE SEATED (BALANCED) BPV**

Wellmark Series 5555 Back Pressure Valve, Double Seated (Balanced)

▶ **WELLMARK THROTTLING/ CHOKE VALVES**

Wellmark Series 2020 Flow Control Choke Valve

Wellmark Series 2021 Flow Control Throttling Valve

▶ **WELLMARK FLOAT NOSE/LEVER OPERATED VALVES**

Wellmark Series 1850 Float Nose

Wellmark Series 1250 Lever Operated Valve

▶ **WELLMARK SIGHT GLASS & GAUGE VALVES**

Wellmark Series W20 Sight Glass Visual Level Indicator

Wellmark Series W30 Gauge Valves

Wellmark Series W40 Low Pressure Gauge Valves

▶ **WELLMARK ACCESSORIES**

Wellmark Series Meter Leveling Saddles

Wellmark Series Fuel Gas Shut-Off Valve

Wellmark Series Probe and Plug Pressure Provers

Wellmark Series LevelGlas

Wellmark Series Blind Flange Assemblies (Closures) and Weld Necks

Wellmark Series WTA In-Line Check Valve

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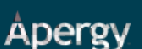


Norriseal Product Brochures

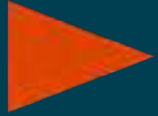
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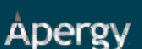


Norriseal Level Controls & Switches

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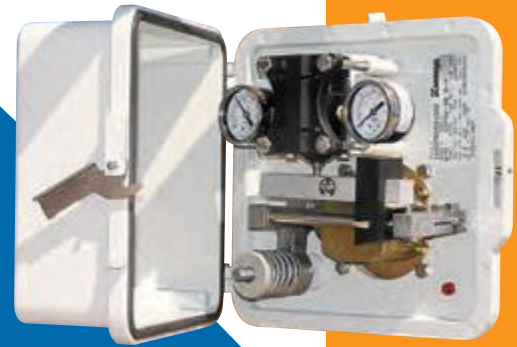
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Norriseal Series EVS Liquid Level Controllers

Zero-Leak Pilot:
Plus easy-to-service design



*EVs are easy-access, back-mounted units that provide liquid level or interface control for gas separator and scrubber applications. EVS controllers feature patented Envirosave snap (on/off) pilots, which prevent fugitive emissions and reduce bleeding of valuable gases. The Envirosave pilot was rated at zero leakage in a U.S. EPA Natural Gas STAR Program report.**

Series EVS controllers operate using Norriseal's force-balance technology, which delivers proven reliability and long service life. Service-enhanced design makes units simpler to install and easy to access for routine maintenance. EVS controllers accommodate both low- and high-pressure applications, making them ideal for a wide range of uses in natural gas production, compression and gas processing.

Features

Controller Body

- Controller body is back-mounted on the case for versatility and ease of installation
- Flush-mounted internals allow easy access
- Removable door
- Field-reversible output for direct or reverse action
- Field-configurable horizontal or vertical displacer

Envirosave Pilot

- Environmentally friendly Envirosave snap (on/off) pilot stops fugitive emissions and conserves valuable gases
- Field-proven, force-balance technology
- High sensitivity for either Top Level or Interface control

- 0 to 60 psig supply and output gauges are standard
- Rated for extreme low-temperature operation (-50°F or -46°C ambient operating temperature)

Weather-Resistant Enclosure

- Weather-resistant sealed enclosure
- Polyurethane dry-powder coating complies with ASTM B117-90 (salt spray) and B2247-87 (humidity resistance)
- High-performance HSN seals standard
- Complies with NACE MR01.75-2002
- 40-micron SST supply filter resists contamination of the pilot

*Natural Gas STAR Program report: Technical Support Documents; Options for Reducing Methane Emissions from Pneumatic Devices in the Natural Gas Industry; Appendix A: Gas Bleed Rate for Various Pneumatic Devices; August 18th, 2003; <http://www.epa.gov/gasstar/pneumat.htm>

This product is covered by U.S. Patents 4,700,738 and 6,497,246.

Contents

- 2 Specifications
- 2 Dimensions
- 3 How to Order
- 4 Model Code

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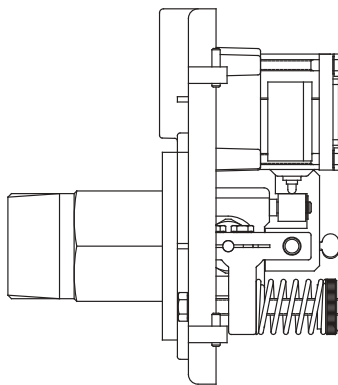
Specifications

Pneumatic Pilots

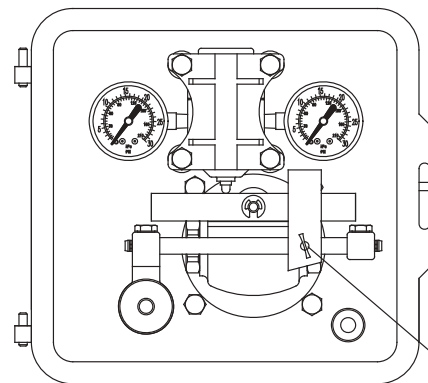
Msmr	
Envirosave, snap	0–20 psig, 0–30 psig
Optional: Throttle, proportional	3–15 psig, 6–30 psig
Snap, on/off	0–20 psig, 0–30 psig
Supply Pressure Required	
3–15 psig, 0–20 psig	20–30 psig (min.)
6–30 psig, 0–30 psig	35–40 psig (min.)
Ambient Temperature	–20° to +180°F (–29° to 82°C)
Pilot Flow Capacity	
Throttle C _v	0.394
Snap C _v	0.282
Envirosave C _v	0.282
Proportional Band Adjustment (Recommended adjustment for a full output pressure change over a percent of sensing element)	
Throttle	20-150%
Snap	7-55%
Envirosave	7-55%
Body	
Throttle	Aluminum w/Aluminum Seat
Snap	Aluminum w/Aluminum Seat
Envirosave	Aluminum w/Elastomeric Seat
Gasket/diaphragm	Nitrile
Internal Valving	Nylon
Filter Element	40 Micron SST
Screws & Nuts	SST

General

Percent Error	1.0% of output span
Dead Band	5.0% of input span
Linearity	1.75% of output span
Mechanical Disturbance Effects on Setpoint	1.0%
Specific Gravity	
Interface	0.035
Top level	0.35 to 2.00
Process Temperature Limits of Body	–50° to +400°F (–46° to +204°C)
Process Pressure Rating	1500 ANSI Class
LLC Body Material	ASTM A352 LCC –50° to +400°F (–46° to +204°C)
Displacers	PVC –20° to +140°F (–29° to +60°C) Acrylic –20° to +200°F (–29° to +93°C) 316 SST –70° to +400°F (–57° to +204°C)
Case and Cover	ASTM A380 die cast aluminum. Polyurethane dry-powder coating com- plies with ASTM B117-90 (salt spray) and B2247-87 (humidity resistance).
Pressure Gauges	Dual scale 0–60 psig/ 0–4 bar, bronze bourdon tube
Operational Service Condition	NACE MR01.75-2002 compliant
Supply, Output and Case Vent/ Relay Exhaust Connections	1/4" NPT, vent assembly installed. (Discard for piped exhaust.)
Total Weight	16 lbs.



Level Adjustment
(Set Point)



Sensitivity Adjustment
(Dump Span)

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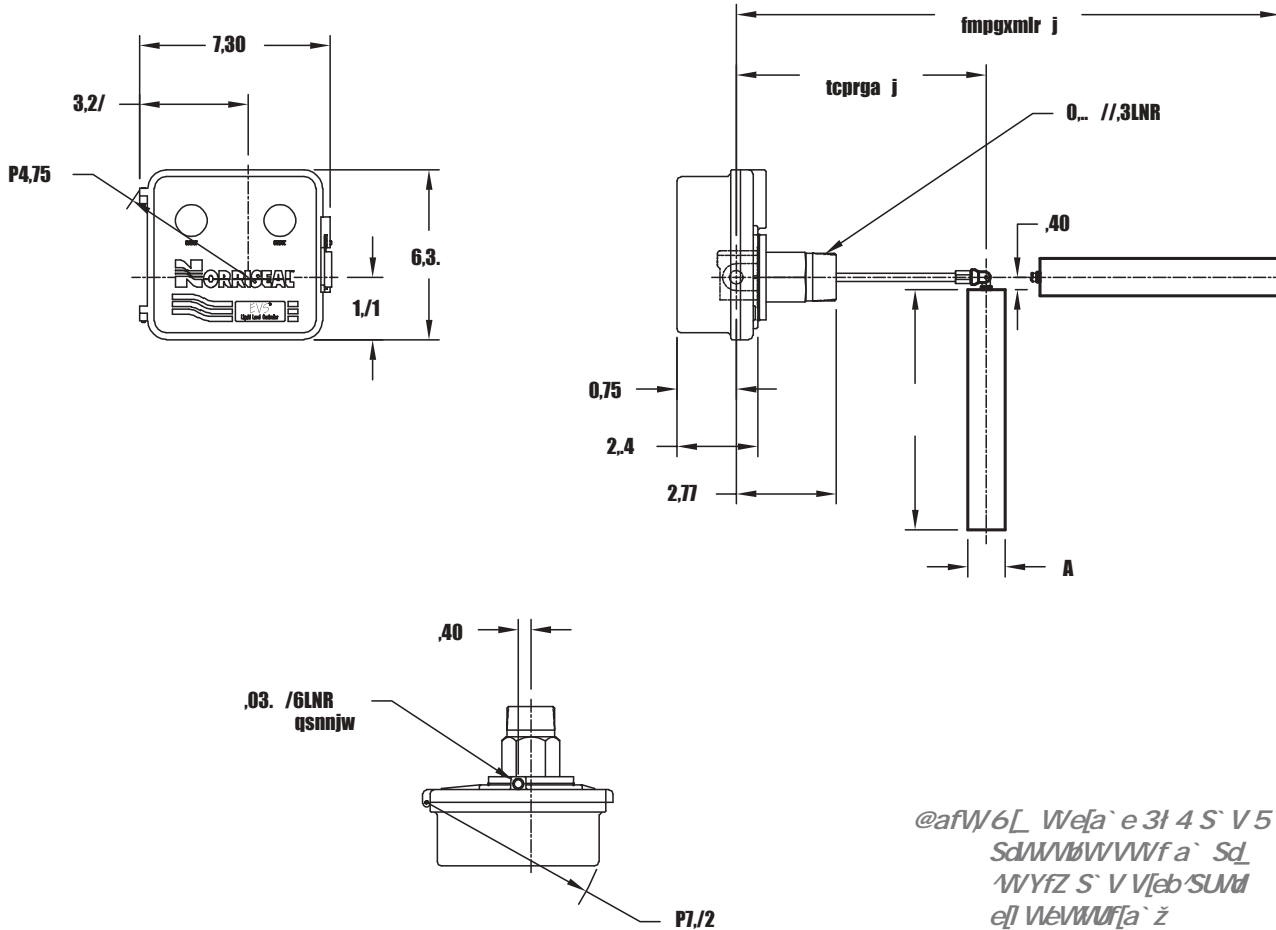
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Dimensions

Dimensions

All dimensions are in inches.



@afW/6L We[a`e 3l 4 S` V 5
SdWVWVWVf a` Sd
WYfZ S` V V[eb`SUVd
e]l WeWVWVf[a` ž

How to order

Determine the model number

The model number specifies the series, size connection, type of pilot, pilot action, seals and service condition.

Required application information

- Fluid media
- Process temperature (minimum and maximum)
- Process pressure
- Vessel size and diameter (distance of connection from bottom of vessel, any obstructions that may hinder performance)
- Displacer position (vertical or horizontal)
- Pilot action
- Top level or interface
- Arm length

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model Code

SIZE END CONNECTION

Bcqpgnrgml	Ambc
2.00	2

boDY t yPE END CONNECTION

Bcqpgnrgml	Ambc
NPT (Screwed Male)	SM

ra tin g boDY END CONNECTION

LQG	P rglel	Ambc
1500	3705	36

*Body pressure rating subject to selection of displacer (reference displacer chart below).

matE rial: boDY/SHaFt/bLoCk

mbw	Qf dr	c pgle jmai	Ambc
LCC Carbon Steel	316	316	-

PnEumatiC PiLot moDE

Bcqpgnrgml	Qc rK rcpj j	Ambc
Envirosave, Snap	Metal/Elastomer	B
Throttle, Proportional	Metal	T
Snap, on/off	Metal	S
Envirosave, Snap, Vib.	Metal/Elastomer	C

*Same as seal material

DiSPLaCEr CHar t DiSPLaCEr tE mPEra turE /Pr ESSurE ra tin g

K rcpj j	Rckn D& A	K vNpcqspc
PVC	-20 to 140 (-29 to 60)	3705
Acrylic	-20 to 200 (-29 to 93)	3705
SST-2	-70 to 400 (-57 to 204)	2000*

Higher pressure SST displacers are available

2SM36-BBDB-N

mountin g CaSE

RwncKmslrle	Ambc
Back Mount	B

SERViCE Condition

Bcqpgnrgml	Ambc
NACE MR0175-2002	N

Pr ESSurE gaugES

Bcqpgnrgml	Ambc
Pressure Gauges Bronze 0-60 psi (0-4 bar)	-

WEt tE D/SEal matE rial

M Pgle	Rckn D& A (l)	Ambc
HSN	-25 to 300 (-32 to 149)	B
Buna TH-70	-50 to 250 (-46 to 121)	Q
AFLAS	-25 to 400 (-32 to 204)	S

**Seal temperature rating subject to selection of displacer.

PiLot aCtion

Ngjmr argml	Ambc
Direct Acting	D
Reverse Acting	R

Please contact your Norriseal-WellMark representative for more details and assistance in specifying the optimal solution for your application.



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Norriseal Series 1001, 1001A and 1001XL Level Controllers

Proven Performers:

Versatile designs with no-bleed,
forced-balanced operation



Model Code				Features			
Case	Pilot	Filter	Material	Door	Seal	Filter	Material
1	2	3	4	5	6	7	8
1	2	3	4	5	6	7	8
1	2	3	4	5	6	7	8
1	2	3	4	5	6	7	8
1	2	3	4	5	6	7	8

Series 1001

The economical Series 1001 Level Controller uses a non-weatherproof case/cover.

Series 1001A

The Series 1001A Level Controller uses a weather-resistant sealed case and a manifold-style pilot assembly.

Series 1001XL

The Series 1001XL Level Controller offers the features of a Series 1001A, but with a back-mount connection.

Features

The pneumatic controller is equipped with one of three types of no-bleed pilots: a snap pilot, throttling pilot, or patented Envirosave™ pilot.

The controller door can only be removed after opening 90°. This feature prevents the door from vibrating loose while in the closed position. A lever latch keeps a positive engagement between the case and the door.

An O-ring gasket seals internals from outside weather and allows the harmful exhaust gases to be vented to a remote area by tubing the vent connection to an exhaust manifold (when equipped with piped exhaust option).

A 40-micron stainless steel filter in the gas supply connection reduces required maintenance of the controller's pilot.

Contents

- 2 Design
- 3 Principle of Operation
- 4 Performance Characteristics
- 5 Materials
- 6 How to Order
- 7 Model Code: Level Controllers
- 8 Dimensions
- 10 Vertical Chambers
- 12 Domes and Horizontal Chambers
- 13 Model Code: Vertical Chambers and Domes
- 14 Model Code: Horizontal Chambers
- 15 Applications

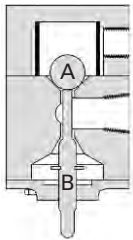
Features (continued)

- A wide spring range makes the control of a liquid interface possible with a standard displacer.
- Stainless steel internals are available.
- This adjustment determines whether rising liquid level will increase or decrease pilot output.
- The controller may be changed for right-hand or left-hand mount in the field without additional parts.

- This option utilizes a standard electric switch; SPDT or DPDT.
- CSA certified Dual Seal to ANSI/ISA 12.27.01 standard meets CEC and NEC secondary seal requirement.
- For liquid dump spans greater than the standard displacers can provide, a split displacer can give dump spans up to 70 feet in length.
- All controllers can be configured to meet NACE MR0175-2002 specifications.

Design

Snap Pilot



The pilot is comprised of two valves – one to admit pilot pressure, and one to exhaust pressure.

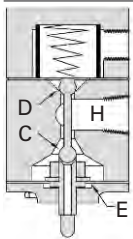
Ball "A" controls the flow of gas into the pilot and is held closed with force exerted by supply pressure on the seating area of the ball.

When the force transmitted to thrust pin "B" is sufficient to overcome the force holding Ball "A" seated, "A" snaps upward allowing gas to flow past "A" and out the side port of the pilot.

The spherical end of thrust pin "B" closes the exhaust port the instant ball "A" snaps upward. The exhaust port seating area is smaller than the seating area of the supply port; therefore, the thrust pin will remain seated against supply pressure until force on the thrust pin diminishes.

A simultaneous action occurs as force is removed from thrust pin "B". Pilot pressure opens the exhaust port by unseating the thrust pin, and supply pressure forces ball "A" to close the supply port. The difference in seating area gives this pilot Snap-Action. The pilot then vents through the thrust pin entry hole.

Throttling Pilot



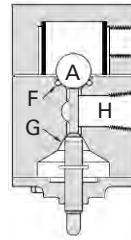
Two valves are used to admit and exhaust pressure. A diaphragm "E" used in cooperation with the valves creates a Force-Balance Pilot.

The pilot output pressure acts upon the diaphragm so that the diaphragm pushes back with the same force being applied by the push rod. These balanced forces are the reason for the term "Force-Balance."

The throttle pilot works in the same manner as the snap pilot except the output pressure is proportioned to the amount of force applied to the pin. More force on the pin produces a proportionate increase in pilot pressure.

When the pin force changes, the pilot seeks a new balance point by either exhausting the output loading at valve "C" or unseating valve "D" to increase output loading. Instrument gas does not flow while the pilot is in balance.

Envirosave™ Pilot

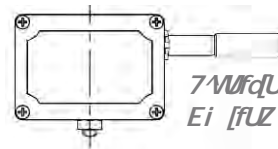


This patented pilot works identically to the snap pilot. The difference between the two is the O-ring seals "F" and "G," which give a positive seal to eliminate leakage and prevent fugitive emissions. The EPA has independently measured the Envirosave™ pilot to have a zero CFH leak rate.*

7 h[daeShW
B[af

Electric Level Switch

The electric level switch uses the force balance



principle to open and close an electrical switch in response to rising or falling levels. Two standard switches are available, single pole

double throw (SPDT) or double pole double throw (DPDT), both with explosion-proof enclosure. Controllers can be supplied "Dual Seal" certified to ANSI/ISA 12.27.01 standard meeting NEC & CEC secondary seal requirement.

* United States of America. Air and Radiation. Environmental Protection Agency. Lessons Learned From Natural Gas Star Partners: Options for Reducing Methane Emissions From Pneumatic Devices in the Natural Gas Industry. Appendix A. Washington, DC 2003

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Principle of Operation

Force Balance Principle

Force Balance Principle

The operation of the Series 1001, 1001A, and 1001XL Level Controllers is based on the Force Balance Principle. The Force Balance Principle states when an object is submerged in a liquid, it creates a buoyant force that is proportional to the weight of the liquid displaced. A Norriseal level controller uses a spring to balance the weight of a displacement-type element (displacer), eliminating the need for custom-weighted displacers and floats. As the displacer is immersed into the liquid, the amount of force available is proportional to the weight of the liquid displaced. The result of this force is transmitted to the controller by a rotational movement of the shaft. This rotational movement causes the fulcrum and lever (flapper bar) to push up the pilot thrust pin. The amount of force is proportional to the level on the displacer, creating a desired output signal. This desired output signal can be a pneumatic on/off signal using a snap pilot, a pneumatic modulating signal using a throttle pilot, or an electrical SPDT or DPDT signal by using an electric micro switch.

Controller Action

Controller action is "Direct Acting" when the output signal increases as the liquid level rises on the displacer. In "Reverse Acting," the output signal decreases as the liquid level increases on the displacer.

Proportional Band

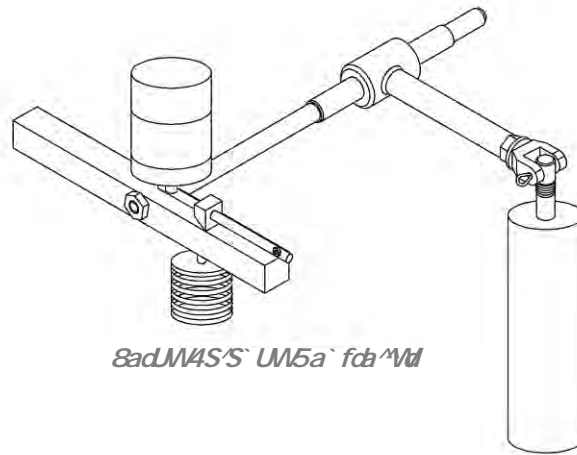
Proportional Band or Span is the ratio of the displacer length used versus the total length of the displacer to achieve a desired output signal. For on/off control, the snap pilot output is equal to the supply pressure over the span of the controller. The span can be changed by sliding the fulcrum on the lever. Moving the fulcrum away from the pilot thrust pin increases the span, and moving the fulcrum towards the pilot decreases the span. For throttling control, the output will vary over the proportional band.

Function of the Adjustable Spring

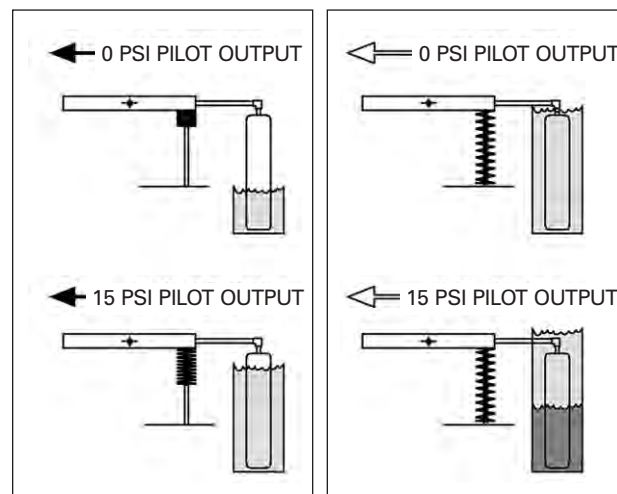
Not only does the spring balance the weight of the displacer, it can also be adjusted to shift the setpoint on the displacer. With spring force held constant, a higher liquid level on the displacer produces a larger force available to the pilot. When the spring force is reduced by decompressing the spring, a higher liquid level on the displacer is required to produce the same force as before. Increasing the spring force by compressing the spring requires a lower liquid level for the same

force. Thus, increasing/decreasing the spring force will change the setpoint accordingly.

The spring compression can be reduced further to a position where a hydrocarbon liquid level will not produce enough force to produce an output from the pilot. This makes the control of a liquid interface possible with the standard displacer. After the spring is adjusted so the lighter liquid will not operate the control, there is still adequate spring force in reserve for the liquid level of heavier liquid to provide enough force to actuate the pilot.



8adUNAS'S UM5a` fcb^Ml



FabZ^M^M^Ua` fcb^

>[cg]V [fV^WSUMUa` fcb^

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Performance Characteristics

PnEumATIC PILOTS

Msr ns r XcpmrmQsnjw	
Proportional, throttle	3–15 psig, 6–30 psig
Differential gap, snap	0–20 psig, 0–30 psig
Differential gap, Envirosave™	0–20 psig, 0–30 psig
Supply Pressure Requirement*	
3–15 psig, 0–20 psig	20–30 psig (min.)
6–30 psig, 0–30 psig	35–40 psig (min.)
0–50 psig	60 psig (max.)
0–100 psig*	100 psig (max.)
Supply and Output Connection	¼ inch NPT Female
Ambient Temperature	-40° to 180°F (-40° to 82°C) -40° to 275°F (High temp) (-40° to 135°C)
Pilot Flow Capacity	
Throttle C _v	0.394
Snap C _v	0.282
Envirosave™ C _v	0.282
Proportional Band Adjustment (Recommended adjustment for a full output pressure change over a percent of sensing element)	
Throttle	20–150%
Snap	7–55%
Envirosave™	7–55%

*Gauges are standard 0-60 psi. Higher pressure gauges are available for an additional fee.

gEnEr AL

Pcnc r gjgrw	1.0% of output span
Dead Band	5.0% of input span
Linearity	1.75% of output span
Ambient Temperature Effect on Setpoint	1.0% @ -40°F (-40°C) 3.0% @ +170°F (77°C)
Mechanical Disturbance Effects on Setpoint	1.0%
Specific Gravity	
Interface detection	0.035
Top level range	0.35 to 2.00
Temperature Limits Body process temperature (dependent on material selection)	-70° to +600°F (-57° to 316°C)
Process Pressure Rating	
Beveled - butt weld	To 6000 psig
Threaded (NPT)	To 6000 psig
Grooved	To 2500 psig
Flanged (RF & RTJ)	150 thru 2500 ANSI Class
Union w/sight glass	To 1500 psig
Ambient Temperature (A case extension is used for extreme temperatures or when body insulation is used.)	-40° to 160°F (-40° to 71°C)

ELECTr IC On/OFF Sw iTCh

Msrnsr	
Proportional band adjustment (Electric – micro switch)	
SPDT	7–55%
DPDT	20–150%
Switch Ratings	
SPDT	15 amps at 125, 250, or 480 V.A.C.
DPDT	10 amps at 125 V.A.C.
Certifications	
Explosion proof switch	UL and CSA listed Class I, Div. 1, Groups C&D Class II, Div. 1, Groups E, F, & G
Dual Seal	CSA listed Dual Seal, ANSI/ISA 12.27.01

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materials

PnEumATIC PiLOTS

mbw	
Throttle	Aluminum w/Aluminum Seat
Snap	Aluminum w/Aluminum Seat
Envirosave™	Aluminum w/Elastomeric Seat
Gasket/diaphragm	Nitrile
Internal Valving	302 SST
Filter Element	40 Micron SST
Screws & Nuts	SST

ELECTr iC On/OFF Sw iTCh

Kgapm QugrafClajmqspc	
Junction Box	Cast aluminum

gEnEr AL

mbw JJA	
1001/1001A	ASTM A696/A105 (std) -20 to +600°F (-29 to +316°C) ASTM A351 CF8M/A182 -70 to +600°F (-57 to +316°C)
1001XL	ASTM A216 WCC/A105 (std) -20 to +600°F (-29 to +316°C) ASTM A351 CF8M/A182 -70 to +600°F (-57 to +316°C)
Hammer Nut (where applicable)	ASTM A105
Sight Glass (For special DU/AU union body)	Acrylic -20 to +200°F (-29 to +93°C) Pyrex -20 to +400°F (-29 to +204°C)
Displacers	PVC -20 to +140°F (-29 to +60°C) Acrylic -20 to +200°F (-29 to +93°C) 316 SST -70 to +600°F (-57 to +316°C)
Displacer Arm	316 SST
Vertical Hanger (swivel for vertical displacer position)	316 SST
Chain	304 SST (for vertical extension and/or split displacer)
Shaft	316 SST -70 to +600°F (-57 to +316°C)
Bearing Blocks	316 SST -70 to +600°F (-57 to +316°C)
Bearings	440 SST -70 to +600°F (-57 to +316°C)
Shaft Seals	Nitrile -20 to +180°F (-29 to +82°C) Nitrile lo-temp -50 to +180°F (-46 to +82°C) Fluorocarbon -20 to +400°F (-29 to +204°C) Aflas -20 to +600°F (-29 to +316°C) EPR -50 to +250°F (-46 to +121°C)
Case & Cover	Die cast chromated aluminum with powder coat
Supply and Output Gauges	Brass (standard) 0-60 psig 316 SST 0-60 psig Brass liquid fill 0-60 psig 316 SST liquid fill 0-60 psig
Torque Bar	Aluminum (standard) 303 SST
Flapper Bar	303 SST
Spring Adjusting Knob	Aluminum (standard) 303 SST
Fulcrum	Nylon w/SST screw
Balancing Spring	Light - SST w/green marking Medium - SST w/no marking Heavy - SST w/yellow marking Extra Heavy - SST w/red marking

Note:
Materials that are certified compatible for NACE service are available upon request.

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how to Order

Series and connection size; pilot type; left, right or back mount; pilot action; seals; and service condition.

Required Application Information:

- A. Fluid media
- B. Process temperature (maximum and minimum)
- C. Process pressure
- D. Vessel size and diameter (distance of connection from bottom of vessel, any obstructions that may hinder performance)
- E. Body connection type, size, and rating
- F. Displacer position (vertical or horizontal)
- G. Controller mount (right or left) if applicable
- H. Pilot action
- I. Area electrical classification if applicable
- J. Top level or interface

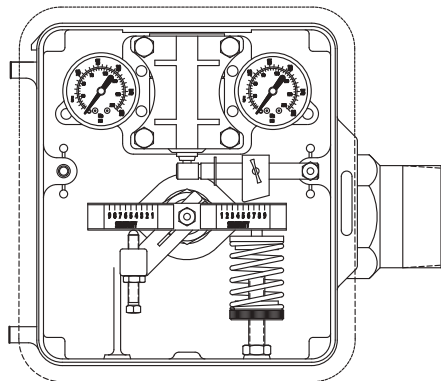
Electric Level Switch

The electric level switch uses the force balance principle to apply force to a standard Micro-switch.

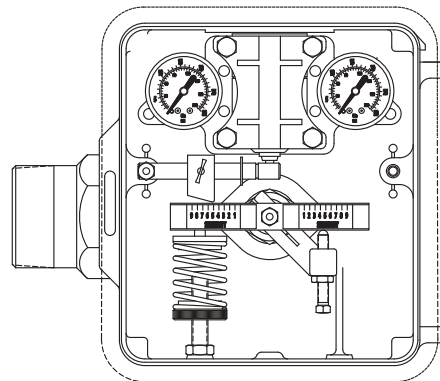
Two standard switches are available, both with explosion-proof enclosures: single pole double throw (SPDT) or double pole double throw (DPDT). Rating for SPDT switch is 15 amps at 125, 250, or 480 volts A.C. The DPDT switch rating is 10 amps at 125 or 250 volts A.C.

Right-Hand Mount vs. Left-Hand Mount

The Series 1001 and Series 1001A can be configured as right-hand mount or left-hand mount. The orientation of the displacer to the controller (while facing the front side of the controller) designates the mounting style. The mounting can be adjusted in the field. The Series 1001XL back-mount controller is utilized when neither right-hand or left-hand mounts are practical.



Right-Hand Mount



Left-Hand Mount

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Apergy

model Code: Level Controllers

2SM60-SRDA-BG

EnD ConnECTiOnS	
Qgxc	Ambc
1.50"	15
2.00"	2
3.00"	3
4.00"	4
6.00"	6

EnD ConnECTiOnS		
Rwnc	Ambc	
Beveled Slip-on	BS	
Beveled Butt Weld Sch 40	B4	
Beveled Butt Weld Sch 80	B8	
Beveled Butt Weld Sch 160	B1	
Beveled Butt Weld Sch XXH	BX	
Grooved	GV	
Flanged	Raised Face	RF
	Ring Type Joint	RJ
	Special 4 Bolt	SF
Screwed Male NPT	SM	
Acme Union	AU	
Dover Union (CEMCO)	DU	

Pr ESSurE rA Ting		
LQG	P rglef	Ambc
150	285	02
300	740	07
600	1480	14
	1500	15
	2000	20
900	2200	21
	3000	30
1500	3750	36
2500	6170	60

*Unit pressure rating subject to selection of displacer (reference displacer chart below).

mATEr iAL: BODy/ShAFT/BLOCK			
mbw	Qf dr	c pgle jmai	Ambc
A696 CS or WCC	316	316	-
A696 CS (NACE)	316	316	N
316 (NACE)	316	316	R
316	316	316	S

PiLOT mODE	
KmbcRwnc	Ambc
Electric DPDT (Ex-Proof)	D
Electric SPDT (Ex-Proof)	E
Electric SPDT (Ex-Proof) Dual Seal Certified	Y
Envirosave™ Snap (On/Off)	B
Pneumatic Snap (On/Off)	S
Pneumatic Throttle (Modulating)	T

NOTE:
Additional materials (not shown above) are available for extreme service conditions.

EnCLOSur E	
Ambc	Rwnc
A	Standard Case (1001 Only)
G	Weather-resistant Case Only
H	Weather-resistant Case and Piped Exhaust
J	Weather-resistant Case, Piped Exhaust and Special Marine Internals
K	Weather-resistant Case and Special Marine Internals

SEr ViCE CONDiTiOn	
Code	Service
B	Standard
C	Vibration

Pr ESSurE gAugES	
Ambc	Rwnc
-	Bronze 0-60 psi (std)
K	316 SST 0-60 psi (1001A/1001XL)
M	Liquid Filled 0-60 psi (1001A/1001XL)

SEAL mATEr iAL		
AMBC	K v,rckn, & D (t	M Pgle
A	180	Buna
E	250	EPR
F	400	Viton
S	400	Aflas

**Unit temperature rating subject to selection of displacer. See displacer chart.

PiLOT ACTiOn	
Ambc	Ngjmr argml
D	Direct Acting
R	Reverse Acting

mOunTing CASE	
Ambc	RwncKmslrge
B	Back XL Only
L	Left Hand
R	Right Hand

DiSPLACEr ChAr T		
DiSPLACEr TEmpErA Tur E/Pr ESSur E rA Ting		
K rcpj	K v,rckn D	K vNpcqspca,NQGE
PVC	-20 to 140	6170
Acrylic	-20 to 200	6170
SST-2	-70 to 600	2000*

* Higher pressure SST displacers are available.

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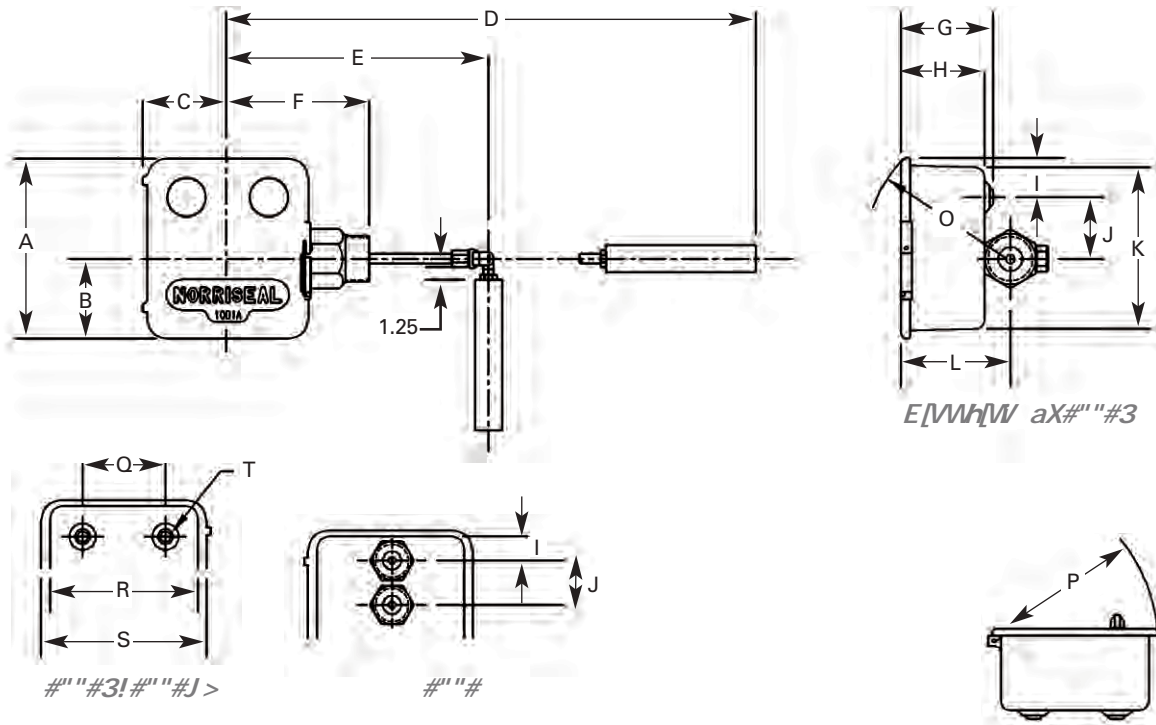
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Dimensions

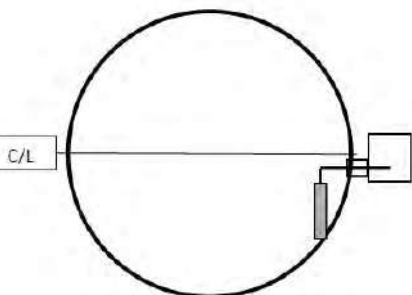
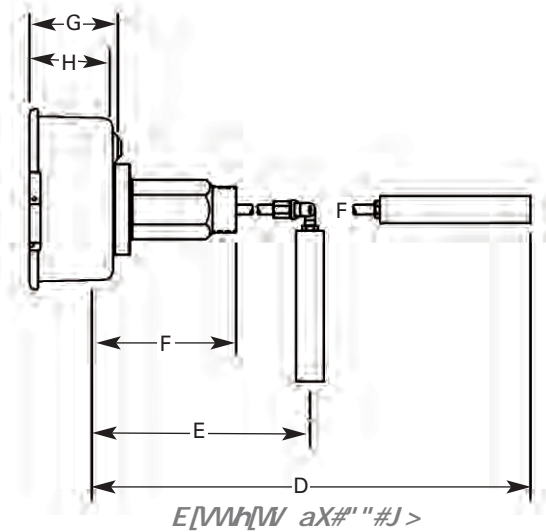


MODEL			
	I, J	I, J	I, J
A	7.68	8.74	8.74
B	3.00	3.85	3.00
C	4.09	4.13	4.13
D	24.43*	24.43*	24.44*
E	13.67*	13.67*	13.67*
F	*	*	*
G	3.12	4.36	4.36
H	2.75	3.95	3.95
I	0.90	1.90	1.90
J	1.00	2.98	2.98
K	7.68	7.98	7.98
L	4.00	5.19	-
O	6.00	7.13	-
P	7.75	7.85	7.85
Q	-	4.00	4.00
R	-	7.06	7.06
S	-	8.01	8.01
T	¼ NPT	¼ NPT	¼ NPT
U	4.75	4.87	5.16

★ See page 9 for "F" dimension for different type of connections.

* Using standard 1.88 dia. X 12 inch displacer and 12.5 inch displacer arm. Length is dependent upon displacer arm and displacer.

QVJGT*NGPIVJU*CTG*CXCKNCDNG



End view of a Horizontal Vessel

Contact Norriseal-Wellmark for arm length selection guidance to avoid the risk of the vertical displacer resting or rubbing against the curvature of the vessel wall.

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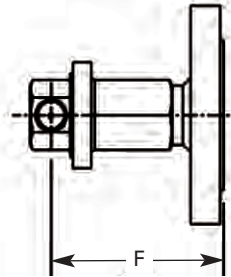
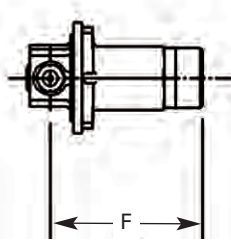
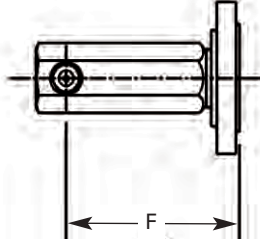
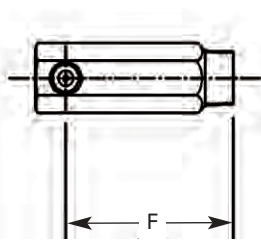
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Dimensions

DimEnSiOnS "F"

mbwQrwjCqV	mbwQgxc			
	0,..	1,..	2,..	4,..
Beveled B/W SCH 40	6.00	–	–	–
SCH 80	6.00	–	–	–
SCH XXH	6.00	–	–	–
Beveled Slip-on	6.00	–	–	–
Screwed Male NPT	6.00	–	–	–
Grooved	6.00	6.88	6.94	7.00
Flanged - 4-bolt -special	6.88	–	–	–
-150 RF	6.50	6.56	6.56	8.75
-300 RF	6.81	6.75	6.88	9.19
-300 RTJ	7.06	7.00	7.25	9.25
-600 RF	7.19	7.13	7.50	10.13
-600 RTJ	7.25	7.31	7.56	10.19
-900 RF	8.00	9.63	10.13	10.56
-900 RTJ	8.06	9.69	10.19	10.63
-1500 RF	8.00	10.25	10.63	11.88
-1500 RTJ	8.06	10.31	10.69	11.94
-2500 RF	9.13	11.00	11.75	13.50
-2500 RTJ	9.19	11.13	11.94	13.75



Series 1001 and 1001A

Series 1001XL

wE ighTS

mbwQrwjCqV	mbwQgxc			
	0,..	1,..	2,..	4,..
Beveled B/W SCH 40	17	NA	NA	NA
SCH 80	17	NA	NA	NA
SCH XXH	17	NA	NA	NA
Beveled Slip-on	18	NA	NA	NA
Screwed Male NPT	18	NA	NA	NA
Grooved	8	19	20	
Flanged - 4-bolt -special	26	NA	NA	
-150 RF	25	30	34	
-300 RF	27	35	45	
-300 RTJ	27	35	45	
-600 RF	29	37	55	
-600 RTJ	29	37	55	
-900 RF	40	51	75	
-900 RTJ	40	51	75	
-1500 RF	45	72	95	
-1500 RTJ	45	72	95	
-2500 RF	61	110	150	
-2500 RTJ	61	110	150	

Weights are for 1001. For 1001A add 1 lb. and for 1001XL add 2 lb.

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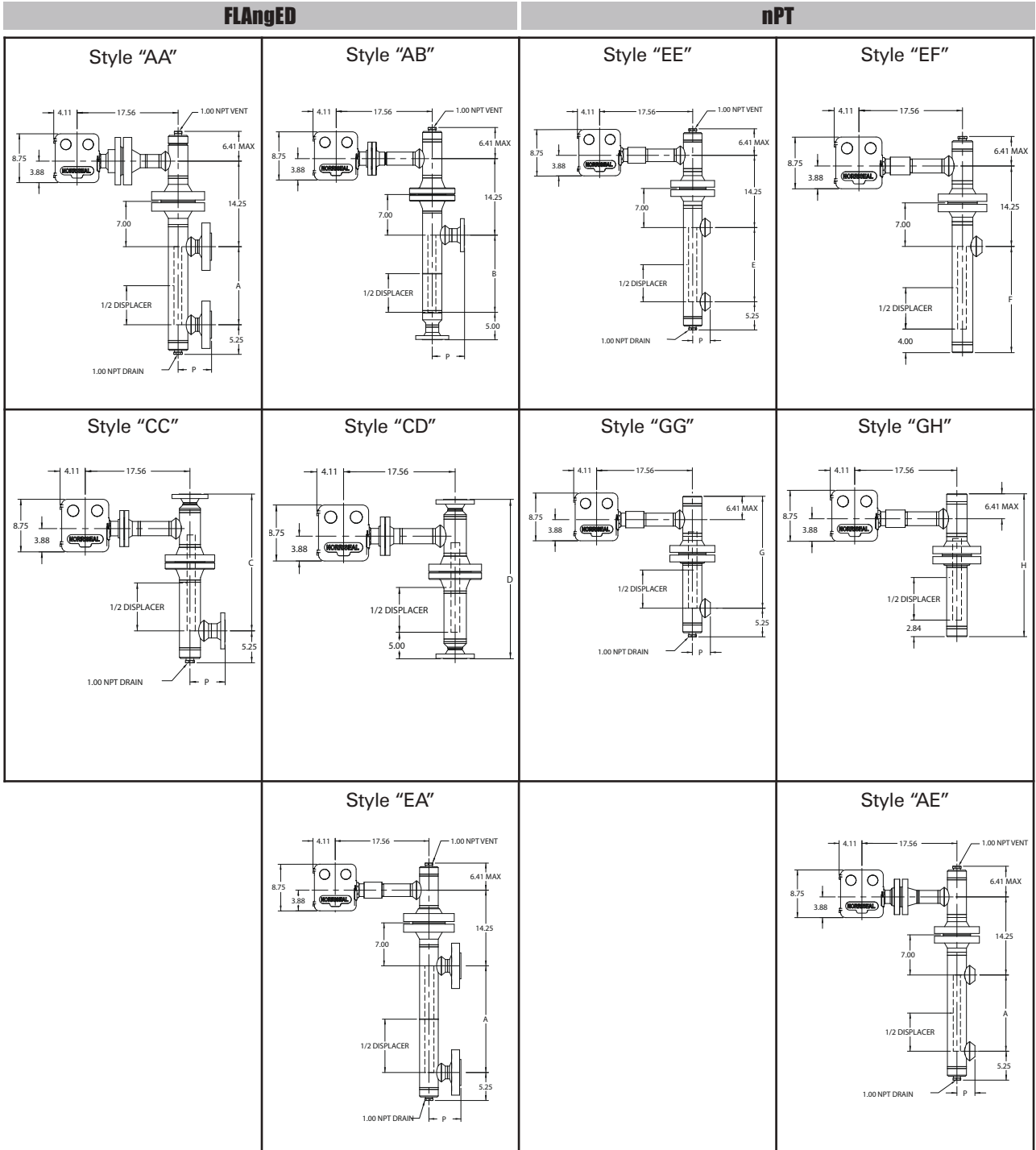
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Series 1006 Vertical Chambers

The Series 1001 and Series 1001A can be externally mounted using our Series 1006 vertical or horizontal external chambers. These external chambers provide more stable operation for vessels with internal obstruction or considerable internal turbulence.



Other process connections available.

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Series 1006 Vertical Chambers

Pr OCESS ConnECTiOnS DimEnSiOnS (inChES)

Rwnc	Qrwc	Bgqj acp	Bgk(l)	Bgk
Flanged	AA	14	A	14
		32		32
	AB	14	B	14
		32		37
	AE	14	E	14
		32		32
	CC	14	C	21
		32		39
	CD	14	D	26
		32		44
NPT	EA	14	A	14
		32		32
	EE	14	E	14
		32		32
	EF	14	F	18
		32		36
	GG	14	G	19
		32		37
	GH	14	H	23
		32		41

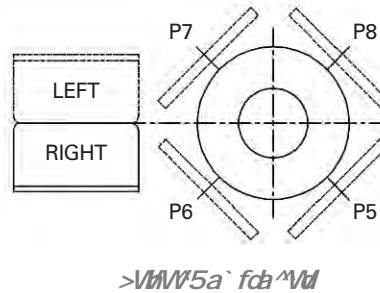
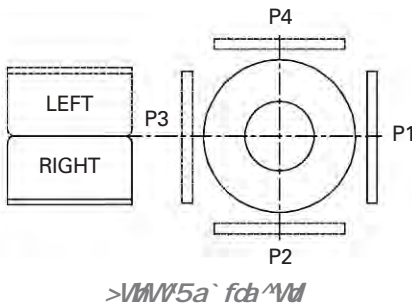
Pr OCESS ConnECTiOnS (inChES)

LQGAj qq	BGK	/3.	1.	4.	
3.00 x 1.50 flg	RF	P	5.62	5.88	6.19
	RTJ	P	5.88	5.62	6.19
3.00 x 2.0 flg	RF	P	5.88	6.12	6.50
	RTJ	P	6.12	6.44	6.56
4.00 x 1.50 flg	RF	P	6.12	6.38	6.69
	RTJ	P	6.38	6.62	6.69
4.00 x 2.0 flg	RF	P	6.38	6.62	7.00
	RTJ	P	6.62	6.94	7.06
NPT Size	DIM	1.0 in.	1.5 in.	2.0 in	
3.00 x NPT	P	3.12	3.19	3.31	
4.00 x NPT	P	3.62	3.69	3.81	

*Other displacer lengths available on request.
 **Charted dimensions are for process connecting piping.
 All other dimensions may vary with respect to flange size and ANSI class.

Position of Process Connections

The following diagram illustrates the location of the process connections and level controller relative to Position 1 (P1) which is zero. Refer to Model Code, Position Process Connection on page 13.



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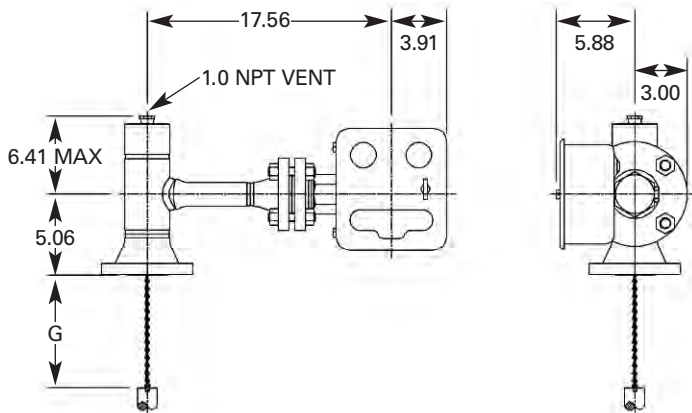
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Domes and horizontal Chambers

Series 1006D Dome

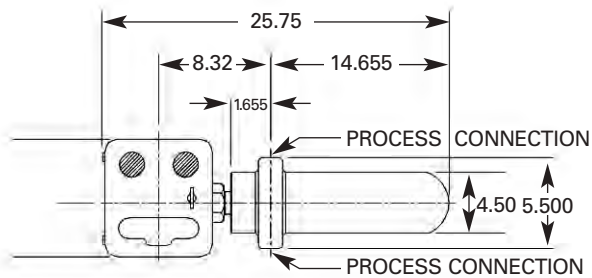
To specify a dome only (this is the top of the vertical chamber), add a suffix letter 'D' to the end of the Series Number. Refer to the Model Code, Vertical Dome Style on page 13.



Note: Standard chain extension is 12". Longer chains available on request.

Series 1006 horizontal Chamber

(For Model Code, refer to page 14)



Fkb[US^@BF >VMM5a` fcb^Vd` 5ZS_ TVd
/8S` YW La` X'Ygdf[a` ShS[ST Vd

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model Code: Vertical Chambers and Domes

ChAmBEr/ DOmE PIPE SIzE

Bcqapgnrgml	Ambc
3.00" (Std.)	3
4.00"	4

VEr TiCAL DOmE STyLE

Bcqapgnrgml	Ambc
Flanged LLC w/NPT Vent	A
Flanged LLC w/top Flanged Process Conn	C
Screwed LLC w/NPT Vent	E
Screwed LLC w/Top NPT Process Conn	G

VEr TiCAL ChAmBEr STyLE

Rwnc Npmacqq Amllcargml	RwncJctcJ Amllrpmj Amllcargml	Npmacqq Amllcargml KmslrjgLeQrwjC	Ambc
Flanged	See Dome	Side Top-Side Btm	A
Flanged	See Dome	Side Top-Btm	B
Flanged	See Dome	None-Side Btm	C
Flanged	See Dome	None-Btm	D
Screwed	See Dome	Side Top-Side Btm	E
Screwed	See Dome	Side Top-Btm	F
Screwed	See Dome	None-Side Btm	G
Screwed	See Dome	None-Btm	H
1006 Dome Only			O

DiSPLACEr LEngTh

Bcqapgnrgml	Ambc
14.00 Inch	14
32.00 Inch	32
48.00 Inch	48
60.00 Inch	60
Dome Only	0

DOmE/ChAmBEr mATEr iAL

Bcqapgnrgml	Ambc
Carbon Steel A105	-
Carbon Steel - NACE, A105/A106	N
316L Stainless Steel - X-Ray NACE	R
316L NACE	W
316 Stainless Steel	S

PrOCeSS COnnECtION

Bcqapgnrgml	Ambc
1.00 Inch	10
1.50 Inch	15
2.00 Inch	20
3.00 Inch	30
4.00 Inch	40

NOTES:

- Controller-to-chamber connection is always 2 in.
- Standard vent and drain connections are 1 in. NPT.
- Additional materials (not shown above) are available for extreme service conditions.

3AA14-20RF 14-PI

POSiTiOn Pr OCeSS COnnECtION

Ambc	Bcqapgnrgml
P1	0 Degrees w/LLC at 180 Degrees
P2	90 Degrees w/LLC at 180 Degrees
P3	180 Degrees w/LLC at 180 Degrees
P4	270 Degrees w/LLC at 180 Degrees
P5	45 Degrees w/LLC at 180 Degrees
P6	135 Degrees w/LLC at 180 Degrees
P7	225 Degrees w/LLC at 180 Degrees
P8	315 Degrees w/LLC at 180 Degrees

STuD & gASKET mATEr iAL

Ambc	Qrsh-Lsr	E qicr	
		PDmpDD	PH
-	ASTM A193-B7/ ASTM A194-2H	316L/GRF CSTL GR	CSTL Solid
A	ASTM A193-B8M/ ASTM A194-8M	316L/GRF CSTL GR	316 SS Solid
B	ASTM A193-B7/ ASTM A194-2H	316L/GRF 316SS GR	316 SS Solid
C	ASTM A193-B7/ ASTM A194-2H	INC/GRF CSTL GR	-
D	ASTM A193-B8M/ ASTM A194-SS8M	316L/GRF 316SS GR	316 SS Solid
L	ASTM A193-B7M/ ASTM A194-2HM	INC/GRF 316SS GR	316 SS Solid
M	ASTM B164/ Monel 400	MON/GRF 316SS GR	-

rA Ting Pr OCeSS COnnECtION

Ambc	Bcqapgnrgml	
02	Flanged (ANSI)	150
07		300
14		600
21		900
36		1500
14	NPT (WP)	1480

NOTE:

1. Flanged-LLC & dome/chamber connection rated same as process connection (except ANSI 150 Class). Dome/chamber connection is ANSI 300.
2. Threaded-dome/chamber connection is ANSI 600 class; higher pressure classes available.

TyPE Pr OCeSS COnnECtION

Ambc	Bcqapgnrgml
RF	Flanged - RF (Raised Face)
RJ	Flanged - RJ (Ring Type Joint)
SC	Screwed Female
SM	Screwed Male

NOTE:

Specify when gauge glass connections are required. Give size, position, and center-to-center dimensions.

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Apergy

model Code: horizontal Chambers

ChAmBEr PiPE SiZE	
Bcqapgnrgml	Ambc
4.00"	4.0

r ATing Pr OCESS COnnECTiOn		
Ambc	Bcqapgnrgml	
30	*NPT (WP)	3000

*Standard. Higher pressures available on application

4 V 12-10SC 30

hOr izOnTAL ChAmBEr STyLE			
Rwnc Npmacqq Amilcargml	RwncJctcj Amirpmj Amilcargml	Npmacqq Amilcargml KmslrjleQrwjc	Ambc
Screwed	Flanged	Top-Bottom	L
Screwed	Screwed	Top-Bottom	V

Please note: not all available options are shown.
Consult factory for additional configurations.

TyPE Pr OCESS COnnECTiOn	
Ambc	Bcqapgnrgml
RF	Flanged - RF (Raised Face)
RJ	Flanged - RJ (Ring Type Joint)
SC	Screwed Female

DiSPLACEr LEngTh	
Bcqapgnrgml	Ambc
12.00 Inch	12

Pr OCESS COnnECTiOn	
Code	Description
10	1.00 Inch

ChAmBEr mATEr iAL	
Bcqapgnrgml	Ambc
Carbon Steel A105/A106	-
Carbon Steel - NACE, A105/A106	N
316 Stainless Steel	S
316 L Stainless Steel - X-Ray NACE	W

NOTES:

- Controller-to-chamber connection is always 2 in.
- Additional materials (not shown above) are available for extreme service conditions.

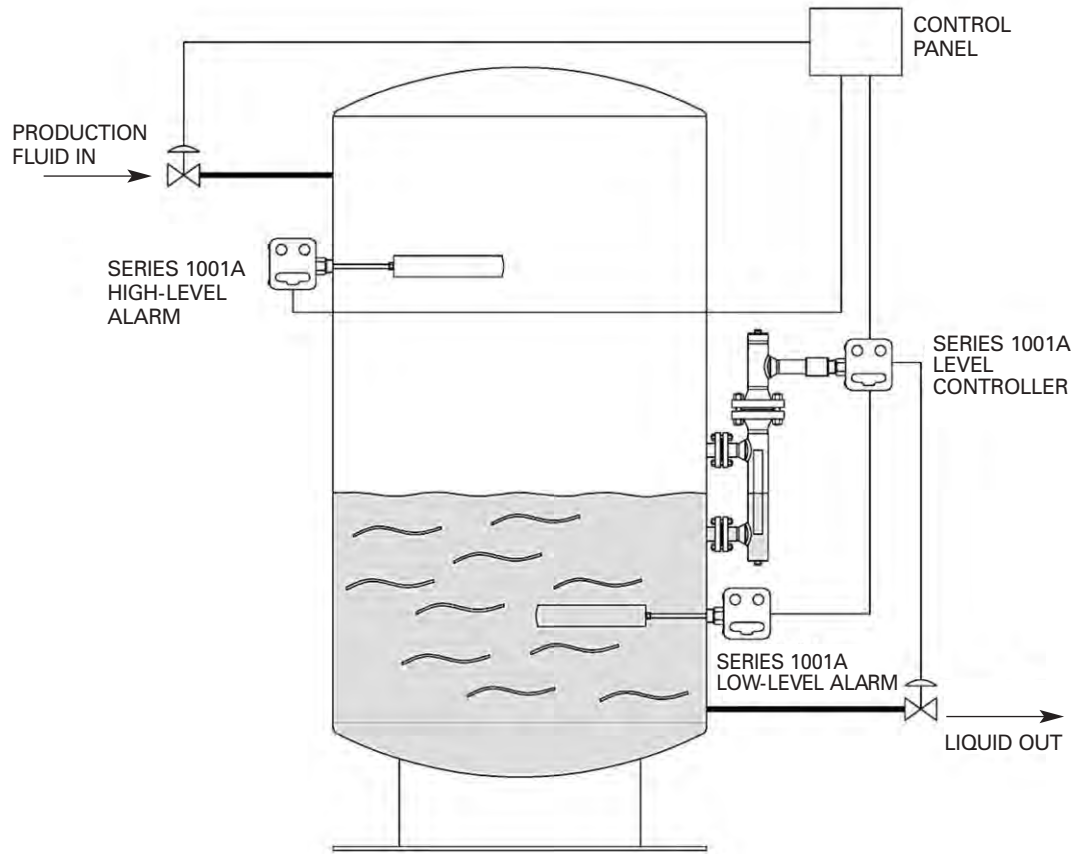
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Applications



Common Applications

1. Custody Transfer Measurement Systems
2. Separators
3. Dehydrators
4. Heater Treaters
5. Well Test Systems
6. Interface Detection
7. Compressor Scrubbers
8. Offshore Production Facilities

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Norriseal Series 1002A Electric Level Switch

A Reliable Float-Operated Device

Operates control equipment and performs a variety of electrical functions.



FZNEVdV# " "\$3 aXVe S dVST Vfloat-operated, high or low liquid level sensing device.

The Series 1002A is listed by the Canadian Standards Association as certified for hazardous locations, Class I, Group C & D. It can be used to sound alarms, operate control equipment, activate panel lights, or perform any other electrical function.

The Series 1002A will operate in liquids with a specific gravity of 0.6 or higher and pressures up to 3000 psi. The field replaceable switch capsule is rated for operation within -40 to 220° F.

Operation

The Series 1002A utilizes a magnetic proximity reed switch to open or close an electrical circuit. The reed switch is actuated by a permanent magnet. A stainless steel arm, containing the magnet, acts as a counterbalance for the float. As the liquid level varies, the float will position the magnet closer to or farther from the reed switch capsule. The operation of the reed switch available in the The Series 1002A is explained below.

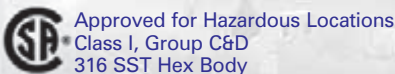
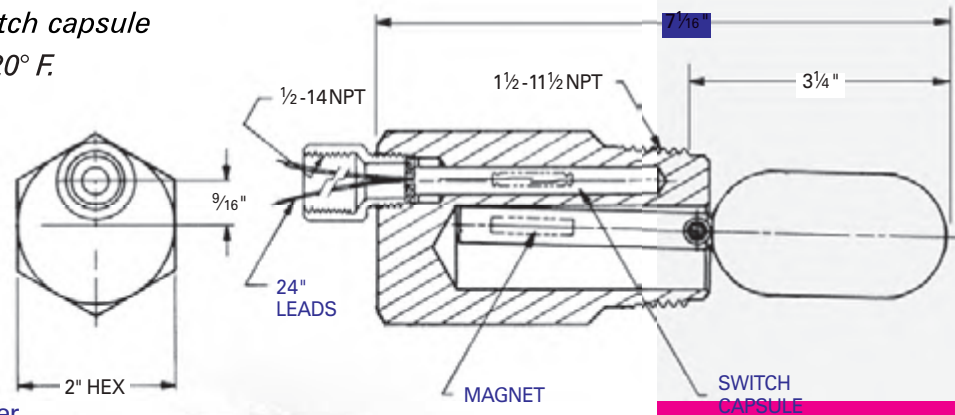
The Single Pole Single Throw Reed Switch is normally open. When the magnet is positioned in close proximity with the switch capsule, the contacts close.

Features

- Field replaceable switch capsule

Contents

- 1 Operation
- 2 Installation
- 3 Specifications
- 3 Model Code



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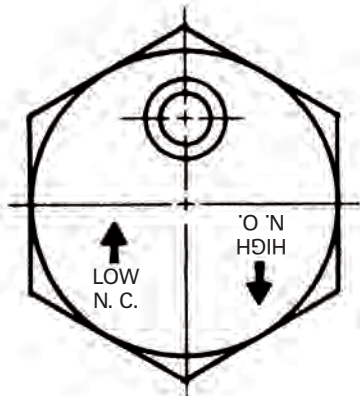
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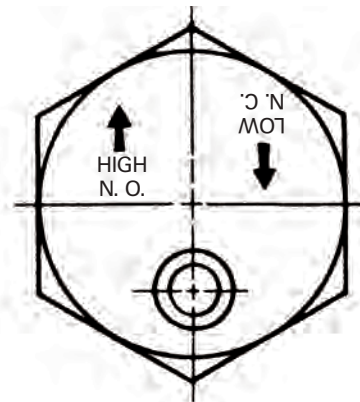
Installation

Orientation

The Series 1002A may be mounted for either high or low alarm, normally closed or normally open by simply positioning the body. The hex body provides flat surface for easy wrenching during installation or positioning.

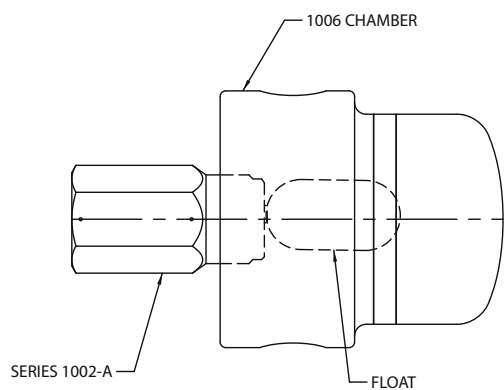
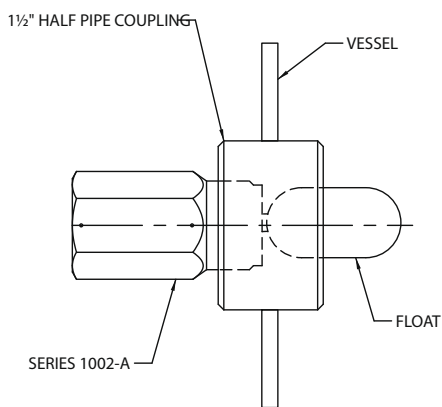


*Bae[fla]` @ad_ S`k 5`aeW
/ >ai >VMV3/Sd_ fi*



*Bae[fla]` @ad_ S`k AbWW
/: [YZ >VMV3/Sd_ fi*

Typical Installations



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Specifications

SERIES 1002A SPECIFICATIONS

mbw	316 Stainless Steel		
Float	Material	Maximum Pressure	Maximum Temperature
	Polypropylene 316 Stainless Steel	3000 psi 1500 psi	140° F 220° F
Electrical	Maximum Volts	Maximum Amp	Maximum Switch Load (Resistive)
Single Pole Single Throw	24 VDC 120 VAC	2.0 .25	30 Watts 30 V.A.
Switch Operating Temperature Range: -40 to 220° F			

model Code

How to Order

1. Specify Series 1002A
2. Select Model Number

1002A 316-14-SPST

bODy mATERIAL	
	Ambc
316 SST	316

Sw ITCH TypE	
B	B
SPST	Single Pole
	Single Throw

FLOAT mATERIAL	
	Ambc
Polypropylene	14
	40

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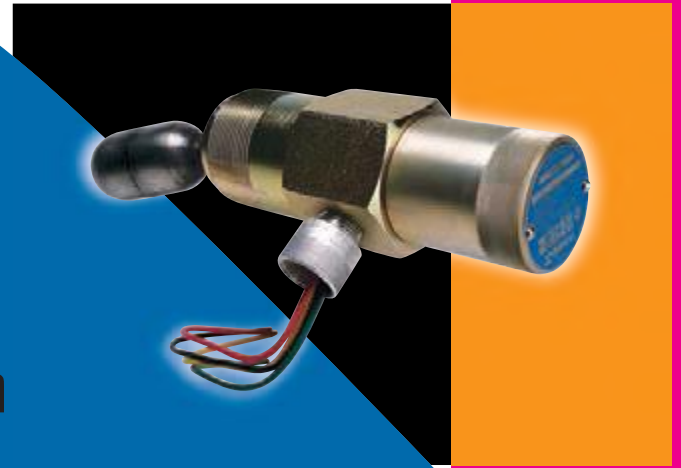
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Norriseal Series 1005E Electric Liquid Level Switch

Float Actuated Electric Switch
Designed for rugged use in pressure vessels



The Series 1005E switch is designed for rugged use and can be used as a high or low level alarm to monitor liquid level in compressor scrubbers and other type pressure vessels. This unit is also available for NACE applications.

Application

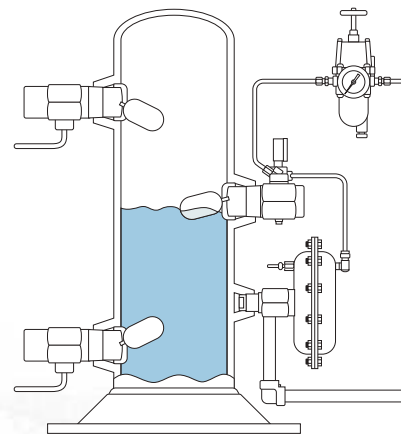
The Series 1005E switch is designed for rugged use and can be used as a high or low level alarm to monitor liquid level in compressor scrubbers and other type pressure vessels. This unit is also available for NACE applications.

Accessories

Small external horizontal float chambers (style V) are available for applications that require external mounting of the 1005E switch.

Features

- 316 Body Material Optional
- NACE Materials Available
- CSA Listed (Class 1, Group C & D Hazardous Locations)
- NEMA 4



TYPICAL
SEPARATOR SCRUBBER
INSTALLATION

Contents

- Specifications
- How to Order
- Dimensions

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Specifications

-
-
-

How to Order

1. Specify Series 1005E
2. Select Model Number

1018 - AVS

BODy, CAP & CONDUIT AdAPT Er mAt Er iAL			
	A n	AmIbsgr b nrCP	Ambc
Carbon Steel	Aluminum	Aluminum	1018
316	Aluminum	Aluminum	0316

Sw it CH ty pE		
	Rwnc	P rgle
S	Single Pole Double Throw	10 amp, 1/2 H.P. @ 125/250 VAC; 1/2 amp @125 VDC; 1/4 amp @250 VDC
D		10 amp, 1/2 H.P. @ 125/250 VAC; 1/2 amp @125 VDC; 1/4 amp @250 VDC

SEr viCE			
	Arm/Stem	Float	Code
Standard	316 SST	316 SST	-
		316 SST	N*

SEAL mAt Er iAL	
	AmIbgrmI
B	Buna-N
E	
L	
M	
V	

*Compliance with NACE Spec. MR 0175-2002

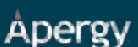
*Also Standard for NACE Applications
Registered U. S. Patent Office for DuPont's
Fluorelastomer

BODy/FLOAt COmBinAt iOnS				
	Npmacqg AmIbcargmI	K vgsK Npcqspc ngge	K vgsK Rckncp rspc D	
A	1.50	1000	220	316 SST
K			220	316 SST
C		2000	140	Poly.

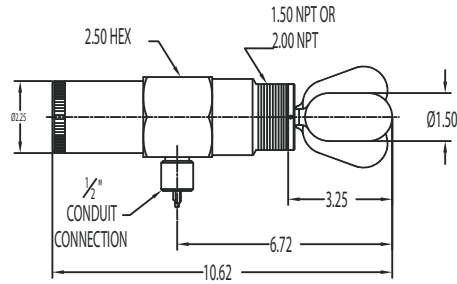
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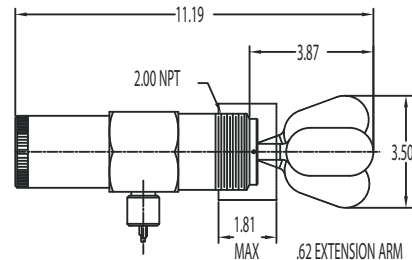
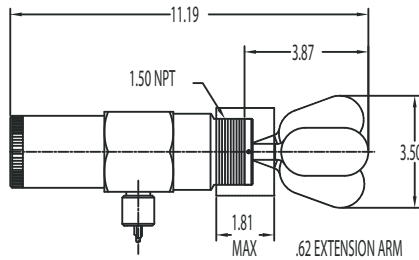
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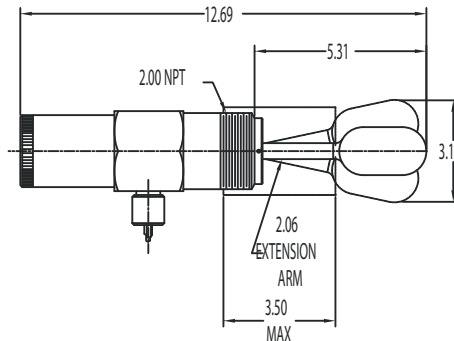
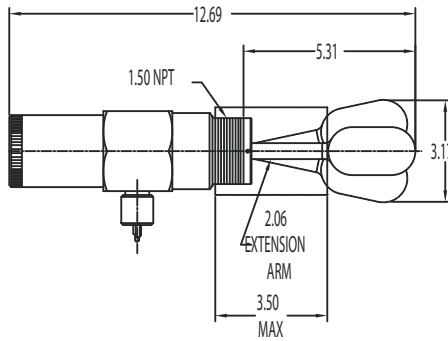
dimensions



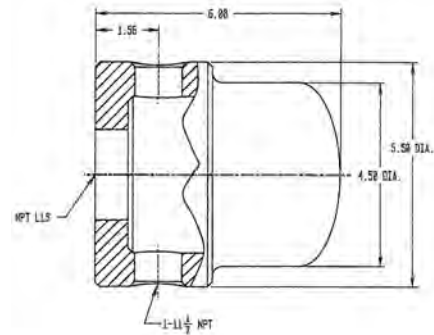
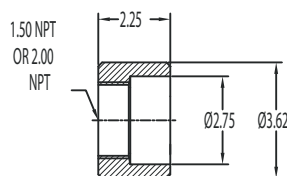
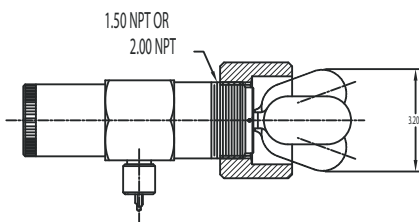
SPDT OR DPDT SWITCH



A 0.62" extension arm must be used when unit is installed in a half coupling, threadolet or reducing bushing. This reduces the minimum specific gravity to 0.61 with the stainless float and 0.86 with the polypropylene float.



A 2.06" extension arm must be used when unit is installed in a full coupling. This reduces the minimum specific gravity to 0.57 with the stainless float and 0.94 with the polypropylene float.



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Apergy

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Norriseal Series 1005P1 Pneumatic Liquid Level Switch

Rugged and Reliable:

Used as a panel alarm or for control valve operation



? aVV/Bfi



? aVV/Afi

? aVV/#' "' B# [e S Xa Sf Z SU r g Sf V W i b` Vg_ Sf [U ei [fUZ

Special Feature

- 3-way pilot valve has a built in manual override and porting for piped exhaust

Specifications

4aVk

- Process Connection
2.00" NPT
- Material
Carbon steel plated (std.)
316 stainless steel (opt.)
- Pressure rating
1500 psig
- Vent connection
0.25" NPT (female)

8'aSf

- Material
316 stainless steel
- Pressure rating
1500 psig

EV8'e

- Material (wetted)
Fluorocarbon (std.), nitrile (opt.)
- Material (non-wetted)
Nitrile (Std.), fluorocarbon (opt.)

3[d

- Supply
Min. operating 15 psig
Max. operating 50 psi
Max. allowable 100 psi
- Connection
0.125" NPT (female)

B[af

- Type
3-way
- Connection
0.125" NPT (female)
- Pressure gauge
0-30 psig (std.) 0-60 psig (opt.)

FVW bVt8fgdVDSf[Y

- 180° F (std.) 250° (opt.)

EbVW[XU 9dsh[fk /? [fi

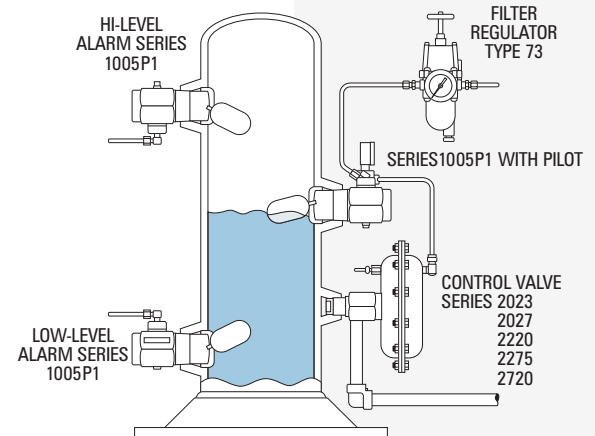
- 0.60 (std.)
Lower specific gravities,
consult factory

Abf[a` S^;fV e

- Float extension arms
- Pipe adapter .125" M x .250" F
- Filter/regulators with gauges
- 40 micron filter
- External float chambers

8'ai 5aVW[UWfe/5hfi

- Block & bleed output 0.11
- Pilot output 0.28
- Pilot consumption 0.007



Fkb[US^

eVt8SbFadelttTTVd
[efS^Sfja`

Note: A supply filter/regulator should be installed to provide clean, dry air for proper performance of switch.

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model Code

How to order

1. Specify Series 1005P1
2. Select Model Number

body material	
Rwnc	Ambc
1018 carbon steel	1018
316 stainless steel	0316

SeRviCe			
Qcptgac	pk-Qrck	Djm r	Ambc
Standard	316 SST	316 SST	-
H ₂ S	316 SST	316 SST	N*

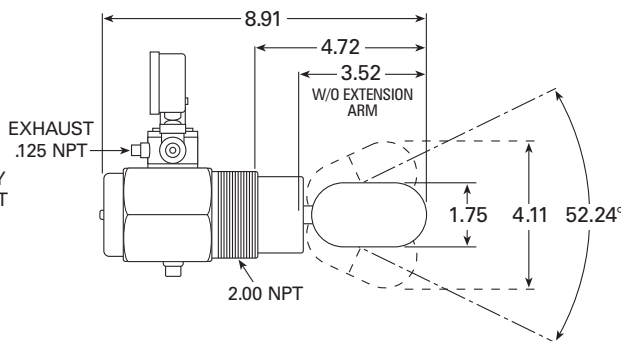
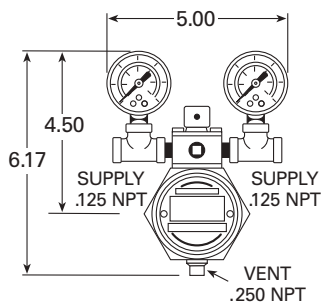
* Compliance with NACE Spec. MR 0175

1018 - V P

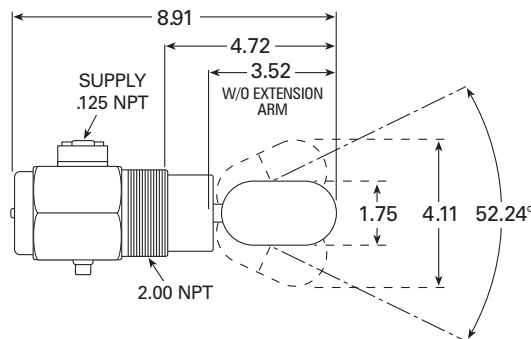
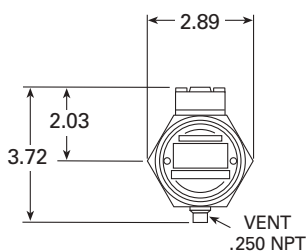
Pilot option	
Ambc	Mnrgml
P	With pilot and gauges
O	Without pilot
N	With pilot and no gauges

Seal material			
Ambc	Ucrrcb	Lmlucrrcb	K v, Rckn,
V (Std)	Viton	Buna N	180° F
B	Buna N	Buna N	180° F
F	Viton	Viton	250° F

*EVdV#''' B#
4'UJ S' V 4'VV
i [fZ B]af ? aVWB*



*EVdV#''' B#
4'UJ S' V 4'VV
? aVWA*



Note: Do not install standard units in a full pipe coupling.

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Norriseal Series 1100A Liquid Level Switch

High/Low Pneumatic and Electric Liquid Level Switch

Accurate and durable in marine applications



utilize the Series 1001A Liquid Level Controller and a cast steel vertical displacer chamber.

Applications

- Gas Compressor Scrubbers
- Separators
- Sumps
- Safety Systems

Specifications

At k cp8

- 1480 psi W.P. (ANSI 600) at 100° F
- Process Connections:
1.00" Screwed NPT; 1.00" Socket Weld;
1.00" Butt Weld, 2.00" Flanged
- Cast Steel ASTM A216
- Displacer Material 300 Series SST
- Weight: 46 lbs.

Controller:

Pilot Action:

- Pneumatic – Snap (on/off)
- Electric – SPDT/DPDT (on/off)
- Maximum Temperature: 400° F
- Minimum Air Supply: 20 psi
- Minimum Specific Gravity:
 - 0.5 (Snap Pilot, SPDT)
 - 0.7 (DPDT)

Special Features

- Pneumatic or Electric Controller
- Stainless Steel Internals for Marine Service
- Weathertight Case
- Stainless Steel Displacer
- Left- or Right-Hand Mount
- Direct or Reverse Acting
- Optional NACE
- Optional 2220 psi W.P. (ANSI 900)

Contents

- 1 Specifications
- 2 Model Code
- 3 Dimensions

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Model Code

1. Specify Series 1100A.
2. Select model number.

Pr oCESS CONNECTION SizE	
Qgxc	Ambc
1.00	1
2.00 (Flanged Only)	2

Pr oCESS CONNECTION TYPE	
Rwnc	Ambc
NPT (Screwed Female)	SC
Socket Weld	SW
Butt-Weld* SCH 40	B4
Butt-Weld* SCH 80	B8
Butt-Weld* SCH 160	B1
Flanged Raised Face	RF
Flanged Ring Joint	RJ

*End connections only.

Pr ESSur E rATING		
LQGAj qq	UN&nqq	Ambc
150	285	02
300	740	07
600	1480	14
900	2220	21

bo DY/CHAMbEr MATErI AL	
Kmbc	Ambc
A696 WCC	-
A696 WCC/NACE	N
316 CF8M/NACE	R
316 CF8M (316)	S

PILOt MODE	
Kmbc	Ambc
Elec. DPDT Explosion Proof	D
Elec. SPDT Explosion Proof	E
Pneumatic Snap w/Gauges	S

Pr ESSur E CONNECTION or IENTATIOn

RF	SF
—	NPT – Specify Plug Placement
A*	Side Top / Side Bottom
B*	Side Top / Bottom
C*	Top / Side Bottom
D*	Top / Bottom

*Required if welded or flanged connections.

1 SC 14 - S R D F - B K

ClOsur E - CASE	
Ambc	Rwnc
H	Sealed Case / Cover & Piped Exhaust
J	Sealed Case / Cover, Piped Exhaust & Marine Service
K	Sealed Case / Cover Marine Service (Standard)

SEr VICE COndITION	
Ambc	Ambgrgml
B	Standard/Bronze 0-60 Gauges
E	Liquid Filled SST Gauges
F	Standard/SST Gauges

SEAL/bEAR ING MATErI AL	
Ambc	K rcpg j
F	Viton/SST*

*Std. seal/bearing material. Consult factory for options.

PILOt ACTIOn	
Ambc	Rwnc
R	Reverse Acting
D	Direct Acting

MOUNTING CASE	
Ambc	Qrwc
L	Left Hand
R	Right Hand

Please note: not all available options are shown.

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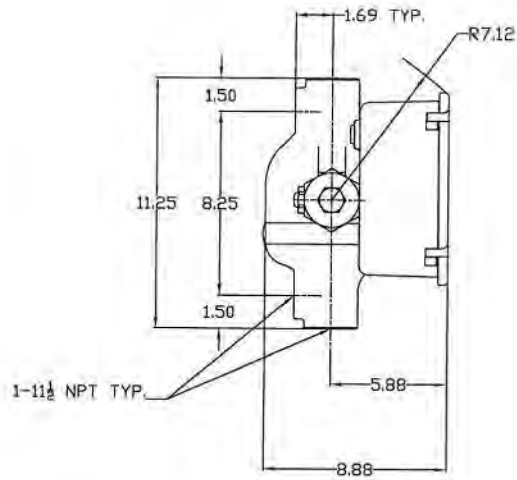
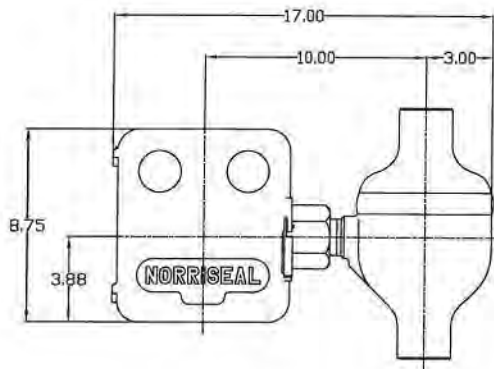
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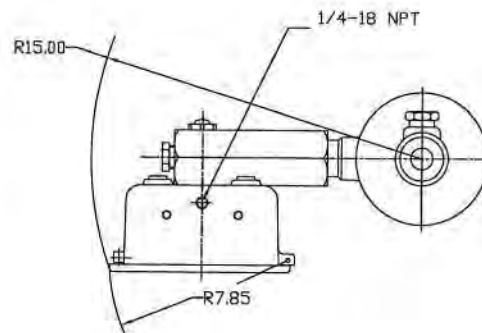
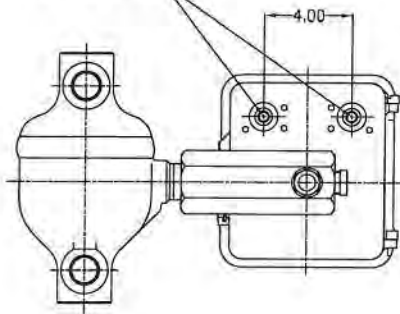
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Dimensions

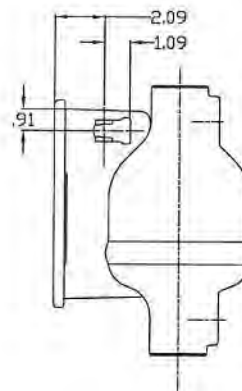
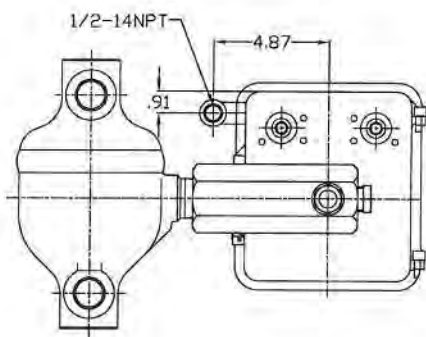
Right-hand Mount, Pneumatic Pilot



SUPPLY & OUTPUT CONNECTIONS
1/4-18 NPT



Left-hand Mount, Electric Switch



Note: All dimensions in inches; all dimensions are applicable for 1.00" NPT, socket weld and butt weld.

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Norriseal Series 1200A Magnetic Level Gauges, Transmitters and Switches

A Superior Alternative
Accurate and dependable in harsh applications



Norriseal Series 1200A magnetic gauges, transmitters and switches provide accurate liquid level measurement, communication and control for storage tanks, separators and other pressure vessels.

Series 1200A gauges feature a robust, low-maintenance design that is ideal for high-temperature, high-pressure and corrosive applications. Series 1210 transmitters are direct-insertion magnetostrictive transmitters for non-invasive and/or redundant level control. Norriseal also offers non-invasive switches that provide alarm and control actions without additional cutouts in the vessel.

Gauge Description

Norriseal magnetic level gauges consist of a float column with process connections matching those of the storage tank, separator or other pressure vessel where level is to be measured. Process connections may be side couplings, flanges or top and bottom flanges as illustrated on Page 2.

The magnetic float rises and falls within the chamber as the process level changes. Floats are custom manufactured and tested to meet process condition requirements. Contained in the float is a 360 degree magnet assembly comprised of a series of vertical magnets. A wide range of float materials are available to meet virtually any temperature, pressure and material compatibility requirement.

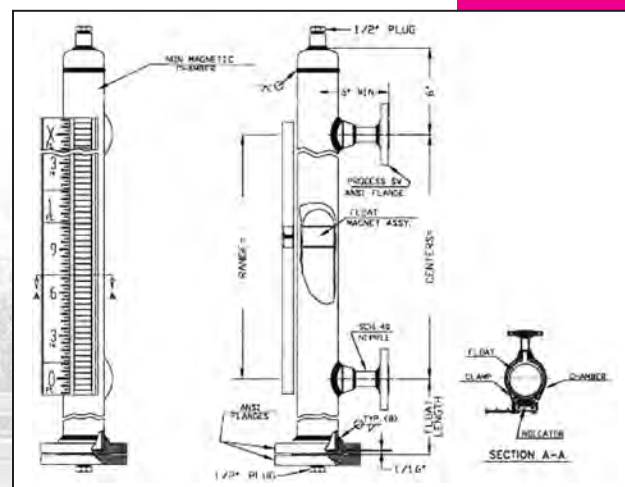
The zippered-type indicator (series of rotating flags) visibility is heightened because all flags are rotated up to the fluid level point.

Gauge Features

- Replaces problematic sight glasses
- Visual level indication from 150+ feet
- No process liquid in contact with indicator glass
- Ideal for high temperature, pressure and corrosive applications
- Manufactured to meet boiler specifications (ASME B31.1/B31.3)
- Magnetostrictive options for non-invasive and/or redundant level control
- Software options: Registered HART DD to revision 5/6 – IEC610804-2

Contents

- 2 Gauge Specifications
- 2 Gauge Mounting Styles
- 3 Model Code
- 4 Magnetostrictive Transmitters
- 4 Series 1210-NT-6000 Level Transmitter
- 5 Series 1220 Level Switches
- 6 Options
- 7 Typical Installations



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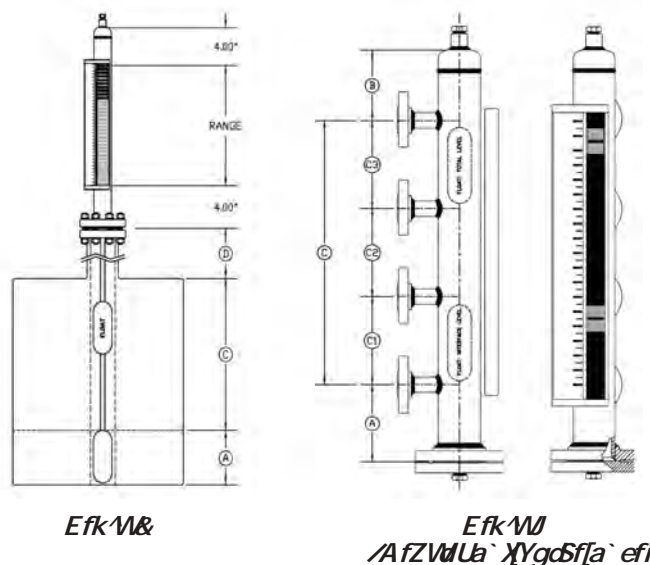
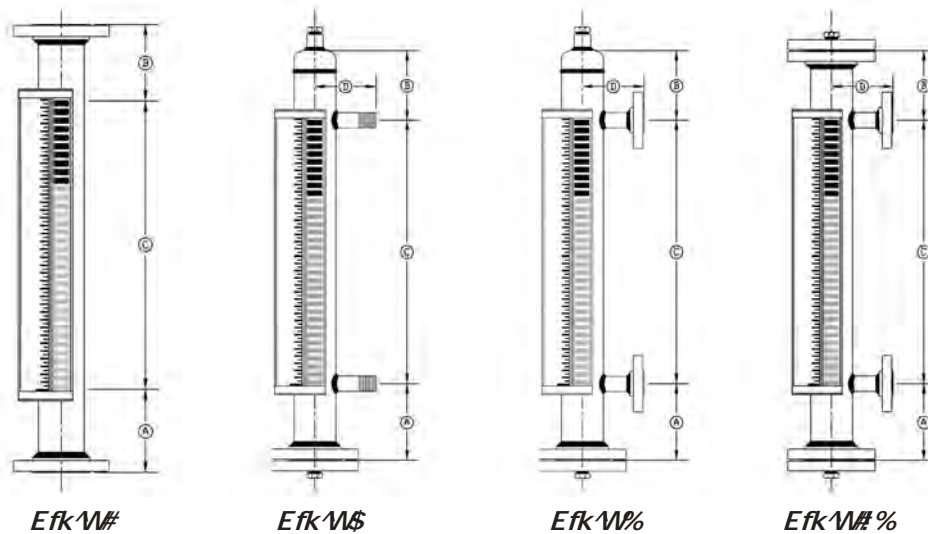
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Gauge Specifications

-
-
-
- 1/2" FNPT vent & drain connections
-
-
-
-
-
-
- Specific gravity range: .28 and up
-
-
-
-
-
-

Level Gauge Mounting Styles



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Model Code

Mounting

	Ambc
Flanged Top – Flanged Bottom	1
	2
	3
	4

Gauge Type

	Ambc
304 Stainless Steel	4
	6

Specific Gravity of Measured Fluid

MAX. OPERATING PRESSURE

	Ambc
xxxP	PSIG
xxxB	BARG

MeASur eMent LenGTh "L" DiM.

1200A-LG6-1-10RF02-1.00-100F-285P-14-FS

Process Connection

	Ambc
.50 inch	05
.75 inch	07
1.0 inch	10
	15
2.0 inch	20
Type	Code
Flanged Raised Face	RF
Flanged Ring Joint	RJ
Screwed Female	SC
Screwed Male	SM
Socket Weld	SW
Rating	Code
ANSI Class 150	
ANSI Class 300	07
ANSI Class 600	14
ANSI Class 900	21
Threaded 3000#	30
ANSI Class 1500	36

Options*

	Type
FS	Flipper Indication with Scale
FL	Flipper no Scale
N	
I	
DI	Dual Indication (follower only)
IB	Insulation Blanket
X	

*List all required

*For options not listed, consult factory.

MAX. OPERATING TEMPERATURE

	Type
xxxF	Fahrenheit
xxxC	Celsius

*BadSWiffa` S^SUUMteadVd
Ua`egf XSUfackz*

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Series 1210-LTM Magnetostrictive Transmitter

Series 1210-nT-6000 Level Transmitter

1210-LTM-NT-6000-30"-RM(10')

MeASurin G LenGTh

OpTiOnS

"PEF	"SF
RM	Remote Electronics (specify cable length)
ELB	Elbow Mounted Electronics
BM	Bottom Mounted Electronics
FM	Factory Mutual Approval
CSA	CSA Approval
A	
I	

Series 1210-nT-6000 Level Transmitter

Norriseal NT-6000 level transmitter is the latest development in magnetostrictive level sensing technology that is designed exclusively for magnetic level gages. The NT-6000 contains a low profile waveguide that is mounted away from the level gage chamber. This durable slim design isolates the dual sealed waveguide from excessive vibration and temperature. From enhanced sensor technology, the output signal is fast, stable and extremely accurate.

Standard Features

-
-
-
-
-

-
-
- Non wetted, dual sealed low profile waveguide design, 316 SS
-
-
-
-
-

- State of the art sensor and transmitter electronics
-
-
-
-
-



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Series 1220 Level Switches

Norriseal level switches are non-invasive alarm switches that clamp to the gauge chamber and are magnetically actuated by the float through the chamber wall. These switches provide a low-cost, reliable alarm and control action without making additional cutouts in the vessel. The external mounting clamps make it easy to adjust the set point or service the switch anytime without interrupting the process. They are also easily added after gauge installation.



All switches may be wired for rising or falling level and NC or NO operation. Each switch has approximately 1/2 inch deadband to eliminate chattering and all have "break before make" action.

Series 1220 Level Switches

LQ 0..C V LQ 0..CV-0

Type: Electrical
 Volts: 150 VAC / VDC
 Current: 1.0 Amps
 Power: 25 Watts
 Contacts: SPDT or DPDT
 Deadband: 1/2 inch
 MAWT: -40°F to +800°F
 Enclosure: NEMA 4X
 Connection: 3/4" FNPT

LQ 5 ..C V LQ 5 ..C V-0

Type: Electrical
 Volts: 125/250 VAC
 Current: 10.0 Amps
 Power: 2500 Watts
 Contacts: SPDT or DPDT
 Deadband: 1/2 inch
 MAWT: -40°F to +600°F
 Enclosure: NEMA 4X
 Connection: 3/4" FNPT



NS-500EX & NS-500EX/2

Type: Electrical
 Volts: 500 VAC / VDC
 Current: 3.0 Amps
 Power: 100 Watts
 Contacts: SPDT or DPDT
 Deadband: 1/2 inch
 MAWT: -40°F to +600°F
 Enclosure: NEMA 4X
 Connection: 3/4" FNPT

NS-900EX & NS-900EX/2

Type: Electrical
 Volts: 125/250 VAC
 Current: 15.0 Amps
 Power: 3750 Watts
 Contacts: SPDT or DPDT
 Deadband: 1/2 inch
 MAWT: -40°F to +600°F
 Enclosure: NEMA 4X
 Connection: 3/4" FNPT

Stainless Steel Enclosures Available for All Switches

AAADNSADBAEAyACADBNPOTAEAAABTAEAAhAEAAAAATAPDEAAhAE
 AASAXAEAAAEAAhAE

AAAmAIAI

Non bleed Pneumatic Switch
 Type: Non bleed Pneumatic
 Supply Pressure: 30 - 200 PSIG
 Deadband: 1/2 inch
 MAWT: 0°F to 200°F
 Enclosure: 316 SS
 Connection: 1/4" FNPT



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options

insulation

Norriseal recommends insulation when gauges are to be used under extreme temperature conditions. In high-temperature applications, Norriseal can provide factory installed, removable insulation blankets (32°F to 600°F; see below left). Norriseal also provides electrical freeze protection (see below right) to prevent “icing” and flashing for fluids with low boiling points.



heat Tracing

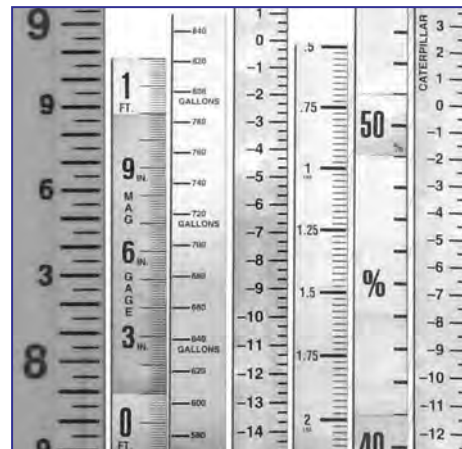
Norriseal offers a wide variety of both electrical and steam heat tracing options. Heat tracing can be used for freeze protection or to maintain the process temperature of molten materials. Electrical tracing is engineered to customer specifications and can be provided with controllers.

Scales

In addition to the standard stainless steel scale, graduated in feet and inches; other scale options are available.

- Negative/Positive (Boiler Service)
- Metric (meters, centimeters)
- Decimal feet (0.1 ft. or 0.01 ft. divisions)
- Offset zero (plus and minus scale divisions)
- Percent (0 to 100)
- Volumetric (gallons, liters)*

*Given that the characteristics of every vessel are different, drawings or strapping tables must be supplied. A one-time charge for artwork may be required.



Testing

Norriseal performs hydrostatic pressure tests on 100% of all level gauges we manufacture at no additional charge. All materials are supported by material traceability reports, (MTR) available upon request. Both NACE-0175 and NACE-103 are available as well as dual NACE stamping if required. All peripheral bolts, nuts and fittings are ANSI B31.1/ B31.3 compliant. Further testing and documentation are available upon request. This includes: dimensional (as built) drawings, positive material identification (PMI), X-ray and dye penetration.

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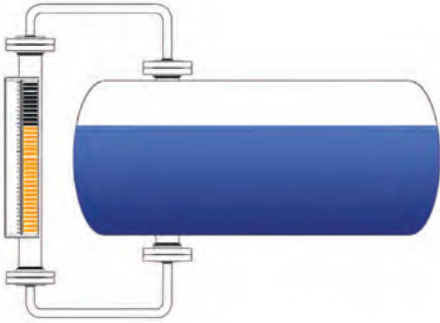
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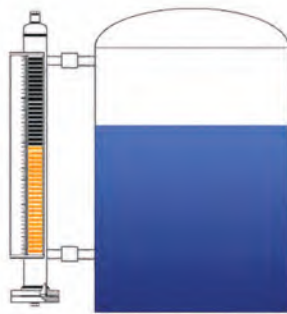
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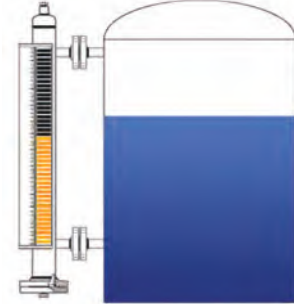
Typical installations



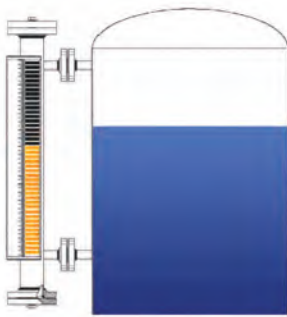
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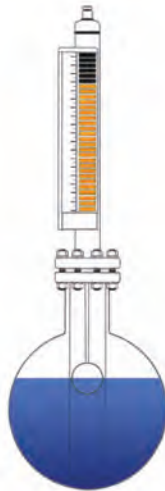
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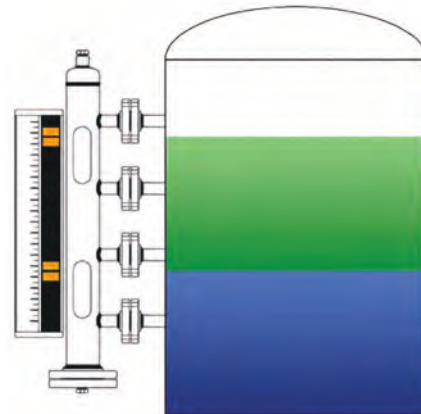
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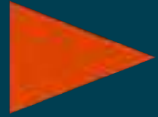
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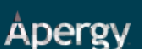


Norriseal 2 Way Control Valves

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Norriseal Series 2023A No-Freeze Valve

Liquid Dump Valve:

Reliable with high pressure, low temperature



FZNEVqVt \$" \$%3 z@a 8dMNV3 Ua` fcb^hS/hW

Application

The Series 2023A is ideal for use as a high pressure liquid dump valve for separators and other process vessels. The valve body is specifically designed for constant trim immersion in the vessel's fluid.

Maximum Differential Pressures (ΔP) No.9 Non-Adjustable Actuator

- Valve/actuator is normally open valve
- Valve/actuator is reverse acting, and is normally closed
- Maximum service pressure = 2220 psig
- Flow in lower port, flow out side port

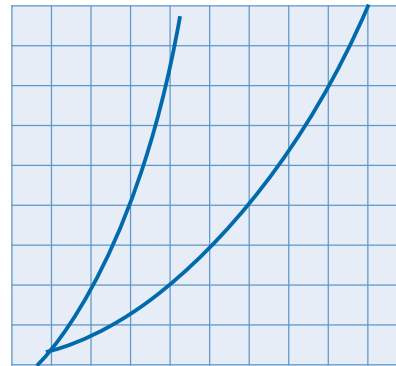
Notes:

1. Maximum $\Delta P = P_1 - P_2$ where $P_2 = 0$ psig.
2. Maximum ΔP cannot exceed maximum value working pressure

Features

- Hexagonal steel body
- Ball type trim design
- Replaceable plug and seat
- 300 Series SST trim standard
- Non-adjustable actuator
- NACE MR-01-75 compliance standard

>[cg[V E]] [Y 5ZScf



1. Maximum Flow Coefficient for 2.22 Trim is 2.22. Maximum Flow Coefficient is 0.1 for 0.375 Trim.
2. For Gravity Correction, multiply by 1/SG.
3. For Gravity Correction, multiply by 1/SG.
4. To Convert Barrels Per Day, Multiply GPM by 34.3

Specifications

- Body inlet connection 1.00" NPT (male)
- Body outlet connection 0.50", 0.75" or 1.00" NPT (female)
- Body style Angle/freeze resistant
- Max. working pressure 2220 psig (ASME Class 900)
- Temperature limits -20° to 180° F
- Trim characteristic Quick opening
- Actuator mode Reverse acting
- Actuator effective area 35 Sq. in.

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Model code

How to order

1. Specify series number – 1.0" Series 2023
2. Specify outlet size – 0.50", 0.75" or 1.0" – 14 NPT
3. Select model number from chart below
4. Specify trim size – 0.25" or 0.375"
5. Select trim material

boDy coNNection	
	Ambc
Threaded (NPT)	S

SerVice	
	Ambc
NACE MR-01-75	N

boDy rAtiNg	
	Ambc
2220 psig Max.	22

ActuA tor St yle	
	Ambc
Reverse – Non Adj.	R

ActuA tor SPriN g	
	Kmbc
BA	Reverse Acting

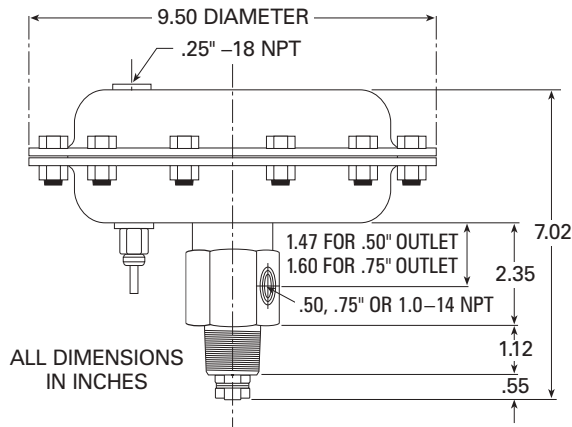
ActuA tor Size	
	pc
09	35 in. ²

SeALS	
	Krcpg j
H	Viton

boDy St yle	
	Nrcpl
A	Angle

triM MAterIAL	
	316 SST

S N 22 R A H 09 BA



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Norriseal Series 2026 and 2027A No-freeze valves

The Industry Standard:
Reliable performance for separators and
process vessels

The Norriseal Series 2026 and 2027A has been the standard on separators and other process vessels in the oil and gas industry. The body is threaded into the process vessel, allowing the valve plug/seat to be placed into the warm process fluid which will prevent or inhibit freezing due to pressure differential or low ambient temperatures.

Specifications

- Body style: 2026 single port angle, 2.0 inch MNPT vessel connection, 1.0 inch FNPT inlet and outlet, 2027A single port angle, 2.0 inch MNPT vessel connection, 1.0 inch FNPT outlet only
- 2250 psig maximum working pressure
- Body material: carbon steel
- Maximum temperature: 180° F (82° C)
- ¼, ⅜ and ½-inch trim sizes



Features

- No-freeze body
- Hammer nut enclosure
- Quick access to trim for inspection or replacement
- SST or carbide trim material
- Optional working pressures
- Adjustable and non-adjustable actuators
- Teflon "V" ring, spring loaded packing
- Optional NACE MR0175 materials



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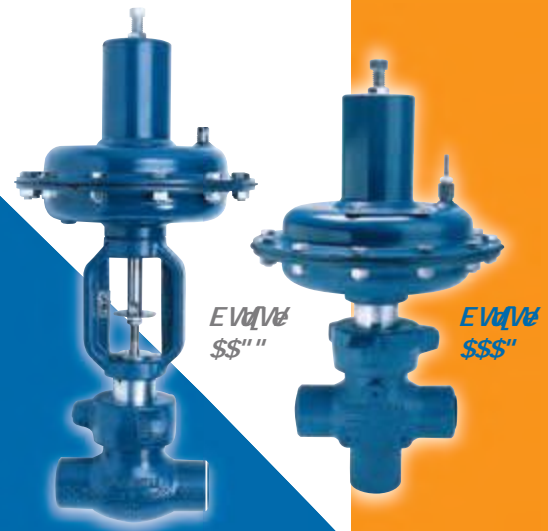
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Norriseal Series 2200 and 2220 Control Valves

Space-Saving Solution:

Yokeless design fits tight separator and scrubber applications



Norriseal Series 2200 and 2220 valves have been the standard for controlling fluids in the oil and gas industry since 1966. The hammer nut entry into the valve body allows quick access for trim inspection. Both Series 2200 and 2220 valves can be furnished with a variety of trims and end connections (see table 7 on page 4 and table 5 on page 3).

The Series 2200 has an open yoke which allows for the mounting of positioners, limit switches and other devices. It is also used in applications that require an exposed stem for accurate travel indication. The yoke allows the valve to be used for higher temperature ranges.

The Series 2220 is the close-coupled or yokeless, space saving version of the Series 2200. This series is ideal for controlling liquids on compressor scrubbers and housed production separators where space is at a premium.

Features

Patented spherical plug and matching seat gives precision seating alignment

Two types of throttling trim for precision control: modified percentage and equal percentage

Hammer nut has extra thread engagement on the valve body to release any pressure within the body and allow safe removal of the bonnet/actuator during disassembly

Integral flange is provided on the bonnet to secure the hammer nut/bonnet to the valve body, improving safety when used in a corrosive atmosphere

Carbide, Stellite and soft seats are available for corrosion and high/low temperatures; other materials are available for NACE applications

Contents

- 2** Body Styles
- 2** Valve Dimensions
- 3** Specifications
- 4** Valve Trim
- 6** Actuators
- 7** Model Code

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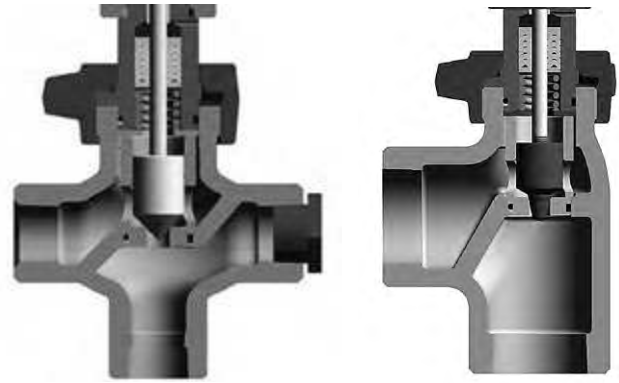
body Styles and dimensions

body Styles

1.00-inch Body Styles

The 1.00-inch comes in two styles: globe and T-body, allowing fluid to flow straight through the body in a globe pattern or angle flow pattern by repositioning the pipe plug (which comes in the bottom port) and replacing it in the upper port. Norriseal popularized the T-body in 1950 and it still is the most popular style in the industry.

The 2.00-inch body comes in two styles, globe and angle.



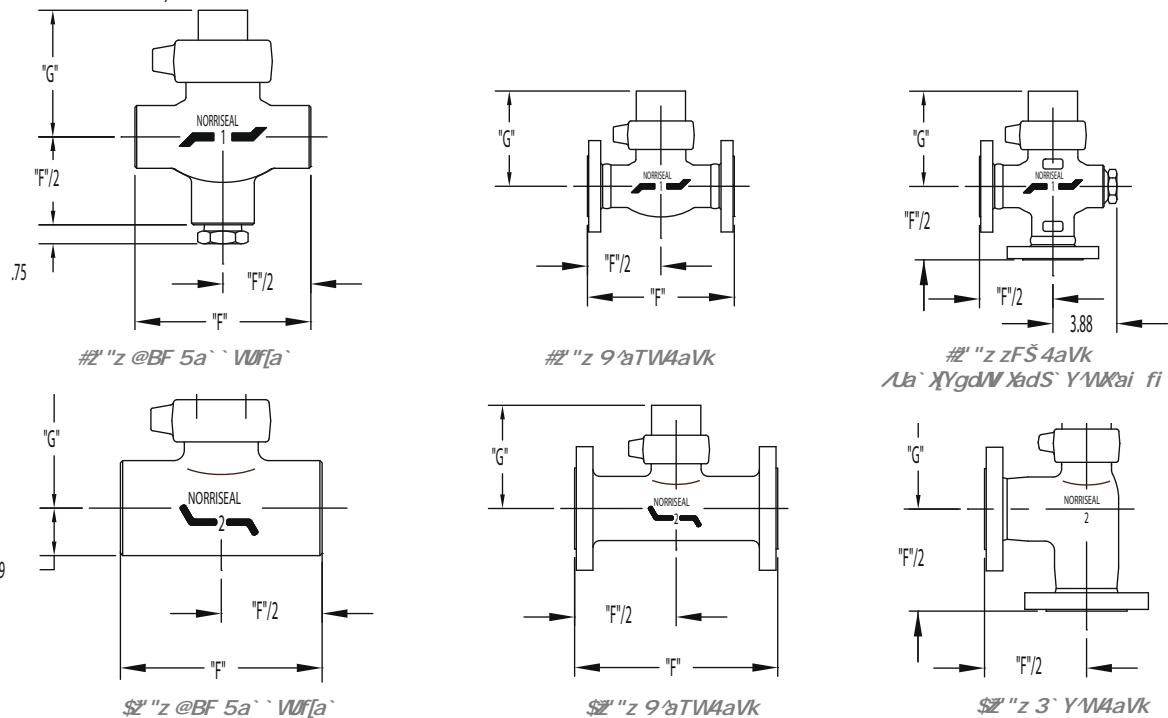
1.00" Globe Valve Dimensions
 1.00" T-Body Valve Dimensions

2.00" Globe Valve Dimensions
 2.00" Angle Valve Dimensions

Table 1: Valve dimensions

Body Size		Connection Type	Face to Face "F"										G"	
			ANSI Rating											
			150		300		600		900/1500		2500			
inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	
1.00	25	NPT**							6.25	159	6.25	159	4.88	124
		RF	7.25	184	7.75	197	8.25	210	9.38	238	11.38	289		
		RTJ	7.75	197	8.25	210	8.25	210	9.38	238	11.38	289		
2.00	50	NPT**							7.50	191	7.50	191		
		RF	10.00	254	10.50	267	11.25	286	12.88	327	16.25	413		
		RTJ	10.50	267	11.13	283	11.38	289	13.00	330	16.48	418		

* Angle 2.00" screwed body not shown. "F" dimension = "F"/2.
 ** Standard NPT body is rated to ANSI 1500.



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Specifications

Table 2: materials of Construction

Body	ASTM A216 Gr. WCC ASTM A351 Gr. CF8M	ASTM A352 Gr. LCC
Bonnet	ASTM A696/C	316 SST
Hammer Nut	ASTM A105 ASTM A350 Gr. LF2	316 SST
Stem	Nitronic 50	
Packing	TFE V Ring Viton/TFE	Fabric V Ring
Packing Spring	316 SST	Inconel X750
Packing Washer	CSTL	17-4 PH
Packing Retainer	17-4 PH	
O-Ring Wetted	Nitrile Aflas	Viton HSN
Diaphragm	Buna/Nylon	Neoprene/Nylon
O-Ring Non Wetted	Viton	HSN
Actuator Spring	Steel	
Adjust. Screw	CSTL/PLtd.	316 SST
Diaphragm Housing	CSTL	
Diaphragm Plate	CSTL	
Travel Indicator	303 SST	
Actuator Pressure Connection Size – 1/4" – 18 NPT Thread		

Table 3: operating Temperature*

2200/2220	Std. WCC Mtl.	-20 to 180°F (-29 to 82°C)
2200/2220	Std. LCC Mtl.	-40 to 180°F (-40 to 82°C)
2200	Opt. Mtl.	-50 to 400°F (-45 to 204°C)
2200	Opt. Mtl.	-50 to 300°F (-45 to 149°C)

* Optional seal material built valves can cover high or low temperature ranges, but not necessarily both.

Table 4: actuator

ars rmp Lsk cp	K v g k s k U N		Q g x c - C d d l , p c		R p t c j	
	n g g e	p	q o , g l q	a k , q o	g l q	k k
9	55	3.8	35	226	0.625	15.9
12	55	3.8	70	452	0.625	15.9

Table 5: body end Connections and pressure ratings*

Body Size		Pressure Rating		NPT	ASME Flanged RF and RTJ				Body Style
Inches	mm	psig	bar		150/300	600	900/1500	2500	
1.00	25	3750	259	X	X	X	X	Globe/"T"	
1.00	25	6250	431	X			X	"T"	
2.00	50	3750	259	X	X	X	X	Globe/Angle	
2.00**	50	6000	414	X			X	Globe/Angle	

* Pressure ratings are based on temperatures of -20 to 100° F (-29 to 38° C) with standard material. Consult factory for pressure ratings for temperatures other than those shown. (X) indicates end connections available.

** 2" 2500# is not available in CF8M

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Valve Trim

Table 6: 2200/2220 globe & angle body, modified per CentAge, equal per CentAge & quick opening, unbalanced, plug Control Trims

ØFT	NW	ØFT	NW											
1.00	25	0.25	6.4	.284	.506	.657	.767	.875	.989	1.10	1.20	1.32	1.43	1.68
		0.38	9.5	.311	.621	.942	1.28	1.64	2.07	2.51	2.93	3.35	3.70	3.82
		0.50	12.7	.557	1.11	1.68	2.26	2.92	3.62	4.30	4.98	5.43	5.60	5.60
		0.75	19.1	.752	1.57	2.43	3.42	4.58	6.08	7.93	9.71	10.6	11.0	11.6
		1.00	25.4	.983	2.01	3.40	6.12	8.90	11.7	13.5	14.4	15.1	15.4	15.4
2.00	50	0.25	6.4	.284	.506	.657	.767	.875	.989	1.10	1.20	1.32	1.43	1.68
		0.38	9.5	.311	.621	.942	1.28	1.64	2.07	2.51	2.93	3.35	3.70	3.75
		0.50	12.7	.592	1.17	1.76	2.34	2.95	3.70	4.57	5.50	5.95	6.08	6.08
		0.75	19.1	.882	1.76	2.76	3.82	5.05	6.57	8.49	10.8	12.2	12.9	13.0
		1.00	25.4	1.01	2.02	3.58	6.45	9.38	12.32	13.7	15.4	16.7	17.1	23.0
		1.25	31.8	Consult Factory										

* Consult factory for equal percentage and micro-groove trim values; ^Angle body

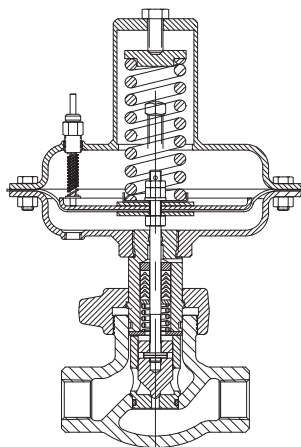
Table 7: plug Types and Sizes

Size		Quick Opening	Modified Percentage	Equal Percentage
Inches	mm			
0.19	4.7			X
0.25	6.4	X	X	X
0.38	9.4	X	X	X
0.50	12.7	X	X	X
0.75	19.1	X	X	X
1.00	25.4	X	X	
1.25	31.75	X		

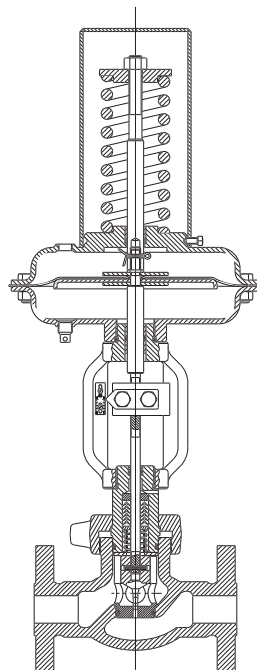
Note: (X) indicates sizes available

Table 8: plug material

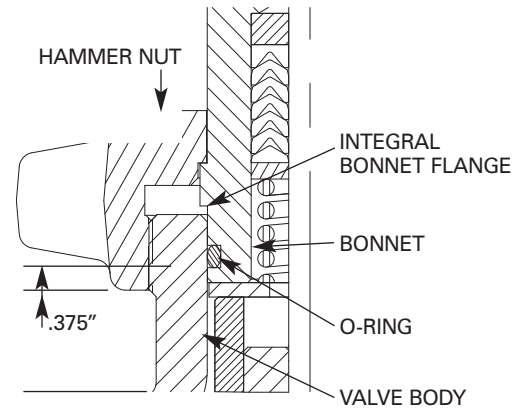
Standard	Optional
17-4 SST	316 SST
	Carbide
	Alloy 6
	UHMW 3/4" and 1" only



8[Yz+Z#Z] "ŠEV[V]V\$ \$\$" hS'hW



8[Yz#Z#Z] "ŠEV[V]V\$ \$\$" hS'hW [fZ S` aZ+ V[dVf /ebq] Y abW[YfiSUfgSfadZ FZcáff'Wfd_ t Xai gbZ

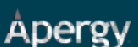


8[Yz##Z]: S_ _ Vd@gf! 4a` ` VV 4aVk 7` YSYW Wf

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Valve Trim (continued)

Table 9: maximum differential pressure (3-15 psi)

Trim Size		Actuator Size	Gas Supply Pressure		Flow Under Seat				Flow Over Seat			
					Throttle				Quick Opening			
					Direct		Reverse		Direct		Reverse	
Inches	mm	Number	psig	bar	psig	bar	psig	bar	psig	bar	psig	bar
.25	6.4	9	33	2.3			6250	431	6250	431		
					6250	431	6250	431	6250	431	6250	431
.38	9.5	9	33	2.3			3300	228	6250	431		
					3955	273	5855	404	6250	431	6250	431
.50	12.7	9	33	2.3			1804	124	6250	431		
					2165	149	3200	221	6250	431	6250	431
.75	19.1	9	33	2.3			751	52	3165	218		
					905	62	1380	95	6250	431	285	20
1.0	25.4	9	33	2.3			393	27	1525	105		
					480	33	745	51	3600	248	175	12

Table 10: maximum differential pressure (6-30 psi)

Trim Size		Actuator Size	Gas Supply Pressure		Flow Under Seat				Flow Over Seat			
					Throttle				Quick Opening			
					Direct		Reverse		Direct		Reverse	
Inches	mm	Number	psig	bar	psig	bar	psig	bar	psig	bar	psig	bar
.25	6.4	9	33	2.3			6250	431	6250	431		
					6250	431	6250	431	6250	431	6250	431
.38	9.5	9	33	2.3			3300	228	6250	431		
					3955	273	5855	404	6250	431	6250	431
.50	12.7	9	33	2.3			1804	124	6250	431		
					2165	149	3200	221	6250	431	6250	431
.75	19.1	9	33	2.3			751	52	3165	218		
					905	62	1380	95	6250	431	285	20
1.0	25.4	9	33	2.3			393	27	1525	105		
					480	33	745	51	3600	248	175	12

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actuators

Table 11: Spring deSCription

3UfgSfad @g_TVd	Ebd Y DSW	DS YW	FST M@až
9	AA	3 – 11 psi	9
	HA	6 – 30 psi	10
12	HA	3 – 15 psi	9
	WM	6 – 30 psi	10

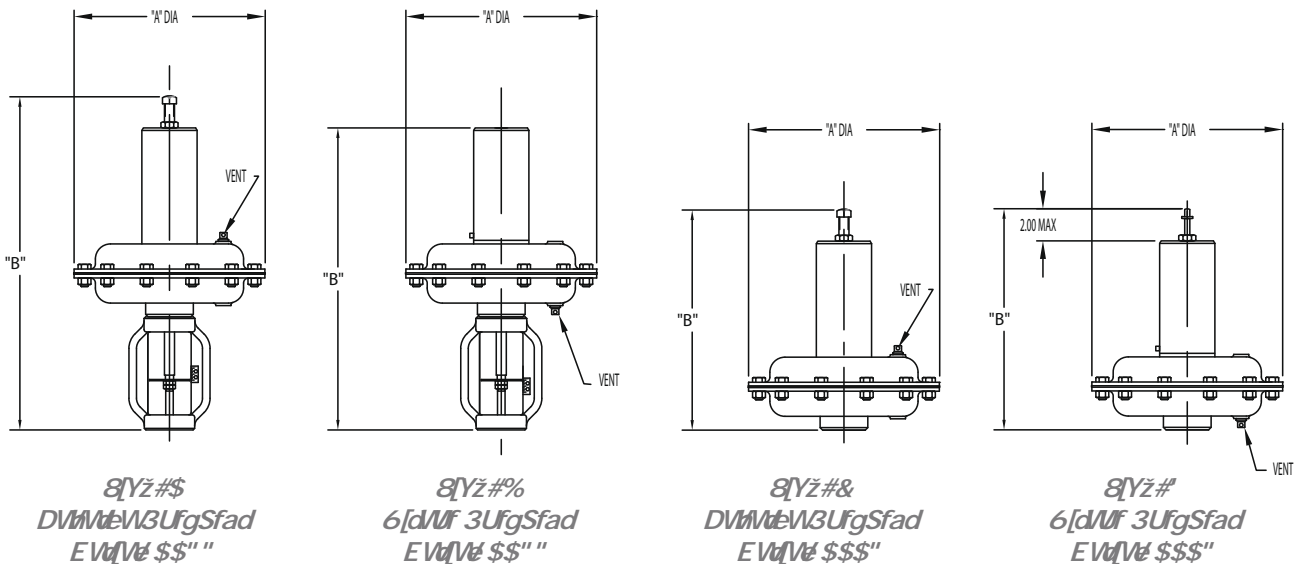
Table 12: ShutOFF ClaSSiFication

Metal Seats	ANSI Class IV (ANSI/FCI 70-2-1998) Leakage less than 0.01% of maximum valve capacity
Soft Seats	ANSI Class VI (ANSI/FCI 70-2-1998) Leakage less than one bubble per minute. (3/4" and 1" only)

Table 13: aCTuaTor diMenSionS

mbwQgxc		ars rmp Lsk cp	Qnpgle Bcqapnrgml	ars rmp Bg kcrp		Pct cpqc				Bggcar				Bggcarl QnpgleA mtcp	
Glafcq	kk			Glafcq	kk	00..		000.		00..		000.		Glafcq	kk
1.00	25	9	AA	9.5	241	15.38	391	9.75	248	15.88	403	10.25	260	5.50	140
2.00	50		HA			17.13	435	11.50	292	17.38	441	11.75	298	7.00	178
1.00	25	12	HA	12.5	318	16.50	419	10.88	276	17.38	441	11.75	298	7.00	178
2.00	50		WM			20.25	514	14.62	371	20.50	521	14.38	365	10.00	254

*Clearance required for "Direct Actuator" cover removal.



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Model Code

Model Code

BODY END CONNECTIONS

Type	Code
Flanged Raised Face	RF
Flanged Ring Type Joint	RJ
Threaded - NPT Female	S
API Conn (RTJ)	AJ
None (No Valve Body)	00

BODY SIZE

Size (Inches)	Code
1	10
2	20
2.06	21
2.56	26

VALVE SERIES

Series	Code
Open Yoke	2200
Close Coupled	2220

SPECIAL COMPONENTS

Body/Bonnet Material	Code
WCC/A696	-
WCC/A696	N ⁽¹⁾
LCC/A350 LF2	P ⁽¹⁾
LCC/A350 LF2	Q
CF8M/316	S ⁽¹⁾

BODY RATING

ANSI Class	Code
150	02
300	07
600	14
900	21
1500	36
5000	50
2500	60

ACTUATOR ACTION

Type	Code
Pneumatic Reverse Acting (Fail Closed)	T
Pneumatic Direct Acting (Fail Open)	B
Manual Handwheel	F
Electric (Fail in Last Position)	E
Verto Valve	V

BODY STYLE

Type	Code
Angle	A ⁽²⁾
Globe	G
"T"	T ⁽³⁾

SEAL MATERIAL

Diaphragm	Wetted	Code
Buna	Buna	A
Buna	Low Temp. Buna	M
Buna	Viton	V
Neoprene	HSN	7 ⁽⁴⁾

TRIM MATERIAL

Code	Plug or Butt Material	Plug Insert Material	Seat or Seat/Cage Material	Seat Insert Material	Temp. (°F)
17-4	17-4 SST	-	17-4 SST	-	-100to+4 00
316	316 SST	-	316 SST	-	-100to+4 00
STL6	STL6/316	-	STL6/316	-	-100to+4 00
CARB	316 SST	Carbide	316 SST	Carbide	-50to+4 00
UHMW	316 SST	Polyethylene	316 SST	-	-20to+180

Note: Soft trim, UHMW, is limited to trim sizes ¾" and 1"

10-2220S-36TGA-9AA 0.38AQCARB

TRIM GEOMETRY & CHARACTERISTIC

Code ¹	Trim Characteristic	Seating Geometry	Trim
AE	Angular	Equal % (0.19 only)	Steel or Stellite
AP	Angular	Modified %	Carbide
AQ	Angular	Quick Open	
BE	Spherical	Equal %	Steel or Stellite
BP	Spherical	Modified %	
BQ	Spherical	Quick Open	

Note: Tungsten-carbide and soft-seated trims are available ONLY with angular seating geometry.

¹ For Equal % trim use code "AE" for 3/16" & code "BE" for ¼", 3/8", ½" and ¾" sizes.

TRIM ORIFICE SIZE

Code	Nominal Size
0.19	3/16"
0.25	1/4"
0.38	3/8"
0.50	1/2"
0.62	5/8"
0.75	3/4"
1.00	1"
1.25	1-1/4"

Note:
1" Series 2200/2220
is limited to 1.00"
maximum trim size.

ACTUATOR SPRINGS

Code	Actuator Number
AA,HA	9
HA,WM	12

ACTUATOR SIZE

Code	Number
"00"	None
9	9
12	12
EO	Electric

PACKING

Code	Material	Temp.
- ⁽¹⁾	PTFE V-Ring	-120 [±] +400°F -84 [±] +204°C
C	Fabric V-Ring	-20 [±] +250°F -28 [±] +121°C
N ⁽¹⁾	PTFE V-Ring	-120 [±] +400°F -84 [±] +204°C
L ⁽¹⁾	Viton/PTFE	-15 [±] +400°F -26 [±] +204°C

Accessories:

Positioners (Electro-Pneumatic, Pneumatic and Digital), Airlock, Limit Switches, Solenoid Valve, Booster Relay, Filter Regulators, I/P Transducers, Pressure Controllers, Temperature Controllers, etc.

(1) Suitable for NACE (2) 2" only (3) 1" only (4) Sold in Canada only

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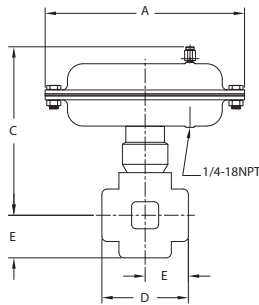
Norriseal series 2275 low cost control Valve

Quality and economy:

The ideal 1-inch dump valve



The 2275 is ideal for use as a dump valve in high- or low-pressure liquid service on separators, dehydrators, etc. The 2275 can also be used as a back pressure or reducing valve when used with a pressure pilot.



actuator dimensions

Qgxc		A
9	9 1/2	9.00

screwed body dimensions

mbwQrwjc	B	C
Globe	4 1/8	2 1/16
Angle	—	2 1/16

features

- 1-Inch Screwed End Connections
- Forged Steel Body (A350-LF2)
- 4000 PSI W.P.
- Direct or Reverse Non-Adjustable Actuator
- Stainless Steel Trim
- Optional Carbide Trim Available
- Meets NACE MR0175 2002
- Threaded Bonnet Closure
- Temperature Range -20°F to 180°F

maximum differential pressures (Δp)¹ no. 9 actuator

Orifice Size	Flow Direction	Supply ² Pressure	Non-Adjustable Actuator ³	
			9BA2 Direct	9BA4 Reverse
0.250" (1/4")	Under Seat	20	3200	4000
		30	4000	4000
	Over Seat	20	4000	2100
		30	4000	2100
0.375" (3/8")	Under Seat	20	1200	2100
		30	4000	2100
	Over Seat	20	4000	4000
		30	4000	4000
0.50" (1/2")	Under Seat	20	300	1150
		30	1600	1150
	Over Seat	20	4000	4000
		30	4000	4000

(1.) Maximum $\Delta P = P_1 - P_2$ where $P_2 = 0$ PSIG. Maximum ΔP cannot exceed maximum valve working pressure.

(2.) Actuator supply pressure required to fully stroke valve.

(3.) ΔP supply pressure based on a 3 PSIG Actuator Spring Pre-Load.

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model code

how to order

1. Select series number – Series 2275 (Std. NACE) or Series 2276 (NACE/Viton Diaphragm)
2. Select proper model code from charts below
3. Select trim size and material, for example, 1/4" 316 SS.

2275 SN40RTV-9BA4

body material	
Rwnc	Ambc
NACE MR0175 2002	N

body connection	
Rwnc	Ambc
Screwed (NPT)	S

series	
2275	
2276	

body pressure rating		
UME	LQG	Ambc
4000	—	40

actuator type	
Qrwjc	Ambc
Reverse Non-Adjustable	R
Direct Non-Adjustable	D

actuator size	
Ambc	Lmk,Bg kcrsp
9	9.5

actuator springs	
Ambc	Lml bhsqr jc
BA2	Direct
BA4	Reverse

packing	
Ambc	K rcpj
—	Teflon

seal/diaphragm material		
Ambc	Qc jq	Bg nfp ek
V	Viton	Neoprene (Std.)
O	Viton (2276)	Viton(2276)
7	HSN	Neoprene (Std.)
8	HSN	Viton(2276)

body style	
Ambc	Rwnc
T	Tee

trim material	
Standard/NACE	316 SS
Optional/NACE	Carbide/316 SS

weight	
22 lb.	

series 1.00" dump Valve			
Maximum Flow Coefficients (Cv) ¹			
Orifice Size	Flow Direction	Flow Coefficient (Cv) ²	
		Globe Flow	Angle Flow
0.250"	Under Seat	2.6	2.8
	Over Seat	3.0	3.5
0.375"	Under Seat	3.5	4.8
	Over Seat	3.9	5.1
0.500"	Under Seat	5.5	5.6
	Over Seat	5.5	6.0

Notes: (1) As determined per ISA-S39.2 test method.
 (2) Cv values with valve in full open position.

Please note: not all available options are shown.

Please contact your Norriseal-WellMark representative for more details and assistance in specifying the optimal solution for your application.

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NORRISEAL SERIES 2400 CONTROL VALVE

The **Norriseal Series 2400 Control Valve** is ideal for oil and gas flow control. The Series 2400 is also a desirable selection where accurate travel indication is needed and positioners or limit switches are required. Temperature rating from -20°F to 400°F.

The **Series 2420** is the close coupled version of the Series 2400. If space and economy are important or a positioner is not required, this model will give the same dependable service as the Series 2400. Temperature rating from -20°F to 180°F.

► FEATURES

- 3/16" through 1¾" orifice sizes
- Modified percentage, quick opening, and equal percentage (3/16" trim only)
- Hammer nut entry
- Yoke-mounted or close-coupled, pressed steel actuators, direct or reverse action
- Teflon packaging

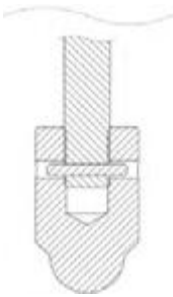


▶ INNER VALVES

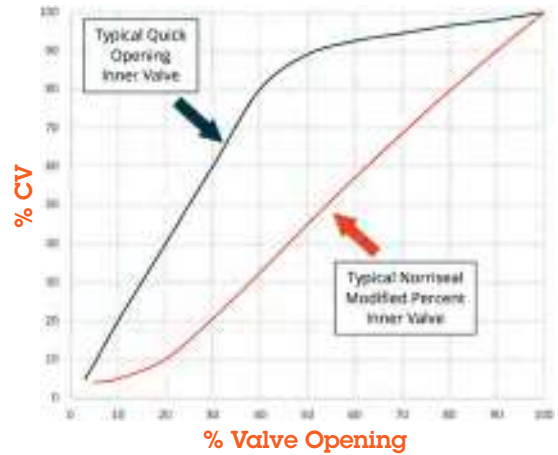
Modified percentage plug is offered by Norriseal-WellMark. It is a combination of linear and equal percentage plug. The advantage of combining these excellent contours is that the characteristics give exceptional control at 10 — 30% and 80 — 100% inner valve openings, as well as in the middle range.

Quick opening plug is offered as optional for throttling service where rangeability is not required.

Assembly of both the modified percentage and quick opening plugs are the same. The plugs are screwed onto the stem. The hole in the plug body is oriented with the hole through the stem. A stainless steel (420 SST) roll pin prevents the plug from turning on the stem. The threads of the plug and stem bear the thrust load, yet some horizontal plug movement is possible to allow positive alignment with the seat. This ensures the most leakproof closure in metal to metal seating surfaces. See "Trim" in Specifications.



Flow Characteristic Curves



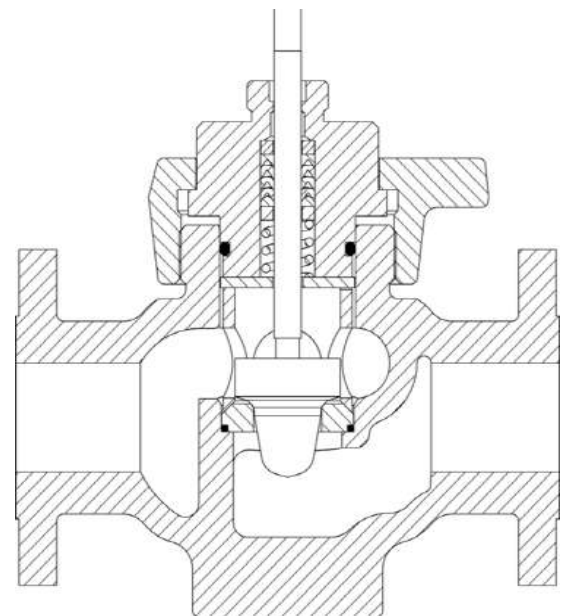
▶ CAGE AND SEATS

The cage has full opening flow capacity.

On valves with 1 1/4" travel the cage fits over the seat in a manner much like the plug fits the orifice — two beveled surfaces are meeting.

On valves with 5/8" travel, the seat and cage are manufactured as one piece.

The cage in both constructions guides the plug. These self-aligning features assure alignment of seating surfaces when the hammer nut closure is made tight.



2" SERIES 2400 BODY ASSEMBLY WITH 1 3/4" TRIM

FLOW COEFFICIENTS (Cv)

NORRISEAL MODIFIED PERCENT & QUICK OPENING

Orifice Size	VALVE OPENINGS - PERCENT TOTAL TRAVEL										Cv MAXIMUM	
	10	20	30	40	50	60	70	80	90	100		
1/4" MP	.09	.16	.24	.33	.41	.49	.57	.65	.73	.81	.89	1.7
3/8" MP	.20	.36	.57	1.2	1.6	2.0	2.4	2.9	3.3	3.8	4.3	8.8
1/2" MP	.34	.61	1.3	2.0	2.7	3.5	4.2	4.9	5.6	6.1	6.8	6.8
3/4" MP	.74	1.3	2.9	4.4	6.0	7.6	9.1	10.7	12.2	13.4	14.7	13.7
1" MP	.98	1.8	3.9	5.9	7.9	10.0	12.1	14.2	16.2	17.8	19.4	24.0
1-1/4" MP	1.6	3.0	6.3	9.8	13.3	16.8	20.2	23.7	27.2	29.8	32.4	29.8
1-1/2" MP	2	3.5	7.6	12.0	16.3	20.7	24.2	27.3	31.4	34.0	36.8	34.0
1-3/4" MP	2.1	3.8	8.1	12.6	17.0	21.4	25.8	30.3	34.8	38.1	41.4	38.1

MAXIMUM DIFFERENTIAL PRESSURE (PSIG)

FLOW UNDER SEAT

FLOW OVER SEAT

Spring Range (PSI)		3 - 15				6 - 30			
Press to Diaphragm (PSIG)		3 - 15				6 - 30			
Orifice Size	Diaphragm Action	18	24	30	36	18	24	30	36
1/4	*DIR	2900	3000	3600		1800	3600	3600	
	**REV	2850	3600	3600		1760	3600	3600	
3/8	DIR	1230	3600	3600		1950	3600	3600	
	REV	1200	3600	3600		2910	3600	3600	
1/2	DIR	650	1100	3600		3600	3600	3600	
	REV	620	1030	3600		3600	3600	3600	
3/4	DIR	255	910	1690		3600	3600	3600	
	REV	230	870	1660		3300	3600	3600	
1	DIR	120	490	930		1560	2220	2790	
	REV	105	470	910		1380	1940	2510	
1-1/4	DIR	60	350	690	300	1020	1440	1800	1920
	REV	70	370	690	340	900	1260	1670	1730
1-1/2	DIR	30	240	450	200	670	930	1180	1260
	REV	40	260	470	225	590	820	1060	1135
1-3/4	DIR	20	170	320	140	480	670	840	900
	REV	25	190	340	160	420	590	760	810

*DIRECT — NORMALLY OPEN VALVE — AIR TO CLOSE
 ** REVERSE — NORMALLY CLOSED VALVE — AIR TO OPEN

SPECIFICATIONS

Valve Body

Material	Cast Steel ASTM A216-WCC
Size	2 inch
Style	Globe
End Connection	Screwed; Flanged (RF or RJ)
Rating	Screwed — 3750 PSIG @ 100°F
	Flanged — ANSI 150, 300, 600, or 1500 lb.
Temperature	2400 Valve from -20°F to 400°F
	2420 Valve from -20°F to 180°F

Trim (Plug and Seat)

Material	17-4 SST, 316 SST, STL6/316, Carbide/316
Orifice Size	3/16, 1/4, 3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2, 1 3/4
Type	Norriseal Modified %, Quick Opening, & Equal % (0.19" Only)

Stem

Material	Nitronic 50
----------	-------------

Cage

Material	17-4 SST or 316 SST
----------	---------------------

Bonnet

Material	Packing Plug — Carbon Steel Bright 2 in. Plate
	Hammer Nut — Forged Steel

Yoke

Material	Ductile Iron ASTM A 395, GR 60-40-18
----------	--------------------------------------

Actuator Case

Material	Pressed Carbon Steel
Size	No. 12 (70 sq. in. Nominal Effective Area)
Action	Direct — (Spring Opens — Air Closes)
	Reverse — (Spring Closes — Air Opens)
Connection	1/4 NPT
Rating	30 PSIG Normal — 50 PSIG Maximum

Diaphragm

Material	Buna N Molded with Nylon insert or Neoprene (sold in Canada)
----------	--

Spring

Material	Tempered Carbon Steel
Range	3-15 PSI & 6-30 PSI

Travel

5/8" for 3/16" through 1" Orifice	
1 1/4" for 1 1/4" through 1 3/4" Orifice	

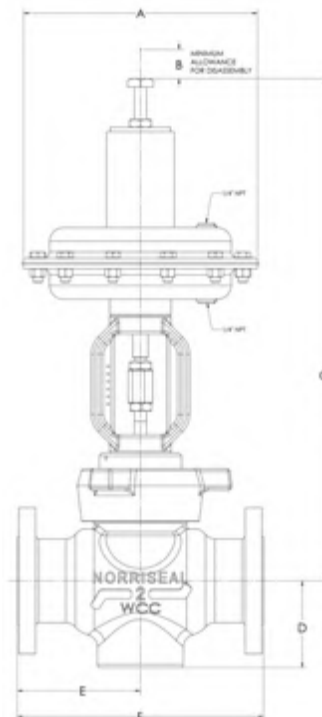
DIMENSIONS

ACTUATOR DIMENSION (INCHES)

STYLE	A	B	C	
			2400	2420
DIRECT	12-1/2	9	27	23
REVERSE		4-3/8	26-5/8	21

BODY FACE TO FACE DIMENSIONS (INCHES)

END CONNECTION			D	E	F
SCREWED (NPT)					
WELD (BUTT OR SOCKET)			3-3/8	4-1/8	8-1/4
				4-1/8	8-1/4
FLANGED	150	RF		5	10
		RJ		5-3/16	10-3/8
	300	RF		5-1/4	10-1/2
		RJ		5-1/2	11
	600	RF		5-5/8	11-1/4
		RJ		5-11/16	11-3/8
1500	RF	4-1/4		7-3/8	14-3/4
	RJ			7-7/16	14-7/8



BODY END CONNECTIONS	
Type	Code
Flanged Raised Face	RF
Flanged Ring Type Joint	RJ
Threaded – NPT Female	S

BODY SIZE	
Size (Inches)	Code
2	2

VALVE SERIES	
Series	Code
Open Yoke	2400
Close Coupled	2420

SPECIAL COMPONENTS	
Body/Bonnet Material	Code
WCC/A216	-
NACE	N ⁽¹⁾

BODY RATING	
ANSI Class	Code
150	02
300	07
600	14
1500	36

ACTUATOR ACTION	
Type	Code
Pneumatic Reverse Acting (Fail Closed)	T
Pneumatic Direct Acting (Fail Open)	B
Manual Handwheel	F
Electric (Fail in Last Position)	E

BODY STYLE	
Type	Code
Globe	G

SEAL MATERIAL		
Diaphragm	Wetted	Code
Buna	Buna	A
Buna	Viton	V
Neoprene	HSN	7 ⁽²⁾

TRIM MATERIAL				
Code	Plug or Butt Material	Plug Insert Material	Seat or Seat/Cage Material	Seat Insert Material
17-4	17-4 SST	-	17-4 SST	-
316	316 SST	-	316 SST	-
STL6	STL6/316	-	STL6/316	-
CARB	316 SST	Carbide	316 SST	Carbide

Note: • 3/16"-1" trim requires a 316 Adapter Seat
 • For 1¼"-1¾" trim, the Seat is 17-4 SST and the Cage is 316 SST. Use Code "17-4".

2-2400 S-36TGA-12HA 0.38 AQ CARB

TRIM GEOMETRY & CHARACTERISTIC				
Code ¹	Trim Characteristic	Seating Geometry	Trim Sizes	Trim
AE	Angular	Equal % (0.19 only)	0.19"	Steel or Stellite
AP	Angular	Modified %	0.25"-1"	Carbide
AQ	Angular	Quick Open		
BE	Spherical	Equal %	0.25"-0.75"	Steel or Stellite
BP	Spherical	Modified %	0.25"-1.75"	
BQ	Spherical	Quick Open	0.19"-1"	

TRIM ORIFICE SIZE	
Code	Nominal Size
0.19	3/16"
0.25	1/4"
0.38	3/8"
0.50	1/2"
0.62	5/8"
0.75	3/4"
1.00	1"
1.25	1-1/4"
1.50	1-1/2"
1.75	1-3/4"

ACTUATOR SPRINGS	
Code	Spring Range (PSIG)
HA	3-15
WM	6-30
OO	None

ACTUATOR SIZE	
Code	Number
"00"	None
12	12
EO	Electric

PACKING		
Code	Material	Temp.
-	PTFE V-Ring	-120°+400°F -84°+204°C
N ⁽¹⁾	PTFE V-Ring	-120°+400°F -84°+204°C
L ⁽¹⁾	Viton/PTFE	-15°+400°F -26°+204°C

(1) Suitable for NACE - includes Inconel X750 Packing Spring and other NACE internals
 (2) Sold in Canada only

Accessories

Positioners (Electro-Pneumatic, Pneumatic and Digital), Airlock, Limit Switches, Solenoid Valve, Booster Relay, Filter Regulators, I/P Transducers, Pressure Controllers, Temperature Controllers, etc.

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Norriseal Series 2700A, 2700E and 2720 Control Valves

Flexible Designs:

Configurations, trims and actuators to suit your application



The Series 2700 family offers the flexibility to select the most effective design and features for a specific application. The Series 2700 family includes three valve/actuator configurations: 2700A Standard, 2700E Extended Bonnet and 2720 Close-Coupled.**

Each configuration includes a single-ported valve body with either balanced, unbalanced, full port or restricted port trims to suit a variety of flow requirements. Both plug-control and cage-control trims are available in metal-to-metal or metal-to-composition seating material for Class VI shut-off. All trims are interchangeable within the valve body.

*Not available in all sizes. Please consult factory.

Features

Series 2700A Standard

- Unbalanced trims 1 inch and smaller
- Plug-control trims (modified percentage, quick opening)
- Cage-control trims (linear, equal percentage, cavitation control, noise reduction)
- 17-4PH SST standard trim, other materials available
- Available with direct- or reverse-acting, yoke-mounted pneumatic diaphragm actuators
- Trim options include erosion-resistant, soft-seat ring, noise abatement and cavitation control
- Cage-control trim features dwell protected seat area
- TFE V-ring packing (non-adjustable, spring-loaded)
- Bolted closure bonnet

Series 2700E Extended Bonnet

- Includes all 2700A features
- High and low temperature services
- Special trim and seal materials

Series 2720 Close-Coupled

Series 2720 Close-Coupled

- Available for a wide range of applications
- Broad selection of accessories, including side- or top-mounted manual handwheel overrides, travel stops and spring ranges for all applications



- Computer-designed, ductile iron yoke adds stability and strength to resist fatigue from vibration and high-frequency service or over-pressurization of the diaphragm housing
- Steel diaphragm housing helps prevent excessive deflection in over-pressure conditions
- Standard 3 to 15 psig and 6 to 30 psig spring ranges

Series 2720 Close-Coupled



- Space saving, economical design
- Reverse, close-coupled (yokeless) actuator
- Non-adjustable, spring-loaded packing
- Interchangeable trim variations
- Visual travel indicator on the actuator housing
- Body sizes from 1 inch (25 mm) through 4 inch (100 mm)

Contents

- 2 Configurations
- 3 Valve Specifications
- 5 Valve Trim
- 9 Actuators
- 11 How to Order
- 12 Model Code

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Valve Specifications

VALVE MATERIAL TEMPERATURE LIMITS

Body/Bonnet			Angle		
Body/Bonnet Material	Limits*		Angle	D	A
	F	C			
ASTM A216 Gr WCC	-20° to 800°	-29° to 427°			
ASTM A352 Gr LCC	-50° to 650°	-46° to 343°			
ASTM A351 Gr CF8M	-100 ⁽¹⁾ to 800°	-73 ⁽¹⁾ to 427°			

Material	Temperature Range (F)	Temperature Range (C)	Angle	D	A
316 SST ⁽²⁾	316 SST	316 SST ⁽²⁾	-300° to 400°		-184° to 204°
316 SST/Alloy 6	316 SST ⁽⁴⁾	316 SST/Alloy 6	-300° to 800°		-184° to 427°
17-4PH SST	17-4PH SST	17-4PH SST	-50° to 800°		-46° to 427°
17-4PH SST/Carbide ⁽⁵⁾	17-4PH SST	316 SST/Carbide	-50° to 600°		-46° to 316°
Duplex SST	Duplex SST ⁽⁴⁾	Duplex SST	-20° to 750°		-29° to 399°

Body/Bonnet MATERIALS of Construction

Valve Component	Material	Material
Body and Bonnet	ASTM A216 Gr. WCC ASTM A351 Gr. CF8M ASTM A352 Gr. LCC	Duplex Stainless Steel Other materials available - Consult factory
Closure Studs	ASTM A193 Gr B7 ASTM A193 Gr B7M ASTM A193 Gr B8M	ASTM A320 Gr L7 ASTM A193 Gr B16
Closure Nuts	ASTM A194 Gr 2H ASTM A194 Gr 2HM ASTM A194 Gr 8M	ASTM A194 Gr 7 ASTM A194 Gr 16
Packing	TFE Graphite	Kalrez/TFE Elastomeric/TFE (various)
Packing Spring	Inconel X-750	
	316L SST/Graphite	Inconel/Graphite
Valve Stem	17-4PH SST Nitronic 50	316 SST
Compressor Bar	316 SST	
	316 SST	
	ASTM A193 Gr B7	
	ASTM A194 Gr 2H	
	316 SST	
	304 SST	
	ASTM A536 Ductile Iron	

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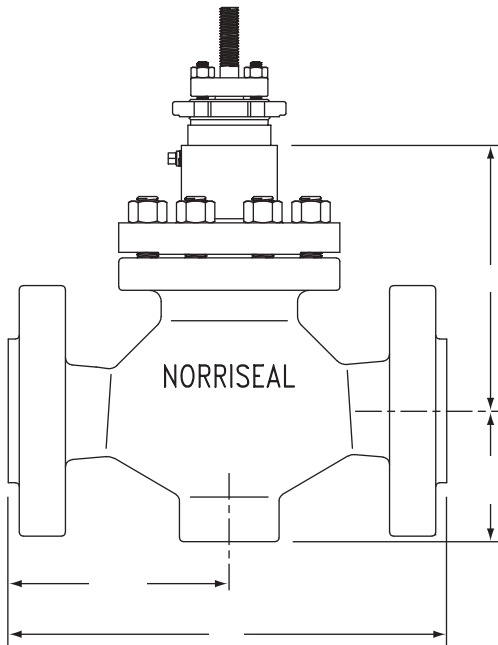
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Valve Specifications (CONTINUED)

Body FACE to FACE "F" DIMENSION S

Body End Connection Type		Body Size, Inches (mm)								
		1.0 (25)	1.5 (40)	2.0 (50)	3.0 (80)	4.0 (100)	6.0 (150)	8.0 (200)	10.0 (254)	12.0 (305)
NPT Female		■	■	11.25 (286)	N/A	N/A	N/A	N/A	N/A	N/A
Butt Weld		■	■							N/A
Socket Weld		■	■			N/A	N/A	N/A	N/A	N/A
ANSI Flanged Raised Face	150	7.25 (184)	8.75 (222)	10.00 (254)	11.75 (299)	13.88 (353)	17.75 (451)	21.38 (543)	26.5 (673)	29.0 (737)
	300	7.75 (197)	9.25 (235)	10.50 (267)	12.50 (318)	14.50 (368)	18.62 (473)	22.38 (568)	27.88 (708)	30.5 (775)
	600	8.25 (210)	9.88 (251)	11.25 (286)	13.25 (337)	15.50 (394)	20.00 (508)	24.00 (610)	29.62 (752)	32.25 (819)
	900	10.75 (273)	12.25 (311)	14.75 (375)	15.50 (394)	17.00 (432)	24.00 (610)	29.00 (737)	N/A	N/A
	1500	10.75 (273)	12.25 (311)	14.75 (375)	18.12 (460)	20.88 (530)	27.75 (705)	32.75 (832)	N/A	N/A
	2500	N/A	N/A	16.88 (429)	22.75 (578)	26.50 (673)	34.00 (864)	40.25 (1022)	N/A	N/A
ANSI Flanged Ring-Type Joint	150	7.75 (197)	9.25 (235)	10.50 (267)	12.25 (311)	14.38 (365)	18.25 (464)	21.88 (556)	27.00 (686)	29.5 (749)
	300	8.25 (210)	9.75 (248)	11.12 (282)	13.12 (333)	15.12 (384)	19.25 (489)	23.00 (584)	28.5 (724)	31.12 (790)
	600	8.25 (210)	9.88 (251)	11.38 (289)	13.38 (340)	15.62 (397)	20.12 (511)	24.12 (613)	29.75 (756)	32.38 (822)
	900	10.75 (273)	12.25 (311)	14.88 (378)	15.62 (397)	17.12 (435)	24.12 (613)	29.12 (740)	N/A	N/A
	1500	10.75 (273)	12.25 (311)	14.88 (378)	18.25 (464)	21.00 (533)	28.00 (711)	33.12 (841)	N/A	N/A
	2500	N/A	N/A	17.00 (432)	23.00 (584)	26.88 (683)	34.50 (876)	40.88 (1038)	N/A	N/A



Body HEIGHT

mbwQgxc* Glafcq&kk	B* Glafcq&kk		C K v,* Glafcq&kk
	05.. -050.	05.C	
1.0 (25)	6.56 (167)	10.56 (268)	3.50 (89)
1.5 (40)	7.29 (185)	11.29 (287)	4.06 (103)
2.0 (50)	9.00 (229)	13.75 (349)	4.56 (116)
3.0 (80)	9.25 (235)	14.00 (356)	6.38 (162)
4.0 (100)	10.19 (259)	14.94 (379)	7.62 (194)
6.0 (150)	12.44 (316)	17.44 (443)	7.62 (194)
8.0 (200)	16.00 (406)	21.00 (533)	10.50 (267)
10.0 (254)	20.82 (525)	N/A	11.71 (297)
12.0 (305)	23.18 (589)	N/A	12.75 (324)

Avail ABIE Body End Connection S

mbwQgxc* Glafcq&kk	LNR	srr Ucjb	Qmaicr Ucjb	LQGDj lecbPD lbPRH						
				/3.	1.	4.	7.	/3.	03.	
1.0 (25)										
1.5 (40)										
2.0 (50)										
3.0 (80)										
4.0 (100)										
6.0 (150)										
8.0 (200)										
10.0 (254)										
12.0 (305)										N/A

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Valve Specifications (CONTINUED)

Body And trim Size CombinationS

4aVk E/W LZV# /_ fi	@a_ [S^Fd_ E/W; LZV#/_ fi										
	G^TS^UV		4S^S^UV								
	"#+, #Z" /&Z, \$ fi	#Z' /\$' fi	#Z' /&' fi	\$Z' / " fi	%Z' / ^" fi	&Z' /#" fi	(Z' /#" fi	*Z' /\$'" fi	#Z' /\$' & fi	#S^Z' /%'" fi	
1.0 (25)	■	■									
	■	■									
	■	■									
	■	■									
				■ ⁽¹⁾	■ ⁽¹⁾	■	■				
						■ ⁽¹⁾	■	■			
								■	■		
									■	■	

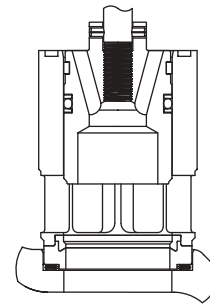
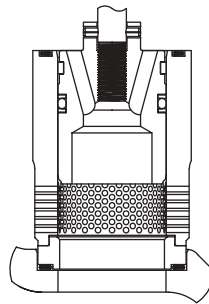
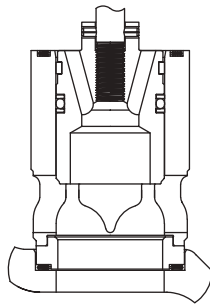
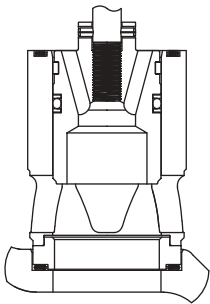
⁽¹⁾ Only plug control

Cage-Control trim

Cage-control trim is designed primarily for process applications. These pressure-balanced, precision-guided trims feature proprietary Norriseal seating surface with Protection Geometry. This design redirects erosive forces of the fluid stream away from critical surfaces of the plug and seat to extend service life.

5ZScSUFVd[ef]Ue,

-
-
-
-
-

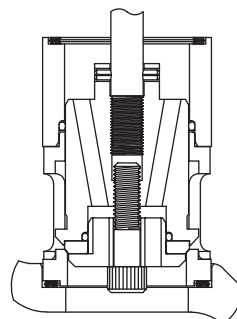
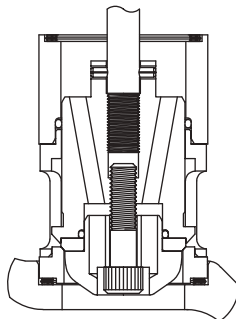


plug-Control trim

Plug-control trim is a rugged, field-proven trim best suited for slurries and other "dirty" fluids. Norriseal offers a wide selection of pressure-balanced, top-guided, contoured plug-control trims.

5ZScSUFVd[ef]Ue,

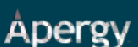
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Valve trim (CONTINUED)

trim MATERIALS OF CONSTRUCTION		
RpgkAmknmlc/r	K rcpg j	
	j lacbA ec AmlrpmjRpgk	
Plug		
Cage		
Plug Seal		
Seat Ring		
Soft Seat Insert		
Bearing Ring		
Trim Gaskets		
Plug/Stem Pin		
Reduced Trim Adapter		
Valve Stem		
-----■-----■-----		
Plug		
Soft Plug Insert		
Guide		
Cage		
Plug Seal		
Seat Ring		
Trim Gaskets		
Plug/Stem Pin		
Valve Stem		
-----■-----■-----■-----		
Plug		
Seat/Cage		
Seat/Cage Seal		
Plug/Stem Pin		
Reduced Trim Adapter(s)		
Valve Stem		

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Valve trim (CONTINUED)

typical trim Characteristics

-
-
-
-
-
-

@AF7E

Norriseal trims provide Class II, IV or V tightness with metal seats and class VI tightness with composition seats.

Flow Coefficients. The following page displays flow coefficients (C_v) for commonly used trim sizes and characteristics. Refer to Norriseal Valve Sizing Program for balanced reduced-port, noise abatement and cavitation control C_v data.

Caution: Pressure Drop Ratings. The rated pressure drop may be less than the body's rated working pressure. The rated shutoff pressure drop is dependent on the actuator's size, spring range, air pressure and seat leakage class. For a chart containing actual pressure drops, please refer to the Norriseal Valve Sizing Manual or our actuator sizing spread sheet available online, or contact your Norriseal representative.

Flow CoEFFiEntS (C_v) For BALAnCED CAgE-Control tr iMS (lin EAR & EquAl pEr CEntAgE)

mbwQgxc RpgkQgxc Glafcqakk Glafcqakk	Af p a rcpgqrga	T jtcMnclgle NcpaclrRmr jRp tcj									
		/.	0.	1.	2.	3.	4.	5.	6.	7.	/.
1.0 (25) 1.0 (25)	Linear	.355	1.01	2.48	5.46	8.43	11.3	14.3	16.9	18.6	19.6
	E.P.	.308	.565	1.21	2.63	4.83	8.16	12.4	15.5	17.8	18.9
1.5 (40) 1.5 (40)	Linear	.906	3.26	7.35	13.1	20.2	27.7	34.5	39.8	43.5	45.5
	E.P.	.400	.813	2.36	4.86	8.49	15.1	22.7	30.3	35.5	39.2
2.0 (50) 2.0 (50)	Linear	1.51	4.87	11.0	20.3	30.9	41.5	50.2	57.0	61.4	64.8
	E.P.	.643	2.20	4.82	9.29	15.6	25.9	39.5	53.0	58.5	62.0
3.0 (80) 3.0 (80)	Linear	3.23	8.30	19.6	37.6	55.8	73.7	88.9	101	110	117
	E.P.	.906	3.31	7.72	15.4	27.7	46.8	70.1	93.7	108	116
4.0 (100) 4.0 (100)	Linear	8.57	21.2	42.7	68.5	94.0	120	145	168	184	195
	E.P.	2.83	9.09	19.5	33.9	52.0	79.8	119	159	185	195
6.0 (150) 6.0 (150)	Linear	19.6	55.8	104	152	200	248	296	339	369	391
	E.P.	6.84	19.6	40.1	69.6	107	163	244	325	360	378
8.0 (200) 8.0 (200)	Linear	55.3	125	224	324	422	521	618	705	752	790
	E.P.	18.1	44.1	86.9	143	221	346	494	642	728	756
10.0 (254) 10.0 (254)	Linear	59.6	122.3	220.5	361	585	835	995	1023	1030	1054
	E.P.	35.7	74.6	137.0	233	398	627	829	948	1000	1014
12.0 (305) 12.0 (305)	Linear	92.7	178.3	303.2	497	810	1159	1341	1365	1362	1389
	E.P.	55.5	108.7	188.3	320	551	871	1118	1264	1323	1336

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Valve trim (CONTINUED)

Flow CoEFFiCiEnt S (C_v) For BAIAncED plug-Cont r ol t r iMS (quiCk opEning, MODiFiED pEr CEnt AgE)

mbwQgxc Glafcqakk	RpgkQgxc Glafcqakk	Af p a rcpgqrga	T jtcMncIgle NcpacrRmr jRp tcj											
			/.	0.	1.	2.	3.	4.	5.	6.	7.	/.		
1.0 (25)	1.0 (25)	Q.O.												
		M.P.												
1.5 (40)	1.5 (40)	Q.O.												
		M.P.												
2.0 (50)	2.0 (50)	Q.O.												
		M.P.												
3.0 (80)	3.0 (80)	Q.O.												
		M.P.												
4.0 (100)	4.0 (100)	Q.O.												
		M.P.												
6.0 (150)	6.0 (150)	Q.O.												
		M.P.												
8.0 (200)	8.0 (200)	Q.O.												
		M.P.												

Flow CoEFFiCiEnt S (C_v) For unBAIAncED plug-Cont r ol t r iMS (MODiFiED pEr CEnt AgE ANd EquAl pEr CEnt AgE)

mbwQgxc Glafcqakk	RpgkQgxc Glafcqakk	Af p a rcpgqrga	T jtcMncIgle NcpacrRmr jRp tcj											
			/.	0.	1.	2.	3.	4.	5.	6.	7.	/.		
	0.19 (5)	E.P.	.002	.007	.016	.027	.040	.057	.101	.191	.320	.561		
		M.P.	.284	.506	.657	.767	.875	.989	1.10	1.20	1.32	1.43		
1.0 (25)	0.25 (6)	E.P.	.043	.061	.095	.146	.229	.338	.477	.717	1.19	1.42		
1.5 (40)		M.P.	.311	.621	.942	1.28	1.64	2.07	2.51	2.93	3.35	3.70		
2.0 (50)	0.38 (10)	E.P.	.092	.140	.220	.341	.495	.717	1.14	2.06	2.91	3.13		
		M.P.	.557	1.11	1.68	2.26	2.92	3.62	4.30	4.98	5.43	5.60		
	0.50 (13)	E.P.	.098	.162	.265	.442	.740	1.52	2.58	3.64	4.68	5.20		
		M.P.	.752	1.57	2.43	3.42	4.58	6.08	7.93	9.71	10.6	11.0		
1.0 (25)	0.75 (19)	E.P.	.185	.334	.481	.835	2.17	3.98	5.79	7.61	8.82	9.25		
		M.P.	.983	2.01	3.40	6.12	8.90	11.7	13.5	14.4	15.1	15.4		
	1.00 (25)	M.P.	.882	1.76	2.76	3.82	5.05	6.57	8.49	10.8	12.2	12.9		
1.5 (40)	0.75 (19)	E.P.	.185	.334	.481	.835	2.17	3.98	6.20	8.46	10.1	10.9		
		M.P.	.964	1.92	3.08	4.67	6.96	10.0	13.0	14.7	15.5	16.3		
	1.00 (25)	M.P.	.882	1.76	2.76	3.82	5.53	7.78	10.2	12.6	15.0	16.2		
2.0 (50)	0.75 (19)	E.P.	.185	.334	.481	.835	2.17	3.98	6.20	8.46	10.1	10.9		
		M.P.	1.01	2.02	3.14	5.07	9.68	11.9	14.9	17.2	19.3	20.9		

Appr oxIMAt E SHIPping w EighT S in poundS For 2700A

T jtc Qgxc	Rfpc bcha.LNR Amllcargml	LQGDJ LECB				
		150 RF	300 RF	600 RF	900 RTJ	1500 RTJ
/.	70 ⁽²⁾	75 ⁽²⁾	90 ⁽²⁾	95 ⁽²⁾	155 ⁽²⁾	162 ⁽²⁾
/3	90 ⁽²⁾	110 ⁽²⁾	125 ⁽²⁾	130 ⁽²⁾	205 ⁽²⁾	210 ⁽²⁾
0.	140 ⁽²⁾	155 ⁽²⁾	175 ⁽²⁾	180 ⁽²⁾	240 ⁽³⁾	250 ⁽³⁾
1.	N/A	190 ⁽²⁾	215 ⁽²⁾	225 ⁽²⁾	425 ⁽³⁾	455 ⁽³⁾
2.	N/A	260 ⁽²⁾	300 ⁽²⁾	320 ⁽²⁾	650 ⁽⁴⁾	680 ⁽⁴⁾
4.	N/A	885 ⁽⁴⁾	940 ⁽⁴⁾	970 ⁽⁴⁾	1370 ⁽⁴⁾	1600 ⁽⁴⁾
6.	N/A	1195 ⁽⁴⁾	1260 ⁽⁴⁾	1310 ⁽⁴⁾	1910 ⁽⁴⁾	N/A
/.	N/A	2015	2125	2293	N/A	N/A
/0.	N/A	2489	2599	2780	N/A	N/A

(2) with #12 Actuator, (3) with #16 Actuator, (4) with #18 Actuator, When #16 actuator is used in place of #12 actuator, add 55 lbs to #12 actuator weight in chart

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Actuators

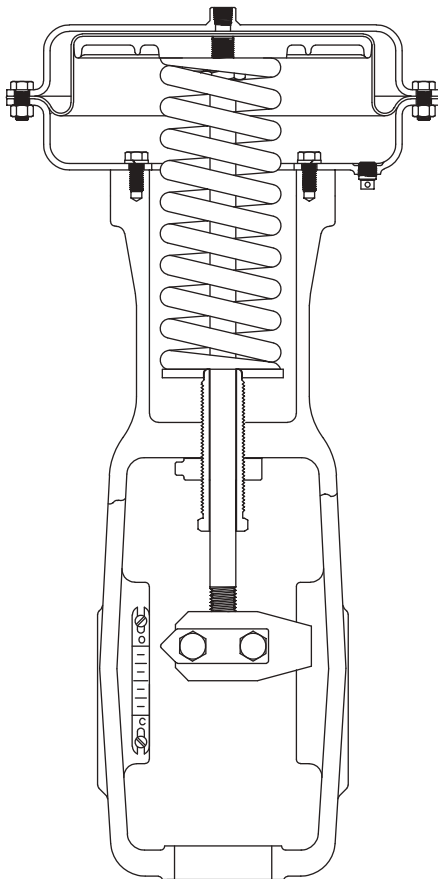
Series 2700A and 2700E yoke-Mounted

Norriseal direct- or reverse-acting, pneumatic diaphragm, spring-return actuators are integral to Series 2700A and 2700E assemblies. Using a pneumatic input signal from a positioner, pressure controller, liquid level controller, temperature

controller, transducer or other control device, these actuators move the valve plug to the required position for both throttling or On/Off service. The yoke provides a means for mounting accessories requiring valve motion take-off.

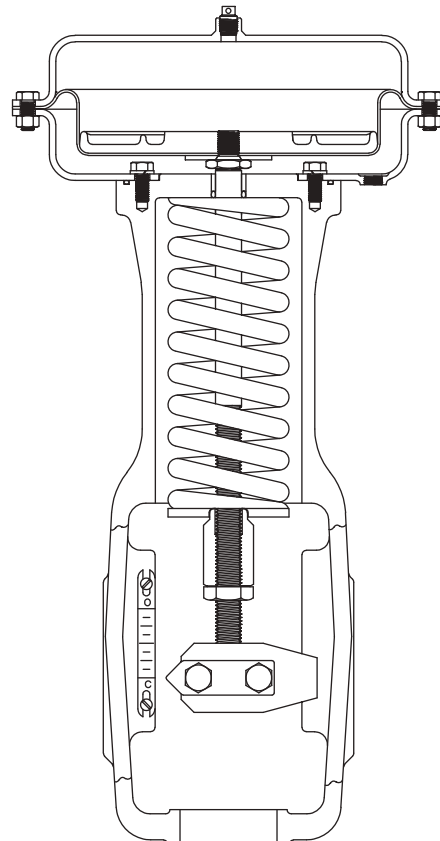
Direct-Acting

This is a fail-open, push-down-to-close style actuator. Applying pneumatic pressure to the upper diaphragm housing forces the valve plug downward to engage the valve seat. Reducing the pressure on the diaphragm enables the opposing spring force to raise the valve plug upward, opening the valve.



Reverse-Acting

This is a fail-closed, push-up-to-open style actuator. Applying pneumatic pressure to the lower diaphragm housing raises the valve plug upward against the opposing spring force, which opens the valve. Reducing pneumatic pressure to the diaphragm causes the spring to move the valve plug downward, closing the valve.



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Actuators (CONTINUED)

BoDY AnD ACT uAt or CoMBinAt ionS

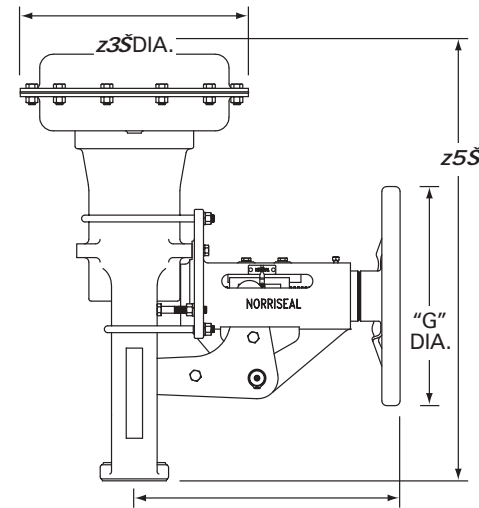
Series	Material	Stroke (in)	Weight (lb)
■	■	0.75	19
■	■	1.00	25
■	■	1.25	32
■	■	1.50	38
■	■	2.00	51
	■	2.75	70
	■	4.00	102
	■	4.00	102
	■	4.00	102

ACT uAt or MAT Er iAlS

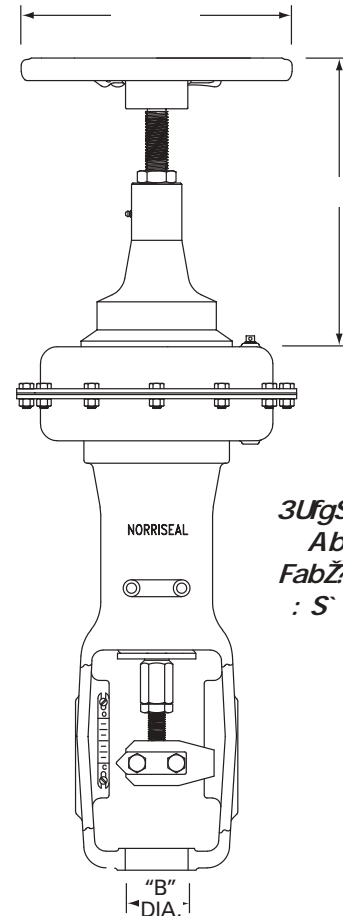
Part Name	Material
Yoke	Ductile iron
Diaphragm	Nitrile with nylon fabric*
Diaphragm housings	Carbon steel
Diaphragm plate	Carbon steel
Stem	303 SST
Stem connector	316 SST
Spring	AISI 5160
Adjusting screw	AISI 1215/Zinc Plated

Dir Ect - AnD r EVEr SE-Act ing yoke-Mount ED ACT uAt or DiMEnSionS

Series & Model	Stroke		A		B	C		D	E							
	in	mm	in	mm	in	in	mm	in	in							
No. 12 MU (1-4)	12.50	(318)	2.81	(71)	25.25	(641)	24.25	(616)	13.12	(333)	12.00	(305)	15.00	(381)	12.00	(305)
No. 16 HU (1-4)	16.75	(425)	2.81	(71)	29.50	(749)	31.75	(806)	13.12	(333)	12.00	(305)	17.00	(432)	18.00	(457)
No. 18 HU (1.5-4)	20.50	(521)	2.81	(71)	30.62	(778)	33.05	(839)	16.50	(419)	18.00	(457)	17.00	(432)	18.00	(457)
No. 18 KU (6)	20.50	(521)	3.19	(81)	30.62	(778)	33.05	(839)	17.38	(441)	18.00	(457)	17.00	(432)	18.00	(457)
No. 18 LU (6 & 8)	20.50	(521)	3.56	(90)	46.22	(1174)	50.81	(1291)	18.62	(473)	18.00	(457)	17.00	(432)	18.00	(457)
No. 22 LU (8, 10 & 12)	25.01	(635)	3.56	(90)	54.64	(1388) ⁺	52.2	(1326)	18.62	(473)	18.00	(457)	17.00	(432)	18.00	(457)



3UfgSfadi [fZ
Abf]a` S^
E[W]Z ag` fW
: S` Vi ZW



3UfgSfadi [fZ
Abf]a` S^
Fab]Z ag` fW
: S` Vi ZW

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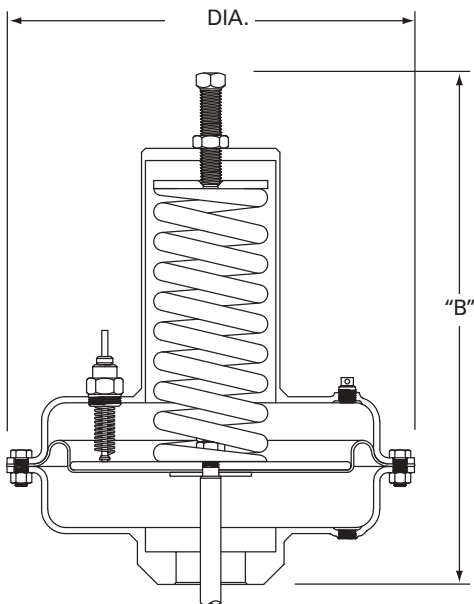


Series 2720 Close-Coupled

A yokeless space-saving arrangement, close-coupled Series 2720 actuators mount directly to the valve bonnet with the adjustable spring positioned above the diaphragm. Operation is identical

to that of the yoke-mounted actuators and available as either direct-acting (fail-open, push-down-to-close) or reverse-acting (fail-closed, push-up-to-open).

Reverse-Acting



ACTUATOR DIMENSIONS CLOSE-COUPLED

ars rmpQgxc & nnjga jct jtcqgxcq	Glafcqa&kk	*Glafcqa&kk	
		Bgpcar	Pctcpqc
No. 12 (1, 1.5, 2, 3 & 4)	12.50 (318)	20.06 (510)	16.50 (419)
No. 16 (1, 1.5, 2, 3 & 4)	16.75 (425)	N/A	24.50 (622)
No. 18 (1.5, 2, 3 & 4)	20.50 (521)	23.75 (603)	26.50 (673)

ACTUATOR MATERIALS

ars rmpAmknmclcr	K rcpq j
Diaphragm	Nitrile with nylon fabric
Diaphragm housings	Carbon steel
Stem	316 SST
Spring	AISI 5160

How to order

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Model Code⁽¹⁾

BoDy pr ESSurE r At ing

LOGAj qq	Ambc
150	02
300	07
600	14
900+	21
1500+	36
2500+	60

*Consult factory for valve sizes 10" and above

BoDy ENd ConnEct ion

Flanged Raised Face	RF
Flanged Ring Type Joint	RJ
Threaded (Female) NPT ⁺	S
Beveled Buttweld ⁺	B*
Socketweld ⁺	W*

*Specify pipe schedule.

*Consult factory for valve sizes 10" and above

BoDy/BonnEt MAtEr iAl

ASTM A216 Gr WCC (Std.)	-
ASTM A216 Gr WCC (NACE)	N
ASTM A351 Gr CF8M (Std.)	S
ASTM A351 Gr CF8M (NACE)	R
ASTM A352 Gr LCC (Std.)	P
ASTM A352 Gr LCC (NACE)	L

ACtuAt or ACtion

Direct (Fail-Open)	B
Reverse (Fail-Closed)	T
Manual (Handwheel)	M

BoDy St y l E

Globe, 2-way	G

gASKEt MAt Er iAl

316L/Graphite	S
Inconel/Graphite (NACE)	N

ACtuAt or SizE

No. 12 (70 in. ²)	12
No. 16 (120 in. ²)	16
No. 18 (180 in. ²)	18
No. 22 (267 in. ²)	22

option S

Handwheel, Side Mount	S-
Handwheel, Top Mount (Up stop-limit opening)	-B
Handwheel, Top Mount (Down stop-limit closing)	-T

ACtu At or t y p E

Pneumatic, 3-15 psi	NX
Pneumatic, 3-27/6-30 psi	WX
Electric, 4-20 mAdc	E2
Electric, on-off	EO ⁺

*Consult factory for valve sizes 10" and above

pACKing

Single TFE	Spring-loaded	-
Single TFE	Adjustable	A
Graphite	Adjustable	G

Fugit iVE EMiSSion pACKing

FES-II	Non-adjustable	K

*Application dependent; consult factory.

RF-14TGS-12NX--

⁽¹⁾Example is for the purpose of displaying Model Code structure and not intended to identify all available materials and configurations.



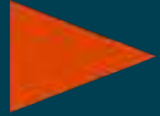
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Norriseal

3 Way

Control

Valves

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Norriseal Series 3023 Three-Way

Two-position High-Pressure Control Valves

Designed for diverting or blending applications.



As a three-way, two-position high-pressure control valve designed to handle the tough problem of system switching when high differential and static pressures are prevalent. While maintaining high flow capabilities, these valves can be expected to give positive shut-off, so that the different systems remain separated.

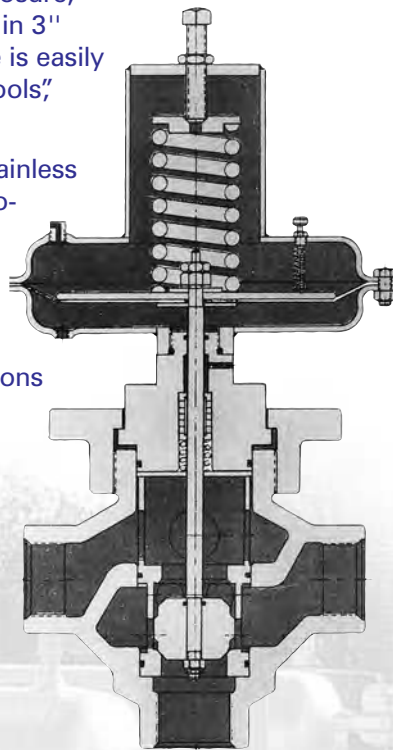
Featuring a cast steel body and hammer nut closure, this series has a CWP of 3600 psig. (3000 psig in 3" size). The construction is such that field service is easily accomplished with the standard "roustabout tools," a hammer and a crescent wrench.

The value of internal construction, featuring stainless steel plug, seats and cages, will resist the corrosion and erosion effects associated with high pressure oil and gas service.

A wide range of seals and trim is available for severe corrosive or abrasive applications. The factory should be consulted for recommendations for such service.

Features

- Reverse acting, direct acting or pressure balanced
- Teflon V ring, spring-loaded, non-adjustable packing
- Optional open yoke



Contents

- 2 Specifications
- 3 Flow Capacity
- 3 Dimensions
- 4 How to Order

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Specifications

materials of Construction

-
-
-
-
-
-
-
-

actuator

-
-
-
-

Trim Size (available in both Hard & Soft Styles)

T jtcQgxc	RpgkQgxc
1	1"
2	1.5" and 2"
3	2" and 3"

Special hard trim for blow case application
 $\frac{3}{8}$ " lower / $\frac{3}{4}$ " upper (1" valve only)

Temperature range

-

Packing

Standard packing material is non-lubricated teflon V-ring packing with brass or stainless steel retainers. The teflon V-ring packing is spring loaded and requires no adjustment.

Table 1: maximum differential Pressure (ΔP)

Trim	Actuator	Spring	1" Valve		1.5" Valve		2" Valve		3" Valve
			Standard	Light	Standard	Light	Standard	Light	
1	#9 - Std	1000	400	500	800	1000	1000	1000	1000
			800	810	1000	1000	1000	1000	
			1000	1000	1000	1000	1000	1000	
1 1/2	#12 - Light	1000	275	310	730	190	670	670	670
			150	150	380	90	310	400	
			590	530	450	590	530	450	
2	#12 - Light	590	120	130	310	40	220	400	400
			45	45	125	15	85	17	200
			265	210	210	265	210	210	

NOTE: Maximum differential pressures are for 30 psi supply pressure and are for the same differential on both ports. Spring type actuators can be adjusted to provide higher ΔP for one port with lesser ΔP on the other. The maximum ΔP is limited to 1000 psig to insure normal valve life. Higher ΔP capability is available on application. For any requirements beyond the above table please consult factory.

•Reduced trim in 1" valve available for blow-case application – 1200 lbs. Delta P w/#9 reverse actuator.

Spring Description

- Standard – 2-3020-19
- Light – 3-3020-20
- Heavy – 1-2200-57

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Flow Capacity

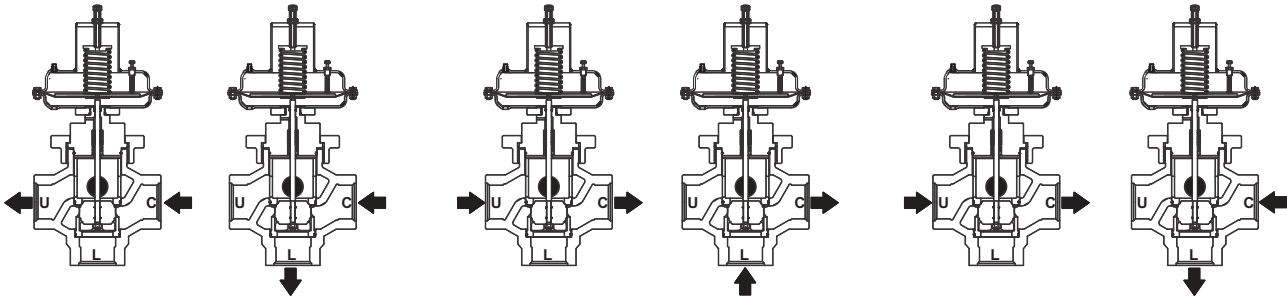
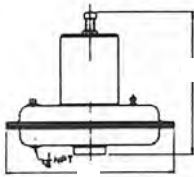


Table 2: Flow Capacity

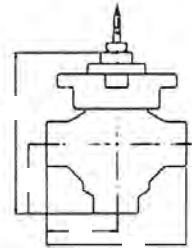
T jtc Qgxc	Mpgdga Qgxc	Djmu rrcplf	AT	U rcpf& ppcjncpb w Bcjr N						E q
				/	0.	3.	/.	
1	1	C - U	9	308	690	976	1,381	2,185	3,009	Use the following formula to determine gas capacity: $Q = 963Cv \sqrt{\frac{\Delta P}{SG(T)}} (P_1 + P_2)$ Q - Gas Flow (SCFH) P ₁ - Upstream Pressure P ₂ - Downstream Pressure or 50% of P ₁ , whichever is higher (psia) ΔP - (P ₁ - P ₂) (psi) T - Operating Temperature SG - Specific Gravity
		C - L	12.5	429	957	1,358	1,918	3,035	4,250	
2	1½	C - U	38	1,302	2,910	4,130	5,840	9,220	13,030	
		C - L	51	1,750	3,910	5,540	7,840	12,390	17,500	
	2	C - U	46	1,579	3,520	4,990	7,060	11,160	15,780	
		C - L	66	2,260	5,060	7,160	10,120	16,020	22,620	
3	2	C - U	48	1,645	3,675	5,210	7,360	11,620	16,450	
		C - L	68	2,330	5,210	7,380	10,420	16,500	23,330	
	3	C - U	105	3,600	8,050	11,400	16,100	25,470	36,000	
		C - L	150	5,150	11,490	16,290	23,000	36,400	51,500	

dimensions



actuator dimensionS (inches)

Actuator Size	A	B		
		Rev.	Dir.	Bal.
9		9½	11¼	5 7/16
12	12½		13¾	5 11/16

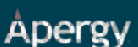


Body End Connections	1"			2"			3"			
	D	E	F	D	E	F	D	E	F	
Screwed	7¾		6¼	12¼		10½	14 7/16	6	12	
Butweld	7 5/8		6	12 1/8	5 1/8	10¼		5 7/8		
Socket Weld	7¾		6¼	12¼		10½	14 7/16	6	12	
Flanged Raised Face	150	8¼	3 5/8	7¼	13½	6½	13	16 3/16	7¾	15½
	300			7¾	13½	6½	13	16 3/16	7¾	15½
	400	8¾		8¼	14¾	7¾	15½		7¾	15½
	600			8¼	14¾	7¾	15½		7¾	15½
	900	9 5/16	4 11/16	9 3/8	14¾	7¾	15½		9 5/8	19¼
		9 5/16	4 11/16	9 3/8	14¾	7¾	15½			
Flanged Ring Type Joint	150	8 7/16	3 13/16	7 5/8	13 11/16	6 11/16	13 3/8	16¼	7 13/16	15 5/8
	300		4 1/16	8 1/8	13¾	6¾	13½	16¼	7 13/16	15 5/8
	400	8¾		8¼	14 13/16	7 13/16	15 5/8	16¼	7 13/16	15 5/8
	600			8¼	14 13/16	7 13/16	15 5/8	16¼	7 13/16	15 5/8
	900	9 5/16	4 11/16	9 3/8	14 13/16	7 13/16	15 5/8	18 1/8	9 11/16	19 3/8
	1500	9 5/16	4 11/16	9 3/8	14 13/16	7 13/16	15 5/8	Not Applicable		

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How to order

1. Select the valve by the body size and series.
Example: 3-3023 for a 3023 series with a 3" connection.
2. Select the proper model number.
3. Specify trim type and size.
4. Specify flow pattern or actuator spring required.

IMPORTANT: Every valve has a serial number. This serial number must be furnished when ordering spare parts.

body Connection	
	Amc
Screwed (Female)	S
	RF
Flanged Ring Type Joint	RJ
Beveled Butt weld	B
	W

aCTuaTor Size (PneumaTiC only)		
	Normal Diameter	Spring Selection
9	9 1/2	
12H	12 1/2	
12L	12 1/2	

NOTE: No. 9 actuator available on 1" valve only

body Pr eSSur e r aTiNg		
IQG	AUN	Amc
150	285	02
300	740	07
600	1480	14
900	2220	
—		
1500		

RF14 - TWA - 12H

PaCKIng		
	Material	Load Type
—	Teflon V Ring	Spring Load
A		Adjustable

Seal S		
	K rcpg j	Rckn P lec
A	Buna N	-20° to 180° F
V		-20° to 180° F

Ser ViCe	
	Amc
Standard	—
	N

body STyle	
	Rwnc
W	3-Way 2-Position

aCTuaTor TyPe	
	Amc
Reverse-Spring Closing Lower Port	T
	B
	P

Please note: not all available options are shown.



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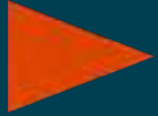
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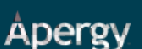


Norriseal Pressure Controls

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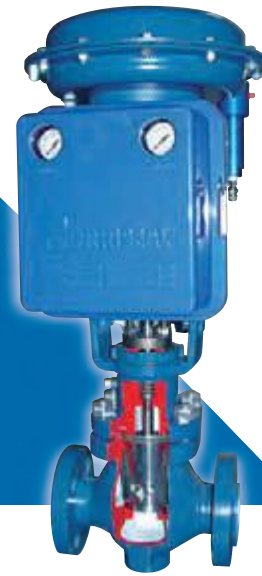
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Norriseal Series 4900 Pressure Controllers and Transmitters

Low-emission Operation:

Open design for easy access



EVdVé&+" b` Vd_ Sf[UbdVégdNUb` fca^Vde combine reliable, low-emission operation with service-enhanced design. Series 4900 controllers provide control in proportional-only, proportional plus integral (reset), differential gap or transmitter modes. Standard pressure ratings up to 10,000psig are available with 316 SST Bourdon tube sensing elements (consult Norrisal for higher pressure ratings). Weather-resistant enclosures assure reliable operation in harsh environments.

Features

- Flush-mounted internals and open design allow easy access and repair
- Removable door
- Easy, field-reversible action
- Significantly reduced leak paths minimize bleeding of valuable gases
- NACE MR0175-2002 compliance with optional diaphragm seals to isolate the sensing element
- Optional instrument air regulator

Contents

- 2** Specifications
- 2** Materials
- 3** Design
- 4** Model Code
- 5** Pressure Ranges
- 5** Mounting Options

Models

- Kmbcj 273.** Proportional-Only Control
- Model 4960** Proportional-Plus-Reset Control

Action (Field Reversible)

- Direct-increasing sensed pressure produces increasing output signal.
- Reverse-increasing sensed pressure produces decreasing output signal.

Output Signal

Npmnmpgml jMljwAmlrpmjmp
Npmnmpgml j Njsq PcqcrAmlrpmjicpq

- 3 to 15 psig ■ 6 to 30 psig

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Specifications

3 to 100%
(3 to 15 psig) or 6 to 100% (6 to 30 psig) of sensing element range

Repeat Adjustment: 0.01 to 100 repeats per minute (0.01 to 74 minutes per repeat)

Remote Set Point Signal: 3 to 15 psig for controller with 3 to 15 psig output signal; 6 to 30 psig for controller with 6 to 30 psig output signal

Ambient Operating Temperature Range:
Standard: 510 to 160°F (-40 to 71°C)
High Temperature: 50 to 220°F (-18 to 104°C)

Typical Ambient Temperature Operating Effect: *Proportional Control Only:* 50 Output pressure changes $\pm 3.0\%$ of sensing element rating for each

50°F (28°C change for a controller set at 100% Proportional Band)
Reset Control Only: Output pressure changes $\pm 2.0\%$ of sensing element rating for each 50°F (28°C) change for a controller set at 100% Proportional Band

Supply and Output Connections:
1/4 inch NPT female

Supply and Output Gauges:
Available with scale indications of psig, kg/cm², kPa

Mounting: Wall, panel, or directly yoke or diaphragm case of valve

Options

- Compliance with NACE MR-0175 with diaphragm seals to isolate sensing element
- Norriseal Instrument Air Regulator

Materials

CONSTRUCTION MATERIALS

	N PR	K RCPG J
GI Amir arugri Npmacqq	Bourdon Tube	316 Stainless Steel or K-Monel - NACE (Optional)
	Control Tubing (Pressure Block to Sensing Element)	316 Stainless Steel
	Pressure Block	316 Stainless Steel
In Contact with Operating Medium	Other Internal Tubing	Polyurethane Tubing or 316 Stainless Steel (Optional)
	Relay Seat	316 Stainless Steel
	Nozzle and Action Reversing Block	316 Stainless Steel
	Relay Springs	302 Stainless Steel
	Relay Springs Plate and Cap	302/304 Stainless Steel
	Relay Diaphragm	Nitrile/Nylon (Standard), Polyacrylate/Nylon (High Temp)
	Bellow, Proportional and Reset	316 Stainless Steel
	Proportional Valve Assembly	302/303 Stainless Steel & Brass
	Reset Valve Assembly	302/303 Stainless Steel & Brass
	O-Rings	Nitrile (Standard) or Viton(2) (High Temp)
Gaskets	Neoprene (Standard), Silicone (High Temp)	
Other	Case & Cover	Aluminum, Except Acrylic Gauge Windows
	Flapper	302 Stainless Steel
	Other Internal Exposed Steel Items	Zinc Plated Steel

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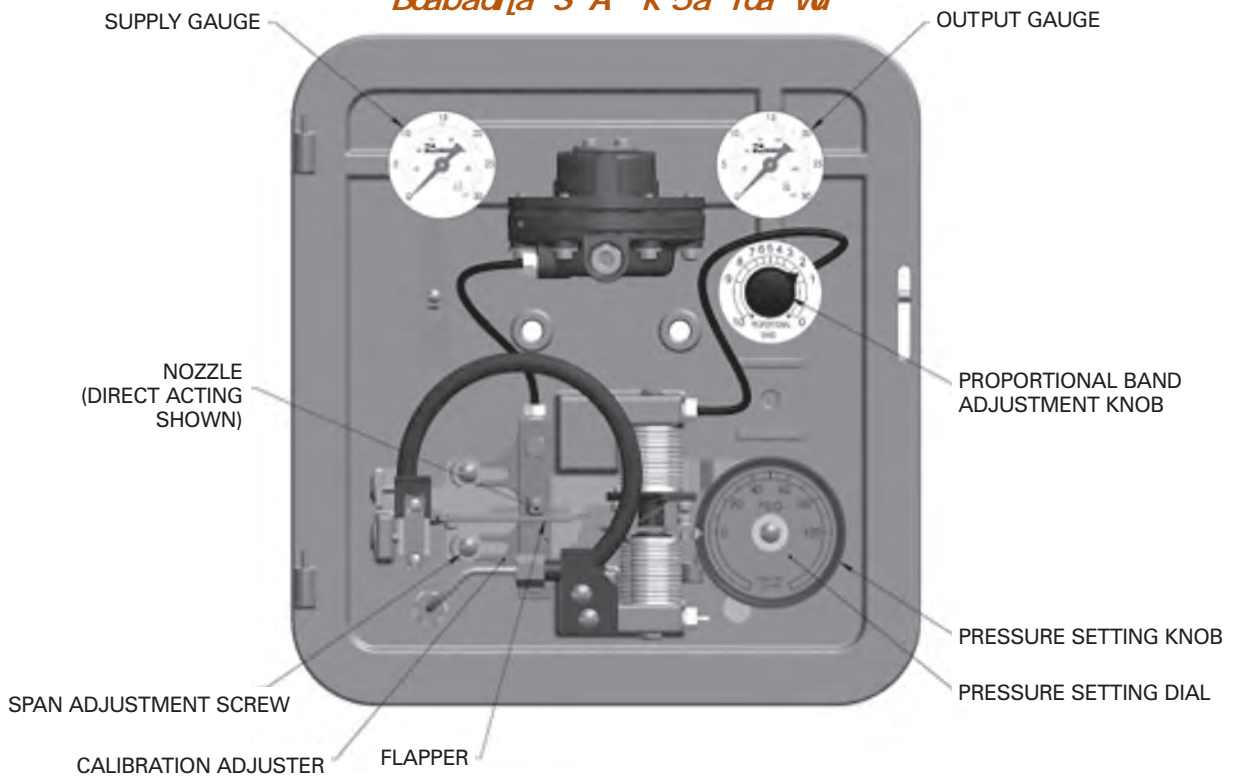
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Design

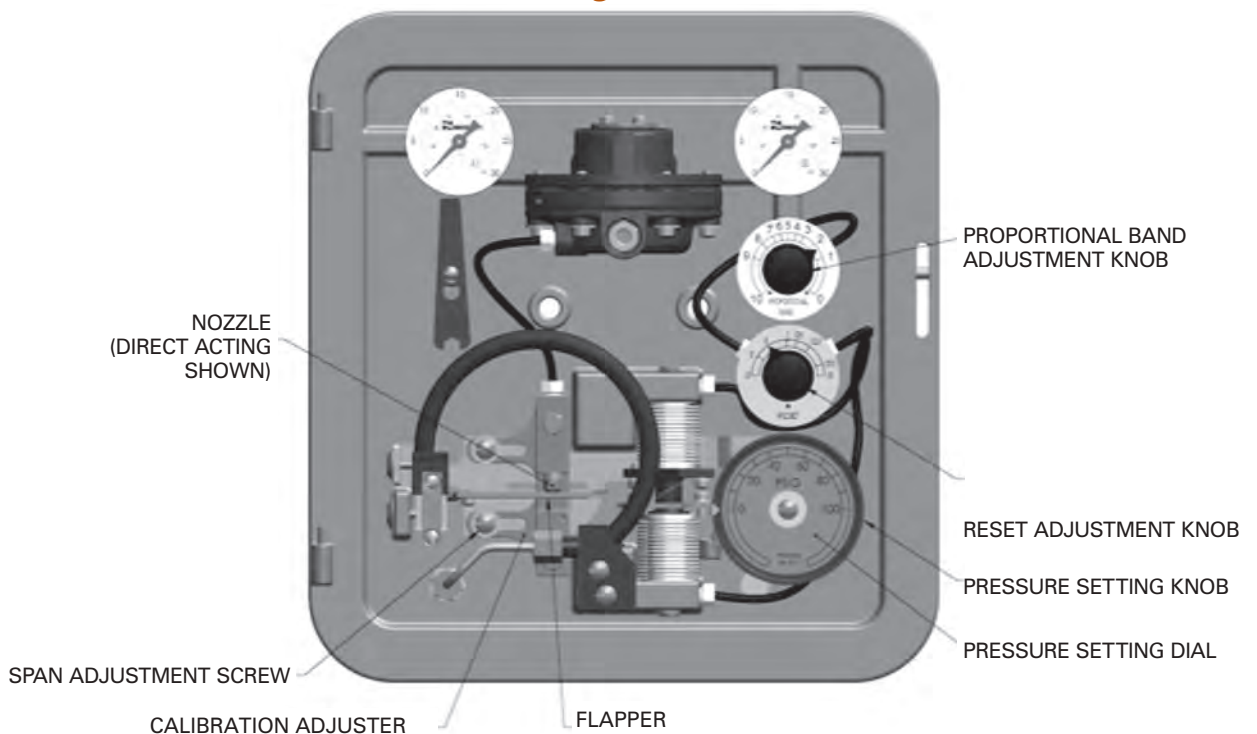
Model 4950

Bɔbbadʃa`S^A`k 5a`fɔ^Vd



Model 4960

Bɔbbadʃa`S^Bʃe DVeV 5a`fɔ^Vd



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Model Code

ACTiOn	
Rwnc	Ambc
Direct	D
Reverse	R

CONTRoL MoDe	
4	
Proportional Band Only	50
Proportional-Plus-Reset	60

SPeCiAl OPTiOnS	
Ambc	Rwnc
	None
OS	Over Travel Stop
AW	Anti-Reset Windup
DS	Diaphragm Seal
ST	Stainless Steel Tubing
DH	Diaphragm Seal (Hastelloy)

eLeMEnT RAnge (BOuRDOn TuBe)	
Nqge	Ambc
0 – 30	003
0 – 60	006
0 – 100	010
0 – 200	020
0 – 300	030
0 – 600*	060
0 – 1000*	100
0 – 1500*	150
0 – 3000	300
0 – 5000	500
0 – 8000	800
0 – 10,000	10K

4950 D 100 – A – OS

PReSSuRe gAge MAtEriAl	
–	Bronze
D	Bronze Liquid Filled
G	SST Liquid Filled
S	SST

SeRviCe CONDiTiOn	
Rwnc	Ambc
Standard	–
NACE (316SS B-TUNE)	N
NACE (K MONEL B-TUBE) 0-600, 0-1000, 0-1500 Tube Ranges	K

OuTPuT	
Ambc	R nc
A	3-15 PSIG
B	6-30 PSIG

CAUTION: For operations and maintenance instructions, consult Norriseal.

SuPPLy PReSSuRe RequiReMEnTS				
MSRNSRQGE L J	QSNWVWNPQQSPC ^{a/}	K VGKSK JJMU ^{a0}	QRc BW QR RCAMLQSKNRGML ^{a1} Kgl, K v,	
3 to 15 psig 0 to 20 psig	20 psig	50 psig	4.2 SCFH	27.0 SCFH
6 to 30 psig 0 to 35 psig	35 psig	50 psig	7.0 SCFH	42.0 SCFH

1. Normal operating pressure. If this pressure is exceeded, control and stability may be impaired
2. If this pressure is exceeded, internal part damage may occur
3. SCFH of Air at 60° F and 14.7 psig

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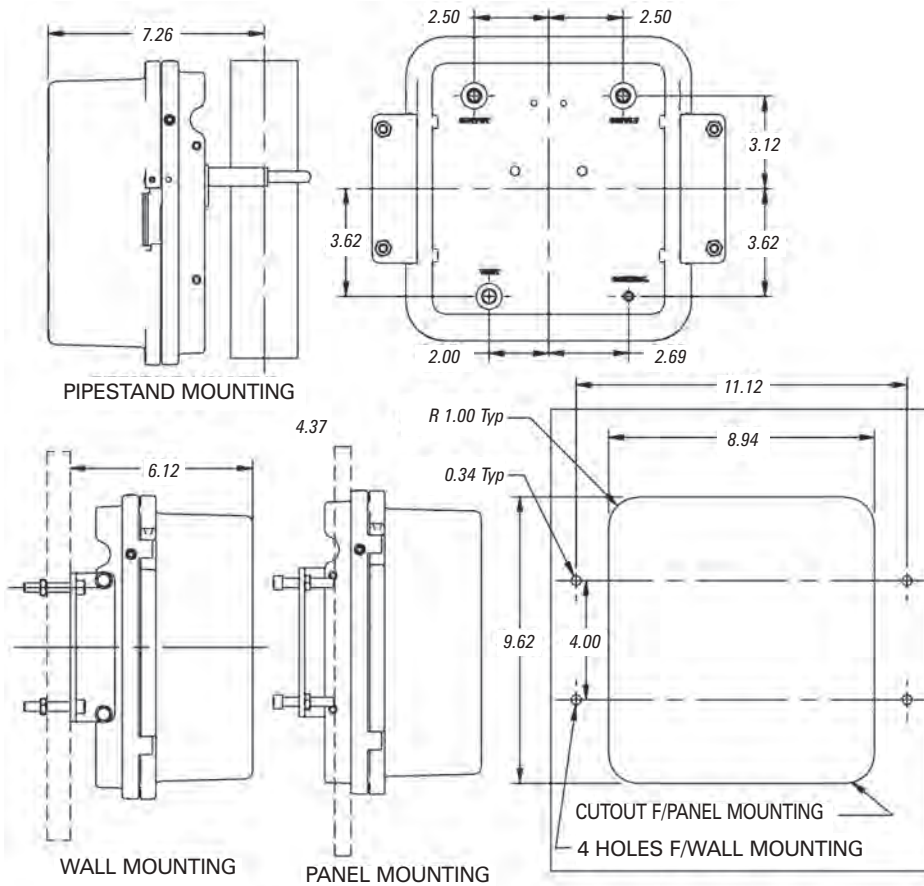
Pressure Ranges

STANDARD STAINLESS STEEL BOURDON TUBE RANGES

K v g k s k j j m u j c Q r r g a N p c q q s p c		s ⁰ J g k g r q s ¹	
NPCQQSPC P LECQ Nqge	QR LB PB Nqge	UGRFMNRGML JRP TCJQRMN Nqge	s ²
0 to 30	30	48	
0 to 60	60	96	
0 to 100	100	160	
0 to 200	200	280	
0 to 300	300	420	
0 to 600	600	720	
0 to 1000	1000	1200	
0 to 1500	1500	1650	
0 to 3000	3000	3300	
0 to 5000	5000	5500	
0 to 8000	8000	8800	
0 to 10,000	10,000	11,000	

1. Range marked on Bourdon tube may be in kPa (1 bar=100 kPa)
2. As defined in ISA Standard S51.-1979
3. Bourdon tube may be pressured to limit shown without permanent zero shift
4. Travel stop set at 110% of range
5. Consult Norriseal for ranges not listed above

Mounting Options



Note: All Connections are 1/4 NPT Female

BS W I S^m B[pVEfs V ? ag` ff` Y

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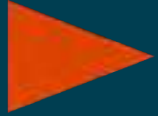
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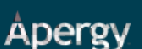


Norriseal Piston Check Valves

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Norriseal Series 7100 Flow-Lift® Piston Check Valve

Award-Winning Design:

Feature-packed valve provides solutions for gas, air or liquid systems



The Norriseal Series 7100 Flow-Lift Piston Check Valve is designed for the prevention of backflow in gas, air or liquid systems. Norriseal's expertise in the design of piston balanced control valves has introduced new concepts to the piston check valve industry.

The piston check valve, with its award-winning design, has been installed in critical services around the world.

Working Pressures

- ANSI Class 150 thru 2,500
- API 5,000 and 10,000

Applications

- Air and gas compressor service
- Gas or liquid pipe lines
- Oil and gas production leases
- Pulsating flows
- Safety systems

* Received the Special Meritorious Award for engineering innovation at the 1981 Offshore Technology Conference in Houston, Texas.

Features

- No-slam closing
- No special tool required to change seat
- Low pressure drop
- High Cv values
- Smooth opening
- Special trims for abrasive and corrosive services
- Built-in lifting device for piston removal and inspection
- PTFE self-lubricating piston seal
- Low maintenance costs

Contents

- 2 Assemblies
- 2 Operation & Installation
- 4 Special Features
- 5 Materials
- 6 Flow Characteristics
- 7 Specifications
- 8 How to Order

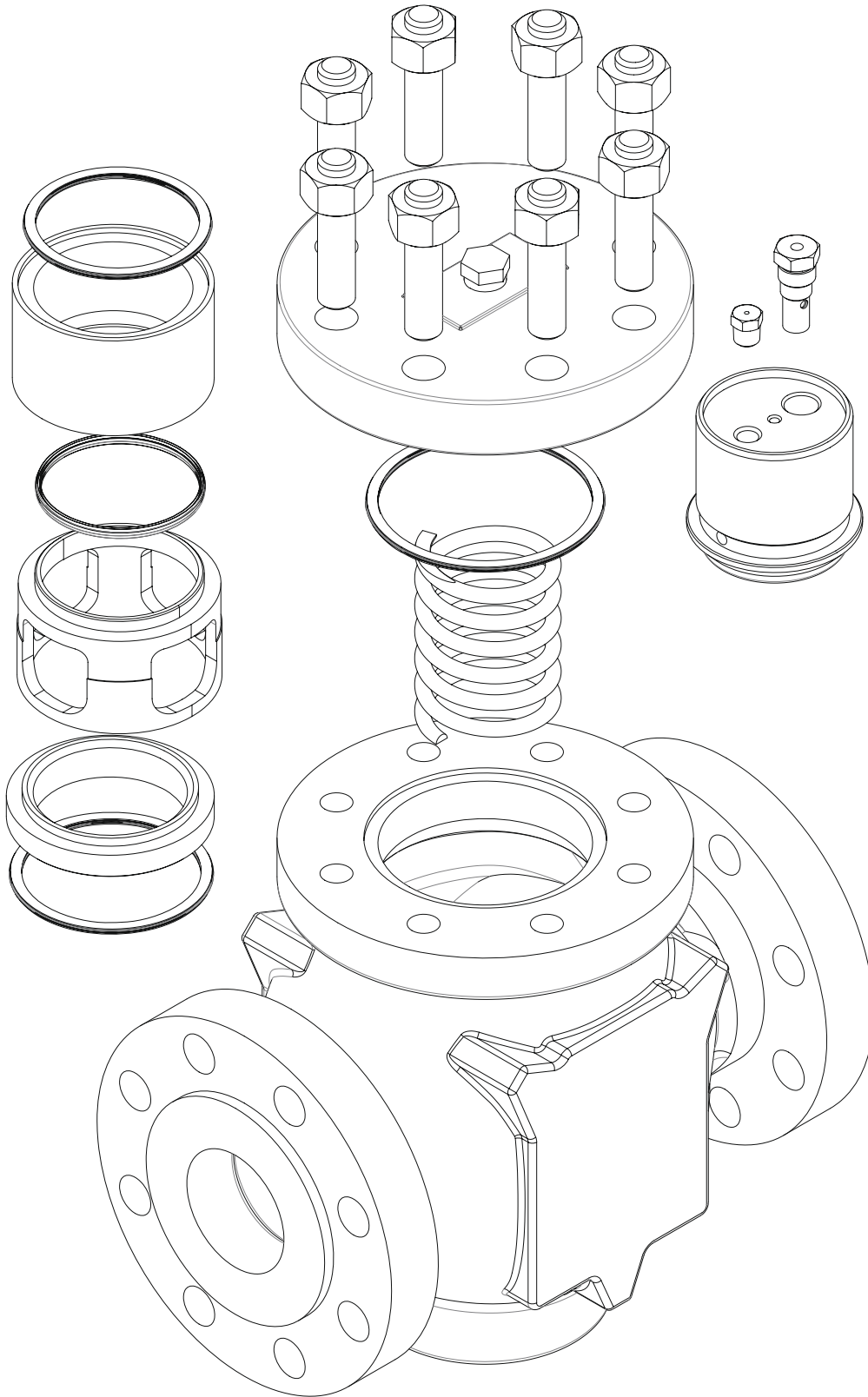


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Assemblies



T jtc qqck iw

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Operation & Installation

Operation

Normal. Flow is directed under the valve piston and lifts it upward. When flow is stopped, the piston descends, closing the valve to prevent flow reversal.

Stabilized/non-slam piston. Pulsating flow through the valve, if unrestricted, would cause the piston to follow the rapidly cycling line pressure, resulting in vibration, chattering and possibly slamming of the piston. The ball check and orifice plug built into the piston are to prevent this from happening. (Fig. 1)

As the piston rises, the pressure in the PTFE sealed cavity above the piston increases, forcing open the ball check. This reduces the cavity pressure and allows the piston to rise smoothly. As the pressure and flow decrease, the piston moves downward. The ball check closes, and descent of the piston is restricted by fluid flowing through the orifice plug. This equalizes the pressure in the cavity above and below the piston and gives stability to the valve.

Installation

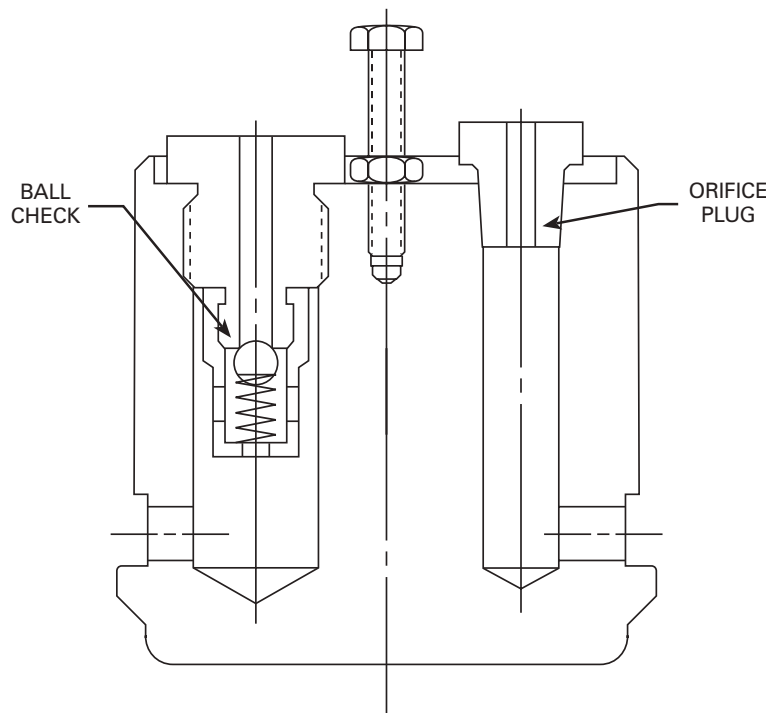
Valves 4.00" and smaller may be installed in a vertical position.

Warning: 6.00" and larger valves should NOT be installed in a vertical plane. If a vertical plane is required, please consult factory for special accessories.

Application

Compressible fluids. Valves come with ball-check and orifice plug in piston.

Non-compressible fluids. Valves furnished same as for compressible fluids; however, some applications where heavy, viscous liquids are present, the ball check should be removed so piston can stabilize quicker.



Dgespc/

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Special Features

PTFE Piston Seal Ring

Norriseal's use of a PTFE spring energized seal ring adds a new dimension to the piston check valve. By use of a full circle ring, leakage between piston and guide/cage is zero. Using a low friction, self-lubricating material allows the piston to move freely and quietly without seizing to the seal.

Guide/Cage

This feature by Norriseal provides positive piston and seat alignment which helps prevent piston vibration and assures stability for proper flow control.

Valve Spring

Furnished on all valves. This gives an added safety feature for shut-off in all pressure ranges.

Seat – Cage Retained Type

Held in position by guide/cage requiring no special tools for removal and can be easily removed by hand.

Optional Trim

For applications where a positive seal with a zero leakage is required, composition seating material is available. This style piston has the feature of a metal back-up in case of wash-out of the composition trim. (Fig. 3)

Abrasive resistant metal trim sets are available for special applications. Please consult factory. (Fig. 3)

NACE

Optional trim available that meets MR0175 recommended practice. (See Materials of Construction)

Easy Maintenance

Norriseal's valve piston comes with a built-in lifting device. No special fittings or tools are required to remove the piston from the valve body.

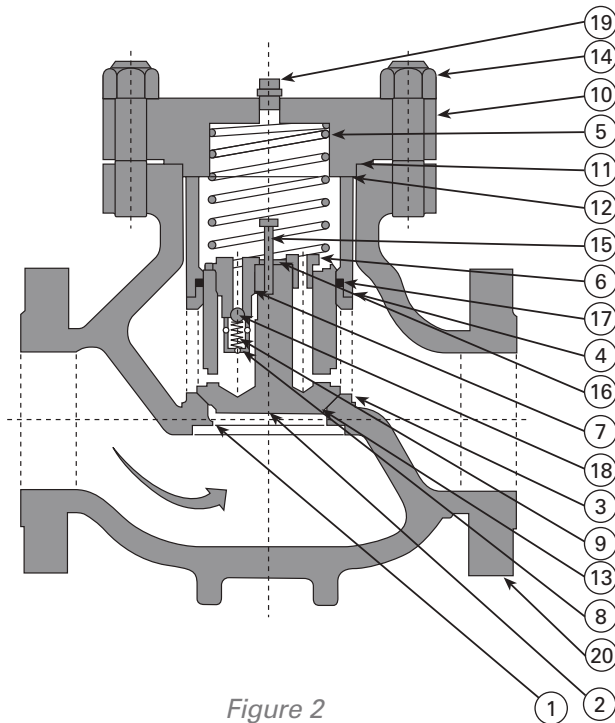


Figure 2

Note: Figure 3 shows piston with replaceable inserted material

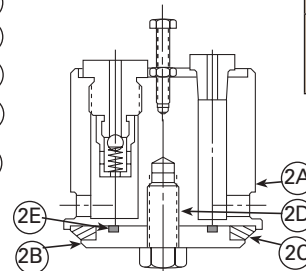


Figure 3

Item No	Description
1	SEAT Valve
2	PISTON Valve Solid
2A	BUTT Piston Valve
2B	RETAINER Piston Valve
	INSERT Piston Valve
	SCREW Retainer Piston
	O-Ring Insert
3	CAGE Piston Valve
4	GUIDE Piston Valve
5	SPRING Valve
6	PLUG Orifice
7	SEAT Ball Check
8	CAGE Ball Check
9	SPRING Ball Check
10	BONNET
11	GASKET Bonnet
12	GASKET Guide
13	GASKET Seat
14	STUD Bonnet w/Nut
15	SCREW Lifting
16	NUT Hex Ring
17	SEAL Piston Guide
18	BALL Check
19	PLUG Pipe
20	BODY

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Materials

MATERIALS OF CONSTRUCTION

Grckq	T jtcQgxc &glafcq	K rcpg j		
		Qr lb pb	L ACKP/53	Mnrgml j
mbw	1.00 - 12.00	ASTM A216, GR. WCC	ASTM A216, GR. WCC	
Bonnet	1.00 - 12.00	ASTM A516, GR 70 or ASTM A216, GR. WCC	ASTM A516, GR 70 or ASTM A216, GR. WCC	ASTM A351, GR CF8A ASTM A352, GR. LCC
Valve Piston	1.00 - 4.00	17-4PH SST/H900	316 SST	316 SST
	6.00 - 12.00	17-4PH SST/H1150-M		
Valve Seat	1.00 - 12.00	17-4PH SST/H1150-M	316 SST	316 SST
Piston Insert (Optional)	1.00 - 12.00	Glass-Filled PTFE	Glass-Filled PTFE	Alloy 6
Valve Cage	1.00, 2.00, 3.00, 4.00	17-4PH SST/H1150-M	17-4PH SST/H1150-M	316 SST
	1.50	316 SST	316 SST	17-4PH SST/H1150-M
	6.00, 8.00	316 SST	316 SST	17-4PH SST/H1150-M
	10.00, 12.00	17-4PH SST/H1150-M	17-4PH SST/H1150-M	316 SST
Piston Guide	1.00	17-4PH SST/H1150-M	17-4PH SST/H1150-M	316 SST
	1.50 - 8.00	316 SST	316 SST	Consult Factory
	10.00, 12.00	N/A	N/A	N/A
Piston Seal	1.00	None	None	None
	1.50 - 8.00	TFE/ELG Ring	TFE/ELG Ring	Fluor-K/ELG Ring
	10.00, 12.00	C.G Filled Ring w/Buna-N O-ring	C.G Filled Ring w/Viton O-ring	Consult Factory
Ball Check Assembly	Seat	1.00	None	None
		1.50 - 12.00	316 SST	316 SST
			316 SST	316 SST
			302 SST	302 SST
	Spring	Inconel 600	Inconel 600	
Valve Spring	1.00, 5.00	Inconel 600	Inconel 600	Consult Factory
	2.00 - 12.00	316 SST	Inconel 600	
Bonnet Studs	1.00 - 12.00	ASTM A193, GR. B7	ASTM A193, GR. B7	Consult Factory
Hex Nuts	1.00 - 12.00	ASTM A194, GR. 2H	ASTM A194, GR. 2H	Consult Factory
Spiral Wound Gaskets	1.00 - 12.00	316L SST w/Graphite Filler	Inconel 600 w/Graphite Filler	Consult Factory
Solid Metal Gaskets (ANSI 2500 and up)	1.00 - 12.00	316 SST	316 SST	Consult Factory
Composition Gaskets (Non-ASB)	10.00 (ANSI 150-600)	Synthetic Fiber w/Nitrile Binder	Synthetic Fiber w/Nitrile Binder	Graphite/Fiberglass
Orifice Plug	1.00	None	None	None
	1.50 - 12.00	316 SST	316 SST	Consult Factory
Piston Lifting Attachment	1.00	None	None	None
	1.50 - 4.00	304 SST	304 SST	316 SST
	6.00, 8.00	302/304 SST	302/304 SST	
	10.00, 12.00	304/316 SST	304/316 SST	
Nameplate	1.00 - 12.00	316 SST	316 SST	Consult Factory
Bonnet Vent Plug	1.00 - 12.00	CSTL/ASTM A105	CSTL/ASTM A105	316 SST
Lifting Attachments (Eye Bolts)	1.00 - 2.00	None	None	None
	1.00 - 12.00	Forged Alloy Steel	Forged Alloy Steel	Consult Factory

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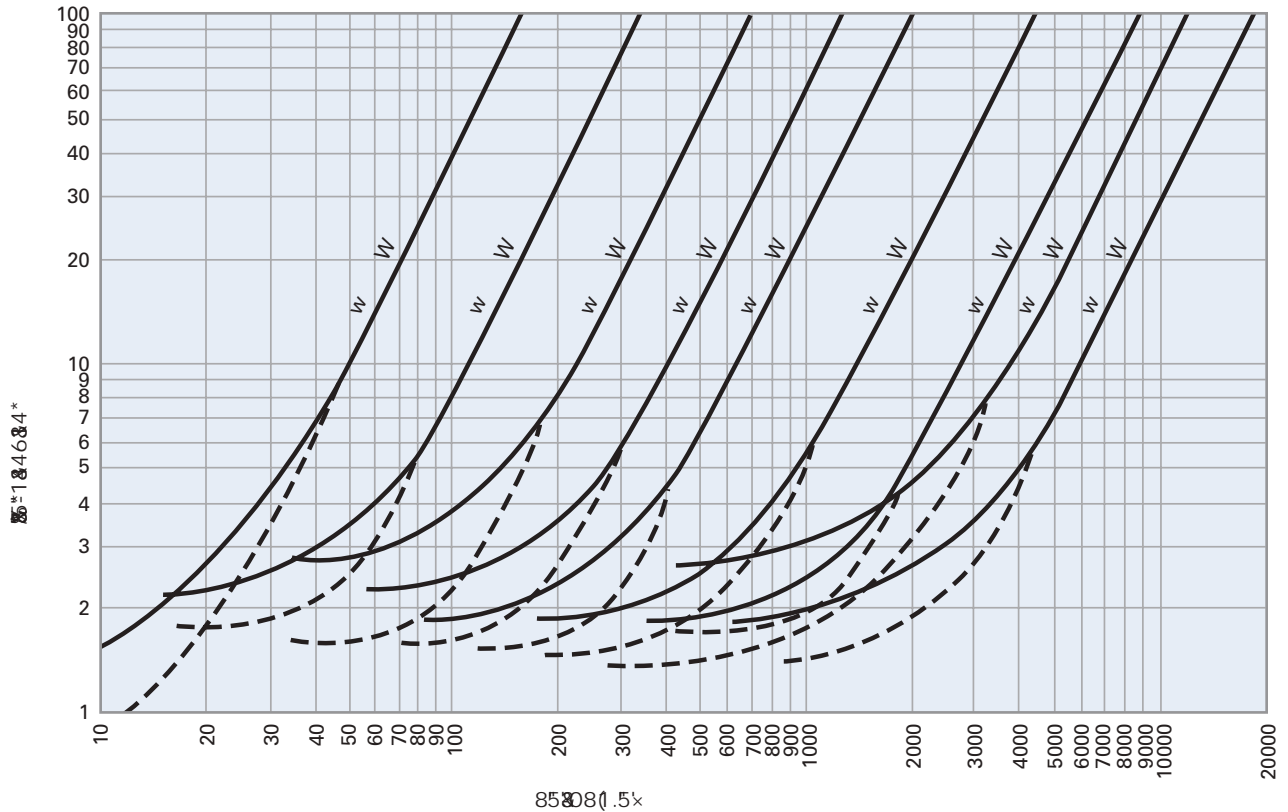
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Flow Characteristics

Pressure Drop vs Flow for Norriseal Series 7100 Piston Check Valves



Note: Dotted portion of curves indicates flow with valve spring removed.

Flow (Water – S.G. = 1.0)

vs.

Pressure Drop (psi)

For liquids other than water multiply by $1/\sqrt{S.G.}$

For barrels per day multiply gpm by 34.3

Flow Coefficients (C _v)	
P	FO F
F F	F
1.00	16
1.50	34
2.00	70
3.00	128
4.00	198
6.00	440
8.00	880
10.00	1200
12.00	1900

The following formulas may be used to determine the actual flow coefficient (C_v) required by a given condition of flow.

1. Liquid

$$C_v = Q \sqrt{\frac{G}{\Delta P}}$$

$$Q = C_v \sqrt{\frac{G}{\Delta P}}$$

2. Gas

$$C_v = \frac{Q}{963} \sqrt{\frac{GT}{(\Delta P) (P_1 + P_2)}}$$

$$Q = 963 C_v \sqrt{\frac{(\Delta P) (P_1 + P_2)}{GT}}$$

Glossary of Terms

Q = Flow Liquids – GPM
Gas – SCFH

C_v = Flow Coefficient

P₁ = Inlet Pressure (PSIA)

P₂ = Outlet Pressure (PSIA)

ΔP = P₁ – P₂, Pressure Drop
[Critical flow (gas) use ½ P₁ for P₂ if P₂ is less than ½ P₁]

T = Absolute Temperature
(°F + 460)

G = Specific Gravity

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Specifications

DIMENSIONS (inches)

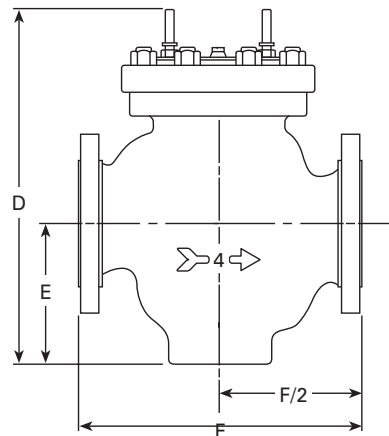
mbw Qgxc	CibAmllcargmlRwnc									
	LNR ¹	srr Ucjb ¹	Qmaicr ucjb ¹	LQGDj lecb						
				Dj lecbwnc	/3.	1.	4.	7.	/3.	03.
/...	8.25	8.25	8.25	RF	7.25	7.75	8.25	9.38	9.38	N/A
				RTJ	7.75	8.25	8.25	9.38	9.38	N/A
1.50	13.00	13.00	13.00	RF	8.75	9.25	9.88	12.25	12.25	N/A
				RTJ	9.25	9.75	9.88	12.25	12.25	N/A
2.00	11.25	11.25	11.25	RF	10.00	10.00	11.25	14.75	14.75	16.88
				RTJ	10.50	11.12	11.38	14.88	14.88	17.00
3.00		CF	CF	RF	11.75	12.50	13.25	15.50	18.12	22.75
				RTJ	12.25	13.12	13.38	15.62	18.25	23.00
4.00		CF	CF	RF	13.38	14.50	15.50	17.00	20.88	26.50
				RTJ	14.38	15.12	15.62	17.12	21.00	26.88
6.00		CF		RF	17.75	18.62	20.00	24.00	27.75	36.00
				RTJ	18.25	19.25	20.12	24.12	28.00	36.50
8.00		CF		RF	21.38	22.38	24.00	29.00	32.75	40.25
				RTJ	21.88	23.00	24.12	29.12	33.12	40.88
10.00		CF		RF	24.50	24.50	31.00	33.00	39.12	C/F
				RTJ	25.00	25.12	31.12	33.12	39.38	C/F
12.00		CF		RF	29.00	30.50	32.25	40.00	44.50	C/F
				RTJ	29.38	31.00	32.38	40.12	45.12	C/F

* For face-to-face dimensions other than those listed above, ie. API 6D, please consult factory
 + ANSI 1500 C.L. Pressure Rating

BODY HEIGHT DIMENSIONS

T jtcQgxc	LQGAJ qq	B	C
/...	150-1500	7.75	3.06
1.50	150-600	9.75	3.50
	900-1500	10.50	4.00
2.00	150-1500	12.12	4.38
	2500	15.12	5.25
3.00	150-900	13.50	5.50
	1500	16.88	6.25
	2500	23.12	7.62
4.00	150-900	18.38	7.00
	1500	19.38	7.50
	2500	23.12	7.62
6.00	150-600	20.75	7.50
	900-1500	25.00	8.62
	2500	30.00	10.50
8.00	150-600	26.50	9.00
	900	27.88	10.38
	1500 & 2500	39.00	12.75
10.00	150-600	34.00	11.63
	900	36.25	11.94
	1500	39.75	13.00
12.00	150-300	37.12	12.00
	600	38.50	12.75
	900	40.12	13.50
	1500	43.59	14.75

* For 10.00" and 12.00" ANSI 2500 Class C/F



STANDARD BODY END CONNECTIONS**

mbwQgxc	LNR	srrUcjb	QmaicrUcjb	Dj lecb & LQGP rgleq
1.00	*	*	*	150-1500
1.50	*	*	*	150-1500
2.00	*	*	*	150-2500
3.00		*	*	150-2500
4.00		*	*	150-2500
6.00		*		150-2500
8.00		*		150-2500
10.00		*		150-2500
12.00		*		150-2500

**For valve body end connections other than those listed and higher

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How to Order

1. Determine required body size.
2. Use model number code below as illustrated to select proper valve type to suit operating conditions.

BODY RATING	
LQG	Ambc
150	02
300	07
400	09
600	14
900	21
1500	36
2500	60
5000	50 ¹
10,000	100 ¹

¹Limited Availability

BODY CONNECTIONS	
Type	Code
Screwed (Female) NPT	S
ANSI Flanged Raised Face	RF
ANSI Flanged Ring Type Joint	RJ
Beveled Butt weld	B ²
Socket weld	W ²
API Flanged Ring Type Joint	AJ

²Specify schedule

SERVICE CODE	
Body, Bonney	Code
WCC Standard (General Serv.)	-
WCC NACE Spec. (MR0175)	N
316 SST	S

VALVE SPRING MATERIAL	
Type	Code
316 SST (Horizontal)	R
Inconel (Horizontal)	L ³
316 SST (Vertical)	V
Inconel (Vertical)	W ³

³NACE MR0175 Suitable

BODY CONFIGURATION	
Configuration	P F
Norriseal F-F (ISA)	-
Non-Std. F-F (Not ISA or API)	C ⁴

⁴Consult factory for non-standard F-F applications

Please note: not all available options are shown.

BODY STYLE	
Ambc	DjmuN rrcpl
D	Globe w/Bottom Drain (Standard 10" and larger)
G	Globe w/o Bottom Drain (Standard 8" and smaller)

GASKETS (SPIRAL WOUND)	
Code	Fluid
S	316 SST/Grafoil
N	Inconel 600/Grafoil

FLUID TYPE	
Code	Fluid
A	Gas or Air
B	Liquid

PISTON SEAL MATERIAL	
Code	Material
E	PTFE/Elgiloy
F	Buna w/TFE Rider (>8.00")
G	Viton w/TFE Rider (>8.00")
K	Fluoroloy K (>8.00")
J	Carbon-Graphite
O	No Seal (1.00")

TRIM MATERIAL				
Code	Piston	Seat	Cage	Guide
A	17-4PH	17-4PH	17-4PH	316 SST
B ⁵	316 SST	17-4PH	17-4PH	316 SST
C ⁵	316 SST	316 SST	316 SST	316 SST
E ⁵	316/STEL	316/STEL	316 SST	316 SST
J ⁵	316/TFE	17-4PH	17-4PH	17-4PH
L ⁵	316/TFE	316 SST	316 SST	316 SST
T	17-4/TFE	17-4PH	17-4PH	316 SST
Z	17-4/UHMW	17-4PH	17-4PH	316 SST

⁵NACE MR0175 Suitable

For specific trim combinations per size, refer to Materials of Construction chart on page 5.

S - 36RGS - AEA

5S SVS Ua fSUF,

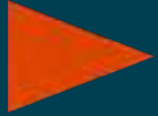


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 www.albertaoiltool.com

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Norriseal Accessories

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VERTO VALVE CONTROL SOLUTION

The **Verto Valve Control Solution** is designed to fit a rotary electric actuator to a linear stem valve, allowing for a simple and efficient method of converting rotary to linear motion. The solution is composed of a rotary electric actuator, a rotary to linear adapter, and our best in class linear stem control valve. Increase your operational efficiency, maintain or improve your automated control, lower emissions, and lower your costs with our field-proven Verto Valve Control Solution.

► FEATURES

Package Features

- Trouble free, emissions friendly actuator
- Simple and high-efficiency rotary to linear motion conversion
- Accurate automated valve control
- Rugged and field proven

Actuator Features

- Class 1, Groups C & D Certified
- 2000 in/lbs torque
- 24VDC Power
- 4-20mA Position Control
- Configurable failure modes (fail open, fail close, fail last)

Rotary to Linear Converter Tool

- Easy installation
- Force loaded seat to accommodate seat wear
- Environmental Resistant Enclosure
- Rugged and durable
- Maintain original travel indication
- Accurate travel for throttling
- Environmentally friendly
- No modifications needed to install



► SPECIFICATIONS

- Voltage : 24VDC
- IO : 4-20mA
- Hazardous Area Rating : Class 1 Groups C & D
- Env. Rating : Nema 4, 4X
- Speed = Full Stroke/Quarter Turn, 15 Seconds
- Duty Cycle = 75%, Automatic Reduction If Overheating Present

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Norriseal Series 8760P & 8760E Valve Positioner

A Universal Approach to Valve Control



FZW@ad[eV8^EVM*) (" HS^hW5a` fcb^Vte
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The Series 8760P is designed to provide a universal approach to valve control. The design provides cam characterization, split ranging, direct or reverse action and single or double output without the need to add additional parts. Key features of the design are the non-interaction of the zero and span adjustments, and the positive cam locking mechanism. This turns calibration of the Models 8760P and 8760E into two easy steps.

All models of the Series 8760 valve controllers have provisions for mounting of internal limit switches as well as position feedback devices without the need for additional housings. Stacking of housings that impede access to adjustments in the main enclosure are eliminated.

Features

- 8760 P (Pneumatic) = Base Pneumatic Unit
- 8760 E (Electronic) = 8760P + I/P Transducer, Field Convertible
- Non Interacting Zero and Span
- NAMUR IEC 534-6 Rectilinear
- VDI/VDE 3845 Rotary
-

Contents

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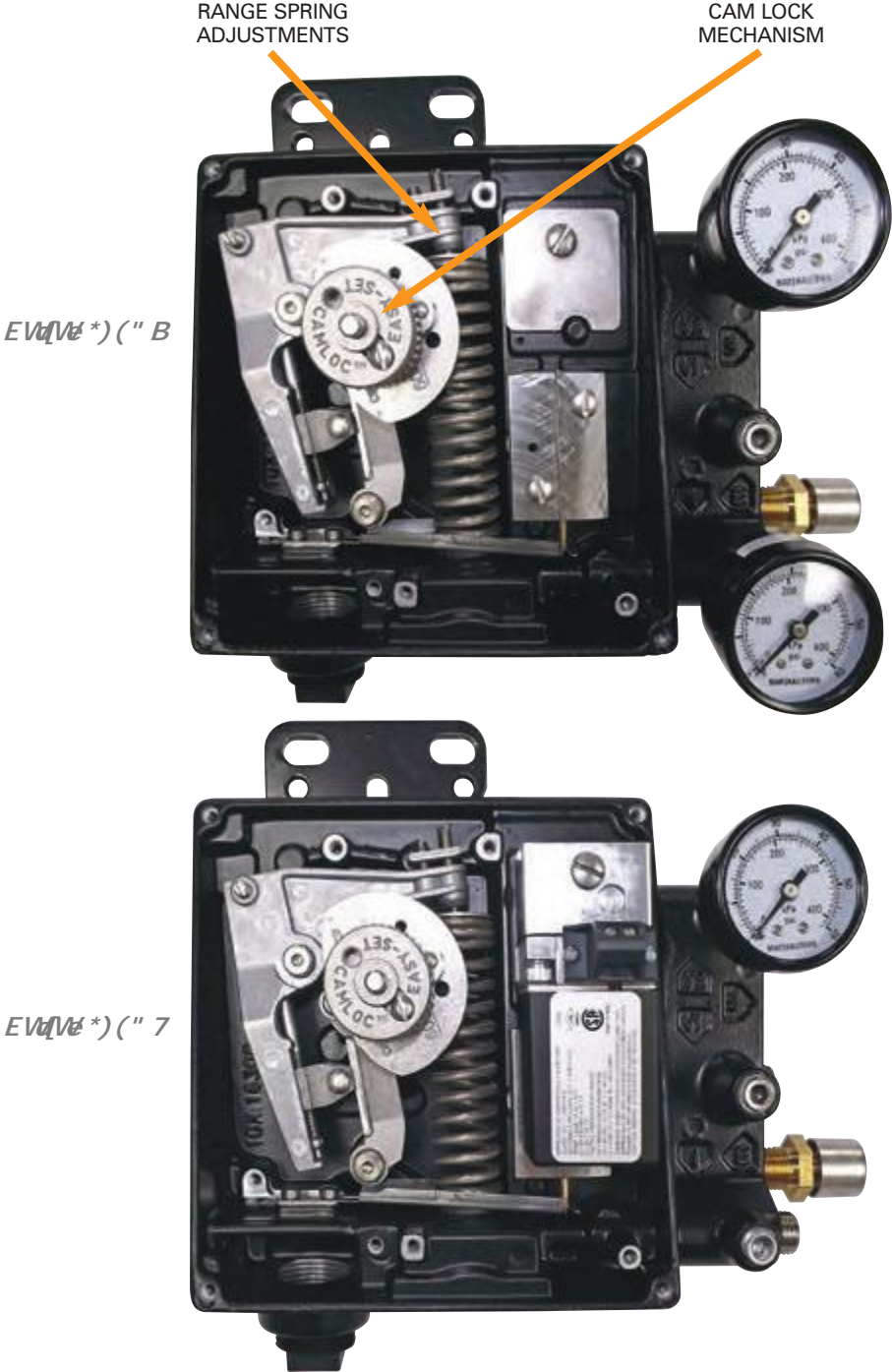


Calibration

Easy Calibration Adjustments

The Series 8760 Valve Positioner has been designed to minimize calibration. All required adjustments can be made with a simple screwdriver. The non-interacting zero and span adjustments are simple and easy. Once the correct cam lobe has been selected, set the cam to the

rough zero position, establish a "zero" input signal (3 psig or 4 mA) and adjust the "zero". Increase the input to full scale (15 psig or 20 mA) and adjust the "span". Note that regardless of the input, pneumatic or electric, the zero and span are the only adjustments required.



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Specifications

Physical Specifications

- 10 to 185° F (-40 to 85° C)
- NEMA 4X std.
- Pneumatic – 1/4" NPT
Gauge – 1/8" NPT
Electrical – 3/4" NPT, 25 mm
Exhaust – 1/4" NPT
- Epoxy/polyester powder coat
- Single or double acting
Configuration
- Direct or reverse
- 150 psig max.
- 0.5 scfm typical
- 9.0 scfm (C_v= 0.3) Standard
18.0 scfm (C_v= 0.6) optional high-flow
- 8760P: 3-15 psig, 6-30 psig up to 50% split range
8760E: 4-20 mA, up to 50% split range
- 90°, rotary std. 1/2" to 6" rectilinear optional
- Cam characterization
Configuration
- 160% @ 60 psig supply standard
- Adjustable -60% to +25% of normal span
- Adjustable -10% to +60% of normal span

Performance Specifications

- 8760P: 0.5% of normal span (typical)
(Independent)
- 8760E: 0.75% of normal span (typical)
- 8760P: 0.75% of normal span (typical)
8760E: 1.0% of normal span (typical)
- Less than or equal to 0.25% of span
- Within 0.5% of valve travel
- Less than 0.2% of span for a 5 psig change in supply pressure
Effect

Options

- 10A @ 125/250 VAC, 10A @ 24VDC, 0.1A @ 125 VDC
(see barrier instructions for power rating)
- 4-20 mA DC
- ## * ' 1K ohm (90°) 666 ohm (60°)

Electrical Classifications

- Class I, Division 1, Groups A, B, C, D
Class II, Division 1, Groups E, F, G
Class III, Division 1; when installed in accordance with Siemens drawing 15032-7602 rev. 5.
*
Class I, Division 2, Groups A, B, C, D
Class II, Division 2, Groups F, G
Class III, Division 2
- Class I, Division 1, Groups A, B, C, D
Class II, Division 1, Groups E, F, G
Class III, Division 1; when installed in accordance with Siemens drawing 15032-7620
Class I, Division 2, Groups A, B, C, D
Class II, Division 2, Groups E, F, G
Class III, Division 2

- EN50081-1 and EN50081-2 Emission
EN61000-6-1 and EN60000-6-2 Immunity

- Ex N IIC T5

- NEMA Type 4X
IP65

- II 2G EEx ia IIC T4/T5/T6
II 3G EEx nL IIC T5
See ATEX Certificates for Service Restrictions

Ordering Information

- Input
- Action
- Enclosure
- Flow Capacity
- Gauges
- Limit Switches
- Feedback
- Electrical Certification
- Bypass
- Filter/Regulator
- Indicator

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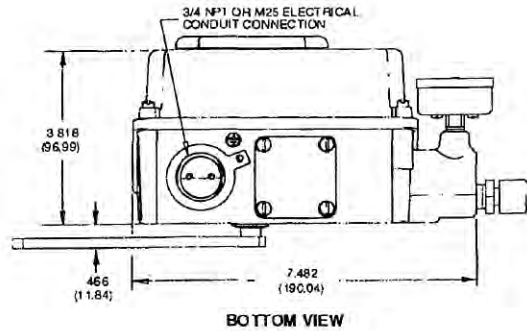
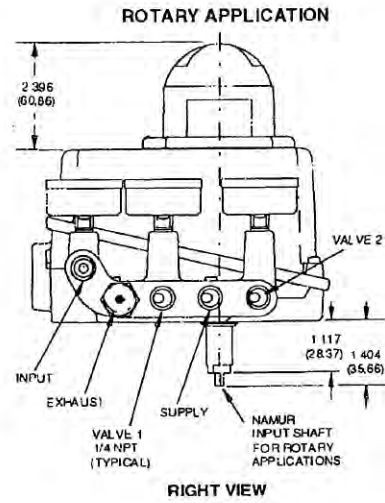
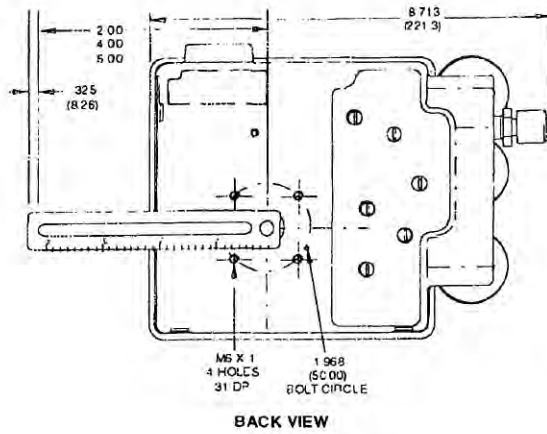
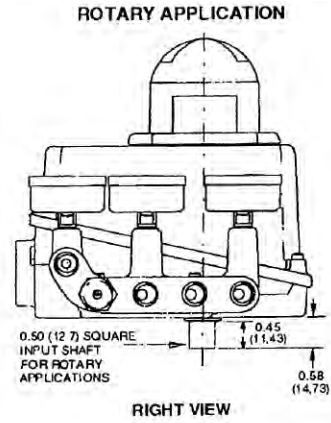
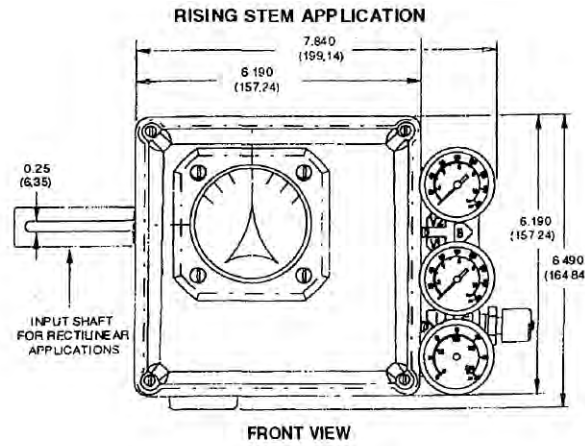
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Dimensions

inches (millimeters)



Manufactured by Seimens

' (' ,) ' # -WellMark # ((* ' ' ' (# ' ## # ' ' # , ' (' (' #) (' ' ,) ' (.

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Norriseal Series 8900 SmartPredictor™ Positioner

Proven Performers:

Reliable, proven valve control with flexible communication protocols.



Norriseal delivers robust, industry-leading, reliable valve solutions that include control valves, butterfly valves, liquid level controllers, pressure controllers, liquid level switches and gauges, regulators, and much more.

The latest addition to our product family is the Series 8900 SmartPredictor™ Positioner, based on the proven Siemens SIPART PS2 Electropneumatic Valve Positioner technology. An intelligent positioner built for linear and rotary actuators, the Series 8900 SmartPredictor Positioner reduces maintenance requirements, improves diagnostics, and simplifies operation and programming.

The Series 8900 SmartPredictor™ Positioner can safely and reliably control any type of Norriseal valve, while performing specialized tasks with extreme precision.

Series 8900 SmartPredictor Positioner

The Series 8900 SmartPredictor Positioner technology has a 20-year track record of proven performance in the oil and gas industry. Known for its reliable and smooth sequences in a wide range of applications, the Series 8900 seamlessly integrates with Norriseal Valves to move beyond analog and pneumatic communications.

With your choice of integrated FOUNDATION fieldbus, HART, or PROFIBUS communications protocols, the Series 8900 offers a level of valve control and understanding that isn't available in traditional valve positioner systems.

Series 8900 At A Glance

- Comes standard with degree of protection IP66 or NEMA 4X, with three options for enclosures: Makrolon, aluminum, or stainless steel
- Variants with external non-contacting travel sensors
- High flexibility in the stroke range from 0.12" to 5.12" (3 mm to 130 mm), with larger strokes available upon request
- Low-bleed construction reduces operating costs
- Communication via PROFIBUS PA, FOUNDATION Fieldbus, or HART
- Intelligent diagnostic functions
- Optional explosion-proof version available

Contents

- 2 Product Highlights
- 3 Technical Specs
- 4 The Norriseal Experience

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Features & Benefit

Resistant to Vibration

With a non-contacting sensor, the Series 8900 SmartPredictor Positioner can withstand severe operating conditions for extended periods of time, without losing reliability or precision.

User-friendly Operation

With an easy-to-use, push-button display, the Series 8900 is designed for field operation. With integrated functions like position feedback and on-board limit signaling, the Series 8900 can easily be configured with its three buttons, without the need for additional equipment.

Approved for Hazardous Areas

The Series 8900 SmartPredictor Positioner is approved for IECEx, ATEX, FM, and CSA as an intrinsically safe (Ex ia/ib) or flameproof (Ex d) device. It is ideal for explosion-protected or maritime applications.

Adaptive Learning

The Series 8900 includes an adaptive learning capability, where it learns to recognize the respective application characteristics and configures itself to meet the particular requirement as best as possible. If changes caused by wear or environmental effects occur, the device has the ability to readjust itself and transmit alarm signals through its HART, PROFIBUS PA, FOUNDATION fieldbus, or digital output communications interface.

Low-Bleed Construction

The Series 8900 features a very low bleed design, which helps to reduce the carbon footprint and lower the overall cost of ownership.

To compare positioner ownership costs, use the online cost of air calculator. <http://www.industry.usa.siemens.com/automation/us/en/process-instrumentation-and-analytics/process-instrumentation/valve-positioners-accessories/sipart-ps2-positioner/pages/cost-of-air.aspx>

The Series 8900 SmartPredictor Positioner offers standard comprehensive diagnostic functions, which continuously check the actuator and valve, to provide advanced failure warnings during operations.

Easy Commissioning and Startup

Because the Series 8900 was designed with the field engineer in mind, it features push-button operation, an easy-to-read display, and an adjustable slipping clutch for fast commissioning and startup that takes just minutes.

Withstands Hostile Environments

The Series 8900 can withstand corrosive or hostile environments with its optional Makrolon, aluminum, or stainless-steel enclosures. Complying with IP66 and NEMA 4X standards, it is approved for the most difficult conditions on the planet.

Flexible Communications Protocols

The Series 8900 integrates seamlessly into intelligent networks, with its ability to communicate via PROFIBUS PA, FOUNDATION fieldbus, or HART. With the HART and PROFIBUS options, SIMATIC PDM can be used to display and document trends, histograms, and commissioning and operating data.

Optional Explosion-proof Housing

The Series 8900 offers an optional explosion-proof enclosure, which features a flap with a bullet-proof glass pane. This allows the display to be read at all times, even with the flap down. Operation is possible with the flap open, for convenient maintenance.



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Specification

Technical Specification

Setpoint signal	0/4 – 20/mA with/without HART signal or PROFIBUS PA/FOUNDATION Fieldbus protocol
Stroke range	0.12" to 5.12" (3 mm to 130 mm) (larger strokes available on request)
Rotary angle range	30° to 100°
Auxiliary power	
–Pneumatic	20 psi to 101 psi (1.4 to 7 bar)
–Electric	4 to 20/mA (two-wire system) or 18 to 30 V (four-wire system) or bus infeed 10.5 mA with PROFIBUS / FOUNDATION Fieldbus
Load voltage	6.36 V (non-Ex without HART)
Airflow	
Supply to actuator (for p = 6 bar)	5.76 scfm (9.8 Nm ³ /h)
Actuator to exhaust (for p = 6 bar)	11.30 scfm (19.2 Nm ³ /h)
Bleed rate (Controlled State)	.0035 scfm (6 · 10 ⁻⁴ Nm ³ /h)
Required air quality	Class 2 in accordance with ISO 8573-1
Binary inputs	One digital input for floating contact
Explosion protection	II 2 G Ex d IIC T6 Gb (explosion-proof enclosure "d") II 2 G Ex ia IIC T6 / T4 Gb (intrinsic safety "ia") II 2 D Ex ia IIIC 110 °C Db (intrinsic safety "ia") II 3 G Ex ic IIC T6 / T4 Gc (intrinsic safety "ic") II 3 G Ex nA IIC T6 / T4 Gc (non-sparking, energy-limited "nA") II 3 D Ex tb IIIC T100 °C Dc IP66 (dust, protected by enclosure "t")
Additional approvals	FM/CSA (with barrier) Class I, Div 1, Gr. A, B, C, D and Zone 1, Area Ex ia/ib IIC FM/CSA (without barrier); Class I, Div 2, Gr. A, B, C, D. SIL 2 in accordance with IEC 61508/ IEC 61551 Others on request
Ambient temperature	–22° F to +176° F (–30° C to +80° C)
Accessories / Options (can be retrofitted)	Limit module: <ul style="list-style-type: none">– Electrical alarm outputs including fault output and– Binary input (floating contact and 24V)– Slot initiators including fault output– Limit value contacts including fault output Mounting kits Pressure gauge block Solenoid valve block Position feedback, 4-20 mA External position sensor, also non-contacting

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- Responsive service and prompt delivery
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Norriseal Tritex II™ Electric Actuator

Precise, Fast and Reliable:

High-performance electric actuators
with Norriseal control valves



For a complete flow control solution, Norriseal offers control valves with Tritex II DC-powered linear actuators. They deliver increased speed, precision and reliability in on/off or modulating control. With one of the largest installed bases in the U.S., Norriseal valves with Tritex II actuators deliver improved performance to reduce your costs and enhance process efficiency.

A Higher Level of Control

Tritex II actuators outperform other electric and pneumatic actuators by providing small hysteresis and dead band, quick response to small signal changes, and stable dynamic responses. Digital Input/Output and analog control options offer flexibility and allow direct communication with SCADA systems.

Tritex II actuators are a zero-emissions replacement for gas-powered pneumatic devices, improving environmental compliance and eliminating the loss of valuable product.



Features / Benefit

- Extreme precision, with accuracy and repeatability better than 0.1%
- Direct feedback capability positions the valve accurately at all speeds and forces
- Operates in any direction for 100% duty cycle
- Longer service life versus conventional electric actuators
- CSA Class I, Division 2 compliant
- Compact size for tight installation envelopes
- Built-in positioner signals exact stroke position with digital or analog output
- 12-48 VDC low power consumption is suitable for use with solar panels or batteries
- Configurable positioning on loss of control signal
- Flexible analog or digital communications (4-20 mA or MODBUS over RS485)

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Tritex II™ Electric Actuator

Tritex II actuators integrate a DC powered servo drive, digital position controller, brushless motor and linear actuator in one compact package. They provide power, speed and performance for modulating control, plus extreme durability and low-maintenance operation.

Tritex II Servo Motor

High-efficiency Tritex II servo motors enable precise control of position, velocity and acceleration to optimize performance under any operating conditions.

- 100% duty cycle rating
- Rapid acceleration and positioning
- Provides position feedback and adjusts to changing loads
- Applies brief bursts of peak current to optimize positioning
- Reserve power up to 2X continuous power
- Quiet operation
- Control, programming and monitoring via RS485 serial interl

Roller Screw Drive

Tritex II actuators employ a patented inverted roller screw mechanism to convert the rotary torque of the motor into highly robust linear motion.

- Direct conversion of rotary motion to a linear force
- Allows full modulation capability
- Shock resistant
- Highly efficient
- Programmable speed and acceleration

Communications & Diagnostics

The integrated controls and positioner used in Tritex II actuators provides closed-loop feedback, eliminating the need for limit switches, torque switches or other mechanical feedback. Electronics include 4-20 mA input and output, as well as digital capability.

Extensive diagnostics are available to determine the health of the actuator and valve. All inputs and outputs can be monitored, including position, temperature, current and more. Data can be captured in the drive's memory at an adjustable rate down to 100 microseconds and then uploaded for plotting.

Typical Applications

- Flow control
- Choke
- Dump
- Pressure control upstream/downstream/differential
- Compressor control
- Gas lift



Tritex II roller screw drive

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Tritex II™ Electric Actuator

Simple, Economical Installation

With the servo drive, digital positioner and actuator all in one convenient package, Tritex II actuators eliminate labor costs for mounting and wiring panels. Cable costs are also reduced by eliminating the need for expensive specialty servo cables.

Tritex II actuators require only an ordinary DC power cord and standard communication cable for digital and analog I/O.

TECHNICAL SPECIFICATIONS

Voltage	12-48 VDC
I/O	4-20 mA
Hazardous Area Rating	Class I, Division 2, Groups A,B,C & D
IP Rating	IP65
Connection	1/2" NPT
Temperature	-20 to 65 °C / -4 to 149 °F
Force	Continuous to 872 lbf (4kN) Peak to 1190 lbf (5kN)
Stroke	3" max
Speed	up to 5 in./sec (635 mm/sec)
Duty Cycle	100%
Life	100M+ strokes

Tritex II actuator packages are readily available for all Norriseal valves up to 4 inches (contact Norriseal for larger sizes).



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- In-depth applications experience
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- Compliance with all industry standards and specifications
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- Field support available worldwide

Please contact your Norriseal-WellMark representative for more details and assistance in specifying the optimal solution for your application.



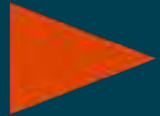
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Norriseal Butterfly Valve General Data

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Norris Butterfly Valves

How to:

- Select and Specify 200 psi and 285 psi Butterfly Valves
- Select Trim
- Install and Service Norris Butterfly Valves



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- 32** Installing Disc O-ring on Norris 2"-36" M Series
- 34** Repair Kits R&M Series
- 35** Valve Storage Procedures

5Sgfla`

Before disassembly or maintenance, all pressure in this device must be relieved. Failure to relieve pressures may result in personal injury, loss of process control or device damage. The resulting uncontrolled venting or spilling of line fluids may cause personal injury or environmental contamination.

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Introduction to Butterfly Valves

Butterfly valves have been around the industry for decades; performing well-defined tasks and showing distinct advantages over other valve types.

Butterfly valves produce dependable bubble-tight shutoff and are ideally suited for throttling control applications because the flow is near linear over 70% of the flow range (Figure 1). They are quick opening and highly efficient because the approach velocity of the flow stream is not lost as the fluid passes through the valve bore. They can be operated manually, mechanically, or automatically, and they can be used in handling a variety of media, including liquids, solids, slurries, gasses and vapor (steam).

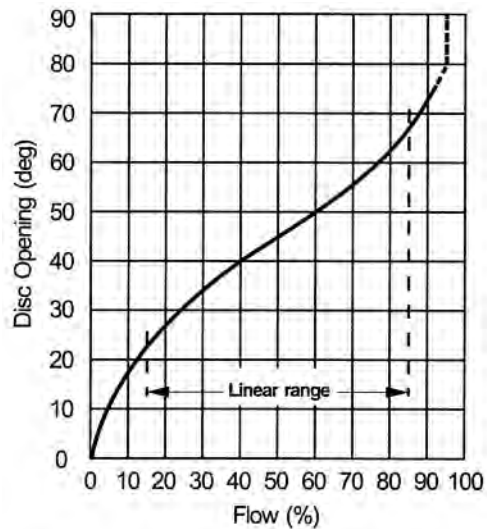
A butterfly valve is a simple device. To control or block the flow, a single vane or wafer disc pivots in the valve body. From closed to open position, the disc is rotated 90 degrees. Torque requirements to make this rotation are determined by static forces, caused by pressure drop across the disc in the closed position, and by dynamic forces, caused by fluid velocity in the pipe and at the edge of the partly closed disc (See Fig. 2).

Although a butterfly valve is hydraulically balanced when fully open or fully closed, force is required to move the disc from either position. Operating torque, for closing or opening the valve, is made up of bearing or shaft friction torque combined with rubber torque.

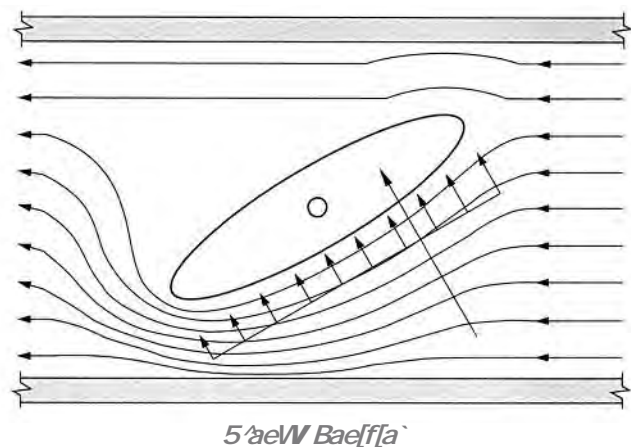
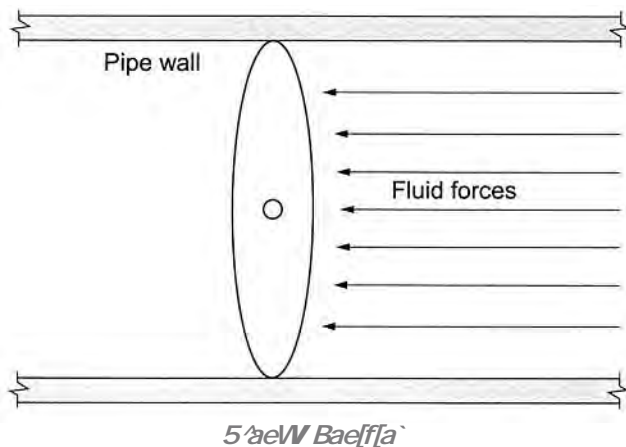
Bearing torque, caused by pressure drop across the valve disc, is determined by differential pressure. It is maximum when the disc is closed and minimum when the disc is fully open.

The torque required to seat or unseat the valve disc, rubber torque, is determined by the design of the valve and must be experimentally established by each valve manufacturer. (See Table VI and VII, pages 16 and 17, for Norris operating torque.)

When the disc begins to rotate toward the open position, it behaves like the wing of an airplane, and is subject to both the lift and drag forces of the flow stream. These fluid forces tend to close the valve, and reach a maximum value when the disc is approximately 67 degrees open. (See Table V, page 15, for fluid dynamic torque.)



8Y #z 4gffVMk hS'hV# geW XadfZdff{ Y bch[VW VJUVWVf La` fcb^ahVdSbbdj [SfVK)". aXfZW Xai dS` YV#



8Y \$zI ZW fZVW[eU [e [fZVU'aeW baeff[a` t eSf[U Xg[V XadM# SdAZ[YZ Tgf fZVhS'hW[e efST'V#;` fZW eVW [ZabW baeff[a` t fZVW[eUSUfe [] V#S` S[cb`S` W [YI YW/V#Sf] Y [Xf S` V VcdY XadM# fZSf SffW bf fa U'aeWfzI ZW [f d#BUZV#S` abW S` YMaX() VVdM#eZai` ff V#k` S_ [U XadM# SdV#f_ Sj [g_ z

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How to Select & Specify Norris Butterfly Valves

To select the Norris butterfly valve which will assure maximum valve life and minimum maintenance and operating costs, it is necessary to:

- Size the valve and operator properly.
- Select the specific valve model according to: function (block or throttling), pressure, flow rates, body type, temperature, trim material compatible with media, and piping.
- Select the proper operator.

Sizing the Valve & Operator

The following are simplified guidelines for sizing butterfly valves. See pages 14 thru 17 of this catalog for detailed information on Norris butterfly valve characteristics (flow coefficients, pressure drop, operating torque, etc.) to assist in the proper sizing of the valve and operator.

1. Determine the system requirements for flow and pressure drop to calculate the probable line size.
2. Calculate the correct valve size based on pressure drop and flow capacity requirements. (Use the 30 to 60 degrees open range for sizing.)
3. Determine the fluid dynamic torque, compare it with operating torque of the selected valve series to assure that the operator is properly sized to handle both the static and dynamic conditions of the valve.
4. Check the system for factors which could lead to water hammer or cavitation. Make necessary adjustments in valve placement, sizing, and speed of closing to prevent this from occurring.

Selecting the Valve

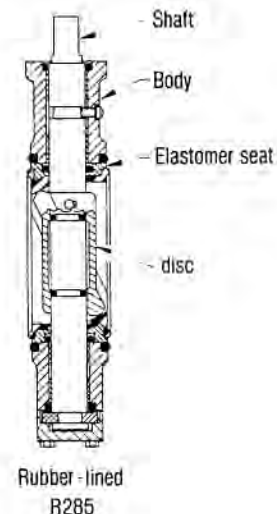
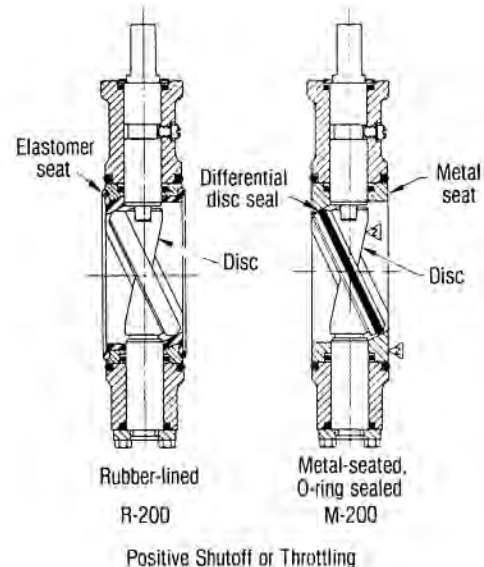
RfcLmppgqT jtcQcpgcq

To select the proper valve series (R, M, or D), determine:

1. The function of the valve (block and/or throttling) and flow rates of the system.
 - a. For positive shutoff (blocking), select Norris R- M- Series valves. Both R- and M- Series valves provide positive shutoff from vacuum to full rated working pressure (200 psi or 285 psi).
 - b. For smoothest throttling control, select D-Series if positive shutoff is not required and flow rates do not exceed 40 fps. Select R-Series for economy and when positive shutoff is required and flow rates do not exceed 30 fps. M-Series valves are limited to 16 fps for throttling applications.

D-Series valves are designed specifically for throttling applications. These high-efficiency, low-leakage valves are capable of controlling in both low and high pressure drop applications. They are especially well suited to applications where a large variation of flow or pressure drop is anticipated. A positioner may not be required for smooth automated control because rubber torque has been eliminated and seating torque has been eliminated and seating torque is minimum.

2. Temperature extremes the system will handle. Although selection of trim material influences adaptability to temperature, a general rule is to:
 - a. Select R-Series valves for temperatures no lower than -30° F and no higher than 250° F.
 - b. Select M-Series or D-Series valves for temperatures as low as -40° F and up to 400° F.



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To summarize, check line velocity and pressure drop against the maximum allowable for the series selected. Check rating of the valve selected. Check rating of the valve to be sure it complies with the maximum pressure and temperature the system will handle.

3. Pressure class ANSI Valve(s).

Norris manufactures two pressure classes of positive shutoff valves:

- a. The 200 series are rated at a maximum of 200 psi, and
- b. The 285 series are rated at the full ANSI pressure class 150 rating of 285 psi.

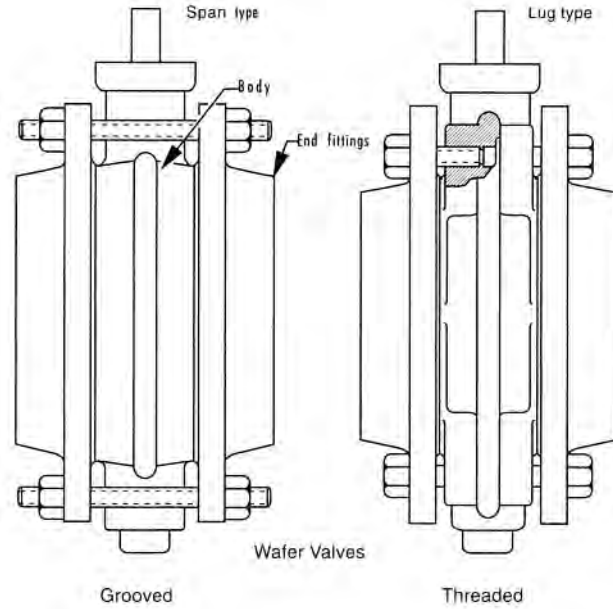
TABLE I. Series Comparison					
	P Qcpgcq		K Qcpgcq		B Qcpgcq
	PO..	PO63	KO..	KO63	KO..
Positive Shutoff (bi-directional)	Yes	Yes	Yes	Yes	No
Bi-directional flow	Yes	Yes	Yes	Yes	Yes
Maximum Velocity for Throttling Controls (liquids)	30 fps	30 fps	16 fps	16 fps	40 fps
Temperature Range	-20° F to +250° F		-40° F to +350° F		-40° F to +400° F

The Norris Valve Model

The tables on pages 10 & 11 will save considerable time in locating the specific Norris valve model you need. On the basis of valve size, body configuration and pressure rating, it will direct you to the appropriate Valve Data Sheet within the R-, M- or D- Series section. Each data sheet includes typical specifications, standard model selection tables, material specifications and model number designations, certified dimensions, including disc clearance charts, and specific flange bolt data.

1. Body Type and Size.

Basic Norris butterfly valve body types are slip-in wafer valves, available in span or lug (single flange) configurations, and body styles with threaded or grooved end-connections. Both span and lug type bodies are available in sizes from 2" through 36", including 22", 26" and 28" for comparable metric piping. Body style valves are available from 2" to 4".



All 14" and larger Norris valves will accommodate 2" of insulation on accompanying pipelines. A neck "X-Tender" is available for use with 2" though 12" wafer valves when lines are insulated.

Norris valves are designed for use with ANSI class 150 flanges with inside diameter equivalent to schedule 40 pipe ID, and can be adapted for ANSI class 300 and DIN flanges. If flanges other than ANSI class 150 are required, user must specify type and rating (i.e. ANSI 300, DIN NP-10 or NP-16) as special bolt drilling or spacers may be necessary. Weldneck, socket weld or slip-on flanges can be used with Norris M-Series or D-Series valves. Weldneck or socketweld flanges are recommended for use with R-Series valves to provide proper support of the seat and to assure optimum performance at the full rated pressure of the valve. Norris does not recommend using the R-Series valves with slip-on type flanges. Before ordering valves, check disc clearance charts on individual data sheets to be sure the inside diameters of companion flanges and piping do not interfere with disc movement when the valve is cycled to the open position. Back beveling may be required for disc clearance when heavy wall, plastic, or cement lined pipe is used.

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For end-of-line suspension, select lug-type valves. Often, butterfly valves are used to isolate other equipment in the line, downstream of the valve, for periodic maintenance and repair. This application requires a lug-body valve with blocking capability which will withstand system pressure and seal the line during the maintenance period.

Without a downstream flange or spool piece, Norris R-Series lug-type valves are derated for safety to 75 psi working pressure when used for end-of-line suspension. Full valve rating may be restored by temporarily installing a downstream flange.

M-Series lug-type valves are not derated and will hold full rated working pressure with downstream flange removed. When M-Series valves will be dead-ended for more than 8 to 10 hours, it is recommended that a downstream flange be temporarily installed for safety.

- b. Where end-of-line suspension is not required, select span-type valves. They are less expensive, weigh less and may be readily inserted between standard flange fittings. Fourteen inch and larger "span" valves have tapped lug holes at top and bottom for easier installation and accurate centering.

2. Differential Pressure Rating

Both Norris R-Series and M-Series valves are available for 200 psi and 285 psi differential working pressure. Valves normally rated at 200 psi may be obtained for 250 psi service with selected trims on special factory order.

Standard production tests require that all Norris valves be shell tested to 150% of rated working pressure. (Example: 200 wp valves are tested to 220 psi.)

3. Trim Material

The best guides for proper trim selection are the materials that have worked satisfactorily for other equipment in your piping system.

Norris butterfly valves are available in a wide variety of trim materials for compatibility with all types of media at temperatures from -40° to 400° F. See section "How to Select Trim Material" for complete list of materials and their compatibility with specific media.

Please contact our applications engineering staff for quotations and assistance in selecting the right valve for your applications.

Selecting the Operator

Butterfly valves tend to be self closing because of lift and drag forces exerted on the disc. If a valve is closed too quickly, or slammed shut, the energy of the flow system is transferred to the piping system and may cause dangerous pressure level fluctuations (hydraulic shock or "water hammer") which can damage the system.

Because of larger disc area and resulting greater fluid dynamic torque, larger valves have a greater tendency to be self closing than small valves. Large valves are therefore best controlled by gear operators diaphragm actuators, pneumatic or hydraulic cylinders, or electric motors – all of which provide controlled speed of closing and prevent the valve from slamming.

Lever operators can be used for control of butterfly valves 5" and smaller, and up to 12" at flow rates less than 5 fps. Properly applied, levers provide quick valve action, economy and simplicity.

See complete details on our full line of manual and mechanical operators in Norriseal's Butterfly Valve Catalog. Sizing charts for air operators and Norris diaphragm actuators are included in this section.

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Norris Butterfly Valves are Designed to Last longer

Norris angle disc design eliminates stress areas which cause many of our competitors performance problems. The unretouched photographs of

Norris and competitive valves and individual parts illustrate how these differences combined with proper trim selection can mean longer valve life.

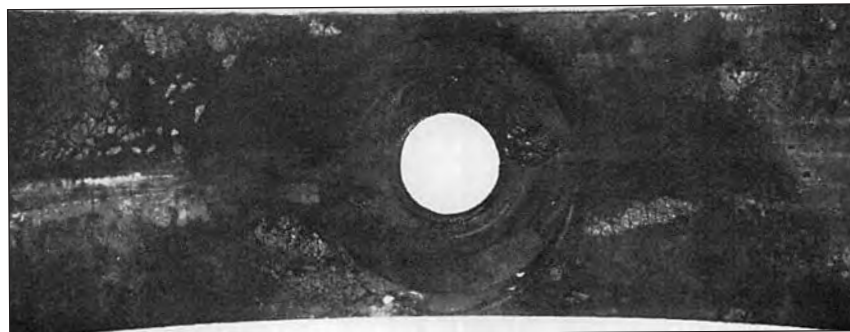


Norris angle-disc design provides positive shutoff with 360 degree, uninterrupted differential seal. The disc does not seat in shaft hole areas, eliminating compression set and scrubbing in this area which occurs on conventional vertical disc butterfly valves.

In the manufacturing process, the Norris perfect circle design allows precise control of outside disc dimension and inside seat dimension to a few thousandths of an inch. Because of close dimensional control, positive shutoff is achieved with minimum interference between disc and set. This unique design minimizes seat and seal wear, reduces operating torque and greatly extends the service life of the valve.

Norris' lower disc/seat interference allows use of harder, high-density seat elastomers which are less porous and less subject to swelling and deterioration by the flow stream than the softer materials which must be used for vertical disc valve seats.

By comparison – Vertical-disc valves have a flattened disc/boss area, making manufacturing variances greater. Increased penetration of disc into seat is required to seal off the flow stream. This produces a scrubbing action, particularly in the flattened disc/boss area, which can cause premature failure of the valve.



FZ[e g` dVlagUZVV bZafaYcSbZ [^gefcdSVz S' Vbafa_ VdeVbf i Z[UZ ZSe TWW VS_ SYVV Sf fZVV eZSX Za^MSdVB Tk fZVWUyTT[Y SUR[a` [S hVaf[US^V[eUTgffVdkk hS^hVZFZVWVbf S'ea eZai e VVVWfacSfa` Tk fZVW_ WVS [fZVWai efdVB_ ž

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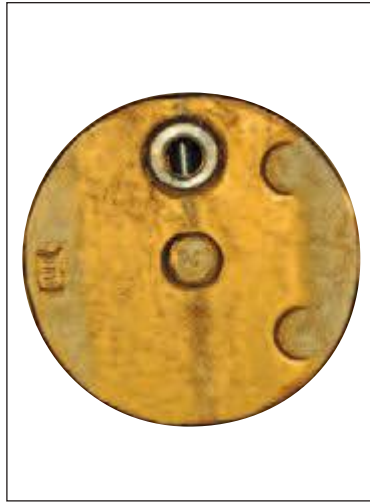
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Norris perfect circle disc design



By Comparison – Flattened disc/boss areas of vertical disc design



Norris angle Design eliminates Stress areas

Most butterfly valves obtain their seal by penetrating a metal disc into an elastomer (rubber) seat, creating internal pressure in the elastomer. As long as the internal pressure in the elastomer exceeds

the pressure in the pipeline, fluid cannot bypass the valve disc edge. Because Norris' close dimensional control, positive shutoff is achieved with minimum interference between disc and seat.



Norris perfect circle disc design makes it possible to machine and polish the disc edge to a smooth, rounded surface which cannot damage the seating surface by scrubbing when the valve is cycled.



By Comparison: The rough-hewn edges of these vertical discs create uneven stresses in the elastomer seat, causing scrubbing of the elastomer and early failure of the differential seal.



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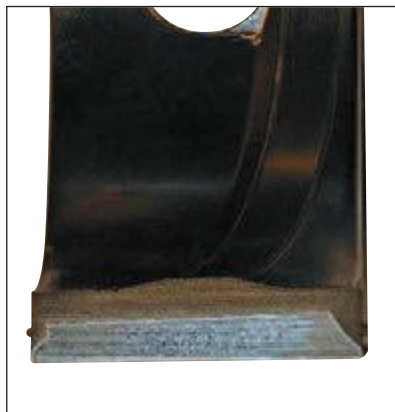
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exclusive separate body o-ring flange seals can be replaced (sometimes simply turned over) without disassembling the valve and replacing the seat. A primary seal bead molded into the face of the elastomer seat (R-Series) serves as an additional seal.



By Comparison: All resilient lined butterfly valves depend exclusively on compression of the face of the seat for sealing between flange and valve. If this sealing face is damaged during installation or shipment, the valve must be dismantled and the entire seat must be replaced.



Norris' field-removable and interchangeable resilient seat is bonded to a rigid plastic backing sleeve to prevent the seat from distorting or collapsing in vacuum or high velocity flow. Free fit of seat permits replacement with no special tools. The seat isolates the flow stream from the body of the valve (dry back construction).

Norris' replaceable metal seat (M-Series and D-Series) also isolates the flow stream from the body of the valve. Because the metal seat is separate from the valve body, expensive alloy seat material can be specified with less expensive grey iron or carbon steel bodies for highly corrosive services at a minimum of expense. Free fit permits easy field replacement of metal seat or conversion to R-Series.

By Comparison: Some vertical disc butterfly valves fit a "boot" seat over the body of the valve. Special tools are required to stretch the seat into position and high velocity flow tends to wash the seat downstream.

An adhesive is used to retain some vertical disc seats. The valves are not field repairable and the adhesive may be attacked by the media in the flow stream.

Other vertical disc seats must be "pressed" into the valve bore making alignment of shaft holes difficult and reassembly unnecessarily complicated.

In other metal seated butterfly valves, the body serves as the seating surface. For corrosive service, the entire body must be made of expensive alloy materials.

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double O-ring shaft seals, plus the primary shaft seal molded into the R-Series seat, provide triple protection against leakage into shaft bearing areas. Line media and outside atmospheric contamination are sealed out of bearing areas and Teflon impregnated grease is sealed in to assure proper lubrication.

Metal-backed Teflon bushings prevent galling of steel or monel shafts with steel bodies.



By comparison: Some vertical disc valves depend entirely on the squeeze of the seat at the disc bosses to seal the flow stream from shaft bearing areas. Constant scrubbing of the disc on this area results in premature seal failure, loss of media and shaft bearing areas.

Norris' Separate Flange & Shaft Seals prevent leakage into Shaft Bearing areas and to the atmosphere

To illustrate the sealing integrity of Norris' shaft o-rings, we photographed this 416 stainless steel shaft which was literally dissolved up to the o-ring seal by chlorinated brine in the flow stream. Note that the seal confined the failure to the pipeline and prevented any external leakage. Selection of the proper shaft material (titanium) would have prevented failure of this valve.



Shaft Retention – the handle shaft of 2" through 12" valves is retained by a sealed retention screw. On 14" and larger valves, the shaft is cross pinned to the disc. A thrust plate provides positive retention of the bottom shaft on all valves.

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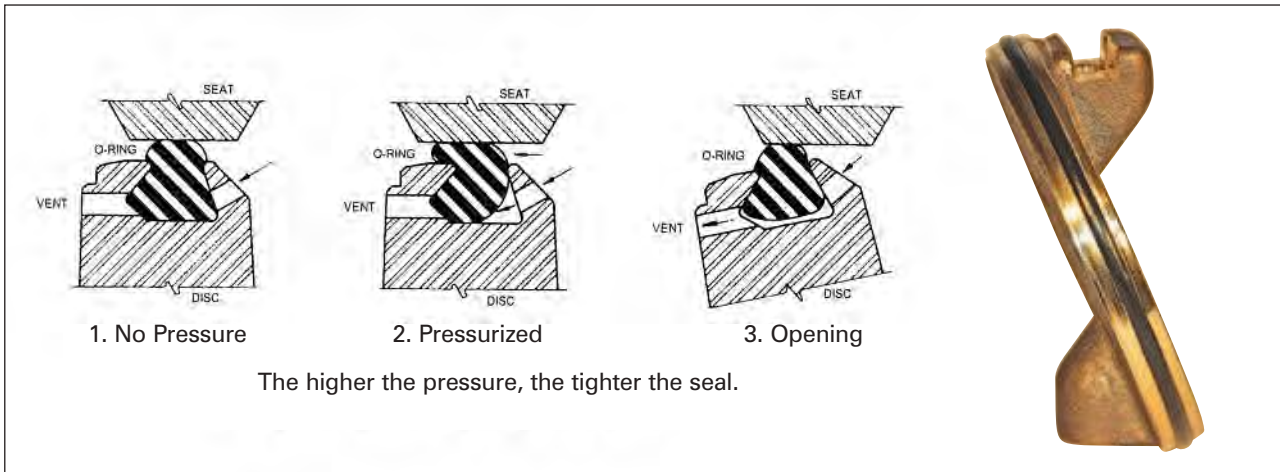
precision fit disc slot assures positive disc action and prevents disc "flutter." There are no bolts, pins, screws or rivets to corrode or fail (12" and smaller valves).

A tough shaft with high-strength 17-4 PH stainless steel or K-Monel straight dowel pin connection assures maximum drive strength and field repairability of larger valves. Norris' straight disc pins do not penetrate the sealing plane of the disc and do not require special fitting of parts when valve repair is necessary.



By Comparison: Bolts, taper pins or screws which are used to connect vertical discs to the shaft provide leakage pathways through the disc and weaken the shaft.

The vertical disc shaft/disc connection illustrated at upper far right is virtually a "square peg in a round hole." Shaft/disc drive strips easily, and becomes sloppy. Blind assembly connection on all vertical disc valves complicates reassembly.



M-Series Sealing – A pressure energized disc o-ring seal contained in a specially designed groove assures positive shutoff every time with Norris' M-Series valves. After making a nominal seal between the metal seat and the disc o-ring, pressure of the flow stream energizes the o-ring and increases the seal. *The higher the pressure, the tighter the seal.* The disc-edge groove is designed to prevent the o-ring being washed downstream in high velocity service.

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Valve Model Number System 200 Wp

ValVe CONFigur at ION	
Aml dgesp rym l	Ambc
Special to be Described	00
Span Wafer Body	10
(1.50"-12) Double Rib Span Wafer Body, 200WP	20
Full Tapped Lug Body	30

Ser IeS	
Qcpgc q	Ambc
Resilient Seat	R
Metal Seat	M
Metal-to-Metal Seat (Damper Style)	D

ValVe Size (IN INCHES)	
Qgxc	Ambc
2" - 36"	2...36

BODy mat er IalS	
K rcp g j R wnc	Ambc
Ductile Iron ASTM A395 60-40-18	11
(WCB) Cast Steel ASTM A216 GR WCB	20
(3) Stainless Steel, ASTM A743 CF-8M*	21
Alloy 20, ASTM A743 GR CN7M	22
(L) Valve Bronze, ASTM B61	30
(FK) NI-CU-AL Bronze ASTM B148, Alloy C95800	31
(A) Aluminum Alloy 356T6 ASTM B26 Alloy 5G70A	40

*Special Order - Consult Factory

SHaFt mat er Ial	
K rcp g j	Ambc
(C) Ductile Iron, ASTM B473 UNS N08020	1
(3) Stainless Steel ASTM A276, Type 316	2
(F) Stainless Steel ASTM A276, Type 416	3
(M) Nickel-Copper Alloy (Monel) ASTM B164 Class A	4
(EN) Nitronic 50	5
(K) NI-CU-AL Alloy QQ-N-286A (K-Monel)*	6
(AP) Stainless Steel 17-4PH ASTM A564 Type 630	7
(W) Inconel 600	8
(AJ) Titanium ASTM B348 GR 4	9
() Special to be Described	0
(BH) Hastelloy B, ASTM B335	B
(AM) Hastelloy C, ASTM B574 Alloy N102:76	C
(EB) Zirconium	F

*K-Monel std. in 22" & Larger Valves with Monel Shaft

Please note: not all available options are shown.

DISC mat er Ial	
Code	Materials
1	(D) Ductile Iron, ASTM A395 60-40-18
2	(3) Stainless Steel 316 ASTM A743 GR CF-8M
3	(C) Alloy 20 ASTM A743 GR CN-7M
4	(AL) ASTM B148 C95400
5	(A) Aluminum Alloy 356T6 ASTM B26 Alloy
6	(M) Nickel-Copper Alloy (Monel) ASTM A494, M30C
9	(AJ) Titanium ASTM B367 GR8A
0	() Special to be described
B	(BH) Hastelloy B, ASTM A494
C	(AM) Hastelloy C, ASTM A494 CW 12-MW
G	(W) Inconel 600 ASTM A494 Alloy CY-40
K	(EA) Ilium PD
P	(FK) NI-CU-AL Bronze ASTM B148 Alloy C98500

Seat mat er Ial	
Code	Seat R Series
A	Buna N
B	Fluoroelastomer (Viton)
B2	Viton GF/Epoxy Backing
B3	Fluoroelastomer/Epoxy Backing
D	TFE Impregnated Fluoroelastomer
E	Neoprene (Black)
E2	Neoprene (Epoxy Backing)
G	Neoprene (White)
J	Nitrile, Abrasive Resistant
N	Natural Rubber
S	EPDM, Peroxide Cured
4	HSN, Highly Saturated Nitrile/ Epoxy Backing
5	Natural Red Rubber
8	Peroxide Cured Nitrile

Ambc	Qc rKQcpgc q
1	(G) Cast Iron, ASTM A126 Class B
2	(3) Stainless Steel 316 ASTM A743 GR CF-8M
3	(AB) Aluminum Bronze ASTM B148 Alloy C95300
4	(A) Aluminum Alloy 356T6 ASTM B26 Alloy SG70A
5	(M) NI CU Alloy (Monel) ASTM A494, M30C
6	(W) Inconel No. 610
7	(C) Stainless Steel Alloy 20 ASTM A743 GR CN7M
9	(AJ) Titanium ASTM B367 GR8A
0	() Special to be described
B	(BH) Hastelloy B, ASTM A494 N-12MV
C	(AM) Hastelloy C, ASTM A494 CW 12-MW
D	(EB) Zirconium
F	(EA) Ilium PD
G	(FK) NI-CU-AL Bronze ASTM B148 Alloy C95800

6 M 30 11 - 4 2 3 BAA - 2R

SealS	
K rcp g j q	Ambc
Buna N	A
Fluoroelastomer	B
Fluorosilicone	C
PTFE Impregnated Fluoroelastomer	D
Neoprene (Black)	E
Neoprene (White)	G
Nitrile (Low Temp)	M
Natural Rubber	N
AFLAS	R
EPDM	S
Low Temp Neoprene	V
Kalrez	Y
Zalak	Z
Highly Saturated Nitrile	4
Peroxide Cured Nitrile	8
TFE/SIL	9A

NORr IS OperatorS

Code	Manual Operators	V REF	i FDCI B I R S R S T	V REF	W . B I S I N G I R S R S T
1A	(1.5-12) STD Handle with 1J Topworks	2E	(2-12) Gear - W.P. - Aluminum Bronze Marine Trim	**	
1F	(2-12) Squeeze Trigger 10 Pos	2ES	(2-12) 2E Subm. for Salt Water	2G11	(2-4) 35 SR Diaphragm Actuator
1FM	(1.5-12) 1F with Marine Trim	2R	(2-12) Gear Operator Aluminum Case	2G12	(2-4) 35 PB Diaphragm Actuator
1J	(2-12) STD Topworks On-Off	2T	(2-36) Gear Operator Cast Iron Case	2G13	(2-8) 70 SR Diaphragm Actuator
1AM	(2-5) STD Handle with 1S Topworks	2RM	2R with Marine Trim	2G14	(2-8) 70 PB Diaphragm Actuator
1P	(2-8) Locking Topworks	2TM	2T with Marine Trim	2G15	(6-12) 180A SR Diaphragm Actuator
1Q	(2-5) 1P Topworks with STD Handle			2G16	(6-12) 180 PB Diaphragm Actuator
1JS	(2-8) STD On-Off Topworks, Stainless Steel			2G17	(12-20) 180 SR Diaphragm Actuator
				2G18	(12-20) 180 PB Diaphragm Actuator

**2G Numbers listed are Basic Numbers Only. Complete Actuator Model Number Must be Used when ordering.
SR - Spring Return. Specify Fail/Open or Fail/Closed.
PB - Pressure Balanced/Double Acting.

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Valve Model Number System R&M 285 Wp

Pressure Class	
Aj qq	Ambc
ANSI 150 Valve 285 PSI	285

Series	
Qcpgcq	Ambc
Resilient Seat	R
Metal Seat	M

Valve Size (IN INCHES)	
Qqxc	Ambc
2.5" - 36"	2...36

BODY CONFIGURATION	
Amdgesp rgml	Ambc
Single Rib	A
Lug, Full	B
Single Rib Longneck (1400) Limited Availability	F
Double Rib	C
Full Lug Longneck	G

BODY material S	
K rcpg jRwnc	Ambc
Ductile Iron ASTM A395 60-40-18	1
(WCB) Cast Steel ASTM A216 GR WCB	2
(3) Stainless Steel, ASTM A743 CF-8M*	5
NI-CU-AL Bronze ASTM B148, Alloy C98500	6

*Special Order - Consult Factory

SHAFT material	
K rcpg j	Ambc
(K) NI-CU-AL Alloy QQ-N-286A (K-Monel)*	6
(AP) Stainless Steel 17-4PH ASTM A564 Type 630	7
Special to be Described	0
Hastelloy C ASTM B574 Alloy N10276	C

DISC material	
Code	Materials
2	316 Stainless Steel ASTM A743 GR. CF8M
3	Alloy 20 Stainless Steel ASTM A743 Gr. CN7M
4	Aluminum Bronze ASTM B148 Alloy C95400
6	Ni Cu Alloy (Monel) ASTM A494, M30C
C	(AM) Hastelloy C, ASTM A494 CW 12-MW
G	(W) Inconel 600 ASTM A494 Alloy CY-40
0	() Special to be described

Seat material	
Code	Seat R Series
A	Buna N
B	Fluoroelastomer (Viton)
B2	Viton GF/Epoxy Backing
B3	Fluoroelastomer/Epoxy Backing
D	PTFE Impregnated Fluoroelastomer
E	Neoprene (Black)
E2	Neoprene (Epoxy Backing)
G	Neoprene (White)
J	Nitrile, Abrasive Resistant
S	EPDM Peroxide Cured
X	Special to be described
4	HSN, Highly Saturated Nitrile
6	White EDPM
7	SBR
8	Peroxide Cured Nitrile

4 M 285 B-166 AAA A-2K

Seals	
K rcpg ja	Ambc
Buna N	A
Fluoroelastomer	B
Fluorosilicone	C
PTFE Impregnated Fluoroelastomer	D
Neoprene (Black)	E
Neoprene (White)	G
Nitrile (Low Temp)	M
Natural Rubber	N
AFLAS	R
EPDM (NORDEL)	S
Low Temp Neoprene	V
Kalrez	Y
Zalak	Z
Highly Saturated Nitrile	4
White EPDM	6
SBR	7
Peroxide Cured Buna N	8
PTFE/SIL	9A
PTEE/Viton	9B

Ambc	Qc rKQcpgcq
2	(3) Stainless Steel 316 ASTM A743 GR CF-8M
3	(AB) Aluminum Bronze ASTM B148 Alloy C95300 (9B)
5	(Monel) ASTM A494, M30C QQ-N-288 COMP A or E
6	Inconel 600 ASTM A494 Alloy CY-40
7	Alloy 20 Stainless Steel ASTM A743 Gr. CN7M
C	Hastelloy C ASTM A494 Alloy CW 12MW
H	Aluminum Bronze ASTM A148 Alloy C95300 Electroless Nickel Plated
0	Special to be described

NORRIS OPERATORS

Code	Manual Operators
1A	(1.5-12) STD Handle with 1J Topworks
1F	(2-12) Squeeze Trigger 10 Pos
1FM	(1.5-12) 1F with Marine Trim
1J	(2-12) STD Topworks On-Off
1AM	(2-5) STD Handle with 1JS Topworks
1P	(2-8) Locking Topworks
1Q	(2-5) 1P Topworks with STD Handle
1JS	(2-5) STD On-Off Topworks, Stainless Steel

V REF	i FDCSIBH I FESBT
2E	(2-12) Gear - W.P. - Aluminum Bronze Marine Trim
2ES	(2-12) 2E Subm. for Salt Water
2R	(2-12) Gear Operator Aluminum Case
2T	(2-36) Gear Operator Cast Iron Case
2RM	2R with Marine Trim
2TM	2T with Marine Trim

V REF	W.BISBIM I FESBT
**	
2G11	(2-4) 35 SR Diaphragm
2G12	(2-4) 35 PB Diaphragm
2G13	(2-8) 70 SR Diaphragm
2G14	(2-8) 70 PB Diaphragm
2G15	(6-12) 180A SR Diaphragm
2G16	(6-12) 180 PB Diaphragm
2G17	(12-20) 180 SR Diaphragm
2G18	(12-20) 180 PB Diaphragm

**2G Numbers listed are Basic Numbers
Only. Complete Actuator Model Number
Must be Used when ordering.
SR-Spring Return. Specify Fail/Open or Fail
Closed.
PB-Pressure Balanced/Double Acting.

Please note: not all available options are shown.

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liquid Sizing equations

english Formula

$$C_v = Q \sqrt{\frac{G}{\Delta P}}$$

$$Q = C_v \sqrt{\frac{\Delta P}{G}}$$

$$\Delta P = \frac{Q^2 \times G}{C_v^2}$$

$$V = \frac{Q \times 0.321}{A}$$

Where:

C_v = Valve flow coefficient

Q = Volume rate of flow in U.S. gpm

G = Specific gravity (water = 1.0)

ΔP = Pressure drop (psi)

V = Velocity in feet per second

A = Area of pipe in square inches

W = Flow in pounds per hour $Q = \frac{W}{500 \times G}$

Sample problem – (solve for C_v)

$Q = 5500$ gpm (kerosene) @ 150 psi

$\Delta P = 2$ psi

$G = 0.824$

hence:

$$C_v = Q \sqrt{\frac{G}{\Delta P}} = 5500 \sqrt{\frac{0.824}{2.0}} = 5500 \times 0.6419 = 3530$$

1. For on-off, an 8" Norris R-200 Series has a C_v of 4100 at 90° open. Checking the liquid velocity of an 8" valve, where $A = 50.0$ sq. in., $V = 35$ fps which is above the velocity limits of M-Series (16 fps). Therefore, a 10" R-Series would be required. To be within the flow velocity limits of M-Series (16 fps), a 12" valve would be required.
1. For a throttling application, a 16" valve would be required, which has a C_v range of 720 @ 30° open and 3850 at 60° open.

metric Formula

$$C_v = 1.16 \times Q \sqrt{\frac{G}{\Delta P}}$$

$$Q = 0.86 \times C_v \sqrt{\frac{\Delta P}{G}}$$

$$\Delta P = \frac{Q^2 \times G}{(0.86 \times C_v^2)}$$

$$V = \frac{Q \times 2.783}{A}$$

Where:

C_v = Valve flow coefficient

Q = Volume rate of flow in m³/hr

G = Specific gravity (water = 1.0)

ΔP = Pressure drop (bar)

V = Velocity in meters per second

A = Area of pipe in square centimeters

W = Flow in kilograms per hour $Q = \frac{W}{500 \times G}$

Sample problem – (solve for C_v)

$Q = 1247$ m³/hr (kerosene) @ 9.7 bar

$\Delta P = 0.138$ bar

$G = 0.824$

hence:

$$C_v = 1.16 \times Q \sqrt{\frac{G}{\Delta P}} = 1447 \sqrt{\frac{0.824}{0.138}} = 1447 \times 2.44 = 3530$$

1. For on-off, a 200mm Norris R-200 Series has a C_v of 4100 at 90° open. Checking the liquid velocity of an 200mm valve, where $A = 322.58$ cm², $V = Q \times 2.783/A = 10.7$ m/s which is above the velocity limits of R-Series (9.14 m/s). Therefore, a 250mm R-Series would be required. To be within the flow velocity limits of M-Series (4.88 m/a), a 200mm valve would be required.
1. For a throttling application, a 400mm valve would be required, which has a C_v range of 720 @ 30° open and 3850 at 60° open.

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metric Conversions r elative to Flow Calculations

RnAmltcpr	glrm	ksjrgnjw w
pounds/hour	kilograms/hour	0.4536
inches ²	centimeters ²	6.4516
feet/second	meters/second	0.3048
pounds/inch ² (psi)	Bar	0.0689
pounds/inch ² (psi)	kilograms/meters ²	0.2268
gallons/minute	meters ³ /hour	0.2268
inches	millimeters	25.40

Specific gravity of Various Liquids

(at standard temp. °F)

Glbsqrpq_b		Oilpatch	
Acetic acid	0.79	Fresh water	1.0
Alcohol-butyl	0.81	Produced water	1.02
Alcohol-ethyl	0.798	Crude oil	
Alcohol-methyl	0.79	20° API	0.924
Ammonia	0.662	30° API	0.876
Automobile oil	0.88-94	40° API	0.825
Benzene	0.879	50° API	0.779
Brine	1.2	Potassium chloride	
Bromine	2.9	8.53 lb/gal	1.024
Carbon tet.	1.59	9.09 lb/gal	1.091
Formic acid	1.221	Calcium chloride	
Freon 11	1.49	9.0 lb/gal	1.079
Freon 12	1.33	10.0 lb/gal	1.199
Freon 21	1.37	Sodium chloride	
Fuel oils	0.82-95	9.0 lb/gal	1.079
Gasoline	0.72	10.0 lb/gal	1.199
Glycol ethylene	1.125	Sodium chloride – calcium chloride solution	
Hydrochloric acid 31.5%	1.15	10.1 lb/gal	1.211
Kerosene	0.824	11.0 lb/gal	1.319
Nitric acid 60%	1.37	Drilling muds	
Sulfuric acid 100%	1.83	10.0 lb/gal	1.20
Sulfuric acid 95%	1.83	13 lb/gal	1.56
Sulfuric acid 60%	1.50	16 lb/gal	1.92
Water – fresh	1.0	19 lb/gal	2.28
Water – sea	1.03	HCL 10%	
		20%	1.100
		30%	1.152
		Diesel Fuel	0.8156

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TABLE II – FLOW COEFFICIENT (C_v) FOR 200 PSI Valves

T jtcMncl		BcepccqMncl							
		0.	1.	2.	3.	4.	5.	6.	7.
2"	50 mm	11.2	17.8	27.5	44	68	107	142	170
2.5"	65 mm	16.5	26	42	67	105	165	225	290
3"	75 mm	22	36	59	94	150	238	330	430
3.5"	90 mm	29	47	78	127	200	320	460	610
4"	100 mm	36	60	100	160	260	420	610	830
5"	125 mm	52	90	152	248	400	650	980	1,400
6"	150 mm	70	125	215	350	580	930	1,420	2,100
8"	200 mm	112	210	365	610	1,000	1,620	2,600	4,100
10"	250 mm	160	310	560	920	1,550	2,520	4,150	6,900
12"	300 mm	220	430	800	1,300	2,200	3,600	6,100	10,500
14"	350 mm	285	570	1,050	1,750	3,000	4,950	8,600	15,000
16"	400 mm	350	720	1,350	2,250	3,850	6,400	11,500	20,000
18"	450 mm	430	880	1,700	2,800	4,900	8,000	14,400	26,800
20"	500 mm	510	1,080	2,100	3,400	6,000	9,900	18,000	34,000
22"	550 mm	600	1,280	2,450	4,100	7,200	11,900	22,000	42,000
24"	600 mm	690	1,490	2,880	4,800	8,500	14,100	26,300	51,800
26"	650 mm	790	1,720	3,350	5,600	10,000	16,500	31,500	62,000
28"	700 mm	900	1,950	3,800	6,400	11,500	19,200	37,000	74,000
30"	750 mm	1,000	2,200	4,300	7,400	13,000	22,000	42,000	85,000
32"	800 mm	1,100	2,500	5,000	8,400	15,000	25,000	50,000	100,000
36"	900 mm	1,400	3,200	6,300	10,600	19,000	31,600	63,000	126,000

NOTE: Use 30° to 60° range (shaded area) for sizing throttling valves.

TABLE III – FLOW COEFFICIENT (C_v) FOR ANSI 150, (285 Series) 285 PSI Valves

T jtcMncl		BcepccqMncl							
		0.	1.	2.	3.	4.	5.	6.	7.
2.5"	65 mm	15	23	38	60	84	132	180	232
3"	75 mm	20	32	52	85	120	190	264	344
4"	100 mm	32	54	90	144	208	336	488	664
5"	125 mm	47	81	137	223	320	520	784	1,120
6"	150 mm	63	113	194	315	464	744	1,136	1,680
8"	200 mm	101	189	329	549	800	1,296	2,080	3,280
10"	250 mm	144	279	504	828	1,240	2,016	3,320	5,520
12"	300 mm	198	387	720	1,170	1,760	2,880	4,880	8,400
14"	350 mm	285	570	1,050	1,750	3,000	4,950	8,600	15,000
16"	400 mm	350	720	1,350	2,250	3,850	6,400	11,500	20,000
18"	450 mm	430	880	1,700	2,800	4,900	8,000	14,400	26,800
20"	500 mm	510	1,080	2,100	3,400	6,000	9,900	18,000	34,000
22"	550 mm	600	1,280	2,450	4,100	7,200	11,900	22,000	42,000
24"	600 mm	690	1,490	2,880	4,800	8,500	14,100	26,300	51,800
26"	650 mm	790	1,720	3,350	5,600	10,000	16,500	31,500	62,000
28"	700 mm	900	1,950	3,800	6,400	11,500	19,200	37,000	74,000
30"	750 mm	1,000	2,200	4,300	7,400	13,000	22,000	42,000	85,000
32"	800 mm	1,100	2,500	5,000	8,400	15,000	25,000	50,000	100,000
36"	900 mm	1,400	3,200	6,300	10,600	19,000	31,600	63,000	126,000

NOTE: Use 30° to 60° range (shaded area) for sizing throttling valves.

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Table VII – Operating Torque S 200 Series (inch pounds)

Operating torques for wet service shown in table below include 50% service factor. For dry torques, multiply the values shown by 1.33.

Valve Size	M-Series – Wet Service											D-Series – Wet Service										
	Line Pressure – PSI											Line Pressure – PSI										
	0	50	75	100	125	150	175	200	0	50	75	100	125	150	175	200						
IN	MM	0	50	75	100	125	150	175	200	0	50	75	100	125	150	175	200					
2	50	64	89	101	114	126	138	150	162	24	63	81	98	115	131	146	164					
2.5	65	72	96	109	121	134	146	158	170	24	63	81	98	115	131	146	164					
3	75	100	129	143	158	172	187	202	216	31	84	106	126	144	166	184	203					
3.5	90	128	172	194	216	238	260	282	304	31	84	106	126	144	166	184	203					
4	100	160	220	248	280	308	340	368	400	64	162	205	249	285	327	368	410					
5	125	245	352	400	440	488	544	584	640	98	260	330	391	451	530	591	656					
6	150	720	800	840	896	940	984	1032	1080	297	600	704	806	881	972	1,045	1,154					
8	200	1,512	1,782	1,848	1,968	2,096	2,224	2,320	2,448	624	1,231	1,478	1,697	1,912	2,113	2,262	2,479					
10	250	2,160	2,512	2,688	2,872	3,040	3,216	3,408	3,600	648	1,601	1,949	2,262	2,508	2,814	3,067	3,330					
12	300	3,448	3,960	4,200	4,400	4,696	4,944	5,192	5,440	690	2,947	2,625	3,053	3,463	3,832	4,154	5,032					
14	350	5,700	6,500	6,900	7,300	7,700	8,200	8,600	9,000	855	2,898	3,600	4,078	4,463	4,743	4,990	5,118					
16	400	7,100	8,100	8,600	9,000	9,500	10,000	10,500	11,000	710	3,404	4,510	5,260	5,780	6,265	6,705	6,975					
18	450	9,550	10,800	11,500	12,100	12,700	13,000	14,000	14,600	860	4,576	6,145	7,328	8,102	8,826	9,986	9,824					
20	500	10,100	12,100	13,100	14,000	15,000	16,000	17,000	18,000	1,010	5,162	6,985	8,286	9,231	10,122	10,939	11,475					
22	550	11,500	13,500	14,400	15,200	16,300	17,000	17,700	18,500	1,265	5,730	6,480	7,600	8,802	9,690	10,443	11,285					
24	600	14,500	17,000	18,000	19,000	20,250	21,500	22,750	24,000	1,595	6,460	8,100	9,500	10,935	12,255	13,423	14,640					
26	650	17,500	20,500	22,000	23,500	25,200	27,000	28,500	30,000	1,925	7,790	9,900	11,750	13,608	15,390	16,865	18,300					
28	700	20,000	25,000	27,500	30,000	32,500	35,000	37,500	40,000	2,000	8,000	10,175	12,300	14,625	16,800	19,125	21,200					
30	750	35,000	38,750	40,625	42,500	44,375	46,250	48,150	50,000	2,100	11,625	15,031	17,425	19,969	22,200	24,544	26,500					
32	800	30,000	36,000	39,000	42,500	45,600	48,800	52,000	55,000	2,200	13,500	17,575	20,500	23,625	26,400	29,325	31,800					
36	900	40,000	47,500	52,200	55,000	58,800	62,500	66,300	70,000	2,600	14,500	20,400	26,300	32,700	38,200	44,100	50,000					

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Table VIII – ANSI 150 Operating G Torque S 285 Series (INCH POUNDS)

Operating torques for wet service shown in table below include 50% service factor. For dry torques, multiply the values shown by 1.33.

		Operating Torque (INCH POUNDS)												
		Wet Service												
		Dry Service												
IN	MM	0	50	100	150	200	285	0	50	100	150	200	285	
2.5	65	100	134	169	204	238	275	86	133	181	229	276	285	
3	75	140	180	221	261	302	504	115	172	230	288	345	448	
4	100	224	308	392	476	560	672	207	328	448	569	690	897	
5	125	343	492	616	761	896	1,050	310	550	787	1,027	1,265	1782	
6	150	1,000	1,120	1,254	1,377	1,512	1,820	575	907	1,240	1,572	1,904	2,645	
8	200	2,116	2,419	2,755	3,113	3,427	4,060	862	1,625	2,386	3,148	3,910	5,175	
10	250	3,024	3,516	4,020	4,502	5,040	5,880	1,207	2,343	3,478	4,615	5,750	7,360	
12	300	4,827	5,544	6,216	6,921	7,616	9,100	1,495	3,938	6,382	8,826	11,270	11,300	
14	350	6,500	7,475	8,400	9,500	10,300	12,600	1,730	4,900	8,000	11,300	14,500	21,000	
16	400	8,000	9,300	10,300	11,500	12,500	15,000	2,050	6,150	10,200	14,300	18,400	26,500	
18	450	11,000	12,500	14,000	15,300	17,000	21,000	2,300	6,800	11,300	15,700	20,000	29,000	
20	500	11,600	14,000	16,000	18,500	20,700	25,300	2,600	8,400	14,300	20,000	26,000	38,000	
24	600	16,700	19,500	22,000	25,000	27,000	33,000	3,100	10,800	18,500	26,000	34,000	50,600	
30	750	40,000	45,000	49,000	53,000	58,000	68,000	3,900	17,600	31,300	45,000	59,000	86,250	
36	900	46,000	55,000	63,000	72,000	71,000	98,000	5,200	27,000	49,000	70,000	92,000	126,000	

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Material Selection

How to Select trim material for Norris Butterfly Valves

The following data is intended as a guide to selecting metals and elastomers for internal wetted parts of Norris butterfly valves in specific applications.

Because of Norris' dry back construction, body materials are not affected by the flow stream. Pressure, temperature and external environment are the critical considerations in selection of body materials.

Norris elastomer seats are harder, less porous and less subject to swell and deterioration than those used in vertical disc butterfly valves. The specially compounded elastomers are of greater density and higher durometer. Use of these harder elastomers is possible because Norris' precision-machined angle disc doesn't have to penetrate as deep into the seat to give positive, bubble-tight shutoff.

When premium elastomers are required for an application, selection of Norris M-Series valves with replacement metal seats may be more economical because of the limited amount of elastomer used for sealing.

How to use the guide

This guide has been prepared from published data, vendor ratings, laboratory and field experi-

ence. Recommendations are based on 75°F. Because of varying temperature, aeration, inhibiting and accelerating contaminants often encountered, Norris does not guarantee corrosion resistance of any material. When chemicals are mixed, it cannot be assumed a metal or elastomer will provide the same corrosion resistance as described for the pure chemical.

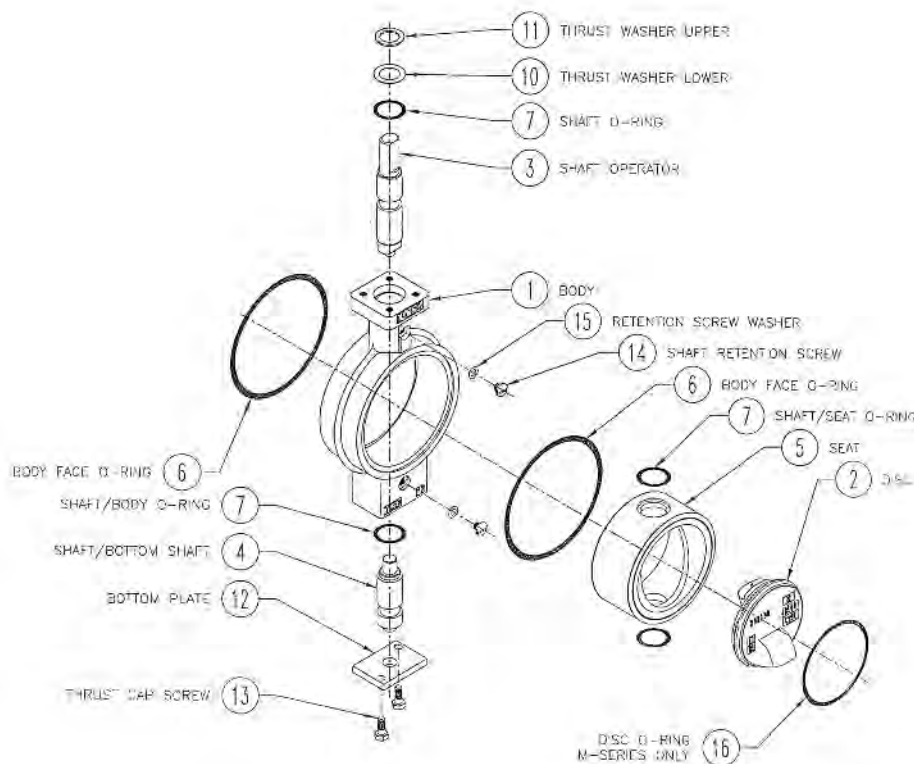
The ratings reported in this brochure should be considered as a guide and not as an unqualified recommendation. It is necessary that the user approve each material for a specific application. Where valve performance is critical, we suggest actual product testing be done to assure material compatibility with the flow stream.

For applications which require clarification or for additional information, contact Norris Butterfly Valve Application Engineering Department, Houston, Texas 713-466-3552.

Rating Legend

- 1 – Fully resistant
- 2 – Satisfactorily resistant (slightly attacked)
- 3 – Test for application
- X – Not recommended
- Insufficient data

For your convenience, the media are presented in alphabetical order.



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How to Install & Service Norris Butterfly Valves

Installation of Norris butterfly valves is a simple procedure that requires no special tools. Special care should be taken, however, in unpacking and installing the valve to avoid damage to the sealing surfaces (o-ring flange seals, seat and disc edge or disc o-ring).

Installation Compatibility

Norris wafer span and lug type valves 2" through 36" are designed for use with ANSI 150 flanges with an inside diameter equivalent to Scheduled 40 pipe ID. Check disc clearance charts on individual valve data sheets to be sure the inside diameter of companion flanges and piping does not interfere with disc movement when the valve is cycled to the open position. Back beveling of heavy wall, plastic or cement pipe may be required for disc clearance.

Weldneck, socket weld or slip-on flanges can be used with Norris metal-lined M-Series and D-Series valves with no special preparation.

Weldneck or socket weld flanges are recommended for use with elastomer-lined R-Series valves. Slip on type flanges are not recommended for use with R-Series valves. Slip on type flanges should only be used with R-Series valves when the flanges have been installed with single beveled, fillet-reinforced weld, per Mil-Std-22A, P43.

Norris automated valves and those with gear operators should be installed between flanges with the operator in place. Lever operated valves are shipped with the handle removed. Attach handle to operator shaft and check disc to be sure it seats on raised sealing surface before installing between flanges.

Required Tools and Materials

The only tool required to install Norris butterfly valves is a wrench suitable for tightening flange bolts and nuts or cap-screws. A hoist may be required for 10" and larger valves. Smaller sizes can usually be handled by one man. Temporary pipe supports may be used to keep the flange faces parallel and aid in installing the valve. Flange gaskets are not required since o-ring flange-face seals are a built-in feature of the Norris valve design.

Flange bolts and nuts or capscrews are not included with valve shipment unless ordered as a separate item. The individual Valve Data Sheets will indicate the required number and size of bolts

or capscrews which are available from most supply stores or distributors.

Preparing Valve and Flanges

If the valve and flanges are properly prepared for installation, problems can be avoided later. Flange faces should be free of dirt, grit, dents or surface irregularities which might damage the body o-ring flange seals and cause leakage at the flange. Also inspect the valve and wipe away any grit or dirt which might be around the seat seals or disc. The valve must be in the "closed position" to protect the sealing edge of the disc.

Installation of all 2"-12" Span Type Valves

Loosely bolt lower half of flanges together. Make sure the flanges are separated enough to allow the valve to be inserted without damaging flange seals and the face of the elastomer seat.

Insert valve between flanges faces with care and lower into bolt cradle. Special care should be taken, especially when raised-face flanges are used, to prevent damage to face of seat and o-ring flange seals during installation.

Loosely install remaining flange bolts and nuts.

Snug all flange bolts. Tighten first one bolt and then the opposite, 180° apart, keeping flange faces parallel. Make sure there is full metal-to-metal contact between flange and valve face. The o-ring seal makes excessive bolt loading unnecessary.

Installation of all 14"-36" Semi-lug & 4"-36" Full Lug Valves

Attach valve to one flange and then the other using the taper flange holes. Loosely install all capscrews in tapped holes on one flange. Tighten evenly working with alternate capscrews 180° apart. Keep flange and valve faces parallel.

Tighten capscrews evenly in the same manner, alternating between screws that are 180° apart. Make sure there is full metal-to-metal contact between flange and valve face. Do not over-tighten capscrews. The o-ring flange seal makes excessive bolt loading unnecessary.

Repeat procedure for second flange.

In the case of semi-lug 14" through 36" valves, install remaining bolts after valve is attached to both flanges.

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Maintenance and Repair

Norris butterfly valves are designed and manufactured to exacting standards to help avoid operating problems. However, trouble with valves can occur if they are improperly handled, if they are used beyond the recommended working pressure and flow rates, or if the wetted parts are not compatible with the flow medium.

Operating maintenance and lubrication is not required. Shaft bearing surfaces have been factory lubricated. O-ring seat and shaft seals are permanently locked in lubricant to prevent flow medium from penetrating major bearing surfaces.

Under normal conditions, operating torques will not exceed a comfortable range for manual operation of the valve although valve torques may increase somewhat with age.

Disassembly/assembly Instructions for 2"-12" 200 psi Valves

Remove all pressure from line. Close valve and remove flange bolts or capscrews. Spread flanges so valve can be removed without damaging face of elastomer seat.

How to Disassemble 2"-12" Valves

Remove all pressure from line. Close valve and remove flange bolts or capscrews. Spread flanges so valve can be removed without damaging face of elastomer seat.

How to Disassemble 2"-12" Valves

1. Open disc (#2) enough to clear raised seating surface.
2. Remove topworks, gear operator or other actuator.
3. Remove capscrews (#13) and bottom plate (#12)
4. Remove top shaft retention screw (#14) and washer (#15)
5. Pull top and bottom shaft (#3 & #4) from body with pliers or visegrips. O-ring shaft seal (#7) and thrust washers (#10 & #11) will come out with top shaft. Bottom O-ring shaft seal (#7) will come out with bottom shaft.
6. Push disc (#2) from seat carefully so as not to damage sealing edge.

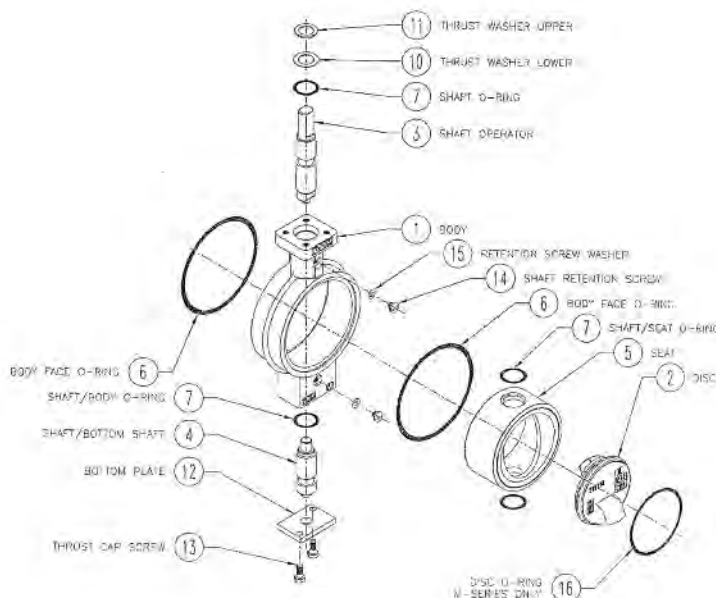
Repairs which may be required

1. O-ring flangeseal replacement if a leak develops between flange and valve body. Flange seal can be replaced without disassembling the valve and replacing the seat. See step 6 of assembly procedure on following pages. Flange face should be inspected for dirt, grit or irregularities which could prevent sealing, or damage replacement seal.
2. Seat, disc or disc o-ring replacement if the valve develops a leak through the valve bore.
3. Replacement of o-ring shaft seals if valve develops a leak at top or bottom shaft or operating torque increases beyond comfortable limits.
4. Shaft replacement if shaft becomes corroded or operating torque increases appreciably.
5. Disc or shaft replacement if drive slot or shaft is damaged by pressure surges or flow velocity exceeding recommended limits.

7. Tap seat (#5) from body with plastic or rubber mallet. O-ring flange seals (#6) will come free as seat is removed. Seat o-rings (#7) will be in counterbore of seat.

For M-Series Valves Only:

Inspect disc o-ring for damage or compression set. If replacement is necessary, carefully cut the o-ring (#16) and remove from disc edge groove. Do not pry the o-ring loose with sharp tools which could damage the disc or groove. See special instructions for replacing the o-ring (page 32).



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Thoroughly clean all parts, then grease outside diameter and raised sealing surface of seat, all o-rings and disc edge with a silicon based lubricant such as Dow Corning Valve-Seal or Magnalube.

5Sgf[a` , HS`hW_ gef` af TVbgf g` VVlbd/tegdV
g` f[^fabi ad]e abVbSfadS` V Taffa_ b`SfVZShW
TVW [efS`Wz

- Place shaft o-rings (#7) in seat counterbores, slip seat (#5) into body (#1), accurately aligning shaft holes in seat with shaft bores in body. A "soft" plastic or rubber mallet may be used to tap seat into place if necessary.
- Grease bearing surface (nub) of bottom shaft (#4) and full length of operator shaft (#3) with a general purpose lubricant. Insert operator shaft and bottom shaft to check alignment of shaft bore in seat and body. Carefully revolve shaft past the seat and seat o-rings to prevent damage to these sealing surfaces. *Do not force shaft past seat o-ring and seat.* If necessary, realign seat with shaft bores. Withdraw the shafts enough to allow clearance for disc.
- Insert disc (#2) perpendicular to shaft holes and raised sealing surface, then rotate 90° to align disc bosses with shaft bores. Engage bottom shaft (#4) with bottom disc boss. Insert shaft

o-ring (#7) in counterbore of body, attach bottom plate (#12) with two capscrews (#13). Align flats of operator shaft (#3) with milled slot in disc boss and insert as far as it will go.
Do not hammer shaft into place.

Install retention washer (#15) and shaft retention screw (#14) in valve. Rotate top shaft (#3) to be sure retention screw (#14) does not interfere with shaft movement.

5ZVW] fa TVtegdV[eUeVbfe a` dS[eVW
eVb [Y egdSUV

If it does not, rotate disc 180°. Disc can be rotated 360° without damaging valve.

- Insert o-ring flange seal (#6) in groove between body and seat. Avoid stretching o-ring by first pressing it into place at four points – 12, 3, 6, and 9 o'clock – then pressing it into place alternately at points between until the entire o-ring is smooth and evenly secured.
- Insert shaft o-ring (#7), stainless steel washer (#10) and Teflon washer (#11) in counterbore of mounting pad. Install topworks or operator. Again, check to be sure disc seats on raised sealing surface.
- Install valve between flanges.

5Sgf[a` , HS`hW_ gef` af TVbgf g` VVlbd/tegdV
g` f[^fabi ad]e adabVbSfad[e [efS`Wz

Disassembly/assembly Instructions for 14"-36" 200 psi Valves

5Sgf[a` , ;f [e` af eSUVfa_ S] VbS` k HS`hWd/bS[de
i Z[VWZVhS`hW[e g` VVlbd/tegdV]6a` af `aaeV
USbeUW e adSfV] bf fa dV ahWfabi ad]e
abVbSfadadTaffa_ b`SfVg] f[^S`^bd/tegdVSe
TVW V [SfV S` V HS`hWdV ahW Xb_ [V

Fa DW ahVHS`hWkb_ > [W

Remove all pressure from line. Close valve. Attach hoist to support valve and aid in removing valve from line. Use of temporary pipe supports will help prevent damage to the valve.

Remove flange bolts. All capscrews should be removed from one flange and then the other. Spread flanges so valve can be lifted from the line without damaging disc edge. o-ring flange seals, or face of elastomer seat.

To Disassemble 14"-36" Valves

Lay valve body flat between two blocks or saw-horses to simplify disassembly and assembly.

- Open disc, then remove gear operator or other actuator and shaft key (#11).
- Remove capscrews (#18) and thrust cap (#9). Remove split thrust washer (#10), shim set (#8) and o-ring shaft seal (#16) from shaft bore, taking care not to damage the shaft.
- Remove capscrews (#22) from disc pin and tap pin (#7) out with a "soft" hammer.
- Attach a sling to support disc and prevent damage to the sealing edge as the shaft is removed from body.
- Remove shaft (#3) through bottom bore of body. Tap top of shaft with a soft plastic or rubber hammer to loosen, then pull the opposite end. Disc (#2) will come free when shaft has been removed.
- Tap seat (#6) from body with plastic or rubber mallet. O-ring flange seals (#15) will come free as seat is removed. Seat o-rings (#16) will be in centerbores of seat.
- Remove shaft o-rings from grooves in shaft.

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Remove o-ring shaft seal (#16) and Teflon washer (#27) from top shaft bore.

For M-Series Valves Only:

Inspect disc o-ring for damage or compression set. If replacement is necessary, carefully cut the o-ring (#25) and remove from disc edge groove. Do not pry the o-ring loose with sharp tools which could damage the disc or groove. See special instructions for replacing the o-ring (page 32)

To Assemble 14"-36" Valves

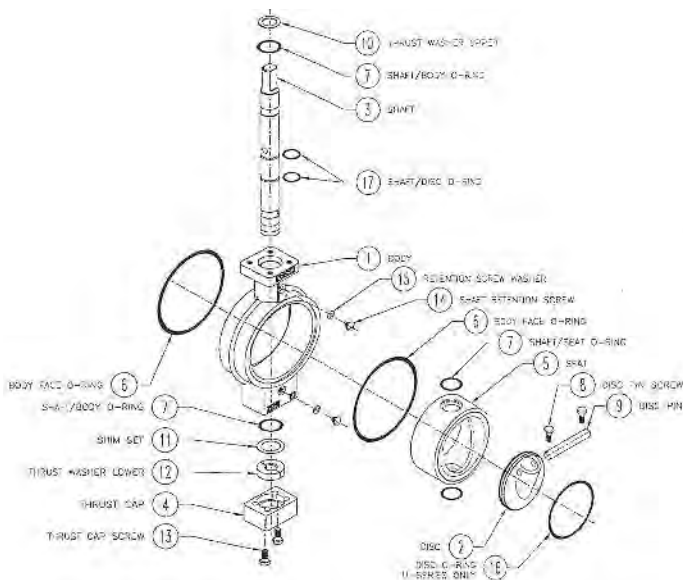
1. Thoroughly clean all parts, then grease outside diameter and raised sealing surface of seat, all o-rings and disc edge with a silicon based lubricant such as Dow Corning Valve-Seal or Magnalube.

5Sgf[a` , BVfcb Vtj_ TSeW` gTqUS` fe US` USgeW VS_ SYWfa ea_ WMSefa_ Vtb S` V eZagV` af TW geW a` djTTVtbSfez`

- 2. Place shaft o-rings (#16) in seat counterbores, slip seat (#6) into body (#1), accurately aligning shaft holes in seat with shaft bores in body. A "soft" plastic or rubber mallet may be used to tap seat into place if necessary.
- 3. Carefully roll shaft o-rings (#17) into shaft grooves.
- 4. Attach a sling to disc (#2). With the hoist, carefully lower disc into seat perpendicular to shaft bores and raised sealing surface. Rotate disc to align bosses with shaft bores.
- 5. Grease shaft (#3) thoroughly with general purpose lubricant. Insert shaft, carefully revolving it past o-rings and seat to prevent damage to these sealing surfaces. Do not force

shaft past seat o-rings and seat. *Do not hammer into place.*

- 6. Rotate disc to align disc pin hole with hole in shaft. Insert disc pin (#7) and attach capscrews (#22). A soft hammer may be used to tap the disc pin into place. Close the disc.
- 7. Insert bottom shaft o-ring (#16) in counterbore of body. A set of shims (#8) is provided to balance the self centering disc. A split thrust washer (#10) and thrust cap (#9) hold them in place. The number of shims necessary for each valve may vary because of manufacturing tolerances. Insert the thrust washer (#10), determine the correct number of shims required for a tight fit. Remove shim and thrust washer. Install the required shims, thrust washer and close with thrust cap (#9) and capscrews.
- 8. Insert o-ring flange seals (#15) in groove between body and seat. Avoid stretching o-ring by first pressing it into place at four points – 12, 3, 6, and 9 o'clock – then pressing it into place alternately at points between until the entire o-ring is smooth and evenly secured.
- 9. Insert o-ring (#16) and Teflon washer (#27) in counterbore and mounting pad.
- 10. Insert shaft key (#11) and install gear operator or other actuator. Close valve to be sure disc seats on raised sealing surface. If it does not, rotate disc 180°. Disc can be rotated a full 360° without damaging the valve.
- 11. Use hoist to install valve between flanges. Temporary pipe supports should be used to keep flanges parallel during installation and prevent damage to disc edge, o-ring flange seals, and face of elastomer seat.



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Disassembly/assembly Instructions for 2½"-12" 285 psi Valves

5Sgf[a` , ;f [e` af eSXVfa _ S] VS` k hS`hVdVbS[cb
i Z[VfZVhS`hV[e g` VVlbdVdegdV6a` af` aaeV
USbeUdV e adSffV bf fa dV ahVfabi adj et
abVbSfadadZdgef USb g` f[^S^bdVdegdVZSe TVWV
V[[SFV S` V hS`hVdV ahV Xb_ ↑ V

DV ah[Y HS`hVXb_ >[W

Remove all pressure from line. Close valve and remove flange bolts or capscrews. Spread flanges so valve can be removed without damaging face of elastomer seat.

To Disassemble 2½"-12" Valves

Lay valve body flat between two blocks or secure rim of body in vise to simplify disassembly and assembly.

1. Open disc, then remove gear operator or other actuator and key.
2. Remove shaft retention screws (#14) and washers (#15).
3. Remove capscrews (#16) and thrust cap (#13). Remove split thrust washer (#12), shim set (#11) and o-ring shaft seal (#7) from shaft bore, taking care not to damage the shaft.
4. Remove capscrews (#8) from disc pin and tap pin (#9) out with a "soft" hammer.
5. Support the disc to prevent damage to the seal edge as the shaft is removed from body.
6. Remove shaft (#3) through bottom bore of body. Tap top of shaft with a soft plastic or rubber hammer to loosen, then pull from the opposite end. Disc (#2) will come free when shaft has been removed.
7. Tap seat (#5) from body with rubber mallet. O-ring flange seals (#6) will come free as seat is removed. Seat o-rings (#7) will be in counterbores of seat.
8. Remove shaft o-rings (#17) from grooves in shaft.
9. Remove o-ring shaft seal (#7) and TFE washer (#10) from top shaft bore.

For M-Series Valves Only:

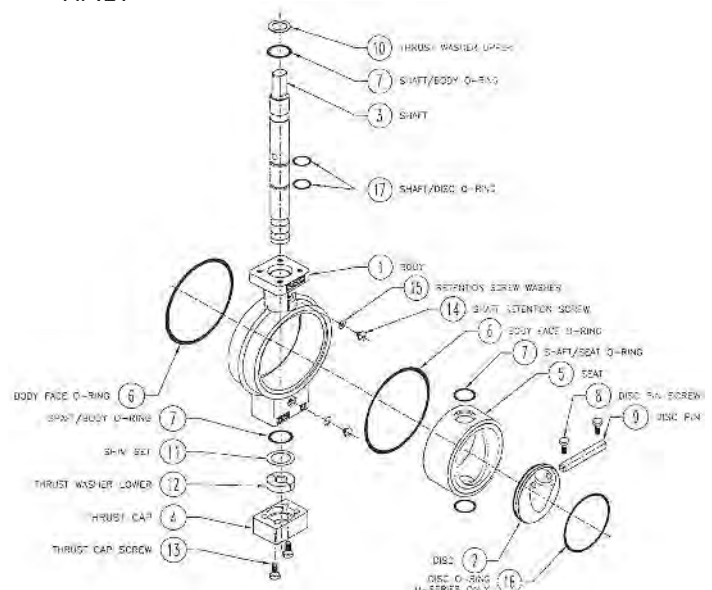
Inspect disc o-ring for damage or compression set. If replacement is necessary, carefully cut the o-ring (#19) and remove from disc edge groove. Do not pry the o-ring loose with sharp tools which could damage the disc or groove. See special instructions for replacing the o-ring (page 32).

To Assemble 2½"-12" Valves

1. Thoroughly clean all parts, then grease outside diameter and raised sealing surface of seat, all o-rings, and disc edge with a silicon based lubricant such as Dow Corning Valve Seal or Magnalube.

5Sgf[a` , BVVb Vd_ TSeW` gTqUS` fe US` USgeW
VS_ SYVfa ea_ VVbSefa_ Vtb S` V eZagV` af TW
geW a` djTTVlbSfez

2. Place o-ring seat seals (#7) in seat counterbores. Slip seat (#5) into body (#1), accurately aligning shaft holes in seat with shaft bores in body. A "soft" plastic or rubber mallet may be used to tap seat into place if necessary.
3. Carefully roll shaft o-rings (#17) into shaft grooves.
4. Carefully lower disc (#2) into seat perpendicular to shaft bores and raised sealing surface. Rotate disc to align bosses with shaft bores.
5. Grease shaft (#3) thoroughly with general purpose lubricant. Insert shaft, carefully revolving it past o-rings and seat to prevent damage to these sealing surfaces. Do not force shaft past seat o-rings and set. *Do not hammer into place.*
6. Rotate disc to align disc pin hole with hole in shaft. Insert disc pin (#9) and attach capscrews (#8). A soft hammer may be used to tap the disc pin into place. Close the disc.
7. Install shaft retention screws (#14) and washers (#15).



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- Insert bottom shaft o-ring (#7) in counterbore of body. A set of shims (#11) is provided to balance the self centering disc. A split thrust washer (#12) and thrust cap (#13) hold them in place. The number of shims necessary for each valve may vary because of manufacturing tolerances. Insert the thrust washer (#12), determine the correct number of shims required for a tight fit. Remove shims and thrust washer. Install the required shims, thrust washer and close with thrust cap (#13) and capscrews (#16).
- Insert o-ring flange seals (#6) in groove between body and seat. Avoid stretching o-ring by first pressing it into place at four points – 12, 3, 6, and 9 o'clock – then pressing it into place

alternately at points between until the entire o-ring is smooth and evenly secured.

- Insert o-ring (#7) and TFE washer (#10) in counterbore of mounting pad.
- Insert key and install gear operator or other actuator. Close valve to be sure disc seats on raised sealing surface. If it does not, rotate disc 180°. Disc can be rotated a full 360° without damaging valve.
- Use hoist to install valve between flanges. Temporary pipe supports should be used to keep flanges parallel during installation and prevent damage to disc edge, o-ring flange seals and face of elastomer seat.

Disassembly/assembly Instructions for 14"-36" 285 psi Valves

5Sgf[a` , ;f [e` af eSVMfa_ S] Vb` k hS`hMdlVbS[cb
i Z[VWZVhS`hV]e g` VVbdlVdegdV6a` af `aaelV
USbeUblV e adSffV bf fa dV ahVfabi ad]el
abVbSfadadTaffa_ b`SfVg` f[V^S`bdVdegdVZSe
TVV V[[SffV S` V hS`hMdlV ahV Vxb_ ↑ V

Fa DV ahVhS`hVxb_ >[W

Remove all pressure from line. Close valve. Attach hoist to support valve and aid in removing valve from line. Use of temporary pipe supports will help prevent damage to the valve.

Remove flange bolts. All capscrews should be removed from one flange and then the other. Spread flanges so valve can be lifted from the line without damaging disc edge, o-ring flange seals, or face of elastomer seat.

To Disassemble 14"-36" Valves

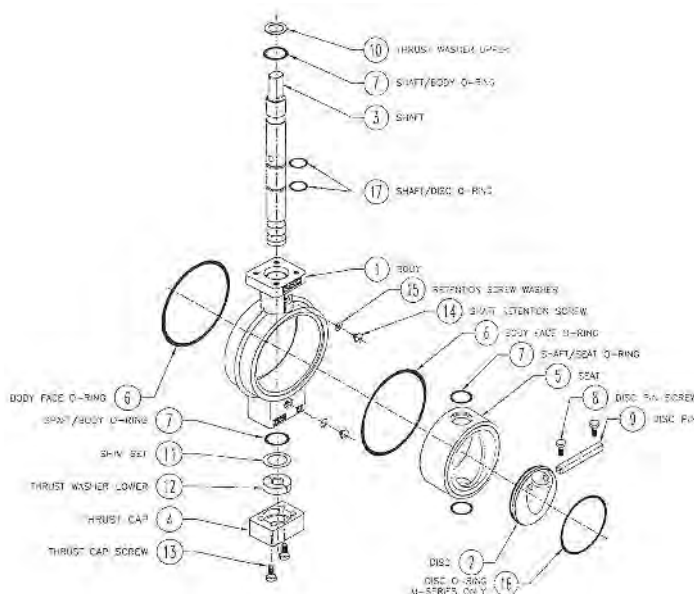
Lay valve body flat between two blocks or saw-horses to simplify disassembly and assembly.

- Open disc, then remove gear operator or other actuator and shaft key (#11).
- Remove capscrews (#18) and thrust washer (#10), shim set (#8) and o-ring shaft seal (#16) from shaft bore, taking care not to damage the shaft.
- Remove capscrews (#22) from disc pin and tap pin (#7) out with a "soft" hammer.
- Attach a sling to support disc and prevent damage to the sealing edge as the shaft is removed from body.
- Remove shaft (#3) through bottom bore of body. Tap top of shaft with a soft plastic or rubber hammer to loosen, then pull from the opposite end. Disc (#2) will come free when shaft has been removed.

- Tap seat (#6) from body with plastic or rubber mallet. O-ring flange seals (#15) will come free as seat is removed. Seat o-rings (#16) will be in centerbores of seat.
- Remove shaft o-rings (#17) from grooves in shaft.
- Remove o-ring shaft seal (#16) and Teflon washer (#27) from top shaft bore.

For M-Series Valves Only:

Inspect disc o-ring for damage or compression set. If replacement is necessary, carefully cut the o-ring (#25) and remove from disc edge groove. Do not pry the o-ring loose with sharp tools which could damage the disc or groove. See special instructions for replacing the o-ring (page 32)



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Thoroughly clean all parts, then grease outside diameter and raised sealing surface of seat, all o-rings and disc edge with a silicon based lubricant such as Dow Corning Valve-Seal or Magnalube.

5Sgf[a` , BVtcb Vtj_ TSeW` gTqUS` fe US` USgeW
VS_ SYWfa ea_ VMSeFa_ VtS` V eZagV` af TW
geW a` djTTVtbbSfez

- Place o-rings (#16) in seat counterbores, slip seat (#6) into body (#1), accurately aligning shaft holes in seat with shaft bores in body. A "soft" plastic or rubber mallet may be used to tap seat into place if necessary.
- Carefully roll shaft o-rings (#17) into shaft grooves.
- Attach a sling to disc (#2). With the hoist, carefully lower disc into seat perpendicular to shaft bores and raised sealing surface. Rotate disc to align bosses with shaft bores.
- Grease shaft (#3) thoroughly with general purpose lubricant. Insert shaft, carefully revolving it past o-rings and seat to prevent damage to these sealing surfaces.
*Do not force shaft past seat o-rings and seat.
Do not hammer into place.*
- Rotate disc to align disc pin hole with hole in shaft. Insert disc pin (#7) and attach capscrews (#22). A soft hammer may be used to tap the disc pin into place. Close the disc.

- Insert bottom shaft o-ring (#16) in counterbore of body. A set of shims (#8) is provided to balance the self centering disc. A split thrust washer (#10) and thrust cap (#9) hold them in place. The number of shims necessary for each valve may vary because of manufacturing tolerances. Insert the thrust washer (#10), determine the correct number of shims required for a tight fit. Remove shim and thrust washer. Install the required shims, thrust washer and close with thrust cap (#9) and capscrews.
- Insert o-ring flange seals (#15) in groove between body and seat. Avoid stretching o-ring by first pressing it into place at four points – 12, 3, 6, and 9 o'clock – then pressing it into place alternately at points between until the entire o-ring is smooth and evenly secured.
- Insert o-ring (#16) and Teflon washer (#27) in counterbore and mounting pad.
- Insert key (#11) and install gear operator or other actuator. Close valve to be sure disc seats on raised sealing surface. If it does not, rotate disc 180°. Disc can be rotated a full 360° without damaging valve.
- Use hoist to install valve between flanges. Temporary pipe supports should be used to keep flanges parallel during installation and prevent damage to disc edge, o-ring flange seals, and face of elastomer seat.

Installing Disc O-ring on 2"-36" m-Series Valves (200 psi and 285 psi rated Valves)

Inspect disc edge for damage. Thoroughly clean the groove tips of dirt and grit which might damage o-ring. Use an emery cloth to smooth edges if necessary. Use a generous amount of silicon based grease such as Dow Corning Valve-Seal or Magnalube on the o-ring. The groove may be lightly greased but excessive amounts of grease in the groove may prevent o-ring from seating properly.

5Sgf[a` , BVtcb Vtj_ TSeW` gTqUS` fe US` USgeW
VS_ SYWfa ea_ VMSeFa_ VtS` V eZagV` af TW
geW a` djTTVtbbSfez

EFVB ° #Z

Place o-ring about half way around disc groove. Holding it in place with one hand, pull o-ring to position on edge of disc with index finger of other hand.

Step #2.

With finger still under o-ring, rotate disc completely to equalize rubber tension.

Step #3.

To ensure equal distribution of the o-ring around the disc, press it into place at four equally spaced points – 12, 3, 6, and 9 o'clock. Six inch and larger valve discs are more easily handled if placed in a vise or laid flat on a clean surface. A smooth bar or hammer handle can be used to press the o-ring into place at the four points.

Step #4.

Continue pressing the o-ring into place at points between the original four, alternately on one side and then the other until the entire o-ring is smooth and evenly secured. Large discs are easily handled by putting the edge of the disc against the chest and working the opposite side. Hold the bar at a

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slight angle and roll a small section of the o-ring into place. Rotate the disc 180° to work the opposite area.

Disc o-rings on large valves can be installed most efficiently with especially prepared sheet metal vise-grips. The grips are heated, flattened and finished so the lips are flush and smooth. They are available from Norris at a nominal charge (Part# 51843A0001).

Follow Step#1 and Step #2 above. Then adjust end screw of vise-grip to close flat plates. Open the grips and turn the end screw one half-turn.

Taking care not to cut through it, squeeze the o-ring with the grips to flatten. The o-ring should slip into the groove easily. Proceed in the same way at 3, 6, and 9 o'clock, then at points between until the o-ring is smoothly secured in the groove.

*@afW/3 [ffVbδSUR[UW [^WST^Wkag fa
WVWd [WfZWJ/SUF SVgef_ Wf Xad[efS^T Y
fZVážq Yž3Vgef_ Wfe i [^hSck XadV[XVdVf
e] Vž axhS^hVž*

DO NOT install o-ring by rolling it up the side of disc into groove. This will cause the o-ring to twist and early failure will result. DO NOT stretch o-ring so cross section is reduced. This will cause it to become large in diameter and even distribution of the o-ring around the disc edge will be more difficult. NEVER pound the o-ring into the groove with a hammer! This will result in damage to the groove lips and prevent the valve from closing properly.



EfVø ° #



EfVø ° \$



EfVø ° %



EfVø ° &



EfVø ° '

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Repair Kits for R&M Series Butterfly Valves

Kits include installation instructions and all rubber goods, washers, shims and lubrication required to rebuild valves. (replacement kit tables – see table copy)



*DZE Valve
d/MS[d] [f
D\$''' ~ D\$*'*

Table 1 – Seat/O-ring Replacement Kits for 200 PSI Rubber Seated Butterfly Valves-r-Series

Use "54000" as a prefix when ordering replacement kits.
Example: Order 54000-A001 for 2" Type A Buna N Replacement Kit.

7'Sefa_ Val	\$S	\$Z S	%S	&S	' S	(S	*S	#'S	#\$\$
Type A Buna N	A001	A004	A007	A010	A013	A016	A019	A021	A024
Type B Viton	B001	B004	B007	B010	B013	B016	B019	B021	B024
Type S EPDM	S001	S004	S007	S010	S013	S016	S019	S021	S024



*DZE Valve
d/MS[d] [f
? \$''' ~ ? \$*'*

Table 2 – O-ring Replacement Kits for 200 PSI Metal Seated Butterfly Valves-m-Series

Use "54000" as a prefix when ordering replacement kits.
Example: Order 54000-A003 for 2" Type A Buna N Replacement Kit.

Elastomer	2"	2.5"	3"	4"	5"	6"	8"	10"	12"
Type A Buna N	A003	A005	A008	A011	A014	A017	A027	A022	A024
Type B Viton	B003	B005	B008	B011	B014	B017	B027	B022	B024
Type S EPDM	S003	S005	S008	S011	S014	S017	S027	S022	S024

Other Available Elastomers:

- Type E Black Neoprene
- Type L ECO
- Type G White Neoprene
- Type 4 HSN
- Type J Abrasion Resistant Buna

Table 3 – Seat/O-ring Replacement Kits for Rubber Seated 285 PSI Butterfly Valves-r-Series

Use "54000" as a prefix when ordering replacement kits.
Example: Order 54000-A127 for 2.5" Type A Buna N Replacement Kit.

Elastomer	2"	2.5"	3"	4"	5"	6"	8"	10"	12"
Type A Buna N	NA	A127	A128	A129	A130	A131	A132	A133	A134
Type B Viton	NA	B127	B128	B129	B130	B131	B132	B133	B134
Type S EPDM	NA	S127	S128	S129	S130	S131	S132	S133	S134

Table 4 – O-ring Replacement Kits for Metal Seated 285 PSI Butterfly Valves-m-Series

Use "54000" as a prefix when ordering replacement kits.
Example: Order 54000-A119 for 2.5" Type A Buna N Replacement Kit.

Elastomer	2"	2.5"	3"	4"	5"	6"	8"	10"	12"
Type A Buna N	NA	A119	A121	A120	A122	A123	A124	A125	A126
Type B Viton	NA	B119	B121	B120	B122	B123	B124	B125	B126
Type S EPDM	NA	S119	S121	S120	S122	S123	S124	S125	S126

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Table 5 – O-RING REPLACEMENT KITS FOR RUBBER SEATED 200 & 285 PSI BUTTERFLY VALVES-R-SERIES

Use "54000" as a prefix when ordering replacement kits.
 Example: Order 54000-A034 for 14" Type A Buna N Replacement Kit.

Elastomer	14"	16"	18"	20"	24"	26"	28"	30"	32"	36"
Type A Buna N	A034	A035	A036	A037	A039	A040	A041	A042	A043	A044
Type B Viton	B034	B035	B036	B037	B039	B040	B041	B042	B043	B044
Type S EPDM	S034	S004	S036	S037	S039	S040	S041	S042	S043	S044

Table 6 – O-RING REPLACEMENT KITS FOR METAL SEATED 200 & 285 PSI BUTTERFLY VALVES-M-SERIES

Use "54000" as a prefix when ordering replacement kits.
 Example: Order 54000-A045 for 14" Type A Buna N Replacement Kit.

Elastomer	14"	16"	18"	20"	24"	26"	28"	30"	32"	36"
Type A Buna N	A045	A046	A047	A048	A050	NA	A052	A053	A054	C.F.
Type B Viton	B045	B046	B047	B048	B050	NA	B052	B053	B054	C.F.
Type S EPDM	S045	S046	S047	S048	S050	NA	S052	S053	S054	C.F.

Table 7 – O-RING REPLACEMENT KITS NORRIS BODY STYLE VALVES

Use "54000" as a prefix when ordering replacement kits.
 Example: Order 54000-A103 for 1.5" Type A Buna N Replacement Kit.

Elastomer	Threaded End					Grooved End			
	1.5"	2"	2.5"	3"	4"	2"	2.5"	3"	4"
Type A Buna N	A103	A104	A105	A106	A107	A108	A109	A110	A111
Type B Viton	B103	B104	B105	B106	B107	B108	B109	B110	B111
Type S EPDM	S103	S104	S105	S106	S107	S108	S109	S110	S111

Valve Storage procedures

1. Valves should be stored in a clean, weather-tight, well-ventilated, fire-resistant storage area. This storage area must provide protection from the weather, plus flooring that seals against dust and dirt and will not be subject to flooding.

2. Valves should be protected against rodent and insect damage.
3. The valves must be protected from mechanical damage. The proper use of racks, pallets, and handling equipment shall be used. The valves should be arranged so as to prevent damage to the stored valves during handling.
4. The valves should be stored off the floor on suitable skids, pallets or racks. They must be protected from excessive dust and dirt.
5. Valves should not be stored in direct sunlight. They should also be covered with black flame retardant visqueen or fire retardant canvas cloth. This is to keep as much light as possible from the valves to protect and prolong the life of the elastomer. After completion of storage and upon installation of the valves, the following steps and precautions should be taken:
 - A. Valves should not be taken out of storage until ready for installation. If valves must be taken to the installation site before piping is

ready, the same storage requirements as above should be followed. Care should be taken to protect the valves from dirt, foreign particles and weather.

- B. Care should be taken in unpacking and installing the valve so damage to the sealing surfaces (face of seat, o-ring flange seals, and disc edge) does not occur.
- C. Flange faces should be free from dirt, grit, or other irregularities which might damage the flange seals.
- D. Inspect valve and clean off any dirt or grit that might have accumulated around seat, seals or disc.
- E. Install valves per Norriseal's standard installation instructions.
- F. Before operating or cycling the valves, flush pipe thoroughly (with valves open). After flushing pipe, slowly cycle valves from full open to full closed approximately 10 times. Leave in the partially open position until shut-off is required.
- G. If valves have not been cycled for an extended period, cycle them 5-10 times before operation start-up.

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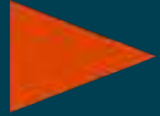
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Norriseal

200/285 Series

Butterfly

Valves

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Norriseal Series 200 Butterfly Valves

Advanced Angle-disc Design:

Provides bi-directional, positive shutoff & and long service life



EVdVd
D\$""



EVdVd
? \$""

Norriseal Series 200 Butterfly Valves provide bi-directional, positive shutoff to 200 psig working pressure. They are available in both resilient-seated (Series R200) and metal-lined (Series M200) configurations. All Series 200 butterfly valves feature a unique, angle disc that creates a 360° uninterrupted differential sealing surface.

Series 200 butterfly valves have double-shaft seals and body bushings to assure smooth, low-torque operation. They are available with a full range of pneumatic, electric and hydraulic actuation.

Series 200 butterfly valves have independent flange seals and a non-wetted body that may be specified with either lug or wafer design. All Series 200 butterfly valves are easily repaired in the field.

Features

- Double-shaft seals and body bushings assure smooth, low-torque operation
- Independent flange seals
- Rigid-backed rubber seat easily field-replaced
- Non-wetted body available in lug or wafer designs
- Rigid drive, precision disc-to-shaft connection
- Resilient-seated design (R200) offered in a wide variety of elastomeric seals and metallic materials
- Metal-lined design (M200) provides positive shutoff with minimum sealing material
- Available with a variety of pneumatic, electric and hydraulic actuation

Contents

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- R&M-1000 Dimensions
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Series R200



When to use Series R-200 Valves

- GeVDŽE VdVhV hS'hVhV Xadbaef[hW eZgfaXfa \$"" befi b.**

Under certain service conditions, Norriseal valves may be rated up to 250 psi wp. Consult factory for trim recommendations and pricing.
- GeVDŽE VdVhV hS'hVhV XadFZdaff[Y La` fcb^Sf Xai dSfVhV gb fa % Xbež**
- GeVDŽE VdVhV hS'hVhV Sf fV_ bVhVfgdVhV Xb_ ŽS" Ofa t \$' "Ož**

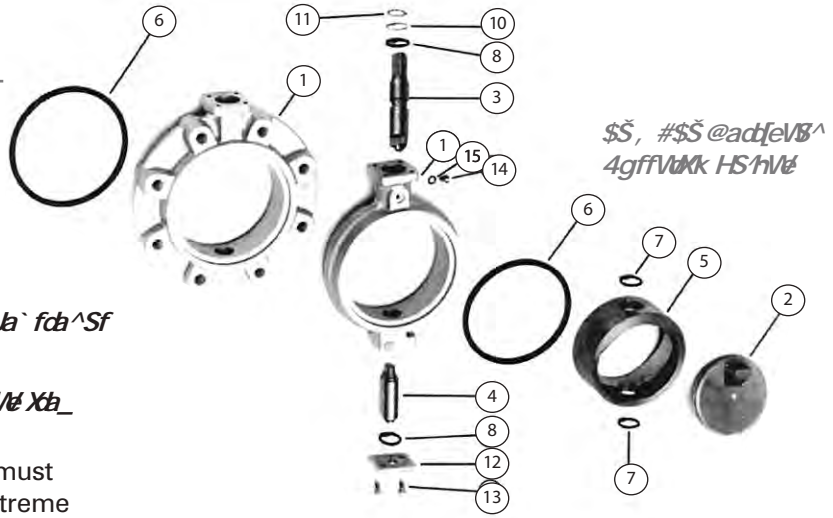
Proper selection of seal elastomers must be made for valve applications at extreme temperatures.
- GeVDŽE VdVhV hS'hVhV XadT[ŽV[dVf[a` S^ Xai La` V[f[a` ež**
- GeVDŽE VdVhV hS'hVhV XadLa` fcb^f Y fZVWkai aX [cg[Vet YSeVhV S` V ea[Vet [UgV[Y StDSe[hW S` V Uadbaef[hW_ SfVdS` ež**

R-Series valves are not recommended for handling gasoline and other volatile media. Volatile materials or solvents tend to dry out elastomers and make the valves difficult to operate. See M-Series section of catalog for gasoline service. Rubber liner and double O-ring shaft seals prevent line media from contacting body of valve, making use of premium body materials unnecessary. Only the internal wetted parts need to be corrosion resistant to the media.
- GeVDŽE VdVhV hS'hVhV XadVVVŽaXŽ[VlegbVVe[a` fa Xg^dSfVW i ad[Y bVhVegdVtk fV_ bacSd[k [eFS^f Y S Vai ` efdV_ XS` YVadebaa^b[VWV**

With the downstream flange removed, R-series valves are derated for safety to 75 psi wp.
- GeVDŽE VdVhV hS'hVhV Xad[eg^SfVW [Vhž**

14 inch and larger Norriseal valves will accommodate 2 inches of insulation on accompanying pipelines. A neck extender is available for use with 2 thru 12 inch wafer valves when lines are insulated.
- GeVDŽE VdVhV hS'hVhV i [fZ 3@E; 5`See #S` USef [ch` ad5`See #` " efVWXS` YVhž**

Weldneck or socket weld flanges are recommended for use with R-Series valves to provide support for the seat and to assure optimum performance at the full rated pressure of the valve. R-Series span type valves can be used with ANSI Class 300 flanges; however, some



\$S, #S\$ @ad[eVhV^ 4gffVhVhV hS'hVhV

valve sizes may require special bolt drilling or spacers. Lug style bodies for use with ANSI Class 300 flanges are available on special order.

- DŽE VdVhV hS'hVhV SdVWVhV Y VV XadgeW [fZ eFS` Ž VSd/i V[VZf adedZVWg^M&" b[bV[e[VWV_ VŽ e[a` ež 5ZVWV] VSfS eZVWVhV XadebVWV[VU UVhVdS` UV V_ WVe[a` ež**

If heavy wall, plastic or cement lined pipe is used, back beveling at the flange may be required for disc clearance.

2"–12" Norriseal Butterfly Valves Parts Description

- Valve body isolated from flow stream** by resilient seat and O-ring seals. Steel bodies have Teflon bushings to prevent seizing with stainless steel shafts. Different models and materials are available. See exploded assembly.
- Angle disc construction** gives 360° uninterrupted contact of disc with seat. Disc does not seat in shaft holes, assuring bubble-tight shutoff time after time with no scrubbing of the elastomer in the shaft hole areas. Disc drive slot assures positive disc action. Precision fit prevents disc "flutter"
- Operator shaft is retained** by a sealed retention screw for safety. Shaft is double O-ring sealed to prevent leakage into shaft bearing areas and protect from outside contamination. Milled drive flats are parallel to disc, indicate disc position.

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Series R200

- Stationary bottom shaft is double O-ring sealed to prevent stem leakage.

- Field replaceable resilient seat is bonded to a rigid backing ring to prevent seat from distorting or collapsing due to high velocity flow or in vacuum service. Rigid backing also prevents seat collapse during installation of valve between flanges.

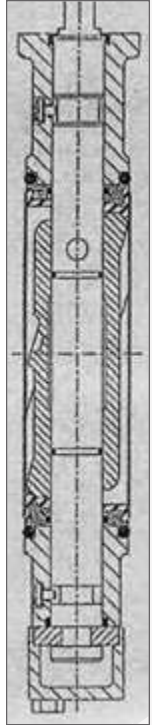
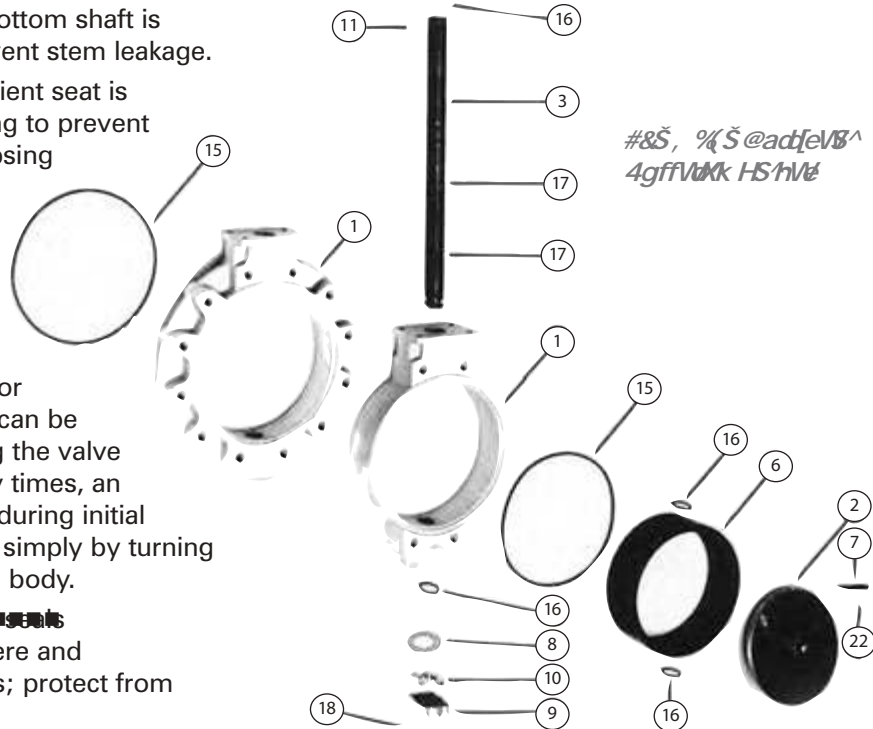
- Body O-ring flange seals eliminate need for flange gaskets. Flange seals can be replaced without dismantling the valve and replacing the seat. Many times, an O-ring flange seal damaged during initial installation may still be used simply by turning it over and returning it to the body.

- Shaft seals prevent leakage to atmosphere and permanently lubricated areas; protect from outside contamination.

- Provide precision fit with topworks. Eliminates "disc flutter"

- Bottom shaft is retained by a thrust plate and retention screw.

- Top shaft is retained by sealed retention screw for safety. Cannot be removed when valve is installed between flanges.



14"-36" Norriseal Butterfly Valves Parts Description

- Valve body isolated from flow stream by resilient seat and O-ring seals. All 14" and larger bodies have inboard and outboard shaft bushings for handling shaft loads and to provide minimum operating torque. Different models and materials are available.

- Angle disc construction gives 360° uninterrupted contact of disc with seat. Disc does not seat in shaft holes, assuring bubble-tight shutoff time after time with no scrubbing of the elastomer in the shaft hole areas.

- Through shaft, cross pinned to disc with straight dowel pin, assures maximum drive strength and field repairability. Disc pin does not penetrate the sealing plane of the disc.

- Field replaceable resilient seat is bonded to a rigid backing ring to prevent seat from distorting or collapsing due to high velocity flow or in vacuum service. Rigid backing also prevents seat collapse during installation of valve between flanges.

- Disc pin does not penetrate the sealing plane of the disc.

- Assures proper disc support and centering in seating area.

- Retains shaft from bottom.

- Provides precision fit with operator.

- Body O-ring flange seals eliminate need for flange gaskets. Flange seals can be replaced without dismantling the valve and replacing the seat. Many times, an O-ring flange seal damaged during initial installation may still be used simply by turning it over and returning it to the body.

- Shaft seals prevent stem leakage to atmosphere and permanently lubricated areas; protect from outside contamination.

- Seals prevent leakage across disc plane.

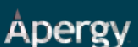
- Retains bottom thrust plate.

- Retains disc pin.

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Series M200

When to use Series M-200 Valves



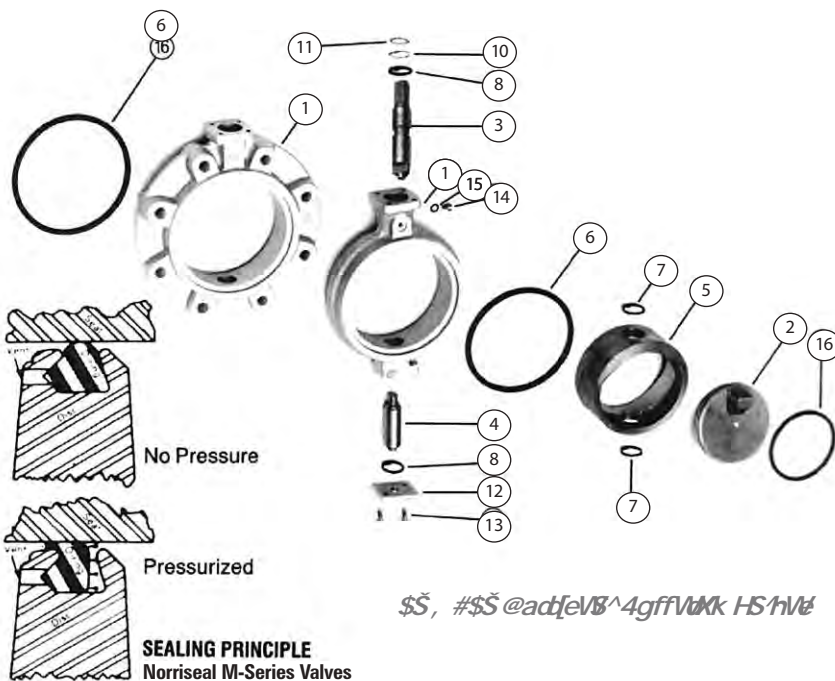
Under certain service conditions, Norriseal valves may be rated up to 250 psi wp. Consult factory for trim recommendations and pricing.

Proper selection of seal elastomers must be made for valve applications at extreme temperatures.

Limited use of elastomers in M-Series valves make them ideal for handling gasolines and other volatile media which tend to dry the elastomer. Field replaceable metal seat is available in a variety of exotic materials to resist corrosion. Metal seat liner and double O-ring shaft seals prevent line media from contacting body of valve, making use of premium body materials unnecessary. Only the internal wetted parts need to be corrosion resistant to the media. M-Series valves are not recommended for use when large abrasive material is present. See R-Series section.

14 inch and larger Norriseal valves will accommodate 2 inches of insulation on accompanying pipelines. A neck extender is available for use with 2 thru 12 inch wafer valves when lines are insulated.

M-Series span type valves can be used with ANSI Class 300 flanges, however, some valve sizes may require special bolt drilling or spacers.



\$\$\$ #\$\$\$ @adfevB^4gffvMk HS'hV

Lug style bodies for use with ANSI Class 300 flanges are available on special order. (Consult factory).

If heavy wall, plastic or cement lined pipe is used, back beveling at the flange may be required for disc clearance.

Operator shaft is retained by a sealed retention screw for safety. Shaft is double O-ring sealed to prevent leakage into shaft bearing areas and protect from outside

Operator shaft is retained by a sealed retention screw for safety. Shaft is double O-ring sealed to prevent leakage into shaft bearing areas and protect from outside

2" - 12" Norriseal Butterfly Valves Parts Description

Valve body isolated from flow stream by metal seat and O-ring seals. Steel bodies have Teflon bushings to prevent seizing with stainless steel shafts. Different models and materials are available. See exploded assembly.

Angle disc construction gives 360° uninterrupted contact of disc O-ring with seat for dependable bubble-tight shutoff. Drive slot assures positive disc action. Precision fit prevents disc "flutter".

Operator shaft is retained by a sealed retention screw for safety. Shaft is double O-ring sealed to prevent leakage into shaft bearing areas and protect from outside

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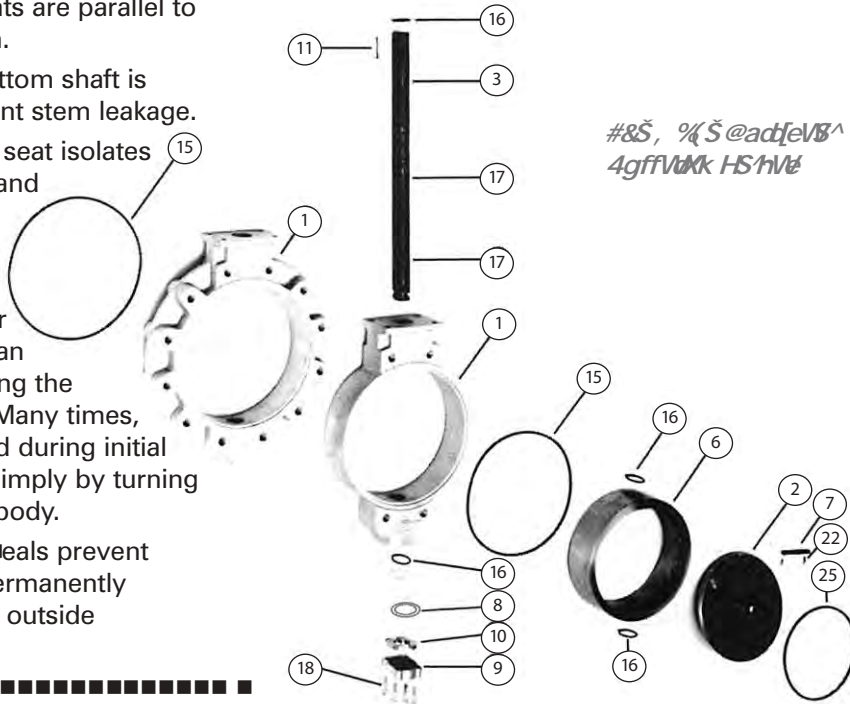
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Series M200

contamination. Milled drive flats are parallel to disc and indicate disc position.

- **Stationary bottom shaft** is double O-ring sealed to prevent stem leakage.
 - **Field replaceable metal seat** isolates valve body from flow stream and eliminates need for premium body material.
 - **Body O-ring flange seals** eliminate need for flange gaskets. Flange seals can be replaced without dismantling the valve and replacing the seat. Many times, an O-ring flange seal damaged during initial installation may still be used simply by turning it over and returning it to the body.
 - **Shaft seals** prevent leakage to atmosphere and permanently lubricated areas; protect from outside contamination.
- Provide precision fit with topworks. Eliminates "disc flutter"



- **Bottom shaft** is retained by a thrust plate.
- **Top and bottom shafts** are retained by sealed retention screws for safety. Cannot be removed when valve is installed between flanges.
- **Pressure energized O-ring seal** contained in specially designed groove in disc edge assures positive shutoff. The higher the pressure, the tighter the seal.

14"–36" Norriseal Butterfly Valves Parts Description

- **Valve body** isolated from flow stream by metal seat and O-ring seals. All 14" and larger bodies have inboard and outboard bushings for handling shaft loads and to provide minimum torque. Different models and materials are available.
- **Angle disc construction** gives 360° uninterrupted contact of disc O-ring with seat for dependable bubble-tight shutoff.
- **Through shaft**, cross pinned to disc with straight dowel pin, assures maximum drive strength and field repairability. Disc pin does not penetrate sealing plane of the disc.
- **Field replaceable metal seat** isolates valve body from flow stream; eliminates need for premium body material.

- **Disc pin** does not penetrate the sealing plane of the disc.
- **Assures proper disc support** and centering in seating area.
- **Retains shaft** from bottom.
- **Provides precision fit** with operator.
- **Body O-ring flange seals** eliminate need for flange gaskets. Flange seals can be replaced without dismantling the valve and replacing the seat. Many times, an O-ring flange seal damaged during initial installation may still be used simply by turning it over and returning it to the body.
- **Shaft seals** prevent stem leakage to atmosphere and permanently lubricated areas; protect from outside contamination.
- **Seals prevent leakage** across disc plane.
- **Retains bottom thrust plate.**
- **Retains disc pin.**
- **Pressure energized O-ring seal** contained in a specially designed groove in disc edge assures positive shutoff. The higher the pressure, the tighter the seal.

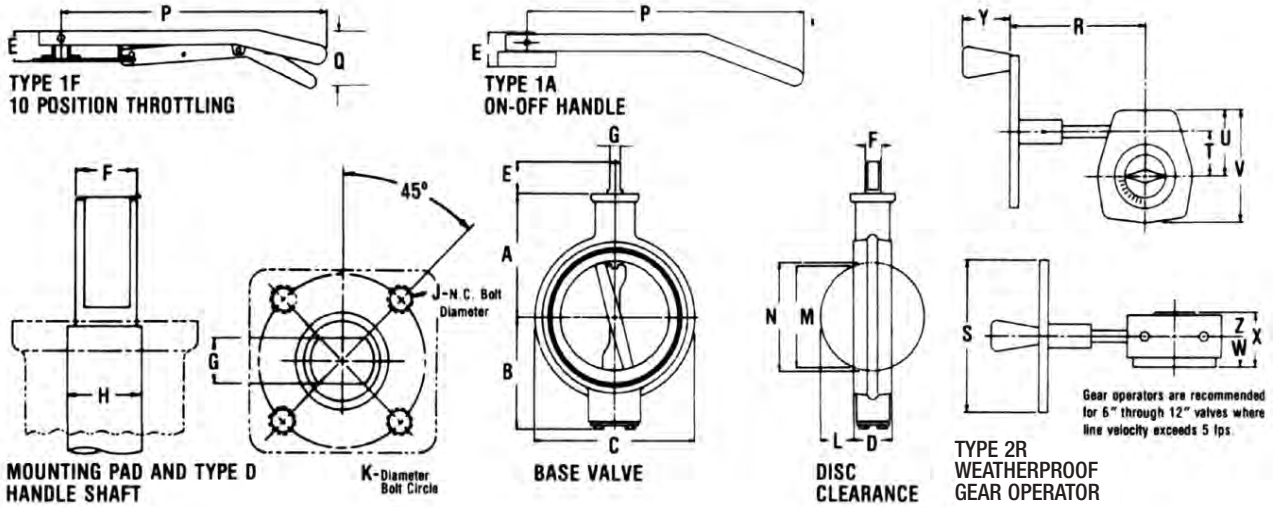
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R&M-1000 2"-12" Valves



VALVE DIMENSIONS

Bgcclqgml Pcdcpclac	T jtcQgxca.Glafcq-kk									
	0-3.	03-43	1-53	13-7.	2-1.	3-/03	4-/3.	6-0.	1-.03.	10-1.
A	3.70	4.16	4.41	N/A	4.88	5.28	6.50	7.47	9.38	10.41
B	3.22	3.75	4.05	N/A	4.50	4.91	6.00	6.94	8.66	9.69
C	4.13	4.88	5.38	N/A	6.88	7.75	8.75	10.88	13.38	16.00
D	1.63	1.75	1.75	N/A	2.00	2.14	2.13	2.50	2.50	3.00
E	1.31	1.31	1.31	N/A	1.31	1.31	1.69	1.69	2.00	2.00
F	.69	.69	.69	N/A	.69	.69	.88	.88	1.06	1.06
G	.50	.50	.50	N/A	.50	.50	.63	.63	.75	.75
H	.69	.88	.88	N/A	.88	.88	1.06	1.06	1.38	1.38
J	.25	.25	.25	N/A	.25	.25	.38	.38	.38	.38
K	1.81	1.81	1.81	N/A	1.81	1.81	2.34	2.34	2.63	2.63

DISC CLEARANCE

L	.38	.50	.75	N/A	1.13	1.56	1.94	2.69	3.75	4.50
M	1.77	2.06	2.69	N/A	3.59	4.72	5.55	7.44	9.58	11.52
N	2.41	2.72	3.20	N/A	4.19	5.17	5.91	7.81	9.89	11.89
Approx Wt. (lbs) Cast Iron Body	5	7	9	-	14	17	23	37	59	80

Bolt Data

For Use with ANSI Class 150 Weldneck Flanges.
For optimum valve performance, it is recommended that butterfly valves be installed between weldneck flanges or flanges with equivalent inside dimensions.

Bolt Size	.63 x 4.00	.63 x 4.50	.63 x 4.50	N/A	.63 x 4.50	.75 x 5.50	.75 x 5.50	.75 x 6.00	.88 x 6.00	.88 x 7.00
No. Required	4	4	4	-	8	8	8	8	12	12

OPERATOR DIMENSIONS

P	9.94	9.94	9.94	N/A	9.94	9.94	15.00	15.00	16.00	16.00
Q	3.34	3.34	3.34	N/A	3.34	3.34	3.66	3.66	3.66	3.66
R	6.88	6.88	6.88	N/A	6.88	6.88	7.50	7.50	8.00	8.00
S	6.00	6.00	6.00	N/A	6.00	6.00	8.00	8.00	8.00	8.00
T	2.36	2.36	2.36	N/A	2.36	2.36	2.36	2.36	3.00	3.00
U	3.50	3.50	3.50	N/A	3.50	3.50	3.50	3.50	4.38	4.38
V	5.93	5.93	5.93	N/A	5.93	5.93	5.93	5.93	7.50	7.50
W	5.25	5.25	5.25	N/A	5.25	5.25	5.25	5.25	6.75	6.75
X	2.92	2.92	2.92	N/A	2.92	2.92	2.92	2.92	3.27	3.27
Y	2.63	2.63	2.63	N/A	2.63	2.63	2.63	2.63	2.63	2.63
Z	1.69	1.69	1.69	N/A	1.69	1.69	1.69	1.69	1.88	1.88
Approx Wt. (lbs) 2R & 2RM Operator	7	7	7	N/A	7	7	8	8	13	13

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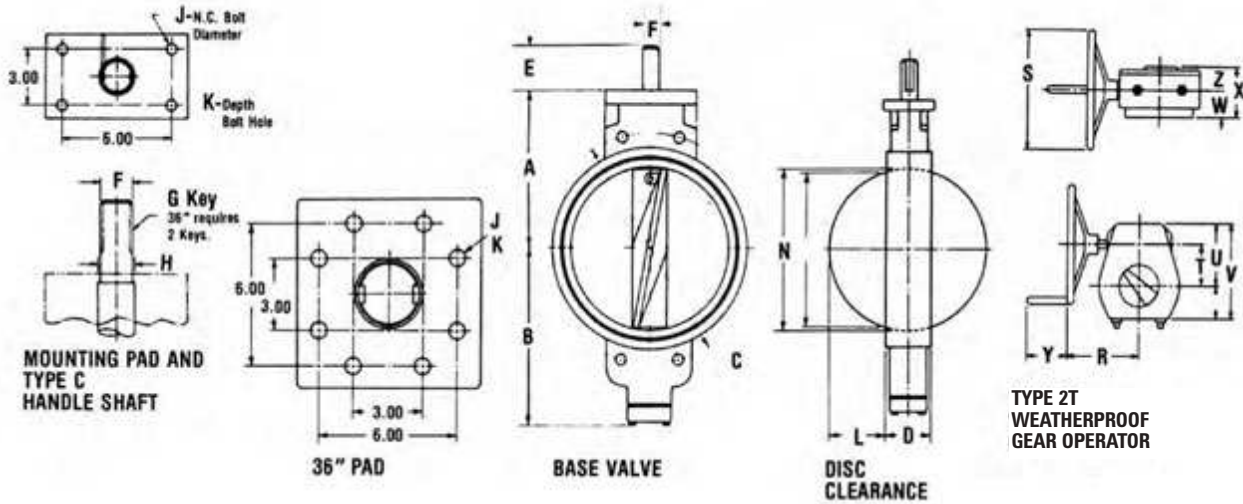
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R&M-1000 14"-36" Valves



VALVE DIMENSIONS

BgtclqgmI Pcdpcclac	T jtcQgxc&Glafcq-kk										
	/2-13.	/4-2.	/6-23.	0-3.	00-33.	02-4.	04-43.	06-5.	1-53.	10-6.	14-7.
A	12.63	14.00	14.75	16.00	17.38	17.50	20.13	22.75	23.75	24.50	26.13
B	14.25	15.63	16.63	17.88	18.00	19.00	20.61	21.83	22.70	24.23	29.38
C	18.75	21.25	22.75	25.00	27.25	29.50	31.75	34.00	36.00	38.50	42.75
D	3.75	4.13	4.63	5.13	5.00	5.00	6.00	6.50	7.00	7.00	8.50
E	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	4.75
F	1.75	1.75	1.75	2.50	2.50	2.50	2.50	2.50	2.50	2.50	3.00
G	.38x2.5	.38x2.5	.38x2.5	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.75x3.0
H	1.75	2.00	2.25	2.50	2.50	2.50	3.00	3.00	3.00	3.50	3.50
J	.63	.63	.63	.63	.63	.63	.75	.75	.75	.75	.75
K	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50

DISC CLEARANCE

L	4.79	5.61	6.36	7.14	8.19	9.19	9.60	10.36	11.10	11.96	12.88
M	12.80	14.78	16.72	18.72	20.75	22.83	24.50	26.38	28.50	30.13	34.25
N	13.34	15.34	17.34	19.41	21.33	23.38	25.51	27.21	29.21	30.96	35.25
Approx Wt. (lbs) Cast Iron Body	187	262	351	432	550	606	790	910	1160	1220	1840

BOLT DATA

For Use with ANSI Class 150 Weldneck Flanges.
For optimum valve performance, it is recommended that butterfly valves be installed between weldneck flanges or flanges with equivalent inside dimensions.

Bolt Size	1.00x 7.75	1.00x 8.50	1.13x 9.00	1.13x 10.00	1.25x 11.50	1.25x 11.50	1.25x 13.00	1.25x 13.50	1.25x 14.00	1.50x 14.00	1.50x 15.00
No. Required (Both Required)	8	12	12	16	16	16	20	24	24	24	28
Capscrew Size	1.00NCx3.00	1.00NCx3.00	1.13NCx3.00	1.13NCx3.00	1.25NCx4.00	1.25NCx4.00	1.25NCx3.50	1.25NCx3.25	1.25NCx3.50	1.50NCx3.75	1.50NCx3.75
No. Required	8	8	8	8	8	8	8	8	8	8	8

OPERATOR DIMENSIONS

R	9.75	9.75	9.75	17.25	17.25	17.25	17.84	17.84	17.84	17.84	17.84
S	12.75	12.75	12.75	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
T	4.83	4.83	4.83	5.38	5.38	5.38	2.69	2.69	2.69	2.69	7.13
U	6.63	6.63	6.63	7.63	7.63	7.63	9.44	9.44	9.44	9.44	10.81
V	10.13	10.13	10.13	11.13	11.13	11.13	14.94	14.94	14.94	14.94	16.31
W	9.00	9.00	9.00	10.81	10.81	10.81	12.00	12.00	12.00	12.00	14.00
X	5.00	5.00	5.00	5.14	5.14	5.14	7.38	7.38	7.38	7.38	7.75
Y	4.50	4.50	4.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Z	2.88	2.88	2.88	2.88	2.88	2.88	4.00	4.00	4.00	4.00	4.00
Approx Wt. (lbs) 2R & 2RM Operator	70	70	70	90	90	90	90	210	210	210	260

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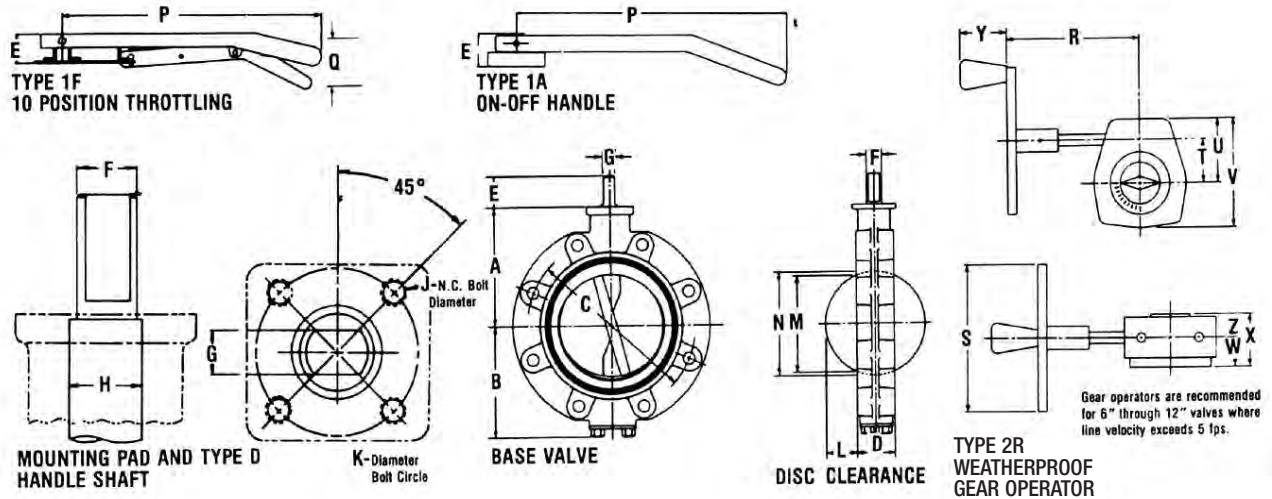
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R&M-3000 2"-12" Valves



VALVE DIMENSIONS

Bgkclqgml Pcdpcplac	T jtcQgxcaGlafcq-kk									
	0.3.	0.3-43	1-53	1.3-7.	2-/.	3-/03	4-/3.	6-0.	/.-03.	/0-1.
A	3.70	4.16	4.41	4.63	4.88	5.28	6.50	7.47	9.38	10.41
B	3.22	3.75	4.05	4.25	4.50	4.91	6.00	6.94	8.66	9.69
C	4.75	5.50	6.00	7.00	7.50	8.50	9.50	11.75	14.25	17.00
D	1.63	1.75	1.75	1.94	2.00	2.13	2.13	2.50	2.50	3.00
E	1.31	1.31	1.31	N/A	1.31	1.31	1.69	1.69	2.00	2.00
F	.69	.69	.69	.69	.69	.69	.88	.88	1.06	1.06
G	.50	.50	.50	.50	.50	.50	.63	.63	.75	.75
H	.69	.88	.88	.88	.88	.88	1.06	1.06	1.38	1.38
J	.25	.25	.25	.25	.25	.25	.38	.38	.38	.38
K	1.81	1.81	1.81	1.81	1.81	1.81	2.34	2.34	2.63	2.63

DISC CLEARANCE

L	.38	.50	.75	.94	1.13	1.56	1.94	2.69	3.75	4.50
M	1.77	2.06	2.69	3.16	3.59	4.72	5.55	7.44	9.58	11.52
N	2.41	2.72	3.20	3.72	4.19	5.17	5.91	7.81	9.89	11.89
Approx Wt.- Cast Iron Body	7	9	11	14	18	22	30	44	68	108

BOLT DATA

For Use with ANSI Class 150 Weldneck Flanges. For optimum valve performance, it is recommended that butterfly valves be installed between weldneck flanges or flanges with equivalent inside dimensions.										
Capscrew Size	.63NC x 1.50	.63NC x 1.50	.63NC x 1.75	.63NC x 1.75	.63NC x 1.75	.75NC x 1.75	.75NC x 2.00	.75NC x 2.25	.88NC x 2.25	.88NC x 2.50
No. Required	8	8	8	16	16	16	16	16	24	24

*Through-tapped from face to face for studs or capscrews unless specified otherwise.

OPERATOR DIMENSIONS

P	9.94	9.94	9.94	N/A	9.94	9.94	15.00	15.00	16.00	16.00
Q	3.34	3.34	3.34	N/A	3.34	3.34	3.66	3.66	3.66	3.66
R	6.88	6.88	6.88	N/A	6.88	6.88	7.50	7.50	8.00	8.00
S	6.00	6.00	6.00	N/A	6.00	6.00	8.00	8.00	8.00	8.00
T	2.36	2.36	2.36	N/A	2.36	2.36	2.36	2.36	3.00	3.00
U	3.50	3.50	3.50	N/A	3.50	3.50	3.50	3.50	4.38	4.38
V	5.93	5.93	5.93	N/A	5.93	5.93	5.93	5.93	7.50	7.50
W	5.25	5.25	5.25	N/A	5.25	5.25	5.25	5.25	6.75	6.75
X	2.92	2.92	2.92	N/A	2.92	2.92	2.92	2.92	3.27	3.27
Y	2.63	2.63	2.63	N/A	2.63	2.63	2.63	2.63	2.63	2.63
Z	1.69	1.69	1.69	N/A	1.69	1.69	1.69	1.69	1.88	1.88
Aprox Wt. 2M & 2RM Operator	7	7	7	N/A	7	7	8	8	13	13

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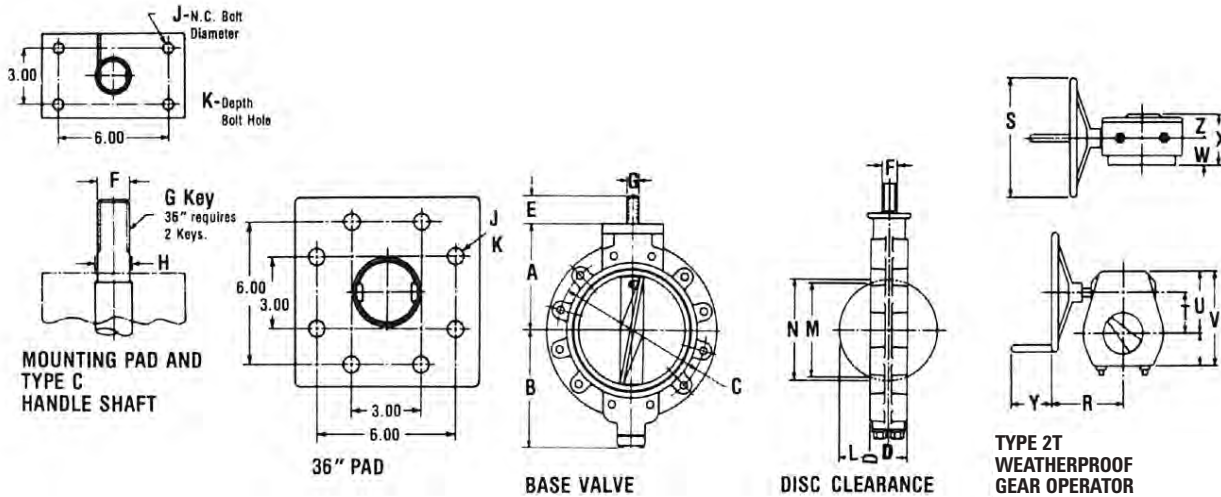
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R&M-3000 14"-36" Valves



VALVE DIMENSIONS

BgkclqgmI Pcdpcplac	T jtcQgxc&Glafcq-kk										
	/2-13.	/4-2..	/6-23.	0-3..	00-33.	02-4..	04-43.	06-5..	1-53.	10-6..	14-7..
A	12.63	14.00	14.75	16.00	17.38	17.50	20.13	22.75	23.75	24.50	26.13
B	14.25	15.63	16.63	17.88	18.00	19.00	20.61	21.83	22.70	24.23	29.38
C	18.75	21.25	22.75	25.00	27.25	29.50	31.75	34.00	36.00	38.50	42.75
D	3.75	4.13	4.63	5.13	5.00	5.00	6.00	6.50	7.00	7.00	8.50
E	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	4.75
F	1.75	1.75	1.75	2.50	2.50	2.50	2.50	2.50	2.50	2.50	3.00
G	.38x2.5	.38x2.5	.38x2.5	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.75x3.0
H	1.75	2.00	2.25	2.50	2.50	2.50	3.00	3.00	3.00	3.50	3.50
J	.63	.63	.63	.63	.63	.63	.75	.75	.75	.75	.75
K	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50

DISC CLEARANCE

L	4.79	5.61	6.36	7.14	8.19	9.19	9.60	10.36	11.10	11.96	12.88
M	12.80	14.78	16.72	18.72	20.75	22.83	24.50	26.38	28.50	30.13	34.25
N	13.34	15.34	17.34	19.41	21.33	23.38	25.51	27.21	29.21	30.96	35.25
Approx Wt.- Cast Iron Body	234	339	432	538	590	621	960	1150	1300	1360	2150

BOLT DATA

For Use with ANSI Class 150 Weldneck Flanges. For optimum valve performance, it is recommended that butterfly valves be installed between weldneck flanges or flanges with equivalent inside dimensions.											
Capscrew Size	1.00NC x 3.00	1.00NC x 3.00	1.13NC x 3.50	1.13NC x 3.50	1.25NC x 4.00	1.25NC x 4.00	1.25NC x 4.00	1.25NC x 4.00	1.25NC x 4.00	1.50NC x 4.50	1.50NC x 4.50
No. Required (Both Required)	24	32	32	32	32	40	40	48	48	48	64
Capscrew Size				1.13NC x 3.00	1.25NC x 3.50		1.25NC x 3.50	1.25NC x 3.25	1.25NC x 3.50	1.25NC x 3.75	1.50NC x 4.00
No. Required	N/A	N/A	N/A	8	8	N/A	8	8	8	8	8

OPERATOR DIMENSIONS

R	9.75	9.75	9.75	17.25	17.25	17.25	17.84	17.84	17.84	17.84	17.84
S	12.75	12.75	12.75	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
T	4.83	4.83	4.83	5.38	5.38	5.38	2.69	2.69	2.69	2.69	7.13
U	6.63	6.63	6.63	7.63	7.63	7.63	9.44	9.44	9.44	9.44	10.81
V	10.13	10.13	10.13	11.13	11.13	11.13	14.94	14.94	14.94	14.94	16.31
W	9.00	9.00	9.00	10.81	10.81	10.81	12.00	12.00	12.00	12.00	14.00
X	5.00	5.00	5.00	5.14	5.14	5.14	7.38	7.38	7.38	7.38	7.75
Y	4.50	4.50	4.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Z	2.88	2.88	2.88	2.88	2.88	2.88	4.00	4.00	4.00	4.00	4.00
Approx Wt. 2P & 2PM Operator	70	70	70	90	90	90	90	210	210	210	260

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Series 200 Model Code

Body Configuration	
Amlldgesp rgml	Ambc
Special to be Described	00
Single Rib Wafer Body	10
ISO Wafer Body (DI only)	11
Double Rib Wafer Body	20
Full Lugged Body	30
ISO Lugged Body (DI only)	31

Series	
Qcpgcq	Ambc
Resilient Seat	R
Metal Seat	M
Metal-to-Metal Seat (Damper Style)	D

Valve Size (in inches)	
Qqxc	Ambc
2" - 36"	2...36

Body Materials	
K rcpg jRwnc	Ambc
Ductile Iron ASTM A395 60-40-18	11
Carbon Steel (WCB) ASTM A216 Gr. WCB	20
316 Stainless Steel ASTM A743 CF8M*	21
Alloy 20 Stainless Steel ASTM A743 CN7M*	22
Valve Bronze ASTM B61	30
Aluminum Bronze (NiAl) ASTM B148 Alloy 95800	31
Aluminum Alloy ASTM B26 Alloy 356-T6	40

*Special Order - Consult Factory

Shaft Material	
K rcpg j	Ambc
Alloy 20 Stainless Steel ASTM B473 N08020	1
316 Stainless Steel ASTM A276 Type 316	2
416 Stainless Steel ASTM A582 Type 416	3
Monel (NiCu Alloy) ASTM B164, Class A	4
Nitronic 50 Stainless Steel ASTM A276	5
K-Monel (NiCuAl Alloy) Alloy QQ-N-286A*	6
17-4 PH Stainless Steel ASTM A564 Type 630	7
Inconel 600 ASTM B166	8
Titanium ASTM B348 Gr. 4	9
Special to be Described	0
Hastelloy "B" ASTM B335	B
Hastelloy "C" 276 ASTM A574 Alloy N10276	C

*K-Monel std. in 22" & Larger Valves with Monel Shaft

Please note: not all available options are shown.

Disc Material	
Code	Materials
1	Ductile Iron ASTM A395 60-40-18
2	316 Stainless Steel ASTM A743 Gr. CF8M
3	Alloy 20 Stainless Steel ASTM A743 Gr. CN7M
4	Aluminum Bronze ASTM B148 Alloy C95400 2" thru 14" B148 Alloy C95500 16" thru 36"
5	Aluminum Alloy ASTM B26 Alloy 356-T6
6	Monel (Ni Cu Alloy) ASTM A494, M30C
9	Titanium ASTM B367 Gr. 8A
0	Special to be described
B	Hastelloy "B" ASTM A494 Gr. N-12MV
C	Hastelloy "C" ASTM A494 CW 12MW
G	Inconel 600 ASTM A494 Alloy CY40
K	Illium PD
P	NiAl Bronze ASTM B148 Alloy C95800

Seat Material	
Code	Seat R Series
A	Buna N
B	Fluoroelastomer (Viton)
E	Neoprene (Black)
G	Neoprene (White)
J	Nitrile, Abrasive Resistant
S	EPDM, Peroxide Cured
4	HSN, Highly Saturated Nitrile/ Epoxy Backing
5	Natural Red Rubber
8	Peroxide Cured Nitrile

Ambc	Qc rKQcpgcq
1	Cast Iron ASTM A126, Class B
2	316 Stainless Steel ASTM A743 Gr. CF8M
3	Aluminum Bronze ASTM B148 Alloy C95300
4	Aluminum Alloy ASTM B26 Alloy 356-T6
5	Monel (Ni Cu Alloy) ASTM A494, M30C
6	Inconel 600 ASTM A494 Alloy CY40
7	Alloy 20 Stainless Steel ASTM A743 Gr. CN7M
9	Titanium ASTM B367 Gr. 8A
0	Special to be described
B	Hastelloy "B" ASTM A494 Gr. N-12MV
C	Hastelloy "C" ASTM A494 CW 12MW
F	Illium PD
G	NiAl Bronze ASTM B148 Alloy C95800

6 M 30 11 - 4 2 3 B - 2R

Seals	
K rcpg jQ	Ambc
Buna N	A
Viton	B
Neoprene (Black)	E
Neoprene (White)	G
AFLAS	R
EPDM	S
Low Temp Neoprene	V
Kalrez	Y
Highly Saturated Nitrile (HSN)	4
Peroxide Cured Nitrile	8

NORRISEAL OPERATORS			
Code	Manual Operators	a REF	b J.B.3134 n FBUST
1A	(2-12) STD Handle with 1J Topworks	2E	(2-12) Gear - W.P. - Aluminum Bronze Marine Trim
1F	(2-12) Squeeze Trigger 10 Pos	2ES	(2-12) 2E Subm. for Salt Water
1FM	(2-12) 1F with Marine Trim	2R	(2-12) Gear Operator Aluminum Case
1J	(2-12) STD Topworks On-Off	2T	(2-36) Gear Operator Cast Iron Case
1AM	(2-5) STD Handle with 1S Topworks	2RM	2R with Marine Trim
1P	(2-8) Locking Topworks	2TM	2T with Marine Trim
1Q	(2-8) 1P Topworks with STD Handle		
1JS	(2-8) STD On-Off Topworks, Stainless Steel		
		**2G Numbers listed are Basic Numbers Only. Complete Actuator Model Number Must be Used when ordering.	
		SR-Spring Return. Specify Fail/Open or Fail/Closed.	
		PB-Pressure Balanced/Double Acting.	
		a REF	b J.B.3134 n FBUST
		**	
		2G11	(2-4) 35 SR Diaphragm Actuator
		2G12	(2-4) 35 PB Diaphragm Actuator
		2G13	(2-8) 70 SR Diaphragm Actuator
		2G14	(2-8) 70 PB Diaphragm Actuator
		2G15	(6-12) 180A SR Diaphragm Actuator
		2G16	(6-12) 180 PB Diaphragm Actuator
		2G17	(12-20) 180 SR Diaphragm Actuator
		2G18	(12-20) 180 PB Diaphragm Actuator

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Series 200 Specifications

R200 Series Specifications

Typical Specifications, general Purpose trim

Valves 2" through 36" shall be resilient lined, wafer or lug butterfly type with replaceable body O-ring flange seals. Bodies shall be of high-strength ductile iron with aluminum bronze discs, 416 stainless steel shafts, aluminum bronze seats and Buna N (Hycar®) seats and seals. For more severe applications, consult trim table for proper body, disc, shaft, seal and O-ring material selection. Valves through 5" shall have lever handles for

on-off service or other specified operator. Valves 6" and larger shall be equipped with weatherproof gear operators or other specified operator. Valves shall be suitable for installation between ANSI Class 150 weldneck flanges or other specified flanges without special preparation. Butterfly valves shall be Norriseal Angle Disc Model R2011-43AA-1A or other specified model number.

M200 Series Specifications

Typical Specifications, general Purpose trim

Valves 2" through 36" shall be metal lined, wafer or lug butterfly type. Bodies shall be of high-strength cast iron with aluminum bronze discs, 416 stainless steel shafts, aluminum bronze seats and Buna N (Hycar®) seats and seals. For more severe applications, consult trim table for proper body, disc, shaft, seal and O-ring material selection. Valves through 5" shall have lever handles for

on-off service or other specified operator. Valves 6" and larger shall be equipped with weatherproof gear operators or other specified operator. Valves shall be suitable for installation between ANSI Class 150 weldneck flanges or other specified flanges without special preparation. Butterfly valves shall be Norriseal Angle Disc Model M1011-433A or other specified model number.



EVVVD\$""



EVVVD? \$""

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Norriseal Series 285 Butterfly Valves

Advanced Angle-disc Design:

Provides bi-directional, positive shutoff & long service life.



EVVVE
D\$*'



EVVVE
? \$*'

EVVVE \$'* TgffVXX hS'hV provide bi-directional, positive shutoff to ANSI 150 standards (285 psig). They feature an exclusive angle disc with a 360° uninterrupted differential sealing surface.

Series 285 butterfly valves offer outstanding flow efficiency, with a rigid-drive, precision disc-to-shaft connection that eliminates load-bearing fasteners in the flowstream. Double-shaft seals and shaft bushings assure smooth, low-torque operation.

Available in both resilient-seated and metal-lined configurations, Series 285 butterfly valves have a non-wetted body and may be specified in lug or wafer designs. They are used with a variety of pneumatic, electric and hydraulic actuation.

Features

- 100% bubble-tight positive shutoff
- Full rated bi-directional shutoff
- Field replaceable resilient seat
- Non-wetted body design
- Wide selection of materials available
- Meets ANSI B16.5 code for Class 150 flange pressure/temperature rating
- Sizes 2½" through 36"

Contents

- 2** Series R285 Benefits
- 4** Series R285 Parts
- 5** Series M285 Benefits
- 7** Series M285 Parts
- 8** Series 285A
2½"-12" Dimensions
- 9** Series 285A
14"-36" Dimensions
- 10** Series 285B
2½"-12" Dimensions
- 11** Series 285B
14"-36" Dimensions
- 12** Operating Torques
- 13** Series R&M 285
Model Code

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Series R285

The Series R285 is the lowest priced long-life butterfly valve with a pressure/temperature rating that meets ANSI B16.5 for class 150 flanges.

Lowest Price Because It Is Completely Lined

The flow stream never touches the body. There is no need for a costly high-alloy body, even in corrosive service. The removable elastomer seat is easily replaced onsite in minutes.

Positive Shutoff With Norriseal Angle-Disc Design

The Series R285 is proven by over 30 years of day-in, day-out service. The disc does not seat in shaft holes, assuring bubble-tight shutoff with no scrubbing or compression set in the shaft hole area. Resilient seats are made from high-density elastomers which are highly resistant to deterioration by flow media.

Usage Between ANSI B16.5 Class 150 WELDNECK Flanges

The schedule 40 inside diameter of the flange is needed to provide proper seat support at the higher working pressure (200 psi and greater).

Flange Gaskets Are Not Required

Separate, replaceable body O-ring flange seals eliminate the need for flange gaskets. Flange seals can be changed, if necessary, without dismantling the valve and replacing the seat. Often a damaged flanged seal need not be replaced, but simply turned over and inserted back into the body face groove.

No Need for Scheduled Lubrication

Four O-ring shaft seals lock in factory lubricant. Along with the primary seal molded into the elastomer seat shaft hole, these seals provide protection against leakage into body shaft bearing areas.

Four self-lubricated, steel-backed shaft bushings reduce operating torque and prevent galling of the shaft. Bushings are designed to operate above temperature limits of elastomer seats and seals with a 2 to 1 safety factor at full differential pressure.

Greater Flow Efficiency and Lower Operating Torque

The Series R285 butterfly valve gives you much greater flow efficiency and lower operating torque than conventional offset disc valves which meet pressure/temperature requirements of ANSI B16.5 code for class 150 flanges.

Bi-directional Flow With No Loss in Flow Efficiency

The symmetrical disc design of Norriseal angle-disc valves gives you the same highly efficient flow in both directions. Since the flow area is equal on both sides of the thru-shaft, no unbalanced flow occurs as is experienced in conventional offset disc designs.

Reserve Strength to Handle Sudden Differential Pressure Surges

The Series R285 butterfly valve provides a 285 psi rating and insures added protection against water-hammer and other unexpected overloads. Every valve is strength tested before shipment and is shell tested to 150% (430 psig) of rated pressure with the disc open. Every valve is tested for positive shutoff – differentially tested to 110% (315 psig) of rated working pressure with the disc closed. Every valve is tested for leakage into the shaft bearing area. The set screw is removed during differential and shell testing to assure that there is no leakage into this area.

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Series R285

Added Strength With a Thru-Shaft

A high-strength, full-length shaft is cross-pinned to the disc with a large-diameter solid, round pin, which is field removable. This connection is stronger than the torsional strength of the shaft itself. The disc pin does not penetrate the sealing surface of the disc. Shafts are manufactured from premium performance material: 17-4PH stainless, K-Monel.

Each Disc Is Individually Centered to Prevent Leakage

Precision thrust bearings keep the disc in precisely centered alignment with the seat, assuring reliable, bubble-tight seating throughout the life of the valve and helping to prevent leakage through the valve bore.

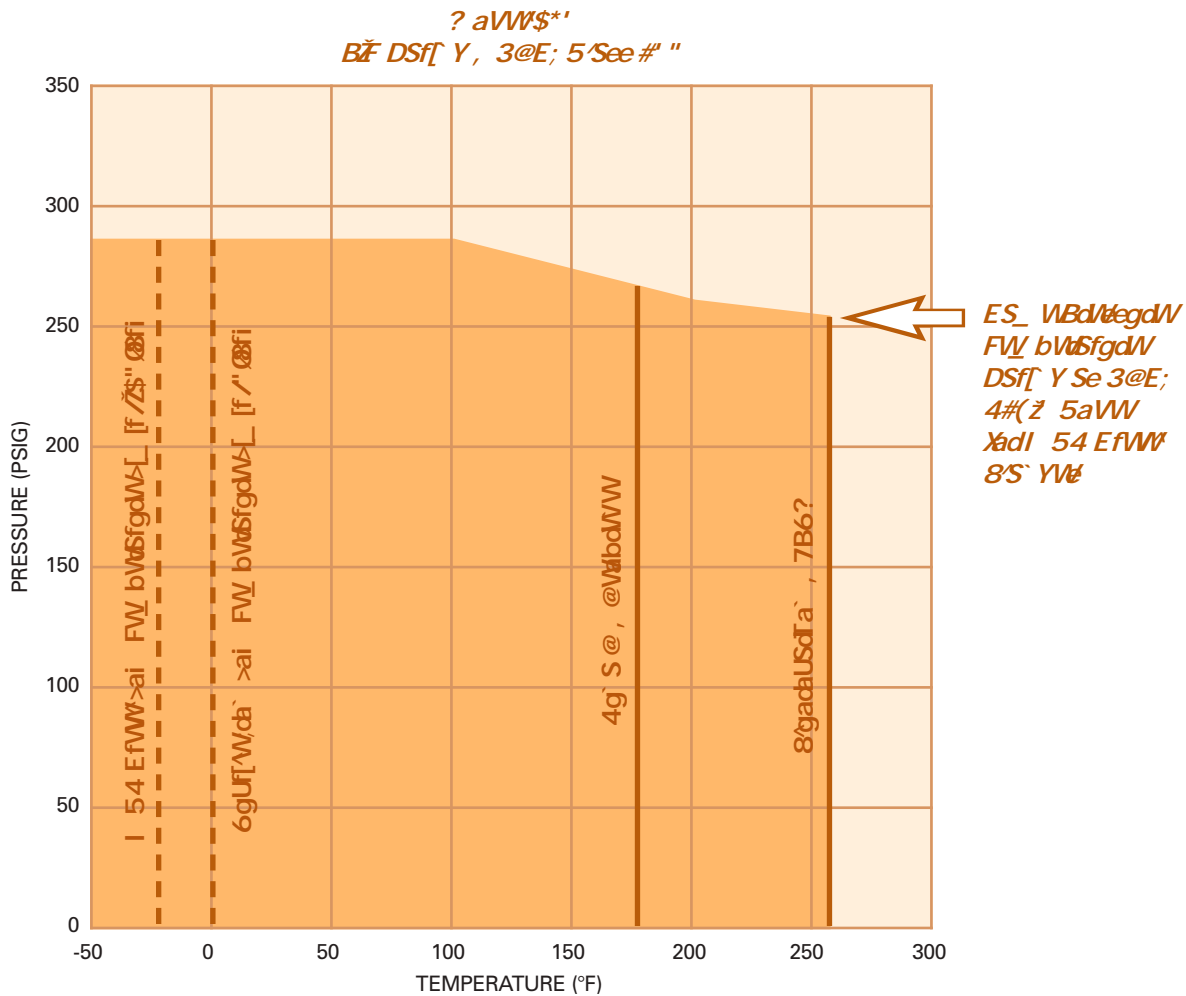
Self-Cleaning Valves

Smooth disc contours resist dirt build-up and turbulence.

Choice of Actuators

All actuators fitting Norriseal 200 psi models also fit the R285 Series – lever handles, gear operators, diaphragm actuators, air cylinder assemblies and electric operators.

Compare the R285 series with the valves you're using now, then call for our application engineering department. We'll fill you in on all the Norriseal money saving angles and help you select a R Series valve for your next application.



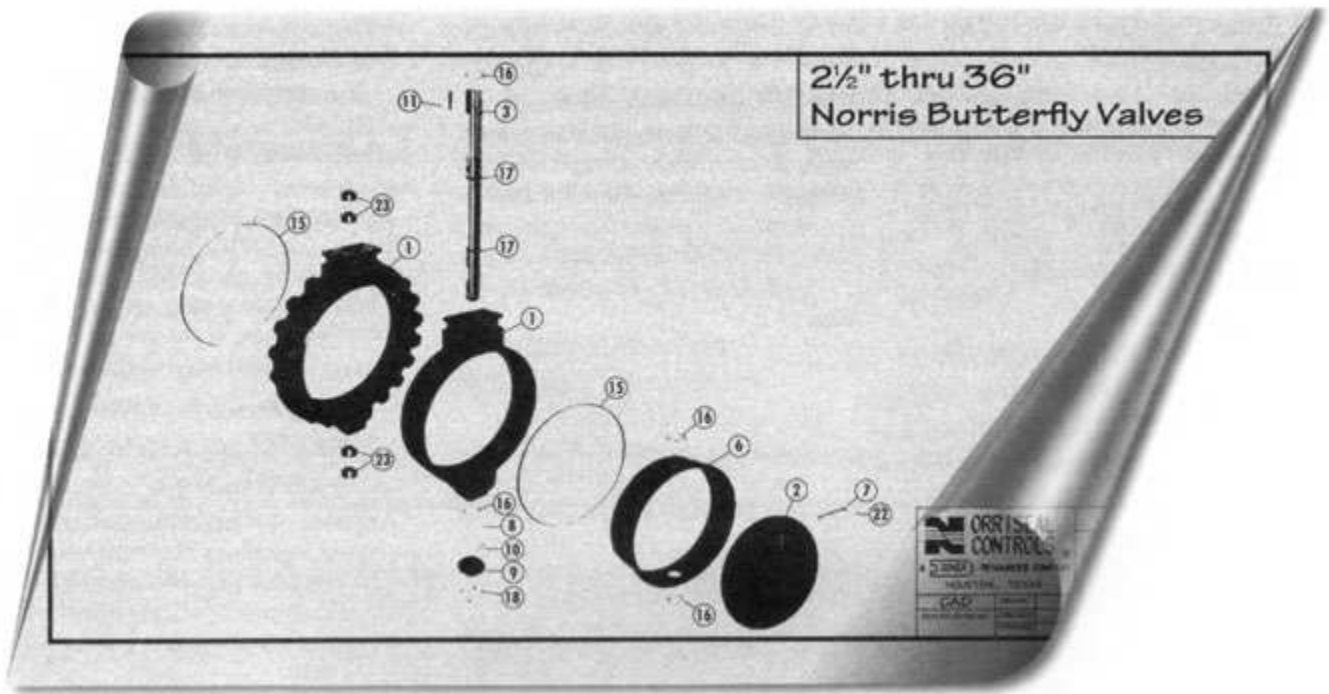
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Series R285



Parts Description

- 1 **mbw** Valve body is isolated from flow stream by resilient seat and O-ring seals. Bodies have shaft bushings for handling shaft loads and to provide minimum operating torque.
- 2 Disc. Angle disc construction gives 360° uninterrupted contact of disc with seat. Disc does not seat in shaft holes, assuring bubble-tight shutoff time after time with no scrubbing of the elastomer in the shaft hole areas.
- 3 Shaft. Through shaft, cross pinned to disc with straight dowel pin, assures maximum drive strength and field repairability. Disc does not penetrate the sealing plane of the disc.
- 6 Seat. Field replaceable resilient seat is bonded to a rigid backing ring to prevent seat from distorting or collapsing due to high velocity flow or in vacuum service. Rigid backing also prevents seat collapse during installation of valve between flanges.
- 7 Disc Pin. Round pin does not penetrate the sealing plane of the disc.
- 8. Shim Set. Assures proper support and centering of disc in seating area.
- 9-10 Thrust Plate & Washer. Retains shaft from bottom.
- 11 Key. Provides precision fit with operator (14" & larger)
- 15 Body O-rings. Body O-ring flange seals eliminate need for flange gaskets. Flange seals can be replaced without dismantling the valve and replacing the seat. Many times, an O-ring flange seal damaged during initial installation may still be used simply by turning it over and returning it to the body.
- 16 O-ring Seat and Shaft Seals . Seat and shaft seals prevent stem leakage to atmosphere and permanently lubricated areas; protect from outside contamination.
- 17 O-ring Disc/Shaft Seals. Seals prevent leakage across disc plane.
- 18 Thrust Plate Capscrews. To retain bottom thrust plate. (not shown)
- 22 Disc Pin Capscrews. To retain disc pin. (not shown)
- 23 Shaft Bushings. Self-lubricated steel-backed shaft bushings reduce operating torque and prevent galling of the shaft.

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Series M285

Reserve Strength to Handle Sudden Differential Pressure Surges

The Series M285 butterfly valve provides a 285 psi rating and insures added protection against water-hammer and other unexpected overloads.

Strength Tested

Shell tested to 150% (430 psig) of rated pressure with the disc open, hydrostatically tested for bi-directional positive shutoff without leakage at 110% (315 psig) of rated working pressure, and tested for absence of leakage into the shaft bearing areas, only valves that meet all of these POSITIVE SHUTOFF standards are approved for shipment.

Longer Life

Series 285 butterfly valves provide long service life because an almost unlimited combination of trim materials for the disc, liner and O-ring seals is available to control even the most destructive flow streams. Any elastomer available in standard O-ring form can be used for sealing M285 valves.

Flow Stream Never Touches the Body

Shaft O-ring seals and a field-replaceable metal seat keep the body dry.

Bi-directional Flow With No Loss in Flow Efficiency

The flow area is equal on both sides of the thru-shaft with Norriseal's symmetrical angle-disc design. There is less turbulence and reduced fluid dynamic torque than in "high-performance" butterfly valves with offset discs.

The redesigned, bi-directional disc O-ring groove (patent applied for) assures positive shutoff in both directions.

Easy On-site Maintenance

No special tools are required and maintenance takes only minutes. Replacing a part will not affect positive shutoff characteristics of the valve.

No Need for Scheduled Lubrication

The shaft is factory lubricated and protected against leakage by four O-ring seals. Four self-lubricated, steel-backed shaft bushings reduce operating torque and prevent galling of the shaft.

No Flange Gaskets Required

Separate body O-ring flange seals are replaceable in minutes without dismantling the valve.

A Choice of Actuators

Actuator options include lever handles, gear operators, diaphragm actuators, cam-operated cylinder assemblies, and electric operators.

@act[el]B^? \$^ hS^hVd SdM^ fVWVW XadgeW TVW VW 3@E; 4#(Z USee # " XS^ YWz*

Application Engineering Assistance

Call 1-713-466-3552 for help in selecting the correct Norriseal M285 valve for each application.

For Chemical Industries

Norriseal valves with stainless steel, Monel, Hastelloy, or nickel aluminum bronze discs and seats and Viton®, Buna N, EPDM, or Neoprene seals solve difficult valving problems in the chemical processing industry – without repairs – over long service periods.

Now In Aviation Fueling Systems Nationwide

M285 valves are ideal for handling volatile materials such as gasolines, jet fuels and solvents, which tend to dry elastomers.

Features

- Metal-lined positive shutoff
- Non-wetted body design
- Full bi-directional shutoff
- Wide selection of materials available

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Apergy

Series M285

For Marine Service

For many years, Norriseal valves have met U.S. Navy specifications for services such as bilge, ballast, fire mains, etc. They also satisfy MIL-V-16468 for positive shutoff of hydrocarbon fuels on shipboard.

During the 1970s, in fire tests by the U.S. Coast Guard, Norriseal valves satisfactorily handled flammable liquids in a fire situation. The Coast Guard has qualified Norriseal metal-lined valves for critical positive shutoff services on shipboard according to paragraph 56.50-60.

For the Petroleum Industry

M-Series valves meet the many requirements on loading racks and manifolds, in tank farms and in distribution systems.

They are approved for control of poisonous hydrogen sulfide gas and other services near the wellhead.

M-Series Valves Meet Industry Standards Around the World

Norriseal M-Series split-shaft valves were the first butterfly valves to be approved under U.S. Navy specifications MIL-V16468, which covers positive shutoff valves for hydrocarbon service on shipboard.

Norriseal M-Series valves also meet the following standards:

Commercial Marine Certificates. U.S. Coast Marine Engineering Regulations, subchapter F (CG-115) and 46 DFT 56.50-60 (d); American Bureau of Shipping Rules for the Classifications and Construction of Steel Vessels.

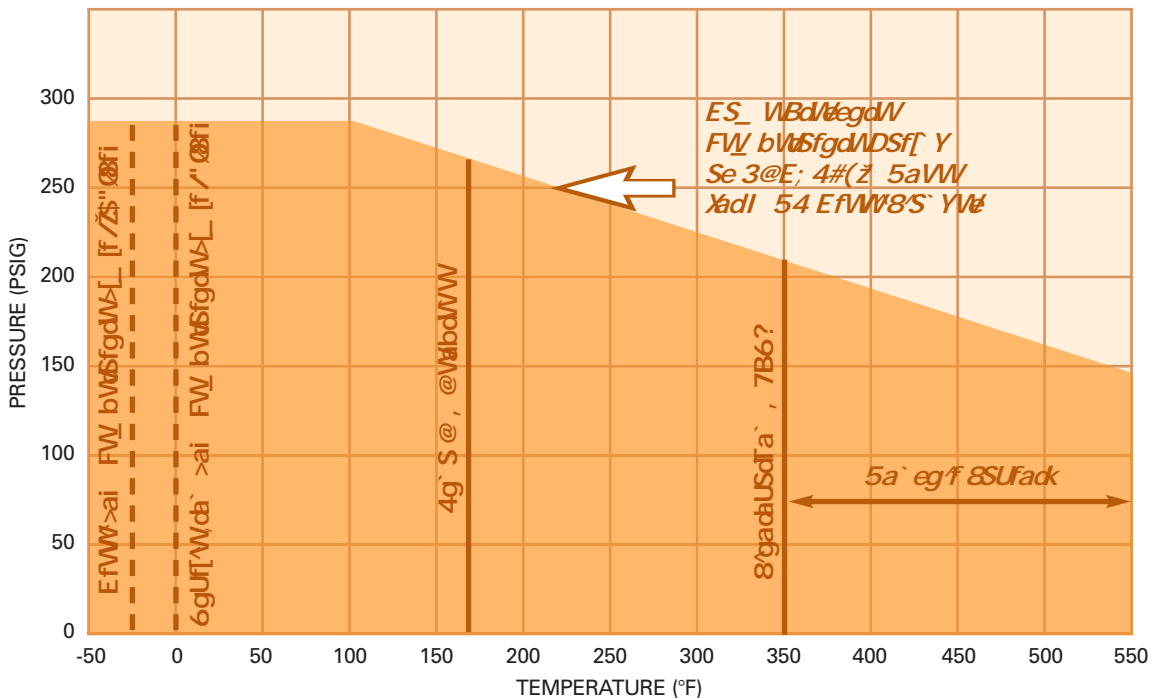
Commercial Marine Compliance. Det Norske Veritas (DNV); Lloyd's Register of Shipping.

Industrial Butterfly Valve Standards. MSS Standard Practice SP-67 Butterfly Valves; American Petroleum Institute – Refinery Division (API) Standard 609 Valve Body Dimensions and Pressure-Temperature Rating for Butterfly Valves;

Piping Standards Which Influence Valve Selection. American National Standards Institute (ANSI) – Standards for Flanges and Fittings – B16.5 Code for Pressure/Temperature Rating of Class 150 Flanges; Deutsches Institut for Normung e.V. (DIN) – Standards for Flanges; Japanese Industrial Standards (JIS) – Flange Standards; British Standards Institute (BSI) – Flange Standards

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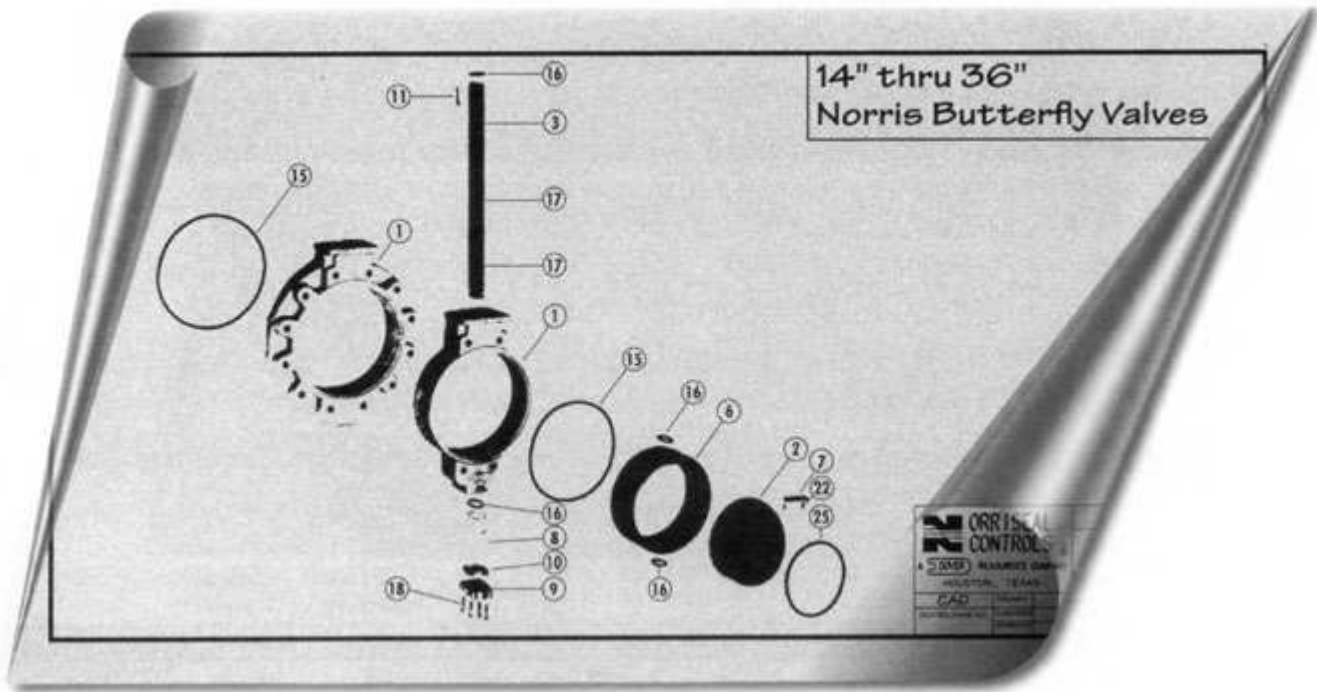
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Series M285



Parts Description

- | | | | |
|------|---|----|--|
| / | mbw , Available in wafer and lug type. | 15 | Body O-rings. Body O-ring flange seals eliminate need for flange gaskets. Flange seals can be replaced without dismantling the valve. |
| 2 | Disc. Angle-disc construction gives 360° uninterrupted contact of disc O-ring seal with metal liner for dependable positive shutoff. | 16 | O-ring Seat and Shaft Seals . Double shaft/bushing seals prevent stem leakage and protect from internal or external contamination. Internal seals are 100% tested to assure there is no leakage behind the seat. |
| 3/7 | Shaft/Disc Pin. Through shaft is cross pinned to disc with large diameter solid straight pin, assuring disc/shaft/pin interchangeability. Disc pin does not penetrate sealing plane of the disc – it is positively retained with two capscrews. | 17 | O-ring Disc/Shaft Seals. Double seals prevent leakage thru disc/shaft hole. |
| 6 | Seat. Field-replaceable metal seat isolates valve body from flow stream; eliminates need for premium body material even when handling corrosive media. | 18 | Thrust Plate Capscrews. Retain bottom thrust plate. |
| 8 | Shim Set. Assures proper disc/seat support and perfectly centers disc in seating area for positive shutoff throughout the life of the valve. | 22 | Disc Pin Capscrews. Retain disc pin. Stainless steel or K-Monel. |
| 9/10 | Thrust Plate & Washer. Retains shaft from bottom. | 23 | Shaft Bushings. Self-lubricated steel-backed shaft bushings reduce operating torque and prevent galling of the shaft. |
| 11 | Key. Provides precision fit with operator (14" & larger). Double key slot is standard so valve action is easily reversed. (Not shown). | 25 | Disc O-ring Seal. O-ring contained in specially designed groove in disc edge (patent applied for) assures bi-directional positive shutoff. |

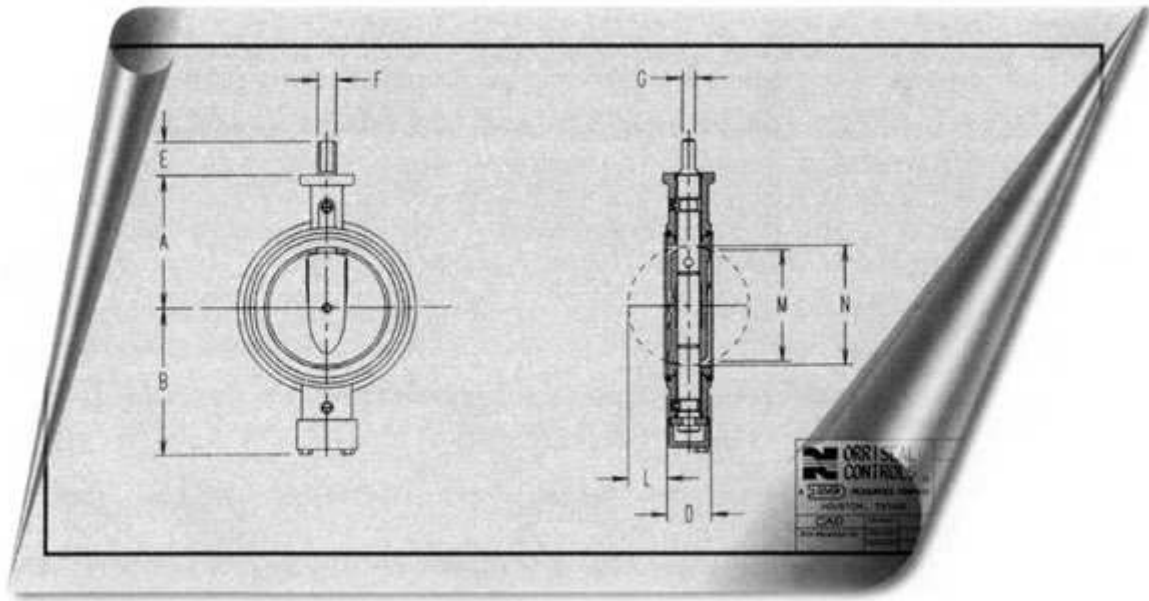
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Apergy

R285A 2½"-12" Valves Certified Dimensions



VALVE DIMENSIONS

BgkclqgmI Pcdcpclac	T jtcQgxc&Glafcq-kk								
	0.3-4.3	1-6.	1.3-7.	2-/.	3-/03	4-/3.	6-0.	/.-03.	/0-1.
A	4.16	4.41	N/A	4.88	5.28	6.50	7.47	9.38	10.41
B	4.48	4.86	N/A	5.31	5.72	7.27	8.22	9.92	10.96
C	4.88	5.38	N/A	6.88	7.75	8.75	10.88	13.38	16.00
D	1.75	1.75	N/A	2.00	2.13	2.13	2.50	2.50	3.00
E	1.31	1.31	N/A	1.31	1.31	1.69	1.69	2.00	2.00
F	.69	.69	N/A	.69	.69	.88	.88	1.06	1.06
G	.50	.50	N/A	.50	.50	.63	.63	.75	.75
H	.88	.88	N/A	.88	.88	1.06	1.06	1.38	1.38
J	.25	.25	N/A	.25	.25	.38	.38	.38	.38
K	1.81	1.81	N/A	1.81	1.81	2.34	2.34	2.63	2.63

DISC CLEARANCE

L	.50	.75	N/A	1.13	1.56	1.94	2.69	3.75	4.50
M	2.06	2.69	N/A	3.59	4.72	5.55	7.44	9.58	11.52
N	2.72	3.20	N/A	4.19	5.17	5.91	7.81	9.89	11.89
Approx Wt.- Cast Iron Body	6	7	-	11	14	18	30	47	64

BOLT DATA

For Use with ANSI Class 150 Weldneck Flanges. For optimum valve performance, it is recommended that butterfly valves be installed between weldneck flanges or flanges with equivalent inside dimensions.									
Bolt Size	.63 x 4.50	.63 x 4.50	N/A	.63 x 4.50	.75 x 5.50	.75 x 6.00	.75 x 6.00	.88 x 6.00	.88 x 7.00
No. Required	4	4	-	8	8	8	8	12	12

OPERATOR DIMENSIONS

P	9.94	9.94	N/A	9.94	9.94	15.00	15.00	16.00	16.00
Q	3.34	3.34	N/A	3.34	3.34	3.66	3.66	3.66	3.66
R	6.88	6.88	N/A	6.88	6.88	7.50	7.50	8.00	8.00
S	6.00	6.00	N/A	6.00	6.00	8.00	8.00	8.00	8.00
T	2.36	2.36	N/A	2.36	2.36	2.36	2.36	3.00	3.00
U	3.50	3.50	N/A	3.50	3.50	3.50	3.50	4.38	4.38
V	5.93	5.93	N/A	5.93	5.93	5.93	5.93	7.50	7.50
W	5.25	5.25	N/A	5.25	5.25	5.25	5.25	6.75	6.75
X	2.92	2.92	N/A	2.92	2.92	2.92	2.92	3.27	3.27
Y	2.63	2.63	N/A	2.63	2.63	2.63	2.63	2.63	2.63
Z	1.69	1.69	N/A	1.69	1.69	1.69	1.69	1.88	1.88
Aprox Wt. 2R & 2RM Operator	7	7	N/A	7	7	8	8	13	13

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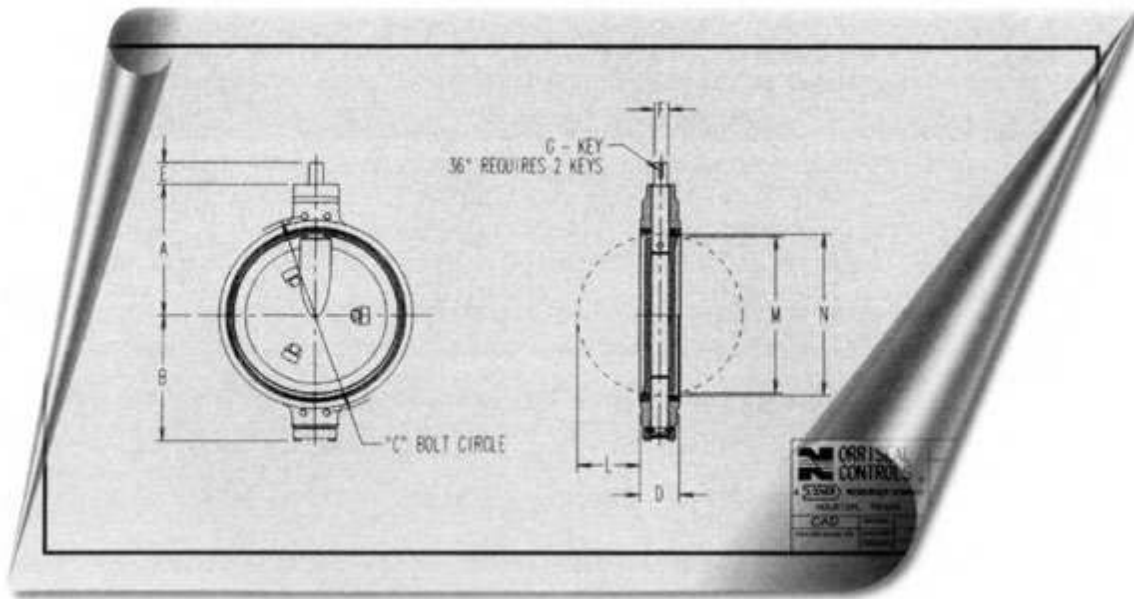
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Apergy

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R285A 14"-36" Valves Certified Dimensions



VALVE DIMENSIONS

Bgkclqgml Pcdcpclac	T jtcQgxc&Glafcq-kk										
	/2-13.	/4-2.	/6-23.	0-3.	00-33.	02-4.	04-43.	06-5.	1-53.	10-6.	14-7.
A	12.63	14.00	14.75	16.00	17.38	17.50	20.13	22.75	23.75	24.50	26.13
B	14.25	15.63	16.63	17.88	18.00	19.00	20.61	21.83	22.70	24.23	29.38
C	18.75	21.25	22.75	25.00	27.25	29.50	31.75	34.00	36.00	38.50	42.75
D	3.75	4.13	4.63	5.13	5.00	5.00	6.00	6.50	7.00	7.00	8.50
E	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	4.75
F	1.75	1.75	1.75	2.50	2.50	2.50	2.50	2.50	2.50	2.50	3.00
G	.38x2.5	.38x2.5	.38x2.5	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.75x3.0
H	1.75	2.00	2.25	2.50	2.50	2.50	3.00	3.00	3.00	3.50	3.50
J	.63	.63	.63	.63	.63	.63	.75	.75	.75	.75	.75
K	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50

DISC CLEARANCE

L	4.79	5.61	6.36	7.14	8.19	9.19	9.60	10.36	11.10	11.96	12.88
M	12.80	14.78	16.72	18.72	20.75	22.83	24.50	26.38	28.50	30.13	34.25
N	13.34	15.34	17.34	19.41	21.33	23.38	25.51	27.21	29.21	30.96	35.25
Approx Wt.- Cast Iron Body	160	224	300	370	420	518	640	740	940	990	1485

BOLT DATA

For Use with ANSI Class 150 Weldneck Flanges. For optimum valve performance, it is recommended that butterfly valves be installed between weldneck flanges or flanges with equivalent inside dimensions.											
Bolt Size	1.00x 7.75	1.00x 8.50	1.13x 9.00	1.13x 10.00	1.25x 11.50	1.25x 11.50	1.25x 13.00	1.25x 13.50	1.25x 14.00	1.50x 14.00	1.50x 15.00
No. Required (Both Required)	8	12	12	16	16	16	20	24	24	24	28
Capscrew Size	1.00NCx 3.00	1.00NCx 3.00	1.13NCx 3.00	1.13NCx 3.00	1.25NCx 3.50	1.25NCx 4.00	1.25NCx 3.50	1.25NCx 3.25	1.25NCx 3.50	1.50NCx 3.75	1.50NCx 3.75
No. Required	8	8	8	8	8	8	8	8	8	8	8

OPERATOR DIMENSIONS

R	9.75	9.75	9.75	17.25	17.25	17.25	17.84	17.84	17.84	17.84	17.84
S	12.75	12.75	12.75	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
T	4.83	4.83	4.83	5.38	5.38	5.38	2.69	2.69	2.69	2.69	7.13
U	6.63	6.63	6.63	7.63	7.63	7.63	9.44	9.44	9.44	9.44	10.81
V	10.13	10.13	10.13	11.13	11.13	11.13	14.94	14.94	14.94	14.94	16.31
W	9.00	9.00	9.00	10.81	10.81	10.81	12.00	12.00	12.00	12.00	14.00
X	5.00	5.00	5.00	5.14	5.14	5.14	7.38	7.38	7.38	7.38	7.75
Y	4.50	4.50	4.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Z	2.88	2.88	2.88	2.88	2.88	2.88	4.00	4.00	4.00	4.00	4.00
Approx Wt. 2T & 2TM Operator	70	70	70	90	90	90	90	210	210	210	260

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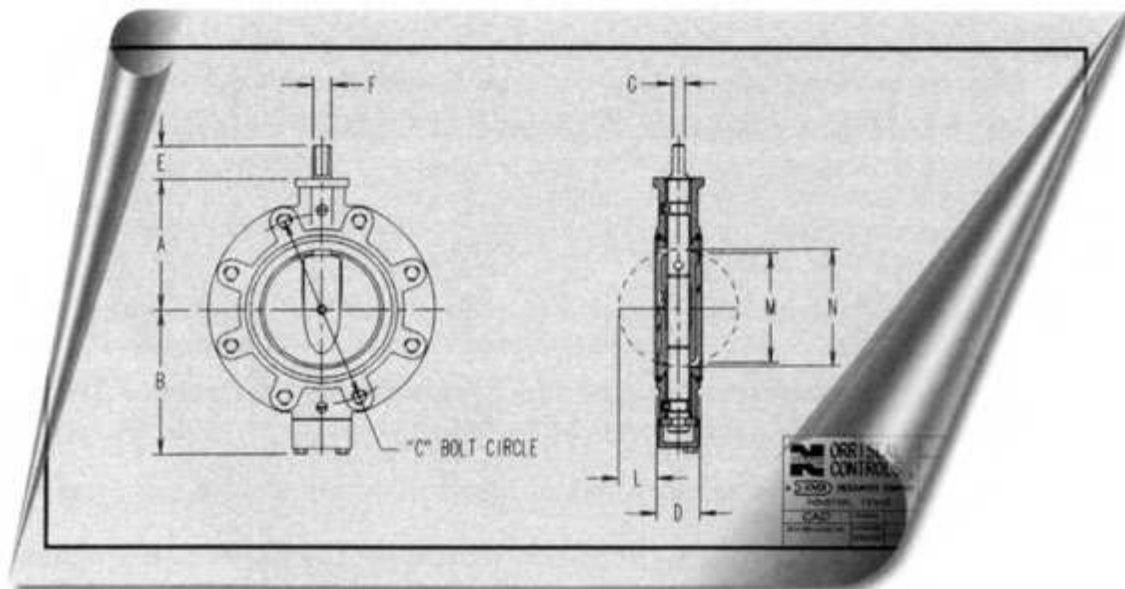
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R285B 2½"-12" Valves Certified Dimensions



VALVE DIMENSIONS

BqkclqgmI Pcdcpclac	T jtcQgxc&Glafcq-kk								
	0,3-43	1-6.	1,3-7.	2-/.	3-/03	4-/3.	6-0..	/-03.	/0-1..
A	4.16	4.41	4.63	4.88	5.28	6.50	7.47	9.38	10.41
B	4.48	4.86		5.31	5.72	7.27	8.22	9.92	10.96
C	5.50	6.00	7.00	7.50	8.50	9.50	11.75	14.25	17.00
D	1.75	1.75	1.94	2.00	2.13	2.13	2.50	2.50	3.00
E	1.31	1.31	1.31	1.31	1.31	1.69	1.69	2.00	2.00
F	.69	.69	.69	.69	.69	.88	.88	1.06	1.06
G	.50	.50	.50	.50	.50	.63	.63	.75	.75
H	.88	.88	.88	.88	.88	1.06	1.06	1.38	1.38
J	.25	.25	.25	.25	.25	.38	.38	.38	.38
K	1.81	1.81	1.81	1.81	1.81	2.34	2.34	2.63	2.63

DISC CLEARANCE

L	.50	.75	.94	1.13	1.56	1.94	2.69	3.75	4.50
M	2.06	2.69	3.16	3.59	4.72	5.55	7.44	9.58	11.52
N	2.72	3.20	3.72	4.19	5.17	5.91	7.81	9.89	11.89
Approx Wt.- Cast Iron Body	8	10	12	16	20	26	40	62	87

BOLT DATA

For Use with ANSI Class 150 Weldneck Flanges. For optimum valve performance, it is recommended that butterfly valves be installed between weldneck flanges or flanges with equivalent inside dimensions.									
Capscrew Size*	.63NC x 1.50	.63NC x 1.75	.63NC x 1.75	.63NC x 1.75	.75NC x 1.75	.75NC x 2.00	.75NC x 2.25	.88NC x 2.25	.88NC x 2.50
No. Required	8	8	16	16	16	16	16	24	24

OPERATOR DIMENSIONS

P	9.94	9.94	N/A	9.94	9.94	15.00	15.00	16.00	16.00
Q	3.34	3.34	N/A	3.34	3.34	3.66	3.66	3.66	3.66
R	6.88	6.88	N/A	6.88	6.88	7.50	7.50	8.00	8.00
S	6.00	6.00	N/A	6.00	6.00	8.00	8.00	8.00	8.00
T	2.36	2.36	N/A	2.36	2.36	2.36	2.36	3.00	3.00
U	3.50	3.50	N/A	3.50	3.50	3.50	3.50	4.38	4.38
V	5.93	5.93	N/A	5.93	5.93	5.93	5.93	7.50	7.50
W	5.25	5.25	N/A	5.25	5.25	5.25	5.25	6.75	6.75
X	2.92	2.92	N/A	2.92	2.92	2.92	2.92	3.27	3.27
Y	2.63	2.63	N/A	2.63	2.63	2.63	2.63	2.63	2.63
Z	1.69	1.69	N/A	1.69	1.69	1.69	1.69	1.88	1.88
Aprox Wt. 2R & 2RM Operator	7	7	N/A	7	7	8	8	13	13

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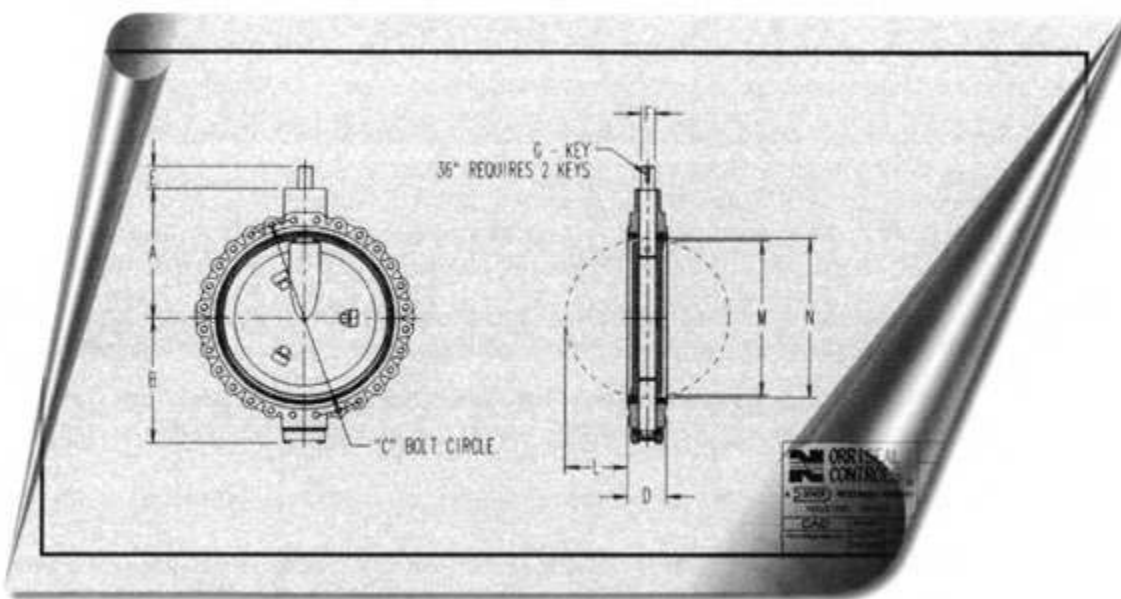
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R285B 14"-36" Valves Certified Dimensions



VALVE DIMENSIONS

Bgkclqgml Pcdpcclac	T jtcQgxc&Glafcq-kk										
	/2-13.	/4-2.	/6-23.	0-3.	00-33.	02-4.	04-43.	06-5.	1-53.	10-6.	14-7.
A	12.63	14.00	14.75	16.00	17.38	17.50	20.13	22.75	23.75	24.50	26.13
B	14.25	15.63	16.63	17.88	18.00	19.00	20.61	21.83	22.70	24.23	29.38
C	18.75	21.25	22.75	25.00	27.25	29.50	31.75	34.00	36.00	38.50	42.75
D	3.75	4.13	4.63	5.13	5.00	5.00	6.00	6.50	7.00	7.00	8.50
E	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	4.75
F	1.75	1.75	1.75	2.50	2.50	2.50	2.50	2.50	2.50	2.50	3.00
G	.38x2.5	.38x2.5	.38x2.5	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.63x2.94	.75x3.0
H	1.75	2.00	2.25	2.50	2.50	2.50	3.00	3.00	3.00	3.50	3.50
J	.63	.63	.63	.63	.63	.63	.75	.75	.75	.75	.75
K	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50

DISC CLEARANCE

L	4.79	5.61	6.36	7.14	8.19	9.19	9.60	10.36	11.10	11.96	12.88
M	12.80	14.78	16.72	18.72	20.75	22.83	24.50	26.38	28.50	30.13	34.25
N	13.34	15.34	17.34	19.41	21.33	23.38	25.51	27.21	29.21	30.96	35.25
Approx Wt.- Cast Iron Body	200	290	370	460	485	531	810	980	1080	1130	1795

BOLT DATA

For Use with ANSI Class 150 Weldneck Flanges.											
For optimum valve performance, it is recommended that butterfly valves be installed between weldneck flanges or flanges with equivalent inside dimensions.											
Capscrew Size	1.00NCx3.00	1.00NCx3.00	1.13NCx3.50	1.13NCx3.50	1.25NCx4.00	1.25NCx4.00	1.25NCx4.00	1.25NCx4.00	1.25NCx4.00	1.50NCx4.50	1.50NCx4.50
No. Required (Both Required)	24	32	32	32	32	40	40	48	48	48	64
Capscrew Size				1.00NCx3.00	1.25NCx3.50		1.25NCx3.50	1.25NCx3.25	1.25NCx3.50	1.50NCx3.75	1.50NCx4.00
No. Required	N/A	N/A	N/A	8	8	N/A	8	8	8	8	8

OPERATOR DIMENSIONS

R	9.75	9.75	9.75	17.25	17.25	17.25	17.84	17.84	17.84	17.84	17.84
S	12.75	12.75	12.75	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
T	4.83	4.83	4.83	5.38	5.38	5.38	2.69	2.69	2.69	2.69	7.13
U	6.63	6.63	6.63	7.63	7.63	7.63	9.44	9.44	9.44	9.44	10.81
V	10.13	10.13	10.13	11.13	11.13	11.13	14.94	14.94	14.94	14.94	16.31
W	9.00	9.00	9.00	10.81	10.81	10.81	12.00	12.00	12.00	12.00	14.00
X	5.00	5.00	5.00	5.14	5.14	5.14	7.38	7.38	7.38	7.38	7.75
Y	4.50	4.50	4.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Z	2.88	2.88	2.88	2.88	2.88	2.88	4.00	4.00	4.00	4.00	4.00
Approx Wt. 2T & 2TM Operator	70	70	70	90	90	90	90	210	210	210	260

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Operating Torques

OPERATING TORQUES 285 SERIES (INCH-POUNDS)

Operating torques for wet service shown in table below include 50% service factor. For dry torques, multiply the values shown by 1.33.

T jtc Qqxc		P 063 UcrQcptgac						K 063 UcrQcptgac					
		JglcNpcqqspc nqg						JglcNpcqqspc nqg					
IN	MM	0	50	100	150	200	285	0	50	100	150	200	285
2.5	65	100	134	169	204	238	275	86	133	181	229	276	285
3	75	140	180	221	261	302	504	115	172	230	288	345	448
4	100	224	308	392	476	560	672	207	328	448	569	690	897
5	125	343	492	616	761	896	1,050	310	550	787	1,027	1,265	1,782
6	150	1,000	1,120	1,254	1,377	1,512	1,820	575	907	1,240	1,572	1,904	2,645
8	200	2,116	2,419	2,755	3,113	3,427	4,060	862	1,625	2,386	3,148	3,910	5,175
10	250	3,024	3,516	4,020	4,502	5,040	5,880	1,207	2,343	3,478	4,615	5,750	7,360
12	300	4,827	5,544	6,216	6,921	7,616	9,100	1,495	3,938	6,382	8,826	11,270	15,100
14	350	6,500	7,475	8,400	9,500	10,300	12,600	1,730	4,900	8,000	11,300	14,500	21,000
16	400	8,000	9,300	10,300	11,500	12,500	15,000	2,050	6,150	10,200	14,300	18,400	26,500
18	450	11,000	12,500	14,000	15,300	17,000	21,000	2,300	6,800	11,300	15,700	20,000	29,000
20	500	11,600	14,000	16,000	18,500	20,700	25,300	2,600	8,400	14,300	20,000	26,000	38,000
24	600	16,700	19,500	22,000	25,000	27,600	33,000	3,100	10,800	18,500	26,000	34,000	50,600
30	750	40,000	45,000	49,000	53,000	58,000	68,000	3,900	17,600	31,300	45,000	59,000	86,250
36	900	46,000	55,000	63,000	72,000	81,000	98,000	5,200	27,000	49,000	70,000	92,000	126,000

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Valve Model Number System R&M 285 WP

PRESSURE CLASS

Aj qq	Ambc
ANSI 150 Valve 285 PSI	285

SERIES

Qcpgcq	Ambc
Resilient Seat	R
Metal Seat	M

VALVE SIZE (IN INCHES)

Qgxc	Ambc
2.5" - 36"	2...36

BODY CONFIGURATION

Amlidgep rgml	Ambc
Single Rib	A
Full Lug	B
Double Rib	C
Single Rib Longneck (1400) Limited Availability	F
Full Lug Longneck	G
ISO Wafer Body (DI only)	H
ISO Lugged Body (DI only)	J

BODY MATERIALS

K rcpq jRwnc	Ambc
Ductile Iron ASTM A395 60-40-18	1
Carbon Steel (WCB) ASTM A216 Gr. WCB	2
316 Stainless Steel ASTM A743 CF8M*	5
Nickel Aluminum Bronze ASTM B148 Alloy C95800	6

*Special Order - Consult Factory

SHAFT MATERIAL

K rcpq j	Ambc
K-Monel (NiCuAl) Alloy QQ-N-286A*	6
17-4 PH Stainless Steel ASTM A564 Type 630	7
Special to be Described	0
Hastelloy "C" 276 ASTM B574 Alloy N10276	C

DISC MATERIAL

Code	Materials
1	Ductile Iron ASTM A395 60-40-18
2	316 Stainless Steel ASTM A743 Gr. CF8M
3	Alloy 20 Stainless Steel ASTM A743 Gr. CN7M
4	Aluminum Bronze ASTM B148 Alloy C95400 2" thru 14" Aluminum Bronze ASTM B148 Alloy C95500 16" thru 36"
6	Monel 400 (Ni Cu Alloy) ASTM A494, M30C
C	Hastelloy "C" ASTM A494 CW 12-MW
P	Nickel Aluminum Bronze ASTM B148 Alloy C95800
0	Special to be Described

SEAT MATERIAL (R SERIES)

Code	Seat
A	Nitrile (BUNA N)
B	Fluoroelastomer (Viton)
E	Neoprene (Black)
G	Neoprene (White)
J	Abrasion Resistant Nitrile
S	EPDM (Ethylene Propylene Rubber)
4	HSN (Highly Saturated Nitrile)
7	SBR (Styrene Buta Diene)
8	Nitrile, Peroxide Cured
X	Special to be Described

SEAT MATERIAL (M SERIES)

Ambc	Qc r
2	316 Stainless Steel ASTM A743 Gr. CF8M
3	Aluminum Bronze ASTM B148 Alloy C95300
5	Monel (Ni Cu Alloy) ASTM A494, M30C
7	Alloy 20 Stainless Steel ASTM A743 Gr. CN7M
C	Hastelloy "C" ASTM A494 CW 12MW
G	Nickel Aluminum Bronze ASTM B148 Alloy C95800
0	Special to be Described

4 M 285 B-166 A A-2R

SEALS

K rcpq jq	Ambc
Buna N	A
Fluoroelastomer (Viton)	B
Neoprene (Black)	E
Neoprene (White)	G
AFLAS	R
EPDM (NORDEL)	S
Low Temp Neoprene	V
Kalrez	Y
Highly Saturated Nitrile (HSN)	4
SBR	7
Peroxide Cured Buna N	8

NORRISEAL OPERATORS

Code	Manual Operators	W RF	k FDCD m FBST	W RF	a BJS m FBST
1A	(2.5-12) STD Handle with 1J Topworks	2E	(2.5-12) Gear - W.P. - Aluminum Bronze Marine Trim	**	
1F	(2.5-12) Squeeze Trigger 10 Pos	2ES	(2.5-12) 2E Subm. for Salt Water	2G11	(2.5-4) 35 SR Diaphragm
1FM	(2.5-12) 1F with Marine Trim	2R	(2.5-12) Gear Operator Aluminum Case	2G12	(2.5-4) 35 PB Diaphragm
1J	(2.5-12) STD Topworks On-Off	2T	(2.5-36) Gear Operator Cast Iron Case	2G13	(2.5-8) 70 SR Diaphragm
1AM	(2.5-12) STD Handle with 1JS Topworks	2RM	2R with Marine Trim	2G14	(2.5-8) 70 PB Diaphragm
1P	(2.5-8) Locking Topworks	2TM	2T with Marine Trim	2G15	(6-12) 180 SR Diaphragm
1Q	(2.5-8) 1P Topworks with STD Handle			2G16	(6-12) 180 PB Diaphragm
1JS	(2.5-8) STD On-Off Topworks, Stainless Steel			2G17	(12-20) 180 SR Diaphragm
				2G18	(12-20) 180 PB Diaphragm

**2G Numbers listed are Basic Numbers
Only. Complete Actuator Model Number
Must be Used when ordering.

SR-Spring Return. Specify Fail/Open
or Fail/Closed.

PB-Pressure Balanced/Double Acting.

Please note: not all available options are shown.

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- In-house engineering and technical support
- In-depth applications experience
- Award-winning innovation and ongoing product development
- ISO 9001 certified manufacturing
- Over five decades of industry service
- Compliance with all industry standards and specifications
- Responsive service and prompt delivery
- Field support available worldwide

Please contact your Norriseal-WellMark representative for more details and assistance in specifying the optimal solution for your application.

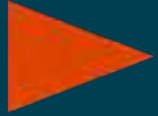
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Norriseal

ISO

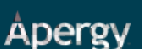
Mount

Valves

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Norriseal Auto-Mate Butterfly Valves: Easy to Use, Inexpensive to Own

Simple to install. Simple to maintain. And simply the most reliable butterfly valve in the world.

With Auto-Mate butterfly valves from Norriseal, you get all of the performance advantages of the renowned Norriseal valve design in a convenient configuration that saves time and money every time you install, actuate or maintain them. What's more, you get complete technical support for specifying your valves and optimizing them for your application.

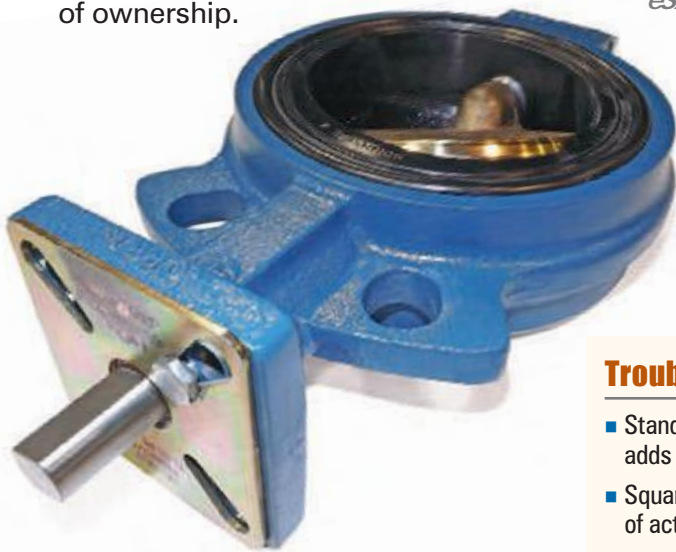
For superior value, choose Auto-Mate: the butterfly valve that gives you maximum dependability and the lowest overall cost of ownership.

*3hS[ST W] TafZ ecgSdW
S` V VagT W6 eZSXfe Xad
VBeVaXSVSbfSf[a`*

*: aV b`SfWAdbaef[hW
eVB^dVWf[a`
[VbWVWf aX
SUFgSfad*

*? g`f[b`WEA Vd^m
bSfVd efa dVgUW
[hWfack*

*EZSX dVWf[a`
eUdV e XadSVWV
eSXVk*



Trouble-free Mounting, Automating and Servicing

- Standard mounting flange with multiple ISO mounting patterns adds versatility and reduces your inventory requirements
- Square and double D shafts simplify use with a variety of actuators
- Hold plate provides positive seal retention, independent of the actuator
- Valve can be installed in open or closed position
- Worn valves are rebuilt using only a wrench and screwdriver
- Rigid-backed rubber seats are easily replaced in the field
- Shaft retention screws offer added safety while servicing the valve

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The High-Performance Butterfly Valve

Auto-Mate butterfly valves incorporate the proven Norriseal valve design. For more than 60 years, Norriseal valves have been preferred for ease of installation and repair, long service life and adaptability in design. No other butterfly valve gives you this broad range of performance-enhancing features.

- Angle disc provides 360° uninterrupted differential sealing surface
- Fully bi-directional, positive-shutoff
- High flow coefficient (Cv)
- Long service life due to angle-disc design
- Double-shaft seals and body bushings assure smooth, low-torque operation
- Independent flange seals
- Rigid drive, precision disc-to-shaft connection
- PTFE-lined bushings for low seating torque and smooth valve positioning

Optimized for Your Application

Auto-Mate butterfly valves are available with a wide variety of options in a fully bi-directional, positive-shutoff design. Experienced Norriseal technical support teams help engineer Auto-Mate valves for optimal performance in your application.

- Available in 200 psi and 285 psi pressure ratings
- Sizes from 3 in. to 12 in.
- Non-wetted, ductile iron body in lug or wafer designs
- Metal or resilient seats
- Resilient-seat design offered with a wide variety of elastomeric seals and metallic materials
- Variety of disc materials
- Full range of pneumatic, electric and hydraulic actuation



Support and Service

With Auto-Mate butterfly valves and Norriseal, you get dependable quality and service.

Every valve is fully tested and documented at the plant: 150% shell and 110% seats. Each valve is backed by a three-year warranty and Norriseal technical support worldwide.

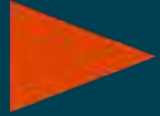
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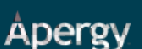


Norriseal Operators & Accessories

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Norriseal Butterfly Valve Accessories

Manual Handles, Gear Operators and Other Accessories



Contents

- 2** Manual Actuator Assemblies
- 3** Mechanical Actuator Assemblies
- 4** Specifications



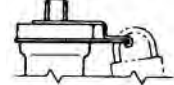
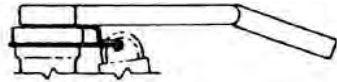
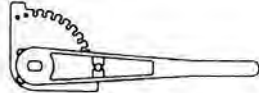

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Manual Actuator Assemblies

Manual Handle Assemblies for 2" – 12" R&M 200, 285 Series

Kmbcj	Bcqapgnrgml	
1J	Standard on-off unitized detent topworks. Milled shaft flats are parallel to the disc. Disc position can be determined by the flattened portion of the shaft. A wrench may be used to operate the valve.	
1S	5 position detent topworks.	
1JS	5 position topworks. 17-4 stainless steel	
1A	Standard on-off handle with 1J detent topworks. Aluminum 2"-8" ductile iron 10"-12" Optional ductile iron handle for 2"-8"	
1AM	Standard aluminum on-off handle with 1JS topworks (marine trim).	
1P	On-off detent topworks with padlocking device for 2"-8" (Padlock not included)	
1Q	Standard on-off topworks and handle with padlocking device for 2"-8" (Padlock not included)	
1F	Squeeze trigger 10 position throttling handle.	
1FM	Squeeze trigger 10 position throttling handle (marine trim).	
1FL	Locking squeeze trigger 10 position throttling handle.	

Accessories for 1J, 1P and IE Topworks

Kmbcj	Bcqapgnrgml	
1A	Handle only, aluminum	
1A	Handle only, ductile iron	
	AWWA Square Nut	
1K	Wrench Adapter	

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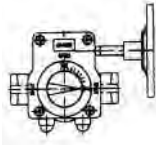



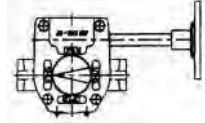

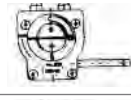
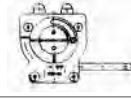
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Mechanical Actuator Assemblies

Gear Actuator Assemblies for 2" – 36" R&M Series

Kmbcj	Bcqapgnrgml	
2R	Standard weatherproof worm and gear actuator with cast aluminum case and cover. 2"–12"	
2RM	Weatherproof worm and gear actuator, stainless steel shaft, bronze sector gear, aluminum case epoxy coated for marine service. 2"–12"	
2RL	Weatherproof worm and actuator with locking device. (Padlock not included) 2"–12"	
2RT	Weatherproof worm and actuator with target indicator for service where pipeline is not visible. Not UL tagged. 2"–12"	
2E	Weatherproof worm and gear actuator Aluminum bronze case and cover. Marine trim. (Special) 2"–12"	
2ES	Submerged/buried service gear actuator Aluminum bronze case and cover. (Special) No indicator 2"–12"	
2T	Weatherproof worm and gear actuator with cast iron case and cover. 2"–36"	
2TM	Weatherproof worm and gear actuator. Stainless steel shaft Bronze sector gear, cast iron case epoxy coated for marine service. 2"–36"	
2TL	Weatherproof worm and actuator with locking device. (padlock not included) 2"–36"	
2TS	Submergible worm and gear actuator for fresh or salt water. No handwheel or indicator. 2"–36"	
2T-Bal	Weatherproof gear actuator. Cast iron case and cover with balance/memory stop. 2"–36"	
Note:	<ol style="list-style-type: none"> 1. Additional accessories can be provided upon special request. 2. When chain wheel is desired in place of standard handwheel, "W" is added as a suffix to gear descriptions, i.e. 2RW, 2TW 	

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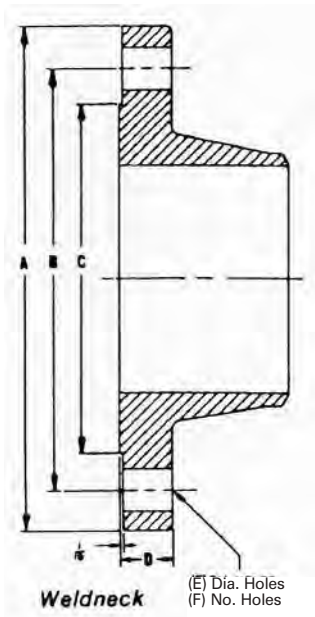
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Specifications

Qgxc	LQG/3.J ,Dj lec						LQG1.J ,Dj lec					
			A	B	C	D			A	B	C	D
2	6.00	4.75	3.63	.75	.75	4	6.50	5.00	3.63	.875	.75	8
2.5	7.00	5.50	4.13	.88	.75	4	7.50	5.88	4.13	1.00	.88	8
3	7.50	6.00	5.00	.94	.75	4	8.25	6.63	5.00	1.13	.88	8
3.5	8.50	7.00	5.50	.94	.75	8	9.00	7.25	5.50	1.13	.88	8
4	9.00	7.50	6.19	.94	.75	8	10.00	7.88	6.19	1.25	.88	8
5	10.00	8.50	7.31	.94	.88	8	11.00	9.25	7.31	1.38	.88	8
6	11.00	9.50	8.50	1.00	.88	8	12.50	10.63	8.50	1.44	.88	12
8	13.50	11.75	10.63	1.13	.88	8	15.00	13.00	10.63	1.63	1.00	12
10	16.00	14.25	12.75	1.19	1.00	12	17.50	15.25	12.75	1.88	1.13	16
12	19.00	17.00	15.00	1.25	1.00	12	20.50	17.75	15.00	2.00	1.25	16
14	21.00	18.75	16.25	1.38	1.13	12	23.00	20.25	16.25	2.13	1.25	20
18	25.00	22.75	21.00	1.56	1.25	16	28.00	24.75	21.00	2.38	1.38	24
20	27.50	25.00	23.00	1.69	1.25	20	30.50	27.00	23.00	2.50	1.38	24
22	29.50	27.25	25.25	1.81	1.38	20	33.00	29.25	25.25	2.63	1.63	24
24	32.00	29.50	27.25	1.88	1.38	20	36.00	32.00	27.25	2.75	1.63	24
26	32.25	31.75	29.25	2.00	1.38	24	28.25	34.50	29.50	3.13	1.75	28
28	36.50	34.00	31.25	2.06	1.38	28	40.75	37.00	31.50	3.38	1.75	28
30	38.75	36.00	33.75	2.13	1.38	28	43.00	39.25	33.75	3.63	1.88	28
32	41.75	38.50	35.75	2.25	1.63	28	45.25	41.50	36.00	2.88	2.00	28



- A. See price list for capscrews required to bolt Norriseal lugged valves to flanges.
- B. See R200 brochure for thru-bolts required to mount Norriseal wafer valves to flanges.

Please contact your Norriseal-WellMark representative for more details and assistance in specifying the optimal solution for your application.



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Norriseal Series 2G Diaphragm Actuators

Precise Control:
Operates valves in on/off, throttling
or proportioning systems



Series 2G actuators are designed for on/off or throttling control of Norris angle-disc butterfly valves and other types of quarter-turn valves. Series 2G actuators can be configured with spring-return (“fail-safe”) operation or with a double-acting diaphragm for low-pressure applications. Series 2G actuators are available in four size ranges with torque output to 17,000 in./lbs. The field-proven design easily adapts to various mounting styles and shaft types. A wide range of accessories is available, including electric and pneumatic positioners and limit switches.

Features

- Provides precise control when used with positioners, switches, solenoids or other available accessories
- Operates using air, natural gas, nitrogen or other readily available gases
- Optional fail-safe operation:
 - (1) with spring-return models or
 - (2) pressure-balanced units equipped with reserve air
- Valve action is easily changed in the field (fail-open to fail-closed and vice-versa) without having to change parts
- Rugged, weatherproof construction includes totally enclosed gear and rack, as well as gear case seals to protect moving parts from corrosion
- Closed yoke to protect the diaphragm stem from corrosive atmospheres
- Offers versatility for reliable, inexpensive operation of valves in on/off, throttling or proportioning systems

Contents

- 2 Spring-Return Actuation
- 2 Pressure-Balanced Actuation
- 2 Mounting
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- 2 Throttling Control
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- 2 How to Use Sizing Charts
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- 4 Sizing Chart — Actuators for Wet Service
- 5 Sizing Chart — Actuators for Dry Service
- 6 How to Order
- 6 Model Code

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Specifications

Spring-Return Actuation

The basic force of spring-return diaphragm actuators is transmitted through the diaphragm plate in response to pressure on one side of the diaphragm. Energy stored in the spring (due to compression) returns the diaphragm to its original position (spring-to-open or spring-to-close).

Should operating air supply be interrupted, the spring acts as a “fail-safe” feature which can be set to fail-open or fail-closed.

The rack-and-pinion operator is designed to allow the operating action to be reversed easily in the field without changing components. There is no need to remove the valve from the line.

Pressure-Balanced Actuation

The pressure-balanced unit is designed for use when supply pressures are too low for cylinder actuators and the fail-safe feature is not required.

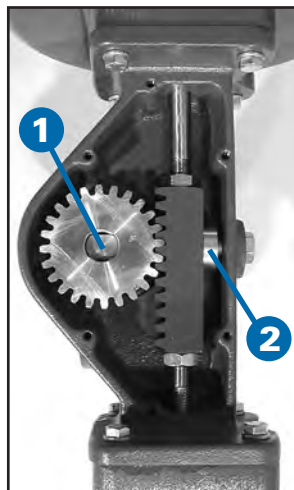
In a pressure-balanced actuator, air pressure is required to change the diaphragm position in either direction. Pressure is exerted from the top of the diaphragm to extend the operator stem, and from the bottom of the diaphragm to retract the stem. In case of failure of the operating system, the valve will stay in the last position. No fail-safe operation is intended. However, a reserve air tank can be used to supply the force necessary to move the valve disc to a “safe” position if the fail-safe feature is required without the use of springs.

Mounting

On all standard Norriseal diaphragm actuators, a direct-mounted, weatherproof rack-and-pinion operator is used to convert the linear thrust of the actuator stem into rotary operating torque.

Rack-and-Pinion Operator

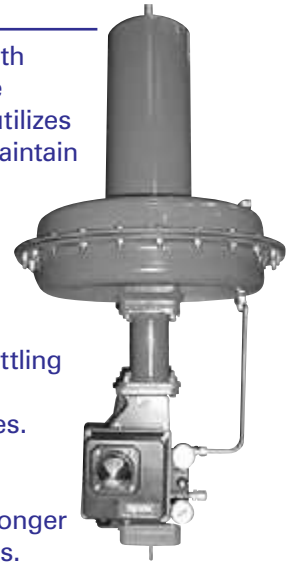
1. Disc indicator clearly shows valve disc position from full-open to fully closed in increments of 10 degrees
2. Adjustable rack guide controls engagement of rack and pinion and minimizes backlash



Throttling Control

A Norriseal diaphragm actuator with positioner provides precise valve throttling control. The positioner utilizes full available supply pressure to maintain the disc position required by the control system. Valve torque requirements are met regardless of the variance of forces with the system.

Butterfly valves provide good throttling control when the valve opening is between 30 degrees and 60 degrees. With an opening of less than 20 degrees or more than 70 degrees, proportional disc movement no longer produces linear flow characteristics.



Standard Configurations

Standard Norriseal diaphragm actuators in 35-, 70-, and 180-square-inch sizes are designed for maximum performance and economy. All working parts of the direct-mounted, closed-yoke units are protected from atmospheric corrosion.

How to Use Sizing Charts

The charts on pages 4 and 5 are designed for sizing closed-yoke diaphragm actuators for all Norriseal R-Series and M-Series valves from 2 inches (50 mm) through 20 inches (500 mm).

The most common operating conditions are covered in these charts and a 50% torque service factor is included in the sizing. If conditions vary from those outlined (for example, if minimum recommended operating air pressure is not available), consult the Norriseal Applications Engineering Department in Houston.

1. Establish wet or dry service conditions. Find required valve size in corresponding chart. Typical dry services are steam, gases, vapors, solvents, etc.
2. Determine maximum line pressure or maximum differential shutoff pressure of flow medium. Check to be sure it is within values shown in column 2.
3. Select column for actuator required: spring-to-close, spring-to-open, or pressure balanced. Determine air supply pressure available to diaphragm actuator. Check to be sure it is within values shown in column 3.
4. Find diaphragm model number in column 4.

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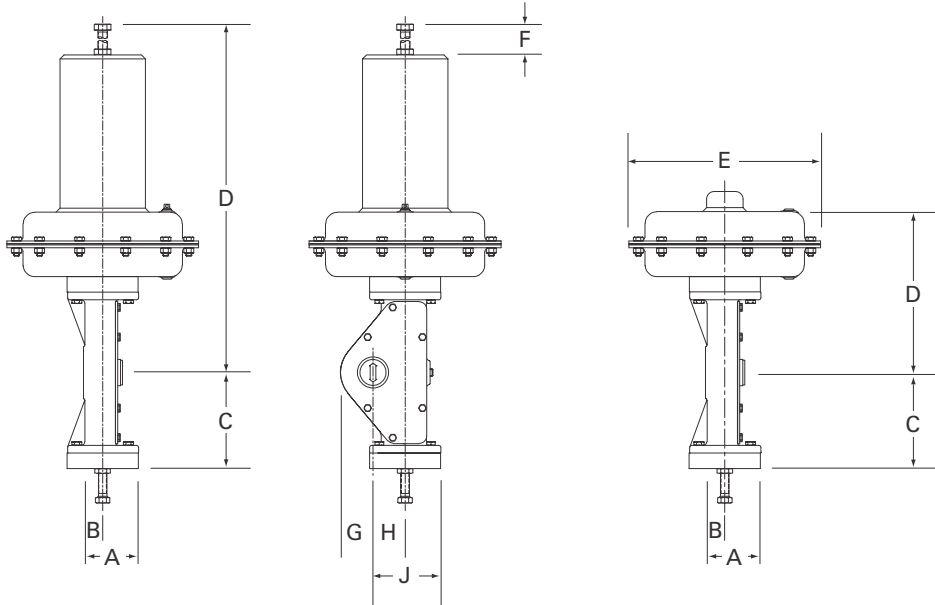
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Dimensions and Sizing

Dimensions

For specific valve dimensions, consult valve data sheet covering individual model numbers.



Ebcf YZDVfgd ? aVWb,
\$9##A \$9##% \$9## i \$9##

Bd/tegdVZAS` UVW ? aVWb,
\$9##\$i \$9##&i \$9##(i \$9##

SERIES 2G DIAPHRAGM ACTUATOR DIMENSIONS

.REM	ZNY / 4 F QRT, A MC	NOTES, QRT, A MC								
		—		"		'D		(
2G11	2-4 (50-100)	2.35 (60)	1.25 (32)	8.5 (216)	18.09 (460)	9.50 (241)	2.97 (75)	2.13 (54)	2.09 (53)	4.19 (106)
2G12	2-4 (50-100)				10.69 (272)		—			
2G13	2-8 (50-200)				25.44 (646)	12.50 (318)	4.50 (114)			
2G14	2-8 (50-200)				11.53 (293)		—			
2G15	6-8 (150-200)				44.34 (1126)	20.50 (521)	10.78 (274)			
2G15	10-12 (250-300)				1.63		—			
2G16	6-8 (150-200)	1.25	—							
2G16	10-12 (250-300)	1.63	11 (280)	41.56 (1056)	5.25 (133)	3.63 (92)	3.56 (90)	6.13 (156)		
2G17	10-12 (250-300)	2.13		—						
2G17	14-20 (350-500)	2.44 (62)		17.22 (437)					—	
2G18	10-12 (250-300)	2.13								
2G18	14-20 (350-500)	3.13								

*Maximum extension. No preload or spring.

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Dimensions and Sizing (Wet service)

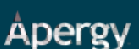
SIMPLIFIED SIZING CHART — DIAPHRAGM ACTUATORS

200/4 F OR, A TC	M .50, - 0 150, A TC	4500 UG " NF		4500 UG 010		1500 — 0000	
		.01, 4/ 15 150, A TC	.01, 4/ 15 150, A TC	.01, 4/ 15 150, A TC	.01, 4/ 15 150, A TC	.01, 4/ 15 150, A TC	P
	50						
2 (50)	100						
	200						
	50						
2.5 (65)	100						
	200						
	50						
3 (75)	100						
	200						
	50						
4 (100)	100						
	200						
	50						
5 (125)	100						
	200						
	50						
6 (150)	100						
	200						
	50						
8 (200)	100						
	200						
	50						
10 (250)	100						
	200						
	50						
12 (300)	100						
	200						
	50						
14 (350)	100						
	200						
	50						
16 (400)	100						
	200						
18 (450)	50						
20 (500)	50						

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Dimensions and Sizing (Dry service)

SIMPLIFIED SIZING CHART — DIAPHRAGM ACTUATORS

2 1/2 (4 F) ORF, A TC	M BH, - O SFRM, A TC	4506 UG " NWF		4506 UG OFO		15FRM; — 15FRM		P
		.01, 4/ FR SFRM, A TC	.FRM /WS	.01, 4/ FR SFRM, A TC	.FRM /WS	.01, 4/ FR SFRM, A TC	.FRM /WS	
	50							
2 (50)	100							
	200							
	50							
2.5 (65)	100							
	200							
	50							
3 (75)	100							
	200							
	50							
4 (100)	100							
	200							
	50							
5 (125)	100							
	200							
	50							
6 (150)	100							
	200							
	50							
8 (200)	100							
	200							
	50							
10 (250)	100							
	200							
	50							
12 (300)	100							
	200							
	50							
14 (350)	100							
	200							
	50							
16 (400)	100							
	200							
18 (450)	50							
20 (500)	50							

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How to Order

State valve size and model number (see individual valve data sheets) and actuator model number from column 4 of sizing charts. If spring-return diaphragm is required, state actuator action — fail-closed or fail-open.

When a positioner is to be included for throttling control, state signal pressure: 3 to 15, 3 to 9 or 6 to 30 psi.

If other accessories are to be included in the assembly, the detailed function of the apparatus should be submitted to the Norriseal Application Engineering Department with the order.

Model Code

6" R1011-13AA-2G 1 3 - A044, Fail Closed



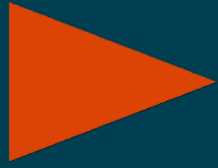
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Wellmark Product Brochures

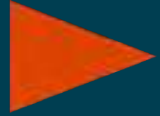
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Wellmark Hydrostatic Liquid Head Indicator Switch

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WellMark Series

Control and Valves for Industry

685

Monitoring and Controlling Liquid Levels Has Never Been Easier, or Safer

Installed and field calibrated in just minutes, as no intrusion into the tank is required. Add the optional Hi-Low switches for pump functions or alarm points, or even a 4 to 20 milliamp signal to give you complete control over your fluid levels.

The Series 685 features an explosion-proof housing for added safety.

Vessel connections are available in an array of styles and materials.



Weather Proof Housing

Electro-Mechanical Liquid Level Monitor

The Series 685 Level Indicator operates by head pressure against the diaphragm which is transmitted by mechanical linkages to monitor and display local liquid levels onsite and remotely with the optional transmitter package.



Specifically designed for use in atmospheric (vented) tanks, standpipes, reservoirs, and similar vessels that in the past required strapping which exposed personnel to noxious fumes for monitoring liquid levels.

Featuring a +-2% level accuracy for tanks up to 60 feet tall, the Series 685 provides increased production and energy efficiency. The Hi-Low models are utilized to actuate valves or signal alarms. WellMark's Multi-Switch model can contain up to seven switches for various level related system functions.

Easy To Read Indicator

Large dial face is easily read from your vehicle window. An optional remote monitor can be installed for even easier access to data.

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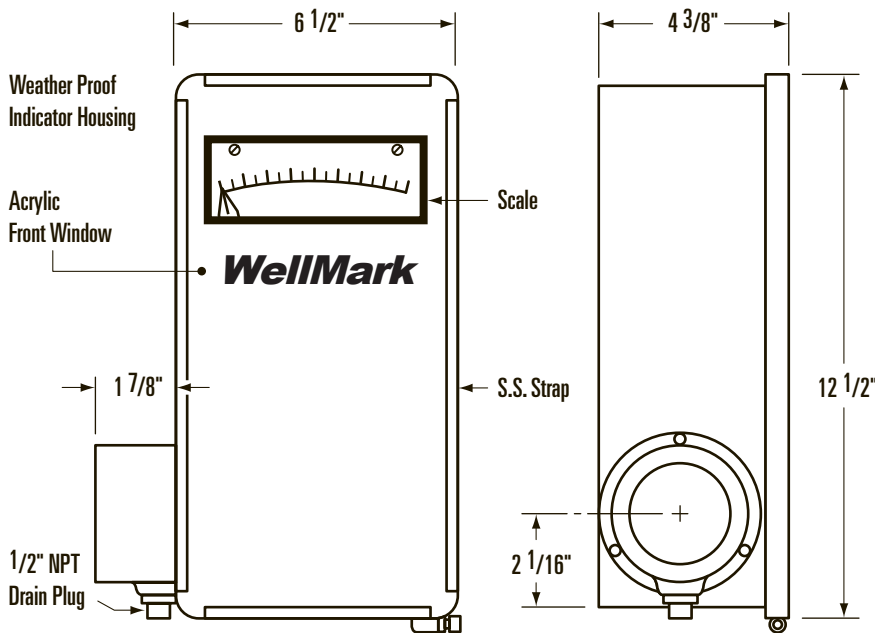
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WellMark Series

685

Dimensional Data



Which Model Is Right For You?

Model 685I • Indication of local liquid level only.

Model 685S • Indication of local liquid level plus Hi-Low switch output for pump start/stop, solenoid action or single alarm. • Multi-Switch style offers indication of local liquid level with one to seven switches for several switching output options.

Model 685E Transmitter • Indication of local liquid level with Proportional Output Transmitter for remote liquid level indication via Computers, Programmable Controllers and Radio Communication Devices.

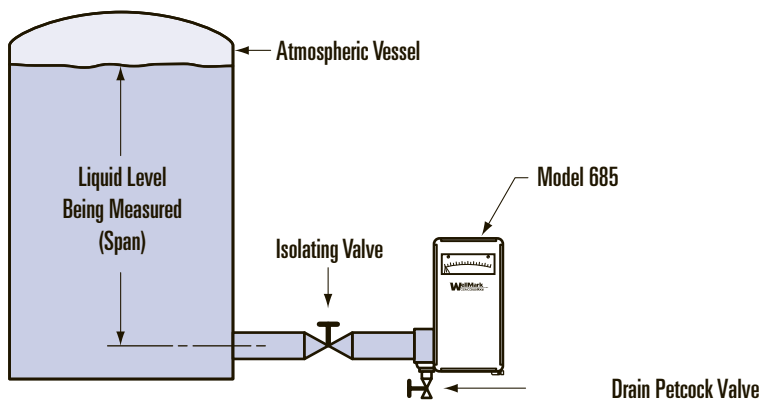


Specifications

Temperature Limit	300° F
Accuracy	+ -2%
Housing	Class I, Groups C & D; Class II, Groups E, F and G;
Rating	CSA Approved, LR-41663

All component parts are manufactured from high quality materials and each unit is assembled to your exact specifications. The Wellmark Series 685 is easy to access, calibrate and maintain, making it the superior choice for liquid level management.

Typical Installation



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WellMark Series

685I Visual Liquid Level Indicator for Atmospheric Vessels

Application

The Model 685I is a liquid head pressure type level indicator. It continuously indicates the liquid level in an atmospheric (vented) tank in feet and inches. Also, the scale on the Model 685I is available calibrated for horizontal cylindrical vessels in pounds, gallons, barrels, percent, etc.

Features

- **Simple Adjustments:** Zero Adjustment Knob and one Specific Gravity (span) Knob. Unit can be factory calibrated for a nominal cost or field adjusted in less than 15 minutes, without having to change the liquid level in the vessel.
- **Easy to Read:** Scale reads the same as a hand tank gauge, making it unnecessary to convert psig of head pressure into feet and inches of liquid to get the correct reading.
- **Long Life:** All bearings are Teflon®, Delrin® or Moly Disulphide baked on Dry Film Lubricated Stainless Steel.



Operation

Liquid head pressure against a flexible elastomer diaphragm is transmitted directly to a leaf spring, which has a fixed pivot point at the upper end and an adjustable fulcrum point in the mid region of the leaf spring. For example, because 8' of heavy liquid exerts more pressure on the diaphragm than 8' of lighter liquid, the spring can be "stiffened" by moving the fulcrum down by the gravity adjustment knob (red), so the indicator will still read 8'. The zero knob (green) moves the entire spring assembly and pointer, having the same effect as shifting the scale.

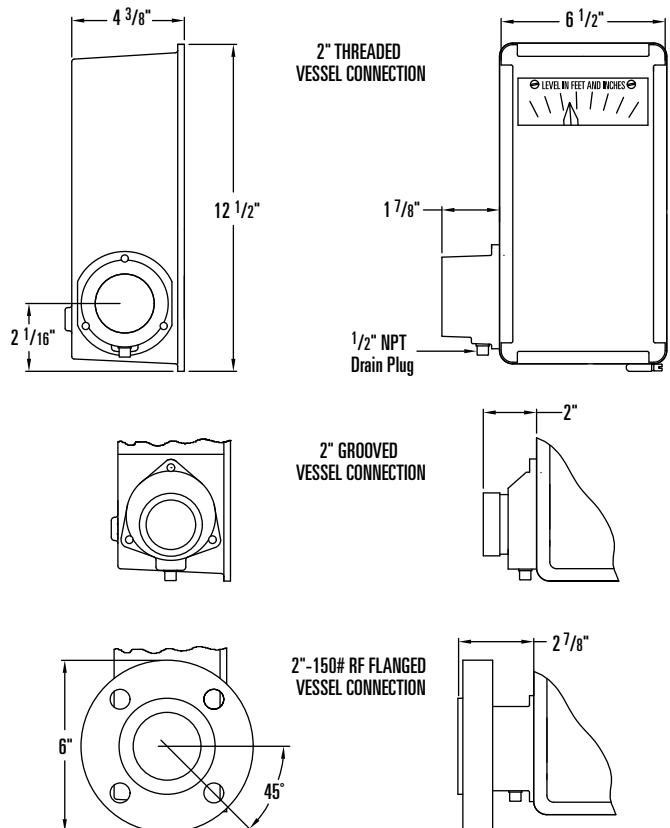
Installation

Since the unit measures liquid head pressure, the point at which it is installed on the vessel is the point that liquid measurement begins. For calibration and maintenance purposes, always install an isolation valve between the model 685I and the vessel. Also, install a drain petcock in the liquid inlet bottom, where a plug is generally located.

Specifications

Indicator Housing	Weatherproof
Proof Pressure	100 psig
Temperature	-20°F to +225°F Standard
Pressure	0 to 4 ounces pressure (Atmospheric)
Range (Vessel Height)	3' thru 60' (see 685 code sheet)

Dimensional Data



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WellMark Series

685I

685I Visual Liquid Level Indicator for Atmospheric Vessels

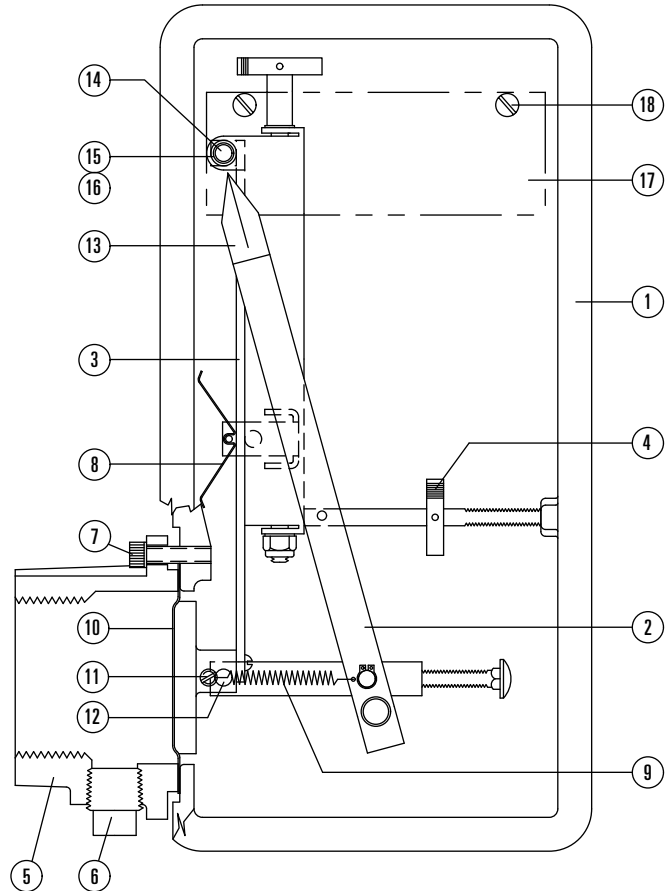
Parts List

Item	Description	Qty.	Part No.
1	HOUSING, ALUMINUM	1	000154-M
2	POINTER ASSEMBLY	1	000071-A
3	MAIN SPRING ASSEMBLY, STD.	1	000053-A
	MAIN SPRING ASSEMBLY, THIN	1	000054-A
	MAIN SPRING ASSEMBLY, DOUBLE	1	000055-A
4	ZERO KNOB, SHAFT & PIN	1	000010-A
5	ADAPTER	1	SEE CHART
6	PIPE PLUG, STEEL PLATED	1	002300-C
	PIPE PLUG, 304S.S.	1	002304-P
	PIPE PLUG, 316S.S.	1	002307-P
	PIPE PLUG, PVC	1	002301-P
7	SCREW, STEEL PLATED	3	001508-P
	SCREW, 2" NPT PVC ADAPTER ONLY	3	001542-P
	SCREW, 2"-150RF PVC ONLY	3	001553-P
8	ZERO SPRING, STAINLESS STEEL	1	003102-P
9	WEAR SPRING, STAINLESS STEEL	1	003103-P
10**	DIAPHRAGM, BUNA-N	1	000700-P
	DIAPHRAGM, VITON®	1	000713-P
	DIAPHRAGM, COMPOUND W	1	000720-P
	DIAPHRAGM, TEFLON®	1	000703-P
11	SCREW, 18-8 STAINLESS STEEL	1	001507-P
12	FOLLOWER BEARING, STAINLESS STEEL	1	003909-L
13	POINT DECAL	1	005900-P
14	SPRING BEARING, STAINLESS STEEL	1	000009-A
15	WASHER, TEFLON®	1	001807-P
16	RETAINER O-RING, NEOPRENE	1	003602-P
17***	SCALE, ALUMINUM	1	0030xx-P
18	SCREW, 18-8 STAINLESS STEEL	2	001504-P
19*	TAG, ALUMINUM	1	005906-P
20*	BEZEL FRAME, STAINLESS STEEL	1	000023-P
21*	BEZEL SEAL	1	003400-P
22*	WINDOW, ACRYLIC	1	000204-S
23*	WASHER, PVC ADAPTER ONLY	1	001809-P

*Not shown.

**Recommended spare parts. Other materials available.

***Specify tank height when ordering.



Item #5 Part Number

Vessel Connection	Cad. Plated	Epoxy Coated	Teflon® Coated
2" NPT, D.I.	000307-C	000307-E	000307-T
2" NPT, 316 S.S.	000317-M*	000317-E	000317-T
2"-150RF, STEEL	000335-C	000335-E	000336-T
2"-150RF, 304 S.S.	000338-M*	000338-E	N/A
2"-150RF, 316 S.S.	000341-M*	000341-E	000341-T
3"-150RF, STEEL	000345-C	000345-E	N/A
2" GROOVE, D.I.	000302-C	000303-E	000302-T
2" NPT, PVC	000343-M*	N/A	N/A
2"-150RF, PVC	000342-M*	N/A	N/A

*Plating not required.

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Apergy

WellMark Series

685S Single Switch Liquid Level Indicator for Atmospheric Vessels Application

The Model 685S is a liquid head pressure type level control. It continuously indicates the liquid level in an atmospheric vessel in feet and inches. It has an adjustable switch which completes an electrical circuit to a solenoid, alarm, or other device when the level rises to the top predetermined point, and breaks the circuit when the level falls to the bottom predetermined point (or the reverse). In addition, the scale on the Model 685S is available calibrated for horizontal cylindrical vessels in pounds, gallons, barrels, percent, etc.

Features

- **Simple Adjustments:** One high adjustment dial for top level set point and one low dial for bottom level set point. One Zero Adjustment Knob and one Specific Gravity (span) Knob. Unit can be factory calibrated for a nominal cost or field adjusted in less than 15 minutes, without having to change the liquid level in the vessel.
- **Easy to Read:** Scale reads the same as a hand tank gauge, making it unnecessary to convert psig of head pressure into feet and inches of liquid to get the correct reading.
- **Long Life:** All bearings are Teflon[®], Delrin[®] or Moly Disulphide baked on Dry Film Lubricated Stainless Steel.
- **Weather Proof and Explosion Proof Housing.**

Operation

Liquid head pressure against a flexible elastomer diaphragm is transmitted directly to a leaf spring, which has a fixed pivot point at the upper end and an adjustable fulcrum point in the mid region of the leaf spring. For example, because 8' of heavy liquid exerts more pressure on the diaphragm than 8' of lighter liquid, the spring can be "stiffened" by moving the fulcrum down by the gravity adjustment knob (red), so the indicator will still read 8'. The zero knob (green) moves the entire spring assembly and pointer, having the same effect as shifting the scale. The switch trigger assembly is normally independent of the indicator mechanism and is free to tilt around the fixed pivot, except that it is weighted to assure a vertical position. At high or low levels, the trigger assembly tilts; thus actuating the cam and engaging the switch.

Installation

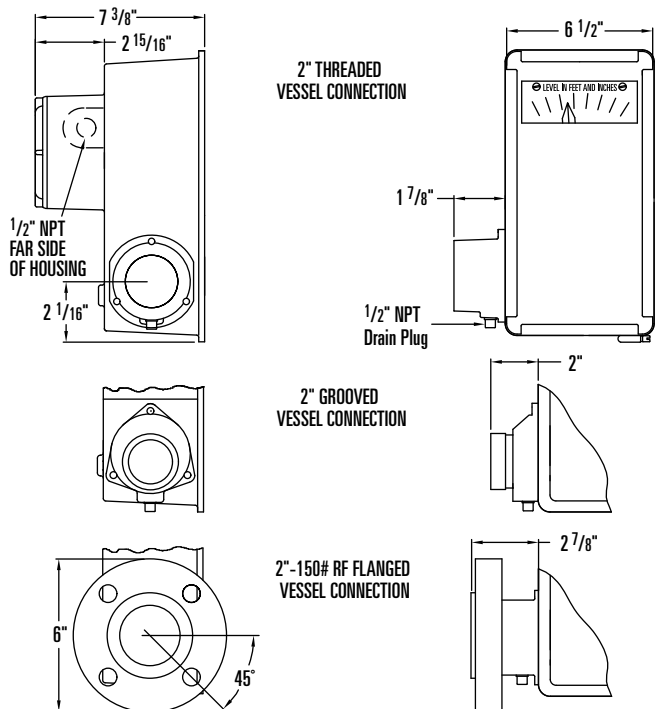
Since the unit measures liquid head pressure, the point at which it is installed on the vessel is the point that liquid measurement begins. For example, if the unit is mounted 1 foot above the bottom of an 8' vessel, the liquid level from the bottom to the 1' mounting will not be measured (or seen); therefore, the indicator should be "zeroed" at 1' and the specific gravity knob should be calibrated accordingly ie. 1 to 8 feet or total of 7 foot span. For calibration and maintenance purposes, always install an isolation valve between the model 685S and the vessel. Also, install a drain petcock in the liquid inlet bottom, where a plug is generally located.



Specifications

- Explosion Proof: CSA Approved Class I, Group C & D, Class II, Groups E, F and G hazardous locations.
- Temperature -20°F to +225°F Standard
- Pressure 0 to 4 ounces pressure (Atmospheric)
- Range (Vessel Height) 3' thru 60' (see 685 code sheet)
- Switches SPDT Micro Switch
5 Amp @ 125, 250 or 480 VAC
1/2 Amp @ 125 VDC, 1/4 Amp @ 250 VDC
- Electrical Connections 1/2" Female Pipe Thread,
3/4" Female Pipe Thread is also available as an option.

Dimensional Data



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WellMark Series

685S

685S Single Switch Liquid Level Indicator for Atmospheric Vessels

Parts List

Item	Description	Qty.	Part No.
1	HOUSING, ALUMINUM	1	000153-M
2	TRIGGER W/ POINTER ASSEMBLY	1	000070-A
3	MAIN SPRING ASSEMBLY, STD.	1	000053-A
	MAIN SPRING ASSEMBLY, THIN	1	000054-A
	MAIN SPRING ASSEMBLY, DOUBLE	1	000055-A
4	ZERO KNOB, SHAFT & PIN	1	000010-A
5	ADAPTER	1	SEE CHART
6	PIPE PLUG, STEEL PLATED	1	002300-C
	PIPE PLUG, 304 S.S.	1	002304-P
	PIPE PLUG, 316 S.S.	1	002307-P
	PIPE PLUG, PVC	1	002301-P
7	SCREW, STEEL PLATED	3	001508-P
	SCREW, 2" NPT PVC ADAPTER ONLY	3	001542-P
	SCREW, 2"-150RF PVC ONLY	3	001553-P
8	ZERO SPRING, STAINLESS STEEL	1	003102-P
9	WEAR SPRING, STAINLESS STEEL	1	003103-P
10**	DIAPHRAGM, BUNA-N	1	000700-P
	DIAPHRAGM, VITON®	1	000713-P
	DIAPHRAGM, COMPOUND W	1	000720-P
	DIAPHRAGM, TEFLON®	1	000703-P
11	SCREW, 18-8 STAINLESS STEEL	1	001507-P
12	FOLLOWER BEARING, STAINLESS STEEL	1	003909-L
13	POINT DECAL	1	005900-P
14	SPRING BEARING, STAINLESS STEEL	1	000009-A
15	WASHER, TEFLON®	1	001807-P
16	RETAINER O-RING, NEOPRENE	1	003602-P
17***	SCALE, ALUMINUM	1	0030xx-P
18	SCREW, 18-8 STAINLESS STEEL	4	001504-P
19*	TAG, ALUMINUM	1	005908-A
20*	BEZEL FRAME, STAINLESS STEEL	1	000023-P
21*	BEZEL SEAL	1	003400-P
22*	WINDOW, ACRYLIC	1	000204-S
23*	WASHER, PVC ADAPTER ONLY	1	001809-P
24	SWITCH CAM, STAINLESS STEEL	1	000015-W
25	WASHER, TEFLON®	2	001803-P
26	BUSHING, STAINLESS STEEL	1	002700-M
27	BRACKET, ALUMINUM	1	002607-P
28	MICRO SWITCH	1	000604-P
29	SCREW, STAINLESS STEEL	2	001534-P
30	WASHER, STAINLESS STEEL	2	001813-P
31*	COVER, ALUMINUM	1	000201-P
32	FLAT WASHER, STAINLESS STEEL	1	001808-P
33	INSULATOR, FIBER	1	001215-P
34	GROUND SCREW, STAINLESS STEEL	1	001504-G
35	GROUND CUP, BRASS	1	001800-P
36	CAM ASSEMBLY, ALUMINUM	1	000065-A

*Not shown.

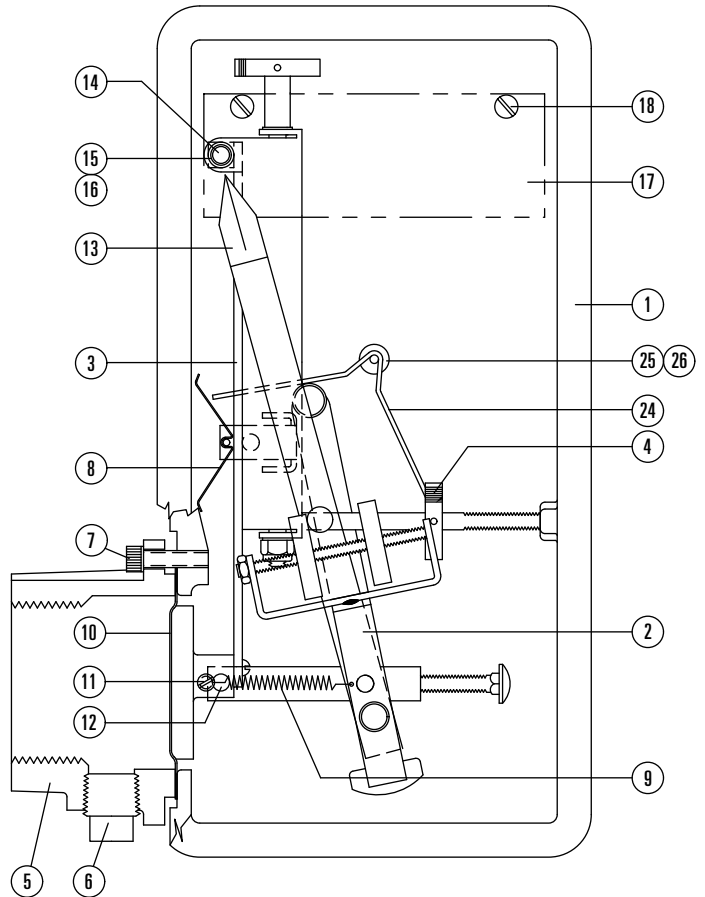
**Recommended spare parts. Other materials available.

***Specify tank height when ordering.

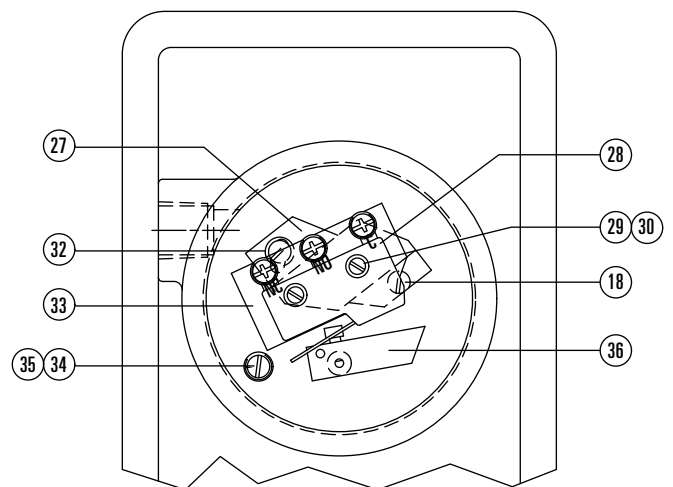
Item #5 Part Number

Vessel Connection	Cad. Plated	Epoxy Coated	Teflon® Coated
2" NPT, D.I.	000307-C	000307-E	000307-T
2" NPT, 316 S.S.	000317-M*	000317-E	000317-T
2"-150RF, STEEL	000335-C	000335-E	000336-T
2"-150RF, 304 S.S.	000338-M*	000338-E	N/A
2"-150RF, 316 S.S.	000341-M*	000341-E	000341-T
3"-150RF, STEEL	000345-C	000345-E	N/A
2" GROOVE, D.I.	000302-C	000303-E	000302-T
2" NPT, PVC	000343-M*	N/A	N/A
2"-150RF, PVC	000342-M*	N/A	N/A

*Plating not required.



MODEL 685S FRONT VIEW



MODEL 685S BACK VIEW

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WellMark Series

685S Multiswitch

685S Multiswitch Liquid Level Indicator for Atmospheric Vessels

Application

The Model 685S Multiswitch is a liquid head pressure type control, which continuously indicates the liquid level and supplies on and off signal as adjusted. Each switch may be set at different set points to control a separate device, such as an auxiliary or motor control relay, alarms, etc.

Features

- Easy to read: Scale reads the same as a hand tank gauge, making it unnecessary to convert psig of head pressure into feet and inches of liquid to get the correct reading.
- Special Scales: Gallons, Pounds, Percent, etc. is available.
- Long Life: All bearings are Teflon®, Delrin® or Moly Disulphide baked on Dry Film Lubricated Stainless Steel.
- Weather Proof and Explosion Proof Housing.

Operation

Liquid head pressure against a flexible elastomer diaphragm is transmitted directly to a leaf spring, which has a fixed pivot point at the upper end and an adjustable fulcrum point in the mid region of the leaf spring. For example, because 8' of heavy liquid exerts more pressure on the diaphragm than 8' of lighter liquid, the spring can be "stiffened" by moving the fulcrum down by the gravity adjustment knob (red), so the unit will still read 8'. The zero knob (green) moves the entire spring assembly and pointer, having the same effect as shifting the scale. The movement of the pointer rotates a linkage connected to a shaft extending into the explosion proof housing where the switches are located. The shaft drives a gear, which is connected to cams that actuate each switch individually.

Installation

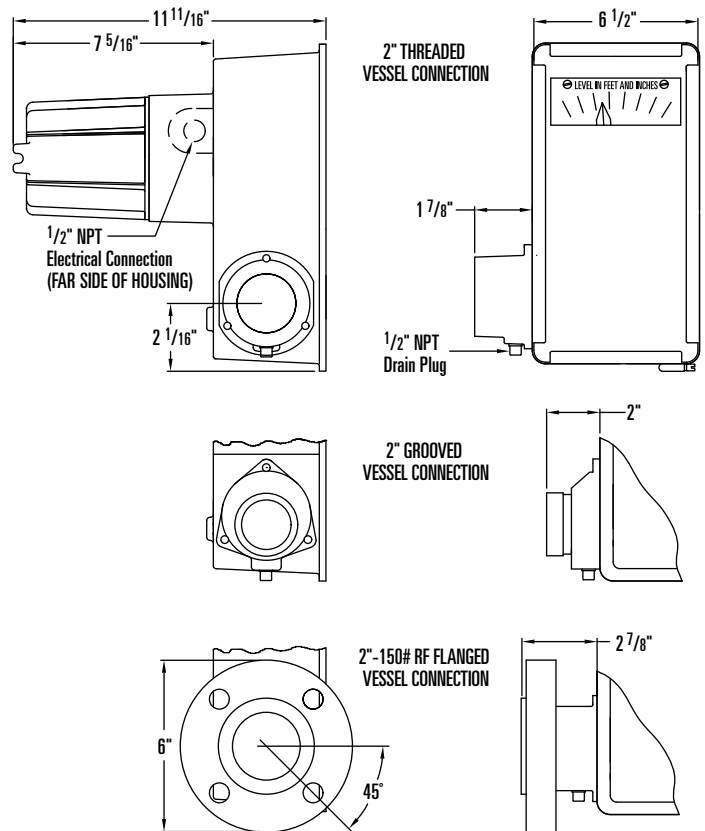
Since the unit measures liquid head pressure, the point at which it is installed on the vessel is the point that liquid measurement begins. For calibration and maintenance purposes always install an isolation valve between the Model 685 and the vessel. Also, install a drain petcock in the liquid inlet bottom, where a plug is generally located.

Specifications

- Explosion Proof: CSA Approved: Class I, Group C & D
 Class II, Groups E, F and G hazardous locations.
- Temperature -20°F to +225°F Standard
- Pressure 0 to 4 ounces pressure (Atmospheric)
- Range (Vessel Height) 3' thru 60' (see 685 code sheet).
- Electrical Switches SPDT Micro Switch
 11 Amp @ 130 or 250 VAC, 1/2 Amp @ 125 VDC
 1/4 Amp @ 250 VDC, 4 Amp @ 125 VAC Induction
- Electrical Connections 1/2" Female Pipe Thread,
 3/4" Female Pipe Thread (Optional)



Dimensional Data



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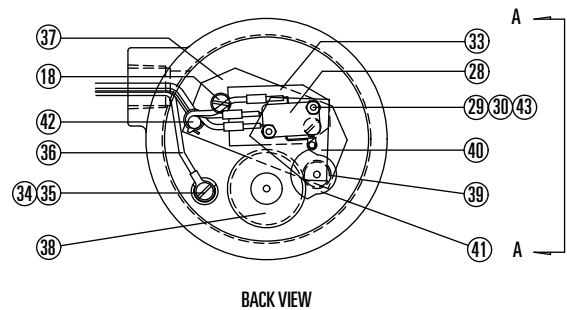
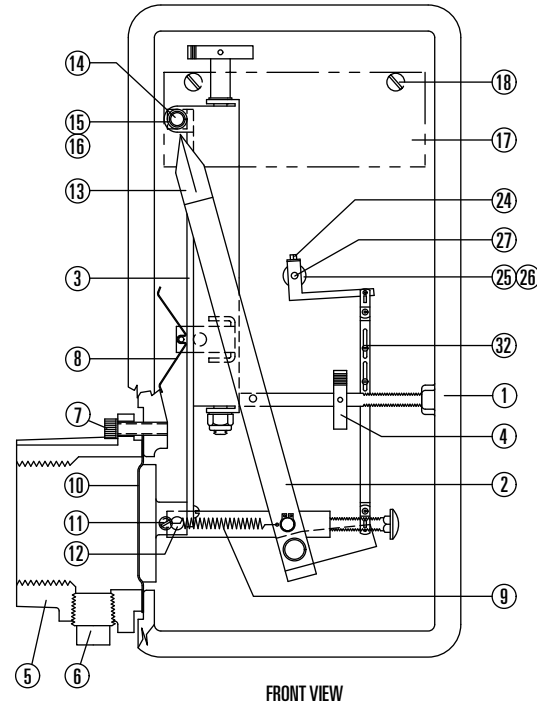


WellMark Series

685S Multiswitch

685S Multiswitch Liquid Level Indicator for Atmospheric Vessels Parts List

Item	Description	Qty.	Part No.
1	HOUSING, ALUMINUM	1	000153-M
2	POINTER ASSEMBLY	1	000072-A
3	MAIN SPRING ASSEMBLY, STD.	1	000053-A
	MAIN SPRING ASSEMBLY, THIN	1	000054-A
	MAIN SPRING ASSEMBLY, DOUBLE	1	000055-A
4	ZERO KNOB, SHAFT & PIN	1	000010-A
5	ADAPTER	1	SEE CHART
6	PIPE PLUG, STEEL PLATED	1	002300-C
	PIPE PLUG, 304 S.S.	1	002304-P
	PIPE PLUG, 316 S.S.	1	002307-P
	PIPE PLUG, PVC	1	002301-P
7	SCREW, STEEL PLATED	3	001508-P
	SCREW, 2"NPT PVC ADAPTER ONLY	3	001542-P
	SCREW, 2"-150RF PVC ONLY	3	001553-P
8	ZERO SPRING, STAINLESS STEEL	1	003102-P
9	WEAR SPRING, STAINLESS STEEL	1	003103-P
10**	DIAPHRAGM, BUNA-N	1	000700-P
	DIAPHRAGM, VITON®	1	000713-P
	DIAPHRAGM, COMPOUND W	1	000720-P
	DIAPHRAGM, TEFLON®	1	000703-P
11	SCREW, 18-8 STAINLESS STEEL	1	001507-P
12	FOLLOWER BEARING, STAINLESS STEEL	1	003909-L
13	POINT DECAL	1	005900-P
14	SPRING BEARING, STAINLESS STEEL	1	000009-A
15	WASHER, TEFLON®	1	001807-P
16	RETAINER O-RING, NEOPRENE	1	003602-P
17***	SCALE, ALUMINUM	1	0030xx-P
18	SCREW, 18-8 STAINLESS STEEL	5	001504-P
19*	TAG, ALUMINUM	1	005908-B
20*	BEZEL FRAME, STAINLESS STEEL	1	000023-P
21*	BEZEL SEAL	1	003400-P
22*	WINDOW, ACRYLIC	1	000204-S
23*	WASHER, PVC ADAPTER ONLY	1	001809-P
24	LINKAGE ARM, STAINLESS STEEL	1	000511-P
25	WASHER, TEFLON®	4	001803-P
26	BUSHING, STAINLESS STEEL	1	002701-M
27	DRIVER SHAFT	1	002803-M
28	MICRO SWITCH	AR	000611-P
29	SHAFT, ALL THREAD, S.S.	2	002808-M
30	HEX NUT	2	001100-P
31*	COVER, ALUMINUM	1	000200-M
32	LINKAGE, STAINLESS STEEL	1	004400-P
33	INSULATOR, FIBER	AR	001216-P
34	GROUND SCREW, STAINLESS STEEL	1	001504-G
35	GROUND CUP, BRASS	1	001800-P
36	GROUND WIRE	1	000087-A
37	MOUNTING PLATE, ALUMINUM	1	001605-M
38	GEAR, 1 1/2" DIA., PLASTIC	1	004301-P
39	GEAR, 1/2" DIA., PLASTIC	1	004302-P
40	TOP PLATE, ALUMINUM	1	001613-P
41	CAM ASSEMBLY, ALUMINUM	AR	000016-A
42	WIRE SUPPORT, ALUMINUM	1	001704-M
43	LOCK WASHER, STAINLESS STEEL	2	001801-P
44	ACTUATOR SHAFT, STAINLESS STEEL	1	002811-M
45	SPACER BLOCK, ALUMINUM	AR	005400-M
46	WIRE, BLACK, BLUE AND RED	AR	000086-A

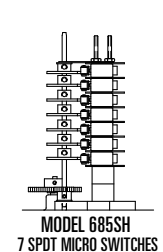
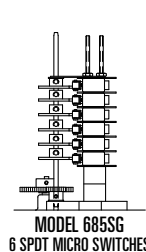
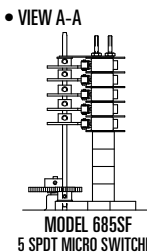
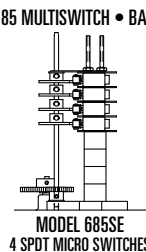
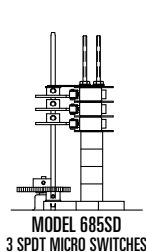
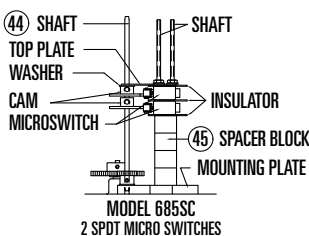


Item #5 Part Number

Vessel Connection	Cad. Plated	Epoxy Coated	Teflon® Coated
2" NPT, D.I.	000307-C	000307-E	000307-T
2" NPT, 316 S.S.	000317-M*	000317-E	000317-T
2"-150RF, STEEL	000335-C	000335-E	000336-T
2"-150RF, 304 S.S.	000338-M*	000338-E	N/A
2"-150RF, 316 S.S.	000341-M*	000341-E	000341-T
3"-150RF, STEEL	000345-C	000345-E	N/A
2" GROOVE, D.I.	000302-C	000303-E	000302-T
2" NPT, PVC	000343-M*	N/A	N/A
2"-150RF, PVC	000342-M*	N/A	N/A

*Not shown. **Recommended spare parts. Other materials available.
***Specify tank height when ordering.

*Plating not required.



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WellMark Series

685E Electric Liquid Level Indicator for Atmospheric Vessels Application

The Model 685E Liquid Level Transmitter is an electro-mechanical level control device, which accomplishes three (3) main functions. These are remote indication, local liquid level indication, and hi-low adjustable switch outputs. The unit continuously indicates the liquid level and transmits a proportional signal.

Features

- **Complementary Adjustments:** Zero and Span adjustments at transmitter.
- **Easy to Read:** Scale reads the same as a hand tank gauge, making it unnecessary to convert psig of head pressure into feet and inches of liquid to get the correct reading.
- **Special Scales:** Gallons, Pounds, Percent, etc. is available.
- **Long Life:** All bearings are Teflon®, Delrin® or Moly Disulphide baked on Dry Film Lubricated Stainless Steel.
- **Weather Proof and Explosion Proof Housing.**

Operation

Liquid head pressure against a flexible elastomer diaphragm is transmitted directly to a leaf spring, which has a fixed pivot point at the upper end and an adjustable fulcrum point in the mid region of the leaf spring. For example, because 8' of heavy liquid exerts more pressure on the diaphragm than 8' of lighter liquid, the spring can be "stiffened" by moving the fulcrum down by the gravity adjustment knob (red), so the transmitter will still read 8'. The zero knob (green) moves the entire spring assembly and pointer, having the same effect as shifting the scale. The movement of the pointer rotates a shaft extending into the explosion proof housing where the electronic transmitter and switches are located. The shaft drives a potentiometer, thereby giving a continuous signal to the plug-in amplifier. The proportional signal is then transmitted to the remote indicating device in proportion to the liquid level which exists in the tank.

Installation

Since the unit measures liquid head pressure, the point at which it is installed on the vessel is the point that liquid measurement begins. For calibration and maintenance purposes, always install an isolation valve between the model 685E and the vessel. Also, install a drain petcock in the liquid inlet bottom, where a plug is generally located.

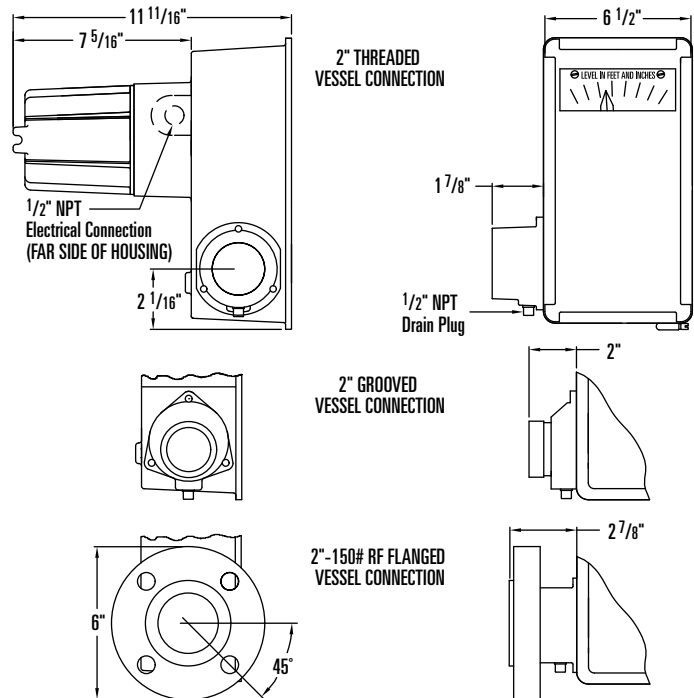
Specifications

Explosion Proof: CSA Approved Class I, Group C & D,
Class II, Groups E, F and G hazardous locations.
Temperature -20°F to +225°F Standard
Pressure 0 to 4 ounces pressure (Atmospheric)
Range (Vessel Height) 3' thru 60' (see 685 code sheet)
Transmitter Output Four (4) Wires or Two (2) Wire System.
Supply Voltage (at transmitter) ... 120 VAC, 60 Cycle, 1 phase (4-Wire)
24 VDC (2-Wire)



- Electrical Switches SPDT Micro Switch
11 Amp @ 130 or 250 VAC, 1/2 Amp @ 125 VDC
1/4 Amp @ 250 VDC, 4 Amp @ 125 VAC Induction
Electrical Connections 1/2" Female Pipe Thread,
3/4" Female Pipe Thread is also available as an option.

Dimensional Data



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WellMark Series

685E

685E Electric Liquid Level Indicator for Atmospheric Vessels

Parts List

Item	Description	Qty.	Part No.
1	HOUSING, ALUMINUM	1	000153-M
2	POINT ASSEMBLY	1	000059-A
3	MAIN SPRING ASSEMBLY, STD.	1	000053-A
	MAIN SPRING ASSEMBLY, THIN	1	000054-A
	MAIN SPRING ASSEMBLY, DOUBLE	1	000055-A
4	ZERO KNOB, SHAFT & PIN	1	000010-A
5	ADAPTER	1	SEE CHART
6	PIPE PLUG, STEEL PLATED	1	002300-C
	PIPE PLUG, 304 S.S.	1	002304-P
	PIPE PLUG, 316 S.S.	1	002307-P
	PIPE PLUG, PVC	1	002301-P
7	SCREW, STEEL PLATED	3	001508-P
	SCREW, 2" NPT PVC ADAPTER ONLY	3	001542-P
	SCREW, 2"-150RF PVC ONLY	3	001553-P
8	ZERO SPRING, STAINLESS STEEL	1	003102-P
9	WEAR SPRING, STAINLESS STEEL	1	003103-P
10**	DIAPHRAGM, BUNA-N	1	000700-P
	DIAPHRAGM, VITON®	1	000713-P
	DIAPHRAGM, COMPOUND W	1	000720-P
	DIAPHRAGM, TEFLON®	1	000703-P
11	SCREW, 18-8 STAINLESS STEEL	1	001507-P
12	FOLLOWER BEARING, STAINLESS STEEL	1	003909-L
13	POINT DECAL	1	005900-P
14	SPRING BEARING, STAINLESS STEEL	1	000009-A
15	WASHER, TEFLON®	1	001807-P
16	RETAINER O-RING, NEOPRENE	1	003602-P
17***	SCALE, ALUMINUM	1	0030xx-P
18	SCREW, 18-8 STAINLESS STEEL	5	001504-P
19*	TAG, ALUMINUM	1	005908-B

Item	Description	Qty.	Part No.
20*	BEZEL FRAME, STAINLESS STEEL	1	000023-P
21*	BEZEL SEAL	1	003400-P
22*	WINDOW, ACRYLIC	1	000204-S
23*	WASHER, PVC ADAPTER ONLY	1	001809-P
24	BELT	1	004310-P
25	WASHER, TEFLON®	4	001803-P
26	BUSHING, STAINLESS STEEL	1	002701-M
27	DRIVE SHAFT, STAINLESS STEEL	1	002810-M
28	PULLEY, STD.	1	004306-A
	PULLEY FOR TEFLON® DIAPH.	1	009680-A
29	SET SCREW, STAINLESS STEEL	2	001520-P
30	BRACKET AND CAM, ALUMINUM	1	000064-A
31*	COVER, ALUMINUM	1	000200-M
32	SCREW, STAINLESS STEEL	1	001507-P
33	BASE PLATE, ALUMINUM	1	001601-M
34	SPACER, ALUMINUM	2	001701-M
35	GEAR, 1 1/2" DIA., PLASTIC	1	004301-P
36	POT TO PLUG ASSY, 4 WIRE	1	000032-A
	POT TO PLUG ASSY, 2 WIRE	1	000033-A
37	TRANSMITTER, 4 WIRE	1	006500-M
	TRANSMITTER, 2 WIRE	1	006502-M
38	MICRO SWITCH, 685EC AND EE ONLY	2	000615-P
39	INSULATOR, 685EC AND EE ONLY	2	001216-P
40	SPACER, 685EC AND EE ONLY	2	002715-P
41	SCREW, 685EC AND EE ONLY	2	001506-P
42	WASHER, 685EC AND EE ONLY	2	001805-P
43	CAM, 685EC AND EE ONLY	2	000016-A
44	WIRE, 685EC AND EE ONLY	6	000086-A

*Not shown.

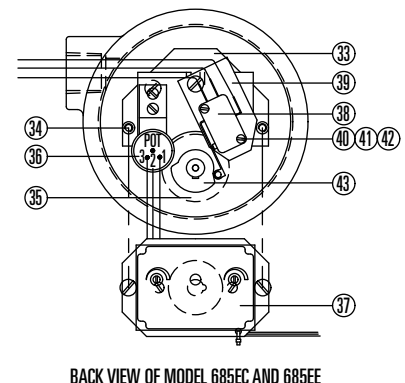
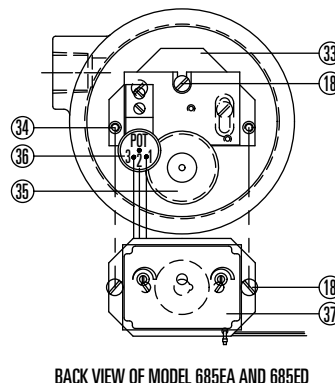
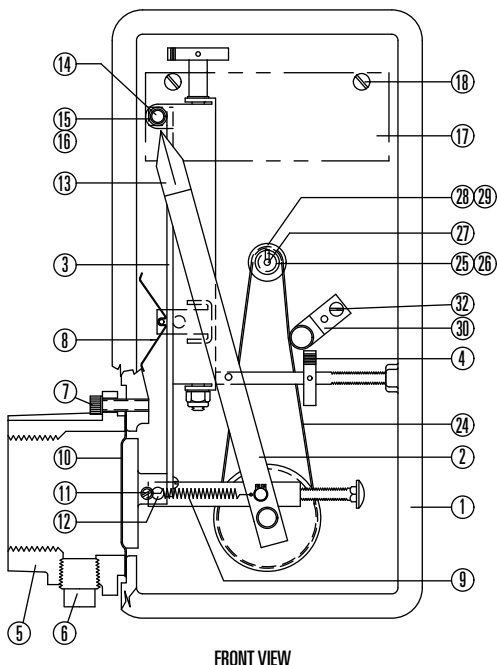
**Recommended spare parts. Other materials available.

***Specify tank height when ordering.

Item #5 Part Number

Vessel Connection	Cad. Plated	Epoxy Coated	Teflon® Coated
2" NPT, D.I.	000307-C	000307-E	000307-T
2" NPT, 316 S.S.	000317-M*	000317-E	000317-T
2"-150RF, STEEL	000335-C	000335-E	000336-T
2"-150RF, 304 S.S.	000338-M*	000338-E	N/A
2"-150RF, 316 S.S.	000341-M*	000341-E	000341-T
3"-150RF, STEEL	000345-C	000345-E	N/A
2" GROOVE, D.I.	000302-C	000303-E	000302-T
2" NPT, PVC	000343-M*	N/A	N/A
2"-150RF, PVC	000342-M*	N/A	N/A

*Plating not required.



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WellMark Series

“Snubber” Pulsation Dampener for 685

Application

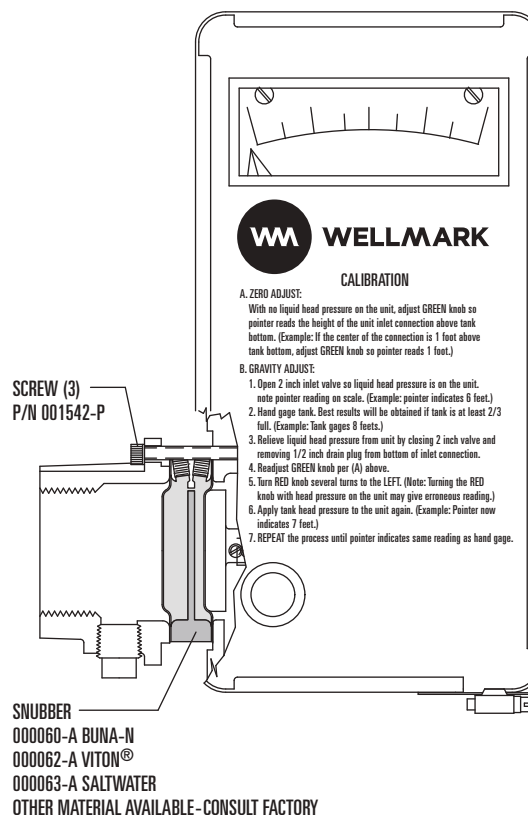
The Snubber is designed to permit the installation of the Major Level Control on a pump suction line without being affected by the surges as the pump starts or stops, or when any other condition results in rapid fluctuation of static head. Of the head type switches in common field use, only the Major Level Control is available with this built-in dampening feature.

Features

- **Dependable:** Factory-sealed snubber assembly eliminates the possibility of orifice plugging from foreign matter.
- **Effective:** Rapid pulsation pressure peaks up to 30 psig resulting in no visible pointer motion.
- **Cost Saving:** The Snubber eliminates the necessity of a separate tank connection and field wiring from the pump unit to the Level Control. The Level Control can be shop mounted and wired on a pump unit skid at a considerable saving in field installation cost.

Operation

Pressure on the upstream diaphragm forces the silicone oil through the orifice and against the downstream diaphragm. The orifice slows the rate of movement of silicone oil. If the head on the upstream diaphragm is suddenly increased from zero to 16', it takes 45 seconds for the pointer to reach the 16' reading. There is no disadvantage to this slowdown, since in normal operation it takes hours for the tank to fill from zero to 16'. The Snubber will operate satisfactorily at all ambient temperatures due to the almost flat viscosity-temperature curve of the silicone oil.



Installation (Snubber to 685)

1. Remove the three cap screws attaching the housing adapter to the level control housing.
2. Remove the diaphragm.
3. Insert the Snubber between the adapter and the housing with the convex (protruding) diaphragm exposed to the liquid.
4. Install the three long screws furnished with the Snubber. **NOTE:** Due to the slow action of the pointer when a Snubber is used, the Level Control can be calibrated more quickly if the Snubber is first removed. Installation of the Snubber will not affect calibration of the Level Control.

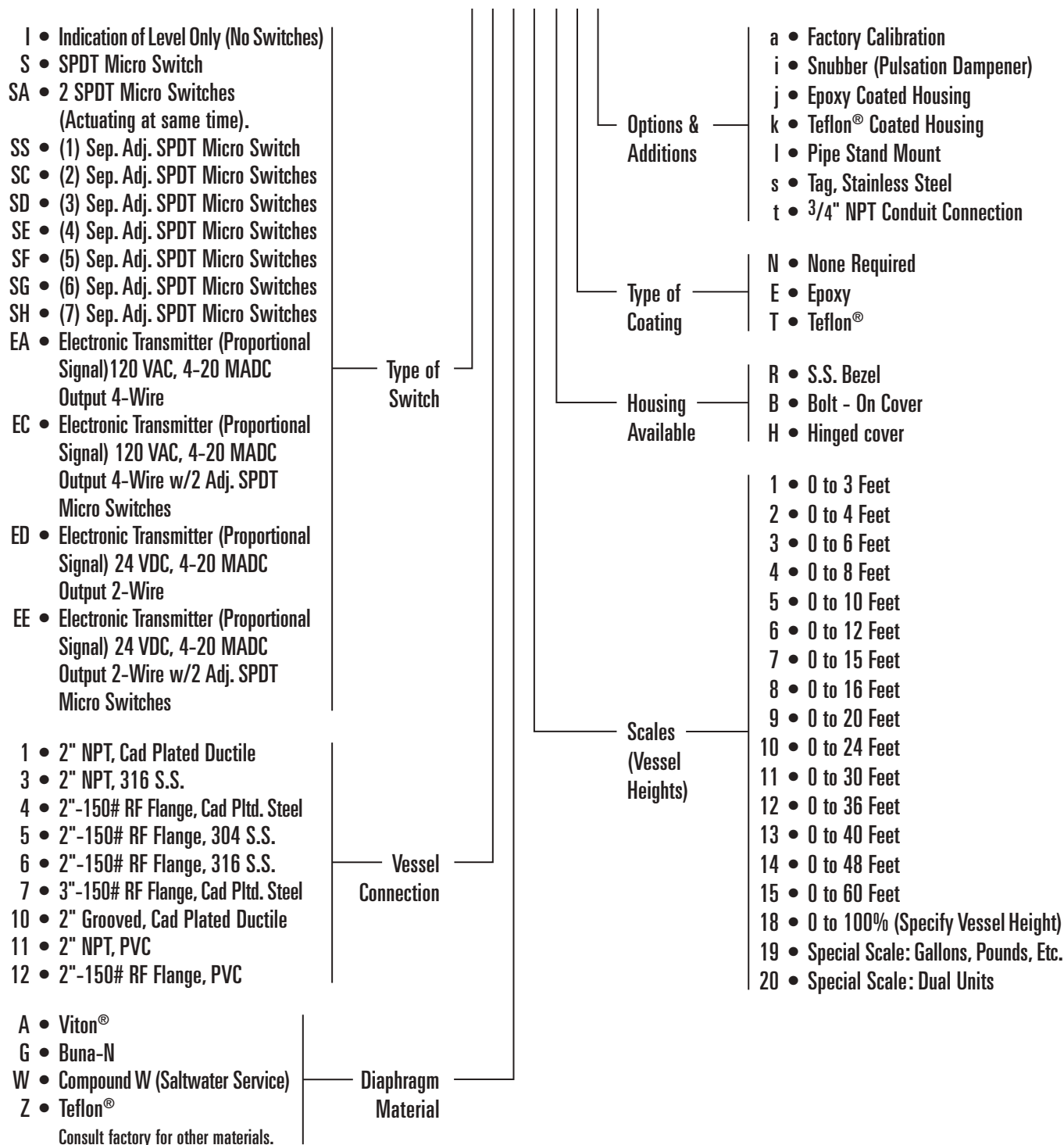
WellMark Series

685 Liquid Level Indicator for Atmospheric Vessels

Determining the Model Number

Example given: Standard Model 685I-1G8-RN Liquid Level Indicator for Atmospheric (Vented) Vessels with, Level Indication Output, 2" NPTF (Cad Plated Ductile) Tank Connection, Buna-N Diaphragm, 0 to 16 Foot Indicator Scale, Standard Aluminum Housing.

MODEL 685 I-1 G 8-R N

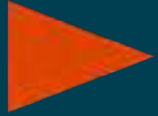


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WellMark Series

790 Horizontal Level Control Floatswitch

Application

The Model 790 Floatswitch is a side-mounted liquid level switch which works on positive magnetic repulsion to complete an electrical circuit to a pump, valve, alarm or other device, when the liquid level in the vessel rises (or lowers) to a predetermined point.

Features

- Corrosion Resistant: All wetted parts are 316 Stainless Steel.
- Variety of Switch Options: SPDT, DPDT, High Amp, High Temp.
- Explosion Proof: CSA APPROVED
 - Class I, Groups C & D
 - Class II, Groups E, F & G
 - Class III, Enclosure Type 4X
- External Chamber Available: Carbon Steel with (2) 1" NPT Connections.

Operation

A magnet is permanently welded into the float arm assembly; as the liquid in the vessel rises, moving the float up, the float arm pivots (down) repelling another magnet inside the 790 unit, causing snap action of the electrical switch. Since SPDT switches are utilized, the level switch can simply be wired to energize at either a high or low level position.

Electrical Contacts: SPDT Micro Switch, Standard.

FUNCTION	TEMP.	SWITCH RATING
Standard	250°F	5 A @ 120 VAC/250 VAC/28 VDC
High Amp	180°F	11 A @ 120 VAC/250 VAC
High Temp	400°F	5 A @ 120 VAC

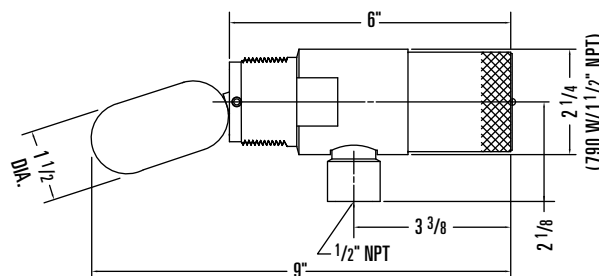
Specifications

Switch Housing	Explosion Proof
Temperature Limit	250°F (standard), 400°F (option)
Mechanical Rating	10,000,000 operations
Operating Pressure:	
316 Stainless Steel Float, Std.	1500 psig
Polypropylene Float	5000 psig
Level Differential	Approximately 1"
Specific Gravity	0.6 Min.
Electrical Connection	1/2" Female Pipe Thread

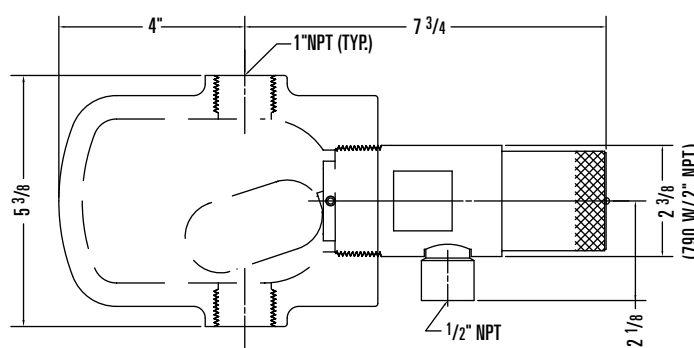


Dimensional Data

790 Std. 1 1/2" NPT Or 2" NPT



790 With External Cage



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WellMark Series

790 Horizontal Level Control Floatswitch

Determining the Model Number

Example given: Standard Model 790SF-1A Float Control with SPDT Micro Switch, 1 1/2" NPT Vessel Connector, 316 S.S. Float, 316 S.S. Arm and Pivot for Internal Vessel Mounting with pressure up to 1500 psi.

MODEL 790SF-1 A

*For variations, change code to match requirements.

- SF • SPDT Dry Contact - STD.
- SG • DPDT Dry Contact - STD.
- SK • SPDT High Amp
- SR • SPDT High Temperature

Type of Switch

- 1 • 1 1/2" NPT
- 2 • 2" NPT

Size

Options & Additions

- c • External Chamber - Carbon Steel with (2) 1" NPT Connections
- e • External Arm (Specify Length)
- h • High Pressure - 5000 psi Polypropylene Float
- s • Stainless Steel Tag
- x • Annulus Plug

Materials

- A • 316 S.S. Process Connection with 316 S.S. Trim

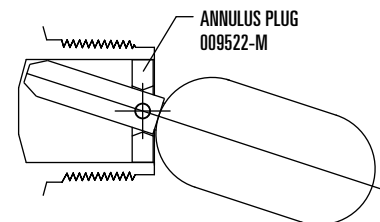
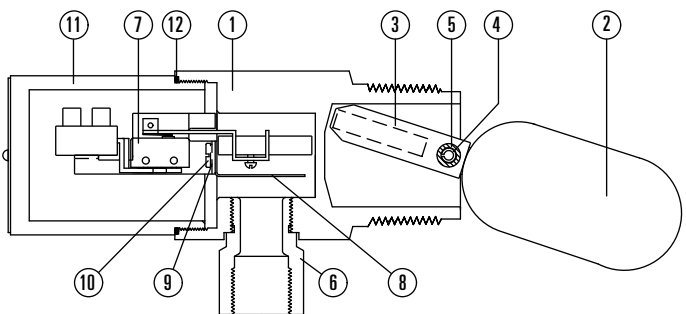
Parts List

Item	Description	Qty.	Part No.
1	BODY 1 1/2" NPT, ASTM A-276 TY.316	1	009513-M
	BODY 2" NPT, ASTM A-276 TY.316	1	009527-M
2	FLOAT, 316 STAINLESS STEEL	1	007418-P
3	COUNTER WEIGHT, ASTM A-276 TY.316	1	007361-W
4	PIVOT PIN, 316 S.S.	1	007233-P
5	SPACER, 316 S.S.	2	007114-M
6	ADAPTER, ASTM A-582 TY.303	1	009533-M
7	SWITCH ASSY, SPDT	1	009584-A
	SWITCH ASSY, DPDT	1	009679-A
8	SWITCH PROTECTOR, 304SS	1	009520-P
9	LOCK WASHER, S.S.	2	001804-P
10	SCREW, 18-8 S.S.	2	001504-P
11	CAP, 303 STAINLESS STEEL	1	009514-M
12	O-RING, BUNA-N	1	05000-0173
13*	SCREW, GROUND, 18-8 S.S.	1	001504-G
14*	GROUND CUP, S.S.	1	001800-P
15*	GROUND WIRE (FOR DPDT SWITCH ONLY)	1	000087-A

*NOT SHOWN

WIRING DIAGRAM FOR 790 WITH FLOAT IN DOWN POSITION

- 1 BLACK COMMON
- 2 BLUE NORMALLY CLOSED
- 3 RED NORMALLY OPEN



OPTIONAL PARTS FOR 790

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WellMark Series

683 Floatswitch for Atmospheric Vessels up to 2 psig

Application

The Model 683 Floatswitch is a float type control which completes an electrical circuit to a pump, valve, alarm or other device, when the liquid level in the vessel rises (or lowers) to a predetermined point.

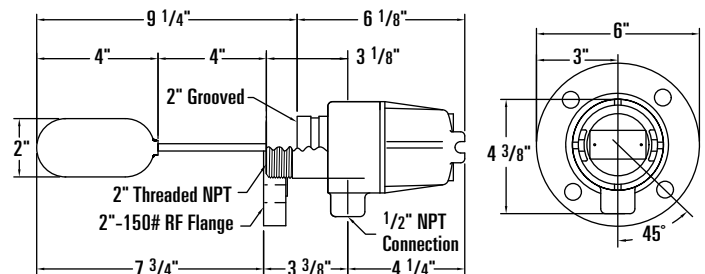
Features

- **Corrosion Proof:** Float and Arm are 304 S.S., Cad Plated Steel Vessel Connection (Other materials available for more corrosive liquids).
- **No Wearing Parts:** Due to the pivoting action of the float arm on the diaphragm, sticking does not occur in thick or corrosive liquids.
- **Variety of Switch Outputs:** The 683 can be obtained with mercury or micro switch output and in various combinations, ie. SPST, SPDT, DPDT, etc.
- **Adjustments:** Nothing to adjust or get out of calibration on the mercury switches. Micro switches can be adjusted from the outside when the floatswitch is installed on the vessel.
- **Simple Installation:** On an INTERNAL MOUNT, the float passes through a 2" nipple. On an EXTERNAL MOUNT, install on 2" external pipe riser connected to the pressure vessel above the high level and below the low level control points.
- **Longer Life:** Since there are no wearing parts, the replacement of stuffing boxes, etc. is eliminated.

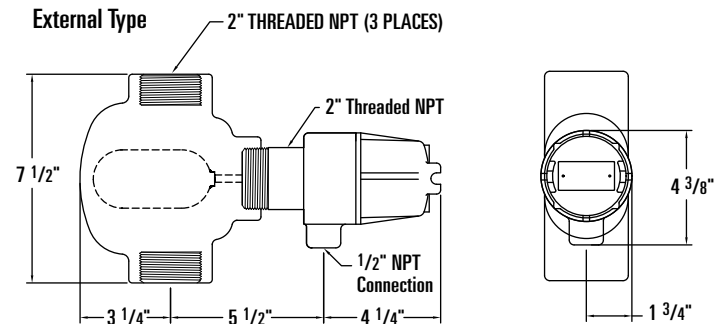


Dimensional Data

Internal Type



External Type



Operation

The float arm passes through a nylon reinforced diaphragm with a special nut on each side of the diaphragm; the switches are attached to the float arm by means of stainless steel supports. The diaphragm acts as a pivot point for the float arm, and as a seal between the vessel and the explosion proof switch housing. The maximum travel of the float between the switch "make" and "break" is 1" for mercury switches and 1/4" for micro switches.

Specifications

Switch Housing	Cast Aluminum
Operating Pressure	Atmospheric to 2 psig
Operating Temperature	-20°F to +225°F
Electrical Connection	1/2" Female Pipe Thread

Switch Ratings

683SA, 683SB	SPST Mercury
	10 A @ 120 VAC, 5 A @ 240 VAC
	3 A @ 440 VAC
683SC	SPDT Mercury
	4 A @ 120 VAC, 2 A @ 240 VAC
	1 A @ 440 VAC
683SF	SPDT Micro Switch
	15 A @ 125, 250 or 480 VAC
	1/8 HP-125 VAC, 1/4 HP-250 VAC
	1/2 A @ 125 VDC, 1/4 A @ 250 VDC
683SG	DPDT Micro Switch
	10 A @ 125 or 250 VAC
	0.3 A @ 125 VDC; 0.15 A @ 250 VDC

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WellMark Series

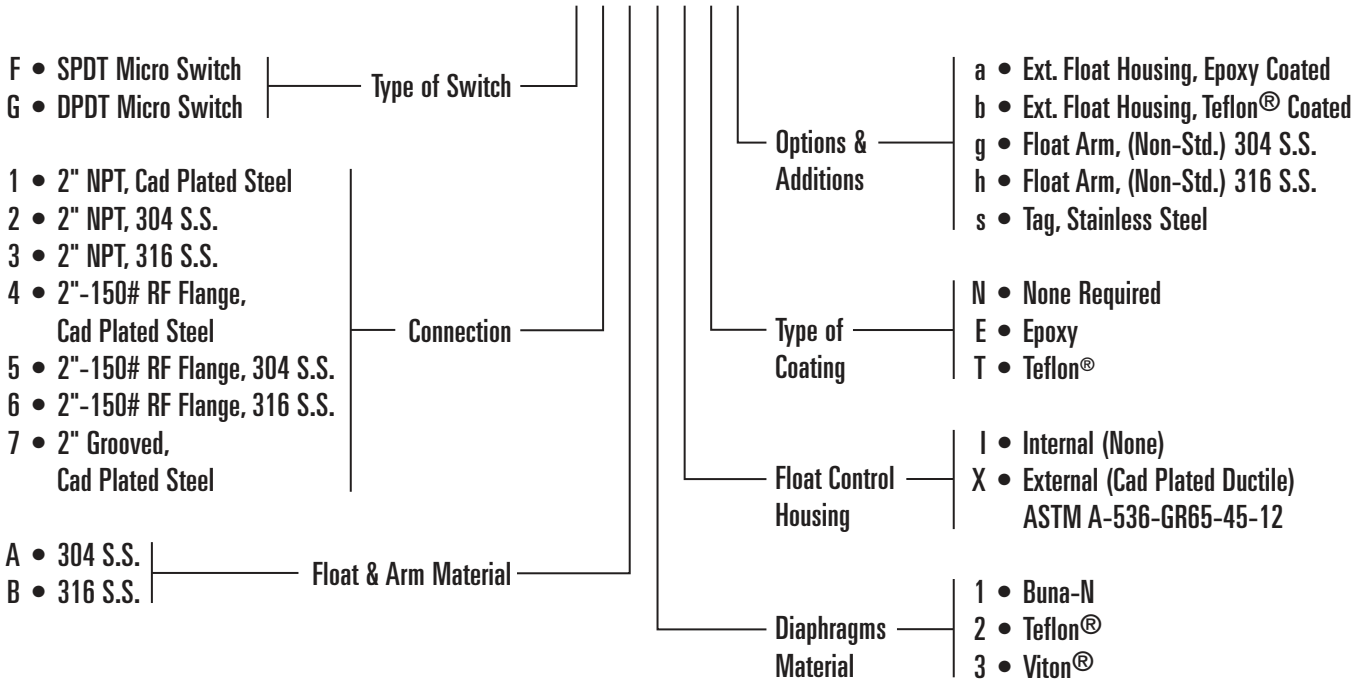
683 Floatswitch for Atmospheric Vessels up to 2 psig

Determining the Model Number

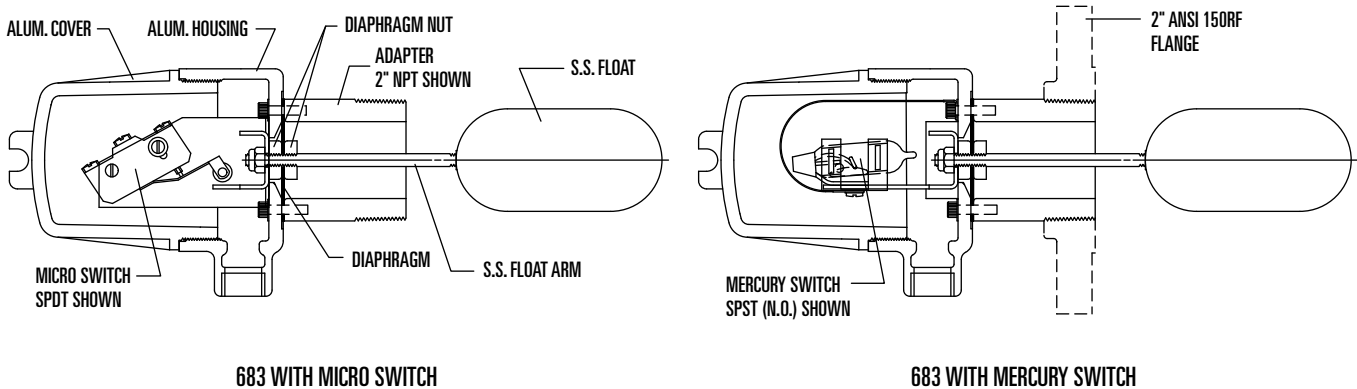
Example given: Standard Model 683-A1A1-IN Floatswitch for Atmospheric (Vented) Vessels with, SPDT Micro Switch Output, 2" NPT (Cad Plated Steel) Vessel Connection, 304 S.S. Float and Float Arm, Buna-N Diaphragm, for Internal Vessel Mounting.

MODEL 683S-F 1 A 1-I N

*For variations, change code to match requirements.



Typical Assembly



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WellMark Series

686 Floatswitch for Pressure Vessels up to 200 psig

Application

The Model 686S Floatswitch is a float type control which completes an electrical circuit to a pump, valve, alarm or other device, when the liquid in the vessel rises (or lowers) to a pre-determined point.

Features

- **Corrosion Proof:** Float and Arm are 304 S.S., Cad Plated Steel Vessel Connection (Other materials available for more corrosive liquids).
- **Explosion Proof:** CSA Approved
Class I Group D
Class II Group E, F and G
Hazardous Locations
- **Variety of Switch Outputs:** The 686 can be obtained with mercury or micro switch outputs and in various combinations, ie.; SPDT, SPST, DPDT, etc.
- **Adjustments:** Nothing to adjust or get out of calibration on the mercury switch. Micro switches can be adjusted from the outside when the floatswitch is installed on the vessel.
- **Simple Installation:** On an INTERNAL MOUNT, the float passes through a 2" nipple. On an EXTERNAL MOUNT, install on 2" external pipe riser connected to the pressure vessel above the high level and below the low level control points.
- **Long Life:** Permanently dry-film lubricated S.S. shaft and Teflon® bearing comprise the only pivot point. Due to large bearing surface area, wear is negligible.

Operation

The Float and Arm are rigidly attached to the dry-film lubricated shaft which rotates in the shaft housing. A bracket at the other end of the shaft actuates the switch. A Viton® O-Ring seals against pressure and leakage along the shaft.

A Teflon® washer separates the metal parts and provides lubricity. If leakage ever occurs, the liquid in the vessel seeps out of the safety vent hole. Thus, it is impossible for the liquid to ever enter the switch housing. The maximum travel of the float between the switch "make" and "break" is 1" for mercury switches and 1/4" for micro switches.

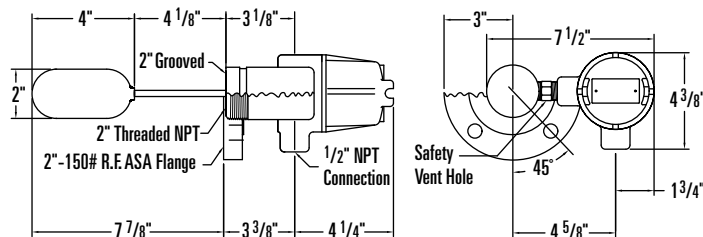
Specifications

Switch Housing	Explosion Proof Cast Aluminum
Operating Pressure	0 to 200 psig
Proof Pressure	400 psig
Operating Temperature	-20°F to +400°F
External Float Housing	Ductile Iron
Electrical Connection	1/2" Female Pipe Thread

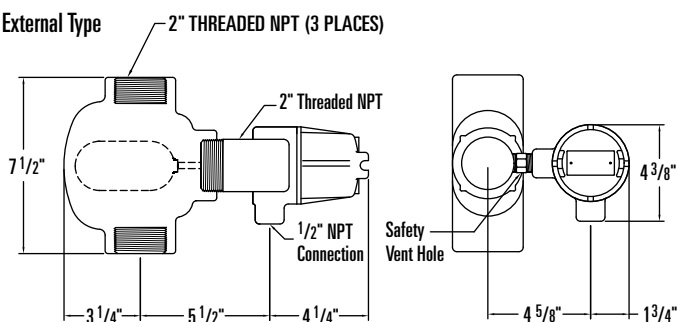


Dimensional Data

Internal type



External Type



Switch Ratings

686SA, 686SB SPST Mercury
	10 A @ 120 VAC, 5 A @ 240 VAC
	3 A @ 440 VAC
686SC SPDT Mercury
	4 A @ 120 VAC, 2 A @ 240 VAC
	1 A @ 440 VAC
686SF SPDT Micro Switch
	15 A @ 125, 250 or 480 VAC
	1/8 HP-125 VAC, 1/4 HP-250 VAC
	1/2 A @ 125 VDC, 1/4 A @ 250 VDC
686SG DPDT Micro Switch
	10 A @ 125 or 250 VAC
	0.3 A @ 125 VDC; 0.15 A @ 250 VDC

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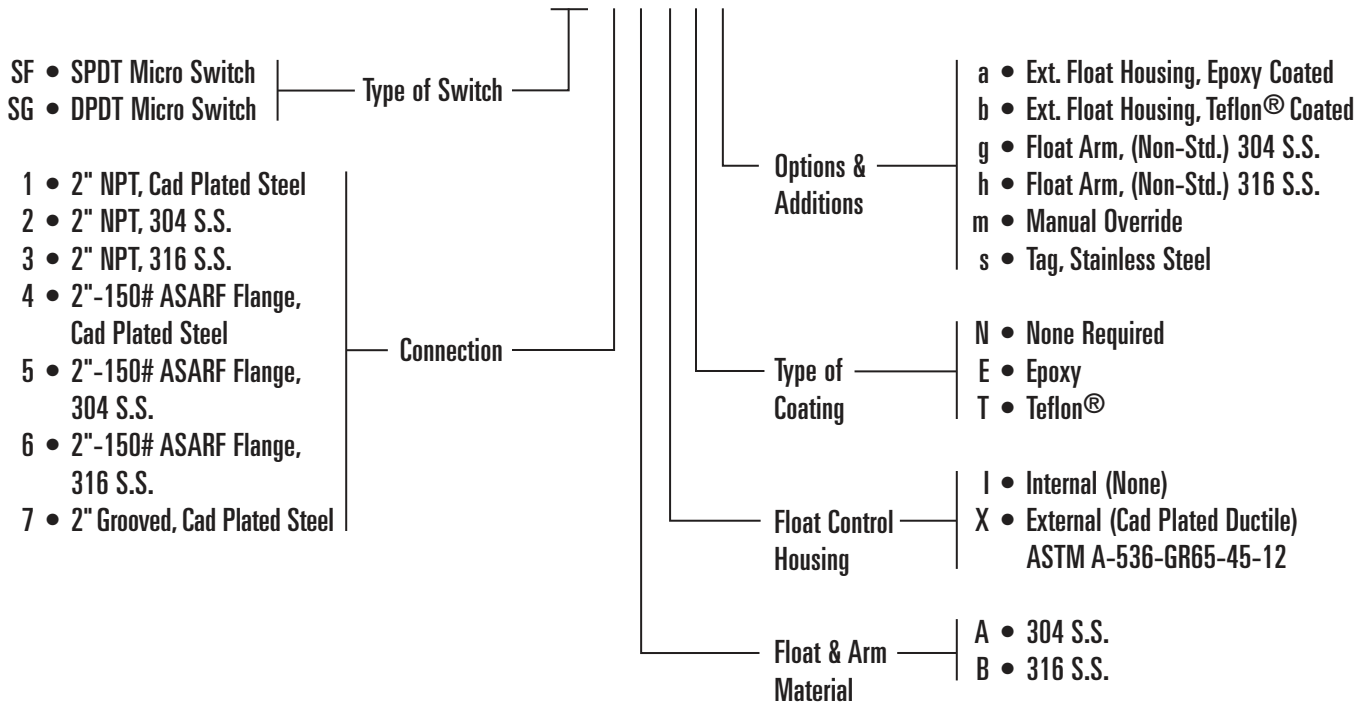
WellMark Series

686 Floatswitch for Pressure Vessels up to 200 psig

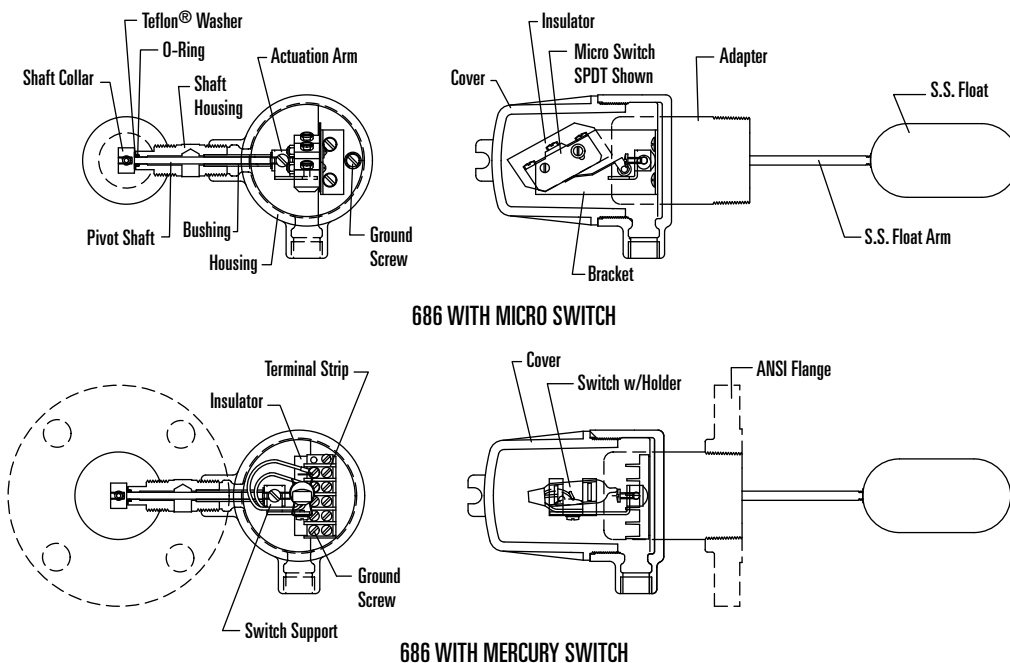
Determining the Model Number

Example given: Standard Model 686SA-1A-IN Float Control for Vented Vessels up to 200 psig with, SPDT Micro Switch Output, 2" NPT (Cad Plated Steel) Vessel Connection, 304 S.S. Float and Float Arm, for Internal Vessel Mounting.

MODEL 686 SF-1 A-I N



Typical Assembly



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WellMark Series

687 Floatswitch for Pressure Vessels up to 1440 psig

Application

The Model 687 Floatswitch is a float type control which completes an electrical circuit to a pump, valve, alarm, or other device, when the liquid in the vessel rises (or lowers) to a pre-determined point.

Features

- **Corrosion Proof:** Float and Arm is 304 S.S., 2" Cad Plated Steel Vessel Connection or Cast Steel External Cage (Other materials are available for more corrosive liquids).
- **Explosion Proof:** CSA Approved for Class I Group D, Class II Group E, F and G hazardous locations.
- **Variety of Switch Outputs:** The 687 can be obtained with mercury or microswitch outputs and in various combinations, ie. SPDT, SPST, DPDT, etc.
- **Adjustments:** Nothing to adjust or get out of calibration on the mercury switch. Micro switches can be adjusted from the outside when the floatswitch is installed on the vessel.
- **Simple Installation:** On an INTERNAL MOUNT, the float passes through a 2" nipple. On an EXTERNAL MOUNT, install on 1" external pipe riser connected to the pressure vessel above the high level and below the low level control points.
- **Long Life:** Permanently dry-film lubricated S.S. shaft and Teflon® bearing comprise the only pivot point. Due to large bearing surface area, wear is negligible.

Operation

The float and arm are rigidly attached to the dry-film lubricated shaft which rotates in the shaft housing. A bracket at the other end of the shaft actuates the switch. A Viton® o-ring seals against pressure and leakage along the shaft. A Teflon® washer separates the metal parts and provides lubricity. If leakage ever occurs, the liquid in the vessel seeps out of the safety vent hole. Thus, it is impossible for the liquid to ever enter the switch housing. The maximum travel of the float between the switch "make" and "break" is 1" for mercury switches and 1/4" for micro switches.

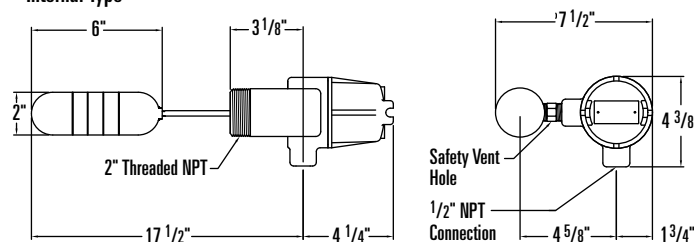
Specifications

Switch Housing	Explosion Proof Cast Aluminum
Operating Pressure	0 to 1440 psig
Proof Pressure	2000 psig
Operating Temperature	-20°F to +400°F
External Float Housing	Cast Steel
Electrical Connection	1/2" Female Pipe Thread

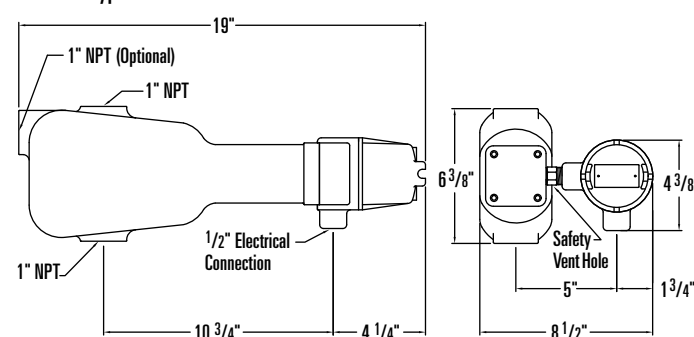


Dimensional Data

Internal Type



External Type



Switch Ratings

687SA, 687SB	SPST Mercury
	10 A @ 120 VAC, 5 A @ 240 VAC
	3 A @ 440 VAC
687SC	SPDT Mercury
	4 A @ 120 VAC, 2 A @ 240 VAC
	1 A @ 440 VAC
687SF	SPDT Micro Switch
	15 A @ 125, 250 or 480 VAC
	1/8 HP-125 VAC, 1/4 HP-250 VAC
	1/2 A @ 125 VDC, 1/4 A @ 250 VDC
687SG	DPDT Micro Switch
	10 A @ 125 or 250 VAC
	0.3 A @ 125 VDC; 0.15 A @ 250 VDC

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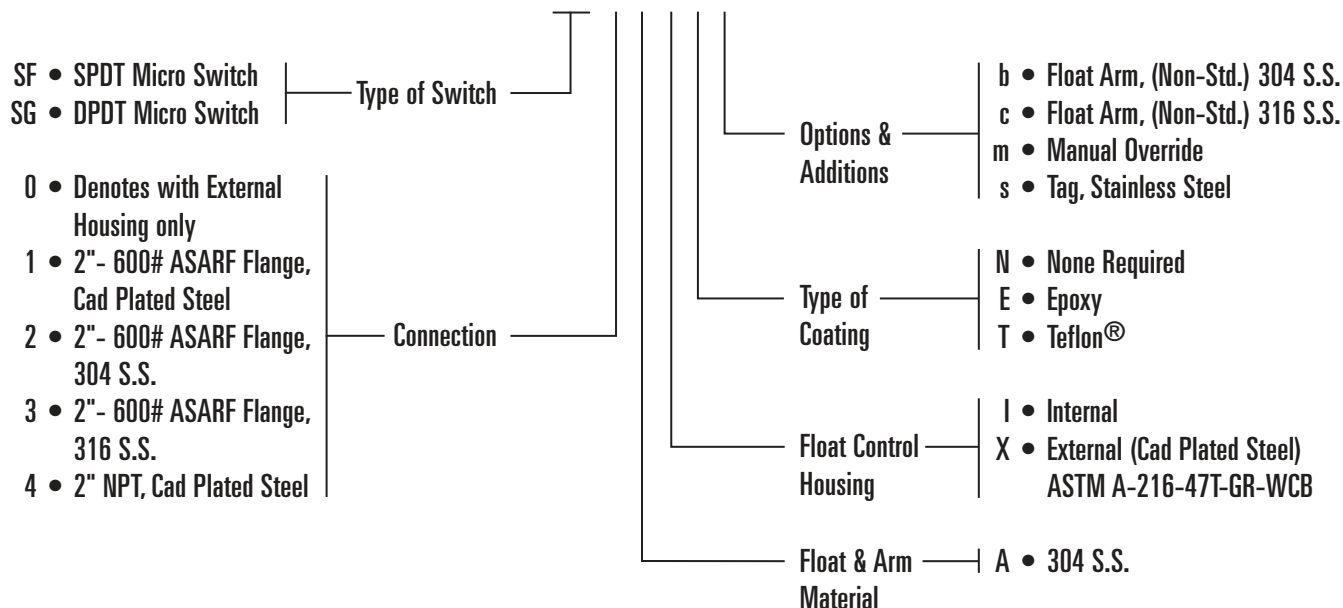
WellMark Series

687 Floatswitch for Pressure Vessels up to 1440 psig

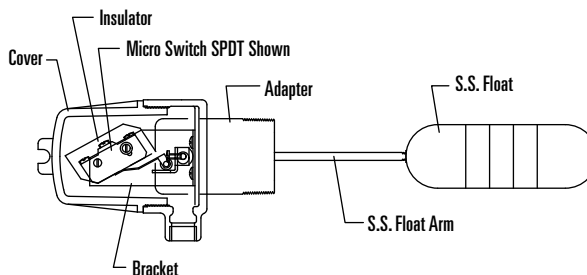
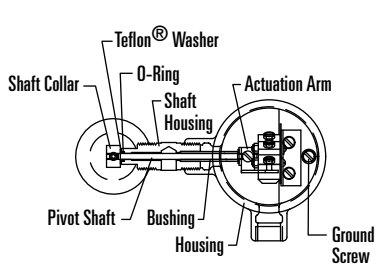
Determining the Model Number

Example given: Standard Model 687SA-4A-IN Float Control for Pressure Vessels up to 1440 psig with, SPDT Micro Switch Output, 2" NPT (Cad Plated Steel) Vessel Connection, 304 S.S. Float and Float Arm, for Internal Vessel Mounting.

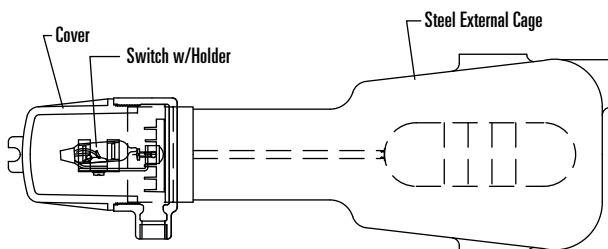
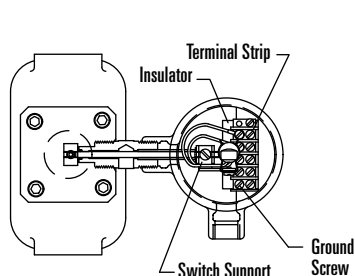
MODEL 687 SF-4 A-I N



Typical Assembly



687 WITH INTERNAL HOUSING, MICRO SWITCH SHOWN



687 WITH EXTERNAL HOUSING, MERCURY SWITCH SHOWN

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WellMark Series

688 Level Switch for Pressure Vessels up to 2000 psig

Application

The Model 688 is a single point on/off level switch, which completes an electrical circuit to a pump, valve, alarm or other device. This unit senses virtually any liquid and does not need adjustment when the vessel contents are changed. It will ignore foam, surge or splash to indicate true liquid level, with repeatability to 0.050 in. standard.

Features

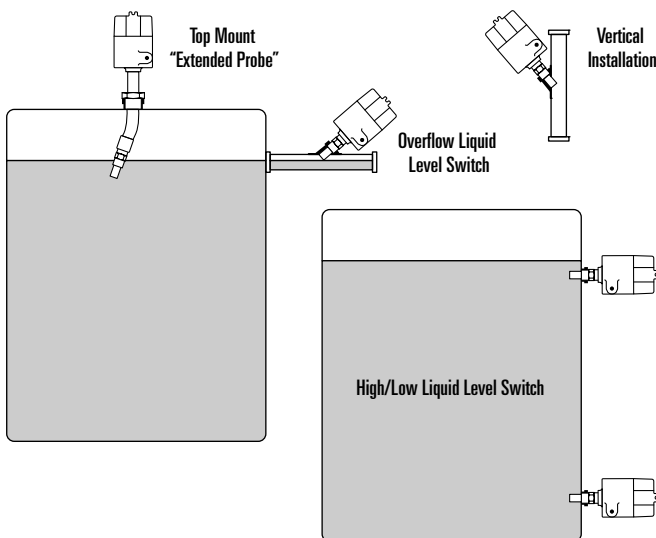
- **Fail-Safe:** Unit is field adjusted to high or low level fail-safe conditions.
- **Auto Test Self-Checking:** The unique self-checking feedback loop constantly "proves" that the switch is working properly and offers superior reliability in critical applications.
- **Long Life:** The all stainless steel, heavy-duty sensor resists damage from product abrasion or corrosion. No packing glands are used.
- **Explosion Proof:** CSA Approved for Class I Group C & D, Class II Group E, F and G hazardous locations
- **Versatile Power Supply:** The standard units are designed to accept 115 VAC, 230 VAC or low voltage AC or DC input power.

Operation

When liquid touches the sensor it starts a chain of activity throughout the sensors internal components, which in turn sends a signal to the circuit board inside the housing. A red LED is illuminated however if there is a sensor failure or other component failure, the relay will immediately transfer to the alarm condition.

Installation

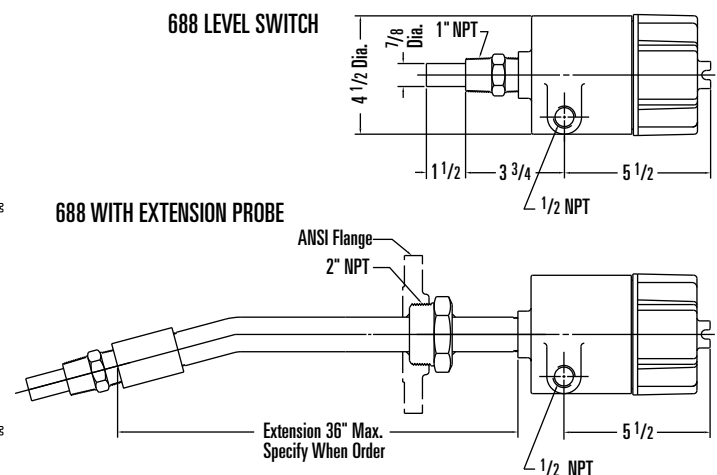
The 688 mounts in many positions.



Specifications

Electrical Housing	CSA Approved Class I, Groups C & D; Class II Groups E, F and G
Housing Operating Temperature	Ambient -20°F to +160°F
Operating Pressure	Up to 2000 psig
Sensor Operating Temperature	-20°F to +220°F
Electrical	
Input Voltage	Nominal: 115 VAC, 230 VAC, 24 VDC
Absolute Limits	90-135 VAC, 180-270 VAC, +-4 VDC
Frequency	AC Power: 50-60 Hz
Time Delay	Independent, non-integrating on make and brake.
Delay Time Range	50 milliseconds min., long delay, 30 sec. max.
Output	Relay DPDT Form C Contacts
Ratings	5A @ 120 VAC Non-Inductive, 5A @ 24 VDC Non-Inductive.

Dimensional Data



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WellMark Series

688 Level Switch for Pressure Vessels up to 2000 psig

Determining the Model Number

Example given: Standard Model 688-SN Level Switch for Pressure Vessels up to 2000 psig Type 347 S.S. Sensor.

MODEL 688-S N

*For variations, change code to match requirements.

- S • Standard 347 S.S.
- E • Extended Probe - 36" Max. with 2" Vessel Connection

Sensor Material

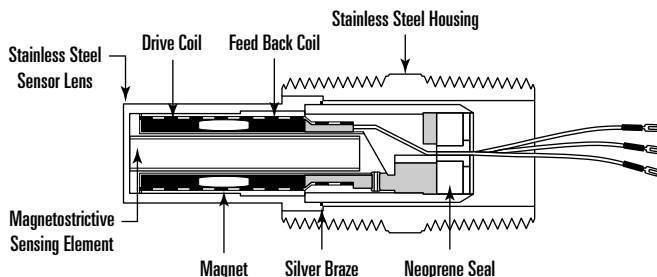
Options & Additions

- e • Epoxy Coated Housing
- s • Stainless Steel Tag
- x • Specify Additional Options

Sensor Coating

- N • None Required
- P • Teflon® (TIP ONLY)

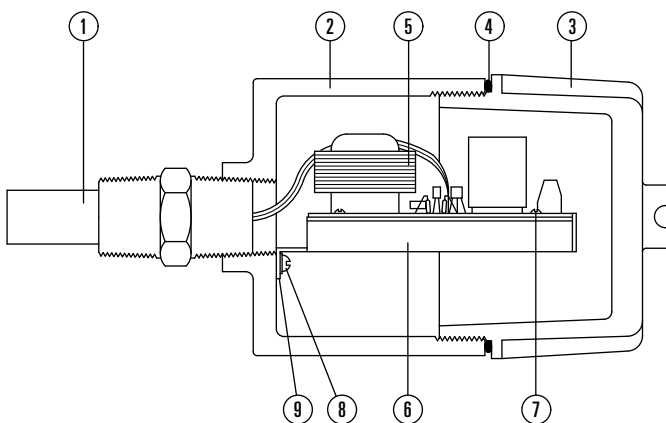
Sensor Detail



Parts List

Item	Description	Qty.	Part No.
1	SENSOR, 347 STAINLESS STEEL	1	005510-P
	SENSOR, 347 S.S. TEFLON® COATED	1	005511-P
2	HOUSING, ALUMINUM	1	000168-M
3	COVER, ALUMINUM	1	000203-M
4	O-RING, BUNA-N	1	007376-P
5	CIRCUIT BOARD	1	005505-P
6	BRACKET, ALUMINUM	1	002605-M
7	SCREW, STAINLESS STEEL	4	001501-P
8	SCREW, STAINLESS STEEL	2	001504-P
9	LOCK WASHER, STAINLESS STEEL	2	001804-P
10*	DECAL	1	005901-P
11*	TAG	1	005903-P

*NOT SHOWN



WellMark Series

710 Flanged Cage Level Control

Application

The Model 710 Series are float-operated units designed for external mounting to the process vessel and provide high pressure capabilities with low specific gravity ratings within the petroleum, power and natural gas industries. These models provide reliable magnetic switching for level alarm or control function applications.

Features

- **Construction Versatility:** Standard Level Control includes a Carbon Steel float cage with a choice of threaded, socket-weld or flanged tank connection. Consult factory for other materials.
- **Explosion Proof:** CSA APPROVED
 Class I, Division I, Groups C & D
 Class II, Groups E, F & G
 Class III, Enclosure Type 4
- **Various Models:** A wide selection of cage & trim materials and switch mechanisms are available.
- **100% Hydrostatic Test @ 1 1/2 Times Related Pressure.**

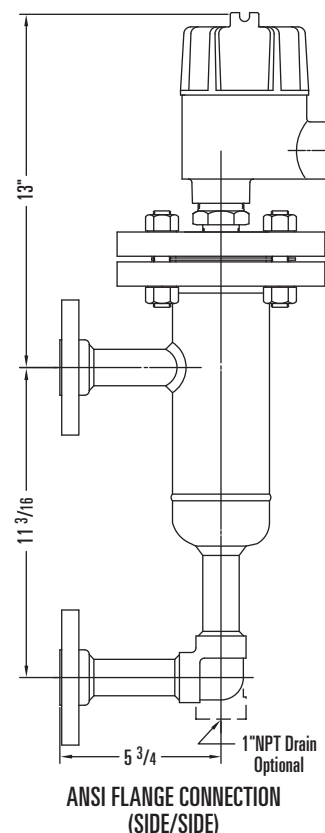
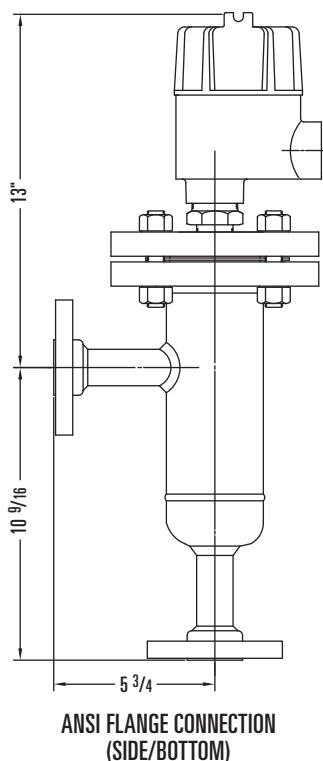
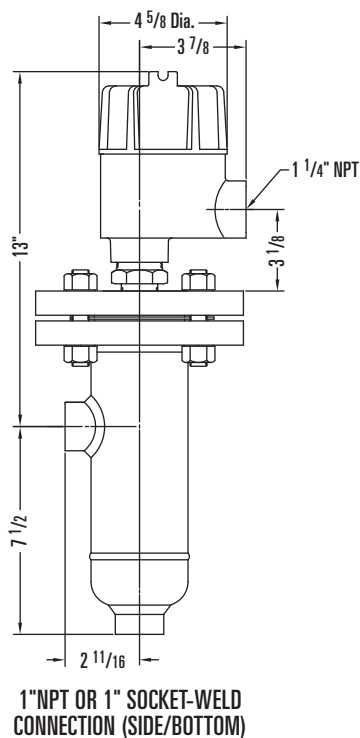
Operation

As the liquid rises, the float moves the attached magnetic attraction sleeve into the field of the magnet located in the switch housing. As this magnet swings toward the enclosing tube, it causes the microswitch to actuate. As the liquid level falls, the magnetic attraction sleeve moves out of the magnetic field and the bias spring pulls the magnet away from the enclosing tube, which deactuates the micro switch.

Specifications

Switch Housing	Explosion Proof Cast Aluminum	
Operating Pressure	350 psi Max.	
Operating Temperature	450°F Max.	
Minimum Specific Gravity	0.69	
Electrical Connections	1 1/4" Female Pipe Thread	
Electrical Contacts	SPDT Micro Switch standard	
FUNCTION	AMBIENT TEMP	SWITCH RATING
Standard	-20 to 160°F	5A @ 250 VAC
High Temp	-20 to 450°F	5A @ 250 VAC

Dimensional Data



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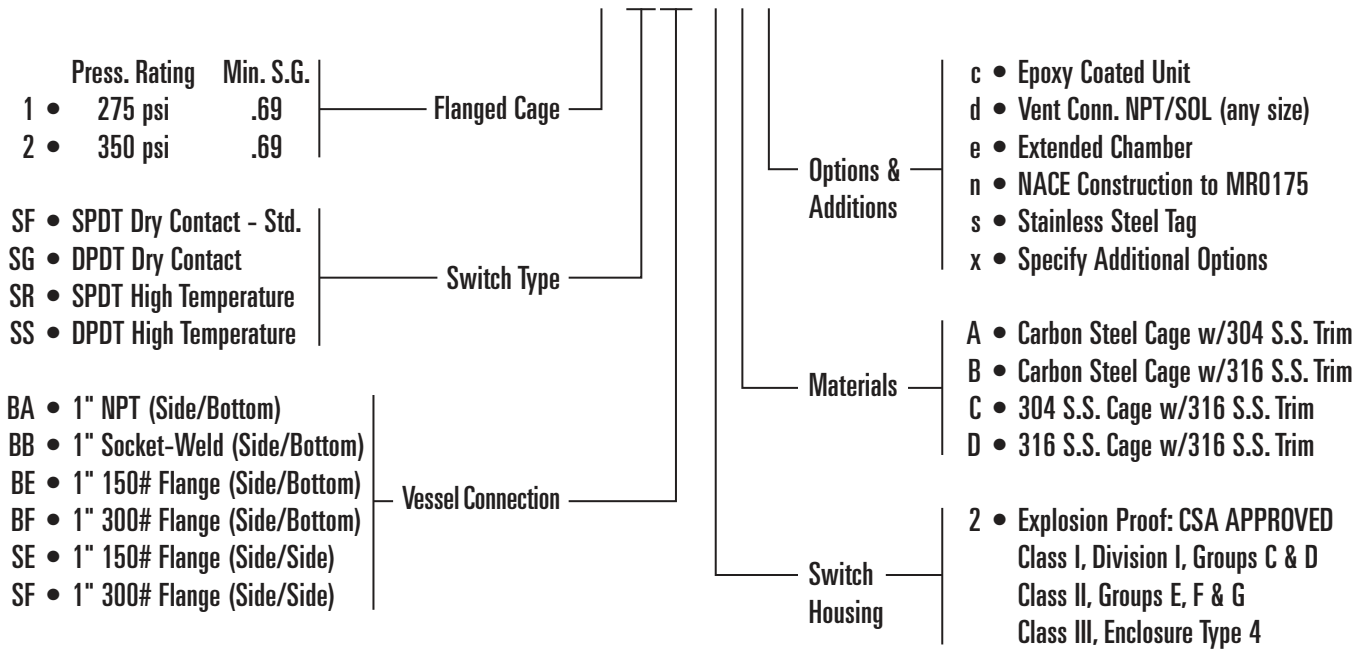
WellMark Series

710 Flanged Cage Level Control

Determining the Model Number

Example given: Sample Model 710 1-SFBA-2A Flanged Cage External Mount Float Control with, SPDT Micro Switch, 1" NPT side and bottom Process Connections, Carbon Steel Cage with 304 S.S. Trim, Pressure rated to 275 psi and with Explosion Proof Switch Housing.

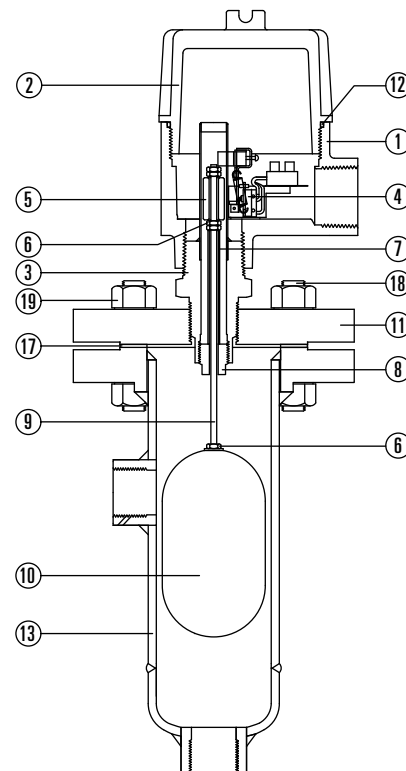
MODEL 710 1-SFBA-2 A



Parts List

Item	Description	Qty.	Part No.
1	HOUSING, ALUMINUM	1	007201-M
2	COVER, ALUMINUM	1	000203-M
3	ADAPTER W/ENCLOSING TUBE, 316 S.S.	1	007524-A
4	SWITCH KIT ASSEMBLY, SPDT	1	009341-A
	SWITCH KIT ASSEMBLY, DTD	1	009342-A
5	ATTRACTION SLEEVE, 17-4PH	1	009532-M
6	LOCK NUT, STAINLESS STEEL	5	05000-2252
7	STOP TUBE, STAINLESS STEEL	1	007119-M
8	GUIDE PLUG, STAINLESS STEEL	1	002304-M
9	FLOAT ARM, STAINLESS STEEL	1	009413-M
10	FLOAT, 304 S.S.	1	007410-P
11	FLANGE, STEEL OR STAINLESS STEEL	1	C/F
12	O-RING, BUNA-N	1	05000-5446
13	CAGE, STEEL OR STAINLESS STEEL	1	C/F
14*	SCREW, STAINLESS STEEL	2	001501-P
15*	GROUND SCREW	1	001504-G
16*	GROUND CUP, BRASS	1	001800-P
17	GASKET, COMPOSITION	1	009442-P
18	STUD, B7	4	009443-P
19	HEX NUT, 2H	8	009444-P

*Not Shown
C/F: Call factory for Part No.



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WellMark Series

720 Sealed Cage Level Control

Application

The Model 720 Series are float-operated units designed for external mounting to the process vessel and provide high pressure capabilities with low specific gravity ratings within the petroleum, power and natural gas industries. These models provide reliable magnetic switching for level alarm or control function applications. The advantage of this unit is lower cost than the flanged chambers.

Features

- **Construction Versatility:** Standard Level Control includes a Carbon Steel float cage with a choice of threaded, socket-weld or flanged tank connection. Consult factory for other materials.
- **Explosion Proof:** CSA APPROVED
Class I, Division I, Groups C & D
Class II, Groups E, F & G
Class III, Enclosure Type 4
- **Various Models:** A wide selection of cage & trim materials and switch mechanisms are available.
- **100% Hydrostatic Test @ 1 1/2 Times Related Pressure.**

Operation

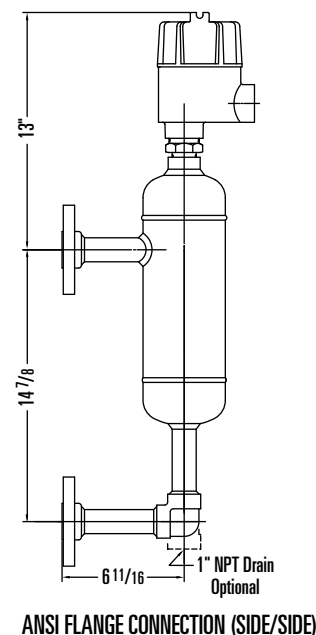
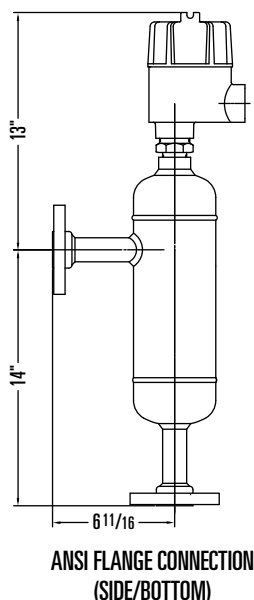
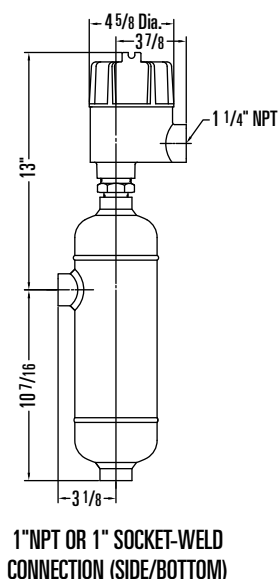
As the liquid rises, the float inside the sealed cage moves the attached magnetic attraction sleeve into the field of the magnet located in the switch housing. As this magnet swings toward the enclosing tube, it causes the micro switch to actuate. As the liquid level falls, the magnetic attraction sleeve moves out of the magnetic field and the bias spring pulls the magnet away from the enclosing tube, which deactuates the micro switch.



Specifications

Switch Housing	Explosion Proof Cast Aluminum	
Operating Pressure	300 psi Max.	
Operating Temperature	450°F Max.	
Minimum Specific Gravity	0.53 Min.	
Electrical Connections	1 1/4" Female Pipe Thread	
Electrical Contacts	SPDT Micro Switch standard	
FUNCTION	AMBIENT TEMP	SWITCH RATING
Standard	-20 to 160°F	5A @ 250 VAC
High Temp	-20 to 450°F	5A @ 250 VAC

Dimensional Data



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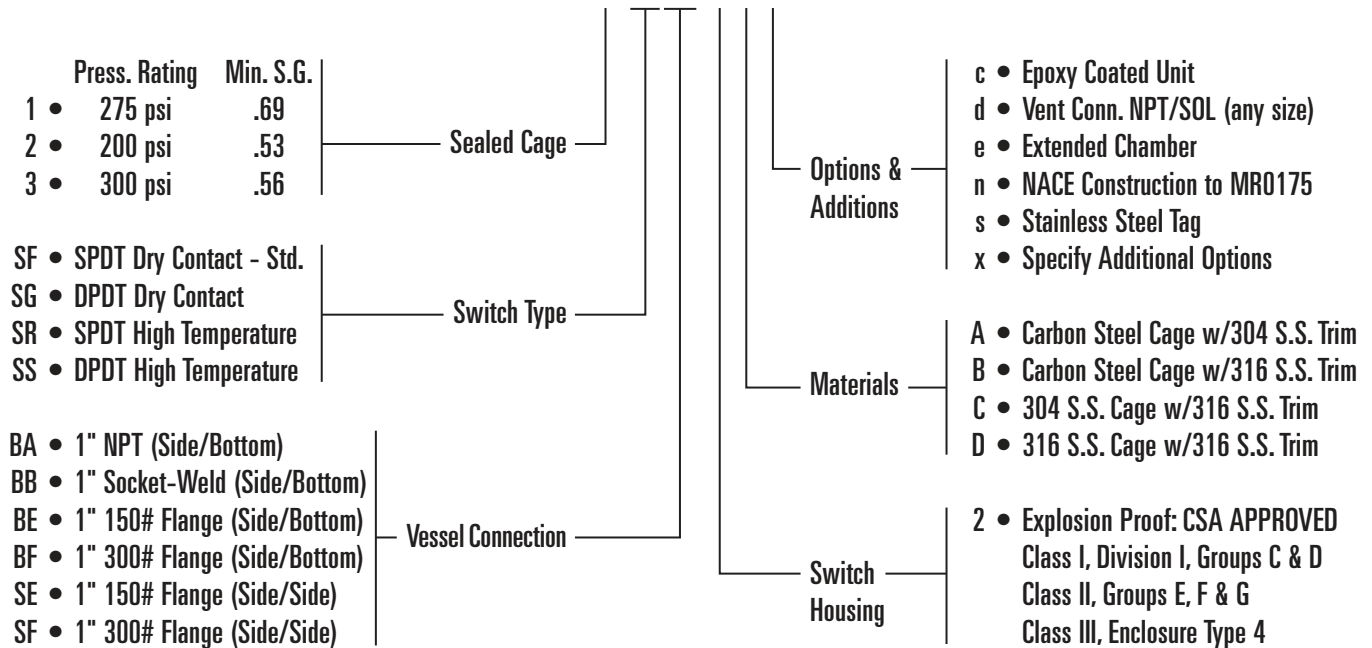


WellMark Series

720 Sealed Cage Level Control Determining the Model Number

Example given: Sample Model 720 1-SFBA-2A Sealed Cage External Mount Float Control with, SPDT Micro Switch, 1" NPT side and bottom Process Connections, Carbon Steel Cage with 304 S.S. Trim, Pressure rated to 275 psi and with Explosion Proof Switch Housing.

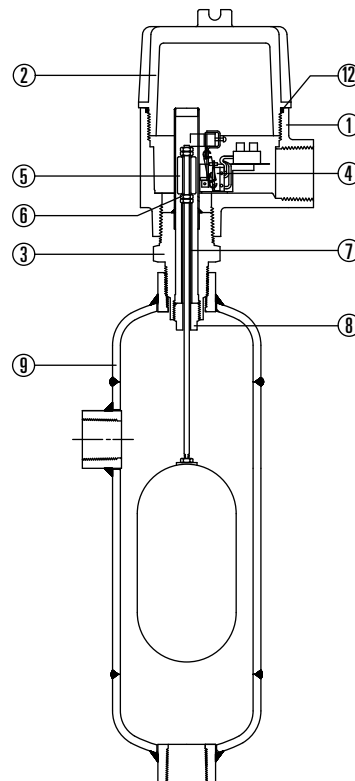
MODEL 720 1-SFBA-2 A



Parts List

Item	Description	Qty.	Part No.
1	HOUSING, ALUMINUM	1	007201-M
2	COVER, ALUMINUM	1	000203-M
3	ADAPTER W/ENCLOSING TUBE, 316 S.S.	1	007524-A
4	SWITCH KIT ASSEMBLY, SPDT	1	009341-A
	SWITCH KIT ASSEMBLY, DTD	1	009342-A
5	ATTRACTION SLEEVE, 17-4PH	1	009532-M
6	LOCK NUT, STAINLESS STEEL	5	05000-2252
7	STOP TUBE, STAINLESS STEEL	1	007119-M
8	GUIDE PLUG, STAINLESS STEEL	1	002304-M
9	CAGE W/ FLOAT AND ARM ASSEMBLY	1	C/F
10*	GROUND SCREW	1	001504-G
11*	GROUND CUP, BRASS	1	001800-P
12	O-RING, BUNA-N	1	05000-5446
13*	SCREW, STAINLESS STEEL	2	001501-P

*Not Shown
C/F: Call factory for Part No.



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WellMark Series

730 Top Mount Level Control

Application

The Model 730 Series are float-operated units designed for internal mounting through the top of the process vessel and provide high pressure capabilities with low specific gravity ratings within the petroleum, power and natural gas industries. These models provide reliable magnetic switching for the lowest cost of high or low level detection.

Features

- **Construction Versatility:** Standard Level Control includes a Stainless Steel float and Carbon Steel NPT or flanged tank connections. Consult factory for other materials.
- **Explosion Proof:** CSA APPROVED
 - Class I, Division I, Groups C & D
 - Class II, Groups E, F & G
 - Class III, Enclosure Type 4
- **Various Models:** A wide selection of trim materials and switch mechanisms are available.

Operation

As the liquid rises, the float moves the attached magnetic attraction sleeve into the field of the magnet located in the switch housing. As this magnet swings toward the enclosing tube, it causes the microswitch to actuate. As the liquid level falls, the magnetic attraction sleeve moves out of the magnetic field and the bias spring pulls the magnet away from the enclosing tube, which deactuates the micro switch.

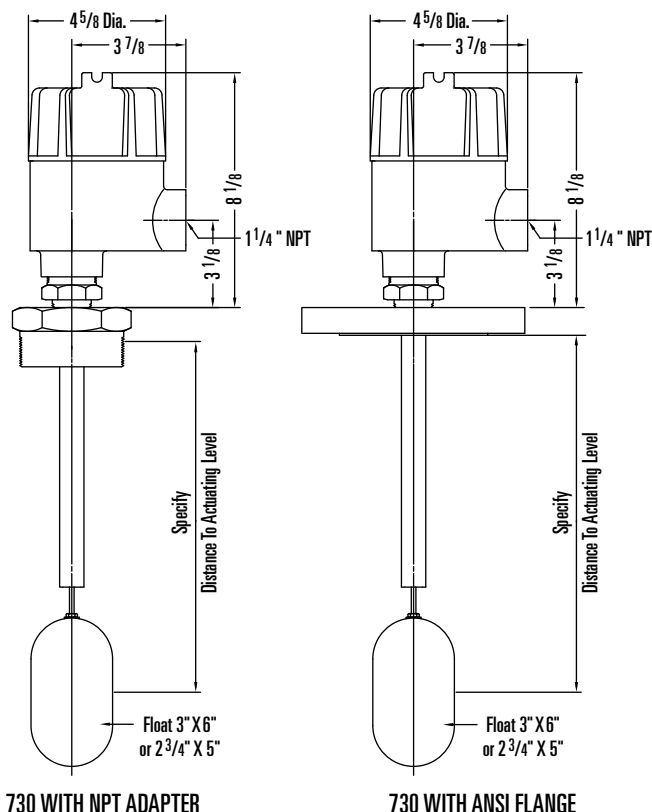
Specifications

Switch Housing	Explosion Proof Cast Aluminum
Operating Pressure	200-275 psi
Operating Temperature	450°F Max.
Minimum Specific Gravity	0.58 Min.
Electrical Connections	1 1/4" Female Pipe Thread
Electrical Contacts	SPDT Micro Switch standard

FUNCTION	AMBIENT TEMP	SWITCH RATING
Standard	-20 to 160°F	5A @ 250 VAC
High Temp	-20 to 450°F	5A @ 250 VAC



Dimensional Data



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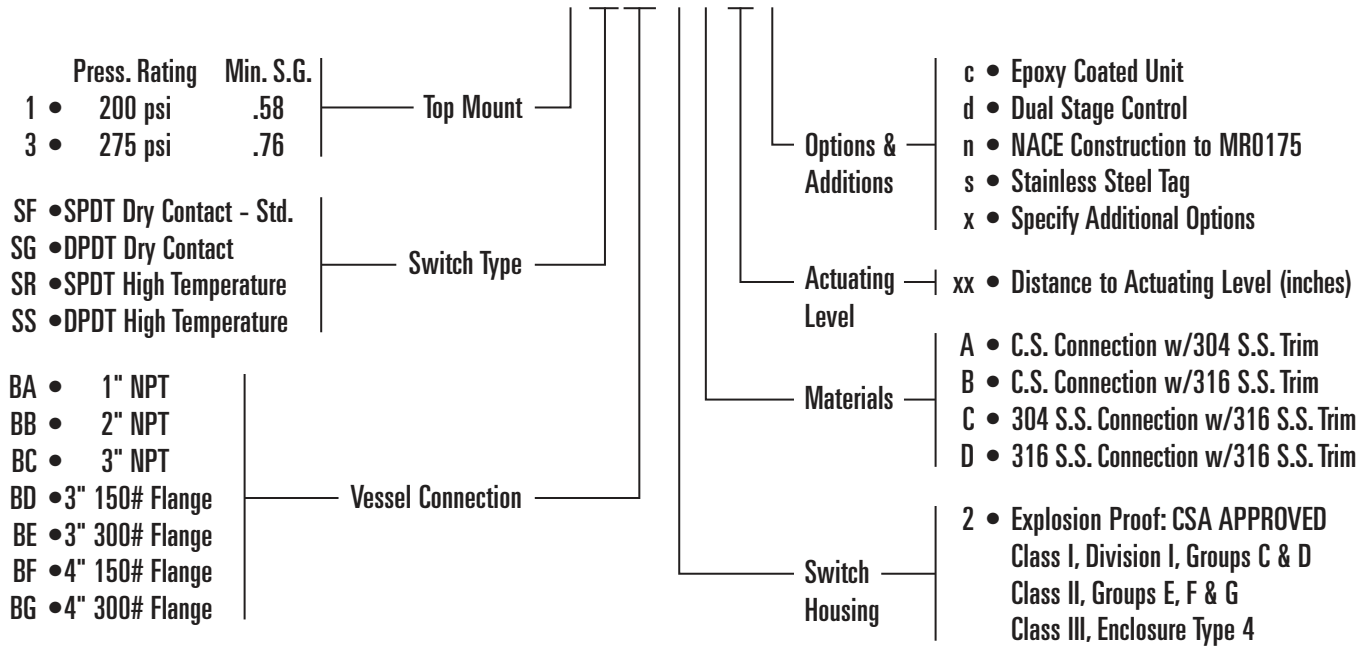
WellMark Series

730 Top Mount Level Control

Determining the Model Number

Example given: Sample Model 730 1-SFBA-2A 18 Top Mount Float Control with, SPDT Micro Switch, 1" NPT Carbon Steel Process Connection with 304 S.S. Trim, Pressure rated to 200 psi and with Explosion Proof Switch Housing, 18" Distance to Actuating Level.

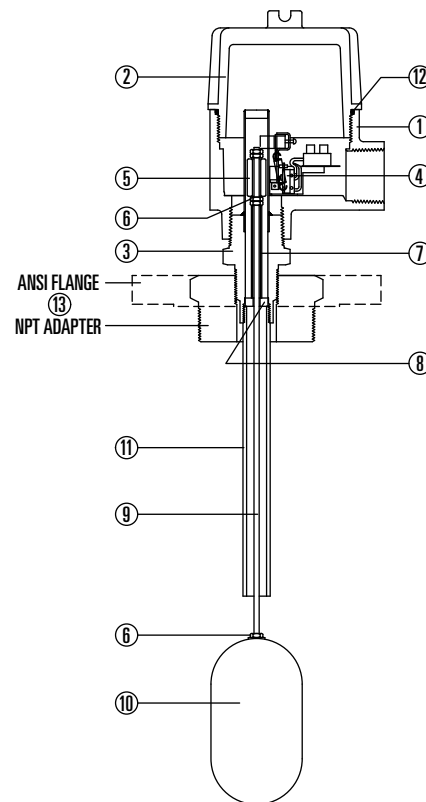
MODEL 730 1-SFBA-2 A 18



Parts List

Item	Description	Qty.	Part No.
1	HOUSING, ALUMINUM	1	007201-M
2	COVER, ALUMINUM	1	000203-M
3	ADAPTER W/ENCLOSING TUBE, 316 S.S.	1	007524-A
4	SWITCH KIT ASSEMBLY, SPDT	1	009341-A
	SWITCH KIT ASSEMBLY, DTD	1	009342-A
5	ATTRACTION SLEEVE, 17-4PH	1	009532-M
6	LOCK NUT, STAINLESS STEEL	5	05000-2252
7	STOP TUBE, STAINLESS STEEL	1	007117-M
8	RETAINER DISK, STAINLESS STEEL	1	007126-M
9	FLOAT ARM, STAINLESS STEEL	1	C/F
10	FLOAT, 3"X6" 304SS STD.	1	007414-P
11	FLOAT TUBE, STAINLESS STEEL	1	C/F
12	O-RING, BUNA-N	1	05000-5446
13	NPT ADAPTER OR ANSI FLANGE	1	C/F
14*	SCREW, STAINLESS STEEL	2	001501-P
15*	GROUND SCREW	1	001504-G
16*	GROUND CUP, BRASS	1	001800-P

*Not Shown
C/F: Call Factory For Part No. Specify Distance Of Operating Level And Material.



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WellMark Series

740 Top Mount Displacer Control

Application

The Model 740 Series are displacer-operated units designed for internal mounting through the top of the process vessel and provide high pressure capabilities with low specific gravity ratings within the petroleum, power and natural gas industries. The use of displacers allows for a narrow or wide-switching differential, field adjustable switch points, high pressure applications and multiple switching points by means of dual switching mechanisms.

Features

- **Construction Versatility:** Standard Level Control includes Stainless Steel Displacer and Carbon Steel NPT or flanged tank connections. Consult factory for other materials.
- **Explosion Proof:** CSA APPROVED
 - Class I, Division I, Groups C & D
 - Class II, Groups E, F & G
 - Class III, Enclosure Type 4
- **Various Models:** A wide selection of connection, trim materials and switch mechanisms are available.

Operation

The stainless steel float/displacer, which is heavier than the liquid, is suspended by a spring. When liquid rises around the displacer, a buoyancy force is produced, which causes the effective weight of the displacer to change. This causes the spring to retract slightly to a new equilibrium position. When the spring retracts, the attraction sleeve also moves upward into the field of the external magnet. The magnet moves forward toward the attraction sleeve that actuates the micro switch.

Displacer Advantages

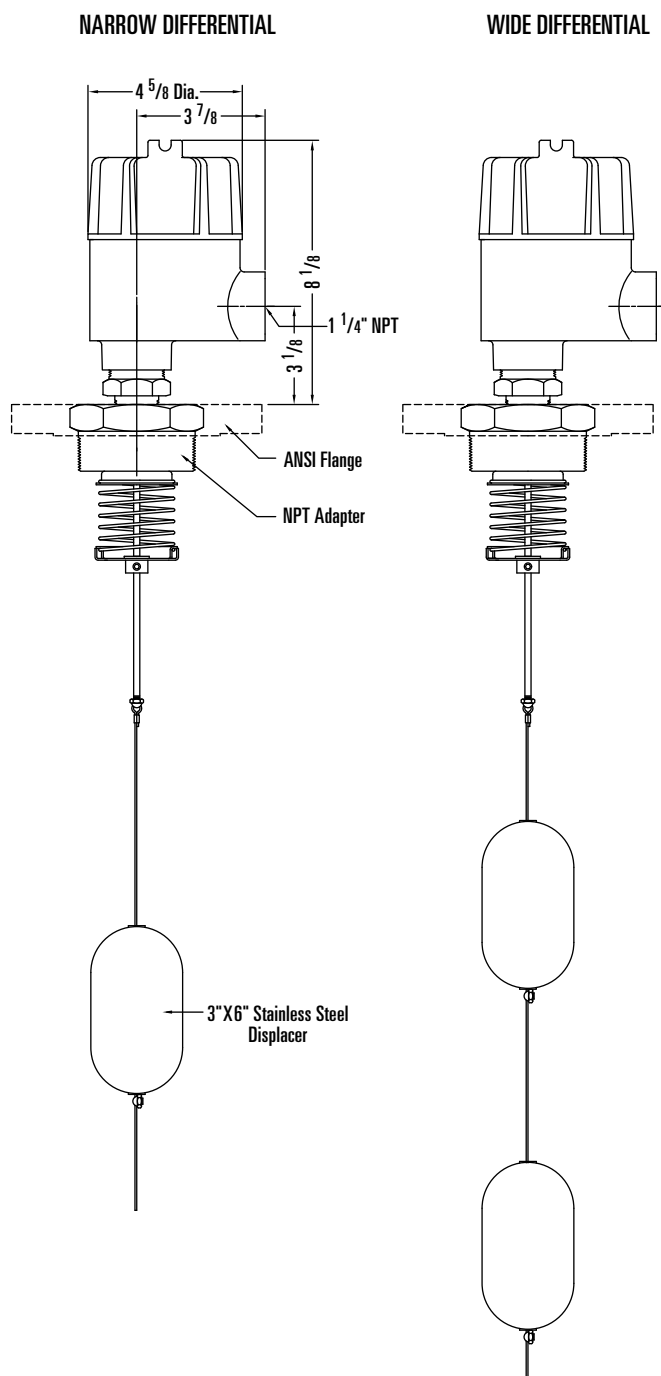
As the liquid level rises, the buoyancy force produced by the displacer causes the range spring to seek a new balance.

1. Ability to withstand higher pressure than a float, since displacers can be solid or constructed with a much heavier wall.
2. Allows wide switching differentials.
3. Allows switch point to be adjusted by moving the displacer up or down.

Specifications

Switch Housing	Explosion Proof Cast Aluminum
Operating Pressure	1000 psi Max.
Operating Temperature	450°F Max.
Minimum Specific Gravity	0.60
Electrical Connections	1 1/4" Female Pipe Thread

Dimensional Data



Electrical Contacts	SPDT Micro Switch standard	
FUNCTION	AMBIENT TEMP	SWITCH RATING
Standard	-20 to 160°F	5 A @ 250 VAC
High Temp	-20 to 450°F	5 A @ 250 VAC

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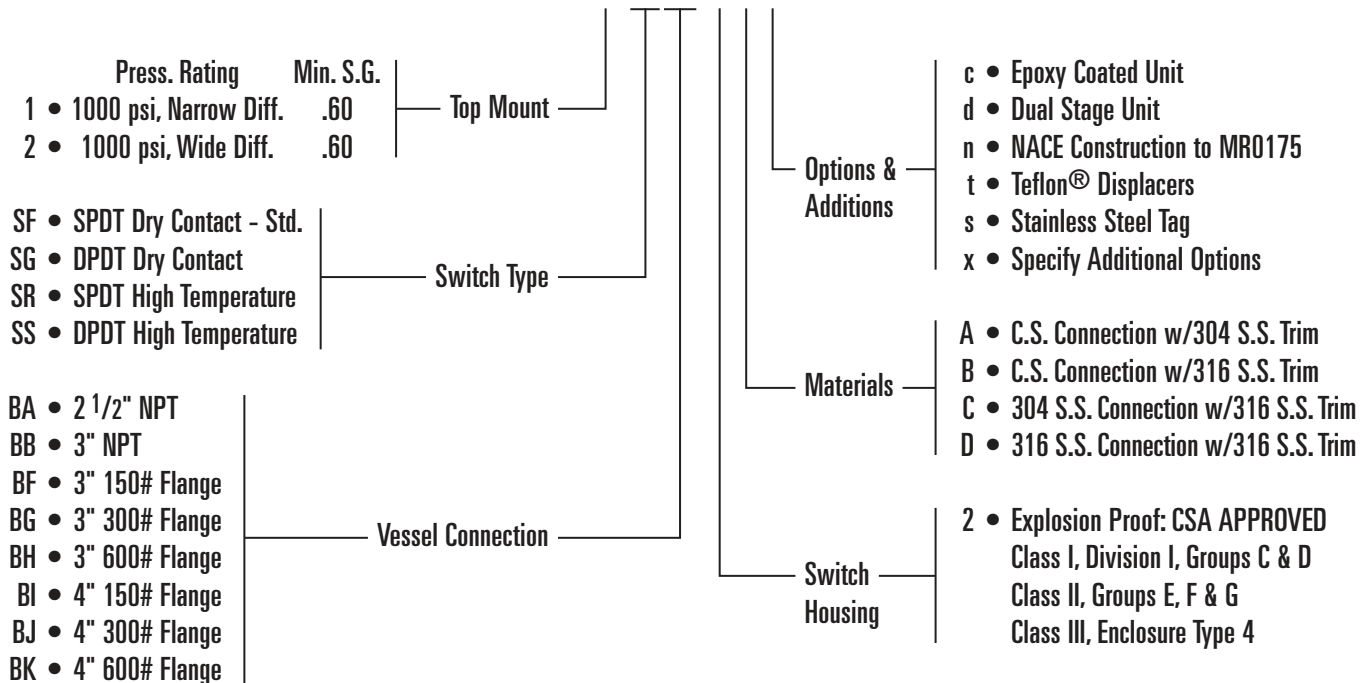


WellMark Series

740 Top Mount Displacer Control Determining the Model Number

Example given: Standard Model 740 1-SFBA-2A Top Mount Displacer Control with, SPDT Micro Switch, 2 1/2" NPT Carbon Steel Process Connection with 304 S.S. Trim, Pressure rated to 1000 psi and with Explosion Proof Switch Housing.

MODEL 740 1-SFBA-2 A

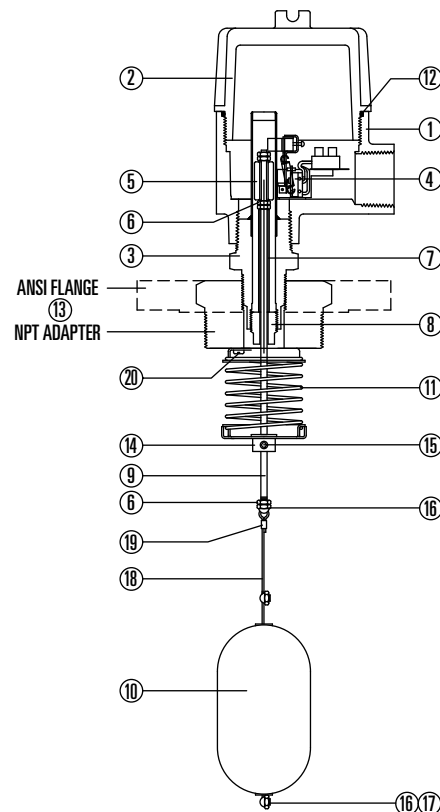


Parts List

Item	Description	Qty.	Part No.
1	HOUSING, ALUMINUM	1	007201-M
2	COVER, ALUMINUM	1	000203-M
3	ADAPTER W/ENCLOSING TUBE, 316 S.S.	1	007524-A
4	SWITCH KIT ASSEMBLY, SPDT	1	009341-A
	SWITCH KIT ASSEMBLY, DTD	1	009342-A
5	ATTRACTION SLEEVE, 17-4PH	1	009532-M
6	LOCK NUT, STAINLESS STEEL	5	05000-1510
7	STOP TUBE, STAINLESS STEEL	1	007119-M
8	GUIDE PLUG, STAINLESS STEEL	1	002304-M
9	FLOAT ARM, STAINLESS STEEL	1	007234-M
10	FLOAT, 3"X6" 304SS STD.	1	009487-A
11	SPRING W/CUP, STD.	1	007334-A
	SPRING W/CUP, WIRE DIFFERENTIAL	1	007329-A
12	O-RING, BUNA-N	1	05000-5446
13	NPT ADAPTER OR ANSI FLANGE	1	C/F
14	SHAFT COLLAR, STAINLESS STEEL	1	009674-M
15	SET SCREW, STAINLESS STEEL	2	001525-P
16	ACORN NUT, STAINLESS STEEL	3	001121-M
17	SET SCREW, STAINLESS STEEL	2	001519-P
18	CABLE, STAINLESS STEEL	10'	009657-P
19	CRIMP ON CONNECTION, S.S.	1	007226-P
20	SCREW, STAINLESS STEEL	3	001504-P
21*	GROUND SCREW	1	001504-G
22*	GROUND CUP, BRASS	1	001800-P
23*	SCREW, STAINLESS STEEL	2	001501-P

*Not Shown

C/F: Call Factory For Part No. Specify Size And Material.



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WellMark Series

780 Hermetically Sealed Level Control

Application

The Model 780 Hermetically Sealed Level Control is a side-mounted float type liquid level control. This unit is used as a high or low level control. Also, can be used to sound alarms or operate control equipment.

Features

- Corrosion Proof: All Stainless Steel Wetted Parts
- Adjustments: Nothing to Adjust or Get Out of Calibration
- Simple Installation: Float Passes Through a 1" Fitting
- Hermetically Sealed Switch
- Replacement Switch Capsule: Can Easily Be Changed in Field
- Explosion Proof Enclosure

Operation

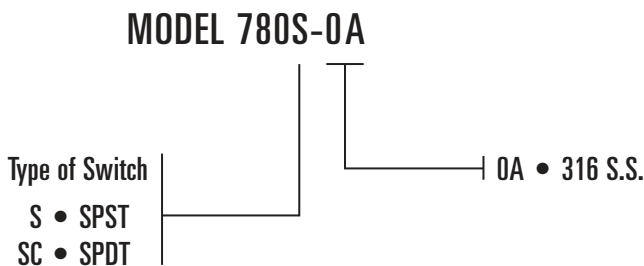
As the liquid in the vessel rises, lifting the float, a magnet (weld sealed inside the arm) is moved downward toward the hermetically sealed reed switch inside the housing body, causing magnetic actuation of the switch.

Specifications

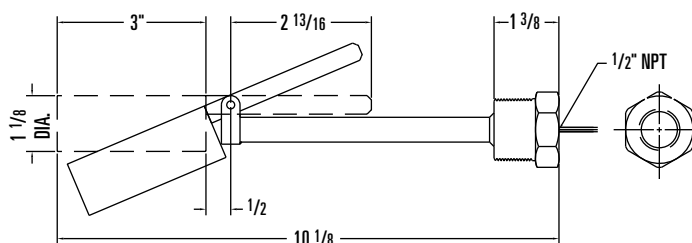
Body Material	316 Stainless Steel
Operating Pressure Rating	1500 psig
Float Material	Polypropylene
Temperature Limit	200°F
Level Differential	Approx. 1"
Housing	Class 1, Group A, B, C & D
Electrical Connection	1/2" Female Pipe Thread
Minimum Specific Gravity	0.60"

Determining the Model Number

Example given: Standard Model 780S-OA Float Control with, SPST Hermetically Sealed Switch, 1" NPT 316 S.S. Vessel Connection, Polypropylene Float, 316 Arm and Pivot for Internal Vessel Mounting with Pressure Up to 5000 psi.

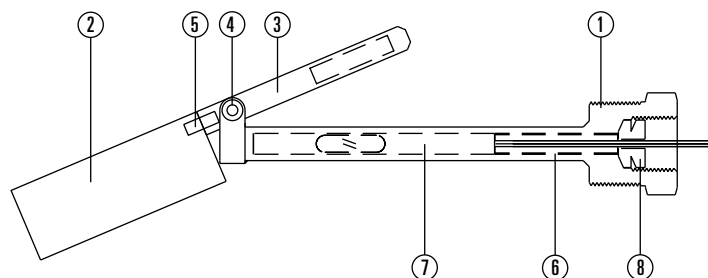


Dimensional Data



Parts List

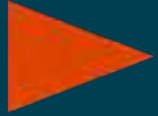
Item	Description	Qty.	Part No.
1	BODY ASSEMBLY, ASTM A-276 TY.316	1	009421-A
2	FLOAT, POLYPROPYLENE	1	007400-M
3	ARM ASSEMBLY, ASTM A-276 TY.316	1	009419-A
4	PIVOT PIN, 316 STAINLESS STEEL	1	009426-M
5	SET SCREW, STAINLESS STEEL	1	001539-P
6	SPACER, STAINLESS STEEL	1	009418-M
7	SWITCH, SPST	1	007224-P
	SWITCH, SPDT	1	007225-P
8	GROMMET, NEOPRENE	1	007000-P



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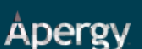


Wellmark Pneumatic Controls

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WellMark Series

2001NB/2001E Pneumatic & Electric Liquid Level Control, High Pressure No-Bleed

Application

The Series 2001NB liquid level control, designed with a Die Cast Aluminum control box and cover, provides a rugged and versatile unit that is ideal for use on compressor scrubbers, separators and any production or process units that require liquid level control. Its proportional band and spring balanced displacement element allows for a wide range of adjustability for a variety of liquid level control requirements.



Features

- No-Bleed: Reduces Gas Consumption
- Sealed and Vented Case
- Snap or Throttle Pilot
- Field Reversible: Left Hand or Right Hand, Direct or Reverse Acting
- Adjustable Level and Span
- Stainless Steel Dual Bearings: Standard for improved repeatability and sensitivity.
- Horizontal or Vertical Displacer
- Interface Control
- Carbon Steel Body
- All 316 Stainless Steel Wetted Internal Parts
- NACE Process, Standard
- Supply Gas Filter, Standard

Specifications

Connections

Process 2" NPT Std. (other available)
 Pilot 1/4" NPT Female
 Case Exhaust 1/8" NPT Female

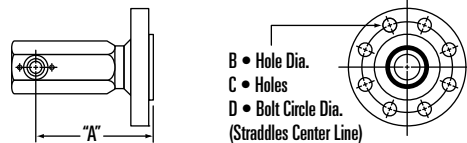
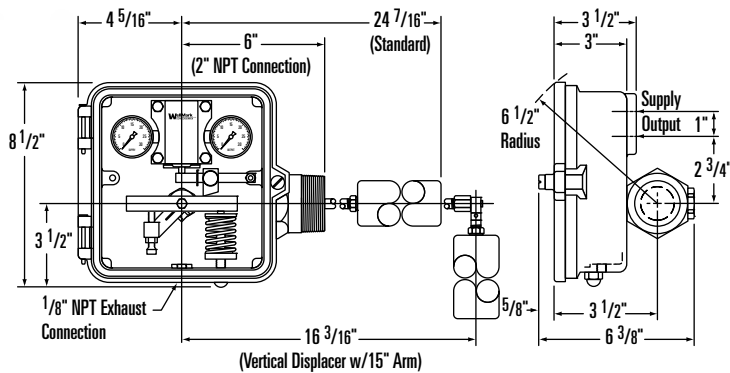
Output

Throttle (Proportional) 3-15 psig or 6-30 psig
 Snap 0 to Full Supply

General

Repeatability 1.0% of Full Scale
 Dead Band 5.0% of Input Scale
 Linearity 2.0% of Full Scale
 Ambient Temp Effect 1.0% @ -40° F
 3.0% @ +180° F
 Specific Gravity4 Minimum
 Temp. Limits -20° F to +200° F
 (Displacer Limiting Factor)

Dimensional Data



2" Flange Connections

ANSI	A	B	C	D
150	6 1/2	3/4	4	4 3/4
300	6 1/2	3/4	8	5
400-600	6 1/2	3/4	8	5
900-1500	7 1/4	1	8	6 1/2

Pressure Rating 6000 psi

Pilot Operating Pressure Normal: 20-35 psi

Overpressure protection: Gauges are the limiting factor.

Maximum Pressure Without Gauges 125 psig

Available Options:

- Outside Cages
- Domes For Top Mount
- Vibration Package
- Marine Package

WARNING

If supply gas is flammable or noxious, this product **MUST** be located in a well ventilated non-hazardous area or sealed and vented to a non-hazardous area.

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WellMark Series

2001NB

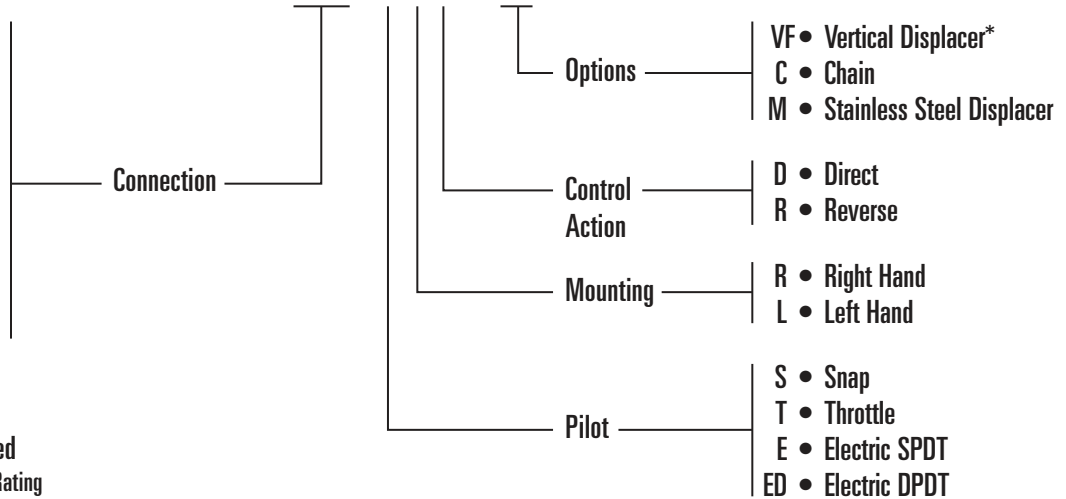
2001NB/2001E Pneumatic & Electric Liquid Level Control, High Pressure No-Bleed Determining the Model Number

Example given: Standard Model 2AS-S R D—Series 2001NB, 2" Screwed Body, Snap Pilot, Right Hand Mounting, with Direct Acting Control.

MODEL 2AS - S R D-A-VF

- 15AS • 1 1/2" Screwed
- 2AS • 2" Screwed
- 2AF • 2" Flanged
- 3AF • 3" Flanged
- 4AF • 4" Flanged
- 4AG • 4" Grooved
- 4AU • 4" Union
- 4AUS • 4" Union w/S.G.

Note: Consult factory for other options.



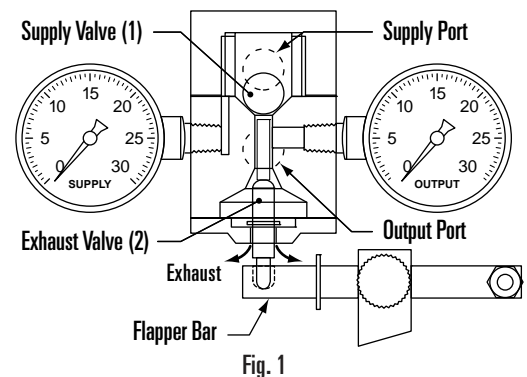
Additional Information Required

- Body Connection Type: Size and Rating
- Fluid Media
- Fluid Temperatures: Maximum and Minimum
- Displacer Size and Material: Standard is 1 7/8" X 12" PVC; 1 7/8" X 12" Acrylic or Stainless Steel optional.

*Displacer Arm Length: Arm length is figured from center line of control box. 15" Standard on vertical displacer, 12 1/2" Standard on horizontal displacer. (Other lengths available upon application)

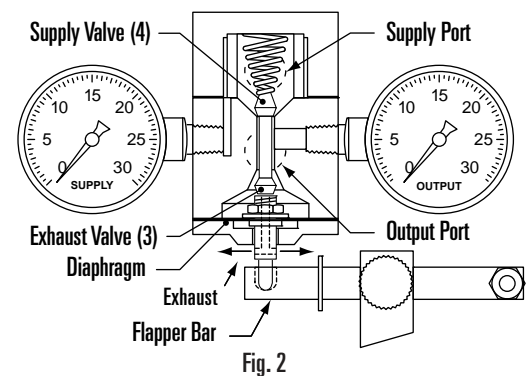
Snap-Acting Pilot • No-Bleed Positive On/Off Flow Action

The Snap-Acting Pilot is comprised of two inner valves. Valve (1) admits system supply gas to output. Valve (2) controls system exhaust from output. Valve (1), as shown in the closed position (Fig. 1), is held closed by force exerted from supply gas. When upward flapper bar force transferred to Valve (2) is sufficient enough to overcome supply force, the ball snaps upward, allowing supply pressure to output port, which operates the diaphragm motore valve (not shown nor included with the control). The spherical end of valve (2) closes the exhaust port the instant the ball snaps upward and remains seated against supply pressure until force on the valve diminishes. As force is removed from valve (2), causing it to unseat, a simultaneous action occurs, causing valve (1) to seat instantly, closing the supply port to output and opening output to exhaust, allowing the diaphragm motor valve to reverse its action.



Throttle Pilot • No-Bleed Modulating Flow Action

The Throttle Pilot utilizes a diaphragm, which creates a forced balance pilot (Fig 2). Output pressure acts upon the diaphragm causing it to push back at the same force being applied to the lower seat. More force on the seat produces a proportionate increase in pilot pressure. When the flapper bar of the control exerts upward force on the lower valve seat (3), it forces the lower seat closed against valve body and opens the supply valve (4). (Supply pressure enters the system, increasing until the control and diaphragm motor valve pressure equals the flapper bar force and produces a forced system balance.) The control will stay in this position until a decrease in the tank level reduces the force allowing exhaust, or an increase in the level produces an action as described. System supply gas does not flow while the pilot is in balance.



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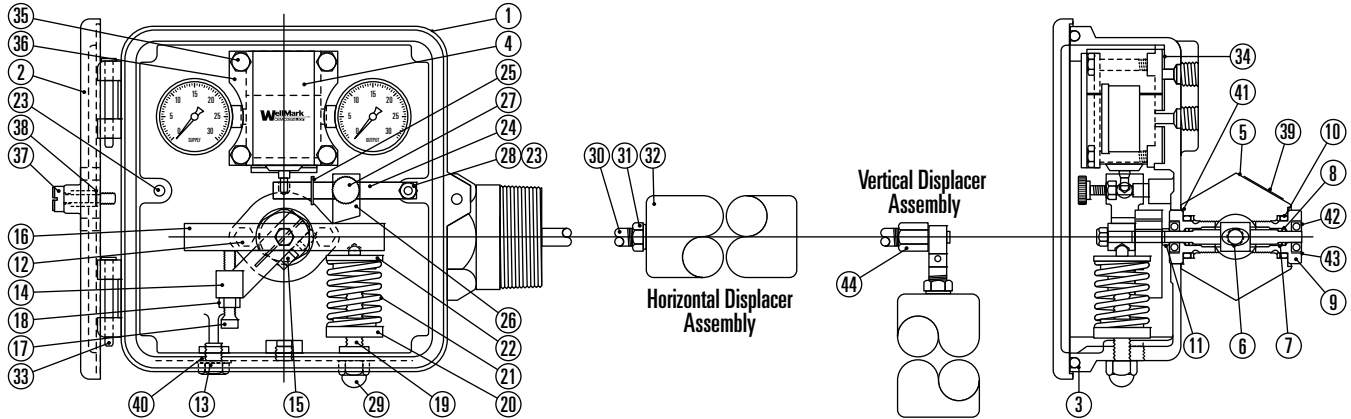
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WellMark Series

2001NB

2001NB/2001E Pneumatic & Electric Liquid Level Control, High Pressure No-Bleed



Parts List

Item	Description	Qty.	Part No.
1	CONTROL BOX, DIE CAST ALUMINUM	1	05012-4841
2	COVER, DIE CAST ALUMINUM	1	05012-4834
*3	BOX SEAL, NEOPRENE	1	06000-5097
*4	SNAP PILOT ASSY., ALUMINUM & 316 S.S.	1	06500-5304
	THROTTLE PILOT ASSY., ALUMINUM & 316 S.S.	1	06500-5387
5	BODY, ASTM A-108GR. 1018	1	05011-4560
6	PIVOT SHAFT, ASTM A-276 TY.316	1	05011-4511
*7	O-RING, VITON®	2	05000-0769
*8	BACK UP RING, TEFLON®	2	06000-1179
9	SHAFT RETAINER, ASTM A-276 TY.316	2	05012-9389
*10	O-RING, VITON®	2	05000-1155
11	SPACER, ASTM A-276 TY. 316	1	05011-4495
12	CAP SCREW, 18-8 S.S.	2	05000-5578
13	CAP SCREW, 18-8 S.S.	1	05000-5453
14	ADJUSTING BAR, ALUMINUM	1	05011-4438
15	CAP SCREW, 18-8 S.S.	2	05000-2526
16	TORQUE BAR, ALUMINUM	1	05011-4545
17	ADJ. SCREW, ASTM A-276 TY.316	1	05011-4537
18	JAM NUT, 18-8 S.S.	1	05000-2559
19	STUD, 18-8 S.S.	1	05011-4552
20	LOWER SPRING GUIDE, ALUMINUM	1	05011-4529
	SPRING, ASTM A-313, STANDARD (YELLOW)	1	06000-4157
	SPRING, ASTM A-313, LIGHT (GREEN)	1	06000-3985
	SPRING, ASTM A-313, HEAVY (RED)	1	06000-9008
22	UPPER SPRING GUIDE, ALUMINUM	1	05011-4479
23	STUD, FLAPPER BAR, ASTM A-276 TY.316	2	05012-9371

*Recommended Spare Part

Item	Description	Qty.	Part No.
24	FLAPPER BAR, ASTM A-276 TY.316	1	05011-4404
25	TRU-ARC RING, PH 15-7 MO	1	06000-1385
26	FULCRUM, ALUMINUM	1	05011-4412
27	THUMB SCREW, S.S./PLASTIC	1	06500-5429
28	NY-LOC NUT, STAINLESS STEEL	2	05000-2567
29	ACORN NUT, STAINLESS STEEL	1	05000-2575
	DISPLACER ARM, STD., ASTM A-276 TY.316	1	06000-1534
	DISPLACER ARM, VF, ASTM A-276 TY.316	1	05011-9296
31	DISPLACER BUSHING, ASTM A-276 TY.316	1	06000-5105
32	DISPLACER, PVC	1	05012-3561
33	HINGE PIN, STEEL PLATED	2	06000-7537
*34	GASKET, NEOPRENE	1	06000-4819
35	CAP SCREW, 18-8 S.S.	4	05000-5313
36	PILOT CLAMP, 304 S.S.	1	05012-6325
37	PANEL SCREW, STAINLESS STEEL	1	06000-1153
38	RETAINER, STAINLESS STEEL	1	06000-2672
39	SERIAL TAG, ALUMINUM	1	06000-1922
*40	THREAD SEAL, STEEL/BUNA N	1	06000-0395
*41	GASKET, VITON®	1	10016
42	BEARING, STAINLESS STEEL	2	06000-7552
43	TOLERANCE RING, STAINLESS STEEL	2	06000-7560
44	ADAPTER V.D. ASSY., ASTM A-276 TY.316	1	06500-4350
45	COVER GLASS, LEXAN (NOT SHOWN)	2	10916
46	COVER GLASS PLATE, S.S. (NOT SHOWN)	2	10915
47	COVER GLASS GASKET, NEOPRENE (NOT SHOWN)	2	10917
48	SCREW, PLATED STEEL (NOT SHOWN)	8	001501P

Repair Kits

BAR FLAPPER KIT	1	03500-1882
NUT	1	05000-2567
RETAINER RING	1	06000-1385
FLAPPER BAR	1	05011-4404
CLAMP KIT	1	03500-1890
CAP SCREW	4	05000-5313
CLAMP	1	05012-6325
SHAFT RETAINER KIT	1	06500-5601
SHAFT RETAINER	1	05012-9389
BEARING	1	06000-7552
TOLERANCE RING	1	06000-7560
STD. FULCRUM KIT	1	03500-1898
FULCRUM	1	05011-4412
THUMB SCREW	1	06500-5429
BAR ADJUSTING LEVEL KIT	1	03500-1906
BAR ADJUSTING LEVEL	1	05011-4438
JAM NUT	1	05000-2559
CAP SCREW	2	05000-2526
ADJUSTING SCREW	1	05011-4537

TORQUE BAR KIT	1	03500-1914
STD. TORQUE BAR	1	05011-4545
LOCK NUT	1	05000-2567
SENSITIVITY SCALE	1	10739
SNAP PILOT KIT	1	03500-1114
FILTER	1	06000-1526
GASKET	1	06000-1484
PIN W/RETAINER RING	1	05011-4503
	1	06000-1393
BALL	1	06000-1906
THROTTLE PILOT KIT	1	03500-1163
FILTER	1	06000-1526
GASKET	1	06000-1484
DIAPHRAGM	1	06000-1559
SEAT	1	05011-4594
FLAT WASHER-NYLON	1	05011-4602
JAM NUT	1	05000-2559
PEANUT	1	05011-4586
SPRING	1	06000-1567

Charts indicate the Kit and Part Descriptions, the Quantities required and the Part Number for ordering.

Model and Part Numbers

Model No.	Displacer Orientation	Part No.
2AS-SLD-A	HORIZONTAL-STANDARD	03051-0850
2AS-SRD-A	HORIZONTAL-STANDARD	03051-0800
2AS-TLD	HORIZONTAL-STANDARD	03051-0892
2AS-TRD	HORIZONTAL-STANDARD	03051-0918
2AS-SLD-VF	VERTICAL DISPLACER	03051-0868
2AS-SRD-VF	VERTICAL DISPLACER	03051-0876
2AS-TLD-VF	VERTICAL DISPLACER	03051-0900
2AS-TRD-VF	VERTICAL DISPLACER	03051-0926

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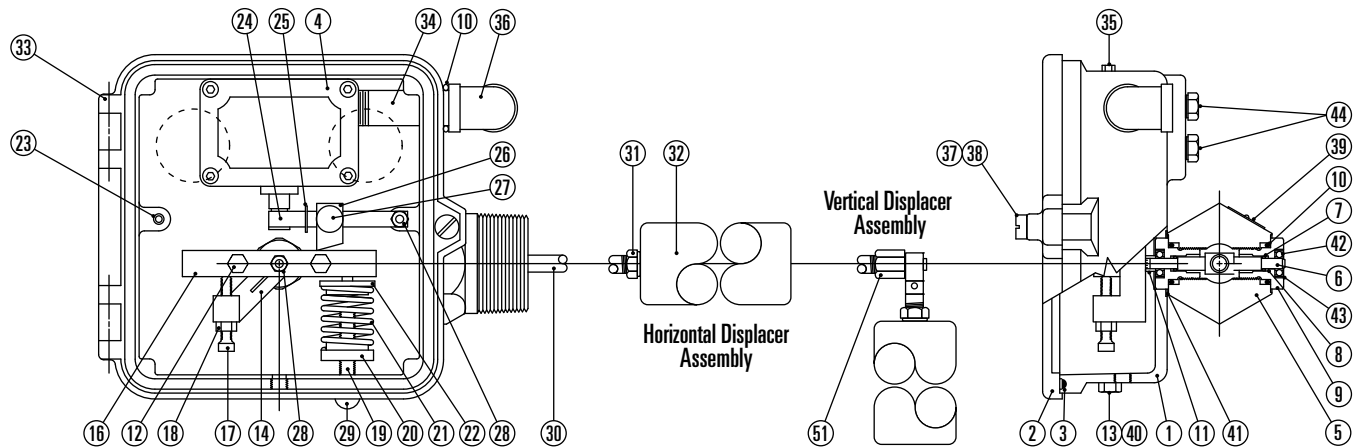
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WellMark Series

2001E

2001NB/2001E Pneumatic & Electric Liquid Level Control, High Pressure No-Bleed



Parts List

Item	Description	Qty.	Part No.
1	CONTROL BOX, DIE CAST ALUMINUM	1	05012-4843
2	COVER, DIE CAST ALUMINUM	1	05012-4834
*3	BOX SEAL, NEOPRENE	1	06000-5097
4	SWITCH	1	10006
5	BODY, ASTM A-108GR. 1018	1	05011-4560
6	PIVOT SHAFT, ASTM A-276 TY.316	1	05011-4511
*7	O-RING, VITON®	2	05000-0769
*8	BACK UP RING, TEFLON®	2	11087
9	SHAFT RETAINER, ASTM A-276 TY.316	2	05012-9389
*10	O-RING, VITON®	3	05000-1155
11	SPACER, ASTM A-276 TY. 316	1	05011-4495
12	CAP SCREW, 18-8 S.S.	2	05000-5578
13	CAP SCREW, 18-8 S.S.	1	05000-5453
14	ADJUSTING BAR, ALUMINUM	1	05011-4438
15	CAP SCREW, 18-8 S.S. (NOT SHOWN)	2	05000-2526
16	TORQUE BAR, ALUMINUM	1	05011-4545
17	ADJ. SCREW, ASTM A-276 TY.316	1	05011-4537
18	JAM NUT, 18-8 S.S.	1	05000-2559
19	STUD, 18-8 S.S.	1	05011-4552
20	LOWER SPRING GUIDE, ALUMINUM	1	05011-4529
21	SPRING, ASTM A-313, STANDARD (YELLOW)	1	06000-4157
	SPRING, ASTM A-313, LIGHT (GREEN)	1	06000-3985
	SPRING, ASTM A-313, HEAVY (RED)	1	06000-9008
22	UPPER SPRING GUIDE, ALUMINUM	1	05011-4479
23	STUD, FLAPPER BAR, ASTM A-276 TY.316	2	05012-9371
24	FLAPPER BAR, ASTM A-276 TY.316	1	06500-7233

Item	Description	Qty.	Part No.
25	TRU-ARC RING, PH 15-7 MO	1	06000-1385
26	FULCRUM, ALUMINUM	1	05011-4412
27	THUMB SCREW, S.S./PLASTIC	1	06500-5429
28	NY-LOC NUT, STAINLESS STEEL	2	05000-2567
29	ACORN NUT, STAINLESS STEEL	1	05000-2575
30	FLOAT ARM, ASTM A-276 TY.316	1	06000-1534
31	FLOAT BUSHING, ASTM A-276 TY.316	1	06000-5105
32	DISPLACER, PVC	1	05012-3561
33	HINGE PIN, STEEL PLATED	2	06000-7537
*34	PIPE NIPPLE	1	06000-8386
35	CAP SCREW, 18-8 S.S.	2	05000-1586
36	ELBOW	1	06000-8394
37	PANEL SCREW, STAINLESS STEEL	1	06000-1153
38	PANEL SCREW RETAINER, STAINLESS STEEL	1	06000-2672
39	SERIAL TAG, ALUMINUM	1	06000-1922
*40	THREAD SEAL, STEEL/BUNA N	1	06000-0395
*41	GASKET	1	10016
42	BEARING, STAINLESS STEEL	2	06000-7552
43	TOLERANCE RING, STAINLESS STEEL	2	06000-7560
44	PLUG	2	10149
45	COVER GLASS, LEXAN (NOT SHOWN)	2	10916
46	COVER GLASS PLATE, S.S. (NOT SHOWN)	2	10915
47	COVER GLASS GASKET, NEOPRENE (NOT SHOWN)	2	10917
48	COVER SCREW, PLATED STEEL (NOT SHOWN)	8	001501-P
51	ADAPTER V.D. ASSY., ASTM A-276 TY.316	1	06500-4350

*Recommended Spare Part

Repair Kits

BAR FLAPPER KIT	1	03500-1882
NUT	1	05000-2567
RETAINER RING	1	06000-1385
FLAPPER BAR	1	05011-4404
CLAMP KIT	1	03500-1890
CAP SCREW	4	05000-5313
CLAMP	1	05012-6325
SHAFT RETAINER KIT	1	06500-5601
SHAFT RETAINER	1	05012-9389
BEARING	1	06000-7552
TOLERANCE RING	1	06000-7560

TORQUE BAR KIT	1	03500-1914
STD. TORQUE BAR	1	05011-4545
LOCK NUT	1	05000-2567
SENSITIVITY SCALE	1	10739
STD. FULCRUM KIT	1	03500-1898
FULCRUM	1	05011-4412
THUMB SCREW	1	06500-5429
BAR ADJUSTING LEVEL KIT	1	03500-1906
BAR ADJUSTING LEVEL	1	05011-4438
JAM NUT	1	05000-2559
CAP SCREW	2	05000-2526
ADJUSTING SCREW	1	05011-4537

Charts indicate the Kit and Part Descriptions, the Quantities required and the Part Number for ordering.

Switch Specifications

Electric Switch Explosion Proof
 Electric Switch, Single Pole / Double Throw, UL and CSA listed:
 "L96" 15 amps, 125, 250, or 480 VAC; 1/8 HP-125 VAC,
 1/4 HP-250 VAC, 1/2 amp-125 VDC, 1/4 amp-250 VDC

Model and Part Number

Model No.	Displacer Orientation	Part No.
2AS-ERD	HORIZONTAL-STANDARD	03051-9000

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WellMark Series

7400 Suptrol Pneumatic & Electric Liquid Level Control, Low Pressure No-Bleed

Application

For use in low-pressure vessels or tanks, this versatile and multi-optional device can be used as a level control or as a component of Hi-Lo level alarm systems. The 1" MNPT unit may be mounted into a 1" coupling when the float is accessible from inside the vessel. If float is not accessible, a 2" or larger connection must be provided to allow passage of the float through the connection. The pneumatic 3-way 2-port no-bleed pilot valve makes this unit an excellent choice for the control of liquid level in oil and gas production equipment such as separators, dehydrators, treaters, as well as in manufacturing plants, hazardous waste disposal, food processing, petro-chemical facilities, or wherever fluid levels need to be monitored or controlled.

Features

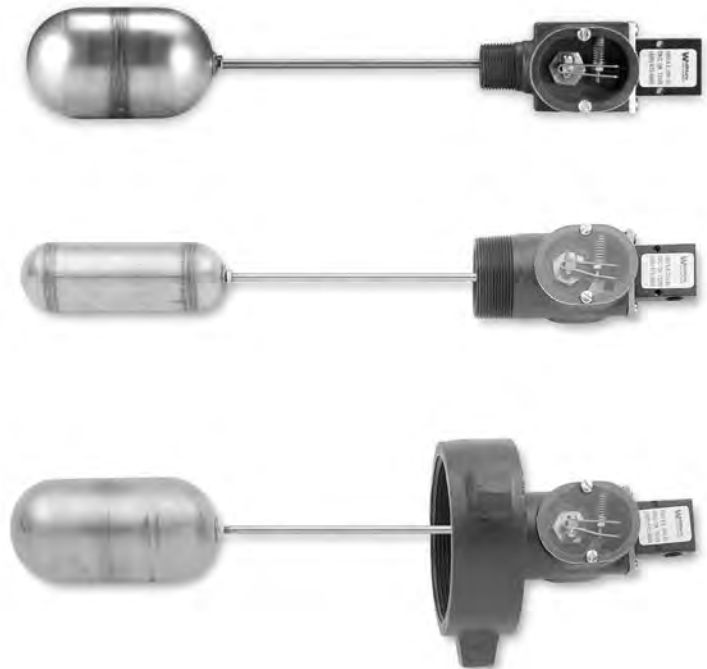
- No-Bleed
- Cost Effective
- Pneumatic or Electric
- 1" and 2" Threaded or 4" Union
- Other Connections Available on Request
- Choices of Float Size and Float Arm Extension Length

Specifications

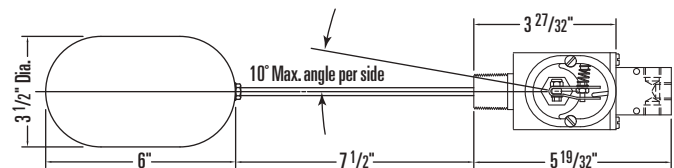
Size	1" Threaded	2" Threaded	4" Union
Body Working Pressure		500 psi	
Float			
Size	*2" x 6"	3" x 6"	**3 1/2" x 6"
Working Pressure	500 psi	500 psi	500 psi
Collapse Pressure	720 psi	850 psi	800 psi
Operating Temperature	-20°F to +212°F (available to 400°F)		
Supply Pressure	75 psi (250 psi available)		
3-Way Pilot Connections	1/4" FNPT		
Material	1" Threaded	2" Threaded	4" Union
Body	A216 WCB	A216 WCB "	A216 WCB
Float		Stainless Steel	
Float Arm		Stainless Steel	
Seals	Buna-N Standard (others available)		
Bushing (Retainer)	360 Brass (S.S. available)		
Electric Switch	Explosion Proof		
Electric Switch, Single Pole / Double Throw, UL and CSA listed:	"L96" 15 amps, 125, 250, or 480 VAC; 1/8 HP-125 VAC, 1/4 HP-250 VAC, 1/2 amp-125 VDC, 1/4 amp-250 VDC		

*Standard on 2"

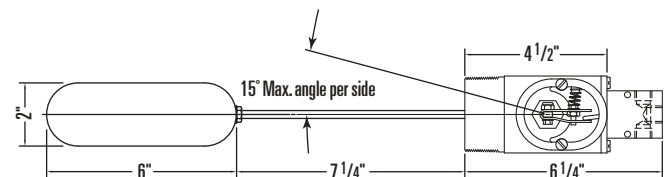
**Standard on 1" Threaded & 4" Union



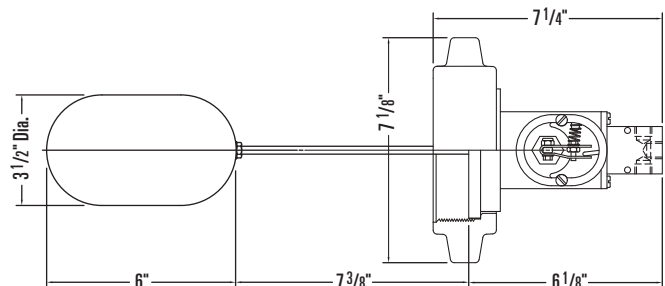
Dimensional Data



1" NPT THREAD WITH STD. FLOAT AND ARM



2" NPT THREAD WITH STD. FLOAT AND ARM



4" UNION WITH STD. FLOAT AND ARM

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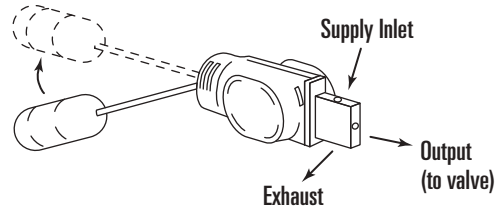


WellMark Series

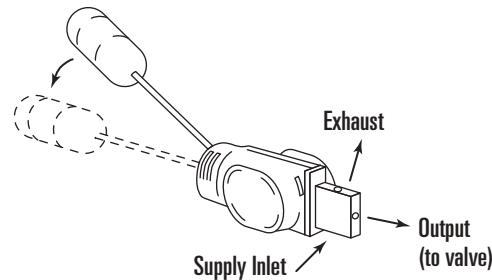
7400 Snaptrol Pneumatic & Electric Liquid Level Control, Low Pressure No-Bleed

Plumbing Schematic

Direct Acting
When float rises,
supply opens
to output.



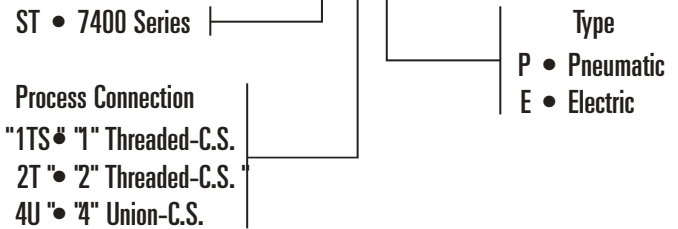
Indirect Acting
When float falls,
supply opens
to output.



Determining the Model Number

Example given: Standard Model ST2TP - Series 7400, 2" Threaded Process Connection, Pneumatic Type Control.

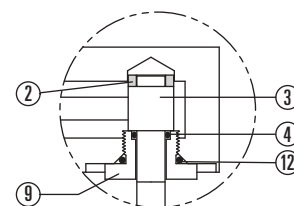
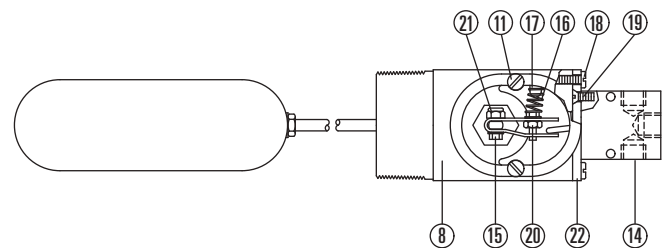
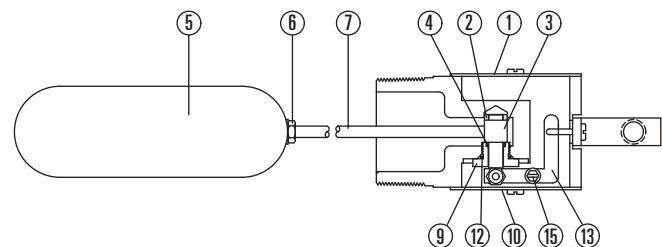
MODEL ST2TP



Parts List

Item	Description	Qty.	Part No.
1	NAME PLATE, ALUMINUM	1	10068
2	BEARING SLEEVE, DELRIN®	1	20031
3	TRUNNION, STAINLESS STEEL	1	20030
4*	O-RING, BUNA-N	1	05000-0041
5	FLOAT 2"x 6", STAINLESS STEEL	1	10051
	FLOAT 3"x 6", STAINLESS STEEL	1	10266
	FLOAT 3 1/2"x 6", STAINLESS STEEL	1	10128
6	JAM NUT, STAINLESS STEEL	1	10007
7	FLOAT ARM, STAINLESS STEEL, 10" STD.	1	20028
8	BODY, 1" NPT PNEUMATIC, STEEL WCB	1	41077
	BODY, 2" NPT PNEUMATIC, STEEL WCB	1	40016
	BODY, 2" NPT ELECTRIC, STEEL WCB	1	40067
	BODY, 4" UNION, PNEUMATIC, STEEL WCB	1	40041
	BODY, 4" UNION, ELECTRIC, STEEL WCB	1	40043
9	BUSHING, 360 BRASS	1	20029
10	COVER PLATE, LEXAN	1	10050
11	COVER SCREW, STL. PLATED	4	10046
12*	O-RING, BUNA-N	1	10133
13	ACTUATOR, STAINLESS STEEL	1	10049
14*	3-WAY VALVE, PNEUMATIC ONLY	1	06000-0577
	ELECTRIC SWITCH, ELECTRIC ONLY	1	10219
15	SCREW, STEEL PLATED	2	10041
16	SPRING, STAINLESS STEEL	1	10045
17	SPRING KEEPER, BRASS	1	20033
18	SCREW, STEEL PLATED	2	10043
19	SCREW, STEEL PLATED	2	10047
20	JAM NUT, STAINLESS STEEL	1	10060
21	LOCK NUT, STL. PLATED	1	10044
22	MOUNTING PLATE, ALUM. PNEUMATIC	1	20032
	MOUNTING PLATE 1, ELECTRIC	1	20185
	MOUNTING PLATE 2, ELECTRIC	1	20186
24*	HAMMER UNION, STD. V THREAD, WCB	1	05012-6705
	HAMMER UNION, ACME THREAD, WCB	1	05012-3702
25*	O-RING, BUNA-N, SCH. 80 WN (4" UNION ONLY)	1	05000-5446
	O-RING, BUNA-N, SCH. 160 WN (4" UNION ONLY)	1	05000-0561

*Recommended Spare Part



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Apergy

WellMark Series

1800 Pneumatic & Electric Liquid Level Control, Low Pressure No-Bleed

Application

The WellMark 1800 Liquid Level Control offers design simplicity, easy installation, adjustment, and reliable liquid-level monitoring. The Model 1800 can be equipped with a snap action 3-way 2-port valve (1800M) or an electrical contact switch (1800E).

The Model 1800 is actuated by movable arms that permit the control range to be adjusted easily and accurately set to the range desired. With the liquid level below the float, the 3-way 2-port valve, or micro switch, will be in low level position and will remain there until the float rises to the pre-set high level. The 3-way 2-port valve, or micro switch, reverses positions as the float rises or drops through the pre-set level.

The 1800 Liquid Level Control can be used in oil and gas processing, manufacturing plants, hazardous waste disposal, food processing, petro-chemical facilities, or wherever fluid levels need to be monitored or controlled.

Installation

The WellMark Model 1800 is available with various standard pipe closures such as ANSI flanges and grooved connections.

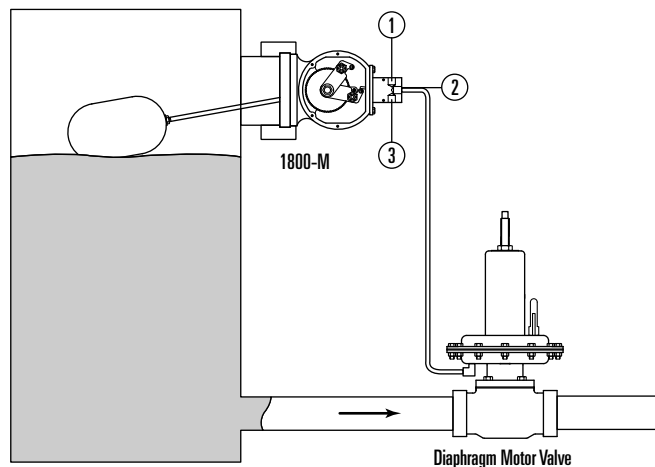


Figure 1

Pneumatic Control Valve Piping

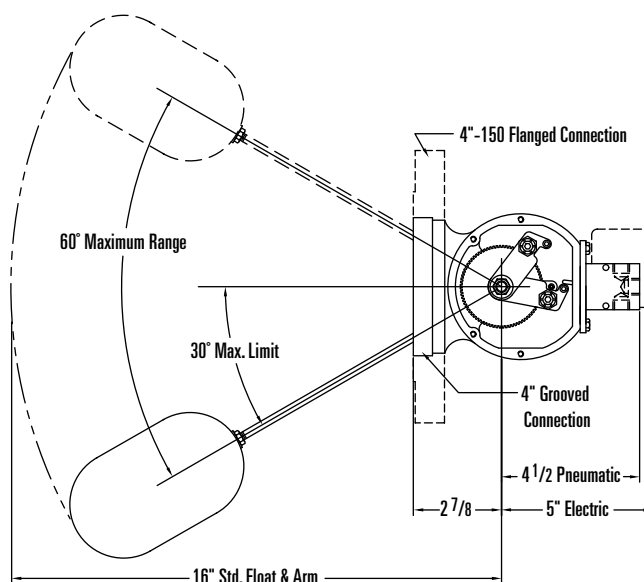
The WellMark Model 1800 Pneumatic Level Control is equipped with a 3-way 2-port valve with three 1/4" NPT ports. The 3-way 2-port valve has a standard working pressure of 100 psi.

The connections to the ports depend on the control action desired. Port positions are shown below. Reference figure 1.

With Float At Low Level	With Float At High Level
PORT 1 CLOSED TO 2	PORT 1 OPEN TO 2
PORT 2 COMMON	PORT 2 COMMON
PORT 3 OPEN TO 2	PORT 3 CLOSED TO 2



Dimensional Data



The WellMark Model 1800 Electric Level Control provides electrical contact switch closure for alarm or control functions. Reference figure 2.

Explosion Proof

Electric Switch, SPDT

UL and CSA listed: "L96" 15 amps, 125, 250, or 480 VAC; 1/8 HP-125 VAC, 1/4 HP-250 VAC

1/2 amp-125 VDC, 1/4 amp-250 VDC

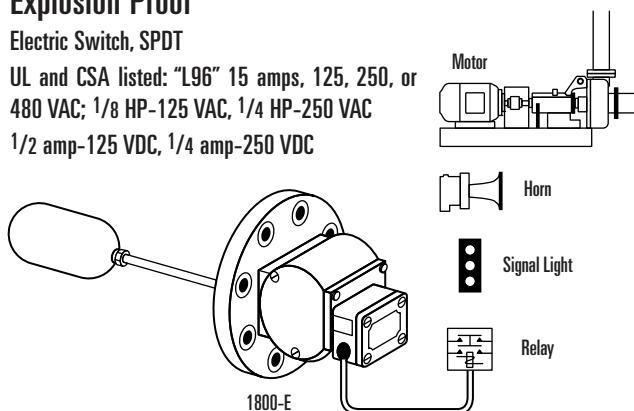


Figure 2

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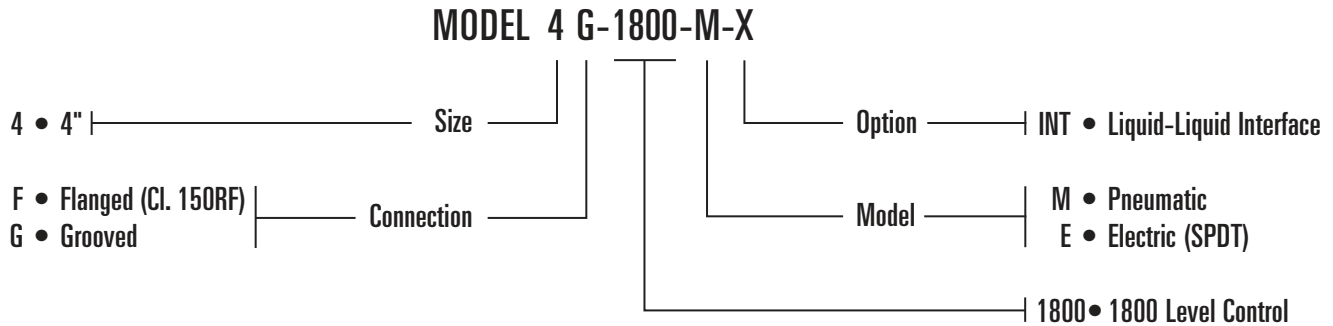
WellMark Series

1800

1800 Pneumatic & Electric Liquid Level Control, Low Pressure No-Bleed

Determining the Model Number

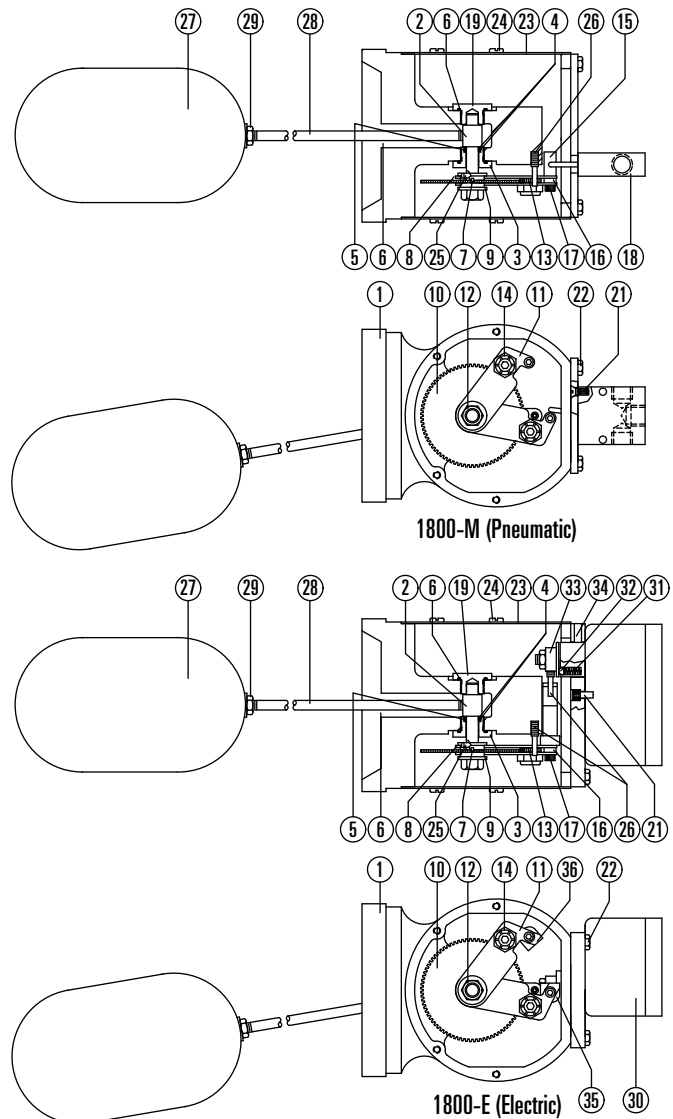
Example given: Standard Model 4G-1800-M—Series 1800, 4" Grooved Connection, Pneumatic Type Control.



Parts List

Item	Description	Qty.	Part No.	
			1800-M	1800-E
1	BODY, 4" GROOVED, DUCTILE IRON	1	05010-7010	05010-7010
	BODY, 4" FLANGED, CL. 150RF, DUCTILE IRON	1	40176	40176
2	STEM, 303 STAINLESS STEEL	1	05010-7028	05010-7028
3	STEM RETAINER, BRASS	1	05010-1757	05010-1757
4	BACK UP RING, TEFLON®	2	05011-3612	05011-3612
5*	O-RING, BUNA-N	1	05000-0041	05000-0041
6*	O-RING, BUNA-N	2	05000-0058	05000-0058
7	PIN, 316 STAINLESS STEEL	1	05011-4149	05011-4149
8	GEAR COLLAR, 303 S.S.	1	05010-7044	05010-7044
9	GEAR COLLAR, 303 S.S.	1	05010-7051	05010-7051
10	GEAR, STEEL NICKLE PLATED	1	05010-7127	05010-7127
11	ACTUATOR ARM, 303 S.S.	4	05010-7119	05010-7119
12	NUT, STEEL PLATED	1	05000-1809	05000-1809
13	PINION GEAR, BRASS	2	05010-7192	05010-7192
14	NUT, STEEL PLATED	2	05000-1973	05000-1973
15	ARM, 303 S.S.	2	05010-7184	—
16	SPACER, 303 S.S.	2	05010-7176	05010-7176
17	SCREW, STEEL PLATED	2	05000-1452	05000-1452
18*	3-WAY VALVE, ALUMINUM/S.S.	1	06000-0577	—
19	RETAINER, BRASS	1	05010-7077	05010-7077
20	MOUNTING PLATE, ALUMINUM	1	05010-7242	05010-7036
21	SCREW, STEEL PLATED	2/1	10047	05000-2302
22	CAP SCREW, STEEL PLATED	4/3	05000-1668	05000-1668
23	COVER, STEEL	2	05010-7093	05010-7093
24	SCREW, STEEL PLATED	4	05000-1536	05000-1536
25	PIN, 17-4PH	1	05010-7069	05010-7069
26	STOP/SWITCH ARM, STEEL	1/2	05010-6707	05010-6707
27	FLOAT 3 1/2"X6", STAINLESS STEEL	1	10128	10128
28	FLOAT ARM, STAINLESS STEEL, 10" STD.	1	20028	20028
29	JAM NUT, STAINLESS STEEL	1	10007	10007
30	MICRO SWITCH, EX-AR16	1	—	10219
31	SPRING, STAINLESS STEEL	1	—	05010-4314
32	PLUG, DELRIN®	1	—	05010-4298
33	COLLAR, BRASS	1	—	05010-4132
34	SET SCREW, STEEL PLATED	1	—	05000-2468
35	ACTUATOR BLOCK, ALUMINUM	1	—	05010-7101
36	ACTUATOR BLOCK, ALUMINUM	1	—	05011-2754

*Recommended Spare Part



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WellMark Series

6900 Cantilever Liquid Level Control

Application

The Cantilever liquid level control series offers design simplicity, easy installation, adjustment, and reliable liquid level monitoring. It is a highly efficient device for the control of liquid level in oil and gas production equipment such as: separators, dehydrators, and treaters, as well as in manufacturing plants, hazardous waste disposal, food processing, water treatment, petro-chemical facilities, or wherever fluid levels need to be monitored or controlled. The sensing element design, with no moving parts exposed to the tank or vessel fluid, makes the simple installation of the control possible in various standard pipe closures such as: ANSI flanges and grooved, or union, connections. The sensing element has a selection of three control head options that control pneumatic supply to control valves, alarm systems, pressure switches, solenoids, and relays, all of which may be used in response to liquid level changes. These control options are:

Throttling

This throttling control head assembly provides a proportional output pressure signal as changes in vessel liquid levels are sensed by the displacers and transmitted by the sensing rod. Constant vessel liquid level can be maintained when the control outlet is connected with a properly sized pneumatic, diaphragm activated control valve. Sensing adjustment is controlled by an external adjusting screw.

Snap Action

The snap action control head assembly provides on/off supply pressure at a specific liquid level set point established by the displacer setting. This on/off signal can be used to power pressure switches, start-up or shut-down controls, alarms, or pneumatic diaphragm activated control valves to open or close system flow lines.

Features

- Industry Standard
- Design Simplicity
- Optional Pilot Head
Throttle or Snap Acting
- Optional Process Connections — See Chart
- Optional Choice of Sensing Rod — See Chart
- Optional Choice of Displacer — See Chart
- Optional Low-Bleed MIZER® — See Chart



Specifications

Max. Working Pressure	1500 psi
Operating Temperature	-20°F or +200°F (higher temperature available)
Process Connections	See Chart
Pilot Connections	1/4" FNPT
Supply Pressure	20 psi Minimum-30 psi Maximum (limited by pressure gauge)
Output Pressure	3-15 psi — Throttle 0-Full Supply — Snap (Pilot good to 75 psi)

Materials

Displacer	See Chart
Process Connection	Carbon Steel
Sight Glass	Polycarbonate
Sensing Rod	316 S.S.
Seals	Buna-N Standard (others available)
Hammer Union Ring	4" and 5" WCB Others Fabricated Carbon Steel

WARNING

If supply gas is flammable or noxious, this product MUST be located in a well ventilated non-hazardous area or sealed and vented to a non-hazardous area.

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WellMark Series

6900 Cantilever Liquid Level Control

Principle of Operation

This liquid level control operates on the basis of two basic physical laws:

1. "A solid, heavier than a fluid (a displacer/s) will, if placed in it, descend to the bottom of the fluid, and the solid will, when weighed in the fluid, be lighter than its true weight by the weight of the fluid displaced." —Archimedes' Principal
2. A Cantilever beam (sensing rod) projecting outward, anchored at one end, will flex in proportion to the weight applied, or removed, at the free end.

Therefore, following Archimedes' Principal, a body (displacer or float) immersed in a fluid experiences a buoyant, or lift force equal to the weight of the displaced fluid. This static lift force acts vertically through the center of gravity of the displaced volume.

Applying the above fundamentals to this liquid level control, we can sense and regulate levels of most gas to fluid interface applications as well as many fluid to fluid interfaces.

By attaching a displacer to the free end of the sensing rod, vertical movement is achieved. The rising and lowering of the fluid gives the static lift force—either up or down, which is transferred along the rod to an actuator pad extending out past the anchored end. As the actuator pad moves to the nozzle, supply pressure is diverted to output, opening a diaphragm-operated motor valve. As fluid is drained, and fluid level declines, the actuator pad moves away from the nozzle and supply pressure is relieved from the diaphragm operated motor valve, and valve closes, allowing the cycle to repeat.

In a throttling mode, this procedure will continually throttle the valve to maintain the fluid level at a desired set point.

In a snap-acting mode, a shuttle pilot is attached to the throttling head converting the throttling output pressure to pilot signal pressure, tripping the shuttle pilot to either full supply pressure, opening valve quickly, or to zero supply pressure, allowing valve to close.

Installation

Before installing this control, inspect the unit for any shipment damage or any foreign material. Visually observe that the actuator pad and rod-end are centered in the sensing rod connector. If not, the unit has been distorted and should be returned to center before placing the control in service.

Check for mechanical clearance of displacer for free movement by flicking the actuator pad after installation of the unit. If vibration is observed, unit is free to work as intended.

Connect suitable supply gas line to the 1/4" FNPT connection stamped "IN". 20 to 30 psi is recommended for proper operation (Filtered gas or air is strongly recommended for better and longer maintenance-free operation.)

Connect "output" port, stamped "OUT" to unit to be controlled.

Start-Up Procedure

Energize the control by opening the supply gas to pilot head (20 to 30 psi recommended).

Adjust the nozzle upward toward the actuator pad, by loosening nozzle lock nut and turning nozzle clockwise, until output pressure gauge starts to indicate a reading (1-3 psi).

Observing the fluid level through the level glasses for desired level, adjust the nozzle up or down to actuate the diaphragm-operated motor valve when desired level is obtained. When satisfactory fluid level is obtained, tighten nozzle lock nut to secure setting.

Observe several cycles to assure that the system is properly functioning.

NOTE: To increase fluid level set-point, adjust the nozzle counter-clockwise away from the actuator pad. To decrease fluid level set-point, adjust nozzle counter-clockwise toward actuator pad.

Normal pilot installation is direct acting, rise in fluid level resulting in an increase of output. For indirect acting, rise in fluid level resulting in a decrease of output, simply loosen 3/4-16 jam nut behind pilot head, and rotate pilot head 180° and retighten 3/4-16 jam nut.

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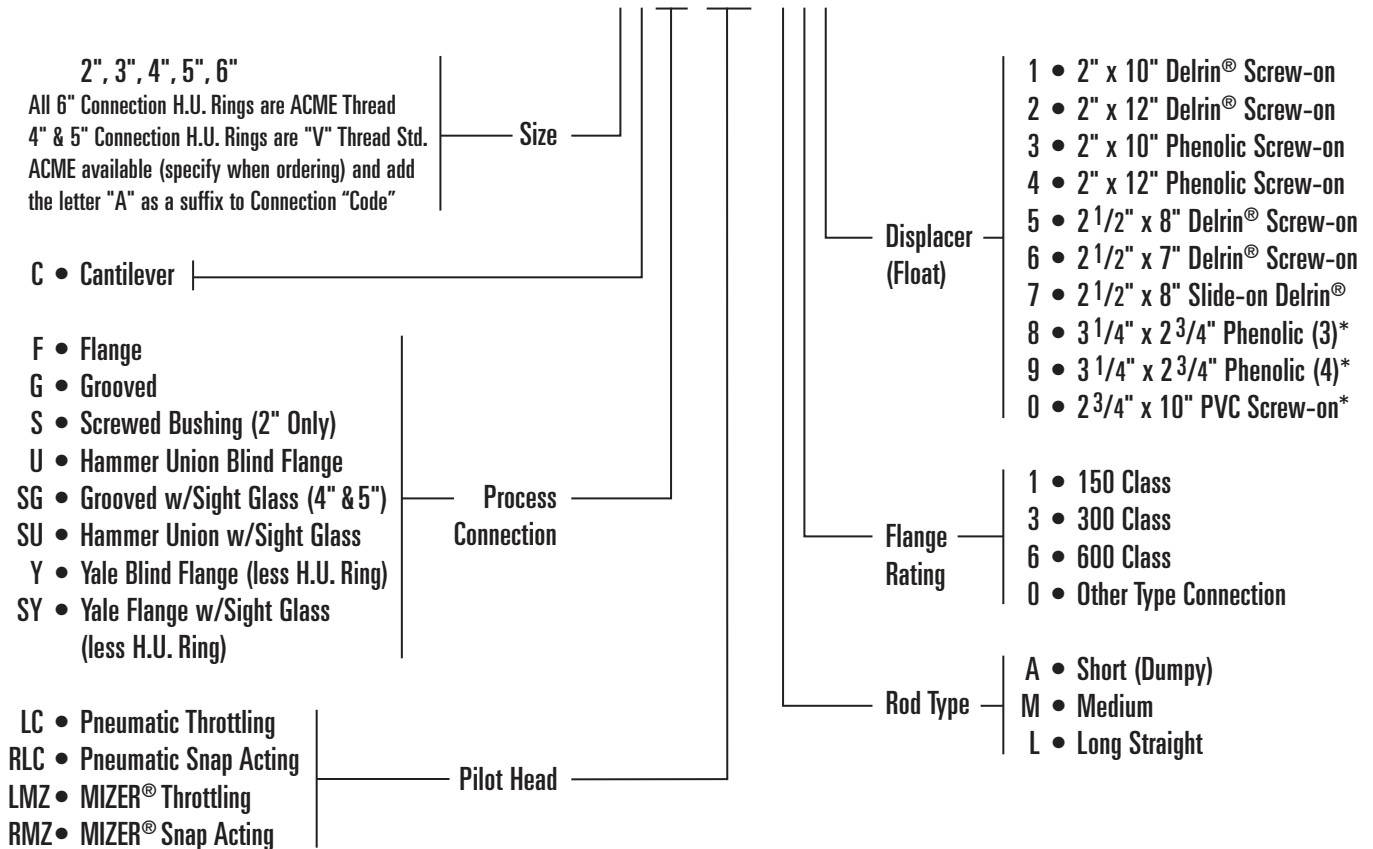
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WellMark Series

6900 Cantilever Liquid Level Control

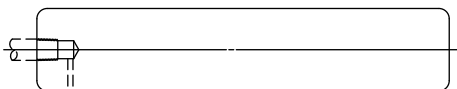
Chart 1: Determining the Model Number

MODEL 4C SU-RLC-A01

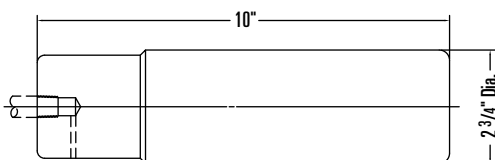


Cantilever Displacers

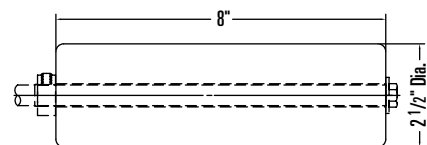
Displacer Size	Material	Part No.	Max. Temp. Continuous
2" DIA. X 10" SCREW-ON	DELRIN®	05011-1582	200
2" DIA. X 12" SCREW-ON	DELRIN®	05011-1590	200
2" DIA. X 10" SCREW-ON	PHENOLIC	06500-2545	275
2" DIA. X 12" SCREW-ON	PHENOLIC	06500-2537	275
2 1/2" DIA. X 8" SCREW-ON	DELRIN®	30076	200
2 1/2" DIA. X 7" SCREW-ON	DELRIN®	05011-0584	200
2 1/2" O.D. X 8" SLIDE-ON	DELRIN®	05011-0352	200
3 1/4" O.D. X 2 1/4" SLIDE-ON*	PHENOLIC	05010-2342	400
2 3/4" DIA. X 10" SCREW-ON*	PVC	30055	165



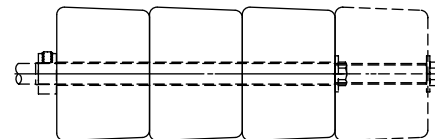
DELRIN® & PHENOLIC SCREW-ON DISPLACERS (MEDIUM AND SHORT RODS)



PVC SCREW-ON DISPLACER (MEDIUM AND SHORT RODS)



DELRIN® SLIDE-ON DISPLACERS (LONG STRAIGHT ROD ONLY)



PHENOLIC SLIDE-ON DISPLACERS (LONG STR. & OFFSET ROD)
3 REQ'D LIQUID-GAS INTERFACE • 4 REQ'D LIQUID-LIQUID INTERFACE

*3 Displacers Required for Liquid Gas Interface

*4 Displacers Required for Liquid Liquid Interface

*2 3/4" x 10" Displacer Applicable for Either Liquid Gas or Liquid Liquid Interface
Stainless Steel displacers available. Contact factory.

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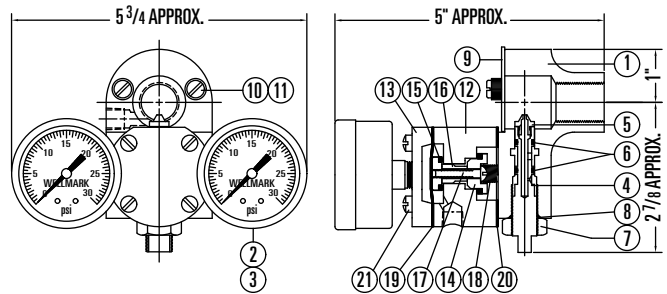
WellMark Series

6900 Cantilever Liquid Level Control

Parts List for Cantilever Snap Acting Pilot Head

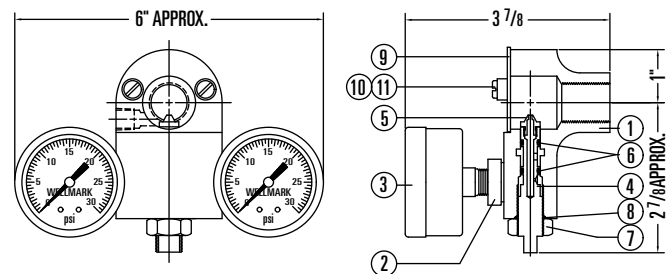
Item	Description	Qty.	Part No.
1	PILOT HOUSING, ALUM. ALLOY 383	1	05010-3472
2	STREET "L", MALLEABLE	2	06000-0684
3	PRESSURE GAUGE	2	06000-0700
4	ADJUSTING SCREW, 303 S.S.	1	05010-1674
5	NOZZLE, 303 S.S.	1	05010-1682
6	O-RING, NITRILE	2	05000-0033
7	JAM NUT, 18-8 S.S.	1	05010-2334
8	O-RING, NITRILE	1	05000-0074
9	COVER PLATE, POLYCARBONATE	1	05010-3720
10	COVER SCREW, NYLON	2	05010-3761
11	O-RING, NITRILE	2	05000-0009
12	BOOSTER BODY, ALUMINUM	1	05010-3456
13	COVER, ALUMINUM	1	05010-3464
14	LOWER SEAT, ALUMINUM	1	05010-3423
15	UPPER SEAT, ALUMINUM	1	05010-3431
16	CONNECTOR, ALUMINUM	1	05010-3449
17	SCREW, STEEL PLATED	1	05000-2591
18	SPRING, ASTM A-313	1	05010-3704
19	DIAPHRAGM, FAIRPRENE	1	05010-3712
20	GASKET, FAIRPRENE	1	05010-3696
21	FILLSTER HD. SCREW, STEEL	4	06000-1601
22*	DAMPNER, STAINLESS STEEL	1	05010-3829

*Not Shown



Parts List for Cantilever Throttling Pilot Head

Item	Description	Qty.	Part No.
1	PILOT HOUSING, ALUM. ALLOY 383	1	05010-1617
2	STREET TEE, MALLEABLE	2	06000-0676
3	PRESSURE GAUGE	2	06000-0700
4	ADJUSTING SCREW, 303 S.S.	1	05010-1674
5	NOZZLE, 303 S.S.	1	05010-1682
6	O-RING, NITRILE	2	05000-0033
7	JAM NUT, 18-8 S.S.	1	05010-2334
8	O-RING, NITRILE	1	05000-0074
9	COVER PLATE, POLYCARBONATE	1	05010-3720
10	COVER SCREW, NYLON	2	05010-3761
11	O-RING, NITRILE	2	05000-0009



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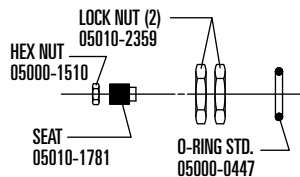
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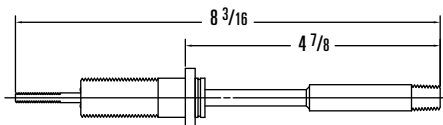
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WellMark Series

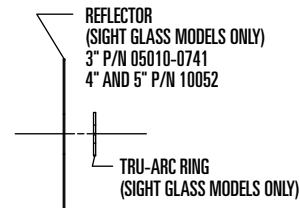
6900 Cantilever Liquid Level Control Cantilever Rods and Additional Components



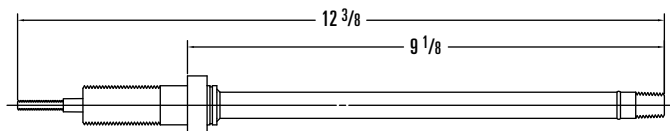
**ADDITIONAL COMPONENTS
FOR ALL RODS**



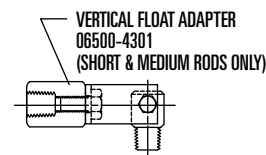
SHORT ROD ASSEMBLY 06500-0630



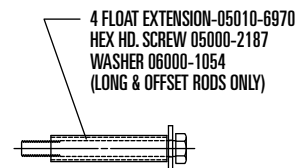
**ADDITIONAL COMPONENTS
FOR ALL RODS**



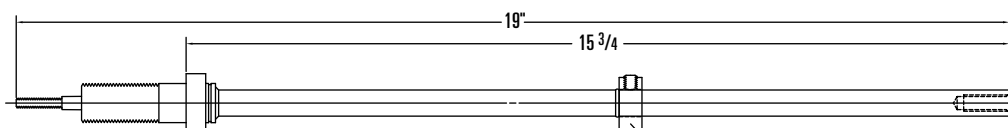
MEDIUM ROD ASSEMBLY 06500-0036



**VERTICAL FLOAT ADAPTER
06500-4301
(SHORT & MEDIUM RODS ONLY)**



**4 FLOAT EXTENSION-05010-6970
HEX HD. SCREW 05000-2187
WASHER 06000-1054
(LONG & OFFSET RODS ONLY)**



LONG ROD ASSEMBLY 06500-0085

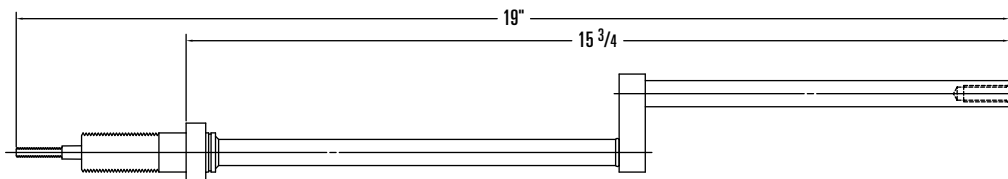


**HEX HD. SCREW-05000-1767
WASHER-06000-1054
(LONG & OFFSET RODS ONLY)**

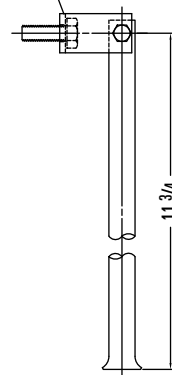
**COLLAR W/ SCREW
P/N 10059
(LONG ROD ONLY)**



**VERTICAL FLOAT ADAPTER
06500-4285
(LONG & OFFSET RODS ONLY)**



OFFSET ROD ASSEMBLY 06500-0002



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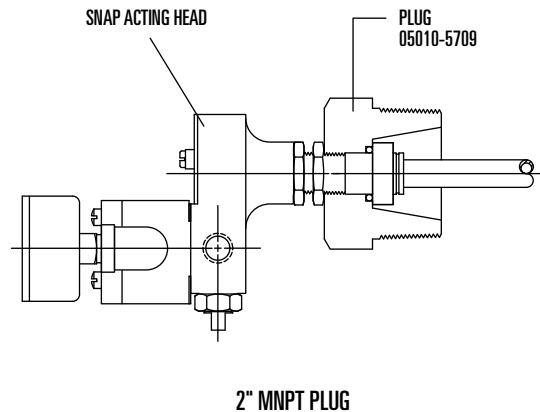
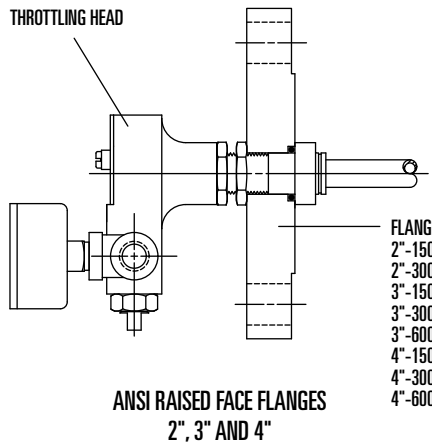
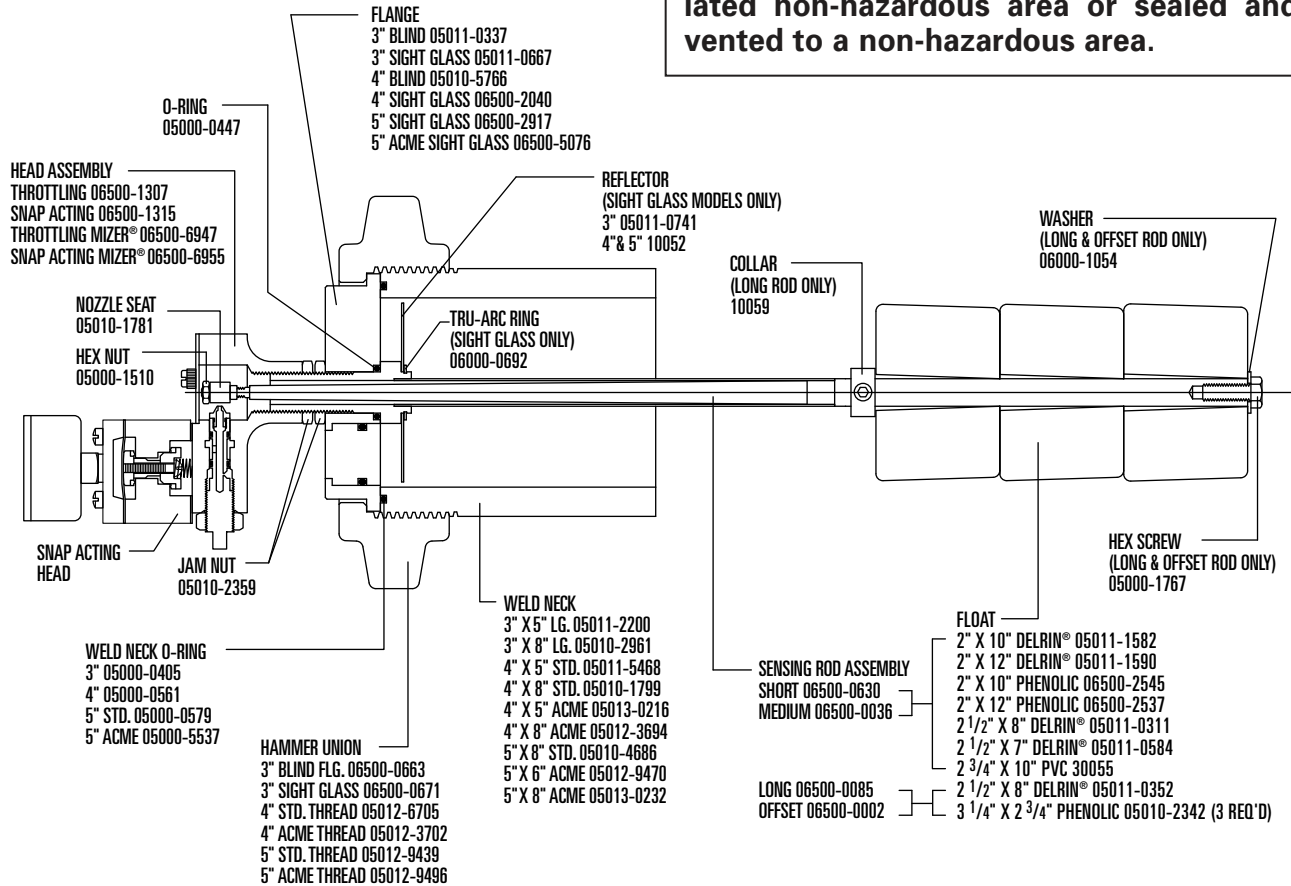
WellMark Series

6900

6900 Cantilever Liquid Level Control

Typical Assembly

WARNING
 If supply gas is flammable or noxious, this product **MUST** be located in a well ventilated non-hazardous area or sealed and vented to a non-hazardous area.



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WellMark Series

PT988

PT988 Pneumatic Liquid Level Switch

Application

WellMark's PT988 Pneumatic Level Switch is designed for horizontal mounting in a tank or vessel through threaded or flanged pipe connections (will work in an API 2" full coupling) and is excellent for applications where space is a factor. It can be externally caged for vessel isolation and can be used as a high or low level alarm, as well as a liquid level control. In addition, it can be switched from direct to indirect action simply by inverting the unit 180°.

The PT988 features a 3-way snap-acting pilot (0 to full output using 20-30 psi supply pressure) or order it with an optional throttling pilot (3 to 15 psi output with a 20 psi supply pressure).

Features

- Snap or Throttle
- Small, Compact
- Direct or Indirect Action
- Economical

Specifications

Max. Working Pressure	1500 psi
Supply Pressure	20 psi Min. — 100 psi Max.
Operating Temperature	-20°F to 275°F
Process Connections	2" MNPT Standard
Pilot Connections	1/4" FNPT
Pilot Mode	Snap Acting Throttling

Materials

Body	Plated Steel Std. (S.S. available)
Float	Stainless Steel (Collapse pressure: 2500 psi)
Wetted Parts	Stainless Steel
Pilot	Stainless Steel

Operation

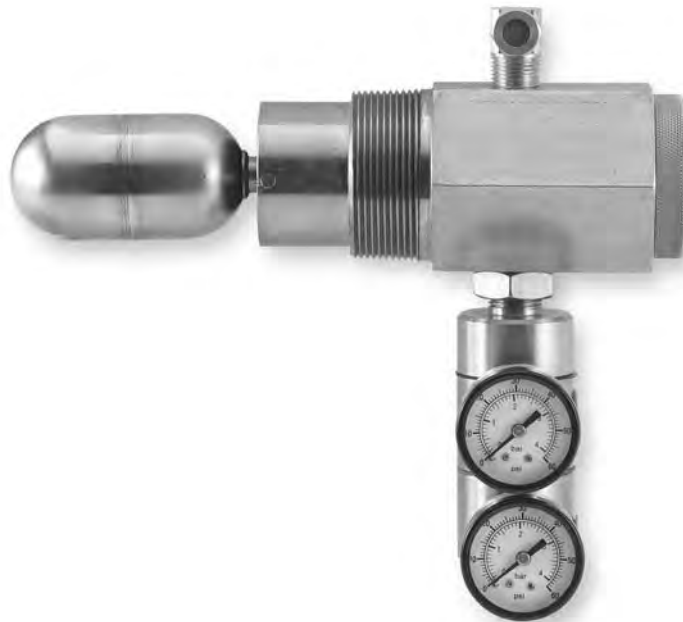
As liquid within the vessel varies, linear movement of the float is converted to rotary movement of the actuator assembly. In the snap acting mode, as the actuator pad moves closer to the nozzle, supply pressure is diverted to signal pressure, tripping the shuttle pilot to either full output pressure, energizing end-device, or to zero output pressure, de-energizing end-device. In the throttling mode, as the actuator pad moves closer to the nozzle, supply pressure is diverted to output pressure, resulting in modulating pressure to the end-device.

Direct Acting

A rise in fluid level resulting in an increase of pilot output. This is accomplished when the pilot is in the downward position

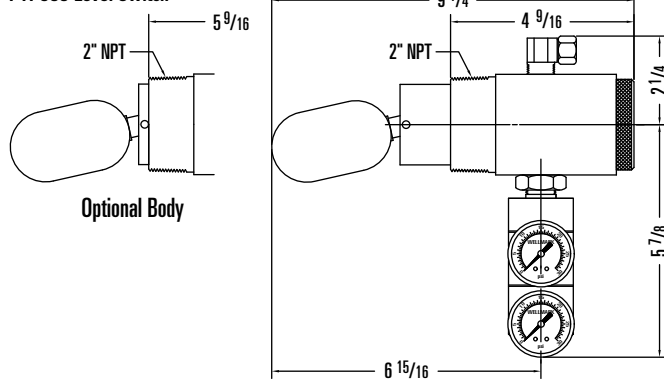
Indirect Acting

A rise in fluid level resulting in a decrease of pilot output. This is accomplished when the pilot is in the upward position.

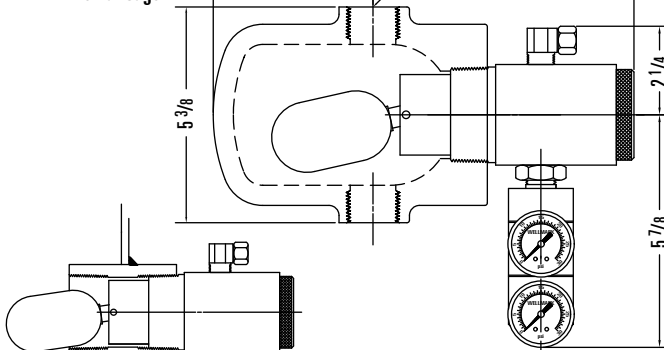


Dimensional Data

PT988 Level Switch



PT988 Level Switch With External Cage



Will Work In An
API 2" Full Coupling

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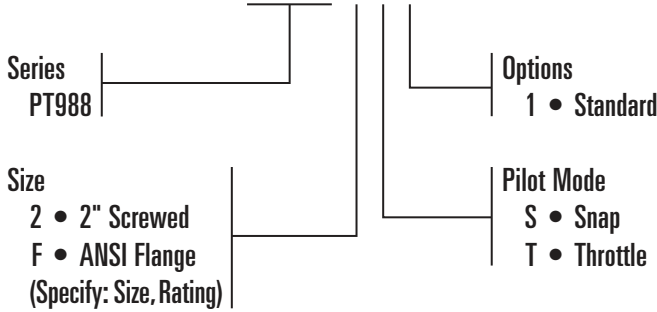
WellMark Series

PT988

PT988 Pneumatic Liquid Level Switch Determining the Model Number

Example given: Standard Model PT988-2S-1, 2" Screwed, Snap-Acting Level Switch.

MODEL PT988-2 S-1

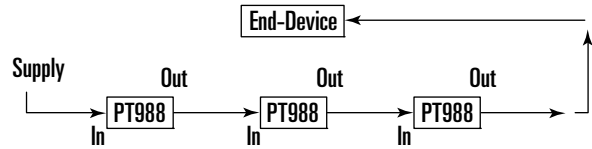
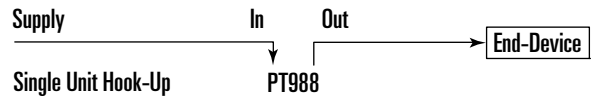


Parts List

Item	Description	Qty.	Part No.
1	BODY, CARBON STEEL	1	30216
2	PORT, STAINLESS STEEL	1	30215
3	RETAINER, STAINLESS STEEL	1	20433
4	FLOAT ARM, STAINLESS STEEL	1	20432
5	PIN, STAINLESS STEEL	1	20434
6	SPACER, STAINLESS STEEL	2	20431
7*	POLYPAK, FLUOROMYTE	1	10482
8	WIRE, SNAP, S.S. (SNAP PILOT ONLY)	1	20439
8	WIRE, THROTTLE, S.S. (THROTTLE PILOT ONLY)	1	20783
9*	O-RING, VITON®	1	004102-P
10	PORT, STAINLESS STEEL	1	20558
11	SET SCREW, STAINLESS STEEL	1	10485
12	NYLOCK NUT, STAINLESS STEEL	1	10500
13	WASHER, PLASTIC	2	10602
14	WASHER, PLASTIC	2	10603
15	VENT ASSEMBLY, BRASS	1	20136
16	PILOT BODY, S.S. (THROTTLE PILOT ONLY)	1	20562
17	INSERT, NYLON	1	10601
18	CAP, STAINLESS STEEL	1	20436
19*	O-RING, BUNA-N	1	05000-0173
20	FLOAT, STAINLESS STEEL	1	10575
21	NAME PLATE	1	10642
22	ORIFICE PLATE, S.S. (THROTTLE PILOT ONLY)	1	20035
23	PILOT NOSE, S.S. (SNAP PILOT ONLY)	1	30276
24	PILOT SEAT, S.S. (SNAP PILOT ONLY)	1	30277
25	PILOT CAP, S.S. (SNAP PILOT ONLY)	1	30278
26	PILOT SPOOL, DELRIN® (SNAP PILOT ONLY)	1	20000
27*	PILOT SEAT, URETHANE (SNAP PILOT ONLY)	1	10024
28*	PILOT SEAT, URETHANE (SNAP PILOT ONLY)	1	10025
29*	PILOT GASKET, CORPRENE (SNAP PILOT ONLY)	1	10003
30*	DIAPHRAGM, BUNA-N (SNAP PILOT ONLY)	1	10004
31	SCREW, S.S. (SNAP PILOT ONLY)	4	10522
32*	SEAT, VITON®	1	20606
33	SCREW, STAINLESS STEEL	1	10604
34*	SCREW, S.S. (SNAP PILOT ONLY)	2	10001
35	CAP TUBE, S.S. (SNAP PILOT ONLY)	1	20519
36	CAM, STAINLESS STEEL	1	20559
37	ACTUATOR, STAINLESS STEEL	1	20549
38	FLAPPER, STAINLESS STEEL	1	10530
39	PRESSURE GAUGE	2	10063
40	JAM NUT, STAINLESS STEEL	1	10273
41	SPRING, S.S. (SNAP PILOT ONLY)	1	10005

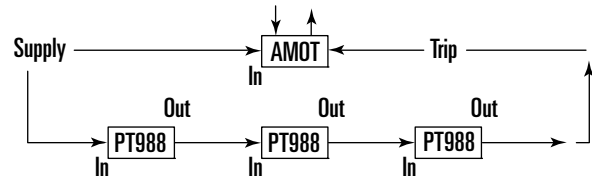
*Recommended Spare Part

Various Pneumatic Hook-Ups

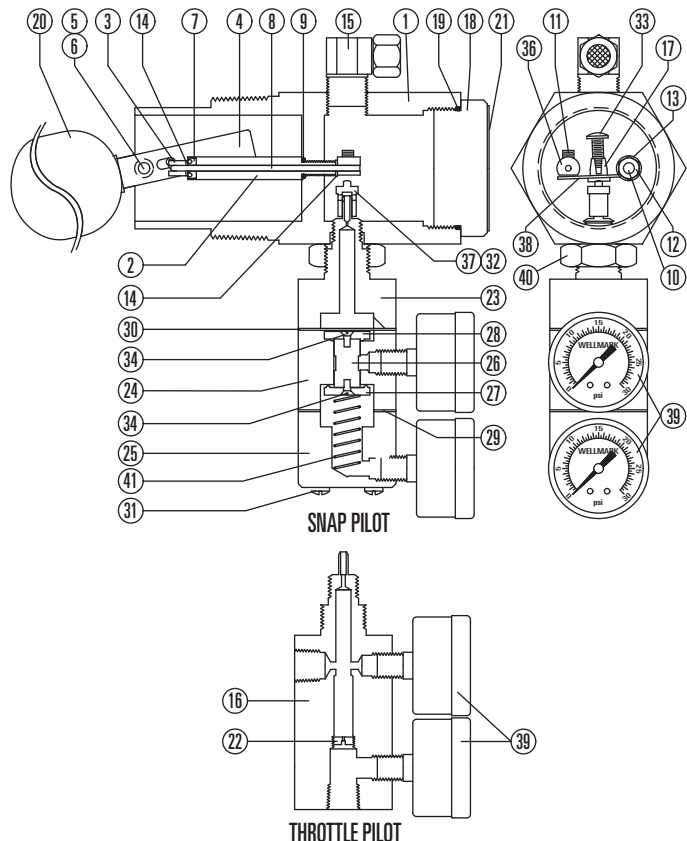


Multiple Unit Hook-Up with Output

If any of above should alarm, the "Supply" would be blocked and the output would



Should the alarm device be something with a restricted orifice (such as an AMOT 2400), the "Supply" to the alarm and the "Supply" to the PT988 should be the same. CAUTION: The "Trip" port of the "AMOT" CANNOT be utilized as the "Supply" to the "IN" port of the PT988. On alarm, the PT988 blocks the "IN" port and opens "OUT" to "EXHAUST."



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Apergy

WellMark Series

9321/9321E Pneumatic & Electric Liquid Level Switch

Application

The WellMark Series 9321 On-Off Pneumatic Liquid Level Switch operates shut-down valves or alarm systems when liquid in a vessel reaches a predetermined level. This switch uses an externally mounted displacer that operates a nozzle-flapper to vent the supply pressure when the switch is activated. The nozzle-flapper has a soft seat for tight shut-off when the switch is in its normal position (flapper against the nozzle).

The Series 9321E is an external cage-mounted electric liquid level switch. Rising liquid exerts a buoyant force on the displacer, producing a torque in the tube. This force will either trip or reset an electrical switch. Falling liquid will trip or reset the same switch if so desired. The WellMark Series 9321E Electric Switch uses the displacer and torque tube movement to trip and reset an electric switch for on-off condition. The displacer can withstand up to 1 1/2 times the maximum working pressure, allowing it to remain in the cage during hydrostatic testing.

Features

- Pneumatic or Electric
- Left Hand or Right Hand
- Hi-Level Alarm or Lo-Level Alarm

Specifications

Output Signal:

Pneumatic Output equal to supply pressure when the switch is in the normal position. Output reduced to approximately atmospheric pressure, depending upon size of the bleed orifice and piping configuration, when the switch is activated. Electric output same as supply signal.

Supply Signal

Pneumatic	Standard 30 - 60 psi Optional 60 -100 or 100 -150
Electric	11 AMP, 1/4 HP @ 125/250 VAC 5 AMP RES @ 28 VDC 0.5 AMP RES @ 125 VDC Leads Factory Sealed

Steady-State Air Consumption:

Less than 1.0 scfh for all supply pressures when the liquid level is one inch below the normal switch position for high-level switching or one inch above the normal switch position for low-level switching.



(Right Hand Mount as Shown)

Maximum Working Pressure	2500 psi
Operating Temperature	-20°F to 400°F
Displacer Diameter	4 in.
Process Connection Size	1" Female NPT
Supply Pressure Connection Size	
Pneumatic	1/4 inch female NPT
Electric	1/2 inch conduit
Shipping Weight	Approx. 35 lb.

Materials

Displacer	Stainless Steel
Cage	Cast Steel
Torque Tube	Monel®
Body	Carbon Steel
Nozzle Block	Aluminum
Switch Box	Stainless Steel

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WellMark Series

9321

9321/9321E Pneumatic & Electric Liquid Level Switch

Principle of Operation

The Series 9321 (Figure 1) is an external, cage-mounted pneumatic liquid level switch. When the switch is in the normal position with the flapper against the nozzle, output pressure cannot bleed off and remains the same as full supply pressure. Rising liquid level exerts a buoyant force on the displacer, producing a torque in the tube. When this torque exceeds the torque exerted on the flapper by the magnet, the flapper snaps away from the nozzle. This action allows output pressure to bleed through the nozzle faster than supply pressure can enter through the bleed orifice. The reduced pressure

in the output signal line activates the shutdown or alarm systems. When the liquid level lowers, the falling displacer forces the flapper into the field of the magnet, letting the magnet snap the flapper against the nozzle and causing output pressure to build to full supply pressure.

On applications where low-level switch operation is required (Figure 2) the nozzle, flapper and magnet are positioned on the opposite side of the torque tube so that downward displacer travel moves the flapper away from the nozzle.

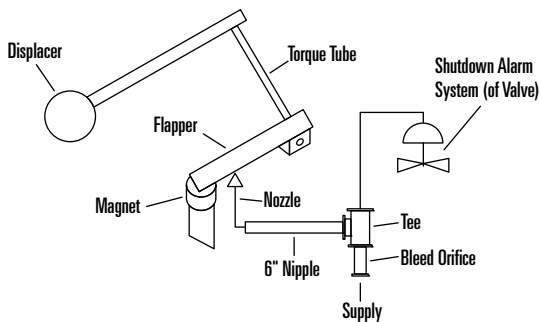


Figure 1: Principle of Operation for Hi-Level

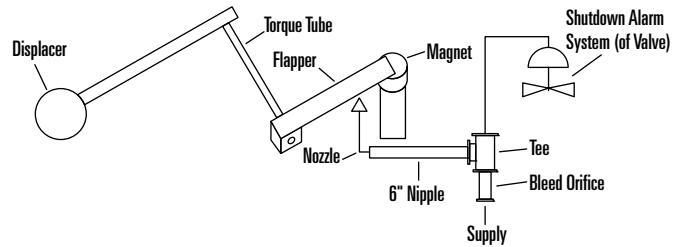
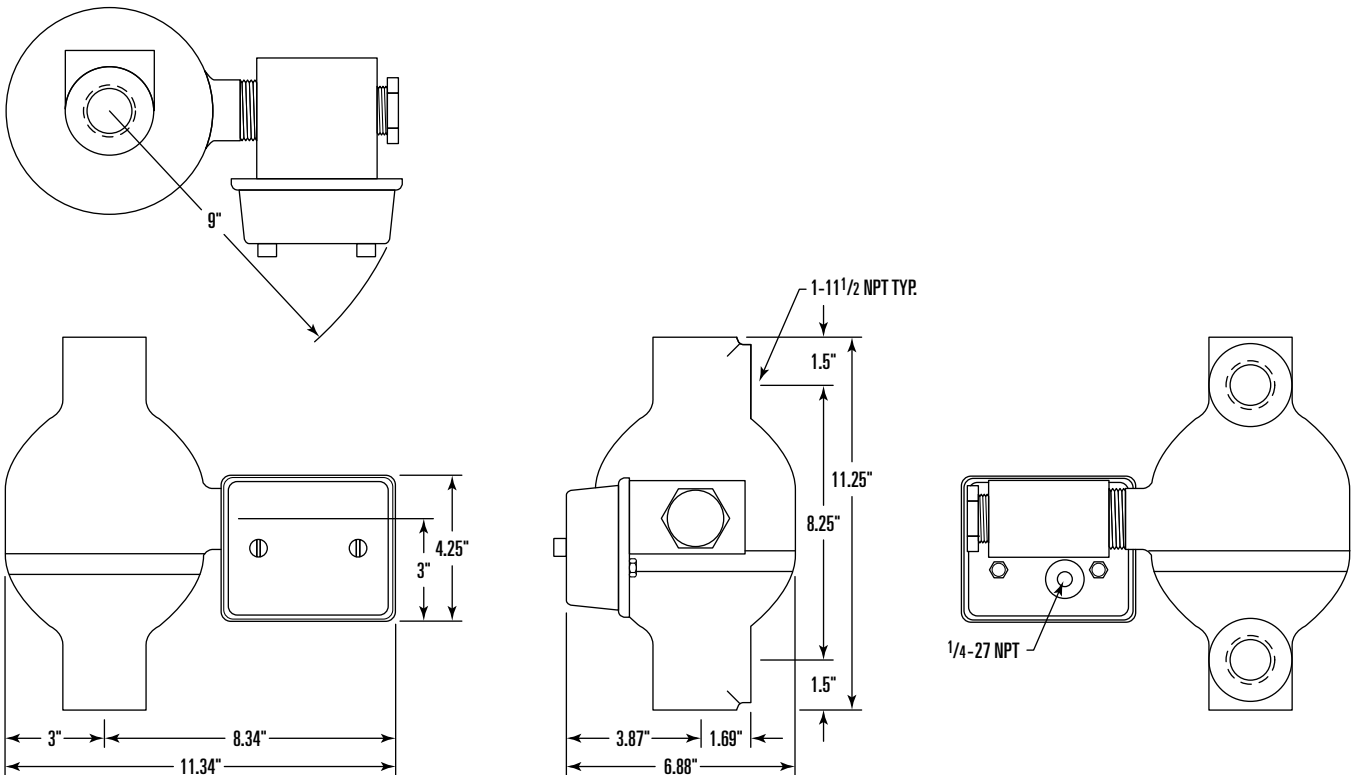


Figure 2: Principle of Operation for Lo-Level

Dimensional Data



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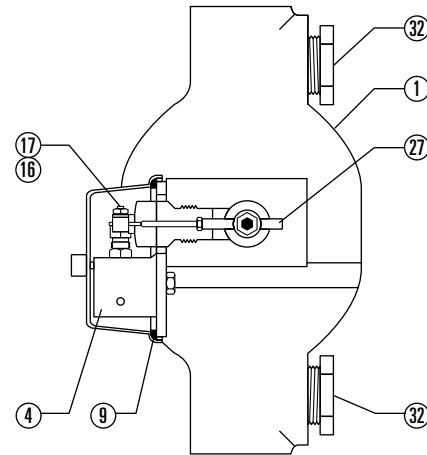
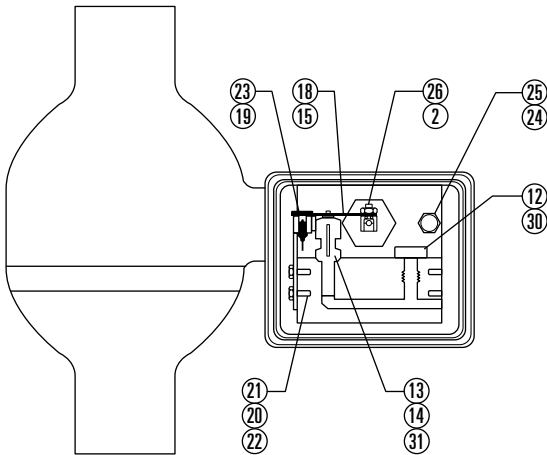
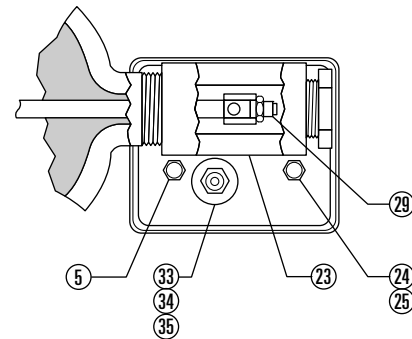
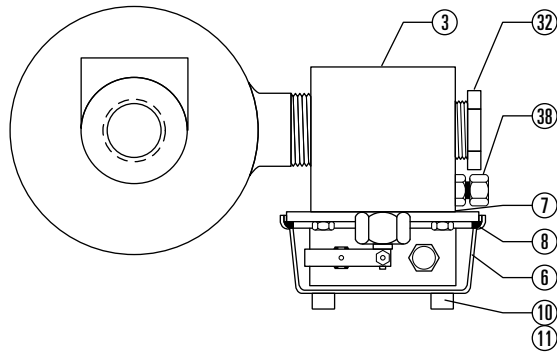
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WellMark Series

9321/9321E Pneumatic & Electric Liquid Level Switch



Parts List Series 9321

Item	Description	Qty.	Part No.
1	CHAMBER WELD ASSEMBLY	1	40298
2*	TORQUE ARM WELD ASSEMBLY	1	30425
3	BODY BLOCK	1	20689
4	NOZZLE BLOCK	1	20691
5	MOUNTING PLATE	1	20690
6	COVER, PLASTIC	1	10693
7*	GASKET, BODY BLOCK	1	10683
8*	GASKET, NOZZLE BLOCK	1	10684
9*	GASKET, PLASTIC COVER	1	10703
10*	SEAL, COVER SCREW	2	10685
11	THUMB SCREW, COVER	2	10688
12	PLUG, PILOT PRESSURE	1	20694
13	NOZZLE, 30-60 PSI	1	20696
	NOZZLE, 60-100 PSI	1	20720
	NOZZLE, 100-150 PSI	1	20721
14	JAM NUT, THIN (NOZZLE)	1	10209
15*	FLAPPER, WELDMENT	1	10713
16*	CLAMP, FLAPPER	1	20697
17*	JAM NUT, FLAPPER CLAMP	1	10710
18*	SEAT, NOZZLE	1	10695

*Recommended Spare Part

Item	Description	Qty.	Part No.
19*	MAGNET	1	10714
20	BRACKET, MAGNET	1	10712
21	S.S. MACHINE SCREW, MAGNET BRACKET	2	10706
22	S.S. FLAT WASHER, MAGNET BRACKET	2	10705
23	S.S. MACHINE SCREW, MAGNET	1	10707
24	S.S. CAP SCREW	4	10708
25	S.S. LOCK WASHER	4	10709
26*	O-RING, VITON® (TORQUE TUBE)	1	10696
27*	BEARING SLEEVE (TORQUE TUBE)	1	10698
28	SLEEVE CLAMP, FLOAT ARM	1	20692
29	S.S. JAM NUT, SLEEVE CLAMP	1	10711
30*	O-RING, VITON®	1	10715
31*	O-RING, VITON®	1	10716
32	PIPE PLUG 1" NPT	3	10183
33	1/4 X 6 S.S. NPT	3	10735
34	1/4 S.S. TEE	1	10734
35	IN-LINE ORIFICE	1	20700
36	CA-PLUG (NOT SHOWN)	2	10686
37	SHIPPING TUBE (NOT SHOWN)	1	10687
38	VENT ASSEMBLY	1	20728

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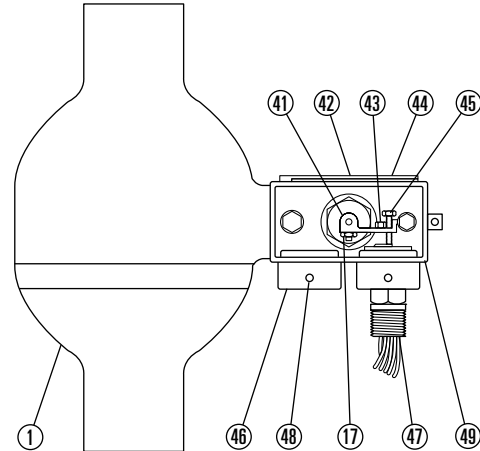
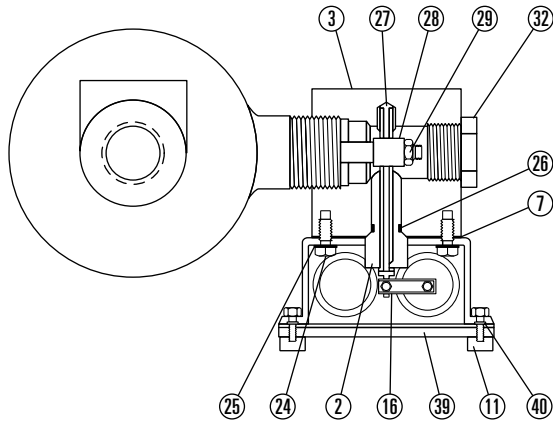
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Apergy

WellMark Series

9321

9321/9321E Pneumatic & Electric Liquid Level Switch



Parts List Series 9321E

Item	Description	Qty.	Part No.
1	CHAMBER WELD ASSLY	1	40298
2*	TORQUE TUBE WELD ASSLY	1	30425
3	BODY BLOCK	1	20689
7*	GASKET	1	10683
11	THUMB SCREW	2	10688
16*	CLAMP	1	20697
17*	JAM NUT	1	10710
24	S.S. CAP SCREW	2	10708
25	S.S. LOCK WASHER	2	10709
26*	O-RING, VITON®	1	10696
27*	BEARING SLEEVE	1	10698
28	SLEEVE CLAMP	1	20692
29	S.S. JAM NUT	1	10711
32	PIPE PLUG	3	10183

*Recommended Spare Part

Item	Description	Qty.	Part No.
36	CA-PLUG (NOT SHOWN)	2	10686
37	SHIPPING TUBE (NOT SHOWN)	1	10687
39	COVER & GASKET	1	10764
40*	O-RING	2	10905
41	SWITCH ARM	1	10765
42	DRIVE SCREW	2	10075
43	S. S. JAM NUT	1	10901
44	NAMEPLATE	1	10772
45	S.S. CAP SCREW	1	10900
46	CA-PLUG	1	10906
47*	SPDT SWITCH	1	10783
	DPDT SWITCH (OPTIONAL)		10790
48	S.S. SET SCREW	2	10794
49	SWITCH BOX	1	30455

How to Order

Pneumatic

Left Hand Hi	9321 LH
Left Hand Lo	9321 LL
Right Hand Hi	9321 RH
Right Hand Lo	9321 RL

Electric

Add the Letter "E" after 9321
Example: 9321E-LH

Repair Kits

Minor Repair Kit Consists of:	20736 Part No.
GASKET	10683
GASKET	10684
GASKET	10685
FLAPPER SEAT	10695
O-RING	10696
BEARING SLEEVE	10698
GASKET	10703
FLAPPER ASSEMBLY	10713
HOLDING MAGNET	10714
O-RING	10715
O-RING	10716
Major Repair Kit Consists of:	20737 Part No.
SAME AS 20735 (ABOVE) PLUS TORQUE TUBE ASSY.	30425

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Apergy

WellMark Series

MIZER®

MIZER® No-Bleed Pilot Valve

Application

The MIZER® No-Bleed Pilot Valve is the most cost-effective solution for converting high-bleed pneumatic controls to low-bleed operation. This device effectively stops continuous bleed operation between dump cycles, thereby reducing environmentally-concerning methane emissions, while allowing previously wasted gas to be sent to the sale line. Conservatively, user can anticipate 90% savings from recaptured gas based upon estimated cycle rates of the controls. 95-98% values may be achieved in some applications.

Features

- Kits Available For:
 - Cemco Cantilever Level Controls
 - FMC Invalco Flexlever Level Controls
 - Emerson/Fisher 2500 Level Controls
 - Emerson/Fisher 4100Z "Wizard" Pressure Controllers
 - Emerson/Fisher 4150/4160 Pressure Controllers
- Cemco and FMC Invalco kits are field-installable in minutes — unit does not have to be shut down for installation. Installation of pressure controller kits, although more in-depth, are still the most painless and cost-effective solution for converting high-bleed to low-bleed.
- Uses existing tubing and connections — no new plumbing required.
- MIZER® works in either snap acting or throttling application.
- MIZER® solution allows field personnel to continue using control devices that are familiar.
- Conversion from high-bleed to low-bleed may qualify user for Carbon Credits.

Specifications

Max. Supply Pressure 64 psig
 Operating Temperature -20°F to + 200°F
 Materials: Stainless Steel with Nitrile and Delrin® seals
 Average Bleed Rate Approx. 6.6 scf per day

Bleed Gas vs. Vent Gas

"Bleed" gas is defined as gas that bleeds to atmosphere between dump cycles. "Vent" gas is that gas which, after energizing the dump or control valve must be released to atmosphere, and is usually a small fraction by comparison to the bleed gas volume. It is because of the high bleed between dump cycles that the EPA discourages the use of high-bleed pneumatic devices to control liquid level and gas pressure. The MIZER® device actually stops the continuous flow of gas from these controllers, only allowing gas to flow to the con-

trolled device (dump valve or control valve) when necessary. Therefore, the amount of potential gas savings is dependent upon (among other things) the initial bleed rate and the frequency of operation of the controller and valve. In other words, a separator unit that fills slowly and dumps infrequently is bleeding substantial amounts of unutilized gas pressure to atmosphere most of the time. All of this gas that is vented to atmosphere between dump cycles would be saved when using a MIZER® retrofitted controller. Likewise, if the controller is very active, dumping fluid frequently, the savings would be less, as more gas is being used to activate the valve.

It should be noted that neither the MIZER® nor any other low-bleed device is capable of saving gas that has been used to energize the valve. This gas will always be lost after the valve cycles and the diaphragm and connection lines vent. If the lines are not allowed to vent the valve will not return to the original (usually closed) position.

Ease of Installation

The Cemco and FMC Invalco level control versions of the MIZER® pilot valve installation is a simple and painless operation. In fact, unlike installing traditional no-bleed level controllers, which require breaking the process connection, the MIZER® pilot valve is installed by simply removing the operating gas pressure from the controller, installing the MIZER®, blowing out the supply line to keep it clean, reattaching the supply line and adjusting.

Different controllers require different kits—some containing more parts than others. Retrofit kits for pressure controllers such as the Emerson/Fisher 4150 or 4160 are more complex and therefore the procedure is also more complex, possibly requiring shut down. But, no welding of new fittings, no new tubing, no new cabinet refits are required. The MIZER® installs in minutes — not hours or days as is the case with installation of any complete new controller. Last, but not least, the operator continues using the controller they already know and trust — no need to learn the operating quirks of a completely new control.



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WellMark Series



MIZER® No-Bleed Pilot Valve

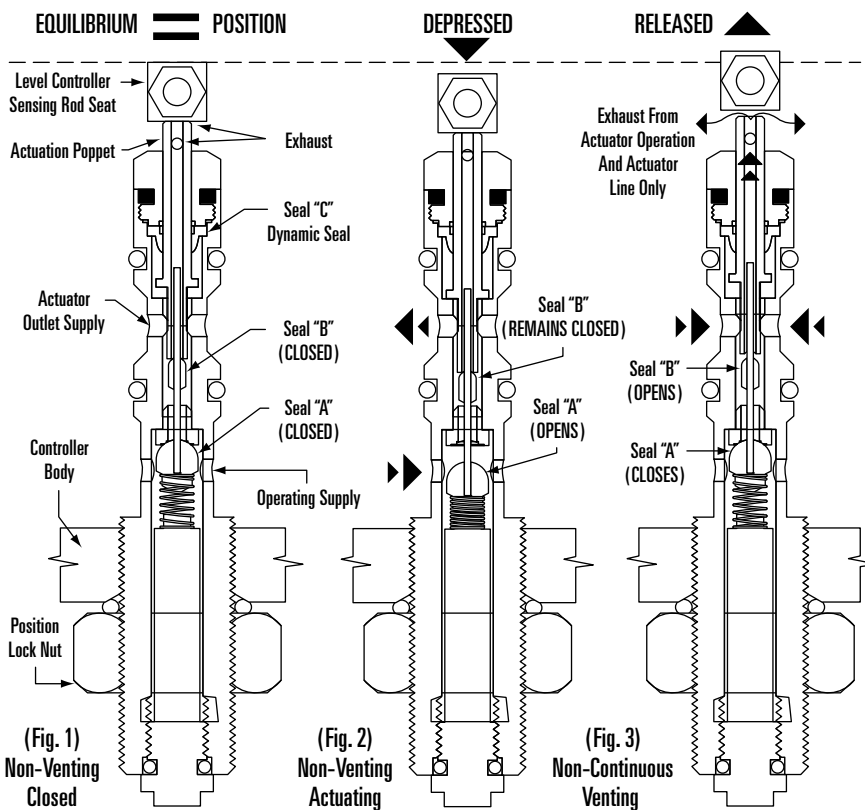
Liquid Level Controls & Pressure Controllers • Potential Savings per Control (3 to 15 psig controllers*)

Based upon typical onshore facility* supply pressure of 20 psig and \$6.00 gas

Type Control	Manufacturer	Model	Supply Pressure psig	Bleed Rate Air SCFH	Bleed Rate Gas SCFH	Daily Bleed Rate SCFD	Yearly Bleed Rate SCFY	Annual Dollars LOST to Emissions
LIQUID LEVEL	CEMCO	6900	20	19.7	26	614	224,119	\$1,344.72
	EMERSON/FISHER	2500	20	27	35	842	307,169	\$1,843.01
	EMERSON/FISHER	2502	20	27	35	842	307,169	\$1,843.01
	EMERSON/FISHER	2506	20	27	35	842	307,169	\$1,843.01
	FISHER	3570	20	13	17	405	147,896	\$887.38
	FISHER	3582	20	13	17	405	147,896	\$887.38
	FISHER	3660	20	5.2	7	162	59,158	\$354.95
	FMC INVALCO	415	20	23	30	717	261,662	\$1,569.97
	FMC INVALCO	215	20	23	30	717	261,662	\$1,569.97
PRESSURE	FMC INVALCO	402	20	23	30	717	261,662	\$1,569.97
	EMERSON/FISHER	4100Z	20	33	43	1029	375,429	\$2,252.57
	EMERSON/FISHER	4150	20	27	35	842	307,169	\$1,843.01
	EMERSON/FISHER	4160	20	27	35	842	307,169	\$1,843.01

* Offshore facilities commonly use 6 to 30 psig controllers with average supply pressure of 35 psig. Bleed rates and dollars lost due to emissions would conservatively be 1.5 times those listed above.

Method of Operation



Equilibrium Position: (Non-Venting Closed)
When the MIZER® Pilot Valve is in "Steady State", both Seal "A" and Seal "B" are closed and the Control Flapper is in neutral position. (See Fig. 1)

Depressed Position: (Non-Venting Actuating)
When the Control Flapper depresses the Actuation Poppet, Seal "A" is opened, supplying gas to the process valve. Seal "B" is closed, preventing gas from bleeding or venting through the vent port. The MIZER® Pilot Valve is designed so that the gas flow is related to the position of the controller flapper. (See Fig. 2)

Released Position: (Non-Continuous Venting)
When the Control Flapper is released it closes Seal "A" and opens Seal "B" allowing gas to vent. Venting occurs ONLY when the control valve calls for it, and then, ONLY the gas in the process line and actuator is released. (See Fig. 3)

Conversion Kit Assembly Part Numbers

Type Control	Conversion Kit Model Number	Part Number	Converts
LIQUID LEVEL	1110-111	06500-6905	CEMCO CANTILEVER CONTROL
	4010-111	31066	FMC INVALCO FLEXLEVER CONTROL
	7010-111	06500-7018	EMERSON/FISHER 2500 CONTROL
PRESSURE	5010-111	06500-7093	EMERSON/FISHER 4100Z "WIZARD" CONTROLLER
	8010-111	06500-7019	EMERSON/FISHER 4150/4160 CONTROLLER

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WellMark Series

W1200

W1200 DVO Low-Bleed Pneumatic Liquid Level Control

Application

The Model W1200 DVO Pneumatic Level Control is float-activated to operate dump valves and similar devices. It is snap-acting, primarily designed for gas compressor scrubber level applications. Control may also be used anywhere level switching of a non-pressurized vessel is required. Low level switch design may be used for fuel, lube oil, hydraulic oil, etc. NACE MR0175 is standard for wetted process components. Models are available in all Stainless Steel. These level controls have screw in connections for direct installation or an optional external float chamber is available.

Features

- NACE MR0175 Process Standard
- Designed for Harsh Gas Compressor Scrubber Applications
- FloatLite Float Operates in 0.5 Specific Gravity and Heavier Fluids
- Rated for 2000 psi Working Pressure
- Improved Design Provides Better Snap Action and Dependability With Reduced Number of Moving Parts
- All Models Screw Directly into the Vessel or can be Mounted Via External Float Chamber
- Nickel Plated Body to Provide Enhanced Corrosion Protection
- Push-button Dump Valve Override Standard

Specifications

Max. Working Pressure

FloatLite Float	2000 psi
304 Stainless Steel Float	1500 psi

Temperature Rating -20°F to 300°F (400°F Available)

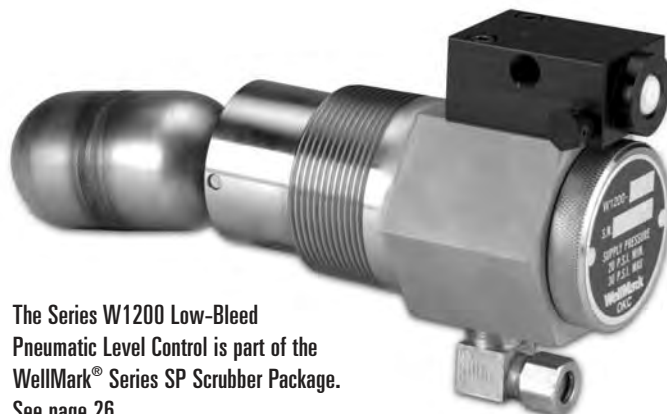
Specific Gravity

FloatLite Float	0.5
304 Stainless Steel Float	0.65

Process Connection 2" NPT

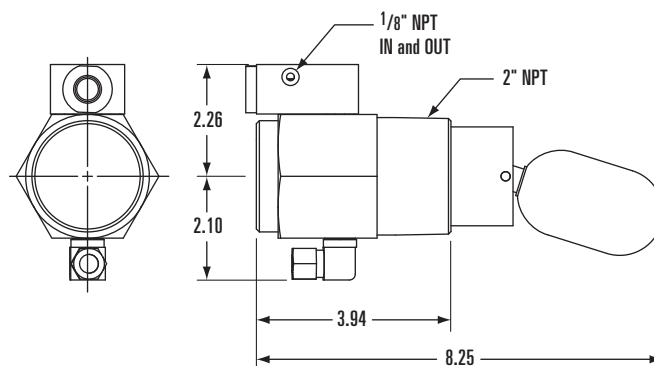
DVO Valve 3-Way N.C. with Manual Override

Connections 1/8" NPT (Min. 30 psig Required)



The Series W1200 Low-Bleed Pneumatic Level Control is part of the WellMark® Series SP Scrubber Package. See page 26

Dimensional Data



Materials

Body	Electroless Nickel Plated Steel Std. (S.S. Available)
Float	S.S. Std. (FloatLite Available)
O-Rings	Viton®

WellMark Series

W1200

W1200 DVO Low-Bleed Pneumatic Liquid Level Control

Determining the Model Number

Example given: Standard Model W1200 DVO - * - Series W1200 DVO Pneumatic Level Control with Manual Override.

MODEL W1200 DVO - *

- R • Airset Regulator
- SS • S.S. Body
- FL • FloatLite (.5 SG)
- H • Hi-Temp (400°F)
- EC • External Cage
- E** • Float Arm Extension

Options

Notes: *For options, add code to end of Model Number.
 **Add length of extension behind code (E).
 For example, the code for a 3" Extension would be "E3".

Wellmark Series SP Scrubber Package includes 790, W1200 DVOR, WDV and optional W2600 Safety Relief Valve.

MODEL SP 1 *

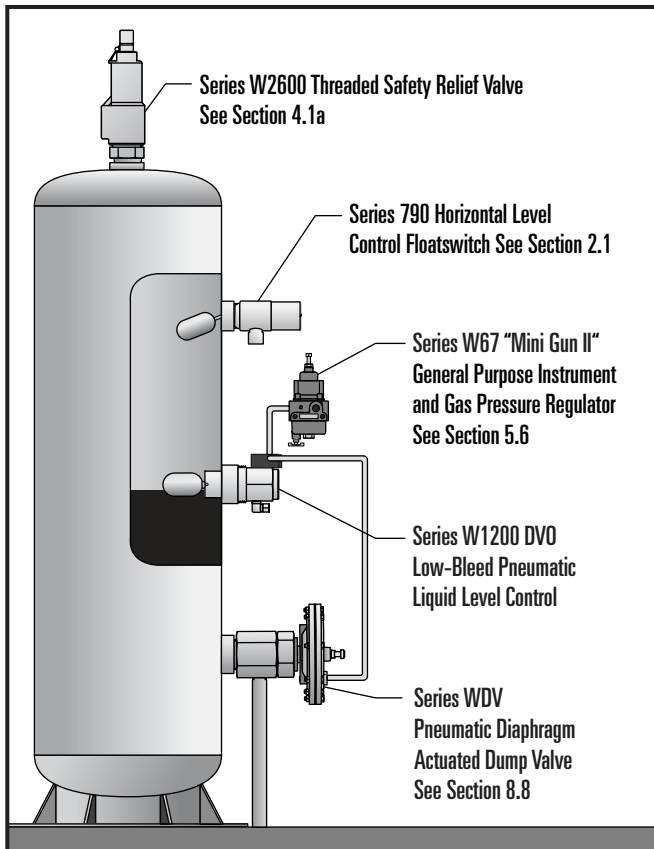
- 1 • 20-100-20
- 2 • 20-100-15
- 3 • 20-100-05
- 4 • 10-075-18
- 5 • 10-050-18

WDV Valve

Options

- LR** • Less Regulator
- RV1 • With 1" Relief Valve
- RV2 • With 2" Relief Valve

Notes: *For options, add code to end of Model Number.
 **Regulator provided at no extra charge.



The WellMark Series SP Scrubber Package

The system provides for liquid control in gas scrubber applications by dumping liquids to drain and protecting compressors with a high liquid level switch. Wetted metal parts are made to survive constant use in corrosive environments.

Pneumatic Level Control

Float actuated level snap acting switch controls pneumatic pressure to open and close the dump valve.

High Level Shutdown Switch

Stainless Steel float actuated level switches to alarm and/or shut-down the equipment. See Section 2 for more information.

Pneumatic Dump Valves

2-Piece union design with manual valve operator allows soft plug and hard seat to be replaced without disassembling outlet piping or scrubber pipe connection. Diaphragm actuated valves operate on 30 to 70 psi. See Section 8 for more information.

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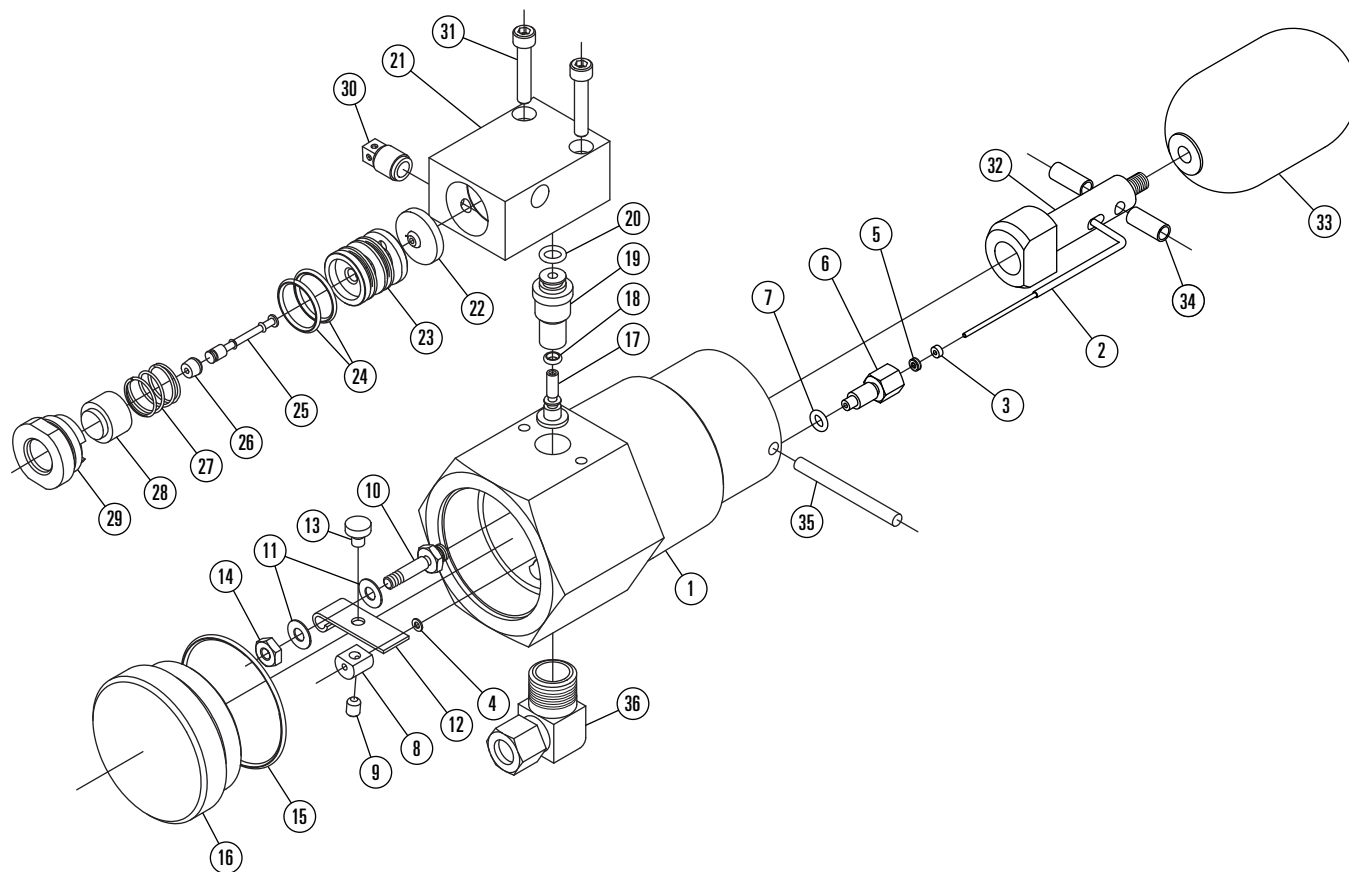
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WellMark Series

W1200

W1200 DVO Low-Bleed Pneumatic Liquid Level Control



Parts List

Item	Description	Qty.	Part No.
1	BODY, STEEL	1	31101
2	WIRE, STAINLESS STEEL	1	21546
3	SPACER	1	21547
4	WASHER, NYLON	1	10603
5	QUAD RING	1	11256
6	PORT, STAINLESS STEEL	1	21545
7	O-RING, NITRILE	1	10483
8	CAM, STAINLESS STEEL	1	21548
9	SET SCREW	1	10485
10	PORT, STAINLESS STEEL	1	20558
11	WASHER, NYLON	2	10602
12	ACTUATOR, STAINLESS STEEL	1	11249
13	SEAT, NITRILE	1	21513
14	NYLOC NUT, STAINLESS STEEL	1	05000-2567
15	O-RING, NITRILE	1	05000-0173
16	CAP, STAINLESS STEEL	1	20436
17	NOZZLE, STAINLESS STEEL	1	21521
18	O-RING, NITRILE	1	05000-0009
19	NOZZLE BODY, STAINLESS STEEL	1	21525

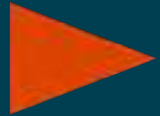
Item	Description	Qty.	Part No.
20	O-RING, NITRILE	1	05000-0033
21	PILOT HOUSING, ALUMINUM	1	21523
22	DIAPHRAGM, NITRILE	1	21527
23	SPOOL, ALUMINUM	1	21524
24	O-RING, NITRILE	2	05000-0058
25	STEM, STAINLESS STEEL	1	21522
26	PLUG, NITRILE	1	21526
27	SPRING, STAINLESS STEEL	1	11250
28	MANUAL BUTTON, DELRIN®	1	21520
29	PILOT CAP, ALUMINUM	1	21519
30	BREATHER, PLASTIC	1	05011-8729
31	SCREW, STAINLESS STEEL	2	05000-6153
32	COUNTER WEIGHT, STAINLESS STEEL	1	21550
33	FLOAT, STAINLESS STEEL	1	10575
34	SPACER, STAINLESS STEEL	2	20431
35	PIN, STAINLESS STEEL	1	20434
36	VENT ASSEMBLY, BRASS	1	20136
37	NAME PLATE, (NOT SHOWN)	1	11255

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Apergy



Wellmark Relief Valves

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WellMark Series

W9503 3" Threaded Safety Relief Valve

Application

These valves are for general purpose gas and air services, and are recommended for over-pressure protection on separators, compressors, pressure vessels, heater-treaters, gathering and transmission lines, meter runs, and other systems where the rated capacities of the valve are commensurate with the requirements of the system. All of these valves are manufactured in accordance with the ASME Boiler and Pressure Vessel Code and have been capacity tested and certified by the National Board to meet the requirements of Section VIII of the ASME Code, as signified accordingly by the symbols "UV" and "NB" on their nameplates.

NOTE: These valves are designed for relief to atmospheric pressure only on the downstream side, and are not intended for use in a closed system. Any backpressure applied to the downstream side of the valve will result in improper pressure relief.

Features

- Curtain - Disc Design: High Capacity - Low Blow Down
- ASME Coded: "UV" Section VIII Air/Gas
- Guided Lift System: Optimum Performance
- Trim: Soft Resilient Seat
- High Volume Applications
- Low Pressure Applications
- Stainless Steel Internals
- NACE Option Available

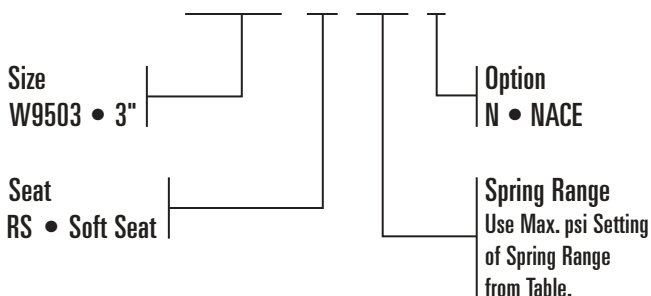
Specifications

90% Slope=36.12, 2.000 Orifice (3.142 Sq. In.)



Determining the Model Number

MODEL W9503-RS-125



Model Type, Pressure Settings & Range

Size	Model No.	SCFM*	Max PSI Setting	Pressure Range	Spring
W9503 3"	TYPE - 25	1542	25	15-25	05011-7233
	TYPE - 60	2806	60	26-60	05011-7241
	TYPE - 125	5497	125	61-125	05011-7258

*SCFM = For set pressures up to 75 psi
 Pressure setting plus 3 psi plus atmospheric pressure (14.7 psi) times 90% slope
 *SCFM = For set pressures over 75 psi
 Pressure setting times 1.1 plus atmospheric pressure (14.7 psi) times 90% slope
 Minimum ASME settings: 15 psi.

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WellMark Series

W9503 3" Threaded Safety Relief Valve

Sizing of Safety Relief Valves

Given certain information as follows, Safety Relief Valves may be sized by use of various formulas prescribed by Appendix 11, Section VIII, Division I of the ASME Boiler and Pressure Vessel Code for capacities of orifices.

Table I – Value Data

Valve Size	Valve Type	Bore	KA	90% KA	Slope*	90% Slope
3"	W9503RS	2.000	2.188	1.969	40.12	36.12

* ASME certified slopes determined by actual tests conducted at the National Board Testing Laboratory, Columbus, Ohio.

NOTE: When sizing for code application, use 90% KA or 90% Slope.

Table II – Molecular Weight and Values of C for Gases

Gas	M	C
AIR	28.97	356
ACETYLENE	26.04	345
AMMONIA	17.03	351
BUTANE	58.12	324
CARBON DIOXIDE	44.01	345
CHLORINE	70.91	352
ETHANE	30.07	339
ETHYLENE	28.05	337
FREON 22	86.48	355
HYDROGEN	2.02	356
HYDROGEN SULFIDE	34.08	348
METHANE	16.04	346
METHYL CHLORIDE	50.48	337
NATURAL GAS (0.6)	17.40	344
NITROGEN	28.02	356
OXYGEN	32.00	356
PROPANE	44.09	331
SULFUR DIOXIDE	64.06	342

Parts List

Item	Description	Qty.	Part No.
1	VALVE BODY, DUCTILE IRON SA-395	1	05011-7191
2	SPRING HOUSING BONNET, DUCTILE IRON SA-395	1	05011-7274
3	SEAT, ASTM A-484 TY. 304	1	05012-7960
4	O-RING, VITON®	1	05000-1262
5	BLOW DOWN RING ASSY., ASTM A-484 TY. 304	1	06500-5132
6	O-RING, VITON®	1	05000-1288
7	HEX SCREW, SA-307 GR. A	4	05000-2013
8	SPRING GUIDE, ASTM A-108	1	05011-7266
9	ADJUSTMENT SCREW, SA-307 GR. B	1	05011-7282
10	JAM NUT, 304 S.S.	1	05000-2088
11*	SPRING 15-25 PSIG, 17-7 S.S.	1	05011-7233
	SPRING 26-60 PSIG, 17-7 S.S.	1	05011-7241
	SPRING 61-125 PSIG, 17-7 S.S.	1	05011-7258
12	NAME PLATE, ALUMINUM	1	10751
13	THREAD SEAL, STEEL/BUNA	1	10578

*Inconel® Optional

Dimensional Data

Model	A	B	C	D	E	F
W9503	4" MAX.	17 1/2"	4 5/8"	4 5/8"	3" FNPT	3" FNPT

Table III – Formulas

Q (SCFM) = Pressure Setting times 1.1 plus atmospheric pressure (14.7 psia) times 90% slope.

$$Q \text{ (SCFM)} = \frac{KACP}{w \times 60} \sqrt{\frac{M}{T}}$$

$$W \text{ (lb/hr)} = KACP \sqrt{\frac{M}{T}}$$

$$KA = \frac{Wa}{CP} \sqrt{\frac{T}{M}}$$

Where:

Q = Required flow (scfm) thru valve at 14.7 psia and 60°F

SCFM = Standard cubic feet per minute.

KA = Product of effective coefficient of discharge and the effective discharge area.

C = Coefficient determined by ratio of the specific heats of gas or vapor at standard conditions.

P = Set pressure x 1.1 plus atmospheric pressure (14.7 psia)

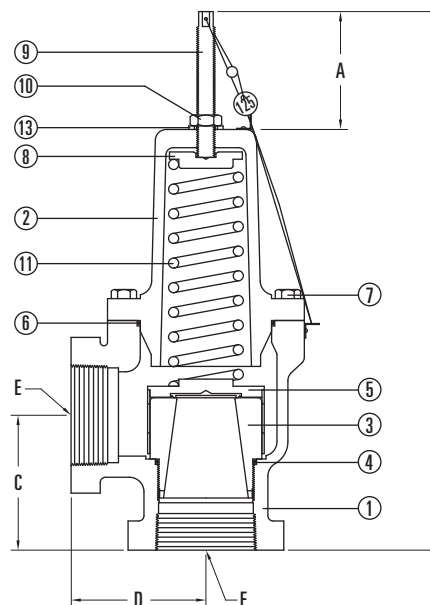
w = Density of gas (lb./cu. ft.) at 60°F, and 14.7 psia (air being .0764 lb. cu. ft.)

M = Molecular weight

T = Absolute temperature at inlet (°F + 460)

W = Flow of any gas or vapor, lb./hr.

Wa = Rated capacity, converted to lb./hr. of air at 60°F, inlet temperature.



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WellMark Series

W2601 and W2602 Safety Relief Valves

Application

2600 Series Safety Relief Valves are for general purpose gas, air and liquid services. They are recommended for over-pressure protection on separators, compressors, pressure vessels, heater-treaters, gathering and transmission lines, meter runs and other systems where the rated capacities of the valve are commensurate with the requirements of the system. The 2600 Series is manufactured in accordance with the ASME Boiler and Pressure Vessel Code and has been capacity tested and certified by the National Board to meet the requirements of Section VIII of the ASME Code, as signified accordingly by the symbols "UV" and "NB" on their nameplates.

NOTE: Standard threaded relief valves are designed for atmospheric relief only, and are not intended to relieve into pressurized systems. Threaded relief valves that relieve into pressurized systems require an additional Back-Pressure test identified by a "B" code in the model number.

Features

- Choice Of Multiple Orifice Sizes
- ASME Coded: "UV" Section VIII Air/Gas and Liquid
- Enhanced Guided Lift System: Optimum Performance
- Trim Option: Soft Seat
- High Volume Applications
- Low Pressure Applications
- Stainless Steel Internals
- NACE Option Available

Specifications

Type W2601—1" Size

Type W2602—2" Size

Soft Resilient Seat

Multiple Orifices Available:

- C—.295" Diameter (1" gas valve only)
- D—.400" Diameter (1" valve only)
- E—.534" Diameter (1" or 2" valve)
- F—.672" Diameter (2" valve only)
- G—.857" Diameter (2" valve only)



Threaded Safety
Relief Valves

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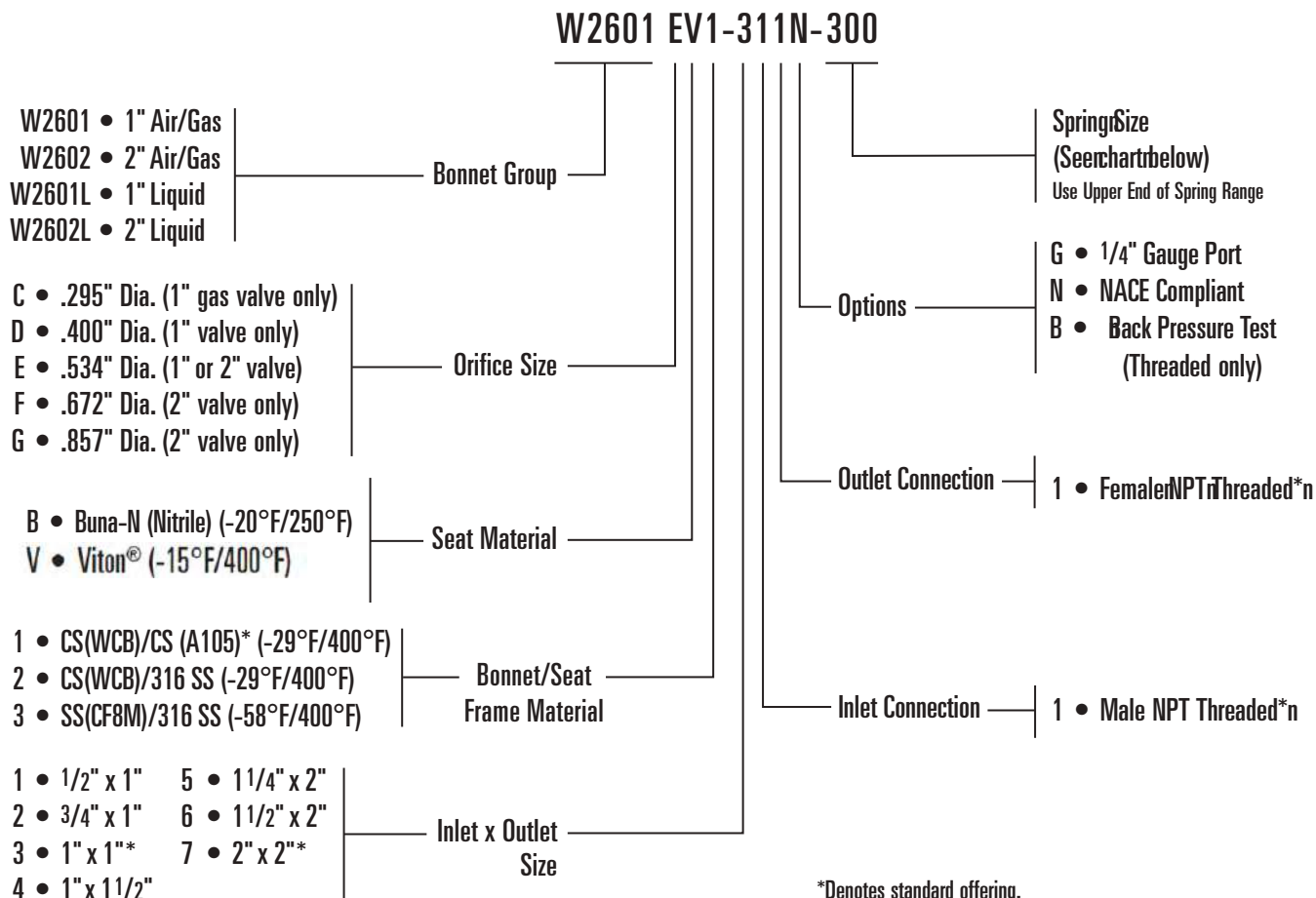
WellMark Series

2600

W2601 and W2602 Safety Relief Valves

Determining the Model Number

Example given: Model 2601 EV1-311N-300 – Series 2601 1" Safety Relief Valve with .534" Orifice Diameter, Viton® Seats, WCB Carbon Steel Bonnet, A105 Carbon Steel Frame, 1" Male NPT Threaded Inlets and 1" Female NPT Threaded Outlets, NACE Compliance and 300 psig Spring.



Specification	Orifice Designation				
	C	D	E	F	G
ORIFICE DIAMETER (IN.)	0.295	0.400	0.534	0.672	0.857
ORIFICE AREA (A) (SQ. IN.)	0.068	0.126	0.224	0.355	0.577
INLET SIZE AVAILABLE (IN.)	1/2, 3/4, 1	1/2, 3/4, 1	1/2, 3/4, 1, 1 1/4, 1 1/2, 2	1 1/4, 1 1/2, 2	1 1/2, 2
OUTLET SIZE AVAILABLE (IN.)	1, 1 1/2	1, 1 1/2	1, 1 1/2, 2	2	2
PRESSURE RANGES (PSIG)	15-2500	15-2500	15-2500	15-1600	75-1000
FLOW COEFFICIENT (K) AIR/GAS	0.859	0.859	0.859	0.859	0.859
FLOW COEFFICIENT (K) LIQUID	N/A	0.628	0.628	0.628	0.628

Orifice	Service	Orifice Diameter	Orifice Area (A)	Spring Ranges (psig)- Use Upper End of Spring Range						
				15-80	80-250	250-400	400-800	800-1600	1600-2500	—
1"	C AIR/GAS	0.295	0.068	15-80	80-250	250-400	400-800	800-1600	1600-2500	—
	D AIR/GAS & LIQUID	0.400	0.126							
	E AIR/GAS & LIQUID	0.534	0.224							
2"	E AIR/GAS & LIQUID	0.534	0.224	15-75	75-250	250-500	500-1200	1200-2500	—	—
	F AIR/GAS	0.672	0.355	15-40	40-200	200-400	400-800	800-1600	—	—
	G AIR/GAS	0.857	0.577	—	75-100	100-200	200-600	600-1000	1000-1500	—
	F LIQUID	0.672	0.355	15-40	40-70	70-200	200-400	400-530	530-800	800-1600
	G LIQUID	0.857	0.577	—	75-125	125-250	250-400	400-600	600-1000	1000-1500

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WellMark Series

W2601 and W2602 Safety Relief Valves

Relieving Capacity for Air • (10% Overpressure) Capacities in standard cubic feet per minute at 60° F

Set Pressure	Orifice Diameter (in.)/Area (sq. in.)					
	C 0.295/0.068	D 0.400/0.126	E 0.534/0.224	F 0.672/0.355	G 0.857/0.577	
15	33	61	110	174	NOT AVAILABLE	
20	39	72	129	205		
25	45	83	148	235		
30	51	94	168	266		
40	62	116	207	328		
50	74	138	245	389		
60	86	160	284	451		
70	98	181	323	512		
75	104	192	342	543		882
80	109	203	362	573		932
90	121	225	400	635	1032	
100	133	247	439	696	1132	
125	162	301	536	850	1382	
150	192	356	633	1004	1632	
175	221	411	730	1158	1882	
200	251	465	827	1311	2132	
250	310	574	1021	1619	2631	
275	339	629	1118	1773	2881	
300	369	683	1215	1926	3131	
350	427	792	1409	2233	3630	
400	486	901	1603	2541	4130	
450	545	1011	1797	2848	4630	
500	604	1120	1991	3156	5129	
550	663	1229	2185	3463	5629	
600	722	1338	2379	3770	6129	
650	781	1447	2573	4078	6628	
700	840	1556	2767	4385	7128	
720	863	1600	2845	4509	7329	
750	898	1665	2961	4693	7627	
800	957	1774	3155	5000	8127	
850	1016	1883	3349	5307	8627	
900	1075	1993	3543	5615	9126	
950	1134	2102	3737	5922	9626	

Set Pressure	Orifice Diameter (in.)/Area (sq. in.)				
	C 0.295/0.068	D 0.400/0.126	E 0.534/0.224	F 0.672/0.355	G 0.857/0.577
1000	1193	2211	3931	6230	10,126
1050	1252	2320	4125	6537	10627
1100	1311	2429	4319	6844	11126
1150	1370	2538	4513	7152	11626
1200	1428	2647	4706	7459	12126
1250	1487	2756	4900	7767	12626
1300	1546	2865	5094	8074	13125
1350	1605	2974	5288	8381	13625
1400	1664	3084	5482	8689	14125
1440	1711	3171	5638	8936	14524
1450	1723	3193	5676	8996	14624
1500	1782	3302	5870	9304	15124
1550	1841	3411	6064	9611	NOT AVAILABLE
1600	1899	3520	6258	9918	
1650	1958	3629	6452		
1700	2017	3738	6646		
1750	2076	3847	6840		
1800	2135	3956	7034		
1850	2194	4066	7228		
1900	2253	4175	7422		
1950	2312	4284	7616		
2000	2371	4393	7810		
2050	2429	4502	8004		
2100	2488	4611	8198		
2150	2547	4720	8392		
2160	2559	4743	8432		
2200	2606	4829	8586		
2250	2665	4938	8780		
2300	2724	5047	8974		
2350	2783	5157	9168		
2400	2842	5266	9362		
2450	2900	5375	9556		
2500	2959	5484	9750		

Sizing of Safety Relief Valves

Given certain information as follows, Safety Relief Valves may be sized by use of various formulas prescribed by Appendix 11, Section VIII, Division I of the ASME Boiler and Pressure Vessel Code for capacities of orifices. The information as shown below allows sizing using the coefficient method.

Table I – Molecular Weight and Values of C for Gases

Gas	M	C
AIR	28.97	356
ACETYLENE	26.04	345
AMMONIA	17.03	351
BUTANE	58.12	324
CARBON DIOXIDE	44.01	345
CHLORINE	70.91	352
ETHANE	30.07	339
ETHYLENE	28.05	337
FREON 22	86.48	355
HYDROGEN	2.02	356
HYDROGEN SULFIDE	34.08	348
METHANE	16.04	346
METHYL CHLORIDE	50.48	337
NATURAL GAS (0.6)	17.40	344
NITROGEN	28.02	356
OXYGEN	32.00	356
PROPANE	44.09	331
SULFUR DIOXIDE	64.06	342

Relieving Capacity Formula Coefficient Method

$$Q \text{ (SCFM)} = \frac{KACP}{w \times 60} \sqrt{\frac{M}{T}}$$

- A = Effective Flow Area (Orifice Area in sq. in.)
- C = Gas Constant
- K = Flow Coefficient
- M = Molecular Weight
- P = Flowing pressure (set pressure x 1.1 + 14.7 psia)
- Q = Flow Rate in SCFM for gases
- T = Absolute temperature in degrees Rankin (°F + 460)
- w = Density of the gas in lb./ft.³ (Air = .0764 @ 14.7 psia)

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WellMark Series

W2601L and W2602L Safety Relief Valves

Relieving Capacity for Water • (10% Overpressure) Capacities in gallons per minute.

Set Pressure	Orifice Diameter (in.) / Area (sq. in.)				
	D 0.400/0.126	E 0.534/0.224	F 0.672/0.355	G 0.857/0.577	
15	13	23	36	NOT AVAILABLE	
20	14	26	41		
25	16	28	45		
30	17	31	49		
40	20	35	56		
50	22	40	63		
60	24	43	69		
70	26	47	74		
75	27	49	77		125
80	28	50	79		129
90	30	53	84		137
100	32	56	89		144
125	35	63	99		161
150	39	69	109		177
175	42	74	118	191	
200	45	79	126	204	
250	50	89	140	228	
275	52	93	147	239	
300	55	97	154	250	
350	59	105	166	270	
400	63	112	178	289	
450	67	119	188	306	
500	71	125	199	323	
550	74	131	208	339	
600	77	137	218	354	
650	80	143	227	368	
700	83	148	235	382	
720	85	150	238	388	
750	86	154	243	395	
800	89	159	251	408	
850	92	163	259	421	
900	95	168	267	433	
950	97	173	274	445	

Set Pressure	Orifice Diameter (in.) / Area (sq. in.)			
	D 0.400/0.126	E 0.534/0.224	F 0.672/0.355	G 0.857/0.577
1000	100	177	281	457
1050	102	182	288	468
1100	105	186	295	479
1150	107	190	301	490
1200	109	194	308	500
1250	111	198	314	511
1300	114	202	320	521
1350	116	206	326	531
1400	118	210	332	540
1440	120	213	337	548
1450	120	213	338	550
1500	122	217	344	559
1550	124	221	350	NOT AVAILABLE
1600	126	224	355	
1650	128	228		
1700	130	231		
1750	132	235		
1800	134	238		
1850	136	241		
1900	137	244		
1950	139	248		
2000	141	251		
2050	143	254		
2100	145	257		
2150	146	260		
2160	147	261		
2200	148	263		
2250	150	266		
2300	151	269		
2350	153	272		
2400	154	275		
2450	156	278		
2500	158	280		

Sizing of Safety Relief Valves

Given certain information as follows, Safety Relief Valves may be sized by use of various formulas prescribed by Appendix 11, Section VIII, Division I of the ASME Boiler and Pressure Vessel Code for capacities of orifices. The information as shown below allows sizing using the coefficient method.

Specific Gravity of Common Liquids

Liquid	Specific Gravity	Liquid	Specific Gravity
AMMONIA	0.606	KEROSENE	0.818
BENZENE	0.883	METHANOL	0.789
BUTANE	0.558	N-OCTANE	0.695
CO2	0.683	PROPANE	0.511
ENGINE OIL	0.887	R-12	1.315
ETHANOL	0.786	R-22	1.195
GASOLINE	0.752	R-134A	1.211
GLYCERINE	1.265	WATER	1.000

Relieving Capacity Formula Coefficient Method

$$Q \text{ (GPM)} = 38KA \sqrt{\frac{P - P_d}{G}}$$

Q (GPM) = Flow Rate in GPM

A = Effective Flow Area (Orifice Area in sq. in.)

K = Flow Coefficient for Liquid (.628)

P = Flowing Pressure (Set pressure x 1.1 + 14.7)

P_d = Discharge pressure (Pressure psia)

G = Specific Gravity of fluid (Water = 1)

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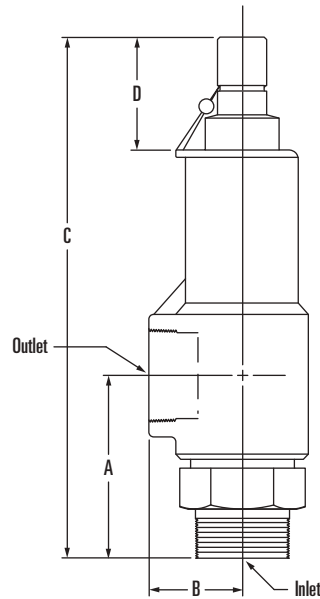
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WellMark Series

W2601 and W2602 Safety Relief Valves



Threaded Dimensional Data

Valve Configuration	Dimension (in.)				Weight (lbs.)
	A	B	C	D	
1/2" x 1"	3.25	1.88	10.5	2.375	7
3/4" x 1"					
1" x 1 ^{**} *					
1" x 1 1/2"					
1 1/4" x 2"	4.62	2.38	13.25	2.875	14
1 1/2" x 2"					
2" x 2 ^{***}					

*Standard configuration for Series 2601. **Standard configuration for Series 2602.

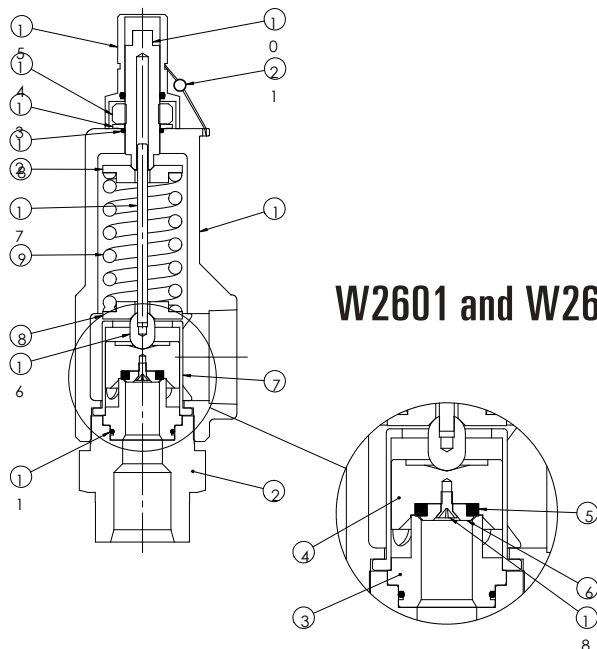
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WellMark Series



W2601 and W2602 Safety Relief Valves

Parts List, W2601

Item	Description	Material	Qty.	Part No.
1	BONNET	SA-216 GR.WCB CS	1	1118928
2	SEAT FRAME 1/2"	SA-105 FS	1	1125964
	SEAT FRAME 3/4"	SA-105 FS	1	1126320
	SEAT FRAME 1"	SA-105 FS	1	1122293
3	SEAT "C" ORIFICE	SA-276 TY. 316 SS	1	1122294
	SEAT "D" ORIFICE	SA-276 TY. 316 SS	1	1122295
	SEAT "E" ORIFICE	SA-276 TY. 316 SS	1	1120643
4	PLUG "C" AND "D" ORIFICE	SA-276 TY. 316 SS	1	1123680
	PLUG "E" ORIFICE	SA-276 TY. 316 SS	1	1122297
5	SQ. O-RING "C" AND "D"	VITON	1	1145692
	SQ. O-RING "E"	VITON	1	1145693
6	O-RING HOLDER "C" AND "D"	SA-276 TY. 316 SS	1	1145518
	O-RING HOLDER "E" ORIFICE	SA-276 TY. 316 SS	1	1145108
7	PLUG GUIDE "C" AND "D"	SA-351 SS	1	1123729
	PLUG GUIDE "E" ORIFICE	SA-351 SS	1	1125161
8	SPRING GUIDE	SA-29 CS	2	1124203
9	SPRING "C" AND "D" 15-80#	302 SS	1	1122138
	SPRING "C" AND "D" 80-250#	302 SS	1	1121795
	SPRING "C" AND "D" 250-400#	302 SS	1	1120228
	SPRING "C" AND "D" 400-800#	302 SS	1	1120127
	SPRING "C" AND "D" 800-1600#	17-7 SS	1	1122741
	SPRING "C" AND "D" 1600-2500#	17-7 SS	1	1123670
	SPRING "E" 15-50#	302 SS	1	1122138
	SPRING "E" 50-150#	302 SS	1	1121795
	SPRING "E" 150-300#	302 SS	1	1120228
	SPRING "E" 300-500#	302 SS	1	1120127
	SPRING "E" 500-1000#	17-7 SS	1	1122741
	SPRING "E" 1000-2500#	17-7 SS	1	1123670
10	ADJUSTING SCREW	307 CS	1	1121900
11	O-RING	VITON	1	1032515
12	O-RING	VITON	1	1122133
13	SEAL WASHER	SS/BUNA-N	1	1124855
14	JAM NUT	STEEL	1	1123641
15	CAP WITH O-RING	ALUMINUM / BUNA	1	1126810
16	GUIDE	SA-29 CS	1	1122296
17	GUIDE STEM	SA-29 CS	1	1121682
18	SCREW "C" AND "D" ORIFICE	18-8 SS	1	1120223
	SCREW "E" ORIFICE	18-8 SS	1	1120637
* 19	NAMEPLATE	304 SS	1	1150439
* 20	DRIVE SCREW	18-8 SS	4	1032590
21	SEAL WIRE AND LEAD	STEEL AND LEAD	1	1125115

* NOT SHOWN

Parts List, W2602

Item	Description	Material	Qty.	Part No.
1	BONNET	SA-216 GR.WCB CS	1	1119673
2	SEAT FRAME 1 1/4"	SA-105 FS	1	1126846
	SEAT FRAME 1 1/2"	SA-105 FS	1	1124721
	SEAT FRAME 2"	SA-105 FS	1	1119647
3	SEAT "E" ORIFICE	SA-276 TY. 316 SS	1	1125290
	SEAT "F" ORIFICE	SA-276 TY. 316 SS	1	1123681
	SEAT "G" ORIFICE	SA-276 TY. 316 SS	1	1122691
4	PLUG "E" ORIFICE	SA-276 TY. 316 SS	1	1120250
	PLUG "F" ORIFICE	SA-276 TY. 316 SS	1	1125244
	PLUG "G" ORIFICE	SA-276 TY. 316 SS	1	1123252
5	SQ. O-RING "E" ORIFICE	VITON	1	1145693
	SQ. O-RING "F" ORIFICE	VITON	1	1145696
	SQ. O-RING "G" ORIFICE	VITON	1	1145697
6	O-RING HOLDER "E" ORIFICE	SA-276 TY. 316 SS	1	1145108
	O-RING HOLDER "F" ORIFICE	SA-276 TY. 316 SS	1	1145473
	O-RING HOLDER "G" ORIFICE	SA-276 TY. 316 SS	1	1145474
7	PLUG GUIDE "E" ORIFICE	SA-351 SS	1	1125790
	PLUG GUIDE "F" ORIFICE	SA-351 SS	1	1126370
	PLUG GUIDE "G" ORIFICE	SA-351 / 316 SS	1	1120897
8	SPRING GUIDE	SA-29 CS	2	1123682
9	SPRING "E" 15-75#	302 SS	1	1121639
	SPRING "E" 75-250#	302 SS	1	1119617
	SPRING "E" 250-500#	302 SS	1	1121640
	SPRING "E" 500-1200#	302 SS	1	1124356
	SPRING "E" 1200-2500#	17-7 SS	1	1122251
	SPRING "F" 15-40#	302 SS	1	1121639
	SPRING "F" 40-200#	302 SS	1	1119617
	SPRING "F" 200-400#	302 SS	1	1121640
	SPRING "F" 400-800#	302 SS	1	1124356
	SPRING "F" 800-1600#	17-7 SS	1	1122251
	SPRING "G" 75-100#	302 SS	1	1119617
	SPRING "G" 100-200#	302 SS	1	1121640
	SPRING "G" 200-600#	302 SS	1	1124356
	SPRING "G" 600-1000#	17-7 SS	1	1122251
	SPRING "G" 1000-1500#	17-7 SS	1	1119093
10	ADJUSTING SCREW	307 CS	1	1125245
11	O-RING	VITON	1	1022452
12	O-RING	VITON	1	1035982
13	SEAL WASHER	SS/BUNA-N	1	1122682
14	JAM NUT	STEEL	1	1122669
15	CAP WITH O-RING	ALUMINUM / BUNA	1	1126251
16	GUIDE	SA-29 CS	1	1122296
17	GUIDE STEM	SA-29 CS	1	1122235
18	SCREW "E" ORIFICE	18-8 SS	1	1120637
	SCREW "F" AND "G" ORIFICE	18-8 SS	1	1121893
* 19	NAMEPLATE	304 SS	1	1150439
* 20	DRIVE SCREW	18-8 SS	4	1032590
21	SEAL WIRE AND LEAD	STEEL AND LEAD	1	1125115

* NOT SHOWN

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WellMark Series

1392V

W1392V Vapor Relief Valve

Application

This WellMark Relief Valve is for the control of vapor emissions. It can be used on glycol dehydrator reboilers to meet EPA standards, or any situation where pressure in ounces is to be controlled.

Features

- All Stainless Steel Internals
- Viton® Seals
- Field Adjustable
- Plated/Coated Externals

Specifications

Process Connection	2" x 2" NPT
Gauge Connection	1/4" NPT
Temperature	400°F
Pressure Setting	3 oz. to 4 lb.
Orifice	1 5/8" Diameter
Spring Range	3 to 12 oz. 3/4 to 4 lb. Non-Code

Determining the Model Number

Example given: Standard Model W1392V-S Vapor Relief Valve with 3 to 12 oz. Spring Range, Set at 8 oz.

MODEL W1392V-S

W1392V • Vapor Relief Valve

Spring Range

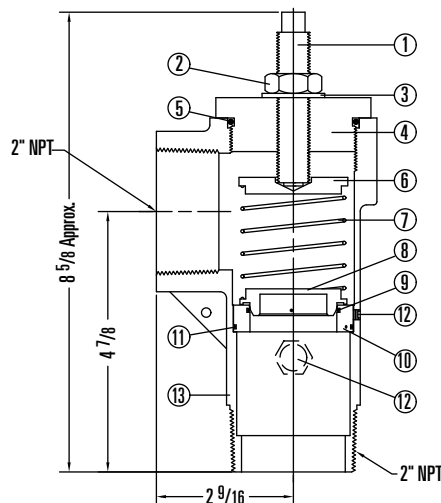
S • 3 to 12 oz.

4 • 3/4 to 4 lb.

NOTE: Specify set pressure when ordering.



Dimensional Data



Parts List

Item	Description	Qty.	Part No.
1	ADJUSTMENT SCREW, STEEL	1	10173
2	JAM NUT, STEEL	1	10174
3	SEAL WASHER, STEEL	1	10578
4	CAP, STEEL	1	20623
5	O-RING, VITON®	1	10381
6	SPRING GUIDE, STAINLESS	1	20622
7	SPRING, 3-12 OZ., STAINLESS	1	10610
	SPRING, 3/4-4 LB., STAINLESS	1	10680
8	PLUG, STAINLESS	1	20620
9*	O-RING, VITON®	1	10380
10	SEAT, STAINLESS	1	20621
11*	SEAT O-RING, VITON®	1	10611
12	SET SCREW, STEEL	1	10485
13	BODY, DUCTILE	1	30360
14	BONNET (NOT SHOWN), PLASTIC	1	10175
15	SEAL WIRE (NOT SHOWN)	1	10178
16	NAME PLATE (NOT SHOWN)	1	10076B
17	DRIVE SCREWS (NOT SHOWN)	1	10075
18	PLUG, STEEL	1	10149

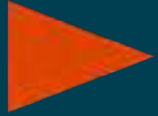
*Recommended Spare Part

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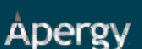


Wellmark Regulators

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WellMark Series

W7702 Back Pressure Regulator (BPR)

Application

The WellMark Back Pressure Regulator is an excellent and economical device for automatic relief of pressure in liquid service. It is actuated by the static upstream pressure, which causes the valve to open at set pressures. The degree of opening will vary and increase in proportion to the increase in pressure over the opening pressure.

The WellMark Back Pressure Regulator is offered in a 2" size. The 2" is suitable for pressure settings up to 1500 psi.

Recommended for a variety of oil and gas production applications, including the following:

Paraffin:

A common cause of paraffin build-up is gas breaking out of solution in the tubing string. Through use of this regulator, constant pressure can be maintained on the oil column, permitting gas bubbles to be pumped out of the string before they rupture and break out of solution.

Heading up:

This regulator, installed on wells that tend to head up and flow, will assure a full tubing string by maintaining constant pressure on the oil column. This assures continuous lubrication of the polish rod, adding to the life of the stuffing box rubbers. This also enhances efficiency of the bottom hole pump.

By-Pass to Casing:

This regulator can also be used as a by-pass to the casing in event lead lines should freeze or get plugged.

Other Uses:

For LACT units to assure full-line operation and for safety relief on separators or casing.

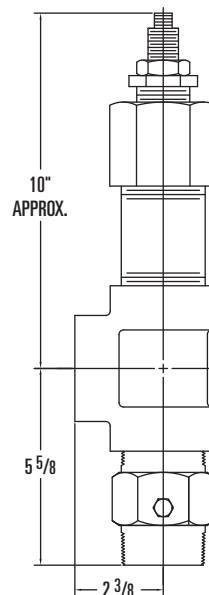
Specifications

Process Connections 2" NPT
 Operating Pressure 1500 psi Max.
 Pressure Setting Adjustment 5-1500 psi
 Operating Temperature -20°F to 300°F

This unit features outside adjustment and is offered in a choice of four pressure ranges. Springs are either steel, stainless steel, or monel as indicated in the parts list. The standard Nipple, Reference No. 6 on the illustrated cutaway picture, is schedule 80, and the standard Tee, Reference No. 11, is forged steel.



Dimensional Data



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WellMark Series

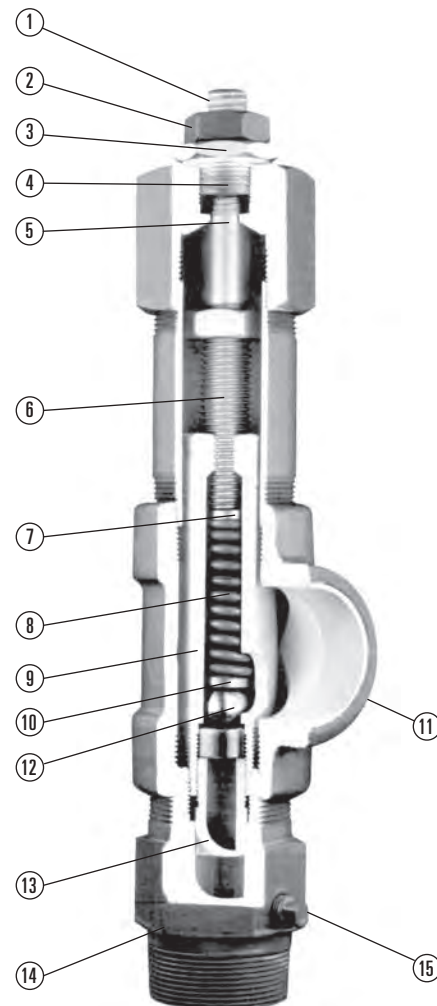
W7702

W7702 Back Pressure Regulator (BPR)

Parts List

Item	Description	Qty.	Part No.
1	ADJUSTMENT SCREW, STEEL	1	20121
2	LOCK NUT, STEEL	1	10141
3	PACKING GLAND, STEEL	1	20122
4*	PACKING (2), ROPE	1	20123
5	PACKING CAP, STEEL	1	30062
6	2 X 4 H.P. NIPPLE, STEEL	1	10143
7	SPRING KEEPER, STEEL	1	20124
8	SPRING (5-200), MONEL	1	10144
	SPRING (10-500), 302 S.S.	1	10145
	SPRING (10-900,10-1500), STEEL	1	10146
9	CAGE, STEEL	1	30063
10	SPRING KEEPER, STEEL	1	20124
11	2" TEE, STEEL	1	10148
12*	BALL & SEAT, STAINLESS	1	20125
	BALL & SEAT (10-1500), STAINLESS	1	20126
13	SEAT RETAINER, STEEL	1	20127
14	BODY, STEEL	1	30064
15	PLUG, STEEL	1	10149

* Recommended Spare Part



How To Order

Pressure Range	Model No.	Wt./Lbs.
5-200 PSI	W7702-2	15
10-500 PSI	W7702-5	15
10-900 PSI	W7702-9	15
10-1500 PSI	W7702-15	16

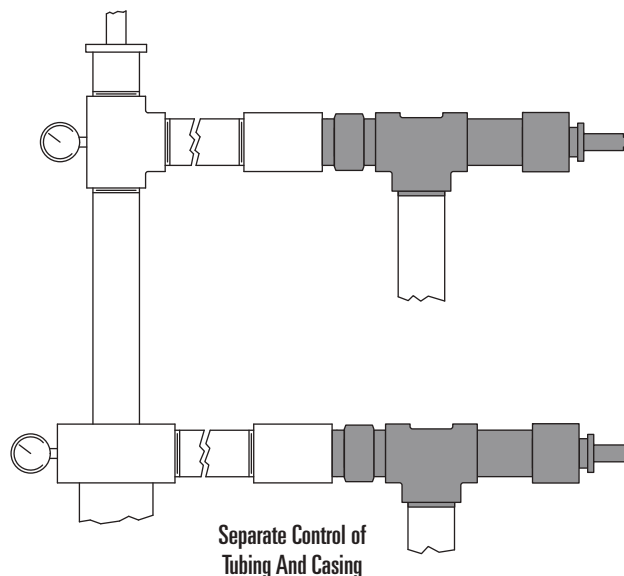
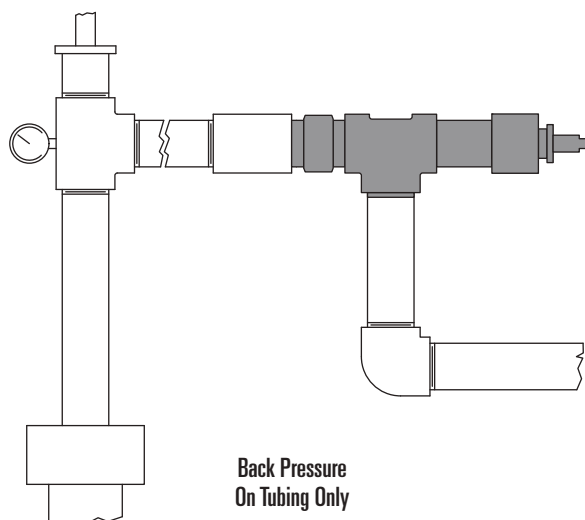
Steel tee and Schedule 80 nipple, Ref. Nos. 6 and 11, are standard on all models.

Cage Assemblies Available (order by part no.)

Part No.	Pressure Range
20608	5-200 PSI
20743	10-500 PSI
20404	10-900 PSI
20421	10-1500 PSI

Consisting of Ref. No. 1,7,8,9,10, 12 & 13

Typical Hook Ups



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WellMark Series

“Top Gun” High Pressure Regulator Application

In the tradition of providing the best of the best, WellMark has developed the “Top Gun” Series 2001PR for accurate reduction of high pressure gas before it enters the distribution system. It is designed for inlet pressures up to 1500 psi and outlet pressures from 27 to 500 psi.



Features

- Multiple Orifice Sizes: Brass or Stainless
- Easy Maintenance
- 6 Spring Ranges
- Rugged WCB Cast Steel Body
- NACE Compatible Option

Specifications

Connection 1" and 2" FNPT
 Seat Ring Orifices 1/8", 3/16", 1/4", 3/8" or 1/2"
 Operating Temperature -20°F to +150°F
 Materials See Parts & Materials
 Maximum Inlet Pressure and Pressure Drop See Table 1
 Outlet Pressure Ranges See Table 2
 Flow Capabilities See Table 3

Overpressure Protection

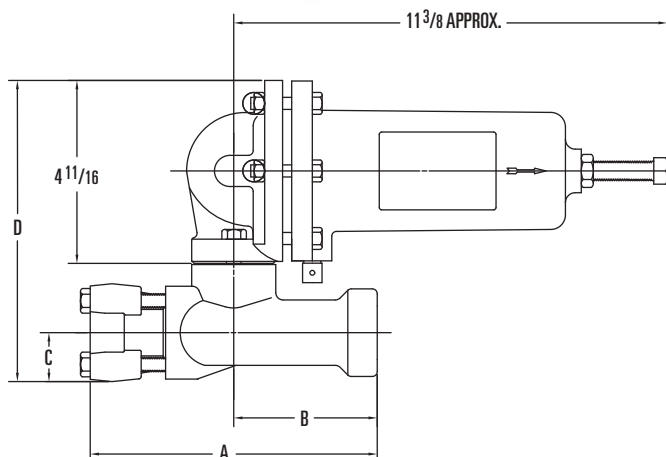
As is true with most regulators, the WellMark “Top Gun” Series 2001PR Regulator has an outlet pressure rating that is lower than the inlet pressure rating. Overpressure protection is needed to avoid overpressure if the actual inlet pressure can exceed the outlet pressure rating.

Table 1. Max. Inlet Pressures and Pressure Drops

Port Diameter	1/8"	3/16"	1/4"	3/8"	1/2"
MAX. ALLOWABLE INLET PRESSURE, PSIG ⁽¹⁾	1500	1500	1500	1000	750
MAX. ALLOWABLE PRESSURE DROP, PSID	1500	1500	1000	500	250

1. The sum of the outlet pressure setting and the maximum allowable pressure drop determines the maximum allowable inlet pressure for a given installation. For example, with a 3/8" seat ring orifice (maximum pressure drop of 500 psi) and a 275 psig outlet pressure setting, the maximum inlet pressure is 775 psig (500 psi + 275 psig).

Dimensional Data



General Dimensions

Size	A	B	C	D
1"	7 3/8	3 11/16	1 3/16	7 5/8
2"	7 7/8	3 15/16	2"	8 7/16

Table 2. Outlet Pressure Ranges

Outlet Pressure Range, Psig	27-50	46-95	90-150	150-200	200-275	275-500
MAXIMUM OUTLET PRESSURE OVER PRESSURE SETTING ⁽¹⁾ , PSIG			200			200 ⁽²⁾
MAXIMUM EMERGENCY OUTLET (CASING) PRESSURE, PSIG			550			

1. Internal parts of the regulator may be damaged if the outlet pressure exceeds the pressure setting beyond the amounts shown.
2. This applies to outlet pressure settings below 350 psig only. For pressure settings above 350 psig, outlet pressure is limited to 550 psig, the maximum emergency outlet (casing) pressure.

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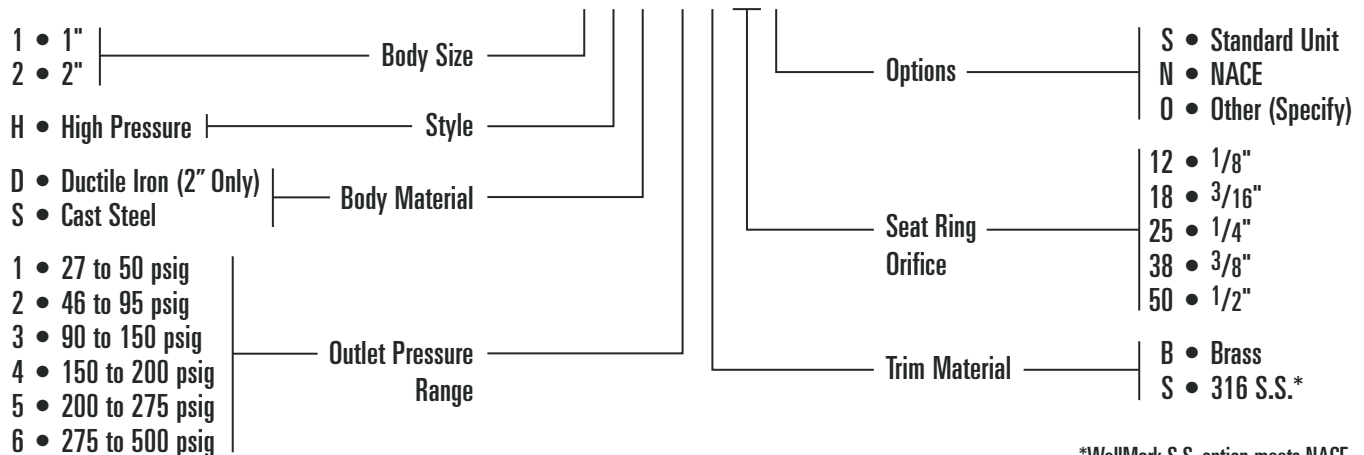
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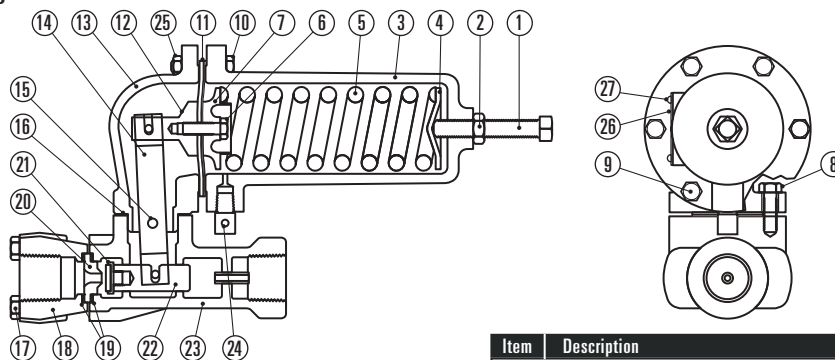
“Top Gun” High Pressure Regulator Determining the Model Number

Example given: A 1" Model 2001PR High Pressure Regulator Constructed of Cast Steel with an Outlet Pressure Range of 46 to 95 psig, Utilizing Brass Trim with a 1/8" Seat Ring Orifice and No Options Chosen.

MODEL 1 H S-2 B 12 S



*WellMark S.S. option meets NACE requirements. When ordering, use the "N" designation.



Parts List

Item	Description	Qty.	Part No.
1	ADJ. SCREW, 27-50 OUTLET PRESSURE	1	11014
	ADJ. SCREW, 46-95 OUTLET PRESSURE	1	11013
	ADJ. SCREW, 90-500 OUTLET PRESSURE	1	10097
2	JAM NUT, STEEL	1	10098
3	SPRING HOUSING, STEEL	1	40440
4	UPPER SPRING GUIDE, UP TO 275 PSI	1	11001
	UPPER SPRING GUIDE, ABOVE 275 PSI	1	11032
5	SPRING, 27-50 OUTLET PRESSURE	1	11027
	SPRING, 46-95 OUTLET PRESSURE	1	11028
	SPRING, 90-150 OUTLET PRESSURE	1	11002
	SPRING, 150-200 OUTLET PRESSURE	1	11029
	SPRING, 200-275 OUTLET PRESSURE	1	11030
6	SPRING, 275-500 OUTLET PRESSURE	1	11031
6	CAP SCREW	1	11012
7	LOWER SPRING GUIDE, UP TO 275 PSI	1	40445
	LOWER SPRING GUIDE, ABOVE 275 PSI	1	40446
8	CAP SCREW	2	10090
9	CAP SCREW	2	11011
10	CAP SCREW	4	11010
11*	DIAPHRAGM, NEOPRENE	1	11004
	DIAPHRAGM, VITON®**	1	11033
12	CONNECTOR HEAD ASSEMBLY, BRASS	1	21052
	CONNECTOR HEAD ASSEMBLY, 316 S.S.**	1	21053
13	DIAPHRAGM ADAPTER, STEEL	1	40443
14	LEVER ASSEMBLY	1	21023
15	PIN, STAINLESS STEEL	1	11000

Item	Description	Qty.	Part No.
16*	GASKET	1	11008
17	CAP SCREW, 1"	4	11009
	CAP SCREW, 2"	4	11050
18	INLET ADAPTER, 1" STEEL	1	40442
	INLET ADAPTER, 2" STEEL	1	40589
19*	INLET BODY GASKET, COPPER	2	11005
	INLET BODY GASKET, COMPOSITION**	2	11015
20	ORIFICE, BRASS 1/8"	1	21042
	ORIFICE, BRASS 3/16"	1	21112
	ORIFICE, BRASS 1/4"	1	21028
	ORIFICE, BRASS 3/8"	1	21040
	ORIFICE, BRASS 1/2"	1	21041
	ORIFICE, 316 S.S. 1/8"***	1	21043
	ORIFICE, 316 S.S. 3/16"***	1	21093
	ORIFICE, 316 S.S. 1/4"***	1	21044
	ORIFICE, 316 S.S. 3/8"***	1	21045
	ORIFICE, 316 S.S. 1/2"***	1	21046
21*	VALVE DISK ASSEMBLY, BRASS/TFE	1	21026
	VALVE DISK ASSEMBLY, 316 S.S./TFE**	1	21047
22	VALVE CARRIER, BRASS	1	31005
	VALVE CARRIER, 316 S.S.**	1	31011
23	BODY, 1" STEEL WCB	1	40444
	BODY, 2" DUCTILE IRON	1	40588
24	BREATHER	1	05011-1640
25	HEX NUT	4	05000-1726
26	NAME PLATE	1	21039
27	DRIVER SCREW	4	10075
28	PLUG 1/8" NPT, 2" ONLY	1	06000-0494

*Included in Repair Kits: Repair Kit for Brass Trim Part No. 21054, Repair Kit for 316 S.S. Trim Part No. 21055

**Meets NACE MR0175-2002 Specifications

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WellMark Series

"Top Gun" High Pressure Regulator

Table 3. High Pressure Regulator Flow Capacities (scfh of 0.6 Specific Gravity Gas; based on 20% Droop)

Outlet Pressure Range, psig	Inlet Pressure, psig	Outlet Pressure, psig	Seat Ring Orifice Diameter (Inches)				
			1/8	3/16	1/4	3/8	1/2
27-50	60	50	900	2000	3100	5200	8100
			1300	2800	3800	7200	10,000
			1700	3500	5700	10,500	13,000
			2600	5700	8700	13,000	17,000
	200	3500	7800	11,000	16,000	19,000	
	300	5300	10,500	14,000	20,000	23,000	
46-95	60	50	800	1500	2400	4300	6400
			1200	2100	3100	5500	8000
			1500	3100	4200	7500	10,000
			2400	4500	6700	11,000	14,000
	200	3400	6600	9400	14,000	17,000	
	300	5200	8900	11,000	16,000	20,000	
46-95	60	75	1700	3200	5000	8000	13,000
			2200	4300	6700	10,000	15,000
			3500	7300	10,000	16,000	22,000
			4400	9400	13,000	19,000	24,000
	400	7100	14,000	19,000	27,000	—	
	575	9700	18,000	23,000	30,000	—	
90-150	60	100	2000	3600	5500	9200	13,000
			2500	4600	6800	11,000	16,000
			3600	6600	9400	13,000	22,000
			4400	8500	11,000	18,000	26,000
	350	6100	10,000	16,000	25,000	32,000	
	400	7000	13,000	18,000	27,000	—	
90-150	60	125	2400	4600	6700	11,000	17,000
			3500	6800	10,000	15,000	23,000
			4300	8900	12,000	19,000	29,000
			5200	10,000	15,000	25,000	34,000
	400	7300	14,500	19,000	29,000	—	
	500	7900	15,000	25,000	36,000	—	
90-150	60	150	3400	6800	10,000	16,000	26,000
			4400	8800	13,000	20,000	32,000
			5300	10,000	15,000	24,000	35,000
			7100	14,000	22,000	34,000	42,000
	650	9000	24,000	33,000	49,000	—	
	800	13,000	29,000	38,000	—	—	

Outlet Pressure Range, psig	Inlet Pressure, psig	Outlet Pressure, psig	Seat Ring Orifice Diameter (Inches)				
			1/8	3/16	1/4	3/8	1/2
150-200	200	150	3400	6200	9300	16,000	24,000
			4300	8800	12,000	20,000	27,000
			5300	10,000	15,000	24,000	30,000
			7100	14,000	21,000	32,000	38,000
	450	7600	15,000	24,000	36,000	—	
	650	9000	21,000	33,000	48,000	—	
150-200	200	200	4200	8300	12,000	20,000	30,000
			5200	10,000	16,000	25,000	35,000
			7800	16,000	26,000	43,000	50,000
			9500	22,000	34,000	55,000	—
	800	13,000	30,000	43,000	—	—	
	1000	16,000	37,000	50,000	—	—	
200-275	250	200	4200	8200	11,000	20,000	29,000
			5200	10,000	14,500	25,000	35,000
			7700	16,000	24,000	40,000	50,000
			9500	22,000	31,000	51,000	—
	800	13,000	29,000	42,000	—	—	
	1000	16,000	36,000	50,000	—	—	
200-275	300	250	4900	9000	15,000	28,000	42,000
			7000	14,000	23,000	40,000	56,000
			8500	18,000	29,000	51,000	65,000
			9500	22,000	34,000	59,000	—
	750	12,500	28,000	44,000	69,000	—	
	1000	16,000	39,000	58,000	—	—	
200-275	300	275	4700	9000	15,000	28,000	39,000
			6900	14,000	25,000	40,000	54,000
			8600	18,000	35,000	68,000	94,000
			11,000	28,000	51,000	95,000	—
	1000	16,000	39,000	67,000	—	—	
	1275	21,000	50,000	87,000	—	—	
275-500	300	275	4500	7500	10,000	20,000	31,000
			6600	12,000	16,000	31,000	43,000
			8600	16,000	21,000	39,000	56,000
			11,000	24,000	32,000	55,000	—
	1000	17,000	32,000	43,000	—	—	
	1275	21,000	40,000	53,000	—	—	
275-500	400	300	6600	11,000	16,000	31,000	42,000
			9700	18,000	23,000	44,000	63,000
			9900	19,000	26,000	48,000	—
			11,000	23,000	30,000	54,000	—
	800	13,000	26,000	35,000	61,000	—	
	900	15,000	29,000	39,000	—	—	
275-500	500	400	8300	16,000	24,000	44,000	62,000
			10,000	24,000	33,000	61,000	86,000
			13,000	30,000	41,000	76,000	—
			15,000	34,000	49,000	85,000	—
	1000	17,000	38,000	54,000	—	—	
	1200	20,000	46,000	63,000	—	—	
275-500	550	500	8700	16,000	26,000	50,000	77,000
			12,000	28,000	40,000	78,000	100,000
			15,000	34,000	52,000	92,000	—
			17,000	39,000	60,000	100,000	—
	800	10,000	26,000	49,000	—	—	
	1500	26,000	59,000	72,000	—	—	

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WellMark Series

“Mighty Gun” High Pressure Regulator

Application

This self-contained pressure-reducing regulator is designed for flexibility and is for low and high pressure systems. It can be used with natural gas, air, or other gases. It is primarily used to regulate pressure and volume to fuel gas valves or production instrumentation on oil and gas process equipment.

Features

- Multiple Orifice Sizes, 316 S.S. Std.
- Easy Maintenance: Trim can be replaced with the body in-line from top entry design.
- Protective Cap: Tamper Resistant Pressure Setting
- Steel body and die cast aluminum diaphragm housing.
- Body can be rotated to four positions with diaphragm housing for user convenience.
- NACE Compatible
- Utility Spring Range Available: 10 to 95 psig

Specifications

Connection 1" FNPT
 Seat Ring Orifices 3/32", 1/8", 3/16", 1/4", 3/8", or 1/2"
 Operating Temperature -20°F to 180°F
 Materials (NACE Compatible) See Parts
 Maximum Inlet Pressure, Differential Pressure, and Outlet Pressure Ranges See Table 1
 Flow Capacities See Table 2
 Maximum Spring and Diaphragm Housing Pressure See Table 3

Overpressure Protection

As is true with most regulators, the WellMark “Mighty Gun” Series 2002PR Regulator has an outlet pressure rating that is lower than the inlet pressure rating. Overpressure protection is needed to avoid overpressure if the actual inlet pressure can exceed the outlet pressure rating.



Dimensional Data

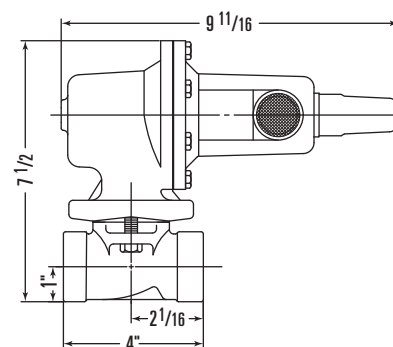


Table 1. Max. Pressure, Differential Press. & Outlet Pressure Ranges

Outlet Pressure Range Spring Part No. Color Code	Port Diameter (Inches)	Maximum Inlet Pressure (psig)	Maximum Differential Pressure (psig)
5 ⁽¹⁾ to 20 psig 11038 (YELLOW)	3/32	2000	2000
	1/8	1000	1000
	3/16	750	750
	1/4	500	500
	3/8	300	300
15 to 40 psig 11039 (GREEN)	1/2	250	250
	3/32	2000	2000
	1/8	1500	1500
	3/16	1000	1000
	1/4	750	750
35 to 80 psig 11040 (BLUE)	3/8	500	500
	1/2	300	300
	3/32	2000	2000
	1/8	2000	2000
	3/16	1750	1750
70 to 150 psig 11041 (RED)	1/4	1500	1500
	3/8	1000	1000
	1/2	750	750
	3/32	2000	2000
	1/8	2000	2000
	3/16	2000	2000
	1/4	1750	1750
	3/8	1250	1250
	1/2	750	750

1. For pressure settings under 10 psig, inlet pressure should be limited to approximately 100 psig so the set point adjustment can be reached.

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“Mighty Gun” High Pressure Regulator

Table 2. Flow Capacities in scfh of 0.6 Specific Gravity Natural Gas ⁽¹⁾

Outlet Pressure Range Spring Part No. Color Code	Outlet Press. Setting (psig)	Inlet Press. (psig)	Port Diameter (Inches)					
			3/32	1/8	3/16	1/4	3/8	1/2
5 to 20 psig ⁽²⁾ 11038 (YELLOW)	5 (3)	10	170	330	710	1100	1900	2500
		15	240	390	890	1600	2500	3350
		20	290	500	1160	2060	3400	4450
		30	380	670	1560	2800	4750	6900
		60	640	1170	2600	4710	8140	13,700
		75	770	1410	3150	5710	9790	14,500
		100	990	1800	4070	7310	12,500	16,000
	10	15	210	375	880	1590	2480	3300
		20	280	490	1150	2050	3380	4410
		30	380	670	1560	2800	4720	6840
		60	640	1170	2600	4710	8140	13,700
		75	770	1410	3150	5710	9790	14,500
		100	990	1800	4070	7310	12,500	16,000
		150	1420	2580	5850	10,500	17,000	18,000
		200	1850	3370	7630	13,700	18,000	18,500
		300	2700	4910	11,200	19,800	20,000	—
		500	4400	8090	15,700	20,000	—	—
		750	5400	12,000	18,000	—	—	—
		1000	5800	14,000	—	—	—	—
		1250	6300	—	—	—	—	—
	1500	6600	—	—	—	—	—	
	1750	6800	—	—	—	—	—	
	2000	7600	—	—	—	—	—	
	20	30	350	620	1450	2580	4360	6290
		50	550	1000	2280	4090	7670	14,100
		60	640	1170	2640	4750	9690	14,500
		100	990	1800	4070	7310	13,900	23,300
		150	1420	2580	5850	10,500	17,700	34,200
200		1850	3370	7630	13,700	26,600	39,100	
300		2700	4910	11,200	20,100	37,000	—	
500		4400	8090	18,300	32,900	—	—	
750		6600	12,000	23,600	—	—	—	
1000		8900	16,000	—	—	—	—	
1250		10,000	—	—	—	—	—	
1500		10,400	—	—	—	—	—	
1750		12,000	—	—	—	—	—	
2000	14,000	—	—	—	—	—		

Outlet Pressure Range Spring Part No. Color Code	Outlet Press. Setting (psig)	Inlet Press. (psig)	Port Diameter (Inches)					
			3/32	1/8	3/16	1/4	3/8	1/2
35 to 80 psig 11040 (BLUE)	60	75	700	1230	2760	4880	8630	16,100
		100	970	1740	4010	7000	13,000	19,300
		150	1420	2580	5850	10,500	18,900	32,800
		200	1850	3370	7630	13,700	24,000	42,200
		300	2700	4910	11,200	20,100	32,500	69,100
		500	4400	8090	18,300	32,900	64,000	94,300
		750	6600	12,000	27,200	43,380	66,900	130,000
		1000	8700	16,000	36,100	50,300	67,700	—
		1250	11,000	19,000	45,000	57,000	—	—
		1500	13,000	22,000	54,000	63,000	—	—
	1750	15,000	25,000	63,000	—	—	—	
	2000	17,000	28,000	—	—	—	—	
	80	100	900	1600	3750	6650	12,200	18,600
		150	1410	2580	5850	10,500	21,100	33,600
		200	1850	3370	7630	13,700	28,400	44,100
		300	2700	4910	11,200	20,100	43,300	75,400
		500	4400	8090	18,300	32,900	71,600	110,000
		750	6600	12,000	27,200	48,900	105,500	135,000
		1000	8700	16,000	36,100	64,900	118,000	—
		1250	11,000	19,000	45,000	80,000	—	—
1500		13,000	22,000	54,000	96,000	—	—	
1750		15,000	25,000	63,000	—	—	—	
2000	17,000	28,000	—	—	—	—		
70 to 150 psig 11041 (RED)	100	150	1170	2510	5540	8710	16,000	24,000
		200	1850	3370	7630	12,000	21,300	34,100
		300	2700	4910	11,200	19,400	30,100	53,200
		500	4400	8090	18,300	31,800	66,500	83,900
		750	6600	12,000	27,200	47,300	95,300	117,000
		1000	8700	16,000	36,100	59,700	100,000	120,000
		1250	11,000	19,000	45,000	72,000	114,000	—
		1500	13,000	22,000	54,000	86,000	—	—
		1750	15,000	25,000	63,000	95,000	—	—
		2000	17,000	28,000	71,000	—	—	—
	125	150	1250	2340	5340	9470	15,700	20,800
		200	1830	3320	7550	13,400	28,100	32,800
		300	2700	4910	11,200	20,100	36,300	52,600
		500	4400	8090	18,300	32,900	70,800	109,000
		750	6600	12,000	27,200	48,900	104,000	158,000
		1000	8700	16,000	36,100	64,800	136,000	160,000
		1250	11,000	19,000	45,000	80,000	145,000	—
		1500	13,000	22,000	54,000	96,000	—	—
		1750	15,000	25,000	63,000	112,000	—	—
		2000	17,000	28,000	71,000	—	—	—
150	200	1760	3200	7290	12,900	21,400	33,600	
	300	2700	4910	11,200	17,200	40,100	55,900	
	500	4400	8090	18,300	32,900	70,300	111,000	
	750	6600	12,000	27,200	48,900	104,000	160,000	
	1000	8700	16,000	36,100	64,800	138,000	162,000	
	1250	11,000	19,000	45,000	80,000	150,000	—	
	1500	13,000	22,000	54,000	96,000	—	—	
	1750	15,000	25,000	63,000	112,000	—	—	
	2000	17,000	28,000	71,000	—	—	—	

- Capacity is based on 20% droop unless otherwise noted. See “Capacity Data” for equivalent capacities of other gases.
- For pressure settings under 10 psig, inlet pressure should be limited to approximately 100 psig so the set point adjustment can be reached.
- For pressure set point of 5 psig, the droop is 2 psig.

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WellMark Series

"Mighty Gun" High Pressure Regulator

Capacity Data

Natural gas regulating capacities for selected inlet pressures and outlet pressure settings are shown in Table 2. Flows are in scfh (60°F and 14.7 psia) of 0.6 specific gravity, natural gas at 60°F. To determine the equivalent capacities for other gases, multiply the table capacity by the following factors: for air use 0.775, for nitrogen use 0.789, for propane use 0.628, or for butane use 0.548. For gases of other specific gravities, multiply the given capacity by 0.775, and divide by the square root of the particular specific gravity.

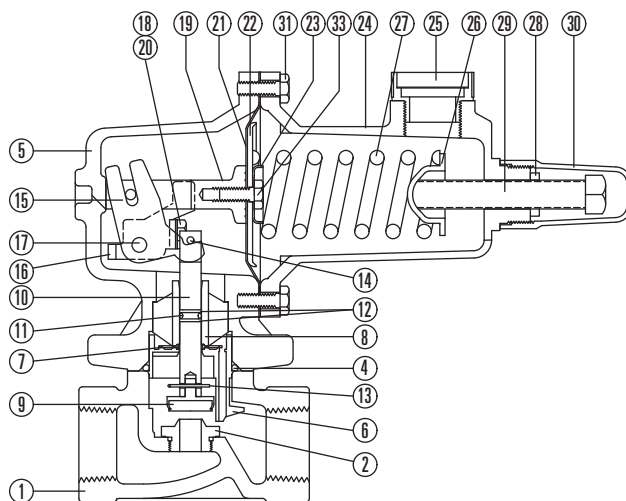
Parts List

Item	Description	Qty.	Part No.
1	BODY, 1" NPT, STEEL WCB	1	40520
2*	SEAT, 3/32" 316 S.S.	1	21069
	SEAT, 1/8" 316 S.S.	1	21070
	SEAT, 3/16" 316 S.S.	1	21071
	SEAT, 1/4" 316 S.S.	1	21072
	SEAT, 3/8" 316 S.S.	1	21073
	SEAT, 1/2" 316 S.S.	1	21074
3	CAP SCREW, STEEL PLATED (NOT SHOWN)	2	11092
4*	O-RING, VITON®	1	10423
5	DIAPHRAGM CASE, ALUMINUM	1	40522
6	BOOST BODY, NYLON	1	40526
7	STABILIZER, NITRILE	1	11036
8	STEM GUIDE, S.S. CF8M	1	21059
9*	DISK ASSEMBLY, 316 S.S./NEOPRENE	1	21082
	DISK ASSEMBLY, 316 S.S./NYLON	1	21083
10	STEM, 316 S.S.	1	21062
11*	O-RING, VITON®	1	05000-0769
12	BACK UP RING, TFE	2	11087
13	HAIR PIN CLIP, STAINLESS STEEL	1	11047
14	PIN, STAINLESS STEEL	1	11046
15	LEVER, STEEL PLATED	1	21061
16	LEVER RETAINER, STEEL PLATED	1	31015
17	LEVER PIN, STAINLESS STEEL	1	11034
18	LEVER CAP SCREW, 316 S.S.	2	11043
19	POST, & PIN ASSY.	1	21130
20	LOCK WASHER, 316 S.S.	2	11045
21*	DIAPHRAGM, NITRILE	1	11037
22	DIAPH. HEAD, STEEL PLATED	1	21078
23	SPRING SEAT, STEEL PLATED	1	21079
	SPRING SEAT FOR 10-95 SPRING ONLY	1	21395
24	UPPER HOUSING, ALUMINUM	1	40524
25	VENT ASSEMBLY, PLASTIC	1	11035
26	UPPER SPRING SEAT, STEEL	1	21080
27	SPRING, 5-20 psig	1	11038
	SPRING, 15-40 psig	1	11039
	SPRING, 35-80 psig	1	11040
	SPRING, 70-150 psig	1	11041
	SPRING, 10-95 psig	1	11211
28	JAM NUT, STEEL	1	21081
29	ADJUSTING SCREW, STEEL	1	11042
30	CAP, PLASTIC	1	31016
31	CAP SCREW, STEEL PLATED	8	11044
32	NAME PLATE, ALUMINUM (NOT SHOWN)	1	21094
33	CAP SCREW, STEEL PLATED	1	11043

*Recommended Spare Part

Table 3. Max. Spring and Diaphragm Housing Pressure

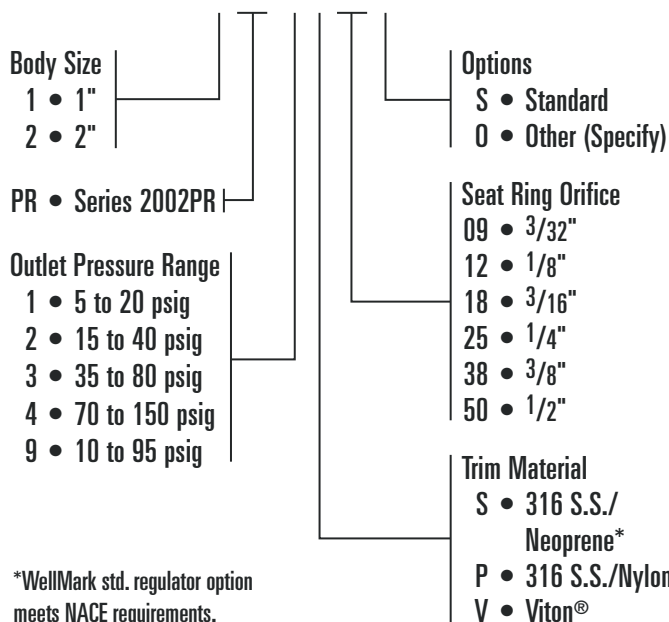
Maximum pressure to avoid leakage to atmosphere or possible damage to internal parts.	250 psi
Maximum pressure to prevent burst of housing or possible damage to internal parts.	375 psi
Maximum diaphragm housing over-pressure (above set point) to avoid damage to internal parts.	60 psi



Determining the Model Number

Example given: A 1" Model 2002PR Pressure Regulator with an Outlet Pressure Range of 70 to 150 psig and 1/4" Seat Ring Orifice.

MODEL 1 PR-4 S 25 S



*WellMark std. regulator option meets NACE requirements.

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Apergy

WellMark Series

“Mini Gun II” General Purpose Instrument And Gas Pressure Regulator

Application

The “Mini Gun II” Series W67R and W67FR regulators are standard equipment for pneumatic liquid level controls and valve positioners, and provide constant and reliable controlled reduced pressures. In addition, they can be used for general-purpose control of gas or air to other pneumatic instruments. The standard regulator is self-relieving. For safety reasons, the NACE version is not self-relieving.

Features

- Rugged, Compact & Lightweight Construction
- Cost Effective
- Internal Relief
- Filtered and Non-Filtered Options
- Filtered Unit, Panel Mount Standard
- Filtered Unit, 40 Micron Cellulose
- Spring Case Vent Standard, 1/4" FNPT
- Three Output Ranges (See Table 1)
- Easy In-line Maintenance
- Dual Outlets

Specifications

Body Material Diecast Aluminum
 Port Sizes 1/4" FNPT
 Inlet Supply Pressure 250 psi Max.
 Temperature -20°F to 180°F
 Four Output Ranges 0-120 psig (See Table 1)
 Capacities (See Table 2)

Table 1 • Outlet Pressure (psig)

Outlet Press. Range	Control Spring Data Part Number	Color Code
0 to 35	11161	UNPAINTED
0 to 60	11163	BLUE
0 to 120	11164	RED

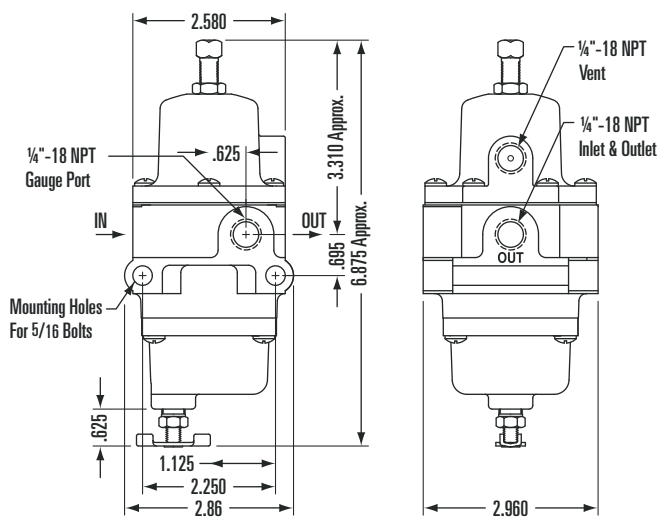
Table 2 • Pressure Range (psig) & Capacity (scfh)

Outlet Press.	Outlet Press. Range	Inlet Press >	Capacity In SCFH of 0.6 Specific Gravity Natural Gas				
			50	75	100	150	250
25	0-35	CAPACITY >	516	710	968	1290	1806
40	0-60	CAPACITY >	194	645	645	903	1806
80	0-120	CAPACITY >	—	—	516	839	1290

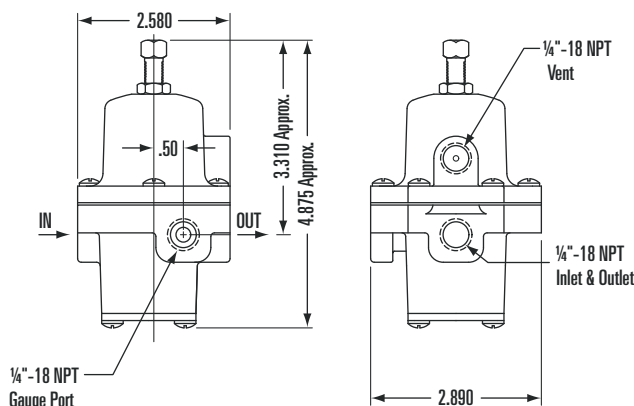


Just One of Many Offered From An Arsenal of General Purpose Pressure Regulators

Dimensional Data



Filtered Units



Non-Filtered Unit

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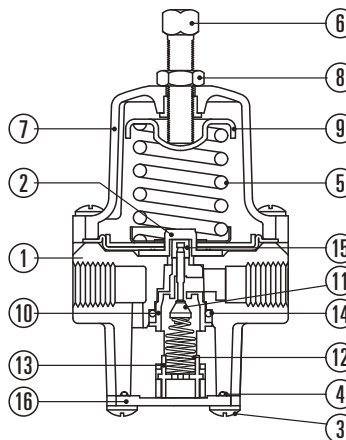
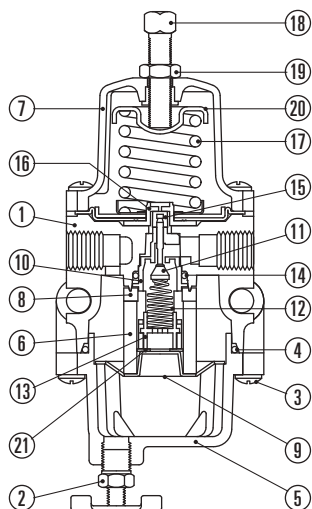
WellMark Series

“Mini Gun II” General Purpose Instrument And Gas Pressure Regulator

Determining the Model Number

Example given: A Filtered, 0-60 psig Outlet Pressure with Square Head Adjustment Screw, Mini Gun II Pressure Reducing Regulator.

“Mini Gun II” Model **W67FR 60 Q - N**



Parts List, Filtered Unit

Item	Description	Qty.	Part No.
1	BODY	1	40598
2	DRAIN VALVE	1	11065
3	SCREW	10	11124
4	O-RING	1	11123
5	DRIPWELL	1	31018
6	FILTER ELEMENT	1	11052
7	SPRING CASE	1	31017
8	FILTER GASKET	1	11053
9	FILTER RETAINER	1	21102
10	VALVE CARTRIDGE	1	40597
11	VALVE PLUG	1	11059
12	VALVE SPRING	1	11062
13	VALVE RETAINER	1	11055
14	O-RING	1	10116
15	SOFT SEAT	1	11057
16	DIAPHRAGM ASSY.	1	21181
17	SPRING, 0-35#	1	11061
	SPRING, 0-60#	1	11163
	SPRING, 0-120#	1	11164
18	ADJUSTING SCREW	1	11060
19	LOCK NUT	1	05000-2435
20	UPPER SPRING SEAT	1	21103
21	WASHER	1	11054
22*	WASHER	2	11064
23*	PIPE PLUG	1	11127

*Not Shown

Parts List, Non-Filtered Units

Item	Description	Qty.	Part No.
1	BODY	1	40793
2	DIAPHRAGM ASSY.	1	21182
3	SCREW	10	11124
4	O-RING	1	10181
5	SPRING, 0-35#	1	11061
	SPRING, 0-60#	1	11163
	SPRING, 0-120#	1	11164
6	ADJUSTING SCREW	1	11060
7	SPRING CASE	1	31017
8	LOCK NUT	1	05000-2435
9	UPPER SPRING SEAT	1	21103
10	VALVE CARTRIDGE	1	40597
11	VALVE PLUG	1	11059
12	VALVE SPRING	1	11062
13	VALVE RETAINER	1	11055
14	O-RING	1	10116
15	SOFT SEAT	1	11057
16	CAP	1	21174
17*	PIPE PLUG	1	11127

*Not Shown

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WellMark Series

W1301

“Mega Gun II” High Pressure Regulator

Application

A direct-acting, self-operated, high pressure gas regulator. Effective reduction of high-pressure gas to operate controllers, valve actuators and chemical injection pumps as well as to supply fuel gas to pilot operated fire tubes on various production equipment.

Rugged “oilfield” design with multi-purpose application reliability. It’s what makes this high pressure regulator the number one choice for reducing large inlet pressures to supply pressures required by other pneumatic driven devices.

Features

- 6000 psi Inlet Pressure
- Rugged Construction
- Cost Effective
- Three Outlet Ranges (See Table 1)



Just One of Many Offered From An Arsenal of General Purpose Pressure Regulators



Specifications

Maximum Inlet	6000 psi
Port Size	1/4" FNPT
	(One Inlet and Three Outlet Connections)
Vent	Four Holes, 5/32"
Materials	Brass or Nickel Plated
Temperature	-20°F to 180°F
Outlet Range	0 to 75 psi
	0 to 150 psi
	0 to 225 psi
(Cv) Flow Coefficient	Approx. .13

Dimensional Data

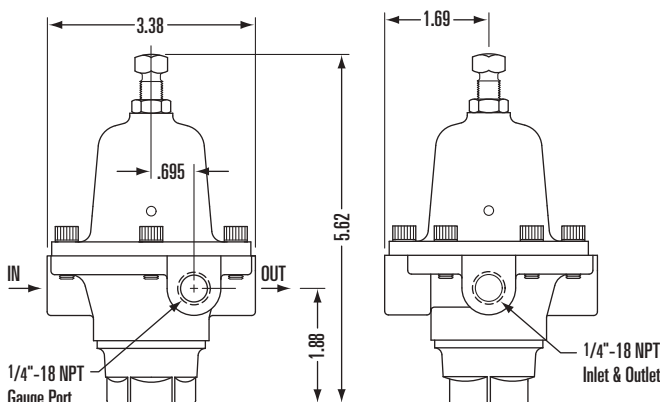


Table 1 • Pressure Range (psig) and Capacity (scfh)

Outlet Pressure Range	Outlet Pressure Setting	Inlet Press > Droop >	Capacity In SCFH of 0.6 Specific Gravity Natural Gas															
			100		250		500		750		1000		1500		2000			
			10%	20%	10%	20%	10%	20%	10%	20%	10%	20%	10%	20%	10%	20%		
0 to 75	25	CAPACITY >	245	374	387	619	516	839	645	968	671	993	697	1032	722	1058		
	50	CAPACITY >	361	516	619	1032	929	1290	1084	1548	1161	1677	1226	1806	1290	1935		
	75	CAPACITY >	323	516	774	1161	1161	1806	1290	2064	1419	2193	1548	2322	1677	2451		
0 to 150	75	CAPACITY >	258	452	645	1032	1032	1677	1226	1935	1290	2064	1419	2193	1548	2322		
	150	CAPACITY >	—	—	968	1290	1419	2322	1871	2967	2064	3354	2193	3612	2322	3870		
0 to 225	150	CAPACITY >	—	—	839	1161	1290	2193	1742	2838	1935	2903	2129	3548	2322	3870		
	225	CAPACITY >	—	—	645	1032	1806	2709	2451	3741	3096	4515	3483	5160	3870	5805		

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“Mega Gun II” High Pressure Regulator

Determining the Model Number

Example given: Standard Model 150-QBR, Series W1301 Regulator, 0-150 psi Outlet Pressure Range, Square Head Adjustment and Brass Body.

“Mega Gun II” Model 150 - Q BR

- 075 • 0-75 psi
- 150 • 0-150 psi
- 225 • 0-225 psi

Outlet
Pressure

Body
Material

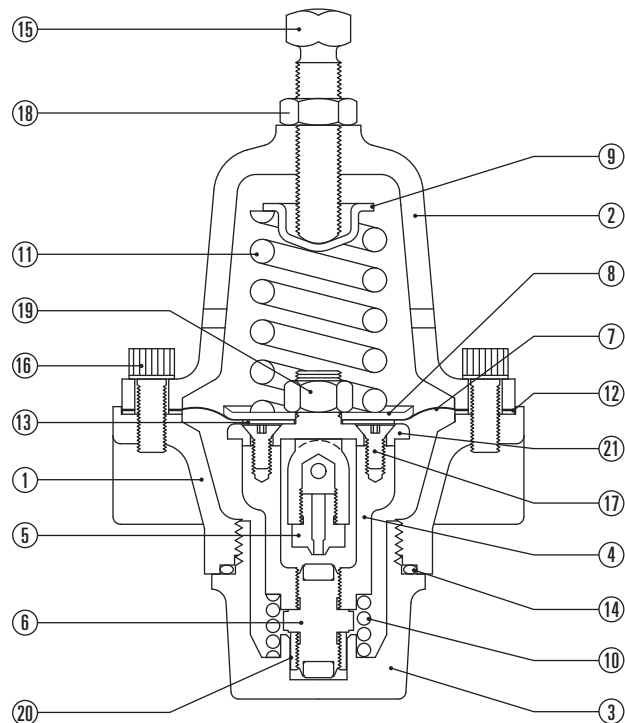
- BR • Brass
- NI • Ni-Plated

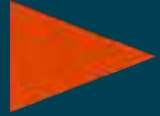
Adjustment
Screw

- Q • Square Head
- T • T-Bar

Parts List

Item	Description	Qty.	Part No.
1	BODY	1	40776
2	SPRING CASE	1	40778
3	BOTTOM CAP	1	31035
4	YOKE, BOTTOM	1	21152
5	SEAT RING	1	21154
6	VALVE DISK ASSEMBLY	1	21156
7	DIAPHRAGM	2	21155
8	DIAPHRAGM HEAD	1	21160
9	UPPER SPRING SEAT	1	21161
10	VALVE SPRING	1	11109
11	SPRING, 0-75#	1	11110
	SPRING, 0-150#	1	11115
	SPRING, 0-225#	1	11116
12	BODY GASKET	1	11108
13	DIAPHRAGM HEAD GASKET	1	11107
14	O-RING	1	10645
15	ADJUSTING SCREW	1	11111
16	SOCKET HEAD SCREW	6	11113
17	FLAT HEAD SCREW	2	11117
18	JAM NUT	1	11112
19	HEX NUT	1	11114
20	VALVE DISK COLLAR	1	21159
21	YOKE, TOP	1	21153



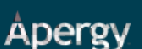


Wellmark Chemical Pumps

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WellMark Series

EIP Solar-Powered Chemical Injection Pump with DigiMax ADC Control

Pump Selection

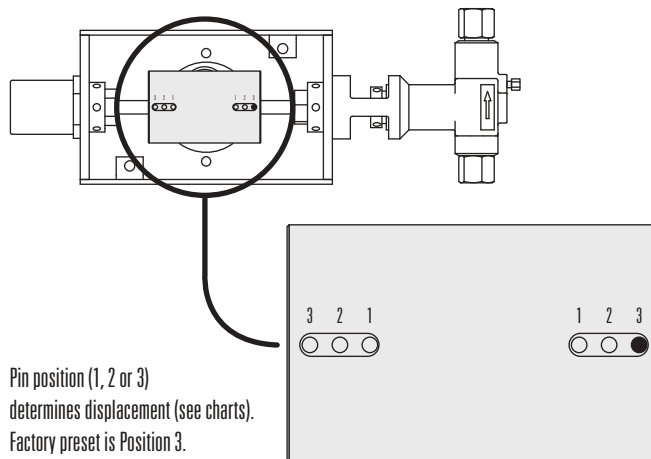
A wide ratio between OFF time and RUN time (OFF:RUN) will usually result in maximized efficiency of the battery/solar charging system. For example: 30 seconds OFF time versus 5 seconds RUN time would result in a ratio of 6:1. Ratios lower than 2:1 may result in progressive loss of battery charge, depending upon available sunlight and differential pumping pressure.

As reviewed against the "Pump Displacement & Timer Settings" charts, (refer to Installation, Operation & Maintenance Instructions for Solar-Powered Chemical Injection Pump) the pump's required rate should optimally fall within the middle of the pumps capacity range. This gives room for adjustment if the service criteria changes.

Operation

The WellMark Solar Electric Chemical Injection Pump features a control timer that allows a broad range of operating conditions.

The pump head can be adjusted for one of three different displacement



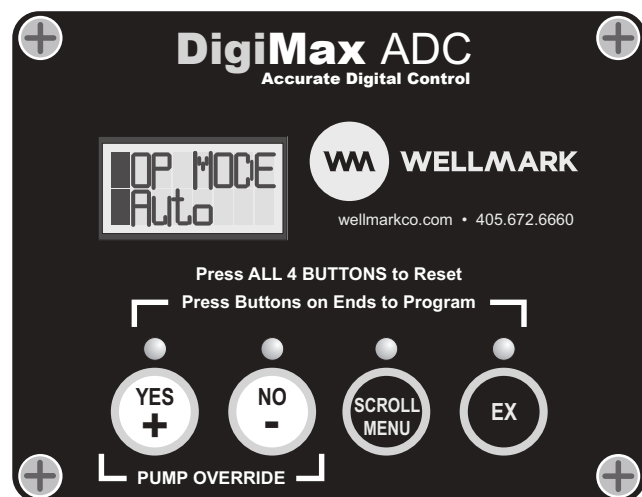
Pin position (1, 2 or 3) determines displacement (see charts). Factory preset is Position 3.

settings. Control of fluid volume can be achieved by utilizing an infinite number of combinations of RUN and OFF times along with three different displacement settings. Suggested settings for common volumes are listed on included charts.

Displacement Volumes by Pin Placement

Displacement Volumes	Plunger/Pin Position								
	1/4" Plunger			3/8" Plunger			1/2" Plunger		
	1	2	3	1	2	3	1	2	3
DISPLACEMENT PER STROKE (OZ.)	0.0170	0.0238	0.0306	0.0382	0.0535	0.0688	0.0679	0.0951	0.1223
DISPLACEMENT PER SECOND (SMALL MOTOR)	0.0085	0.0119	0.0153	0.0191	0.0267	0.0344	0.0339	0.0475	0.0611
DISPLACEMENT PER SECOND (LARGE MOTOR)	0.0181	0.0254	0.0326	0.0407	0.0570	0.0733	0.0724	0.1014	0.1304

DigiMax ADC Control/Timer



Temperature Sensor

The Control Timer is equipped with a Temperature Sensor feature. When activated this feature turns the pump off until the temperature drops to a set temperature threshold or lower, regardless of program settings. This allows the user to minimize the waste of methanol by only pumping during conditions approaching freezing temperatures.

Program Functions

Auto Mode

After a one-time setup, this feature allows the operator to simply enter the number of quarts desired per day - No need to consult RUN TIME and OFF TIME charts. The DigiMax ADC is programmed to be hassle-free. Of course, Manual Mode is available allowing the user to manually set the control if desired.

In Auto Mode Digital Display continuously indicates settings:

- Plunger Size and Pin Setting
- Battery Voltage
- Temp. Settings (ON/OFF, Temp. Threshold Setting and Current)
- Pump Rate (Quarts per Day)

In Manual Mode Digital Display continuously indicates settings:

- RUN Time
- OFF Time
- Cycle Count
- Battery Voltage
- Temp. Settings (ON/OFF, Temp. Threshold Setting and Current)

Pump Override

Runs pump continuously, overriding the program until the button is pressed again or until the pump runs for 5 minutes.

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WellMark Series

EIP Solar-Powered Chemical Injection Pump with DigiMax ADC Control

Pump Specifications

Specification	Plunger/Pin Position								
	1/4" Plunger			3/8" Plunger			1/2" Plunger		
	1	2	3	1	2	3	1	2	3
PISTON AREA (SQ. IN.)	0.0491			0.1104			0.1963		
STROKE (IN.)	0.624	0.874	1.124	0.624	0.874	1.124	0.624	0.874	1.124
DISPLACEMENT PER STROKE (CU. IN.)	0.0306	0.0429	0.0562	0.0689	0.0965	0.1241	0.1225	0.1716	0.2206
DISPLACEMENT PER STROKE (OZ.)	0.0170	0.0238	0.0306	0.0382	0.0535	0.0688	0.0679	0.0951	0.1223
DISPLACEMENT PER SECOND (SMALL MOTOR)	0.0085	0.0119	0.0153	0.0191	0.0267	0.0344	0.0339	0.0475	0.0611
DISPLACEMENT PER SECOND (LARGE MOTOR)	0.0181	0.0254	0.0326	0.0407	0.0570	0.0733	0.0724	0.1014	0.1304

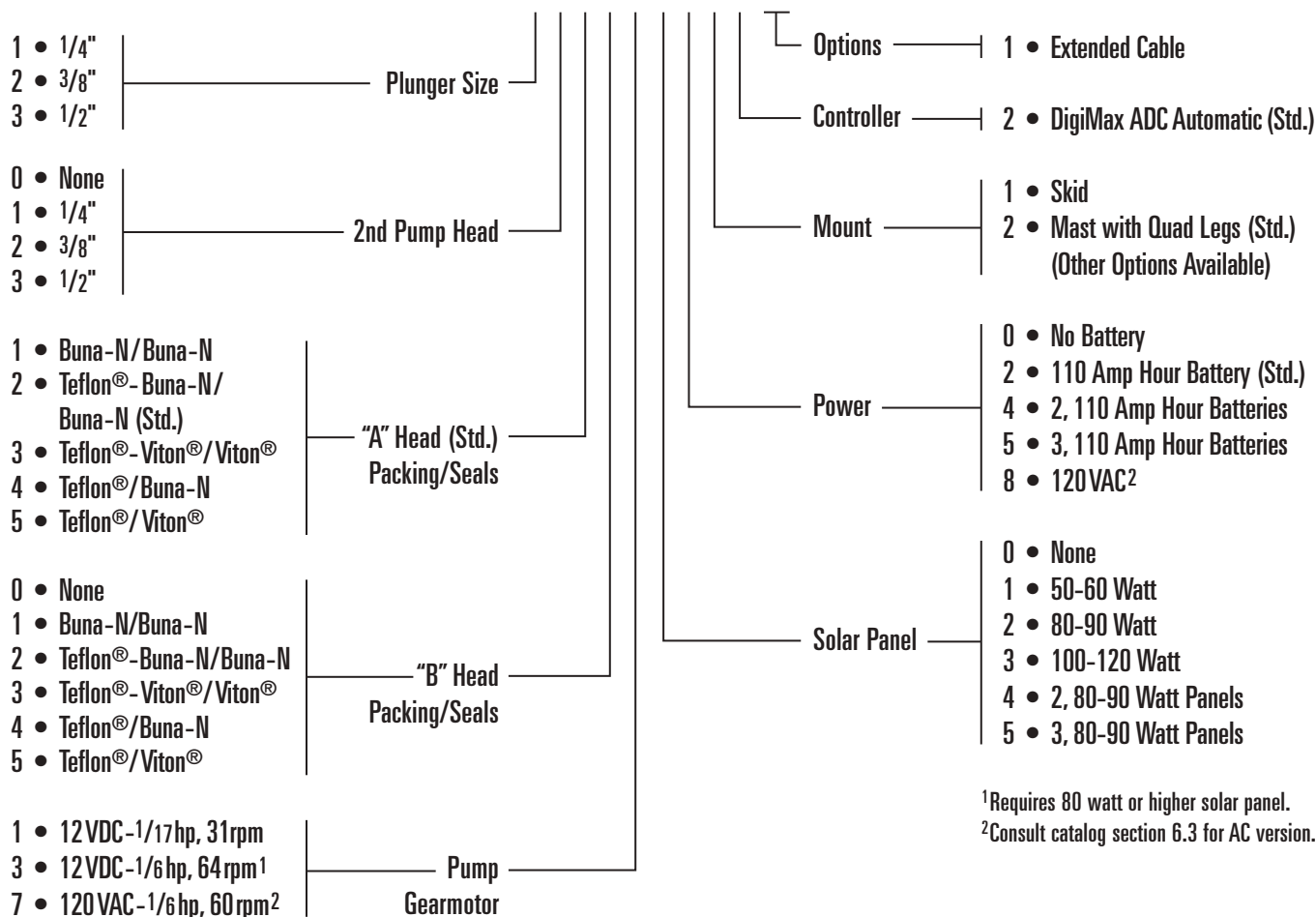
Maximum Discharge Pressures

Motor	Plunger/Discharge Pressure		
	1/4" Plunger	3/8" Plunger	1/2" Plunger
SMALL MOTOR - 1/17HP DC	3000 PSI	1500 PSI	800 PSI
LARGE MOTOR - 1/6HP DC AND AC	5000 PSI	2500 PSI	1200 PSI

Determining the Model Number

Example given: Standard Model EIP-102011222 Pump with 1/4" Plunger, No 2nd Head, Teflon®-Buna-N/Buna-N Packing and Seals, 1/17hp 12VDC Gearmotor, 50-60 Watt Solar Panel, 110 Amp Hour Battery, Mast with Quad Legs, DigiMax ADC Timer with Temperature Sensor.

MODEL EIP - 1 0 2 0 1 1 2 2 2 -



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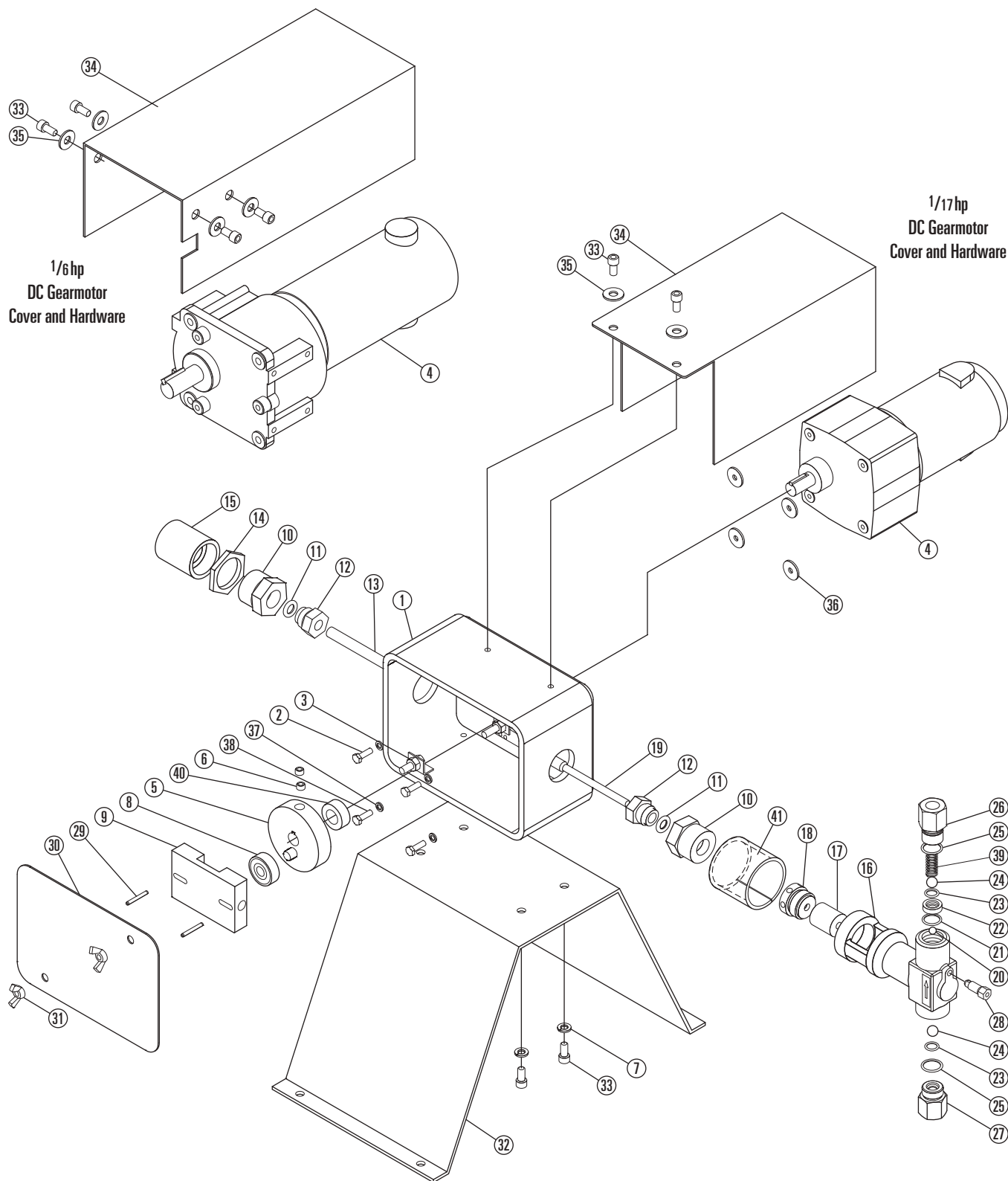
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WellMark Series

EIP Solar-Powered Chemical Injection Pump with DigiMax ADC Control

Solar-Powered Pump Unit Component Parts



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WellMark Series

EIP Solar-Powered Chemical Injection Pump with DigiMax ADC Control

Solar-Powered Pump Parts List

Item	Description	Qty.	Part No.	
1	HOUSING	1/17HP SMALL MOTOR	1	06500-7215
		1/6HP LARGE MOTOR	1	06500-7219
2	SCREW		2	05000-1692
3	HEX NUT		2	10007
4	MOTOR	1/17HP (SMALL)	1	06000-8487
		1/6HP (LARGE)	1	06000-8485
5	ECCENTRIC WHEEL	1/17HP SMALL MOTOR	1	06500-7205
		1/6HP LARGE MOTOR	1	06500-7209
6	SET SCREW		2	05000-2294
7	LOCK WASHER	1/17HP SMALL MOTOR	4	10709
		1/6HP LARGE MOTOR	7	10709
8	BEARING		1	06000-8477
9	RECIPROCATING BLOCK		1	05013-6995
10	BUSHING		2	05013-7012
11	O-RING		2	11017
12	GUIDE NUT		2	05013-7020
13	GUIDE		1	05013-6986
14	JAM NUT		1	05013-6968
15	CAP		1	05013-7119
16	FLUID END	1/4"	1	05013-6907
		3/8"	1	05013-6909
		1/2"	1	05013-6905
		1/4"	1	06000-9293
17	PACKING SET-TEFLON®/BUNA-N*	3/8"	1	06000-9301
		1/2"	1	06000-9319
		1/4"	1	05013-7005
18	GLAND NUT	3/8"	1	05013-7001
		1/2"	1	05013-7007
		1/4"	1	05013-6975
19	PLUNGER	3/8"	1	05013-6977
		1/2"	1	05013-6979
		1/4"	1	06000-0265
20	BALL - 1/4"		1	06000-0265
21	O-RING		1	10460
22	SEAT		1	05013-6950
23	O-RING		2	05000-0066

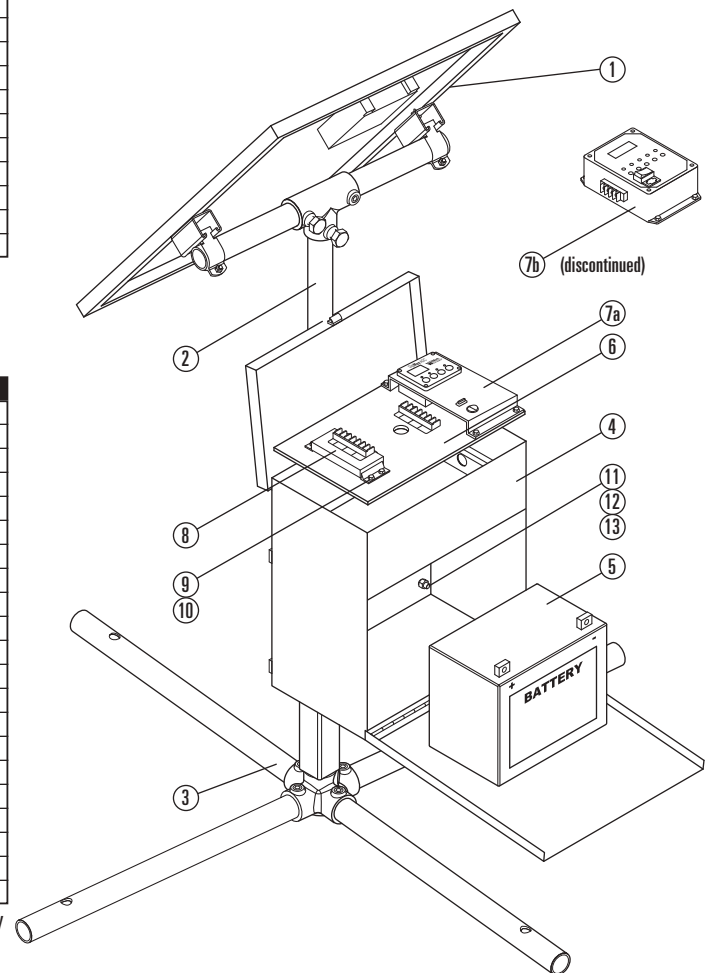
*Other packing materials available. Consult factory for information.

Panel, Control Box & Stand Parts List

Item	Description	Qty.	Part No.	
1	SOLAR PANEL ASSEMBLY	50 WATT	1	06500-7285
		80 WATT	1	06500-7281
		110 WATT	1	06500-7283
2	POST		1	05013-7180
3	QUAD-LEG ASSEMBLY		1	06500-7342
	SKID ASSEMBLY (NOT SHOWN)		1	06500-7227
4	BATTERY BOX		1	05013-7255
5	BATTERY		1	06000-8429
6	CONTROL MOUNTING PLATE		1	05013-7269
7a	DIGIMAX ADC CONTROL		1	06000-6385
7b	TIMER (DISCONTINUED)		1	06000-8435
8	CHARGER	FOR 50 WATT PANEL	1	06000-8425
		FOR 80 WATT PANEL	1	06000-8427
		FOR 110 WATT PANEL		CONSULT FACTORY
9	SCREW		8	05000-1585
10	NY-LOC NUT		8	05000-2567
11	SCREW		4	05000-1841
12	LOCK WASHER		4	11018
13	NUT		4	05000-2104
14	LOCK SCREW (NOT SHOWN)		1	05000-2005
15	STAKE (NOT SHOWN)		4	06500-7418

Note: Wiring harnesses are included with Solar Panel Assemblies and Pump Assemblies. They may however be ordered separately. Consult factory for part numbers, prices and availability. AC Power Versions, Consult Catalog Section 6.3.

Item	Description	Qty.	Part No.	
24	BALL - 3/8"	2	06000-0267	
25	O-RING	2	05000-0058	
26	DISCHARGE VALVE BODY	1	05013-6942	
27	SUCTION VALVE BODY	1	05013-6934	
28	BLEED SCREW	1	05013-1558	
29	PIN	2	001000-P	
30	HOUSING COVER	1	05013-7136	
31	WING NUT	2	05000-5642	
32	PUMP BASE	1	05013-7142	
33	SCREW, SOCKET HEAD	1/17HP SMALL MOTOR	6	05000-5648
		1/6HP LARGE MOTOR	8	05000-5648
34	MOTOR COVER	1/17HP SMALL MOTOR	1	05013-7192
		1/6HP LARGE MOTOR	1	05013-7190
35	FLAT WASHER	1/17HP SMALL MOTOR	2	007124-P
		1/6HP LARGE MOTOR	4	007124-P
36	FLAT WASHER	1/17HP SMALL MOTOR	4	05000-6148
37	LOCK WASHER	1/17HP SMALL MOTOR	4	05000-5836
38	SCREW	1/17HP SMALL MOTOR	4	05000-1585
		1/6HP LARGE MOTOR	3	05000-5646
39	SPRING		1	10606
40	SPACER	1/17HP SMALL MOTOR	1	05013-7535
		1/6HP LARGE MOTOR	1	05013-7543
41	PACKING COVER		1	05013-7527



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WellMark Series

EIP AC-Powered Electric Chemical Injection Pump with DigiMax ADC Control

Application

The WellMark EIPAC-Powered Electric Chemical Injection Pump provides an environmentally-clean method for injection of chemical into a line under pressure when AC power is available. It is a positive-displacement design, powered by an electric motor, thereby eliminating the gas emissions inherent with pneumatic-style pumps. Applications include injection of methanol, corrosion inhibitors, friction reducers or scale inhibitors into wellheads or pipelines. Unique Temperature Sensor allows operator to set temperature threshold to disallow pumping until temperature falls to a specified level.

Specifications

Connections

Pump Inlet and Outlet 1/4" Female NPT Threaded
 Electric Straight-Blade Plug with Ground

Pump

Fluid Head Stainless Steel, Single or Dual
 120VAC Gearmotor Size 1/6hp, 60rpm
 Available Plunger Sizes 1/4", 3/8", 1/2"
 3-Position Adjustable Displacement

Power • AC

Requirement Single Phase, 115VAC, 60 Hertz

General

Control DigiMax ADC Digital Display
 with Auto Mode, Temperature Sensor,
 Manual Pump Override,
 Breaker-Protected NEMA 4x Enclosure
 Mount A-Frame Support



WellMark Series

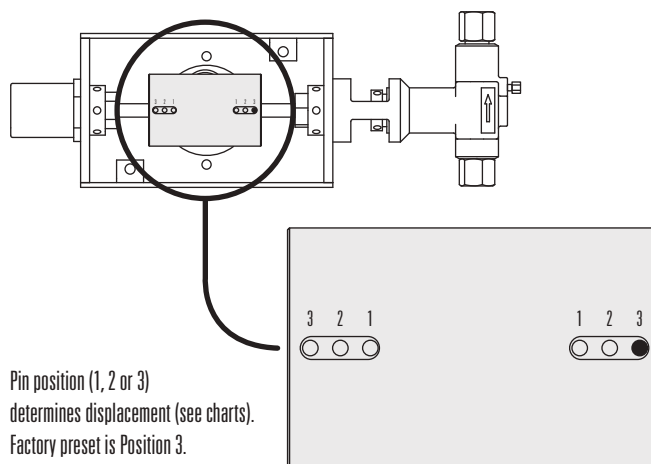
EIP AC-Powered Electric Chemical Injection Pump with DigiMax ADC Control

Operation

The WellMark AC-Powered Electric Chemical Injection Pump features a control timer that allows a broad range of operating conditions.

The pump head can be adjusted for one of three different displacement settings. Control of fluid volume can be achieved by utilizing an infinite number of combinations of RUN and OFF times along with three different displacement settings. Suggested settings for common volumes are listed on charts included with each pump.

As reviewed against the "Pump Displacement & Timer Settings" charts, (refer to Installation, Operation & Maintenance Instructions for Solar-Powered Chemical Injection Pump) the pump's required rate should optimally fall within the middle of the pumps capacity range. This gives room for adjustment if the service criteria changes.



Displacement Volumes by Pin Placement

Displacement Volumes	Plunger/Pin Position								
	1/4" Plunger			3/8" Plunger			1/2" Plunger		
	1	2	3	1	2	3	1	2	3
DISPLACEMENT PER STROKE (OZ.)	0.0170	0.0238	0.0306	0.0382	0.0535	0.0688	0.0679	0.0951	0.1223
DISPLACEMENT PER SECOND (LARGE MOTOR)	0.0181	0.0254	0.0326	0.0407	0.0570	0.0733	0.0724	0.1014	0.1304

DigiMax ADC Control/Timer



Temperature Sensor

The Control Timer is equipped with a Temperature Sensor feature. When activated this feature turns the pump off until the temperature drops to a set temperature threshold or lower, regardless of program settings. This allows the user to minimize the waste of methanol by only pumping during conditions approaching freezing temperatures.

Program Functions

Auto Mode

After a one-time setup, this feature allows the operator to simply enter the number of quarts desired per day - No need to consult RUN TIME and OFF TIME charts. The DigiMax ADC is programmed to be hassle-free. Of course, Manual Mode is available allowing the user to manually set the control if desired.

In Auto Mode Digital Display continuously indicates settings:

- Plunger Size and Pin Setting
- Temp. Settings (ON/OFF, Temp. Threshold Setting and Current)
- Pump Rate (Quarts per Day)

In Manual Mode Digital Display continuously indicates settings:

- RUN Time
- OFF Time
- Cycle Count
- Temp. Settings (ON/OFF, Temp. Threshold Setting and Current)

Pump Override

Runs pump continuously, overriding the program until the button is pressed again or until the pump runs for 5 minutes.

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WellMark Series

EIP AC-Powered Electric Chemical Injection Pump with DigiMax ADC Control Pump Specifications

Specification	Plunger/Pin Position								
	1/4" Plunger			3/8" Plunger			1/2" Plunger		
	1	2	3	1	2	3	1	2	3
PISTON AREA (SQ. IN.)	0.0491			0.1104			0.1963		
STROKE (IN.)	0.624	0.874	1.124	0.624	0.874	1.124	0.624	0.874	1.124
DISPLACEMENT PER STROKE (CU. IN)	0.0306	0.0429	0.0562	0.0689	0.0965	0.1241	0.1225	0.1716	0.2206
DISPLACEMENT PER STROKE (OZ.)	0.0170	0.0238	0.0306	0.0382	0.0535	0.0688	0.0679	0.0951	0.1223
DISPLACEMENT PER SECOND (OZ.)	0.0170	0.0238	0.0306	0.0382	0.0535	0.0688	0.0679	0.0951	0.1223

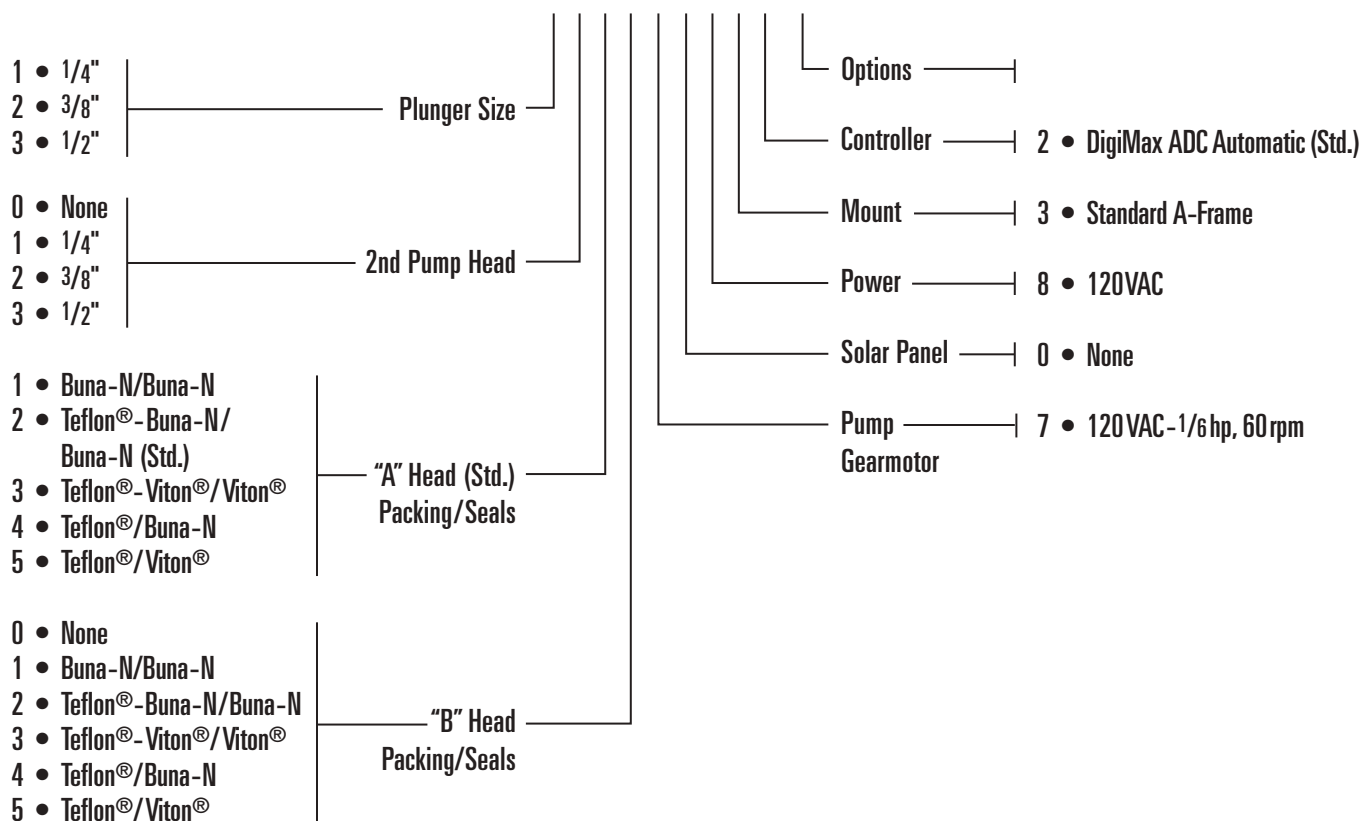
Maximum Discharge Pressures

Motor	Plunger/Discharge Pressure		
	1/4" Plunger	3/8" Plunger	1/2" Plunger
LARGE MOTOR - 1/6HP AC	5000 PSI	2500 PSI	1200 PSI

Determining the Model Number

Example given: Standard Model EIP-102070832 Pump with 1/4" Plunger, No 2nd Head, Teflon®-Buna-N/Buna-N Packing and Seals, 1/6hp 120VAC Gearmotor, DigiMax ADC Timer.

MODEL EIP - 1 0 2 0 7 0 8 3 2 -



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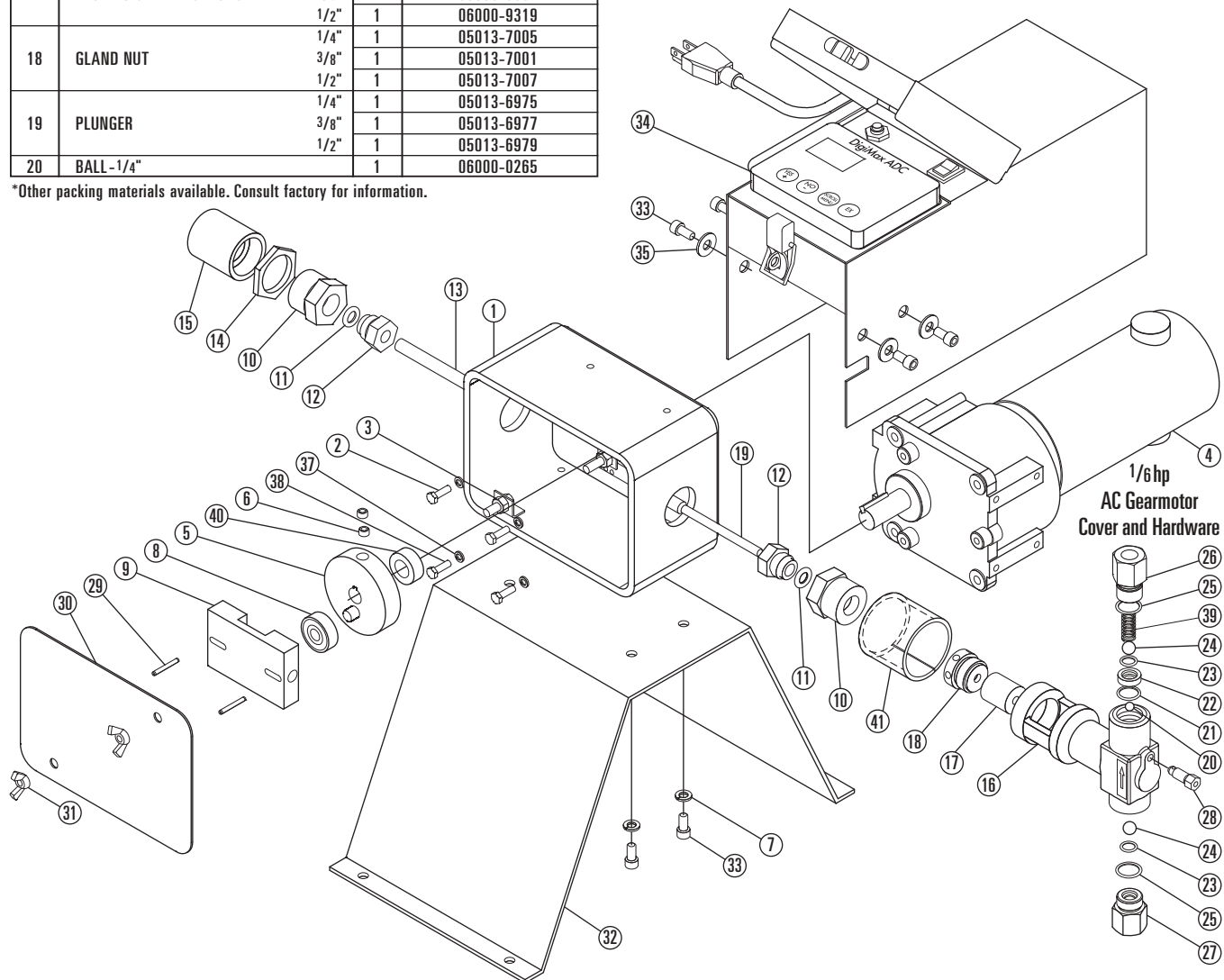
WellMark Series

EIP AC-Powered Electric Chemical Injection Pump with DigiMax ADC Control AC-Powered Pump Component Parts & Parts List

Item	Description	Qty.	Part No.
1	HOUSING	1	06500-7219
2	SCREW	2	05000-1692
3	HEX NUT	2	10007
4	MOTOR -1/6HP 115VAC, 60 HERTZ	1	06000-9411
5	ECCENTRIC WHEEL	1	06500-7209
6	SET SCREW	2	05000-2294
7	LOCK WASHER	7	10709
8	BEARING	1	06000-8477
9	RECIPROCATING BLOCK	1	05013-6995
10	BUSHING	2	05013-7012
11	O-RING	2	11017
12	GUIDE NUT	2	05013-7020
13	GUIDE	1	05013-6986
14	JAM NUT	1	05013-6968
15	CAP	1	05013-7119
16	FLUID END	1/4"	05013-6907
		3/8"	05013-6909
		1/2"	05013-6905
17	PACKING SET-TEFLON®/BUNA-N*	1/4"	06000-9293
		3/8"	06000-9301
		1/2"	06000-9319
		1/4"	05013-7005
18	GLAND NUT	3/8"	05013-7001
		1/2"	05013-7007
		1/4"	05013-6975
19	PLUNGER	3/8"	05013-6977
		1/2"	05013-6979
		1/4"	06000-0265

Item	Description	Qty.	Part No.
21	O-RING	1	10460
22	SEAT	1	05013-6950
23	O-RING	2	05000-0066
24	BALL -3/8"	2	06000-0267
25	O-RING	2	05000-0058
26	DISCHARGE VALVE BODY	1	05013-6942
27	SUCTION VALVE BODY	1	05013-6934
28	BLEED SCREW	1	05013-1558
29	PIN	2	001000-P
30	HOUSING COVER	1	05013-7136
31	WING NUT	2	05000-5642
32	PUMP BASE	1	05013-7142
33	SCREW, SOCKET HEAD	8	05000-5648
34	DIGIMAX ADC CONTROL AND HOUSING	1	06000-6395
35	FLAT WASHER	4	007124-P
38	SCREW	3	05000-5646
39	SPRING	1	10606
40	SPACER	1	05013-7543
41	PACKING COVER	1	05013-7527

*Other packing materials available. Consult factory for information.



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WellMark Series

EXP Solar and AC-Powered Chemical Injection Pump for Class I, Division 2 Hazardous Locations with DigiMax ADC Control

Application

The WellMark EXP Class I, Div. 2 Solar-Electric Chemical Injection Pump provides an environmentally-clean method for injection of chemical into a line under pressure. It is a positive-displacement design, powered by an electric motor, thereby eliminating the gas emissions inherent with pneumatic-style pumps. Applications include injection of methanol, corrosion inhibitors, friction reducers or scale inhibitors into wellheads or pipelines. A unique Temperature Sensor allows the operator to set a temperature threshold to disallow pumping until the temperature falls to a specified level.

Specifications

Connections

Pump Inlet and Outlet 1/4" Female NPT

Pump

Fluid Head Stainless Steel, Single or Dual

12 VDC Gearmotor Size 1/6hp, 64rpm

120 VAC Gearmotor Size 1/3hp, 60rpm

Available Plunger Sizes 1/4", 3/8", 1/2"

3-Position Adjustable Displacement

Hazardous Location Rating • Class I, Division 2

Certifying Body Intertek

Power • DC

Available Solar Panels Single or Multiple, 80 Watt

Battery(s) Single or Multiple

110 Amp Hour Deep Cycle

General

Control DigiMax ADC Digital Display with Auto Mode, Voltage Monitor, Temperature Sensor, Manual Pump Override, Fuse Protected

Mounts Mast with Quad Legs (Standard)
Skid Mount (Optional)

Principle of Operation

Any chemical injection pump utilizing a photovoltaic power system must manage numerous variables in an attempt to maintain adequate power for the task at hand. Among those variables are:

- Available Sunlight
- Size and Capability of the Solar Panel
- Size of the Battery or Batteries
- Power Draw of the Motor
- Size/Displacement of the Plunger
- Required Discharge Pressure of the Pump

All of these variables must be considered when sizing a photovoltaic pump system.

Solar-Powered Model

Shown with skid mount, double battery and single solar panel.



AC-Powered Model

Unit Positioning and Panel Tilt Adjustment

Regional information about available sunlight can be found at <http://www.nrel.gov/gis/solar.html>. Further evaluation of the specific site may be necessary to maximize clear presentation of the solar panel to the sun. Any adjacent items that may cast shadows on the panel throughout the day will negatively affect the overall performance of the package. Maximum exposure will help to assure that the battery maintains enough power to drive the pump throughout the night. To get the most from position-fixed (or seasonally adjusted) photovoltaic solar panels, you need to point them in the direction that captures the most sun. Solar panels should always face true south in the Northern Hemisphere and north in the Southern Hemisphere, tilted from the horizontal at a degree equal to your latitude plus 15 degrees in winter, or minus 15 degrees in summer. An additional 3-5% can be gained by evaluating this more carefully and fine-tuning adjustments accordingly.

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WellMark Series

EXP Solar and AC-Powered Chemical Injection Pump for Class I, Division 2 Hazardous Locations with DigiMax ADC Control

Pump Selection

A wide ratio between OFF time and RUN time (OFF:RUN) will usually result in maximized efficiency of the battery/solar charging system. For example: 30 seconds OFF time versus 5 seconds RUN time would result in a ratio of 6:1. Ratios lower than 2:1 may result in progressive loss of battery charge, depending upon available sunlight and differential pumping pressure.

As reviewed against the "Pump Displacement & Timer Settings" charts, (refer to Installation, Operation & Maintenance Instructions for Solar and AC-Powered Chemical Injection Pumps) the pumps' required rate should optimally fall within the middle of the pumps' capacity range. This gives room for adjustment if the service criteria changes.

Operation

The WellMark Solar and AC-Powered Chemical Injection Pumps feature a control timer that allows a broad range of operating conditions. The pump head can be adjusted for one of three different displacement settings. Control of fluid volume can be achieved by utilizing an infinite number of combinations of RUN and OFF times along with three different displacement settings. Suggested settings for common volumes are listed on included charts.

DigiMax ADC Control/Timer

Program Functions

Auto Mode

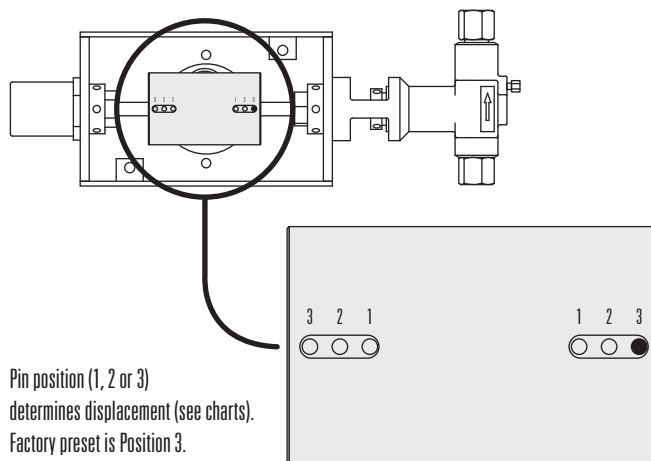
After a one-time setup, this feature allows the operator to simply enter the number of quarts desired per day - No need to consult RUN TIME and OFF TIME charts. The DigiMax ADC is programmed to be hassle-free. Of course, Manual Mode is available allowing the user to manually set the control if desired.

In Auto Mode Digital Display continuously indicates settings:

- Plunger Size and Pin Setting
- Battery Voltage
- Temp. Settings (ON/OFF, Temp. Threshold Setting and Current)
- Pump Rate (Quarts per Day)

In Manual Mode Digital Display continuously indicates settings:

- RUN Time
- OFF Time
- Cycle Count
- Battery Voltage
- Temp. Settings (ON/OFF, Temp. Threshold Setting and Current)



Pump Override

Runs pump continuously, overriding the program until the button is pressed again or until the pump runs for 2 minutes.

Temperature Sensor

The Control Timer is equipped with a Temperature Sensor feature. When activated this feature turns the pump off until the temperature drops to a set temperature threshold or lower, regardless of program settings. This allows the user to minimize the waste of methanol by only pumping during conditions approaching freezing temperatures.

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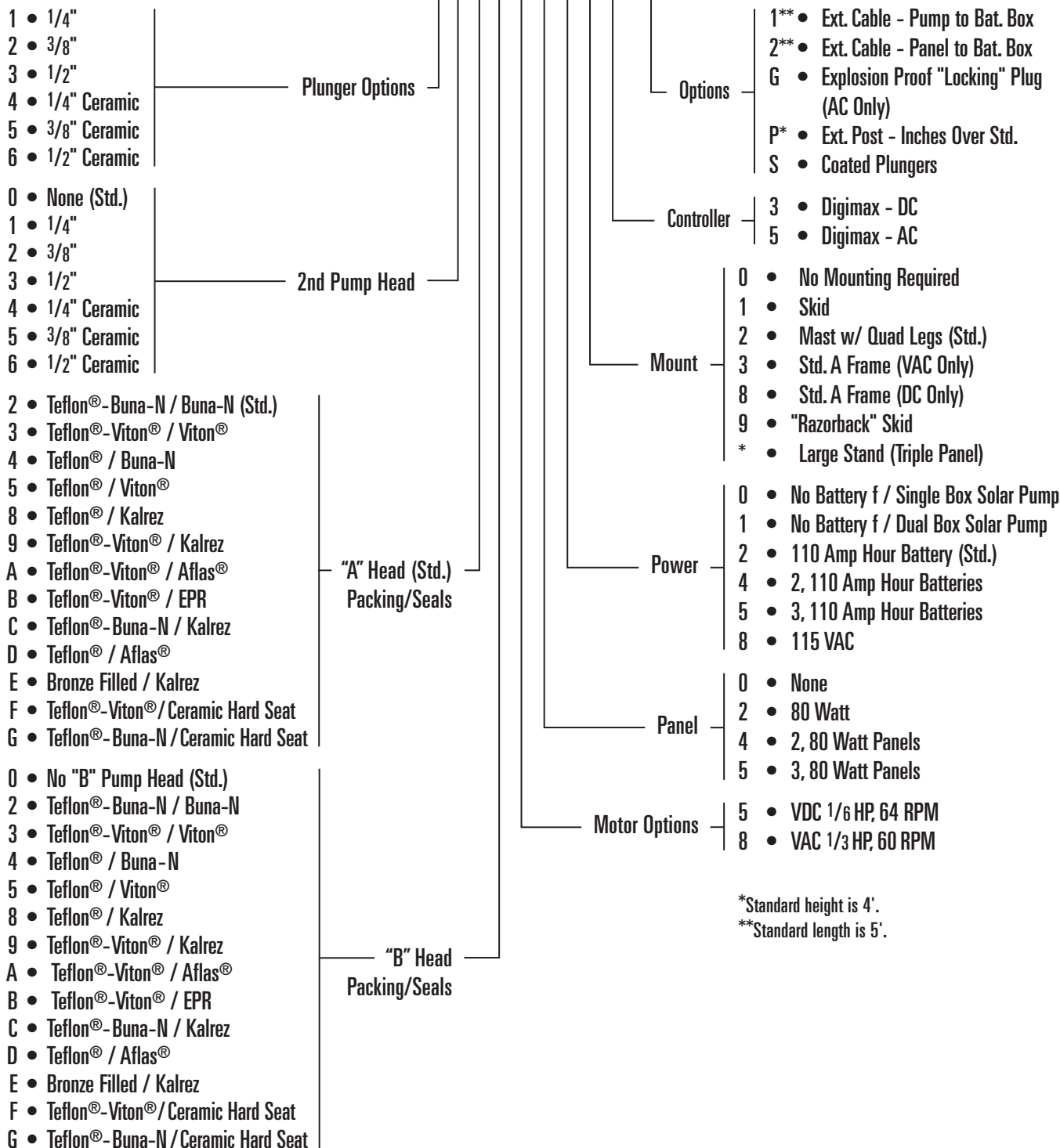
WellMark Series

EXP Solar and AC-Powered Chemical Injection Pump with DigiMax ADC Controller

Determining the Model Number

Example given: Standard Model EXP-102052223-S Pump with 1/4" Plunger, No 2nd Head, Teflon®-Buna-N/Buna-N Packing and Seals, 1/6 hp 12 VDC 64 RPM Motor, 80 Watt Solar Panel, 110 Amp Hour Battery, Mast with Quad Legs, DigiMax DC Timer Controller with Coated Plungers.

MODEL EXP - 1 0 2 0 5 2 2 2 3 - S



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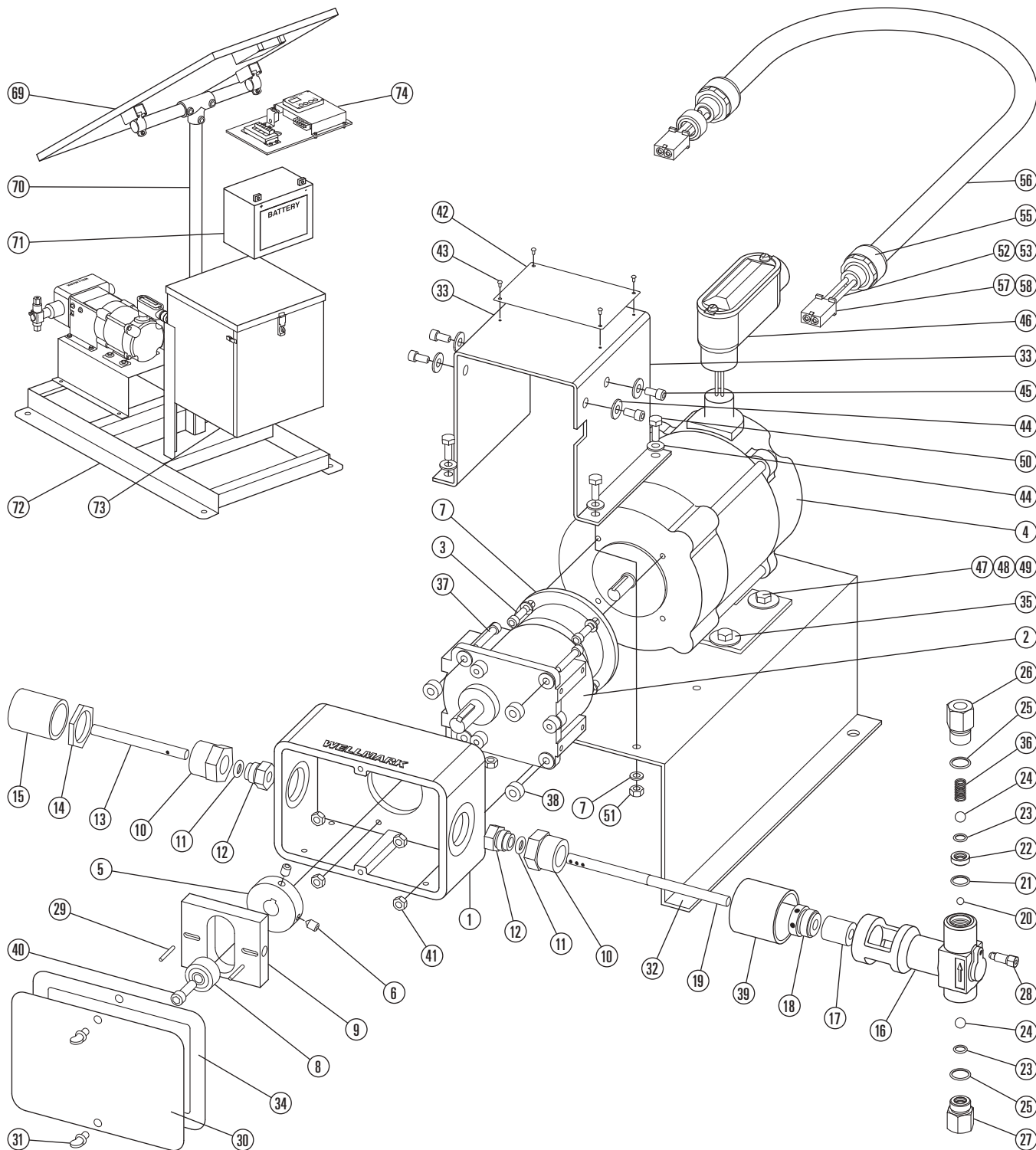
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WellMark Series

EXP Solar and AC-Powered Chemical Injection Pump for Class I, Division 2 Hazardous Locations with DigiMax ADC Control Solar-Powered Pump Unit Component Parts



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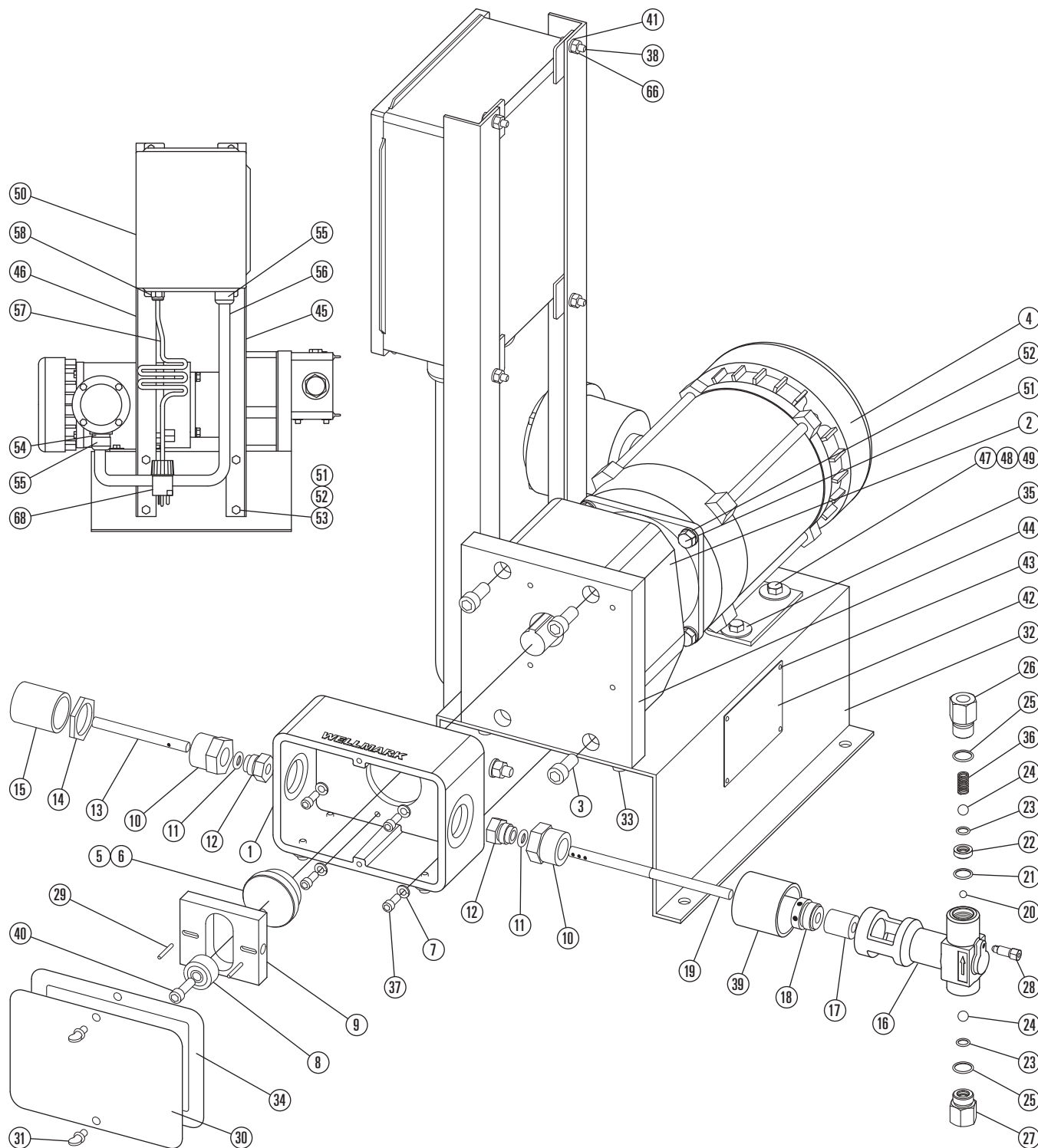
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EXP Solar and AC-Powered Chemical Injection Pump for Class I, Division 2 Hazardous Locations with DigiMax ADC Control AC-Powered Pump Unit Component Parts



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WellMark Series

EXP Solar and AC-Powered Chemical Injection Pump for Class I, Division 2 Hazardous Locations with DigiMax ADC Control Solar and AC-Powered Pump Unit Component Parts

Item	Description	Qty.	Part No.	
			Solar-Powered	AC-Powered
1	HOUSING	1	05013-9999	05013-9998
2	SPEED REDUCER	1	06000-9515	06000-9543
3	SOCKET HEAD SCREW	4	05000-5640	05000-6322
4	MOTOR	1	06000-9495	06000-9535
5	ELECTRIC WHEEL ASSEMBLY	1	05013-7059	06500-7542
6	SET SCREW	1 or 2	05000-6264	
7	LOCK WASHER	4 or 8	10709	
8	BEARING	1	06000-9563	
9	RECIPROCATING BLOCK	1	05013-7810	
10	BUSHING	2	05013-7012	
11	O-RING, BUNA	2	11017	
12	GUIDE NUT	2	05013-7020	
13	GUIDE	1	05013-6986	
14	JAM NUT	1	05013-6968	
15	CAP	1	05013-7119	
16	FLUID END, 1/4"	1	05013-6907	
	FLUID END, 3/8"	1	05013-6909	
	FLUID END, 1/2"	1	05013-6905	
17	PACKING SET	1	SEE FACTORY	
18	GLAND NUT, 1/4"	1	05013-7005	
	GLAND NUT, 3/8"	1	05013-7001	
	GLAND NUT, 1/2"	1	05013-7007	
19	PLUNGER, 17-4PH, 1/4"	1	05013-6975	
	PLUNGER, 17-4PH, 3/8"	1	05013-6977	
	PLUNGER, 17-4PH, 1/2"	1	05013-6979	
20	BALL, 1/4"	1	06000-0265	
21	O-RING, TEFLON®	1	10460	
22	SEAT	1	05013-6950	
23	O-RING, BUNA-N	2	05000-0066	
	O-RING, VITON®	2	10608	
24	BALL, 3/8", STAINLESS STEEL	2	06000-0267	
25	O-RING, BUNA-N	2	05000-0058	
	O-RING, VITON®	2	05000-0801	
26	DISCHARGE VALVE BODY	1	05013-6942	
27	SUCTION VALVE BODY	1	05013-6934	
28	BLEED SCREW	1	05013-1558	
29	PIN	2	05000-6272	
30	HOUSING COVER	1	05013-9995	
31	THUMB SCREW	2	05000-6330	
32	PUMP BASE	1	05013-7223	05013-8270
33	COVER, SPEED REDUCER	2	05013-7715	—
	HEX HEAD SCREW, 5/16"	1	—	05000-5198
34	COVER GASKET	1	05013-9991	
35	FLAT WASHER	4	06000-1054	
36	SPRING	1	10606	
37	SOCKET HEAD SCREW	4	05000-6256	05000-1684
38	SPACER	4	05013-7828	—
	HEX HEAD SCREW, 1/4"	4	—	05000-1668

Item	Description	Qty.	Part No.	
			Solar-Powered	AC-Powered
39	PACKING COVER	1	05013-7527	
40	SOCKET HEAD SCREW	1	05000-6248	05000-6246
41	NYLOC NUT	4	05000-1635	—
	LOCK WASHER, 1/4"	4	—	11045
42	NAME PLATE	1	06000-9289	
43	RIVET	4	001555P	
44	FLAT WASHER, 1/4"	8	007124P	—
	MOUNTING PLATE	1	—	05013-7785
45	SOCKET HEAD SCREW, 1/4"	4	05000-5648	—
	BRACKET, RIGHT	1	—	05013-8456
46	CONDUCT OUTLET	1	06000-9525	—
	BRACKET, LEFT	1	—	05013-8458
47	HEX HEAD SCREW, 5/16"	4	05000-1742	
48	HEX NUT, 5/16"	4	05000-1726	
49	LOCK WASHER, 5/16"	4	06000-5860	
50	HEX HEAD SCREW, 1/4"	4	11044	—
	TIMER ASSEMBLY	1	—	06000-9725
51	HEX NUT, 1/4"	4	05000-1619	—
	HEX HEAD SCREW, 3/8"	8	—	05000-1841
52	WIRE, BLACK	10.5'	01007-0943B	—
	LOCK WASHER, 3/8"	8	—	11018
53	WIRE, WHITE	10.5'	01007-0943W	—
	HEX NUT, 3/8"	4	—	05000-2104
54	REDUCING BUSHING	1	06000-9527	06000-9529
55	CONDUCT FITTING	2	06000-8493	06000-8492
56	CONDUCT	1	05013-7577	05013-8536
57	FEMALE TERMINAL	2	06000-8548	—
	ELECTRIC CORD	13'	—	06000-9819
58	PIN AND SOCKET PLUG	2	06000-8551	—
	CONNECTOR	1	—	06000-8610
59	GROUND SCREW (NOT SHOWN)	1	—	001504G
60	GROUND CUP (NOT SHOWN)	1	—	001800P
61	AC PUMP LABEL (NOT SHOWN)	1	—	06000-9805
62	AC PUMP IN/OUTDOOR STICKER (NOT SHOWN)	1	—	06000-9807
63	AC PUMP WARNING STICKER (NOT SHOWN)	1	—	06000-9809
64	REPAIR WARNING STICKER (NOT SHOWN)	1	—	06000-9784
65	WARNING STICKER, (NOT SHOWN)	1	—	06000-9782
66	HEX NUT, 1/4"	4	—	05000-1619
67	WIRE ASSEMBLY, (NOT SHOWN)	1	—	06500-8078
68	EXPLOSION PROOF PLUG	1	—	06000-6970
69	SOLAR PANEL ASSEMBLY	1	06500-7281	—
70	POST	1	05013-7184	—
71	BATTERY	1	06000-8429	—
72	SKID	1	06500-7225	—
73	BATTERY BOX	1	05013-9994	—
74	CONTROL ASSEMBLY	1	06500-7292	—

Pump Specifications

Specification	Plunger/Pin Position								
	1/4" Plunger			3/8" Plunger			1/2" Plunger		
	1	2	3	1	2	3	1	2	3
PISTON AREA (SQ. IN.)	0.0491			0.1104			0.1963		
STROKE (IN.)	0.624	0.874	1.124	0.624	0.874	1.124	0.624	0.874	1.124
DISPLACEMENT PER STROKE (CU. IN)	0.0306	0.0429	0.0562	0.0689	0.0965	0.1241	0.1225	0.1716	0.2206
DISPLACEMENT PER STROKE (OZ.)	0.0170	0.0238	0.0306	0.0382	0.0535	0.0688	0.0679	0.0951	0.1223
DISPLACEMENT PER SECOND (OZ.)	0.0181	0.0254	0.0326	0.0407	0.0570	0.0733	0.0724	0.1014	0.1304
MAX. DISCHARGE PRESSURE-1/6HP MOTOR	5000 PSI			2500 PSI			1200 PSI		

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WellMark Series

ELP Low Pressure Chemical Metering Pump

Application

The Series ELP metering pumps provide reliable, economical chemical addition for a wide variety of applications. Precise stroking speed is maintained with a dual output adjustment (stroke length and speed). Metering accuracy is achieved with double ball guided checks. A NEMA 4X style housing allows for outdoor installations. Series ELP pumps are available in outputs up to 45 GPD and pressures up to 250 psi. The manual stroke length and speed adjustment provides a wide turndown capability on all models.



Features

- Dual Output Adjustment
- NEMA 4X Style Enclosure
- Guided Double Ball Checks
- Circuit Voltage Protection
- Thermal Overload Protection
- LED Indicating Lights
- Splash Cover Over Controls
- One Year Warranty

Specifications

Input	12 VDC, 120 VAC or 240 VAC @ 50/60 Hz
Stroke Adjustment	10-100%
Stroke Frequency	1-125 Strokes/min.
Enclosure	NEMA 4X Style (Thermoplastic w/Lexan Cover)
Relative Humidity	0 to 100%
Shipping Weight	10 lbs. (4.536 kg)

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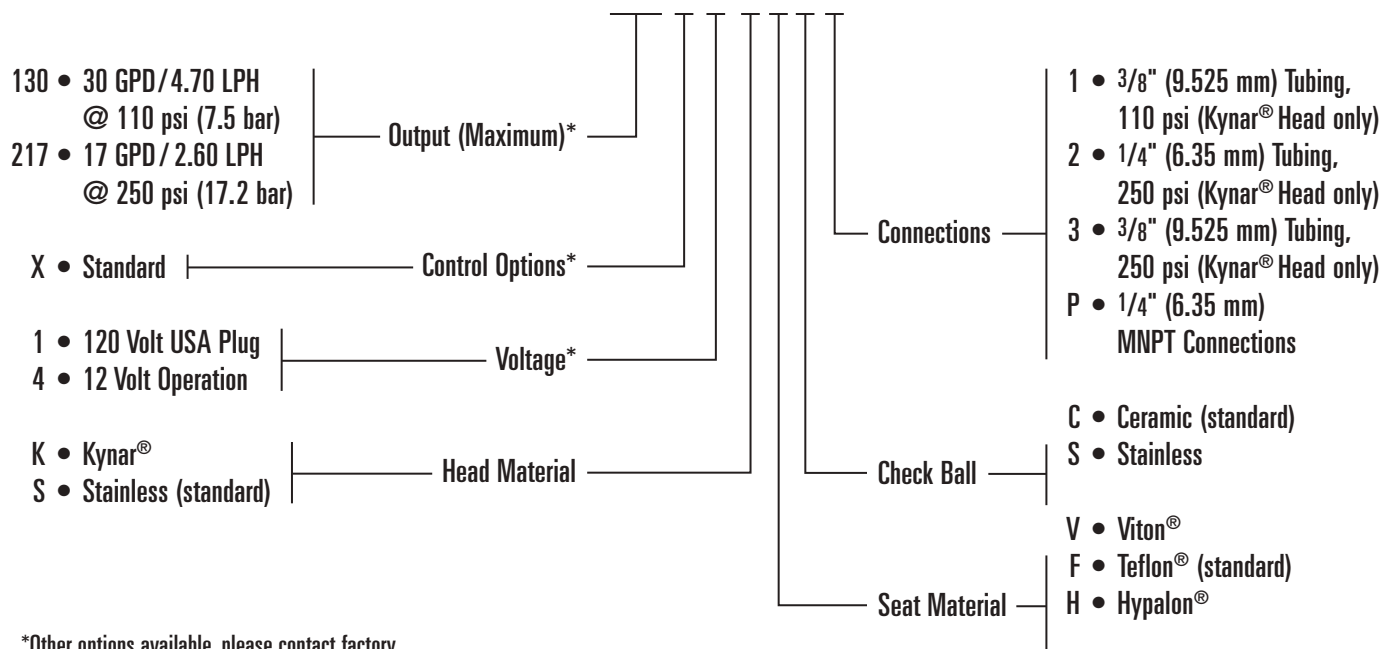
WellMark Series

ELP Low Pressure Chemical Metering Pump

Determining the Model Number

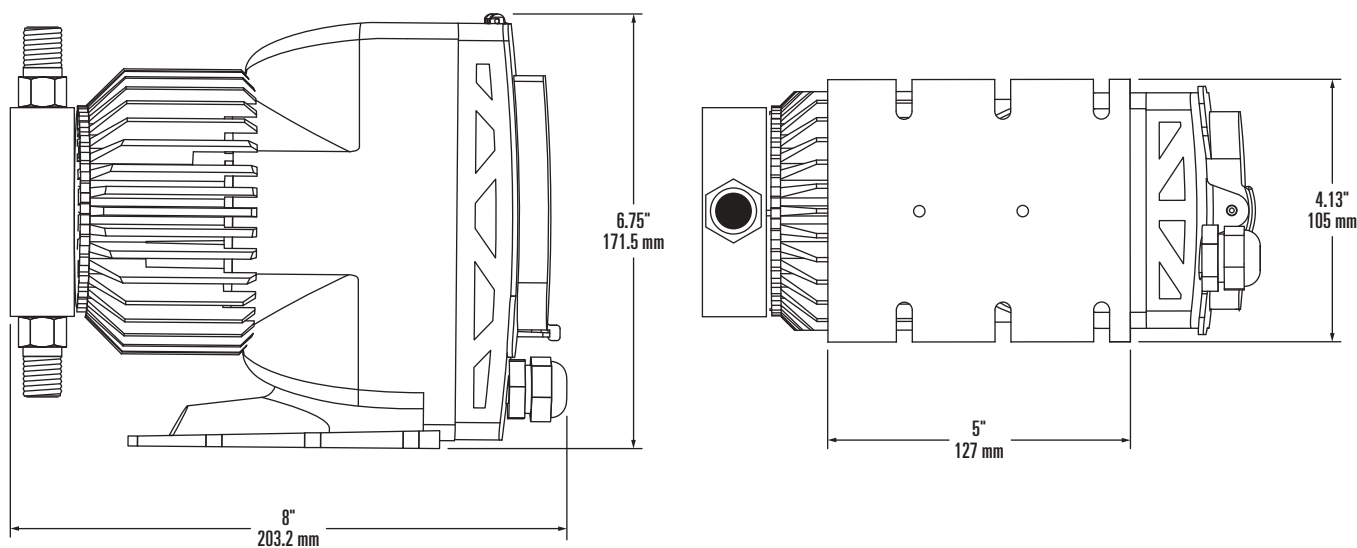
Example given: Standard Model ELP217X1-SFC2, Series ELP, Standard Control Options, 120 Volt USA Plug, Stainless Head Material, Teflon® Seats and Ceramic Check Ball, 1/4" (6.35 mm) Tubing Connections for 17 GPD/2.60 LPH with Max. Output @ 250 psi.

MODEL ELP 217 X 1-S F C 2



*Other options available, please contact factory.

Dimensional Data



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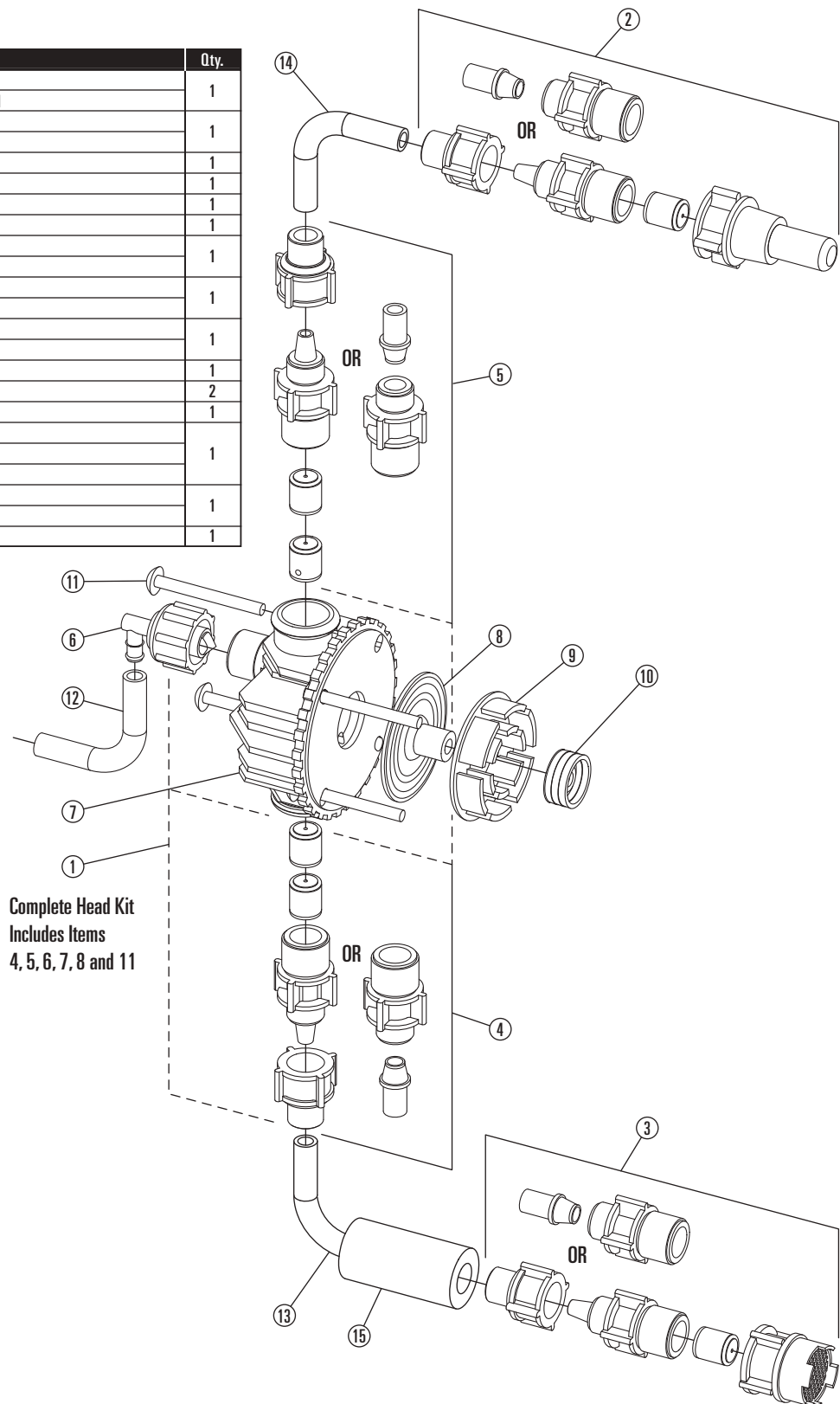
WellMark Series

Metering Pump Liquid End

Parts List

Item	Description	Qty.
1	COMPLETE HEAD ASSEMBLY, 110 PSI	1
	COMPLETE HEAD ASSEMBLY, 150 & 250 PSI	
2	INJECTION VALVE ASSEMBLY	1
	OPTIONAL 3-FUNCTION INJECTION VALVE	
3	FOOT VALVE ASSEMBLY	1
4	SUCTION VALVE ASSEMBLY	1
5	DISCHARGE VALVE ASSEMBLY	1
6	PRIMING VALVE ASSEMBLY	1
7	PUMP HEAD, 110 PSI	1
	PUMP HEAD, 150 & 250 PSI	
8	PUMP DIAPHRAGM, 110 PSI	1
	PUMP DIAPHRAGM, 150 & 250 PSI	
9	SUPPORT RING, 110 PSI	1
	SUPPORT RING, 150 & 250 PSI	
10	SHAFT SEAL	1
11	HEAD BOLTS	2
12	PRIMING TUBING	1
13	SUCTION TUBING, 3/8" CLEAR	
	SUCTION TUBING, 3/8" PE	
	SUCTION TUBING, 1/4" PE	
14	DISCHARGE TUBING, 3/8" PE	1
	DISCHARGE TUBING, 1/4" PE	
15	WEIGHT, SUCTION TUBING	1

Note: Drawing and table for reference only.
Contact factory to order spare parts.



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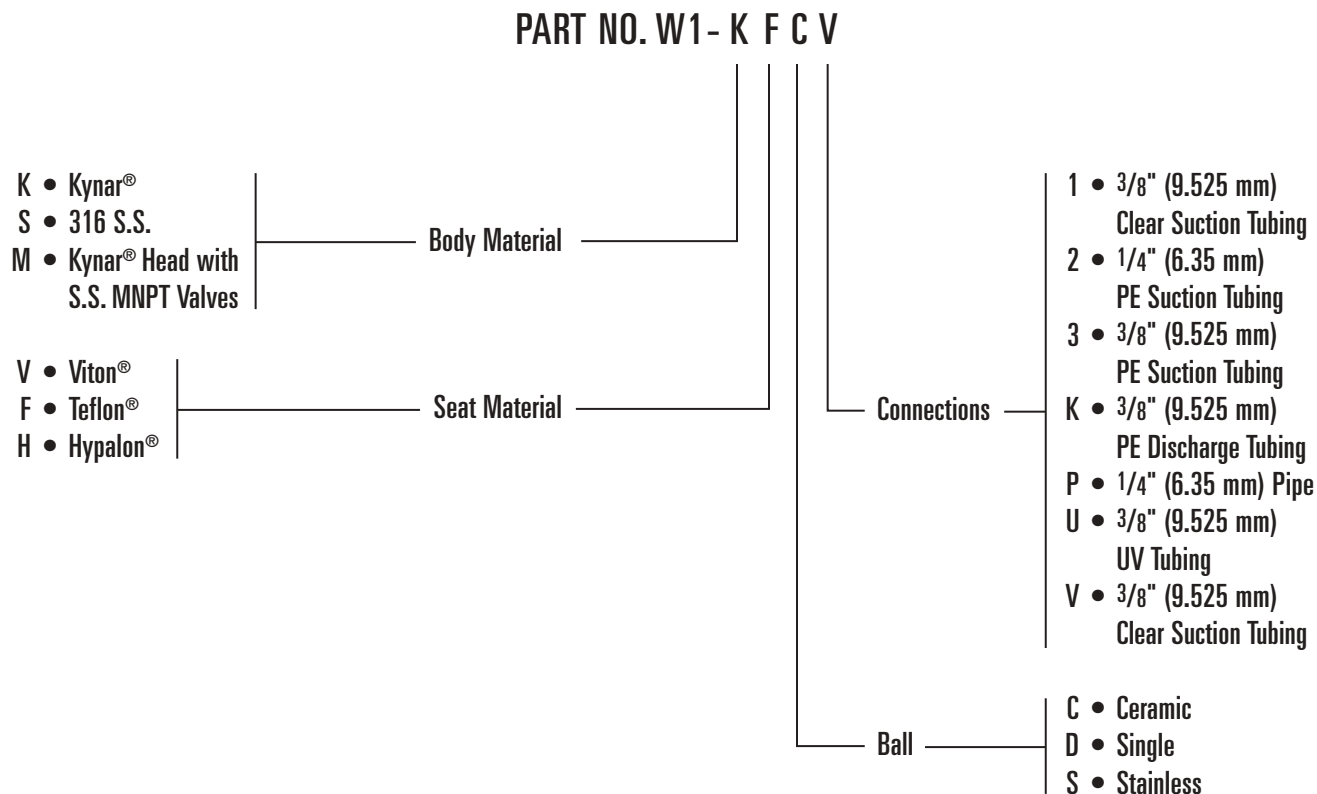
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WellMark Series

Metering Pump Liquid End

Determining the Part Number

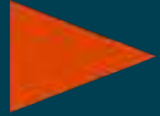
Example given: Part Number W1-KFCV Complete Head Assembly for 110 psi Metering Pump with Kynar® Body Material, Teflon® Seats, 3/8" Clear Suction Tubing Connections and Ceramic Ball.



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Wellmark Diaphragm Two-Way Valves

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WellMark Series

General Data

General Data

Flow Calculations for Valve Sizing:

Broadly speaking, the rate of flow of a liquid or gas through a given valve depends upon the temperature, gravity, and pressure drop of that liquid or gas through that particular valve.

The design style of each valve affects flow volume through the valve differently. The development of a "Factor" to adjust the relationship of temperature, gravity, and pressure drop through that particular valve enables us to predict the flow volume through that valve. This factor is called C_v —or Flow Coefficient—for the valve and it has been developed through actual flow tests or long time field results.

Most C_v factors for a particular valve style can be found in the individual valve catalog sheets. Approximate flow capacity can be determined for any of these valves by using the given C_v factor for that valve and applying them to the following formulas.

For Liquids:

$$Q = 34.3 C_v \sqrt{\frac{\Delta P}{G}}$$

For Gas:

$$Q = .0234 C_v \sqrt{\frac{\Delta P (P_1 + P_2)}{G T}}$$

Where:

Q = Flow (Barrels/Day)

C_v = Flow Factor

ΔP = Pressure Drop Across Valve

G = Specific Gravity (Water=1.0)

Where:

Q = Flow (MMSCFD)

C_v = Flow factor

P_1 = Inlet pressure (psia)

P_2 = Outlet pressure (psia)

ΔP = Pressure drop ($P_1 - P_2$). When P_2 is less than $1/2 P_1$, use $1/2 P_1$ for P_2 in formula.

G = Specific gravity (air= 1.0)

T = Flowing temperature absolute ($^{\circ}F + 460$)

If flow capacity required is known and valve selection is desired, solve for C_v with the following formulas and select appropriate valve from C_v factor chart.

For Liquids:

$$C_v = \frac{Q}{34.3 \sqrt{\frac{\Delta P}{G}}}$$

For Gas:

$$C_v = \frac{Q}{.0234 \sqrt{\frac{\Delta P (P_1 + P_2)}{G T}}}$$

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WellMark Series

General Data

ANSI B16.5 Maximum Pressure and Temperature Ratings for Steel Pipe Flanges

Temperature (°F)	Maximum Allowable Non-Shock Pressure (psig)						
	Pressure Class (lb.)						
	150	300	400	600	900	1500	2500
	450	1125	1500	2225	3350	5575	9275
-20 - 100	285	740	990	1480	2220	3705	6170
200	260	675	900	1350	2025	3375	5625
300	230	655	875	1315	1970	3280	5470
400	200	635	845	1270	1900	3170	5280
500	170	600	800	1200	1795	2995	4990
600	140	550	730	1095	1640	2735	4560
650	125	535	715	1075	1610	2685	4475
700	110	535	710	1065	1600	2665	4440
750	95	505	670	1010	1510	2520	4200
800	80	410	550	825	1235	2060	3430
850	65	270	355	535	805	1340	2230
900	50	170	230	345	515	860	1430
950	35	105	140	205	310	515	860
1000	20	50	70	105	155	260	430

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WellMark Series

1010 Fuel Gas Control Valve or Low Pressure Motor Valve

Application

This valve is used as a fuel gas control valve to feed the pilot on heated separators, treaters, and other similar liquid accumulators, as well as a low pressure, low volume dump valve on oil and gas production separators, compressors, or any type of liquid accumulator.

Features

- WCB Body and Housing
- Minimum Maintenance, Easy Access: All Internal Parts Can Be Removed without Taking Valve Out of Line.
- Positive Shut-Off
- Optional Seat: Integral or Removable
- Optional Topworks: Direct, Indirect, Adjustable Single-Acting or Double-Acting

Specifications

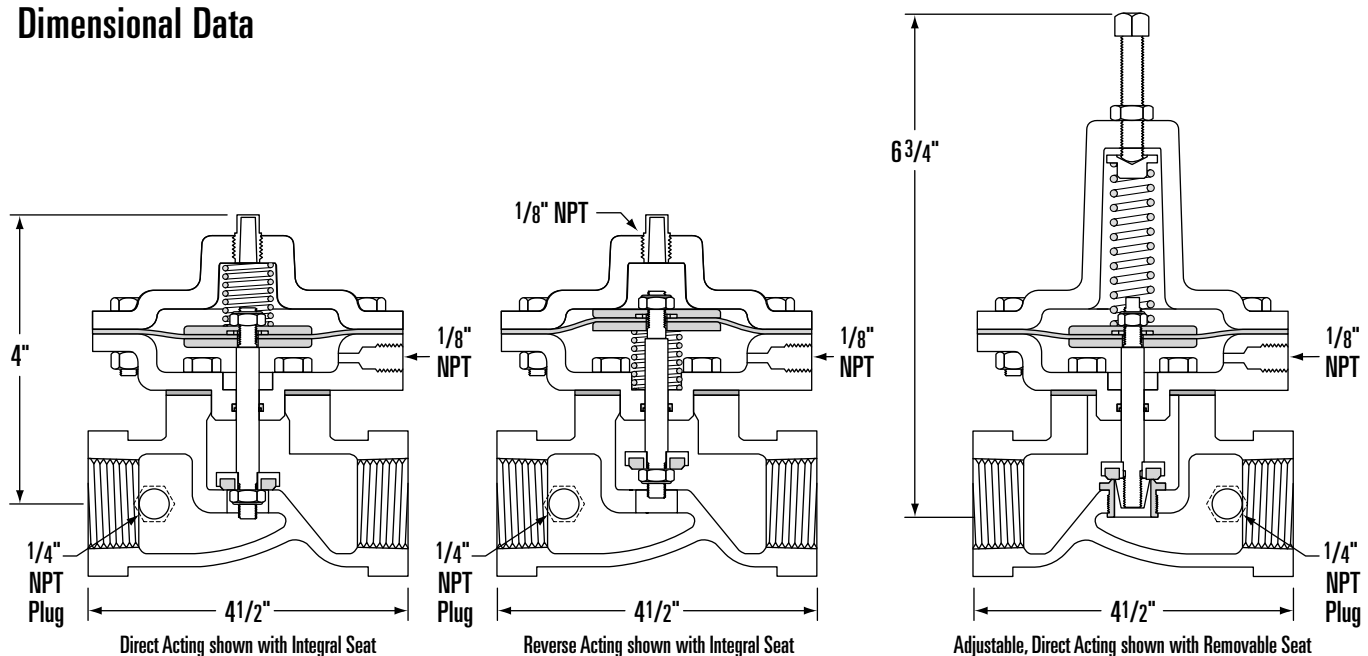
Size	1" NPT Threaded
Working Pressure	300 psi
Temperature	180° F Std., Avail. to 400° F
Seals	Buna-N Std.
Diaphragm to Seat Ratio	From 18:1 to 7:1
(Cv) Flow Coefficient	
Integral Seat	5.0
Removable	2.8
Spring Adjustment	5-80 psi Back Pressure



Materials

Body	
Integral Seat	WCB
Removable Seat	WCB
Diaphragm	Buna-N
Stem	303 S.S.
Spring	Stainless Steel

Dimensional Data



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WellMark Series

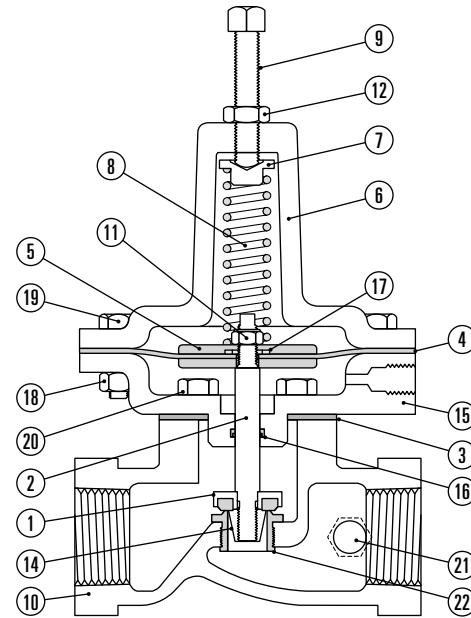
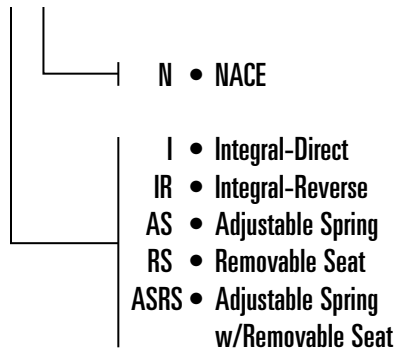
1010

1010 Fuel Gas Control Valve or Low Pressure Motor Valve

Determining the Model Number

Use the Model Number below and specify the appropriate Design Code for "X", and "Y" if required.

MODEL 100-DSG-X-Y

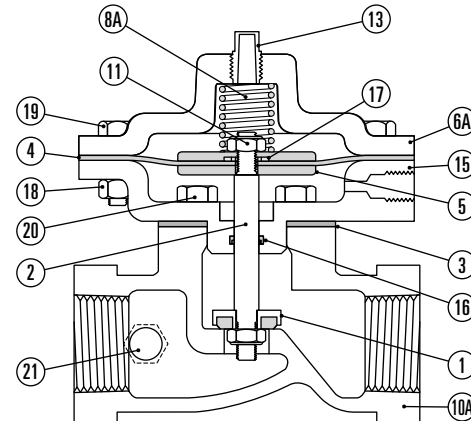


Adjustable, Direct Acting Shown with Removable Seat

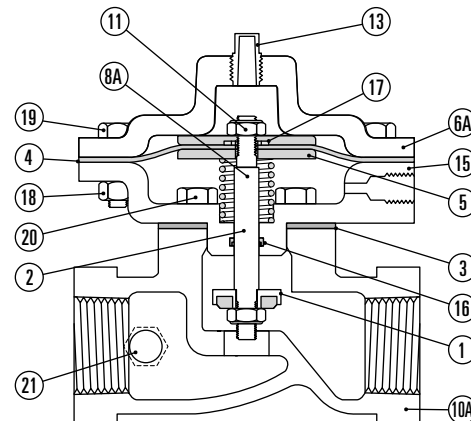
Parts List

Item	Description	Qty.	Part No.
1*	PLUG, 303 S.S./BUNA-N	1	05011-1293
2	STEM, 303 S.S.	1	05011-1301
3*	GASKET, URETHANE	1	05012-6861
4*	DIAPHRAGM, BUNA-N	1	05012-5467
5	BACK UP PLATE, STEEL	2	05012-5459
6	UPPER CASE, WCB	1	05013-2979
6A	UPPER CASE, WCB	1	05012-5435
7	UPPER GUIDE, STEEL	1	05013-3252
8	SPRING, STAINLESS STEEL	1	06000-8841
8A	SPRING, STAINLESS STEEL	1	06000-4686
9	ADJUSTING SCREW, STEEL PLATED	1	05000-5894
10	BODY, WCB-REMOVABLE SEAT	1	05012-2988
10A	BODY, WCB-INTEGRAL SEAT	1	05012-5443
11	HEX NUT	1	05000-1635
12	JAM NUT	1	10012
13	BREATHER, POLYETHYLENE	1	05011-8728
14	THROTTLE NUT, 303 S.S.	1	05013-3171
15	LOWER CASE, WCB	1	05012-5427
16*	O-RING, BUNA-N	1	05000-0041
17*	THREAD SEAL, STEEL/BUNA-N	1	06000-8527
18	NUT, STEEL PLATED	6	05000-1619
19	CAP SCREW, STEEL PLATED	6	06000-8552
20	CAP SCREW, STEEL PLATED	4	05000-1668
21	PIPE PLUG	1	10149
22	SEAT, BRASS	1	05013-2995

*Recommended Spare Part



Direct Acting Shown with Integral Seat



Reverse Acting Shown with Integral Seat

Repair Kits

Type	Part No.	Type	Part No.
MAJOR REPAIR KIT	03500-1866	MINOR REPAIR KIT	03500-1874 (Less Plug)

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WellMark Series

WDV Pneumatic Diaphragm Actuated Dump Valve

Application

The WDV scrubber valve is used for on/off control of high pressure water, oil, or gas. Compressor scrubbers, oil and gas separators, or any liquid accumulators are a few suitable applications. The valve trim is designed to be constantly immersed in the vessel fluid so as to utilize the warmth of the process to help prevent freezing. The WDV opens and closes automatically by pneumatic control from a WellMark level controller and dump valve operator. Diaphragm actuated, WDV dump valves operate at 30-70 psi and up to 2000 psi working pressure depending on model.

Features

- Compact and Economical
- S.S. Replaceable Trim
- Visual Indicator
- For Separators and Scrubbers to 2000 psi Working Pressure
- Hex Union Allows Plug and Seat Replacement Without Piping Removal
- Soft Seat Valve
- Manual Valve Operator

Specifications

Operating Temperature -20°F to 250°F

Maximum Working Pressure

WDV-10-050-18/WDV-10-075-18 1800 psi

WDV-20-100-05 500 psi

WDV-20-100-15 1500 psi

WDV-20-100-20 2000 psi

Materials

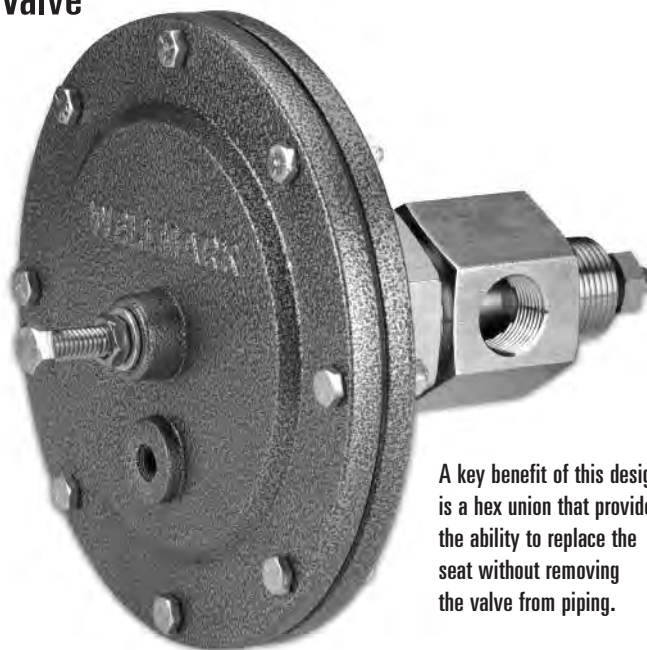
Body Electroless Nickel Plated 12L14 C.S.

Plug Seal 303 S.S., 90 Durometer Urethane

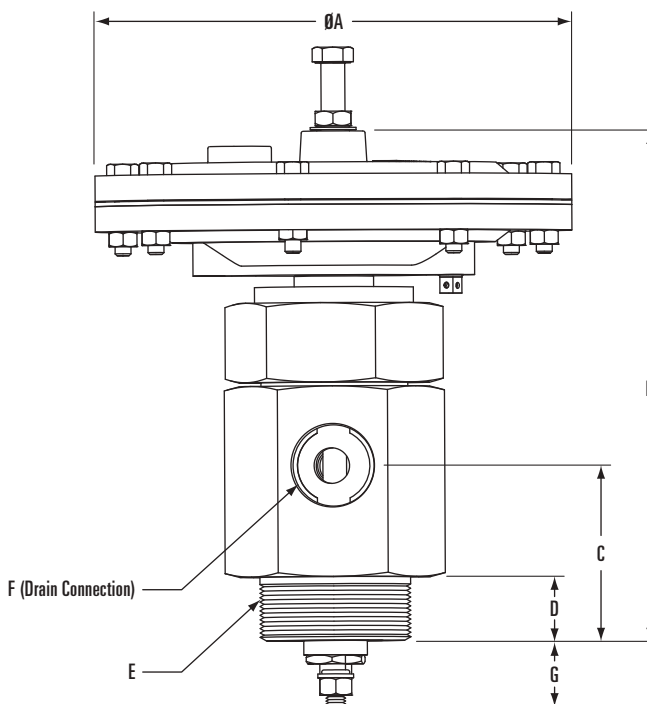
Diaphragm Reinforced Nitrile

Stem 303 S.S.

Spring 302 S.S.



A key benefit of this design is a hex union that provides the ability to replace the seat without removing the valve from piping.



Dimensional Data

Model	Trim Size	Max W.P.	Dimension						
			A	B	C	D	E	F	G
WDV-10-050-18	.359	1800 PSI	7.50	6.75	2.06	1.00	1" NPT	1/2" NPT	1.03
WDV-10-075-18	.359	1800 PSI	7.50	6.75	2.06	1.00	1" NPT	3/4" NPT	1.03
WDV-20-100-05	.859	500 PSI	7.50	8.00	2.75	1.00	2" NPT	1" NPT	1.03
WDV-20-100-15	.576	1500 PSI	7.50	8.00	2.75	1.00	2" NPT	1" NPT	1.03
WDV-20-100-20	.436	2000 PSI	7.50	8.00	2.75	1.00	2" NPT	1" NPT	1.03

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WellMark Series

WDV Pneumatic Diaphragm Actuated Dump Valve

Determining the Model Number

Example given: Standard Model WDV-20-100-20—Series WDV Scrubber Valve, 2" MNPT Inlet, 1" FNPT Outlet, .436" Trim Size, and Maximum Working Pressure of 2000 PSI.

MODEL WDV-20-100-20

10-050 • 1" MNPT Inlet x 1/2" FNPT Outlet
 10-075 • 1" MNPT Inlet x 3/4" FNPT Outlet
 20-100 • 2" MNPT Inlet x 1" FNPT Outlet

Model

Trim Size / Max. Pressure

18 • .359"/1800
 20 • .436"/2000
 15 • .576"/1500
 05 • .859"/500

(Code 18 applies to 1" inlet only.)

Wellmark Series SP Scrubber Package includes 790, W1200 DVOR, WDV and optional W2600 Safety Relief Valve.

MODEL SP 1 *

1 • 20-100-20
 2 • 20-100-15
 3 • 20-100-05
 4 • 10-075-18
 5 • 10-050-18

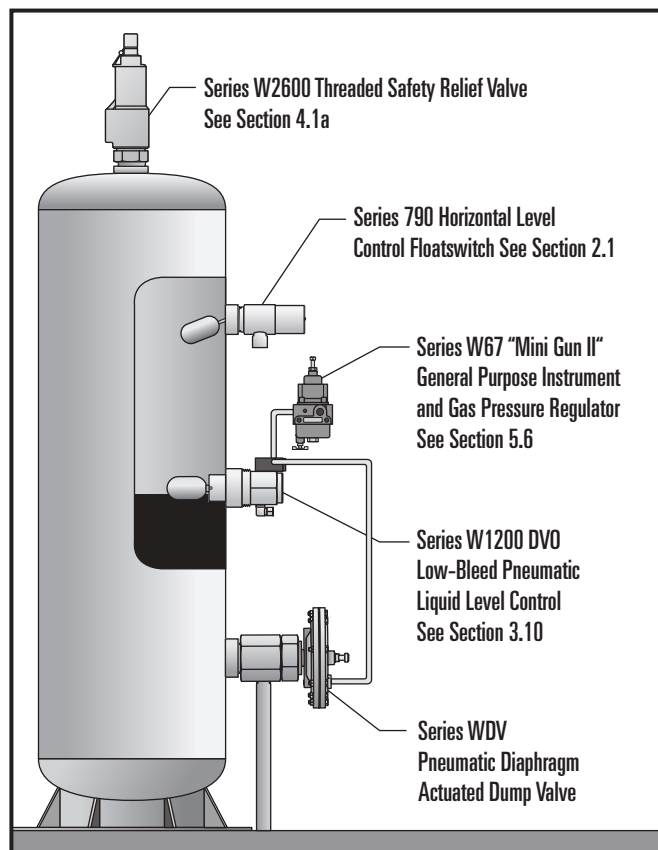
WDV Valve

Options

LR** • Less Regulator
 RV1 • With 1" Relief Valve
 RV2 • With 2" Relief Valve

Notes: *For options, add code to end of Model Number.

**Regulator provided at no extra charge.



The WellMark Series SP Scrubber Package

The system provides for liquid control in gas scrubber applications by dumping liquids to drain and protecting compressors with a high liquid level switch. Wetted metal parts are made to survive constant use in corrosive environments.

Pneumatic Level Control

Float actuated level snap acting switch controls pneumatic pressure to open and close the dump valve. See Section 3 for more information.

High Level Shutdown Switch

Stainless Steel float actuated level switches to alarm and/or shut-down the equipment. See Section 2 for more information.

Pneumatic Dump Valves

2-Piece union design with manual valve operator allows soft plug and hard seat to be replaced without disassembling outlet piping or scrubber pipe connection. Diaphragm actuated valves operate on 30 to 70 psi.

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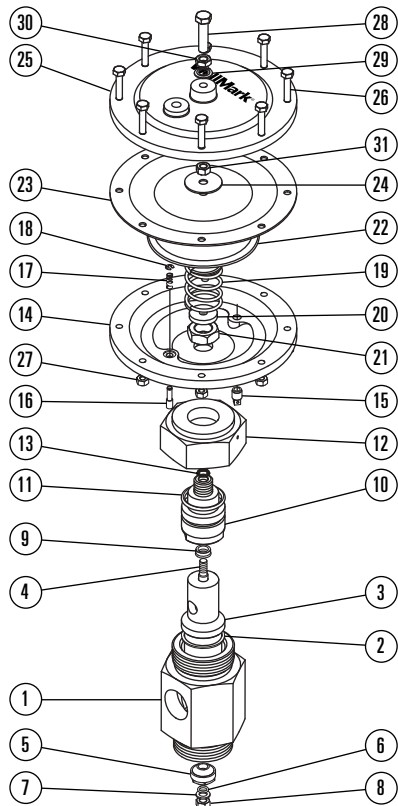
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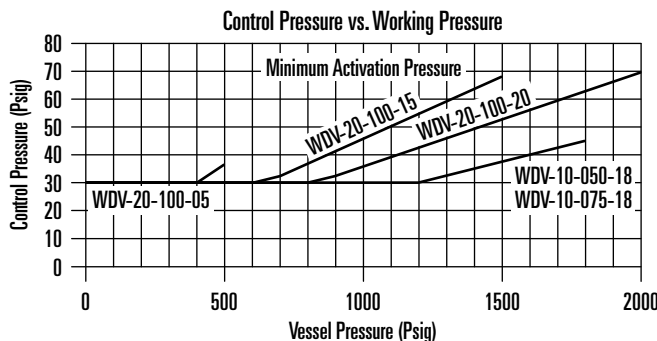
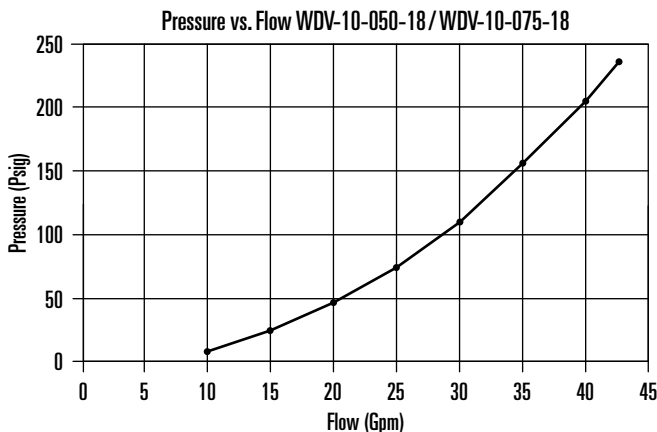


WellMark Series

WDV Pneumatic Diaphragm Actuated Dump Valve



Flow Charts



Parts List

Item	Description	Qty.	Part No.				
			WDV-10-050-18	WDV-10-075-18	WDV-20-100-05	WDV-20-100-15	WDV-20-100-20
1	BODY, STEEL PLATED	1	42071	42044	42043	42043	42043
2	GASKET, ALUMINUM	1	21491	21491	21487	21487	21487
3	SEAT, 303 S.S.	1	21471	21471	21493	21496	21467
4	STEM, 303 S.S.	1	21489	21489	21482	21482	21482
5	PLUG ASSEMBLY, 303 S.S./URETHANE	1	21505	21505	21506	21507	21508
6	O-RING, NITRILE	1	10483	10483	05000-0041	05000-0041	05000-0041
7	WASHER, STAINLESS STEEL	1	11241	11241	11238	11238	11238
8	NYLOC NUT, STAINLESS STEEL	1	05000-2567	05000-2567	11236	11236	11236
9	POLYPAK®, NITRILE	1	11242	11242	11234	11234	11234
10	DIAPHRAGM SUPPORT, 303 S.S.	1	21472	21472	21469	21469	21469
11	O-RING, NITRILE	1	05000-0470	05000-0470	10073	10073	10073
12	VALVE UNION, STEEL PLATED	1	21470	21470	21468	21468	21468
13	QUAD RING, NITRILE	1	11243	11243	11239	11239	11239
14	LOWER CASE, ALUMINUM	1	42035	42035	42035	42035	42035
15	BREATHER	1	05011-8729	05011-8729	05011-8729	05011-8729	05011-8729
16	INDICATOR, ALUMINUM	1	21485	21485	21485	21485	21485
17	SPRING, 302 S.S.	1	11229	11229	11229	11229	11229
18	SNAP RING, STEEL	1	11237	11237	11237	11237	11237
19	SPRING	1	11227	11227	11227	11227	11227
20	SPRING GUIDE, 303 S.S.	1	21490	21490	21481	21481	21481
21	HEX NUT, STEEL PLATED	1	10273	10273	10273	10273	21473
22	BACK UP PLATE, 304 S.S.	1	21480	21480	21480	21480	21480
23	DIAPHRAGM, REINFORCED NITRILE	1	21484	21484	21484	21484	21484
24	WASHER, 304 S.S.	1	21483	21483	21483	21483	21483
25	UPPER CASE, ALUMINUM	1	42034	42034	42034	42034	42034
26	CAP SCREW, STEEL PLATED	8	11233	11233	11233	11233	11233
27	HEX NUT, STEEL PLATED	8	05000-1619	05000-1619	05000-1619	05000-1619	05000-1619
28	MAINTENANCE BOLT, S.S.	1	11235	11235	11235	11235	11235
29	SEAL WASHER, STEEL/NITRILE	1	06000-0395	06000-0395	06000-0395	06000-0395	06000-0395
30	JAM NUT, STAINLESS STEEL	1	10012	10012	10012	10012	10012
31	NYLOC NUT, STAINLESS STEEL	1	11236	11236	11236	11236	11236

Seal Repair Kits

Model	Part Number
WDV-10-050-18	21528
WDV-10-075-18	21528
WDV-20-100-05	21529
WDV-20-100-15	21530
WDV-20-100-20	21531

Included in Repair Kit: Nut, Washer (1 to 3), O-Ring, Plug and Seal, Seat, Crush Washer.

Diaphragm Repair Kits

Model	Part Number
WDV-10-050-18	21532
WDV-10-075-18	21532
WDV-20-100-05	21533
WDV-20-100-15	21534
WDV-20-100-20	21535

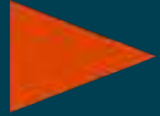
Included in Repair Kit: Diaphragm, Diaphragm Washer (Upper), Diaphragm Nut, Diaphragm Plate (1 or 2 Pieces), Packing, O-Ring, Stem, Seal Washer for Maintenance Bolt.

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Wellmark Diaphragm Double Seated (Balanced) Valves

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WellMark Series

5050 Two-Way Double Seated Valve (Balanced) Application

These valves are used where higher flow is desired with little force required to operate. These pilot operated double seated, near balanced, valves perform ideally for this service. Additionally, they have been used successfully on separators, meters, and water knockouts, where a reduced signal pressure is available.

Features

- Available in 2" Threaded; 2" 3", and 4" Flanged; Globe or Angle; Ductile Iron
- Unique Buna-N or Viton Seat Plugs: Designed for high capacity, smooth flow, and positive sealing.
- SS Internal Wetted Parts
- Pressed Steel Topworks

Specifications

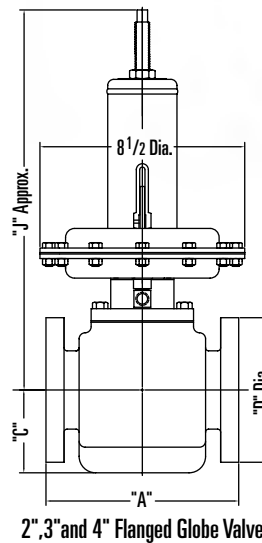
Size	2" Threaded	2", 3", & 4" Flanged
Working Pressure	400 psi	275 psi
Temperature	-50°F to +250°F Standard (other materials available)	
Size Topworks	#20	

Material

Body	Ductile Iron
Topworks	Press Steel
Diaphragm	Nylon Reinforced Buna-N (50 psi pressure max.)
Stem	.303 SS
Packing	Cotton Reinforced Buna-N
Trim	Buna-N or Viton® Molded Plug, Integral Seat

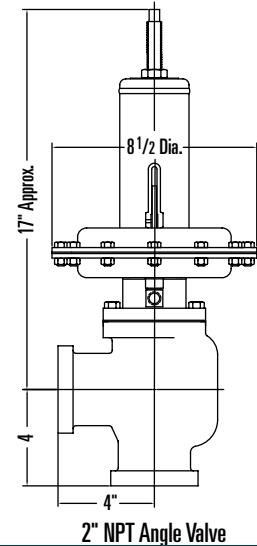
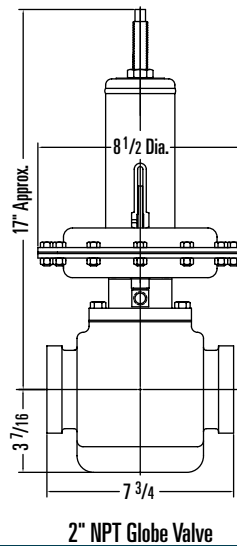


Dimensional Data



General Dimensions

Size	"A"	"C"	"D"	"J"
2"	7 3/4"	3 7/16"	6"	17"
3"	11"	4 1/4"	7 1/2"	18"
4"	12 3/4"	5"	9"	19"



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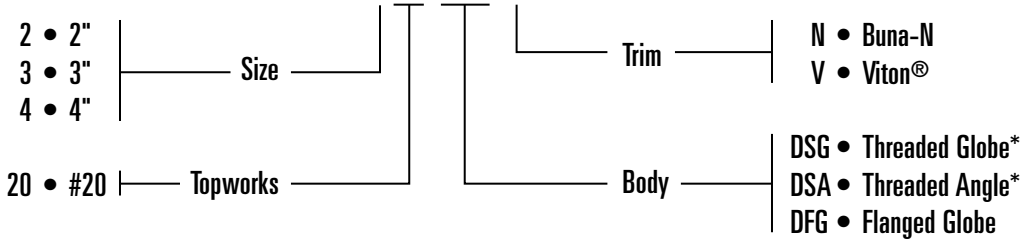
WellMark Series

5050

5050 Two-Way Double Seated Valve (Balanced) Determining the Model Number

Example given: Standard Model 320-DFG-N — Series 5050 Two-Way Double Seated Valve, 3" Flanged, Globe Body, Buna-N Trim.

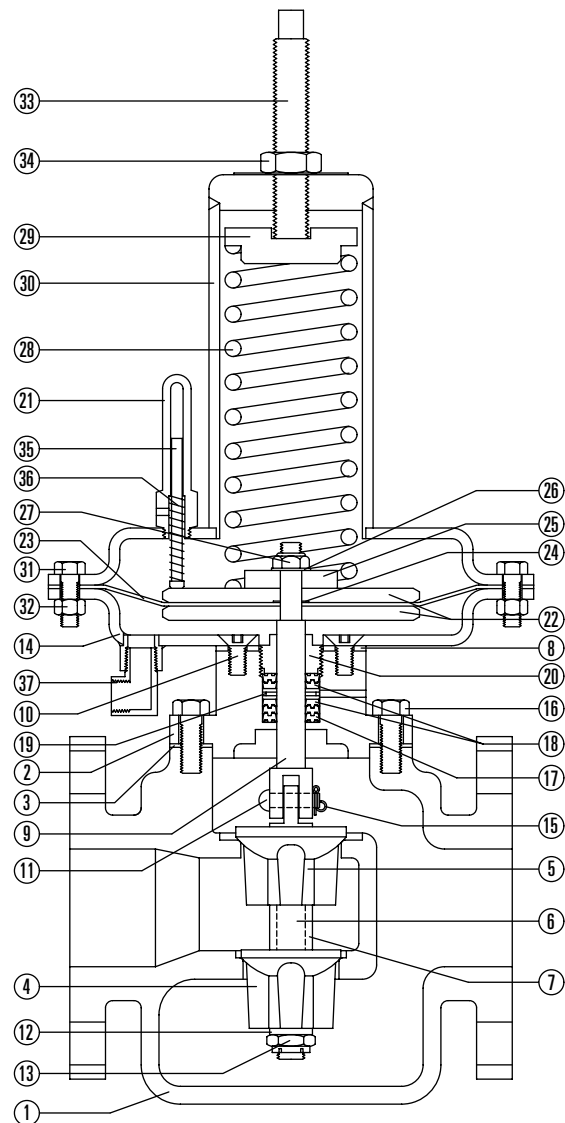
MODEL 320-DFG-N



Parts List

Item	Description	Qty.	Part No.		
			2"	3"	4"
1	BODY, 2"NPT ANGLE, DUCTILE IRON	1	05010-1211		
	BODY, 2"NPT GLOBE, DUCTILE IRON	1	05012-3611		
	BODY, FLANGED GLOBE, DUCT. IRON	1	05010-6947	05010-4827	05010-5584
2	DIA. SUPPORT, STEEL	1	05010-6095		
	DIA. SUPPORT, DUCTILE IRON	1		05010-1989	05010-1401
3*	GASKET, MOLDED BUNA-N	1	05011-0816	05011-0857	05011-0840
4*	BOTTOM PLUG, MOLDED BUNA-N	1	05010-1252	05010-1369	05010-1377
5*	TOP PLUG, MOLDED BUNA-N	1	05010-1260	05011-2663	05011-2655
6	STEM, ASTM A-582 TY.303	1	05010-1435	05010-1419	05010-1427
7	SPACER, ASTM A-582 TY.303	1	05011-3455	05010-1443	05010-1468
8*	GASKET, MOLDED BUNA-N	1	05010-3662		05010-4579
9	LINKAGE, ASTM A-582 TY.303	1	05010-1351		05010-1864
10	FLAT HD. SCREW, STAINLESS STEEL	4	05000-1759	05000-2278	
11	HINGE PIN, STAINLESS STEEL	1	05010-2037	05010-2029	
12	WASHER, ASTM A-582 TY.303	1	05010-1492	05010-1450	
13	FLEX-LOC NUT, STAINLESS STEEL	1	05000-2062	05000-2096	
14	LOWER CASE, ASTM A-569	1	06500-0572	06500-1257	
15	COTTER PIN, MONEL	1	06000-0239	06000-0247	
16	CAP SCREW, ASTM A-307 GR.B	4	05000-1841	05000-2013	
17*	PACKING, COTTON RENF. NITRILE	3	06000-0387		
	PACKING, COTTON RENF. NITRILE	4		06000-0387	
18*	PACKING, FLAT, COTTON RENF. NITRILE	2		06000-0528	
19	GLAND, LANTERN, DELRIN	1		05010-7457	
20	PACKING ADJ., ASTM B-16	1		05010-3639	
21	GLASS, IND., POLYCARBONATE	1		06000-4074	
22	DIAPH. PLATE, ASTM A-569	2		05010-1922	
23*	DIAPHRAGM, NYLON RENF. NITRILE	1		06000-0056	
24*	THREAD SEAL, STEEL/BUNA-N	1		06000-0395	
25	LOWER GUIDE, ASTM A-108GR.1213	1		05010-2169	
26	LOCK WASHER, STEEL	1		06000-0403	
27	NY-LOC NUT, ASTM A-307 GR.B	1		05000-2997	
28	SPRING, ASTM A-229	1		05010-7291	
29	UPPER GUIDE, ASTM A-108GR. 1213	1		05010-2151	
30	UPPER CASE, ASTM A-569	1		06500-1042	
31	CAP SCREW, ASTM A-307 GR.B	12		05000-1742	
32	HEX NUT, ASTM A-307 GR.B	12		05000-1726	
33	ADJ. SCREW, ASTM A-307 GR.B	1		05010-3407	
34	JAM NUT, ASTM A-307 GR.B	1		05000-2070	
35	PIN, INDICATOR, ABS PLASTIC	1		05010-5378	
36	SPRING, ASTM A-313	1		05010-2888	
37	ELBOW, BRASS	1		06000-2052	

* Available in 2" Only



*Recommended Spare Part

Model and Part No.

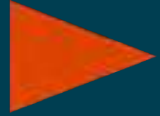
Size	Model No.	Body	Cv	Wt.	Part No.
2"	220-DSA-N	2"NPT, ANGLE	40	35	03000-1481
	220-DSG-N	2"NPT, GLOBE	40	41	03000-5771
	220-DFG-N	2"FLANGED, GLOBE	40	43	03000-1507
3"	320-DFG-N	3"FLANGED, GLOBE	75	73	03000-1556
4"	420-DFG-N	4"FLANGED, GLOBE	110	115	03000-1614

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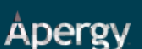


Wellmark Back Pressure Valves

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WellMark Series

3535 Back Pressure Valve, Low Pressure, Single Seat

Application

WellMark's Back Pressure Valve can be used in any installation where upstream pressure is required to be kept at a preset range. It may also be used as: a pressure relief valve, a custody transfer dump valve to hold a certain back pressure, or as a separator back pressure valve on the gas or liquid side. Upstream pressure is applied to the bottom of the diaphragm through connecting tubing. Spring tension above the diaphragm opposes this pressure, and when the pressure exceeds the pressure setting on the spring, the plug is raised off the seat. By varying the spring tension, the pressure setting can be varied.

The typical application for these valves is to hold back pressure on separators, treaters, Lact units, etc.

Features

- Simple Design
- Self-Contained: There are no pilots or small orifices to plug or freeze.
- Easy Access: All internal parts can be removed without taking valve out of line.
- Optional Seat: Integral or Removable
- Available in 1" and 2" Size
- Pressed Steel Topworks
- Threaded body, Ductile Iron
- Flanged Body, Steel

Specifications

Size 1" & 2" Threaded, 2" Grooved, 2" Flanged

Working Pressure Dictated by Spring Range

Spring Range From 0 to 150 psi

Temperature -50°F to +250°F Standard
(other materials available)

Size Topworks #10 or #20

(C_v) Flow Coefficient 1" = 11 2" = 25

Material

Body 1" & 2" Threaded Ductile Iron
2" Flanged WCB

Topworks #20 Press Steel, #10 Steel WCB

Diaphragm Nylon Reinforced Nitrile

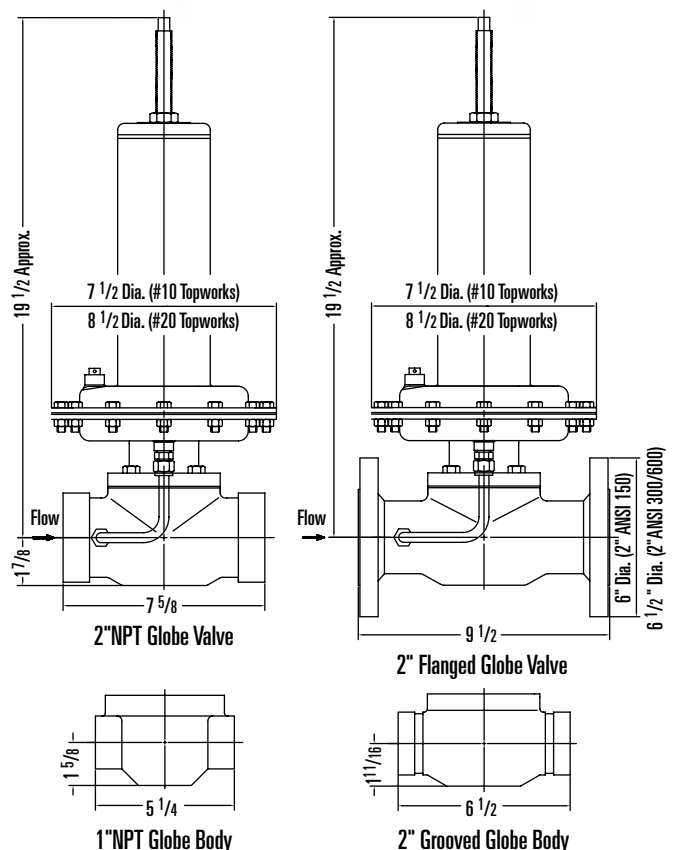
Stem 316 SS

Packing Cotton Reinforced Nitrile

Trim 303 SS Molded Buna-N



Dimensional Data



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WellMark Series

3535

3535 Back Pressure Valve, Low Pressure, Single Seat

Parts List Series 3535 w/#20 Topworks

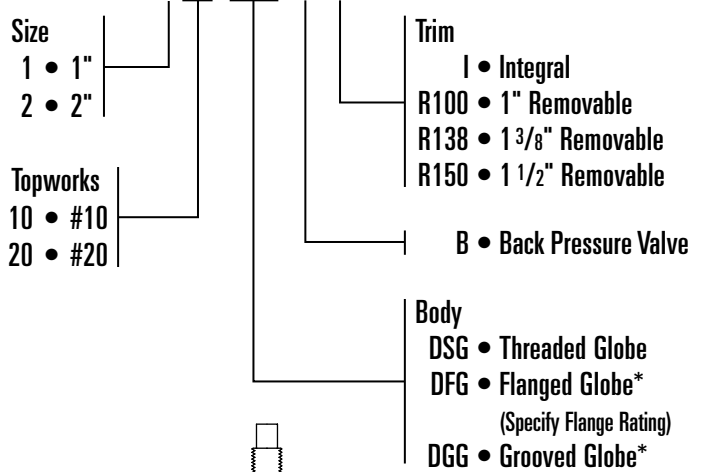
Item	Description	Qty.	Part No.
1	BODY, 1" NPT, DUCTILE IRON	1	05011-8397
	BODY, 2" NPT, DUCTILE IRON	1	05011-8256
	BODY, 2" GROOVED, DUCTILE IRON	1	05011-8207
	BODY, 2" ANSI 150RF, STEEL WCB	1	06500-3345
2*	PLUG, 1" VALVES, 303SS MOLDED BUNA-N	1	05011-1251
	PLUG, 2" VALVES, 303SS MOLDED BUNA-N	1	05010-4561
3*	GASKET, MOLDED BUNA-N	1	05011-0816
4	DIA. SUPPORT, ASTM A-108GR.1018	1	05010-4363
5	WASHER, 304 STAINLESS STL.	1	05010-4116
6	STEM, ASTM A-276 TY.316	1	05010-4587
7	FLEX-LOC NUT, STAINLESS STEEL	1	05000-1817
8	CAP SCREW, ASTM A-307 GR.B	4	05000-1858
9	O-RING, BUNA-N	1	05000-0066
10	FLAT HD. SCREW, STAINLESS STEEL	4	05000-1759
11	LOWER CASE, ASTM A-569	1	06500-0572
12	GASKET, MOLDED BUNA-N	1	05010-3662
13	BREATHER, HPE	1	05011-1640
14	UPPER CASE, ASTM A-569	1	06500-1059
15*	THREAD SEAL, STEEL/BUNA-N	1	06000-0395
16*	PACKING, FLAT, COTTON REIN. NITRILE	1	06000-0528
17	PACKING ADJ., ASTM B-16	1	05010-3639
18	SPACER, DELRIN	1	05010-4322
19*	PACKING, COTTON REIN. NITRILE	3	06000-0387
20	LOCK WASHER, STEEL	1	06000-0403
21	NY-LOC NUT, ASTM A-307 GR.B	1	05000-2997
22	DIAPH. PLATE, ASTM A-569	2	05010-1922
23*	DIAPHRAGM 0-30#, NYLON RENF. NITRILE	1	06000-0056
	DIAPH. 30-100#, NYLON RENF. NITRILE	1	06000-0064
24	UPPER GUIDE, ASTM A-108GR.1213	1	05010-1906
	UPPER GUIDE 50-100#, ASTM A-108GR.1213	1	05010-5071
25	LOWER GUIDE, ASTM A-366	1	05010-1914
	LOWER GUIDE 50-100#, ASTM A-366	1	05010-5089
26	SPRING 0-30#, ASTM A-401	1	05010-1344
	SPRING 10-80#, ASTM A-401	1	05010-6293
27	ADJ. SCREW, ASTM A-307 GR.B	1	05010-7820
28	JAM NUT, ASTM A-307 GR.B	1	05000-2070
29	SPRING, ASTM A-401, INNER	1	05010-5055
30	CAP SCREW, ASTM A-307 GR.B	12	05000-1742
31	HEX NUT, ASTM A-307 GR.B	12	05000-1726
32	ELBOW, CONN., BRASS	1	06000-0445
33	CONNECTOR, BRASS	1	06000-0429
34	TUBING, COPPER	1	06000-0437
35	STEM GUIDE, DELRIN	1	05010-4231

*Recommended Spare Part

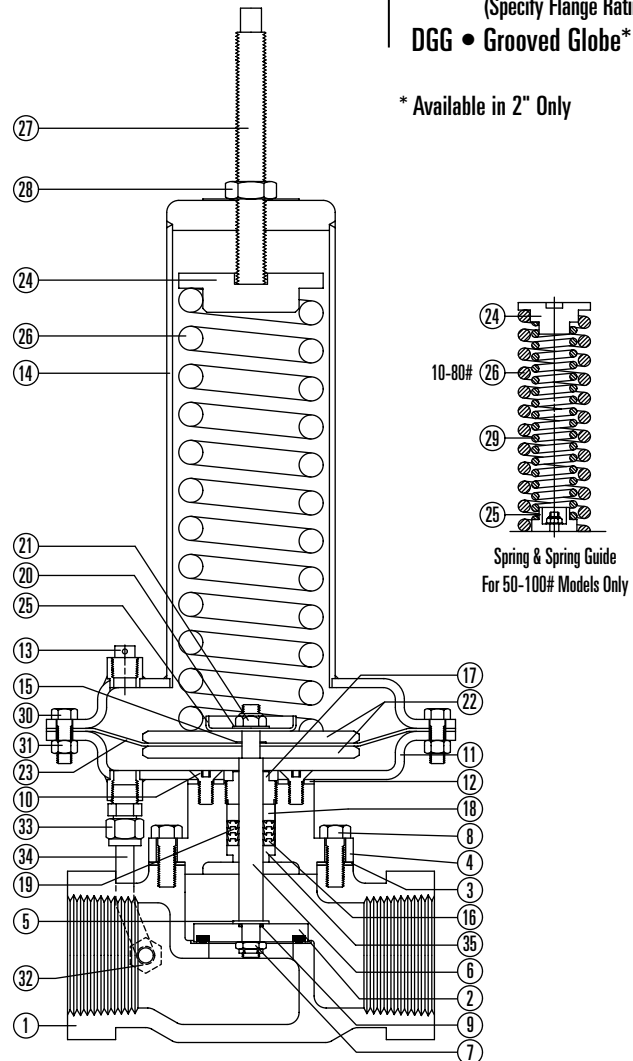
Determining the Model Number

Example given: Standard Model 220-DSG-B-I—Series 3535, 2" Threaded Globe Body, #20 Topworks, Integral Seated Back Pressure Valve.

MODEL 220-DSG-B-I



* Available in 2" Only



Model and Part No.

Size	Model No.	Ends Connection	Spring Range	C _v	Wt.	Part No.	
1"	120-DSG-B-I	1" NPT	0-30 lbs	11	32#	03027-0003	
	120-DSG-B-I		10-80 lbs			03027-0011	
2"	220-DSG-B-I	2" NPT	0-30 lbs	25	38#	03001-0086	
	220-DSG-B-I		10-80 lbs			03001-0094	
	220-DSG-B-I		50-100 lbs			03001-0177	
	220-DGG-B-I		0-30 lbs			03001-0037	
	220-DGG-B-I	2" GROOVED	10-80 lbs	25	35#	03001-0052	
	220-DGG-B-I		50-100 lbs			03001-0011	
	220-DFG-B-I		0-30 lbs			03001-0144	
	220-DFG-B-I		10-80 lbs			03001-0151	
	220-DFG-B-I		2" ANSI 150 RF			50-100 lbs	03001-0193
	220-DFG-B-I					50-100 lbs	03001-0193

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WellMark Series

3535 Back Pressure Valve, Low Pressure, Single Seat

Parts List Series 3535 w/#10 Topworks

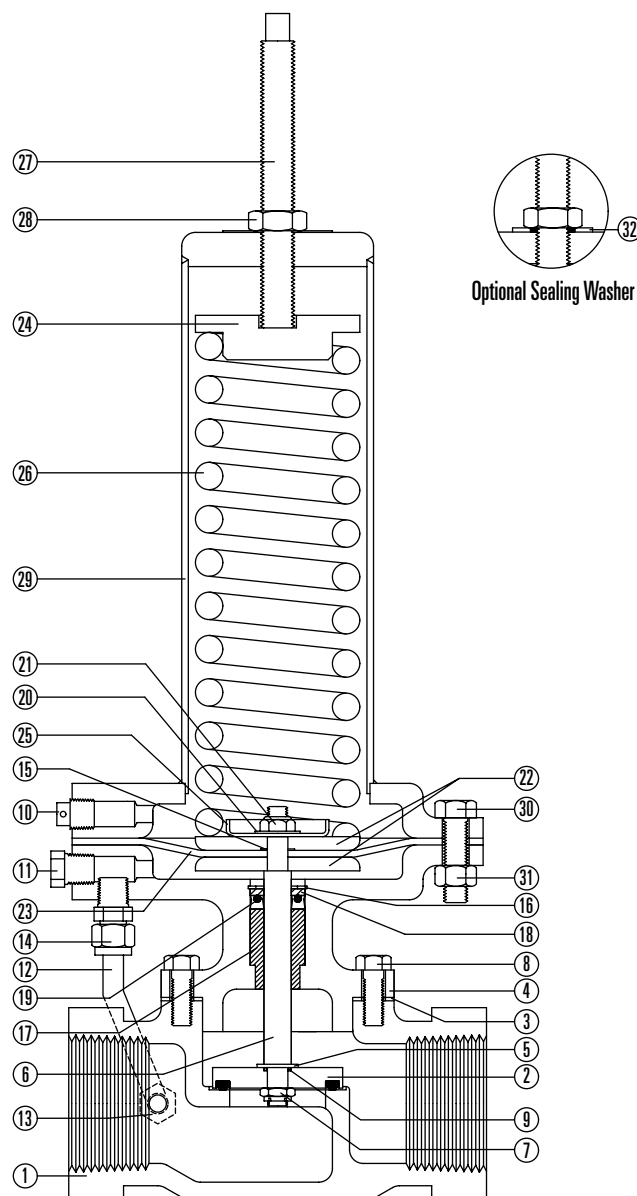
Item	Description	Qty.	Part No.
1	BODY, 1" NPT ANGLE, DUCTILE IRON	1	05011-8397
	BODY, 2" NPT , DUCTILE IRON	1	05011-8256
	BODY, 2" GROOVED, DUCTILE IRON	1	05010-4678
	BODY, 2" ANSI 150RF, STEEL WCB	1	06500-3345
	BODY, 2" ANSI 300RF, STEEL WCB	1	06500-3352
	BODY, 2" ANSI 600RF, STEEL WCB	1	06500-3360
2*	PLUG, 1" VALVES, 303SS MOLDED BUNA-N	1	05011-1251
	PLUG, 2" VALVES, 303SS MOLDED BUNA-N	1	05010-4561
3*	GASKET, MOLDED BUNA-N	1	05011-0816
4	DIA. SUPPORT, STEEL WCB	1	05010-8596
	DIA. SUPPORT, ANSI 300/600 FLG.	1	05011-8298
5	WASHER, 304 STAINLESS STL.	1	05010-4116
6	STEM, ASTM A-276 TY.316	1	05010-9222
7	FLEX-LOC NUT, STAINLESS STEEL	1	05000-1817
8	CAP SCREW, ASTM A-307 GR.B	4**	05000-1874
9*	O-RING, BUNA-N	1	05000-0066
10	BREATHER, HPE	1	05011-1640
11	PIPE PLUG, STEEL	1	06000-0478
12	TUBING, COPPER	1	06000-0437
13	ELBOW CONN., BRASS	1	06000-0445
14	CONNECTOR, BRASS	1	06000-0429
15*	THREAD SEAL, STEEL/BUNA-N	1	06000-0395
16	TRU-ARC RING, STAINLESS STEEL	1	06000-0452
17	STEM GUIDE, DELRIN	1	05010-8638
18	SPACER, DELRIN	1	05010-8646
19*	POLYPAK, MOLYTHANE	1	06000-0353
20	LOCK WASHER, STEEL	1	06000-0403
21	NY-LOC NUT, ASTM A-307 GR.B	1	05000-2997
22	DIAPH. PLATE, ASTM A-569	2	05010-8786
23*	DIAPHRAGM, NYLON RENF. NITRILE	1	05010-8612
24	UPPER GUIDE, ASTM A-108GR.1213	1	05010-1906
25	LOWER GUIDE, ASTM A-366	1	05010-1914
26	SPRING 0-60#, ASTM A-401	1	05010-1344
	SPRING 20-150#, ASTM A-401	1	05010-6293
27	ADJ. SCREW, ASTM A-307 GR.B	1	05010-7820
28	JAM NUT, ASTM A-307 GR.B	1	05000-2070
29	UPPER CASE, ASTM A-216 GR.WCB	1	06500-0986
30	CAP SCREW, ASTM A-307 GR.B	8	05000-1890
31	HEX NUT, ASTM A-307 GR.B	8	05000-2104
32	SEAL WASHER, STEEL PLATED	1	06000-0460

*Recommended Spare Part

**8 Req'd For ANSI 300/600 Flanged Valves

Model and Part No.

Size	Model No.	Ends Connection	Spring Range	C _v	Wt.	Part No.
1"	110-DSG-B-I	1" NPT	0-60 lbs	11	40#	03031-0007
	110-DSG-B-I		20-150 lbs			03031-0015
2"	210-DSG-B-I	2" NPT	0-60 lbs	25	44#	03032-0030
	210-DSG-B-I		20-150 lbs			03032-0048
	210-DGG-B-I	2" GROOVED	0-60 lbs	25	41#	03032-0063
	210-DGG-B-I		20-150 lbs			03032-0071
	210-DFG-B-I	2" ANSI 150 RF	0-60 lbs	25	60#	03032-0121
	210-DFG-B-I		20-150 lbs			03032-0139
	210-DFG-B-I	2" ANSI 300 RF	0-60 lbs	25	64#	03032-0154
	210-DFG-B-I		20-150 lbs			03032-0162
	210-DFG-B-I	2" ANSI 600 RF	0-60 lbs	25	68#	03032-0188
	210-DFG-B-I		20-150 lbs			03032-0196



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Apergy

WellMark Series

3535

3535 Back Pressure Valve, Low Pressure, Single Seat

Parts List Series 3535 w/Removable Seat & #10 Topworks

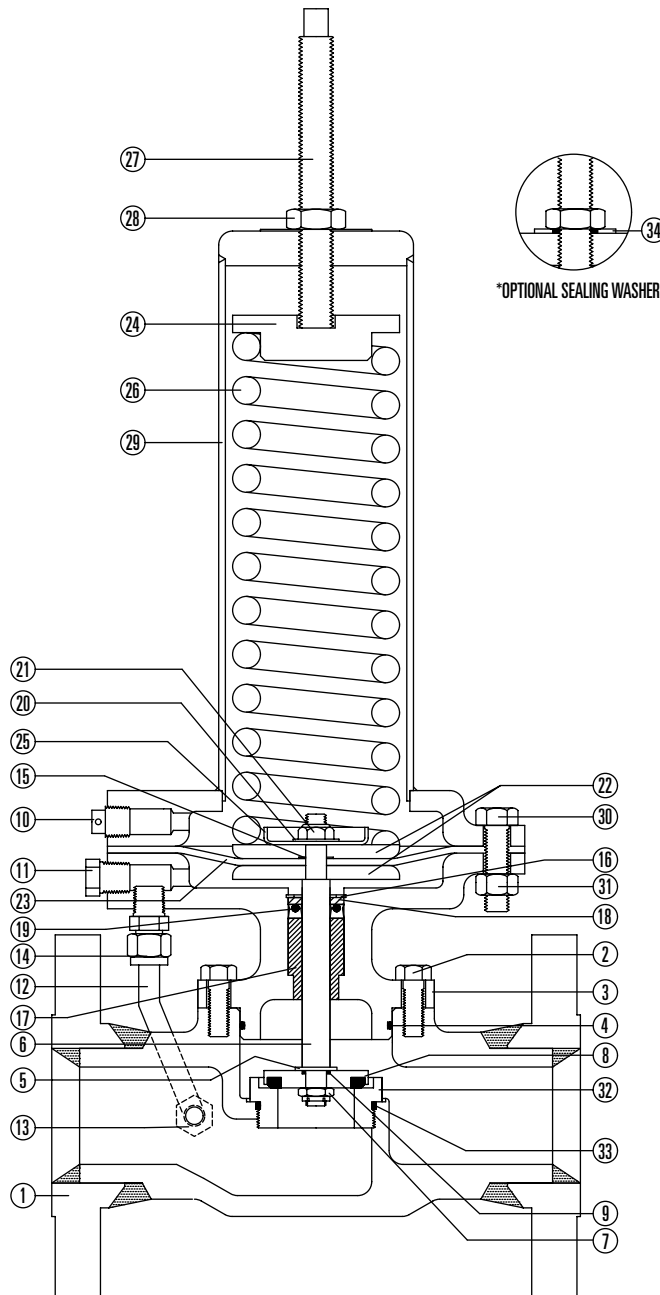
Item	Description	Qty.	Part No.
1	BODY, 2" ANSI 150RF, STEEL WCB	1	06500-3204
	BODY, 2" ANSI 300RF, STEEL WCB	1	06500-3212
	BODY, 2" ANSI 600RF, STEEL WCB	1	06500-3220
2	CAP SCREW, ASTM A-307 GR.B	4**	05000-1874
3	DIA. SUPPORT ANSI 150 FLG., WCB	1	05010-8596
	DIA. SUPPORT ANSI 300/600, WCB	1	05011-8298
4*	O-RING, BUNA-N	1	05000-0371
5	WASHER, 304 STAINLESS STL.	1	05010-4116
6	STEM, ASTM A-276 TY.316	1	05012-3181
7	FLEX-LOC NUT, STAINLESS STEEL	1	05000-1817
8*	PLUG, 303SS MOLDED BUNA-N	1	05012-1458
9*	O-RING, BUNA-N	1	05000-0066
10	BREATHER, HPE	1	05011-1640
11	PIPE PLUG, STEEL	1	06000-0478
12	TUBING, COPPER	1	06000-0437
13	ELBOW CONN., BRASS	1	06000-0445
14	CONNECTOR, BRASS	1	06000-0429
15*	THREAD SEAL, STEEL/BUNA-N	1	06000-0395
16	TRU-ARC RING, STAINLESS STEEL	1	06000-0452
17	STEM GUIDE, DELRIN	1	05010-8638
18	SPACER, DELRIN	1	05010-8646
19*	POLYPAK, MOLYTHANE	1	06000-0353
20	LOCK WASHER, STEEL	1	06000-0403
21	NY-LOC NUT, ASTM A-307 GR.B	1	05000-2997
22	DIAPH. PLATE, ASTM A-569	2	05010-8786
23*	DIAPHRAGM, NYLON RENF. NITRILE	1	05010-8612
24	UPPER GUIDE, ASTM A-108GR.1213	1	05010-1906
25	LOWER GUIDE, ASTM A-366	1	05010-1914
26	SPRING 0-60#, ASTM A-401	1	05010-1344
	SPRING 20-150#, ASTM A-401	1	05010-6293
27	ADJ. SCREW, ASTM A-307 GR.B	1	05010-7820
28	JAM NUT, ASTM A-307 GR.B	1	05000-2070
29	UPPER CASE, ASTM A-216 GR.WCB	1	06500-0986
30	CAP SCREW, ASTM A-307 GR.B	8	05000-1890
31	HEX NUT, ASTM A-307 GR.B	8	05000-2104
32	SEAT, ASTM A-582 TY.303	1	05011-1657
33*	O-RING, BUNA-N	1	05000-0322
34	SEAL WASHER, STEEL PLATED	1	06000-0460

*Recommended Spare Part

**8 Req'd For ANSI 300/600 Flanged Valves

Model and Part No.

Size/ANSI	Model No.	Spring Range	C _v	Wt.	Part No.
2"-150	210-DFG-B-R138	0-60 lbs	25	61#	03032-0287
	210-DFG-B-R138	20-150 lbs			03032-0295
2"-300	210-DFG-B-R138	0-60 lbs	25	65#	03032-0303
	210-DFG-B-R138	20-150 lbs			03032-0220
2"-600	210-DFG-B-R138	0-60 lbs	25	69#	03032-0311
	210-DFG-B-R138	20-150 lbs			03032-0329

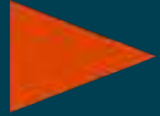


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Wellmark Diaphragm Double Seated (Balanced) BPV

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WellMark Series

5555 Back Pressure Valve, Double Seated (Balanced) Application

This unique valve, with its simple and near-balanced double-seated design, along with its history of trouble free operation, has contributed materially to its wide acceptance in the oil industry. Primary application is to hold back pressure on separators, treaters, Lact units, and other accumulators when upstream pressure is required to be kept at a preset range. However, this valve may also be used as a differential valve by utilizing secondary signal pressure, along with spring force on top of the diaphragm, to oppose flow pressure applied to the bottom of the diaphragm.

Features

- Simple Design
- Self-Contained: There are no pilots or small orifices to plug or freeze.
- Easy Access: All internal parts can be removed without taking valve out of line.
- Available in 2" Threaded: 2", 3", 4" Flanged
- Molded Buna-N or Viton® Plugs for Corrosion Resistance & Tight Shut-Off
- Multiple Spring Ranges: 0-30 lb to 20-150 lb

Specifications

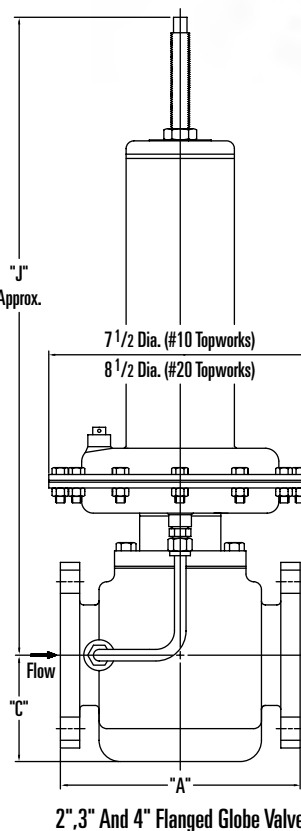
Size	2" Threaded	2", 3", 4" Flanged
Working Pressure	Dictated by Spring Range	
Spring Range	0-30 lb to 20-150 lb	
Temperature	-50°F to +250°F Standard (other materials available)	
Size Topworks	#10 or #20	
(C _v) Flow Coefficient	2" = 40	3" = 70 4" = 110

Material

Body	Ductile Iron	
Topworks	#20 Press Steel	#10 WCB
Diaphragm	Molded Nylon Reinforced Buna-N (Viton® Available)	
Stem	303 SS	
Packing	Cotton Reinforced Nitrile	
Trim	Buna-N or Viton® Molded Plug, Integral Seat	

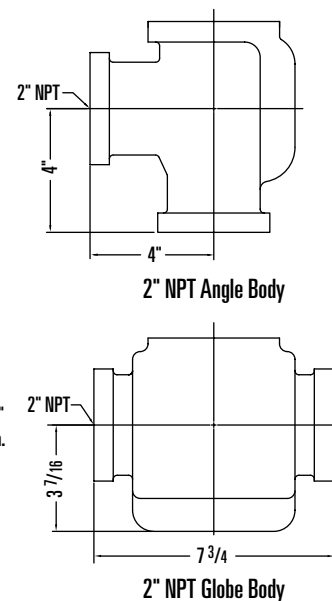


Dimensional Data



General Dimensions

Size	"A"	"C"	"D"	"J"
2"	7 3/4"	3 7/16"	6"	21"
3"	11"	4 1/4"	7 1/2"	22"
4"	12 3/4"	5"	9"	23"



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WellMark Series

5555

5555 Back Pressure Valve, Double Seated (Balanced)

Parts List Series 5555 w/#20 Topworks

Item	Description	Qty.	Part No.		
			2"	3"	4"
1	BODY, 2"NPT ANGLE, DUCTILE IRON	1	05010-1214		
	BODY, 2"NPT GLOBE, DUCTILE IRON	1	05012-3614		
	BODY, FLANGED GLOBE, DUCT. IRON	1	05011-7639	05011-8355	05011-8371
2	DIA. SUPPORT, STEEL	1	05011-5195		
	DIA. SUPPORT, DUCTILE IRON	1		05013-0455	05013-0463
3*	GASKET, MOLDED BUNA-N	1	05011-0816	05011-0857	05011-0840
4*	BOTTOM PLUG, MOLDED BUNA-N	1	05010-1252	05010-1369	05010-1377
5*	TOP PLUG, MOLDED BUNA-N	1	05010-1260	05011-2663	05011-2655
6	STEM, ASTM A-582 TY.303	1	05010-1435	05010-1419	05010-1427
7	SPACER, ASTM A-582 TY.303	1	05011-3455	05010-1443	05010-1468
8	TRAVEL STOP, ASTM A-582 TY.303	1	05010-6798	05010-6277	05010-6285
9	LINKAGE, ASTM A-582 TY.303	1	05010-1351	05010-1864	
10	FLAT HD. SCREW, STAINLESS STEEL	4	05000-1759	05000-2278	
11	HINGE PIN, STAINLESS STEEL	1	05010-2037	05010-2029	
12	WASHER, ASTM A-582 TY.303	1	05010-1492	05010-1450	
13	FLEX-LOC NUT, STAINLESS STEEL	1	05000-2062	05000-2096	
14	LOWER CASE, ASTM A-569	1	06500-1257	06500-0572	
15	COTTER PIN, MONEL	1	06000-0239	06000-0247	
16	CAP SCREW, ASTM A-307 GR.B	4	05000-1841	05000-2013	
17*	GASKET, MOLDED BUNA-N	1	05010-3662	05010-4579	
18	SPACER, DELRIN	1	05010-8000	05010-4322	
19*	PACKING, COTTON REIN. NITRILE	3	06000-0387		
	PACKING, COTTON REIN. NITRILE	2		06000-0387	
20	LOCK WASHER, STEEL	1		06000-0403	
21	NY-LOC NUT, ASTM A-307 GR.B	1		05000-2997	
22	DIAPH. PLATE, ASTM A-569	2		05010-1922	
23*	DIAPH. 0-30#, NYLON RENF. NITRILE	1		06000-0056	
	DIAPH. 30-100#, NYLON RENF. NITRILE	1		06000-0064	
24	UPPER GUIDE, ASTM A-108GR.1213	1		05010-1906	
	UPPER GUIDE 50-100#, ASTM A-108GR.1213	1		05010-5071	
25	LOWER GUIDE, ASTM A-366	1		05010-1914	
	LOWER GUIDE 50-100#, ASTM A-366	1		05010-5089	
26	SPRING 0-30#, ASTM A-401	1		05010-1344	
	SPRING 10-80#, ASTM A-401	1		05010-6293	
27	ADJ. SCREW, ASTM A-307 GR.B	1		05010-7820	
28	JAM NUT, ASTM A-307 GR.B	1		05000-2070	
29	UPPER CASE, ASTM A-569	1		06500-1042	
30	CAP SCREW, ASTM A-307 GR.B	12		05000-1742	
31	HEX NUT, ASTM A-307 GR.B	12		05000-1726	
32	BREATHER, HPE	1		05011-1640	
33	SPRING, INNER, ASTM A-401	1		05010-5055	
34*	THREAD SEAL, STEEL/BUNA-N	1		06000-0395	
35*	PACKING, FLAT, COTTON REIN. NITRILE	1		06000-0528	
36	PACKING ADJ., ASTM B-16	1		05010-3639	
37	CONNECTOR, BRASS	2		06000-0429	
38	TUBING, COPPER	1		06000-0437	

*Recommended Spare Part

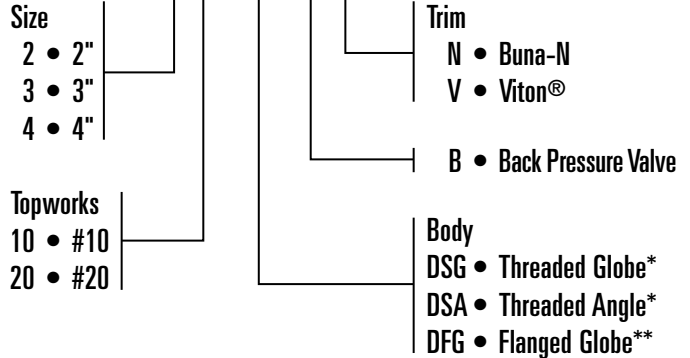
Model and Part No.

Size	Model No.	Body Material	Spring Range	C _v	Wt.	Part No.
2"	220-DSA-B-N	DUCTILE IRON	0-30 lbs	40	42#	03004-0034
	220-DSA-B-N		10-80 lbs			03004-0067
	220-DSA-B-N		50-100 lbs			03004-0000
	220-DSG-B-N		0-30 lbs			03004-0200
	220-DSG-B-N		10-80 lbs	40	46#	03004-0213
	220-DSG-B-N		50-100 lbs			03004-0221
	220-DFG-B-N		0-30 lbs			03004-0059
	220-DFG-B-N		10-80 lbs			03004-0083
3"	320-DFG-B-N	DUCTILE IRON	50-100 lbs	70	78#	03004-0026
	320-DFG-B-N		0-30 lbs			03028-0093
	320-DFG-B-N		10-80 lbs			03028-0101
	320-DFG-B-N		50-100 lbs			03028-0051
4"	420-DFG-B-N	DUCTILE IRON	0-30 lbs	110	123#	03028-0184
	420-DFG-B-N		10-80 lbs			03028-0192
	420-DFG-B-N		50-100 lbs			03028-0234

Determining the Model Number

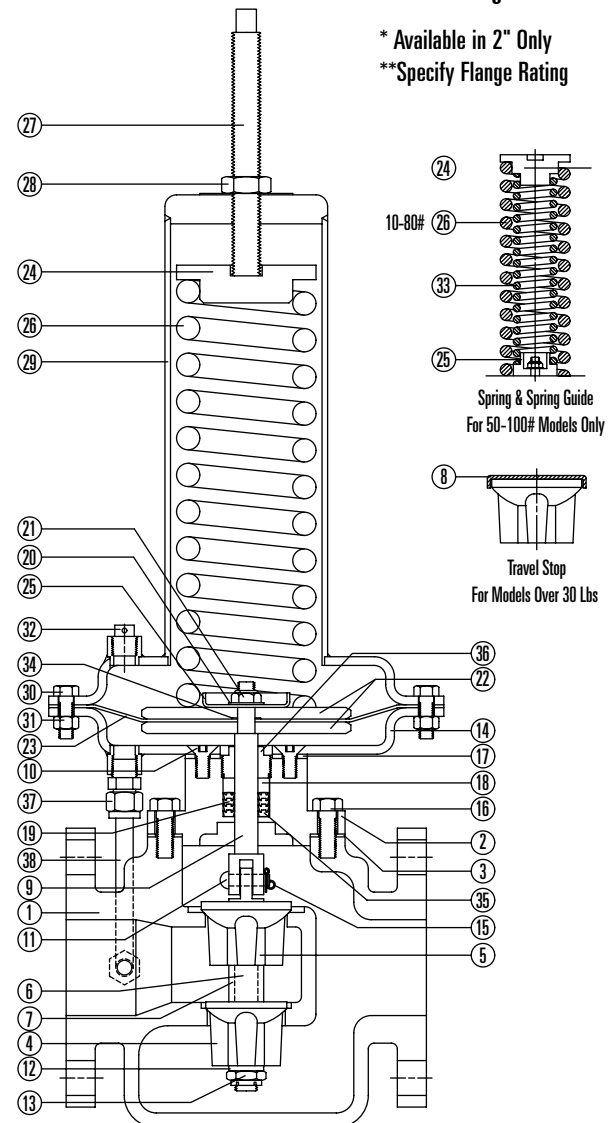
Example given: Model 410-DFG-B-V – Series 5555, 4" Flanged Globe Body, #10 Topworks, Viton® Plug, Back Pressure Valve.

MODEL 410-DFG-B-V



* Available in 2" Only

**Specify Flange Rating



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WellMark Series

5555 Back Pressure Valve, Double Seated (Balanced)

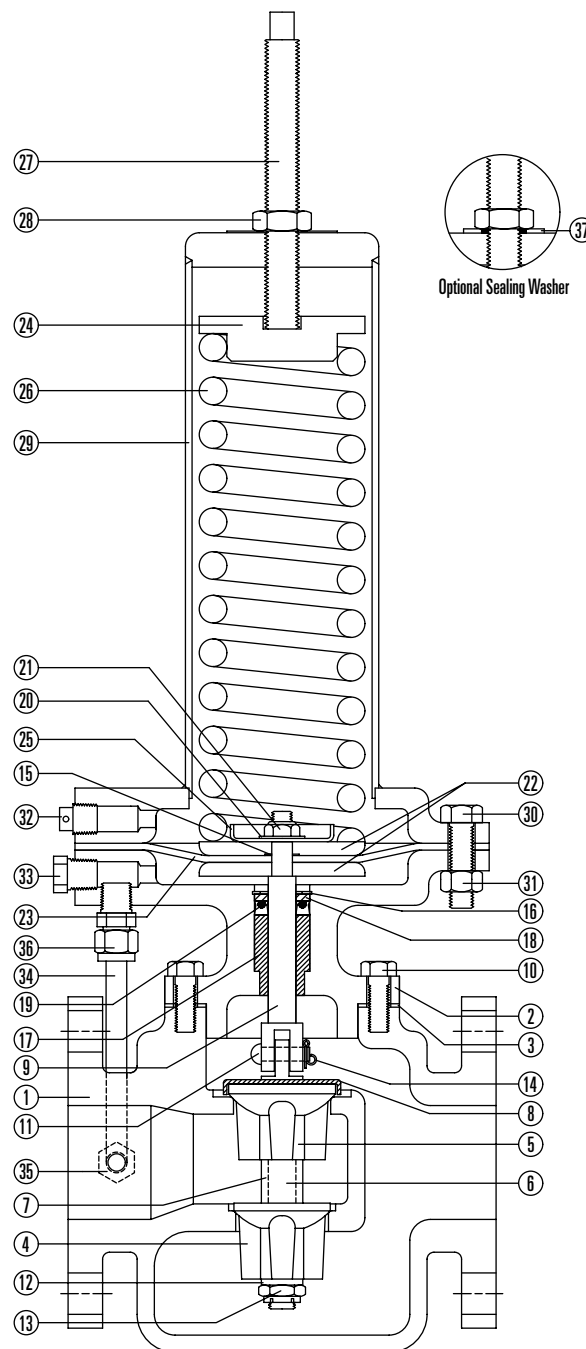
Parts List Series 5555 w/#10 Topworks

Item	Description	Qty.	Part No.		
			2"	3"	4"
1	BODY, 2"NPT ANGLE, DUCTILE IRON	1	05010-1214		
	BODY, 2"NPT GLOBE, DUCTILE IRON	1	05012-3614		
	BODY, FLANGED GLOBE, DUCT. IRON	1	05011-7639	05011-8355	05011-8371
2	DIA. SUPPORT, ASTM A-216 GR.WCB	1	05010-8596	06500-1968	06500-1976
3*	GASKET, MOLDED BUNA-N	1	05011-0816	05011-0857	05011-0840
4*	BOTTOM PLUG, MOLDED BUNA-N	1	05010-1252	05010-1369	05010-1377
5*	TOP PLUG, MOLDED BUNA-N	1	05010-1260	05011-2663	05011-2655
6	STEM, ASTM A-582 TY.303	1	05010-1435	05010-1419	05010-1427
7	SPACER, ASTM A-582 TY.303	1	05011-3455	05010-1443	05010-1468
8	TRAVEL STOP, ASTM A-582 TY.303	1	05010-6798	05010-6277	05010-6285
9	LINKAGE, ASTM A-582 TY.303	1	05010-8794	05010-1864	
10	CAP SCREW, ASTM A-307 GR.B	4	05000-1841	05000-2013	
11	HINGE PIN, STAINLESS STEEL	1	05010-2037	05010-2029	
12	WASHER, ASTM A-582 TY.303	1	05010-1492	05010-1450	
13	FLEX-LOC NUT, STAINLESS STEEL	1	05000-2062	05000-2096	
14	COTTER PIN, MONEL	1	06000-0239	06000-0247	
15*	THREAD SEAL, STEEL/BUNA-N	1		06000-0395	
16	TRU-ARC RING, STAINLESS STEEL	1		06000-0452	
17	STEM GUIDE, DELRIN	1		05010-8638	
18	SPACER, DELRIN	1		05010-8646	
19*	POLYPAK, MOLYTHANE	1		06000-0353	
20	LOCK WASHER, STEEL	1		06000-0403	
21	NY-LOC NUT, ASTM A-307 GR.B	1		05000-2997	
22	DIAPH. PLATE, ASTM A-569	2		05010-8786	
23*	DIAPHRAGM, NYLON RENF. NITRILE	1		05010-8612	
24	UPPER GUIDE, ASTM A-108GR.1213	1		05010-1906	
25	LOWER GUIDE, ASTM A-366	1		05010-1914	
26	SPRING 0-60#, ASTM A-401	1		05010-1344	
	SPRING 20-150#, ASTM A-401	1		05010-6293	
27	ADJ. SCREW, ASTM A-307 GR.B	1		05010-7820	
28	JAM NUT, ASTM A-307 GR.B	1		05000-2070	
29	UPPER CASE, ASTM A-216 GR.WCB	1		06500-0986	
30	CAP SCREW, ASTM A-307 GR.B	8		05000-1890	
31	HEX NUT, ASTM A-307 GR.B	8		05000-2104	
32	BREATHER, HPE	1		05011-1640	
33	PIPE PLUG, STEEL	1		06000-0478	
34	TUBING, COPPER	1		06000-0437	
35	ELBOW CONN., BRASS	1		06000-0445	
36	CONNECTOR, BRASS	1		06000-0429	
37	SEAL WASHER, STEEL PLATED	1		06000-0460	

*Recommended Spare Part

Model and Part No.

Size	Model No.	Body Material	Spring Range	C _v	Wt.	Part No.
2"	210-DSA-B-N	DUCTILE IRON	0-60 lbs	40	48#	03005-0070
	210-DSA-B-N		20-150 lbs			03005-0080
	210-DSG-B-N		0-60 lbs			03005-0041
	210-DSG-B-N		20-150 lbs	55#	03005-0058	
	210-DFG-B-N		0-60 lbs		03005-0009	
	210-DFG-B-N		20-150 lbs		03005-0017	
3"	310-DFG-B-N	DUCTILE IRON	0-60 lbs	70	80#	03033-0039
	310-DFG-B-N		20-150 lbs			03033-0047
4"	410-DFG-B-N	DUCTILE IRON	0-60 lbs	110	120#	03034-0038
	410-DFG-B-N		20-150 lbs			03034-0046

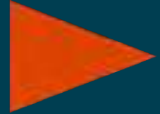


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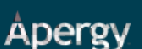


Wellmark Throttling/ Choke Valves

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WellMark Series

2020 Flow Control Choke Valve

Application

This versatile and proven valve is ideal for use in well head control, in gas gathering systems to regulate flow, for CO₂ and water or steam injection systems as well as pressure separators. Suitable for water, gas and other liquid service.

Features

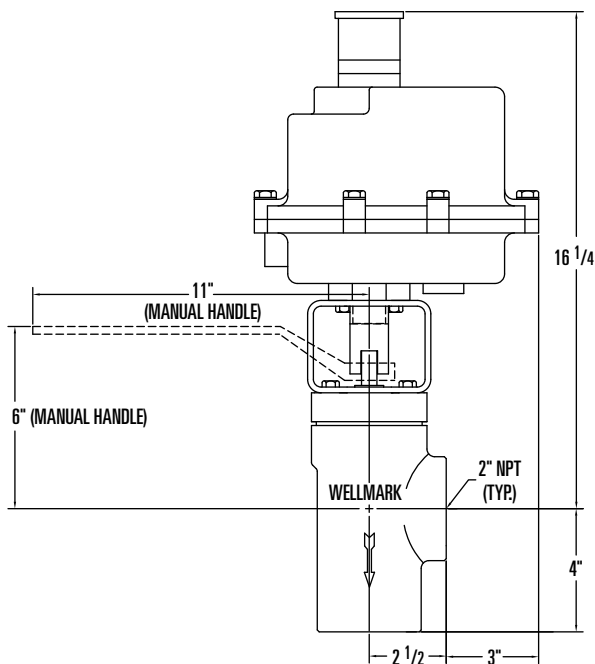
- Choice of Manual, Electric, or Pneumatic Actuation
- Choice of Angle or "Y" Body Style in Carbon or Stainless Steel
- Choice of Tungsten Carbide or Ceramic Disc Material
- Multiple Orifice Sizes for Greater Control
- Low Torque At High Differential Pressure

Specifications

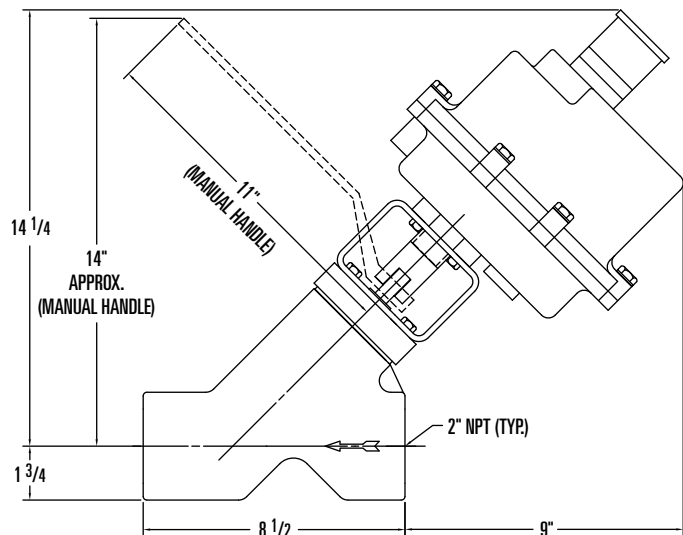
Working Pressure To 3600 psi
 Body Material WCB Carbon Steel or CF8M Stainless Steel
 Disc Material Tungsten Carbide or Ceramic



Dimensional Data



2" ANGLE VALVE



2" "Y" VALVE

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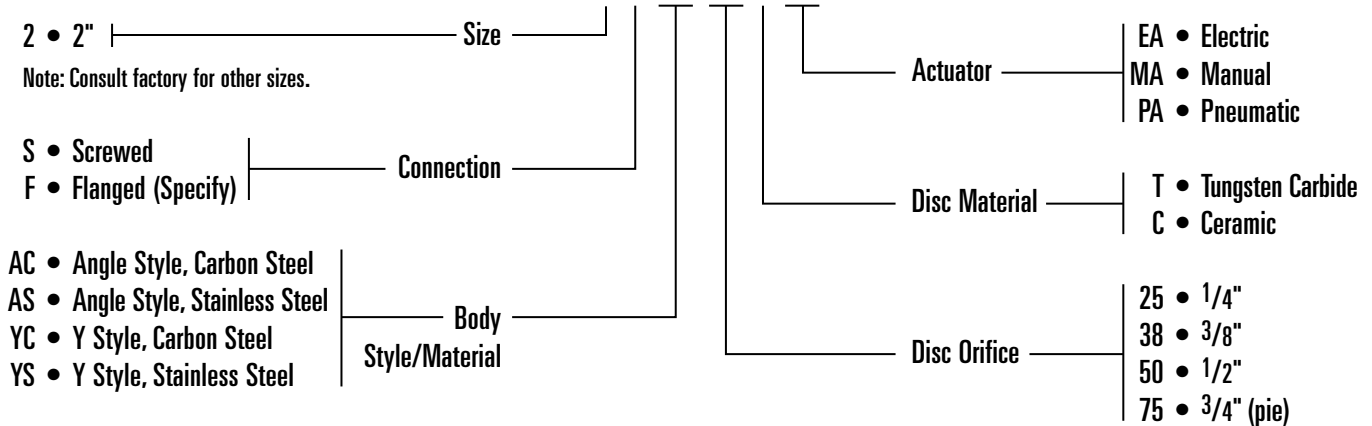
WellMark Series

2020 Flow Control Choke Valve

Determining the Model Number

Example given: A 2" Model 2020 Choke Valve with Screwed Ends in the Angle Style Body Configuration Constructed of Carbon Steel, Utilizing a 3/4" Disk Orifice and Tungsten Carbide Disc Material with Electric Actuation.

MODEL 2 S AC-75 T EA

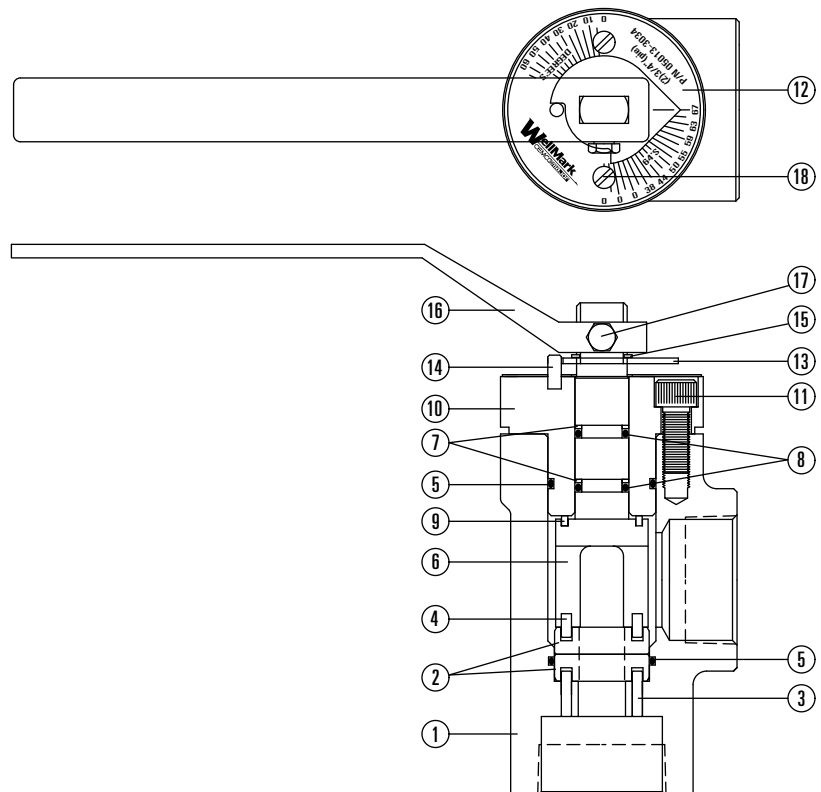


Parts List Series 2020 w/Manual Handle

Item	Description	Qty.	Part No.
1	BODY, 2" ANGLE, STEEL WCB	1	05013-2879
	BODY, 2" "Y", STEEL WCB	1	05013-3000
2"	DISC, 1/4" DIA., TUNGSTEN CARBIDE	2	06000-8741
	DISC, 3/8" DIA., TUNGSTEN CARBIDE	2	06000-8775
	DISC, 1/2" DIA., TUNGSTEN CARBIDE	2	06000-8809
	DISC, 3/4" PIE, TUNGSTEN CARBIDE	2	06000-8534
	DISC, 1/4" DIA., CERAMIC	2	06000-8759
	DISC, 3/8" DIA., CERAMIC	2	06000-8783
	DISC, 1/2" DIA., CERAMIC	2	06000-8817
	DISC, 3/4" PIE, CERAMIC	2	06000-8725
3	PIN, 17-4PH, ANGLE BODY ONLY	2	05013-2961
4	PIN, 17-4PH	2**	05013-2953
5"	O-RING, BUNA-N	2	05000-2914
6	STEM, STEEL PLATED	1	05013-2887
7"	BACK UP RING, TEFLON®	2	05000-5844
8"	O-RING, BUNA-N	2	05000-0447
9	BEARING, BRONZE	1	05013-2929
10	BONNET, STEEL	1	05013-2895
11	SOCKET HEAD SCREW, 18-8 S.S.	4	05000-2021
12	INDICATOR, 1/4", ALUMINUM	1	05013-3105
	INDICATOR, 3/8", ALUMINUM	1	05013-3155
	INDICATOR, 1/2", ALUMINUM	1	05013-3163
	INDICATOR, 3/4" PIE, ALUMINUM	1	05013-3034
13	STOP PLATE, STAINLESS STEEL	1	05013-3042
14	PIN, STAINLESS STEEL	1	06000-8700
15	RETAINER RING, STEEL	1	936200000
16	HANDLE, DUCTILE IRON	1	929200000
17	HANDLE SCREW, STEEL PLATE	1	915000000
18	INDICATOR SCREW, STEEL	2	05000-5878

*Recommended Spare Part

**4 Req'd on 2" "Y" Valve



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Apergy

WellMark Series

2020 Flow Control Choke Valve

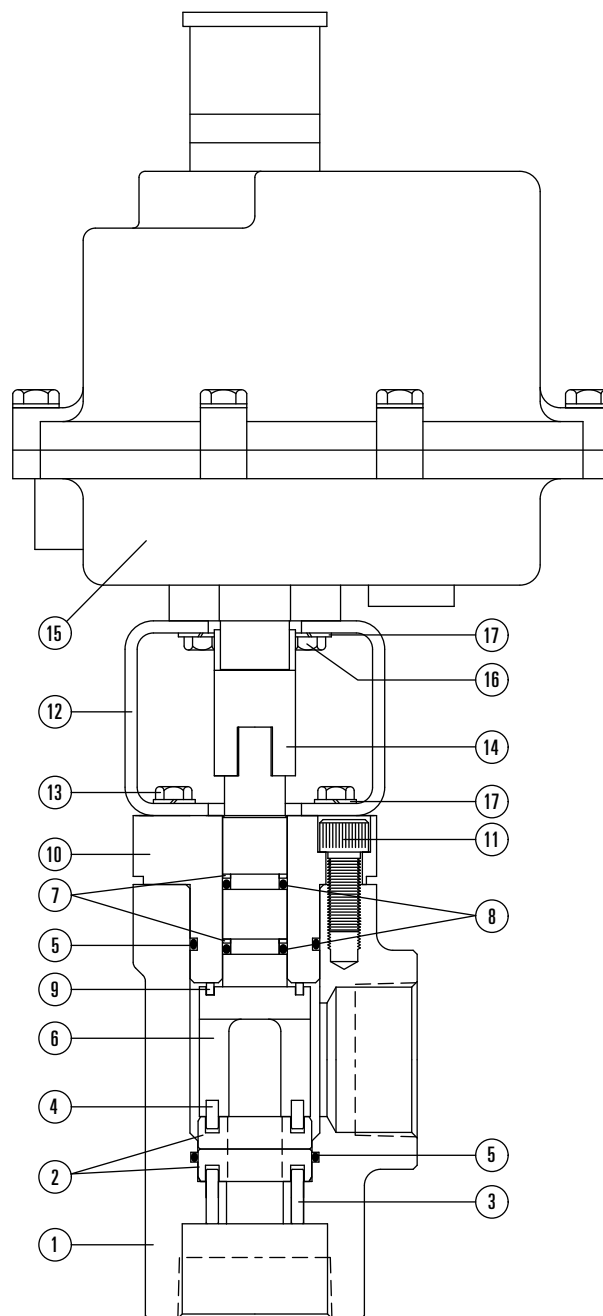
Parts List Series 2020 w/Electric Actuator

Item	Description	Qty.	Part No.
1	BODY, 2" ANGLE, STEEL WCB	1	05013-2879
	BODY, 2" "Y", STEEL WCB	1	05013-3000
2*	DISC, 1/4" DIA., TUNGSTEN CARBIDE	2	06000-8741
	DISC, 3/8" DIA., TUNGSTEN CARBIDE	2	06000-8775
	DISC, 1/2" DIA., TUNGSTEN CARBIDE	2	06000-8809
	DISC, 3/4" PIE, TUNGSTEN CARBIDE	2	06000-8534
	DISC, 1/4" DIA., CERAMIC	2	06000-8759
	DISC, 3/8" DIA., CERAMIC	2	06000-8783
	DISC, 1/2" DIA., CERAMIC	2	06000-8817
	DISC, 3/4" PIE, CERAMIC	2	06000-8725
3	PIN, 17-4PH, ANGLE BODY ONLY	2	05013-2961
4	PIN, 17-4PH	2**	05013-2953
5*	O-RING, BUNA-N	2	05000-2914
6	STEM, STEEL PLATED	1	05013-2887
7*	BACK UP RING, TEFLON®	2	05000-5844
8*	O-RING, BUNA-N	2	05000-0447
9	BEARING, BRONZE	1	05013-2929
10	BONNET, STEEL	1	05013-2895
11	SOCKET HEAD SCREW, 18-8 S.S.	4	05000-2021
12	BRACKET, STEEL	1	05013-2945
13	SCREW, STEEL PLATED	4	05000-5198
14	DRIVER, STEEL PLATED	1	05013-2937
15	ELECTRIC ACTUATOR***	1	06000-8526
16	SCREW, STEEL PLATED	4	05000-5852
17	LOCK WASHER, STEEL PLATED	8	05000-5860

*Recommended Spare Part

**4 Req'd on 2" "Y" Valve

***Consult Factory for Actuation Details



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Apergy

WellMark Series

2020

2020 Flow Control Choke Valve

Flow Data

C _v Factor Chart				
VALVE ORIFICE	1/4"	3/8"	1/2"	3/4" (pie)
C _v FACTOR	2.98	6.84	11.83	31.3

Using the C_v factors above for any valve, its approximate flow capacity can be determined by the formulas at right.

If required flow capacity is known and valve selection is desired, solve for C_v with the formulas below and select appropriate valve from C_v Factor Chart above.

For Liquids:

$$C_v = \frac{Q}{34.3 \sqrt{\frac{\Delta P}{G}}}$$

For Gas:

$$C_v = \frac{Q}{.0234 \sqrt{\frac{\Delta P (P_1 + P_2)}{GT}}}$$

For Liquids:

$$Q = 34.3 C_v \sqrt{\frac{\Delta P}{G}}$$

Q = Flow (Barrels/Day)

C_v = Flow factor

ΔP = Pressure drop across valve

G = Specific gravity (water=1.0)

For Gas:

$$Q = .0234 C_v \sqrt{\frac{\Delta P (P_1 + P_2)}{GT}}$$

Q = Flow (MMSCFD)

C_v = Flow factor

P₁ = Inlet pressure (psia)

P₂ = Outlet pressure (psia)

ΔP = Pressure drop (P₁-P₂).

When P₂ is less than 1/2 P₁, use 1/2 P₁ for P₂ in formula.

G = Specific gravity (air= 1.0)

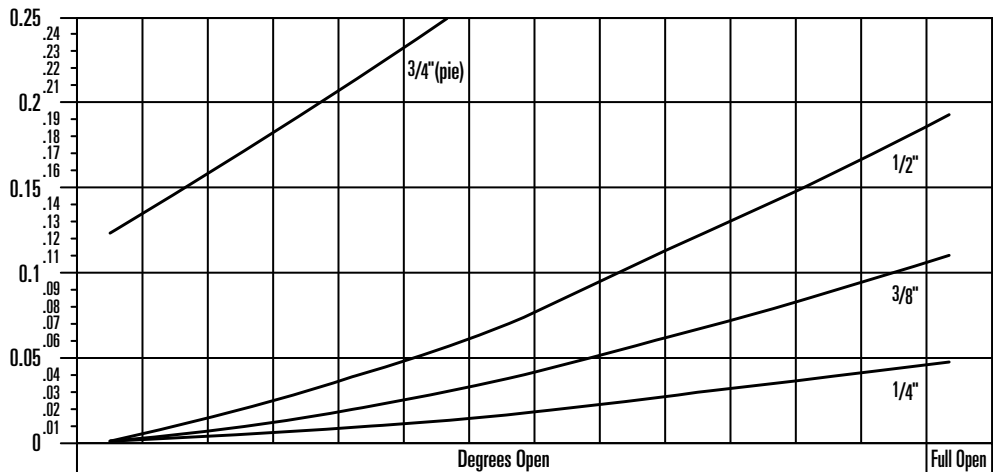
T = Flowing temperature absolute (°F + 460)

Conversion Chart To Determine Open Area of Disc Orifice to 64th's

Degrees Open	Orifice Size							
	1/4"		3/8"		1/2"		3/4" (pie)	
	64th's	Area Open (Sq. in.)	64th's	Area Open (Sq. in.)	64th's	Area Open (Sq. in.)	64th's	Area Open (Sq. in.)
0-20°	0	0	0	0	0	0	0	0
25°	2.04	.0004	3.23	.001	5.59	.003	34.93	.117
30°	4.57	.002	6.46	.004	9.69	.009	38.35	.141
35°	6.54	.0041	9.63	.0089	13.7	.018	41.55	.1655
40°	8.42	.0068	12.42	.0148	17.39	.029	44.52	.19
45°	10.16	.0099	15.08	.0218	20.68	.041	47.3	.2145
50°	11.82	.0134	17.57	.0296	23.95	.055	49.93	.239
55°	13.39	.0172	19.94	.0381	27.02	.07	52.43	.2635
60°	14.87	.0212	21.21	.0473	29.95	.086	54.81	.288
65°	16.3	.0255	24.38	.057	32.78	.103	57.05	.312
70°	17.69	.03	26.48	.0672	35.53	.121	59.19	.336
75°	18.99	.0346	28.47	.0777	38.08	.139	61.32	.3605
80°	20.27	.0394	30.37	.0884	40.59	.158	63.37	.385
85°	21.47	.0442	32.19	.0994	42.97	.177	65.35	.4095
90°	22.6	.049	33.87	.11	45.21	.196	67.28	.434

Conversion formula for converting known open orifice area to 64th's:

$$64th's = 128 \sqrt{\frac{2 \times \text{Area Open}}{3.1416}}$$



Orifice Open Area Data

Open area of one hole in sq. in.

Area Open	Orifice	Degrees Open														Full Open
		25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	
Area Open	1/4"	0.0004	0.002	0.0041	0.0068	0.0099	0.0134	0.0172	0.0212	0.0255	0.03	0.0346	0.0394	0.0442	0.049	
	3/8"	0.001	0.004	0.0089	0.0148	0.0218	0.0296	0.0381	0.0473	0.057	0.0672	0.0777	0.0884	0.0994	0.11	
	1/2"	0.003	0.009	0.018	0.029	0.041	0.055	0.07	0.086	0.103	0.121	0.139	0.158	0.177	0.196	
	3/4" (pie)	0.117	0.141	0.1655	0.19	0.2145	0.239	0.2635	0.288	0.312	0.336	0.3605	0.385	0.4095	0.434	

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WellMark Series

Series 2021

2021 Flow Control Throttling Valve

Application

The WellMark Throttling Valve is designed to function as a pressure control valve, and will handle pressure drops up to 4500 psi liquid and 2200 psi gas. It has been used widely in gas gathering systems to regulate flow, CO₂, and steam injection systems, as well as in low, medium, and high-pressure separators.

Features

- Anti-Cavitating Plug Design
- Manual or Electric Actuation
- "Y" or Angle Style Body: Carbon or Stainless Steel
- Multiple Orifice Sizes
- Low Torque at High Differential Pressure
- Wide C_v Range: 3.2 - 95

Operation

Most control valves operate similar to the nozzle on a garden hose. When the valve is set to a partially closed or choked position, the flow of fluid decreases in pressure and in turn increases in velocity. This high velocity stream causes two problems: mechanical erosion or wear and a highly destructive process called cavitation. After sustained use, these processes will result in premature valve failure.

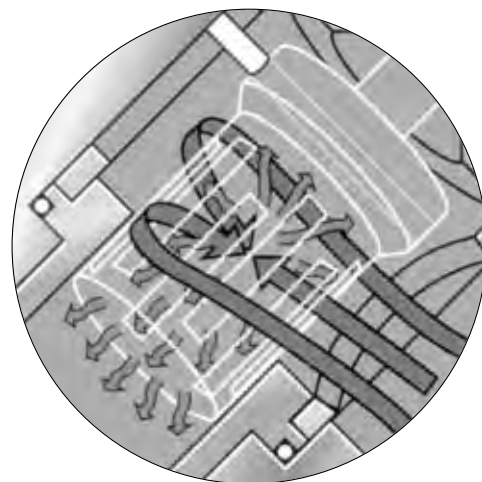
The 2021 Series' unique throttling choke valve design remedies these self-destructive processes by channeling the fluid into a cylinder through opposing slots in its sides; thus, allowing each mini-stream to impinge on itself, changing the otherwise high-velocity laminar flow into a disrupted non-linear stream, eliminating the destructive effects of erosion and cavitation. The plug also provides extraordinary accurate control to less than 0.1%. The result is long valve life and highly reliable precision control.

Specifications

Size	
1"	Series 2021-1
2"	Series 2021-2
3"	Series 2021-3
Working Pressure	5000 psi Max.
Max Pressure Drops	4500 psi Liquid 2200 psi Gas



Temperature	-20°F to +450°F Standard
Body Configuration	"Y", Angle (Top Entry)
End Connection	NPT, Socket-Weld, Flanged
Trim	Linear Cage
Flow Direction	Over & Under Plug
Repeatability	2%
Shut off	Bubble Tight @ Rated Pressure
Actuation	Manual Handwheel or Electric Actuation



Anti-Cavitating Plug Design

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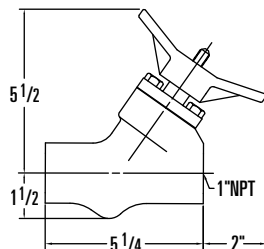


WellMark Series

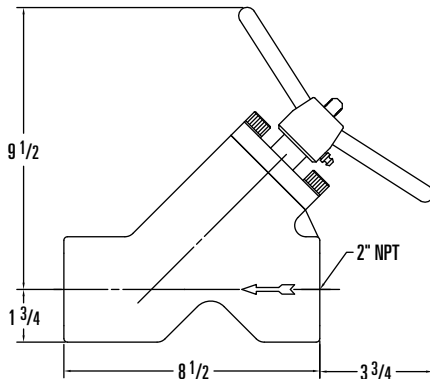
2021

2021 Flow Control Throttling Valve

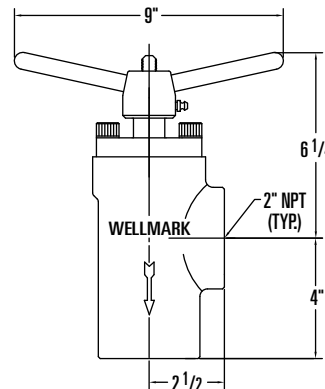
Dimensional Data



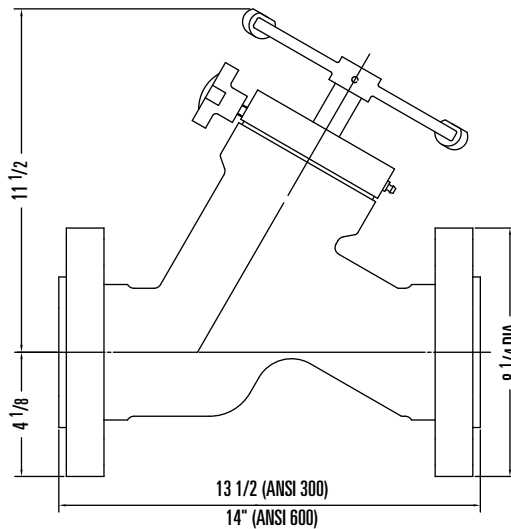
1" "Y" VALVE



2" "Y" VALVE



2" ANGLE VALVE

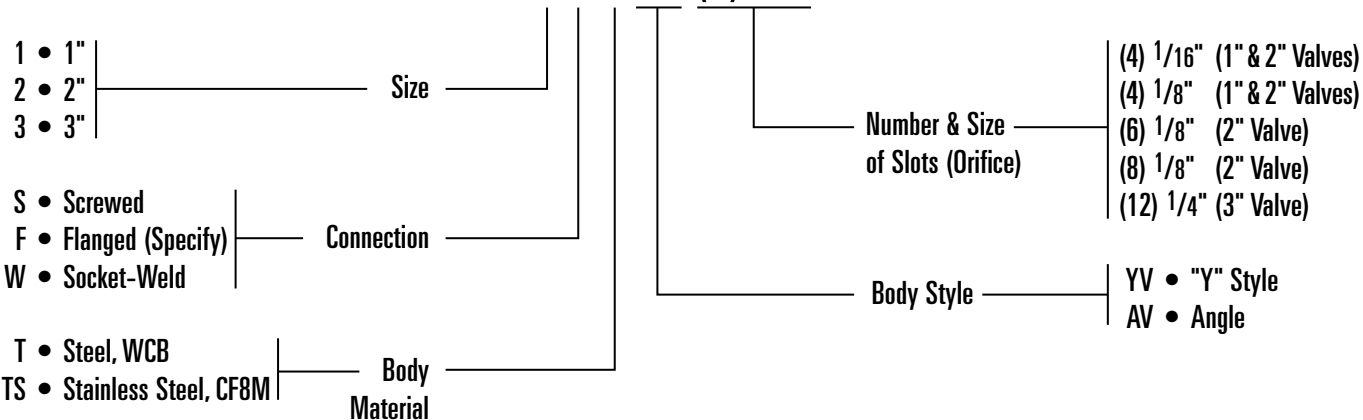


3" ANSI 300-600 "Y" VALVE

Determining the Model Number

Example given: Standard Model 2S-TYV (4) 1/8 — Series 2021, 2" "Y" Style, Screwed End, Carbon Steel Body with Manual Actuation and four (4) 1/8" Slot Throttling Valve

MODEL 2 S-T YV (4) 1/8"



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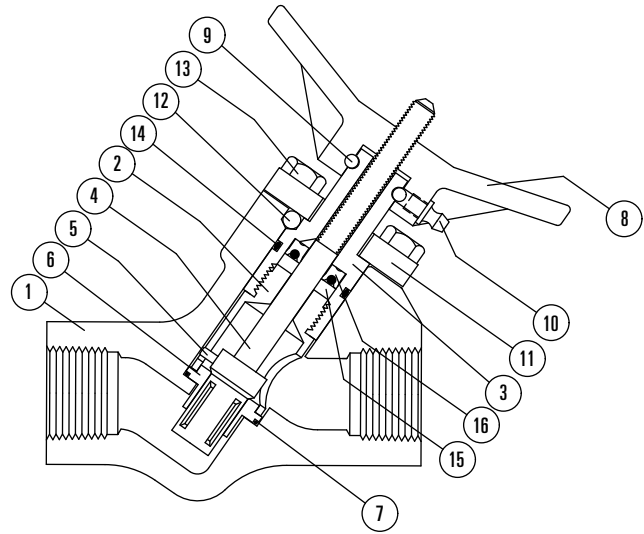
2021-1

2021-1 Flow Control Throttling Valve (1" Manually Actuated)

Parts List

Item	Description	Qty.	Part No.
1	BODY, "Y", STEEL WCB	1	05010-1997
	BODY, "Y", STAINLESS STEEL CF8M	1	05010-2003
2	LOWER CAGE, 303 STAINLESS STEEL	1	05010-1500
3	UPPER CAGE, 303 STAINLESS STEEL	1	05010-1567
4*	STEM & PLUG, (4) 1/16", 17-4PH	1	06500-0838
	STEM & PLUG, (4) 1/8", 17-4PH	1	06500-0820
5	PIN, 17-4PH	1	05010-2136
6*	SEAT, 17-4PH	1	05010-4504
7*	O-RING, TEFLON®	1	05000-2161
8	HANDLE, IRON	1	05010-1724
9	BALL, 440 STAINLESS STEEL	13	06000-0361
10	GREASE ZERK, STEEL PLATED	1	06000-0221
11	BONNET, STEEL	1	05010-2011
12	BALL, 440 STAINLESS STEEL	1	06000-0262
13	CAP SCREW, STEEL PLATED	4	05000-1874
14*	O-RING, BUNA-N	1	05000-0264
15*	SPACER, DELRIN®	1	05010-8091
16*	POLY-PAK, MOLYTHANE	1	06000-0379

*Recommended Spare Part



Model and Part No.

Size	Model No.	Body Style/Material	Part No.
1"	1S-TYV(4)1/16	"Y", WCB	03000-0186
	1S-TYV(4)1/8	"Y", WCB	03000-0152
	1S-TSYV(4)1/16	"Y", CF8M	03000-0202
	1S-TSYV(4)1/8	"Y", CF8M	03000-0178

Flow Data

Plug Orifice	C _v	
	FTC	FTO
TYV FOUR (4) 1/8" SLOTS	5.3	5.3
TYV FOUR (4) 1/16" SLOTS	3.2	3.2

Seat Orifice: 5/8"

Stroke = .79 in.

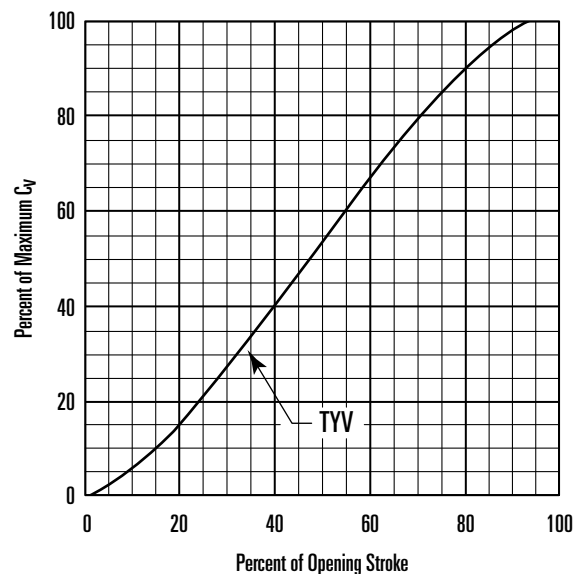
No. of Turns from 0 to Full Stroke: 12 1/2

Test Data per ISA S-75.02

Maximum Capacity: Model 1S-TYV

Based on water @ 60°F in BBL's/Day

Model: 1S-TYV		
Slots	1/16	1/8
Flow	Both	Both
C _v	3.2	5.3
ΔP, Psig		
10	340	570
25	540	900
50	770	1280
100	1090	1810
200	1550	2560
300	1900	3140
400	2190	3630
500	2450	4060
600	2680	4450
700	2900	4800
800	3100	5130
900	3290	5450
1000	3460	5740



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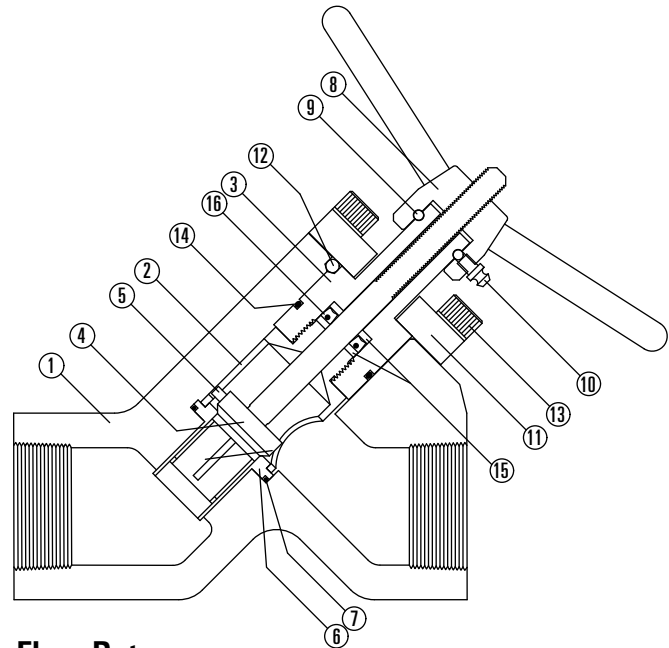
2021-2

2021-2 Flow Control Throttling Valve (2" Manually Actuated)

Parts List

Item	Description	Qty.	Part No.
1	BODY, 2" "Y", STEEL WCB	1	05010-3050
	BODY, 2" "Y", STAINLESS STEEL CF8M	1	05010-3043
	BODY, 2" ANGLE, STEEL WCB	1	05013-3361
	BODY, 2" ANGLE, STAINLESS STEEL CF8M	1	05013-3379
2	LOWER CAGE, 303 STAINLESS STEEL	1	05010-3241
3	UPPER CAGE, 303 STAINLESS STEEL	1	05010-3258
4*	STEM & PLUG, (4) 1/16" SLOTS, 17-4PH	1	06500-1349
	STEM & PLUG, (4) 1/8" SLOTS, 17-4PH	1	06500-0812
	STEM & PLUG, (6) 1/8" SLOTS, 17-4PH	1	06500-0804
	STEM & PLUG, (8) 1/8" SLOTS, 17-4PH	1	06500-0796
5	PIN, 17-4PH	1	05011-1723
6*	SEAT, 17-4PH	1	05010-3209
7*	O-RING, TEFLON®	1	05000-2112
8	HANDLE ASSEMBLY, 416 STAINLESS STEEL	1	06500-0325
9	BALL, 440 STAINLESS STEEL	16	06000-0361
10	GREASE ZERK, STEEL PLATED	1	06000-0221
11	BONNET, STEEL	1	05010-3225
12	BALL, 440 STAINLESS STEEL	1	06000-0262
13	CAP SCREW, 18-8 STAINLESS STEEL	4	05000-2021
14*	O-RING, BUNA-N	1	05000-2914
15	SPACER, DELRIN®	2	05010-8646
16*	POLY-PAK, MOLYTHANE	1	06000-0353

*Recommended Spare Part



Model and Part No.

Size	Model No.	Body Style/Material	Part No.
2"	2S-TYV(4)1/16	"Y", WCB	03002-0135
	2S-TAV(4)1/16	ANGLE, WCB	03002-0930
	2S-TYV(4)1/8	"Y", WCB	03002-0002
	2S-TAV(4)1/8	ANGLE, WCB	03002-0932
	2S-TYV(6)1/8	"Y", WCB	03002-0028
	2S-TAV(6)1/8	ANGLE, WCB	03002-0934
	2S-TYV(8)1/8	"Y", WCB	03002-0044
	2S-TAV(8)1/8	ANGLE, WCB	03002-0936
	2S-TSYV(4)1/16	"Y", CF8M	03002-0119
	2S-TSAV(4)1/16	ANGLE, CF8M	03002-0940
	2S-TSYV(4)1/8	"Y", CF8M	03002-0010
	2S-TSAV(4)1/8	ANGLE, CF8M	03002-0941
	2S-TSYV(6)1/8	"Y", CF8M	03002-0036
	2S-TSAV(6)1/8	ANGLE, CF8M	03002-0943
	2S-TSYV(8)1/8	"Y", CF8M	03002-0051
	2S-TSAV(8)1/8	ANGLE, CF8M	03002-0945

Flow Data

Plug Orifice	C _v	
	FTC	FTO
EIGHT (8) 1/8" SLOTS	15.3	19.0
SIX (6) 1/8" SLOTS	13.6	15.4
FOUR (4) 1/8" SLOTS	9.8	11.1
FOUR (4) 1/16" SLOTS	5.9	6.2

Seat Orifice: 1 1/8"

Stroke = 1.14 in.

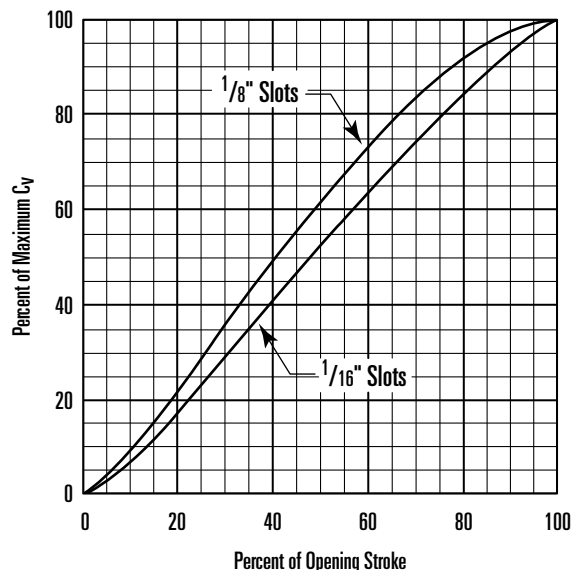
No. of Turns from 0 to Full Stroke: 15

Test Data per ISA S-75.02

Maximum Capacity: Model 2S-TYV

Based on water @ 60°F in BBL's/Day

Slots	Model: 2S-TYV							
	4 1/16"		4 1/8"		6 1/8"		8 1/8"	
	FTC	FTO	FTC	FTO	FTC	FTO	FTC	FTO
Flow C _v	5.9	6.2	9.8	11.1	13.6	15.4	16.3	19.0
ΔP, Psig								
10	630	670	1060	1200	1470	1660	1760	2050
25	1010	1060	1680	1900	2330	1640	2790	3250
50	1430	1500	2370	2690	3290	3730	3950	4600
100	2020	2120	3360	3800	4660	5280	5580	6510
200	2860	3000	4750	5380	6590	7460	7900	9210
300	3500	3680	5810	6590	8070	9140	9670	11,280
400	4040	4250	6720	7610	9320	10,560	11,170	13,020
500	4520	4750	7510	8500	10,420	11,800	12,490	14,560
600	4950	5200	8230	9320	11,420	12,930	13,680	15,950
700	5350	5620	8880	10,060	12,330	13,960	14,780	17,230
800	5720	6010	9500	10,780	13,180	14,930	15,800	18,420
900	6060	6370	10,080	11,410	13,980	15,840	16,760	19,540
1000	6390	6720	10,620	12,030	14,740	16,690	17,670	20,600



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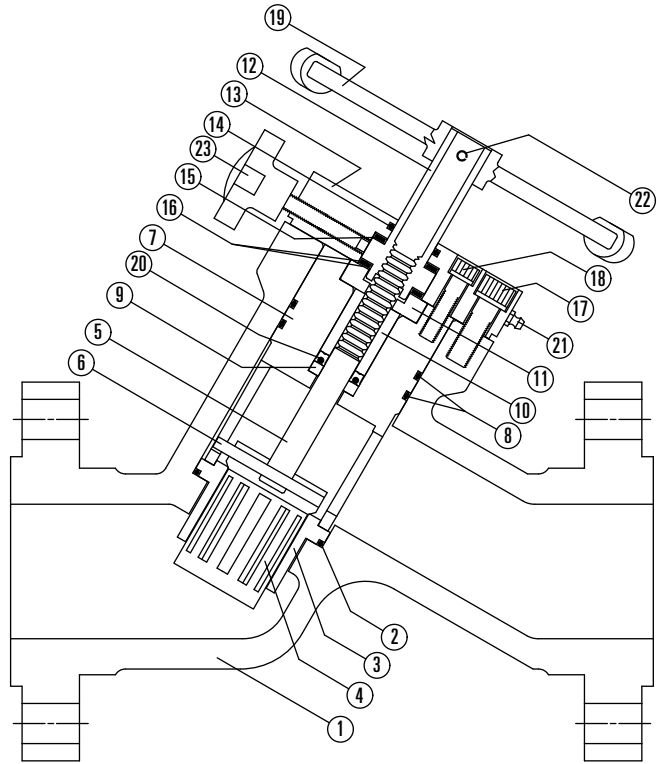
2021-3

2021-3 Flow Control Throttling Valve (3" Manually Actuated)

Parts List

Item	Description	Qty.	Part No.
1	BODY 3"-300RF, STEEL WCB	1	05013-0505
	BODY 3"-600RF, STEEL WCB	1	05012-7820
	BODY 3"-300RF, STAINLESS STEEL CF8M	1	05012-8069
	BODY 3"-600RF, STAINLESS STEEL CF8M	1	05013-0513
2*	O-RING, TEFLON®	1	05000-5396
3*	SEAT, 17-4PH COND. H-900	1	05012-7853
4*	PLUG (12) 1/4", 17-4PH COND. H-900	1	05012-7879
5	STEM, 17-4PH COND. H-1150	1	05012-9237
6	PIN, 17-4PH COND. H-900	1	05012-7895
7	CAGE, ASTM A-582 TY. 303	1	05012-7838
8*	O-RING, BUNA-N	2	05000-3292
9	SPACER, ALUM. BRONZE	1	05012-9245
10	SPACER, ALUM. BRONZE	1	05012-9252
11	WASHER, 17-4PH COND. H-900	1	05012-7903
12	DRIVER, 17-4PH COND. H-900	1	05012-8085
13	BEARING RETAINER, STEEL	1	05012-7846
	BEARING RETAINER, 303 S.S.	1	05012-8077
14*	O-RING, BUNA-N	1	05000-0470
15	THRUST BEARING, STAINLESS STEEL	2	06000-7245
16	THRUST WASHER, STAINLESS STEEL	4	06000-7252
17	SOCKET HD. SCREW, ASTM A-307 GR.B	8	05000-2021
18	SOCKET HD. SCREW, ASTM A-307 GR.B	4	05000-5404
19	HANDWHELL, ASTM A-536	1	05012-7937
20*	POLYPAK, MOLYTHANE	1	06000-7260
21	GREASE ZERK, STL. PLATED	1	06000-0221
22	ROLL PIN, STEEL	1	06000-3068
23	STEM LOCK, STEEL/ALUMINUM	1	06000-7719

*Recommended Spare Part



Model and Part No.

Model No.	W.P.	Material	Part No.
3F-TYV-300RF(12) 1/4	720	WCB	03002-0565
3F-TSYV-300RF(12) 1/4	720	CF8M	03002-0326
3F-TYV-600RF(12) 1/4	1440	WCB	03002-0540
3F-TSYV-600RF(12) 1/4	1440	CF8M	03002-0599

Flow Data

Plug Orifice	C _v	
	FTC	FTO
*TWELVE (12) 1/4" SLOTS	80	95

*Other C_v available on request.

Seat Orifice: 2"

Stroke = 1.5 in.

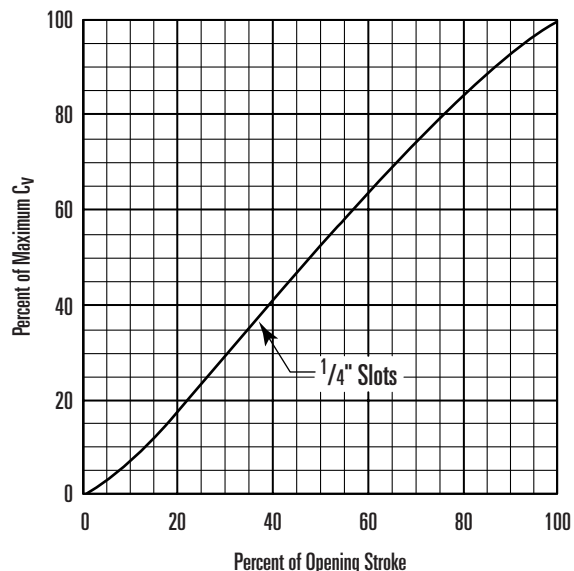
No. of Turns from 0 to Full Stroke: 12

Test Data per ISA S-75.02

Maximum Capacity: Model 3F-TYV

Based on water @ 60°F in BBL's/Day

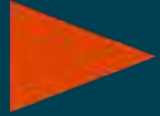
Model: 3F-TYV		
Slots Flow C _v ΔP, Psig	12 1/4" To Open 95 GPM	12 1/4" To Open 95 BBL/Day
10	300	10,200
25	475	16,150
50	575	22,850
100	950	32,300
200	1900	3140
300	1645	56,000
400	1900	64,600
500	2124	72,000
600	2327	79,000
700	2513	85,400
800	2667	91,300
900	2850	96,900
1000	3000	102,000



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Wellmark

Float Nose/Lever

Operated

Valves

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WellMark Series

1850 Float Nose

Application

The WellMark Float Nose is an inexpensive mechanical lever control that provides convenient vessel access. The 7" x 12" float provides sufficient lift torque to operate WellMark's near-balanced 1250 Series lever valve as well as other industry balanced valves. The float nose is widely used as an oil or water dump control on separators, water knockouts, horizontal emulsion treaters, and other similar accumulators.

Features

- 500 psi Working Pressure, Std.
- Cast Steel Float Nose, Std.
- Cast Steel Hammer Union Ring, Std.
- ACME Thread for Long Wear

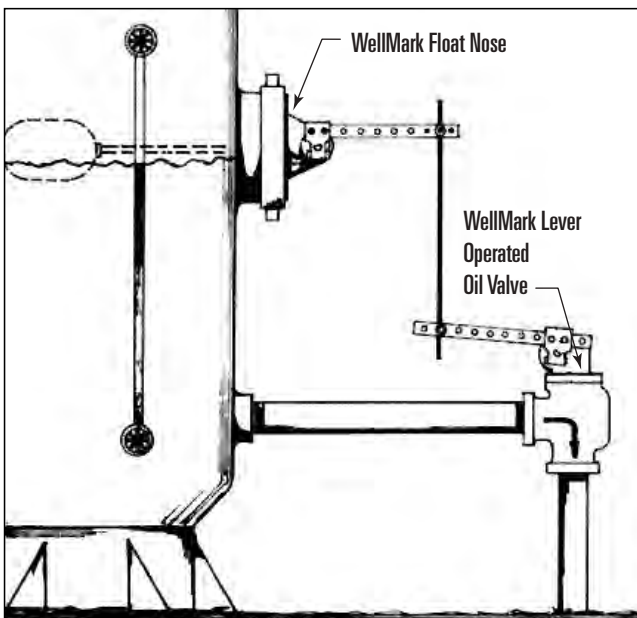
Specifications

Max. Working Pressure 500 psi

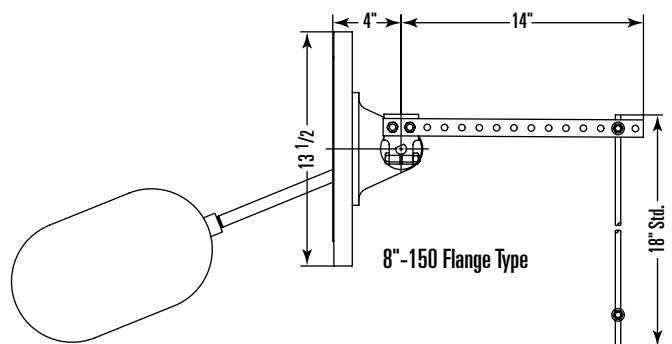
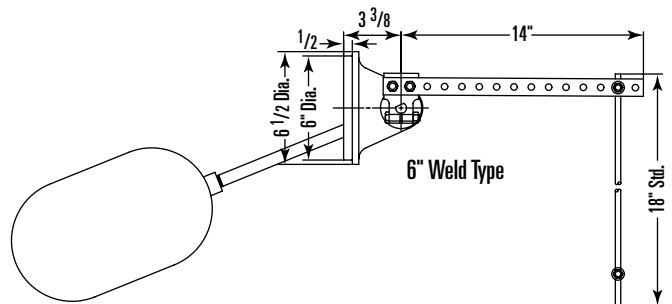
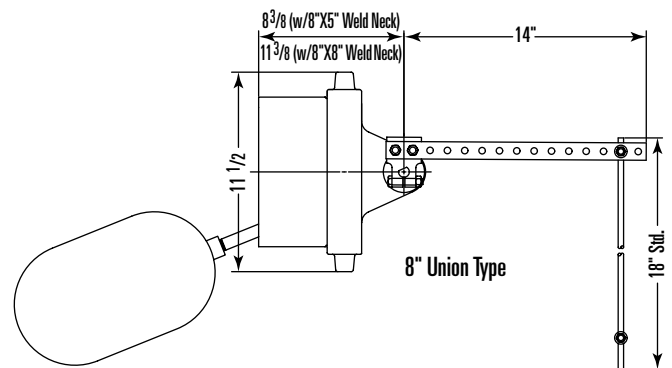
Materials

Float Nose	WCB Cast Steel
Hammer Union	WCB Cast Steel
Stuffing Box	Steel
Stem	303 S.S.
Float	7" x 12" Plated Steel (3/8" NPT Connection)
Weld Neck	Sch. 100 A106 GR. B Pipe

Installation



Dimensional Data



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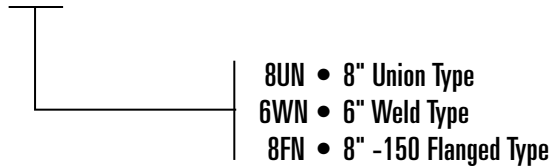
1850

1850 Float Nose

Determining the Model Number

Example given: Example given: Standard Model 8UN – 1850 Series 8" Union Type Float Nose.

MODEL 8UN



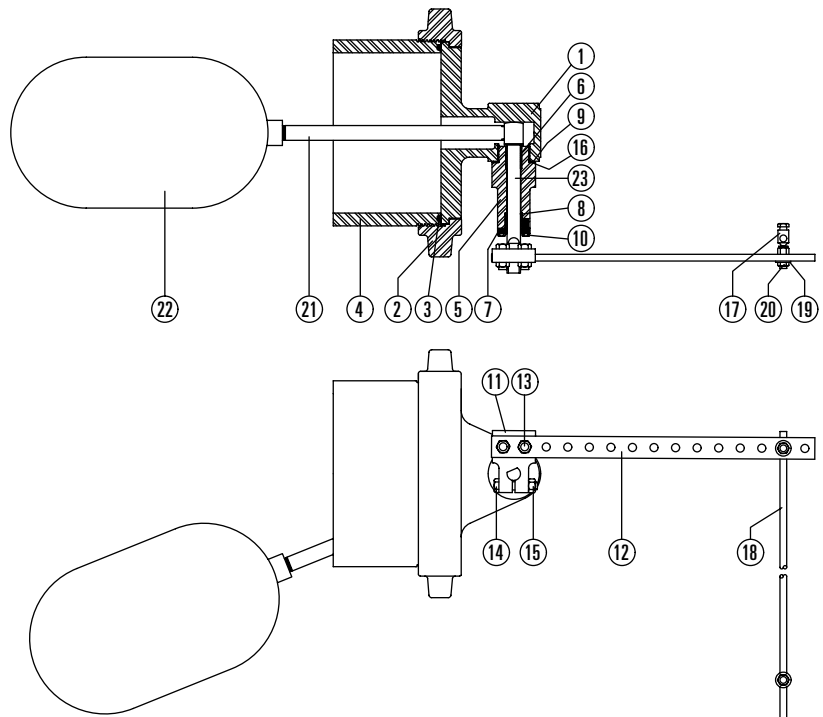
NOTE: Weldneck, float, and float arm (specify length) are ordered separately.

Parts List

Item	Description	Qty.	Part No.
1	FLOAT NOSE, 8" UNION, STEEL WCB	1	05010-9354
	FLOAT NOSE, 6" WELD, STEEL WCB	1	05010-9388
	FLOAT NOSE, 8"-150 FLANGE, STEEL	1	06500-4418
2*	HAMMER UNION, STEEL WCB	1	05013-3205
3*	O-RING, BUNA-N	1	05000-0710
4*	WELD NECK, 5" LG. STEEL	1	05013-3213
	WELD NECK, 8" LG. STEEL	1	05013-3221
5	STUFFING BOX, STEEL	1	05010-0817
6	BEARING, OILITE	1	06000-0007
7	RETAINER CUP, DELRIN	1	05010-0825
8	O-RING, BUNA-N	1	05000-0223
9	GASKET, DELRIN	1	05010-6715
10	HEX SCREW, STEEL PLATED	3	05000-1585
11	LEVER COLLAR, STEEL WCB	1	05010-0858
12	LEVER, STEEL	1	05010-3910
13	HEX CAP SCREW, STEEL PLATED	2	05000-1874
14	HEX CAP SCREW, STEEL PLATED	1	05000-1916
15	HEX NUT, STEEL PLATED	3	05000-2104
16	O-RING, BUNA-N	1	05000-0132
17	BALL JOINT, STEEL	2	06000-0619
18	ROD 18"LG., STEEL	1	05011-1053
19	WASHER, STEEL PLATED	2	06000-1054
20	HEX NUT, STEEL PLATED	2	05000-2435
21**	FLOAT ARM, STEEL	1	SPECIFY LENGTH
22	FLOAT, 500#, STEEL PLATED	1	06000-0163
23	STEM, 303 STAINLESS STEEL	1	05010-9362

*8" Union Only

**Float Arm Length 10" To 30"



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WellMark Series

1250 Lever Operated Valve

Application

The WellMark lever operated "dump" valve is used in conjunction with a float nose to dump oil or water from separators, knockouts, treaters, and other accumulators.

Features

- 500 psi Working Pressure, Std.
- Ductile Iron Body and Bonnet
- Balanced Double Seats for High Flow
- No Diaphragms to Rupture

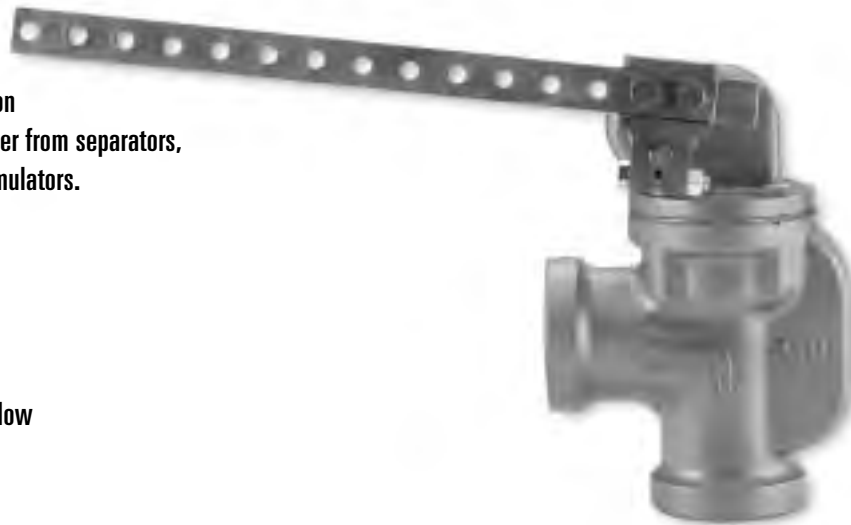
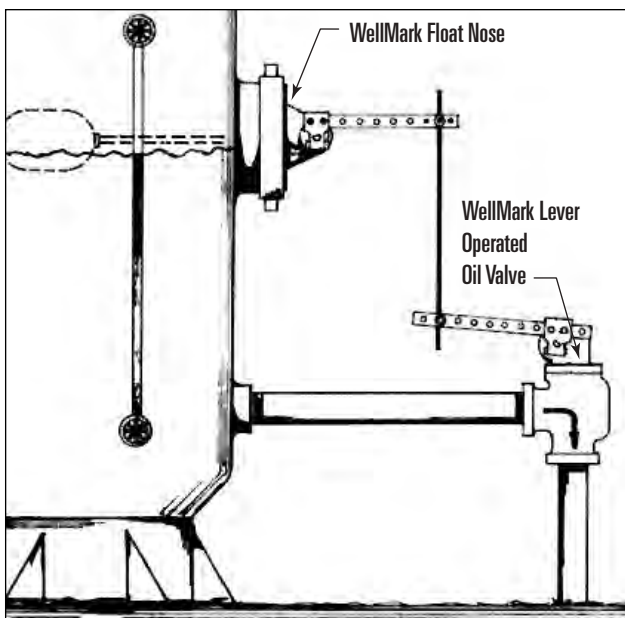
Specifications

Working Pressure 500 psi

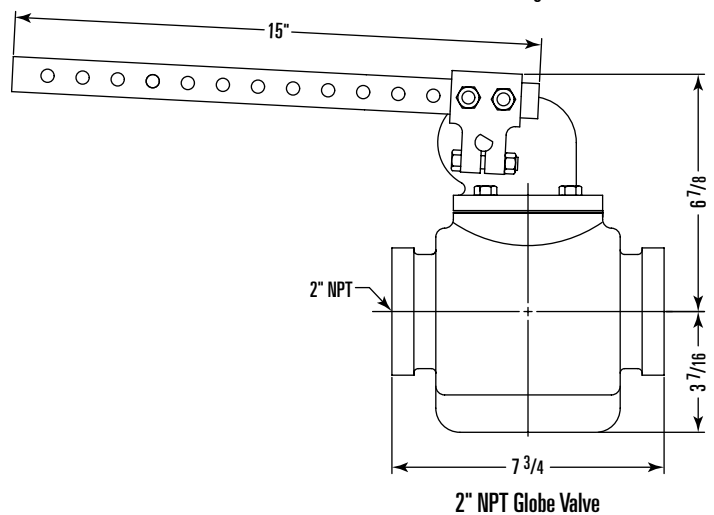
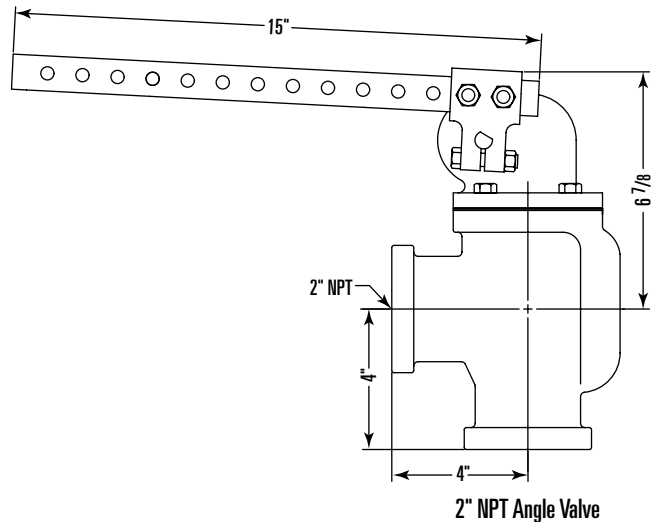
Material

- Body 2" Globe or Angle Ductile Iron
- Bonnet Ductile Iron
- Trim Viton® Molded Plug, Integral Seat
- Stem 303 S.S.
- Stuffing Box Steel

Installation



Dimensional Data



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WellMark Series

1250

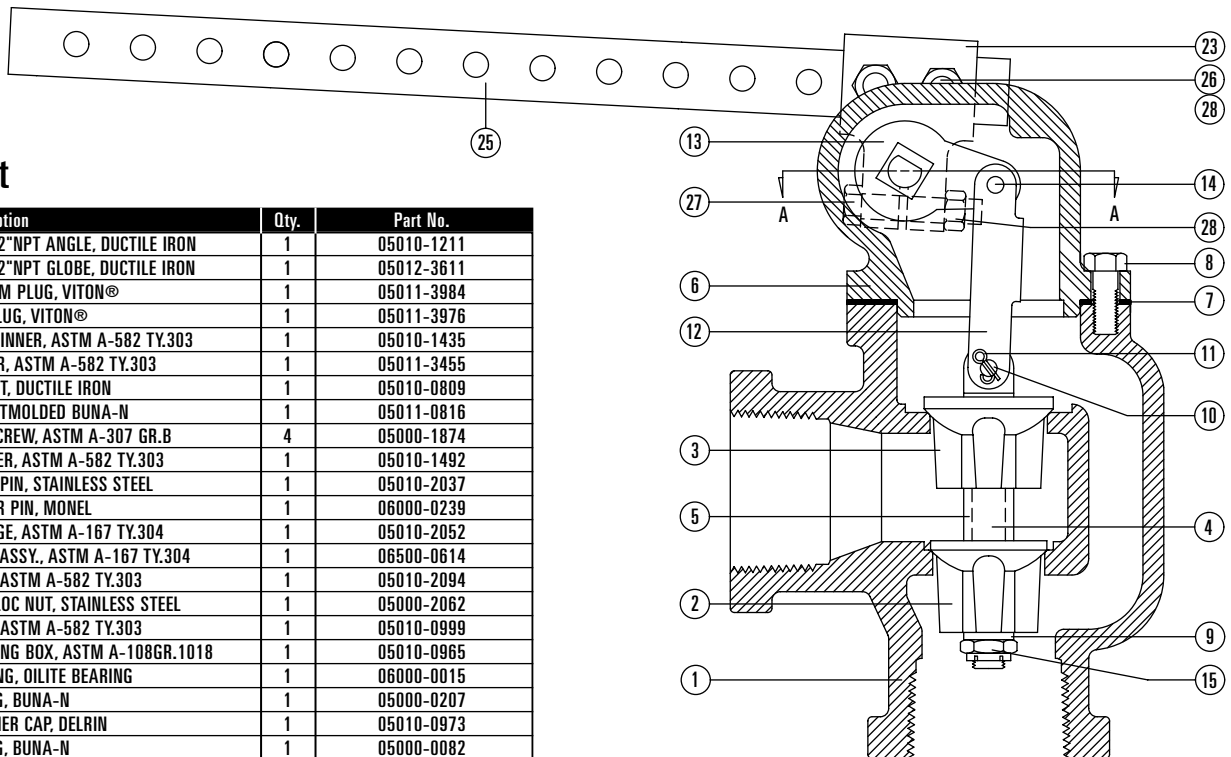
1250 Lever Operated Valve

Determining the Model Number

Example given: Standard Model 2LS – Series 1250 2" Angle Lever Valve with NPT Connection.

MODEL 2LS

2LS • 2" Angle Lever Valve
2LSG • 2" Globe Lever Valve



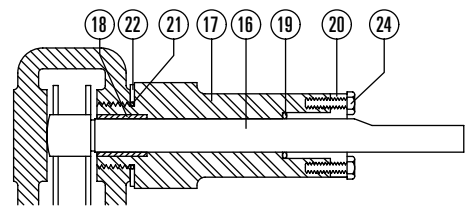
Parts List

Item	Description	Qty.	Part No.
1	BODY, 2"NPT ANGLE, DUCTILE IRON	1	05010-1211
	BODY, 2"NPT GLOBE, DUCTILE IRON	1	05012-3611
2*	BOTTOM PLUG, VITON®	1	05011-3984
3*	TOP PLUG, VITON®	1	05011-3976
4	STEM, INNER, ASTM A-582 TY.303	1	05010-1435
5	SPACER, ASTM A-582 TY.303	1	05011-3455
6	BONNET, DUCTILE IRON	1	05010-0809
7*	GASKETMOLDED BUNA-N	1	05011-0816
8	CAP SCREW, ASTM A-307 GR.B	4	05000-1874
9	WASHER, ASTM A-582 TY.303	1	05010-1492
10	HINGE PIN, STAINLESS STEEL	1	05010-2037
11	COTTER PIN, MONEL	1	06000-0239
12	LINKAGE, ASTM A-167 TY.304	1	05010-2052
13	HINGE ASSY., ASTM A-167 TY.304	1	06500-0614
14	RIVET, ASTM A-582 TY.303	1	05010-2094
15	FLEX-LOC NUT, STAINLESS STEEL	1	05000-2062
16	STEM, ASTM A-582 TY.303	1	05010-0999
17	STUFFING BOX, ASTM A-108GR.1018	1	05010-0965
18	BEARING, OILITE BEARING	1	06000-0015
19*	O-RING, BUNA-N	1	05000-0207
20	RETAINER CAP, DELRIN	1	05010-0973
21*	O-RING, BUNA-N	1	05000-0082
22*	GASKET, DELRIN	1	05011-1665
23	LEVER COLLAR, CAST STEEL	1	05010-0841
24	CAP SCREW, STAINLESS STEEL	3	05000-1585
25	LEVER, 15", ASTM A-36	1	05010-3910
26	CAP SCREW, ASTM A-307 GR.B	2	05000-1874
27	CAP SCREW, ASTM A-307 GR.B	1	05000-1916
28	HEX NUT, ASTM A-307 GR.B	3	05000-2104

*Recommended Spare Part

Model and Part No.

Size	Model No.	Connection	W.P.	Cv	Wt.	Part No.
2"	2LS	2"NPT	500	40	27	03000-0210
	2LSG	2"NPT	500	40	31	03000-0211



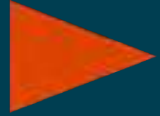
Section A-A

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Wellmark Sight Glass & Gauge Valves

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WellMark Series

W20 Sight Glass Visual Level Indicator

Application

The Series W20 is a one-piece chamber general purpose, rugged flat glass gauge for mid-range pressure temperature applications. Standard construction includes a solid one-piece chamber machined from carbon steel with carbon steel covers, toughened glass, and plated carbon steel bolts and nuts. All metal parts are rustproofed, and a recessed gasket seat prevents movement, insuring leak-free service.

Features

- Available in 9 standard glass sizes
- Constructed with multiple vision slots for longer size requirements
- Toughened molded glass is resistant to thermal and mechanical shock and made in accordance with BS 3463, DIN 7081
- Quality Assurance Testing: All gauges are hydrostatically tested to 1.5 times the rated pressure at 100°F (38°C)
- Materials conform to NACE MR0175 specifications
- Replaces industry standard level gauges
- Female NPT and Union connections available
- Series W20 Sight Glass and W30 Gauge Valve assemblies available
- Repair kit available upon request

Specifications

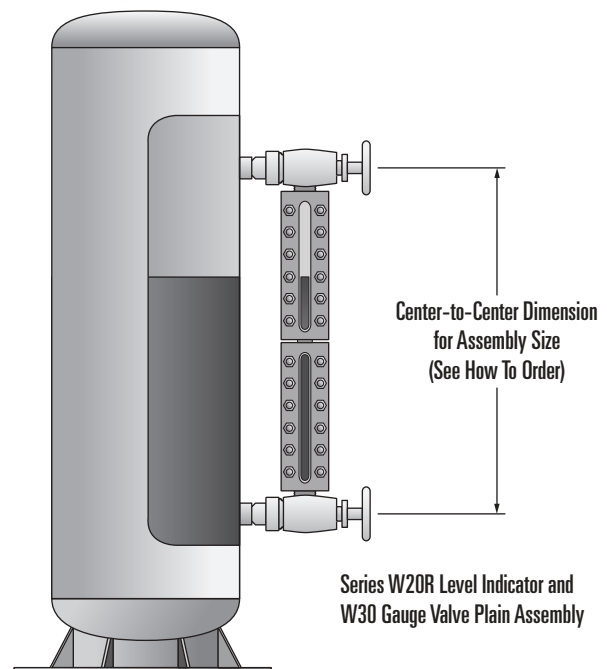
Size 1 through 9

Connections 1/2" NPT Top-bottom, Standard



Series W20R Shown

Series W30 Gauge Valves and W20 Visual Level Indicator Assembly Shown



Series W20R Level Indicator and W30 Gauge Valve Plain Assembly

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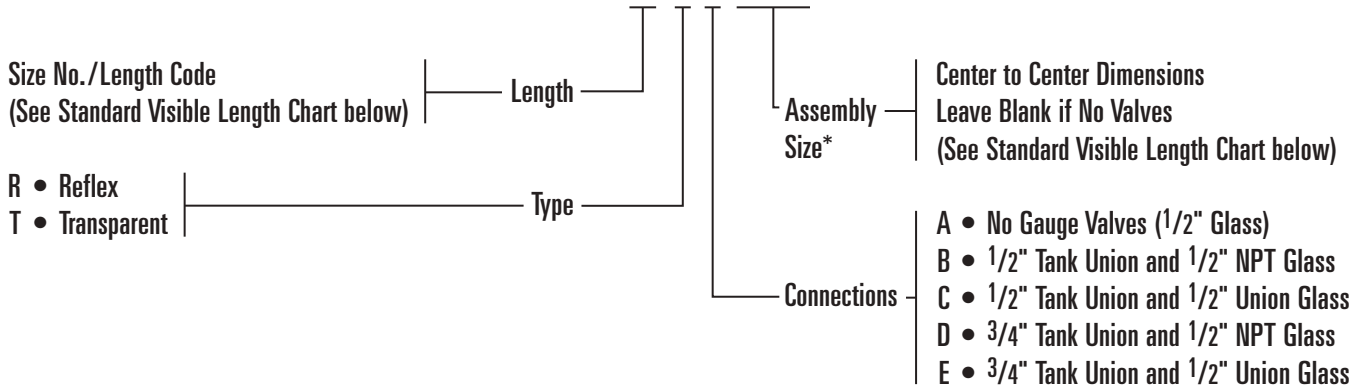
WellMark Series

W20 Sight Glass Visual Level Indicator

Determining the Model Number

Example given: Model W20 - 11RB1021, Series W20 Sight Glass with a Visible Length of 3.75", Reflex Style Glass, one set of W30 Gauge Valves, with 10.21" Valve Center-to-Center Dimension once assembled, 1/2" Tank Union to Valve and 1/2" Valve to Glass Connections.

MODEL W20 - 11 R B 1021

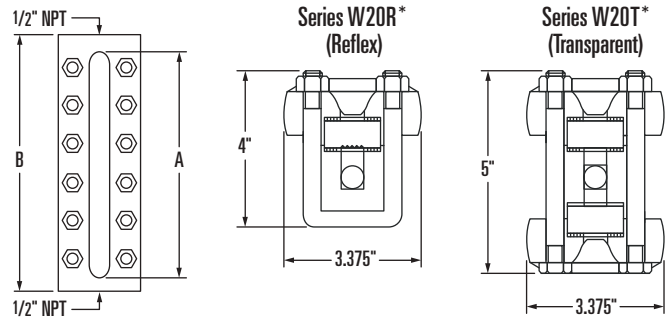


Standard Visible Length

Size No/ Length Code	(A) Visible	(B) Overall	Weight (lbs.)		Assembly Center-to-Center*	
	Length (in.)	Length (in.)	Reflex	Trans.	Plain (in.)	Union (in.)
11	3.75	5.25	8	12	8.75	12.00
12	4.75	6.25	9	14	9.75	13.00
13	5.75	7.25	11	17	10.75	14.00
14	6.75	8.25	12	17	11.75	15.00
15	7.88	9.38	14	21	12.88	16.13
16	9.13	10.63	16	24	14.13	17.38
17	10.13	11.75	18	27	15.13	18.50
18	11.88	13.38	20	30	16.88	20.13
19	12.63	14.13	21	32	17.63	20.88
23	13.00	14.50	22	33	18.00	21.25
24	15.00	16.50	25	38	20.00	23.25
25	17.25	18.75	28	43	22.25	25.50
26	19.75	21.25	32	49	24.75	28.00
27	22.00	23.50	35	54	27.00	30.25
28	25.25	26.75	40	61	30.25	33.50
29	26.75	28.25	43	64	31.75	35.00
36	30.38	31.88	48	73	35.38	38.63
37	33.75	35.25	53	80	38.75	42.00
38	38.63	40.13	60	92	43.63	46.88
39	40.88	42.38	64	97	45.88	49.13
47	45.50	47.00	70	107	50.50	53.75
48	52.00	53.50	80	122	57.00	60.25
49	55.00	56.50	85	129	60.00	63.25
57	57.25	58.75	87	134	62.25	65.50
58	65.38	66.88	100	152	70.38	73.63
59	69.13	70.63	106	161	74.13	77.38
68	78.75	80.25	121	182	83.75	87.00
69	83.24	84.75	127	193	88.24	91.50
78	92.13	93.63	144	212	97.13	100.38
79	97.38	98.88	148	226	102.38	105.63
88	105.50	107.00	165	242	110.50	113.75
89	111.50	113.00	173	258	116.50	119.75
98	118.88	120.38	185	272	123.88	127.13
99	125.63	127.13	193	276	130.63	133.88

All information stated above is approximate and is given for guidance only.
*Assemblies shipped as individual components unless otherwise requested.

Dimensional Data



Pressure Temperature

Temp. (°F)	Reflex Gauges								
	Length Code								
	1	2	3	4	5	6	7	8	9
	Pressure (psi)								
100	2988	2901	2727	2611	2495	2350	2219	2103	2002
200	2828	2727	2596	2466	2350	2219	2089	2002	1900
300	2654	2538	2437	2321	2205	2089	1973	1871	1755
400	2466	2350	2248	2132	2031	1929	1813	1711	1610
500	2263	2161	2060	1958	1856	1755	1653	1552	1450
600	2031	1944	1857	1755	1668	1552	1479	1378	1305
750	1653	1595	1494	1407	1305	1247	1160	1044	1001

Temp. (°F)	Transparent Gauges								
	Length Code								
	1	2	3	4	5	6	7	8	9
	Pressure (psi)								
100	2002	1856	1755	1595	1508	1349	1247	1102	1001
200	1755	1784	1668	1552	1436	1305	1175	1059	957
300	1769	1668	1552	1450	1334	1218	1102	1001	899
400	1682	1581	1465	1349	1247	1146	1044	928	856
500	1537	1450	1349	1247	1160	1044	957	856	754
600	1349	1276	1175	1102	1015	928	856	754	682
750	1102	1059	1001	899	856	754	696	609	551

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WellMark Series

W30 Gauge Valves

Application

Series W30 Gauge valves are recommended for use with WellMark's Series W20 Visual Level Indicators and are compatible with all industry standard, armored flat-glass liquid level gauges. Plain/Union and Union/Union connections make for easy installation and removal.

Features

- Equipped with stainless steel ball check upstream of the seat to shut off flow in case of Level Indicator glass breakage.
- Indicator Union Connection to allow top and bottom connected Indicators to be rotated to any angle visibility and allows for easy Indicator removal.
- Gauge Valve and drain connections are offset from the vessel connection centerline for easier Indicator glass cleaning.
- Materials meet NACE MR0175 specifications.

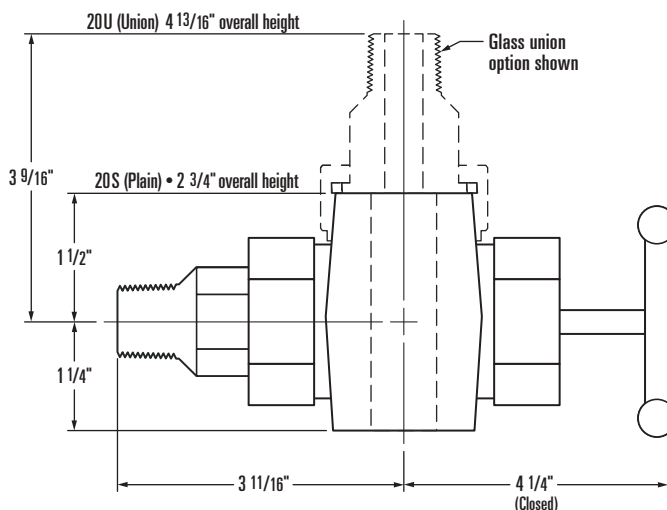
Specifications

Sight Glass Connection 1/2" NPT or Union

Tank Connection 1/2" and 3/4" Union



Dimensional Data



Determining the Model Number

Example given: Standard Model W30P1, Series W30 Gauge Valve with 1/2" Tank Union and 1/2" Glass Connections.

MODEL W30P1

- W30P1 • 1/2" Tank Union and 1/2" NPT Glass
- W30U1 • 1/2" Tank Union and 1/2" Union Glass
- W30P2 • 3/4" Tank Union and 1/2" NPT Glass
- W30U2 • 3/4" Tank Union and 1/2" Union Glass

Connections

NOTE: Sold in pairs only.

WellMark Series

W40 Low Pressure Gauge Valves

Application

Wellmark W40 low pressure gauge valves are intended for use with 5/8" tubular gauge glass.

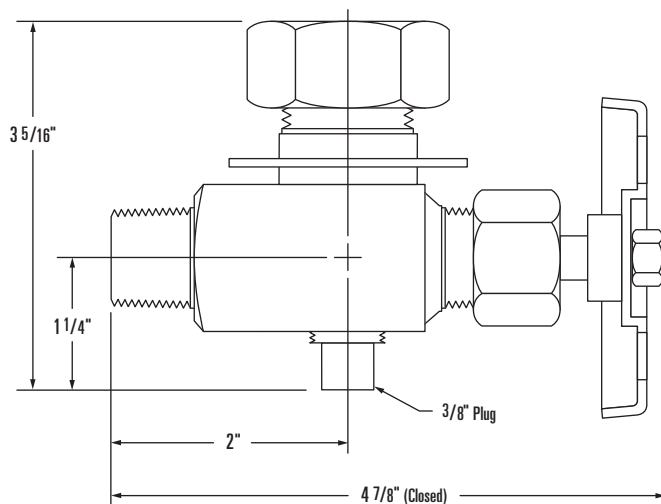
Features

- Equipped with stainless steel ball check upstream of the seat to shut off flow in case of glass breakage.
- Available in Carbon and Stainless Steel
- Viton® Glass Seal
- Soft Seat Design for Tight Shutoff
- 600 PSI Rating at 100°F
- Max Temperature 400°F Non-Steam Applications or 340°F for Steam Applications
- Materials meet NACE MR0175 specifications.

Specifications

Sight Glass Tube Connection 5/8"
 Tank Connection 1/2" NPT

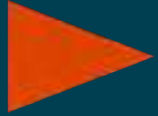
Dimensional Data



How To Order

Description	Model No.
W40 CARBON STEEL	21671
W40 STAINLESS STEEL	21672

NOTE: Sold in pairs only.



Wellmark Accessories

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WellMark Series

Accessories

Meter Leveling Saddles

Application

The Meter Level Saddle is an accepted means to support chart recorders on meter runs or as an economical means to support pipe runs.

Features

- Rugged Ductile Iron Construction
- Standard 2" NPT Meter Mount: Fits all Sizes
- Multiple Pipe Sizes: 2", 3", 4", 6" & 8"

Specifications

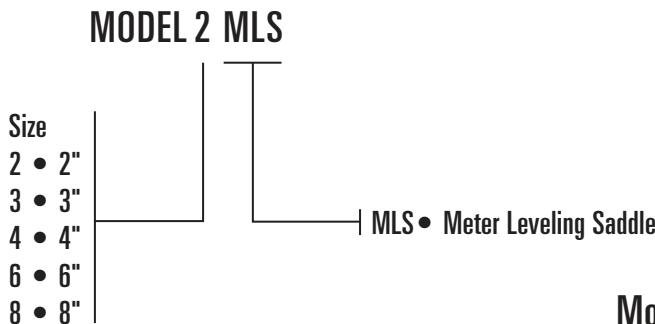
Size 2", 3", 4", 6" and 8"

Materials

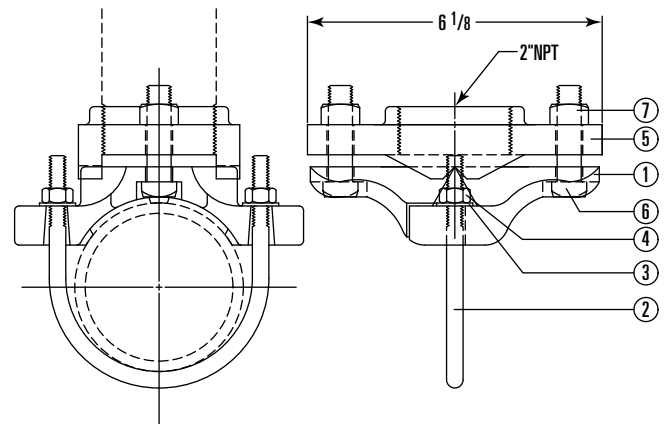
- Saddle Ductile Iron
 Mount Ductile Iron
 U-Bolt A307 GR. B

Determining the Model Number

Example given: Standard Model 2MLS – Series MLS, 2" Leveling Saddle



Dimensional Data



Model and Part No.

Model	Part No.
2MLS	03000-2687
3MLS	03000-2695
4MLS	03000-2703
6MLS	03000-2711
8MLS	03000-2729

Parts List

Item	Description	Qty.	Part No.				
			2"	3"	4"	6"	8"
1	SADDLE, DUCT. IRON	1	01008-1404	01008-1412	01008-1420	01008-1438	01008-0323
2	U-BOLT, A-307 GR.B	1	05010-4967	01008-1461	01008-1479	01008-1487	01008-1495
3	WASHER, STEEL	2	06000-0718				
4	HEX NUT, A-307 GR.B	2	05000-2104				
5	METER MOUNT, DUCT.IRON	1	05010-0544				
6	SQ. BOLT, A-307 GR.B	2	05000-2211				
7	NUT, A-307 GR.B	2	05000-1999				

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WellMark Series

Fuel Gas Shut-Off Valve

Application

The Fuel Gas Shut-Off Valve is for use in fuel gas scrubbers on gas production units, indirect line heaters, heater treaters, etc.

Operation

The float buoyancy lifts an elastomer plug to shut off gas flow to burner when the liquid level reaches a predetermined height.

Specifications

Connections 2" x 1" Std.
(others available)

Working Pressure 250 psi

Materials

Body Forged Steel

Float 2 x 12 S.S.
(others available)

How To Order

Example Given: FGSV212FS

Description	Type/Size	Code
FUEL GAS SHUT-OFF VALVE		FGSV
FLOAT	2" X 12"	212
BODY	FORGED STEEL	FS
FOR VARIATIONS		SPECIFY



In-Service Test Tool

Application

An in-line device installed between a safety relief valve and a pressure vessel for in-field testing of pressure settings and/or seat leakage.

Operation

A hydraulic pump or Nitrogen bottle, with a flexible hose, gauges, and needle valves can be attached to the connector nipple, and the relief valve can be tested to determine if the set pressure is correct without taking the line out of service, or removing the valve from the line.

CAUTION: Never use Oxygen.

Specifications

Connections 2" x 2" NPT
1 1/2" x 1 1/2" NPT, 1" x 1" NPT

Materials

Body Carbon or Stainless Steel (Specify)

Seat Durable Plastic

Ball Stainless

Connector Nipple Stainless



How To Order

Example Given: ITT-2C

Description	Code
IN-SERVICE TEST TOOL	ITT
Process Connection	Code
2" NPT	2
1 1/2" NPT	15
1" NPT	1
Body Material	Code
CARBON STEEL	C
STAINLESS	S

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Apergy

Accessories

WellMark Series

Probe and Plug Pressure Provers

Application

For fast, on-location, pressure checks. Use on wellheads, on flow lines and on pressure vessels, or wherever repetitive pressure readings are taken.

Features

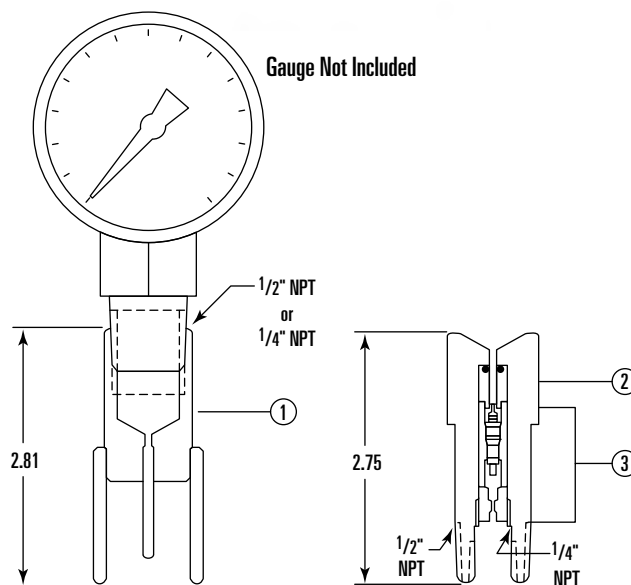
- Stainless Steel Materials
- Eliminates the Requirement of Multiple, On Site, Expensive Gauges
- Field Repairable Plug Repair Kit
- No Special Tools Required for Repair
- 5000 psi Working Pressure

How To Order

Pressure Prover	Part No.	Model No.
PLUG ASSEMBLY	30317	M50F25SS
PROBE ASSEMBLY (1/2")	30316	F50SS
PROBE ASSEMBLY (1/4")	30332	F25SS

Parts List

Item	Description	Part No.
1	PROBE (COMPLETE)	30316
2	PLUG BODY	20582
3	PLUG REPAIR KIT	30318



LevelGlas

Application

For use with in-line level control connections in order to show visual liquid level over a small area, or wherever small area visual sight of liquid is required.

Specifications

Temperature 180°F Maximum
 Working Pressure 3000 psi Maximum @100°F
 Process Connection 2" NPT Screwed

Materials

Body Stainless Steel
 Lens Lexan®
 O-Ring Buna-N



How To Order

Example Given: LG2TL

Description	Code
SERIES "LEVELGLAS"	LG
Process Connection	Code
2" NPT SCREWED	2T

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WellMark Series

Blind Flange Assemblies (Closures) and Weld Necks

Weld Necks or Nozzles

These are offered in 3", 4", 5", 6" and 8" pipe sizes, screwed by weld end. Standard material is SA106 Gr. B Pipe.

Blind Flange Assemblies (Closures)

A blank process body, hammer union and a weld neck makes an excellent blind flange. This permits easy field installation of a second control on vessels having two or more nozzle openings but initially shipped with only one control.



Blind Flange Assemblies

Standard Straight Pipe Threaded (NPSL)

Size x Lg.	Pipe Schedule	Pipe O.D.	Wall Thickness	W.P. (psi)	Wt. (Lb.)	Part No.
3" X 5"	SCH. 160	3.500	.438	1500	10	03000-2935
3" X 8"	SCH. 160	3.500	.438	1500	13	03000-2943
4" X 5"	SCH. 160	4.500	.531	1500	17	03000-2950
4" X 8"	SCH. 160	4.500	.531	1500	22	03000-2968
5" X 5"	XX STRONG	5.562	.750	1500	28	03000-2976
5" X 8"	XX STRONG	5.562	.750	1500	37	03000-2984
6" X 5"	SCH. 160	6.625	.719	1500	38	03000-3008
6" X 8"	SCH. 160	6.625	.719	1500	49	03000-3016
8" X 5"	SCH. 100	8.625	.594	1500	64	03000-5904
8" X 8"	SCH. 100	8.625	.594	1500	72	03000-3065

ACME Threaded

Size x Lg.	Pipe Schedule	Pipe O.D.	Wall Thickness	W.P. (psi)	Wt. (Lb.)	Part No.
4" X 5"	SCH. 160	4.500	.531	1500	17	03000-8135
4" X 8"	SCH. 160	4.500	.531	1500	22	03000-8143
5" X 6"	XX STRONG	5.562	.750	1500	31	03000-7895
5" X 8"	XX STRONG	5.562	.750	1500	37	03000-8168
8" X 5"	SCH. 100	8.625	.594	1500	64	03000-9200

Weld Necks (W.P. 1500 psi)

Standard Straight Pipe Threaded (NPSL)

Size x Lg.	Pipe Schedule	Wt. (Lb.)	Part No.
3" X 5"	SCH. 160	7	05011-2200
3" X 8"	SCH. 160	10	30074
4" X 5"	SCH. 160	10	05011-5468
4" X 8"	SCH. 160	15	05010-1799
5" X 5"	XX STRONG	13	05011-2218
5" X 8"	XX STRONG	22	30220
6" X 5"	SCH. 160	19	05010-2383
6" X 8"	SCH. 160	30	05011-2226
8" X 5"	SCH. 100	21	05010-8893
8" X 8"	SCH. 100	34	05011-3745

ACME Threaded

Size x Lg.	Pipe Schedule	Wt. (Lb.)	Part No.
4" X 5"	SCH. 160	10	05013-0216
4" X 8"	SCH. 160	15	05012-3694
5" X 6"	XX STRONG	17	05012-9470
5" X 8"	XX STRONG	22	05013-0232

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Apergy

WellMark Series

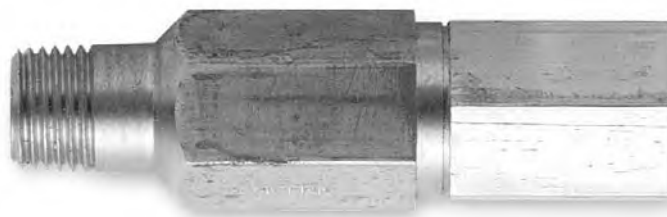
WTA In-Line Check Valve

Application

The WellMark In-Line Check Valve is for liquid, air, gas, vapor or steam service. It is also suitable for injection lines, such as chemical and lubrication. The standard spring opens with 10 psi flow pressure.

Features

- Choice of Body Material: 316 S.S. or 360 Brass
- Viton® O-Ring, Std. (EPR included separately for methanol service.)
- 316 S.S. Spring and Ball, Std.
- 1/2" Connection Size Available



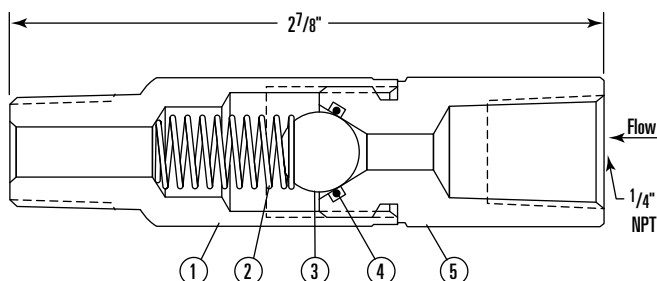
Parts List

Item	Description	Qty.	Part No.
1	OUTLET BODY, 316 S.S.	1	20615
	OUTLET BODY, 360 BRASS	1	20613
2	SPRING, 316 S.S.	1	10606
3	BALL, 316 S.S.	1	10605
4	O-RING, VITON®	1	10608
5	INLET BODY, 316 S.S.	1	20614
	INLET BODY, 360 BRASS	1	20612

How To Order

Model	Connection	W.P.	Material
WTA-676	1/4" NPT FXM	3000# MAX.	360 BRASS
WTA-675	1/4" NPT FXM	6000# MAX.	316 S.S.

Dimensional Data



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