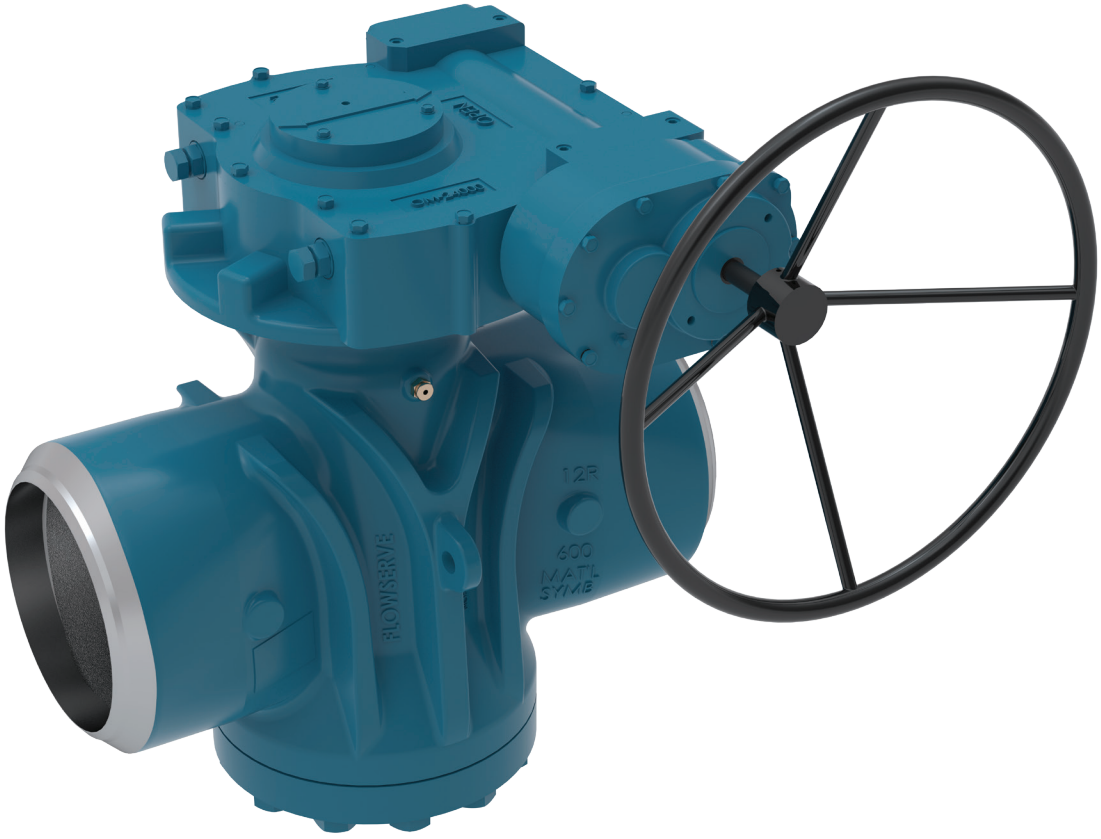
FLOWSERVE

TECHNICAL BULLETIN

Nordstrom® Steel Plug Valves

Dynamic Balance, Super Nordstrom and Nordstrom Plug Valves



Experience In Motion

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Valve figure number explanation

Valve figure numbers ending in a 4 or 5 indicate wrench-operated valves. (Valve figure numbers ending in a 4 indicate threaded ends. Valve figure numbers ending in a 5 indicate flanged ends.)

Valve figure numbers ending in a 7 indicate flanged ends with spur gear operator.

Valve figure numbers ending in a 9 indicate flanged ends with worm gear operator.

Valve figure numbers ending in ½ indicate welding ends.

Valve figure numbers ending in ¼ indicate one welding end and one flanged end.

Dynamic Balance, Nordstrom and Super Nordstrom are registered trademarks.

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Conformance to standard specifications

Wherever applicable, Nordstrom steel plug valves conform to the latest edition of the following standard specifications as to pressure ratings, dimensions and construction. Consult your Flowserve customer service representative for additional information.

ASME – American Society of Mechanical Engineers

B1.20.1 Pipe Threads, General Purpose (in.)
B16.5 Pipe Flanges and Flanged Fittings
B16.10 Face-to-Face and End-to-End Dimensions of Valves
B16.11 Forged Steel Fittings, Socket-Welding and Threaded
B16.25 Buttwelding Ends
B16.34 Valves – Flanged, Threaded and Welding End
B18.2.1 Square and Hex Bolts and Screws
B18.2.2 Square and Hex Nuts

API – American Petroleum Institute

6A Specification for Wellhead and Christmas Tree Equipment
6D Specification for Pipeline Valves
6FA Fire Test for Valves
599 Steel and Ductile Iron Plug Valves
607 Fire Test for Soft-Seated Quarter-turn Valves
641 Type Testing of Quarter-turn Valves for Fugitive Emissions

MSS – Manufacturers Standardization Society of the Valve and Fittings Industry

SP-6 Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings
SP-25 Standard Marking System for Valves, Fittings, Flanges and Unions
SP-55 Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components
SP-84 Steel Valves – Socket Welding and Threaded Ends

NACE – National Association of Corrosion Engineers

MR0175 Standard Material Requirements Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment (Valves for NACE Service)

DOT – United States Department of Transportation

49 CFR Part 192 Pipeline Safety Regulations (U.S. Department of Transportation)

CAN/CSA Z245.15
Steel Valves

CAN/CSA Z299.3

ISO 9001 certified

Chapter 1

NORDSTROM STEEL PLUG VALVES OVERVIEW

Nordstrom steel plug valves

Nordstrom provides an extensive global customer base with valves known for reliable operation, exceptional sealing and easy maintenance.

Nordstrom steel plug valves are designed for critical shutoff applications where there's no room for error, safeguarding your people, processes and the environment. Their reliability is regularly proven in compressor isolation, pump isolation, meter isolation, water or gas injection system isolation, critical vents, drains, and other applications.

Notable in the series are Nordstrom Dynamic Balance® hard-surfaced valves, which provide excellent resistance to abrasion in coal, limestone, iron ore, copper ore and other slurries. For these severe services, valves can be supplied with the plug and body hard surfaced with nickel or cobalt base alloys. These materials provide a protective coating, which greatly reduces erosion of the plug seating surfaces, extending valve life and significantly improving performance.

Key benefits

- **Trusted reliability —** Turns easily every time; shuts off with the proven dependability of a plug valve.
- **Automatically resists jams —** Balance holes at the top and bottom of the plug maintain equal pressure above and below the plug and in the plug port so that line pressure cannot jam the plug into the body taper. A stainless-steel spring pre-loads the plug to prevent vibration and thermal cycling from wedging the plug in the taper.
- **Bubble-tight shutoff —** The Nordstrom Dynamic Balance valve design provides durable, metal-to-metal seats and a sealant system for secure shutoff of hard-to-hold fluids and restoration of damaged seats.
- **Extra security compared with normal pressure balancing —** The Dynamic Balance valve design also offers the protected pressure balancing feature for increased reliability in service where there is a possibility of foreign particles in the media. This design ensures that the balancing holes are not exposed to the line media in the plug port.
- **Extreme temperature capability —** Standard carbon steel API 6D and B16.34 valves are suitable for general service at temperatures from -29°C to 232°C (-20°F to 450°F).
- **Ensures safety —** Dynamic Balance plug valves with their metal-to-metal seats have been fire-tested in conformance with API Standards 607 and 6FA.

Available designs

Dynamic Balance plug valve

The Nordstrom Dynamic Balance plug valve from Flowserve incorporates proven features and user benefits from over 60 years of experience in valve applications and design technology.

A pressure-balanced plug assures predictable torque, even under high pressure differential, vibration and thermal cycling. Pressure-energized stem seals eliminate external adjustments, and the stem and the cover weatherseal provide superior corrosion resistance in hostile environments.

The Dynamic Balance plug valve is available in the broadest range of sizes, pressure classes and materials of construction of any Nordstrom valve. Dynamic Balance valves are available in sizes from 1 to 30 in ASME pressure classes from 150 to 2500, and in sizes 2 1/16 to 4 1/16 in API 3000 and 5,000 psi.

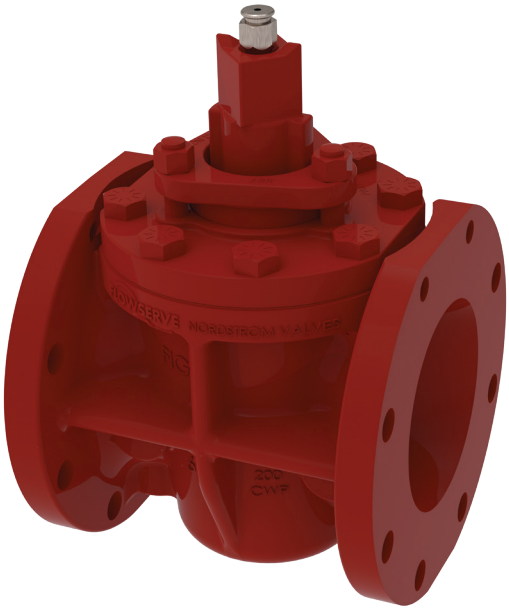
Super Nordstrom two-bolt cover plug valve

The Super Nordstrom two-bolt cover plug valve is a low-pressure valve (200 CWP) in sizes ¾ through 4 for a broad range of applications in gas distribution and general industrial services.

Super Nordstrom plug valve with controlled-balance plug

The Super Nordstrom steel plug valve complements the Dynamic Balance plug valve line, offering the benefits of predictable low torque at a competitive price, in a limited range of smaller sizes and lower pressure classes for less critical and demanding services.

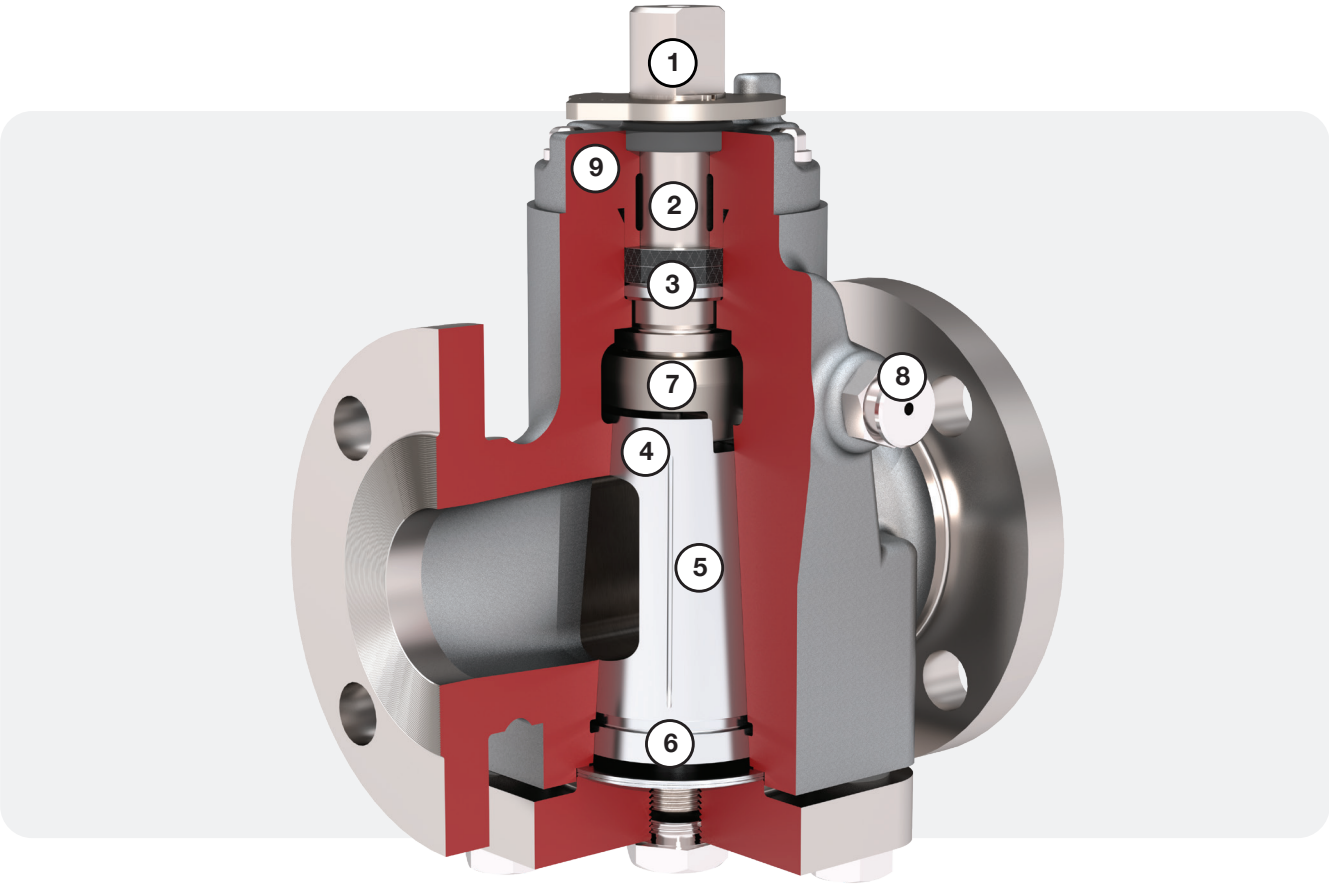
The Super Nordstrom steel plug valve is available in sizes from ½ to 4 in ASME pressure classes 150, 300 and 600, and sizes ¾ to 4 in 200 CWP pressure rating for a broad range of applications in gas distribution and general services.



Nordstrom bolted gland plug valve

The standard Nordstrom plug valve line includes low-pressure valves (ASME Class 150) in sizes 6, 8 and 12 for a broad range of applications in gas distribution and general industrial services.

Valve components



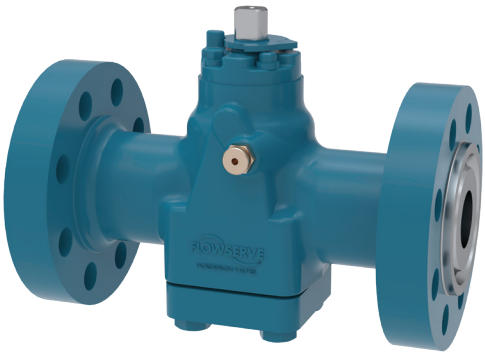
1. **Stem head** – Doubles as an easily visible position indicator via an obround shape with two wrench flats that align the wrench in the direction of the port opening. Square adapters are available to allow operational flexibility where space is limited.
2. **Stem** – Reduces overall valve torque with low-friction PTFE coating. Wrench-operated valve stems are made of 400 series stainless steel for corrosion protection (i.e., tough offshore applications).
3. **Proprietary stem packing** – Designed by Flowserve from a combination of graphite and TFE, the stem packing is pressure-energized (no external adjustments necessary) and inert to a wide range of fluids and gases.
4. **Plug-balancing spring** – Prevents vibration and thermal cycling from wedging the plug into the taper, regardless of installed position.
5. **Plug** – Is coated with permanently bonded, low-friction coating.
6. **Bottom balance hole** (not shown) – Is an integral part of the Dynamic Balance valve design which maintains pressure equalization between the plug port and the bottom of the plug.
7. **Balance hole with ball check** (not shown) – Reduces operating torque by ensuring that pressure above the plug is the same as or greater than in the plug port.
8. **Sealant injection fitting** – Permits restoration of damaged seats and drop-tight shutoff on hard-to-hold fluids.
9. **Weatherseal** – Two different types are found in Dynamic Balance valves. The stem weatherseal is specially shaped and constructed to protect the stem and packing from hostile environments that can lead to corrosion. The cover weatherseal is an elastomeric ring compressed between the body and cover to protect cover bolts from corrosion.

Plug valve operating and selection principals

Plug valve patterns

Nordstrom plug valves are available with threaded, flanged or buttwelding ends—or combination thereof—to meet the needs of your piping systems. Valves are wrench- or gear-operated, as listed in the detailed specification pages. Nordstrom valves come in a variety of engineered patterns to assure maximum efficiency and economy for the full range of valve services.

These include:



Regular pattern, providing the largest port opening in a trapezoidal configuration. Consult the valve dimensional data pages in this brochure for applicable valve patterns for Dynamic Balance, Super Nordstrom and Nordstrom plug valves.

Short pattern, incorporating the largest practical port area consistent with matching gate valve face-to-face dimensions.

Venturi pattern, having a smaller port than either the regular or short patterns, provides optimized approach and discharge angles, plus smooth flow contours to provide minimum pressure drop.

Why select a plug valve?

Robust metal-to-metal seats cope well with the solid impurities that can run at high velocities in close proximity to the integral seating surfaces, particularly when the valve is opened against a high differential pressure. Plug valves are the preferred choice for bypass and equalisation on main gas pipelines by most major gas transportation companies. (Fig. 5)

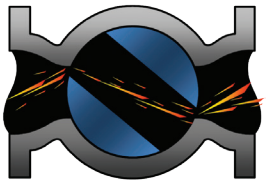


Fig.5

Robust metal-to-metal seats have also high resistance to solids objects and lack of gap/cavity between plug and body ensure that particles do not become trapped between plug and body thus avoiding damage to the seats while closing the valve. (Fig. 6)

Fig.6

Large seating area further enhances the resistance to erosion. The wide area maximizes the effectiveness of sealant, so that if the valve starts passing it can quickly be solved by injecting Nordstrom Sealant, restoring the valve's bubble tight shut-off capabilities without the need of valve overhaul. Sealant can be injected with the valve in any position and also under pressure, making the valve in-line maintainable. (Fig. 7)

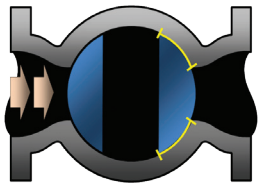


Fig.7

When the valve is open, unlike in other valve designs, the seats are well protected from the line media. This ensures that even if the valve is left open for long periods of time, its seating areas will not get damaged, thus ensuring good sealing and long valve life. (Fig. 8)

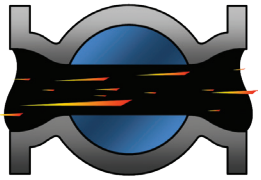


Fig.8

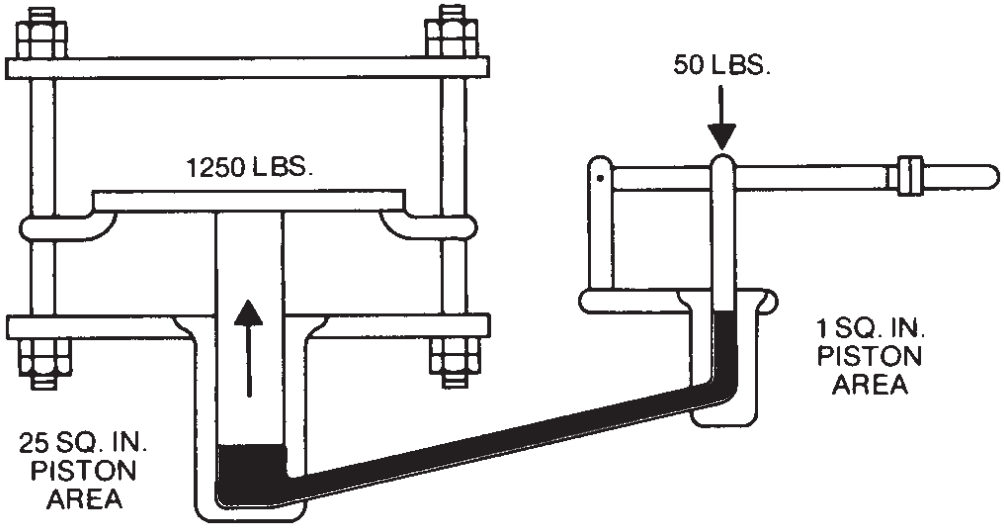
Why select a Nordstrom Dynamic Balance valve?

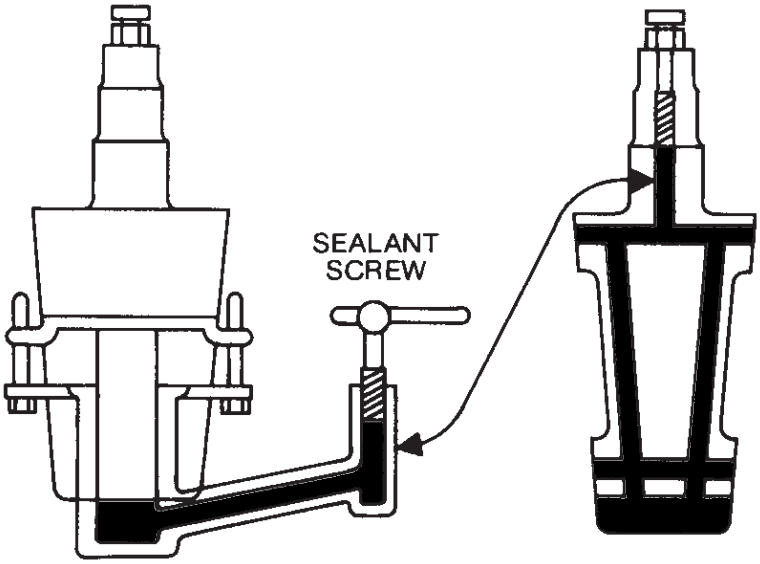
With experience in valves manufacturing dating back to 1914 and a continuous drive for improvement, Nordstrom has all the knowledge to make the finest quality plug valve, including:

Benefit	How It Is Achieved
• Certainty of zero through-leakage in the event of metal seal damage.	• Precise seat mating procedures • Effective sealant injection system combined with wide seating areas
• Certainty of operation with low and consistent torque which is stable over long periods of time • Minimal maintenance regime	• Pressure balanced plug as standard, with option of Protected Pressure balance® • Anti Friction Treatment on plug and stem • Precise factory set plug loading
• Full in-line maintainability even under full pressure and without any need of shut down	• Provision for sealant injection for the seats • Provision for stem packing re-injection
• Assured sealing to atmosphere	• Independent stem sealing design that can meet stringent fugitive emissions requirements • All pressure seals in fire safe metal or graphite

Pascal's Law

Nordstrom plug valves make use of the scientific principle known as Pascal's Law. This law states that "a unit pressure applied to the fluid contained in a sealed vessel is transmitted uniformly to all areas of the confining surfaces of the fluid with undiminished force, thus multiplying the force many times, depending on the area of the interior of the vessel."





1. Shown is a demonstration of Pascal's Law. A given force of 50 lbs. lifts 1,250 lbs. over an enlarged area of 25 to 1 ratio.
2. This superimposed drawing of a Nordstrom plug valve shows application of Pascal's Law. The sealant screw, when turned, exerts powerful hydraulic force that will slightly raise the plug from its seat if necessary.
3. The sealant fitting or screw, inserted in the top of the plug, performs the same operation, pressure being transmitted through the sealant grooves. The sealant grooves connect in the plug and body, forming a transmission line to the bottom chamber. The plug is always sealed against line pressure.

Sealant systems are incorporated in metal-seated plug valves as an integral part of the valve, and sealant is required to ensure proper valve performance.

Range

Nordstrom plug valves are available with threaded, flanged or buttwelding ends — or combination thereof — to meet the needs of your piping systems. Valves are or gear-operated, as listed in the detailed specification pages.

Nordstrom valves are available in regular, short or Venturi pattern, in accordance with API 6D and API 599. The different patterns vary in regard to face-to-face dimension and port area for a given size of valve.

- Regular pattern valves have the largest port area, the same face-to-face dimension and ball valves.
- Short pattern valves have a reduced port area as a consequence of their compact face-to-face dimensions, which match those of gate valves, and are used on low-pressure classes.
- Venturi pattern valves have a reduced port area and a flow path approximating a Venturi shape to aid pressure recovery. They tend to used in larger size valves.

Face-to-face and end-to-end dimensions conform to ASME B16.10 and BS 2080.

The table shows our current production range with a colored indication of the usually selected patterns. For many size pressure class combinations, more than one pattern is available, as indicated in the cells.

Flowserve can make special configurations/sizes/classes and our actual range is wider than shown below. So for valves not shown in the table, please contact Flowserve with specific requirements.

API 6D Dimensions	in.	½-	¾-	1	1½-	2	3	4	6	8	10	12	14	16	18	20	24	26	28	30	36	42
ASME 150		S/R	S/R	S/R	S/R	S/R	S/R	S/R	S/R	S/R	S/R	S/R	V	V	V	V	V	*	*	V	*	*
ASME 300		S/R	S/R	S/R	S/R	S/R	S/R	S/R	S/R/V	S/R/V	S/R/V	S/R/V	V	V		V	V	*	*	*	*	*
ASME 600		*	*	R	*	R	R	R	R/V	R/V	R/V	R	*	V	V	V	V	*	*	*	*	*
ASME 900		*	*	*	*	R	R	R	R	R	R	R/V	V	V	V	V	V	V	V	V		
ASME 1500		*	*	R	*	R	R	R	R/V	R	R	V	*	V	*	V	V	*	*			
ASME 2500		*	*	*	*	R	R	R	R	R	R	V	*	V								
API 2000																						
API 3000						•	•	•	•													
API 5000						•	•	•	•													
API 6A Dimensions	in				2-1⁄16	2-3⁄16	3-1⁄8	4-1⁄16	7-1⁄18													

Most common pattern:
Short
Regular
Venturi
API 6A

Refer to individual cells for available patterns.
*Contact Flowserve for more details.

Standards and quality assurance

Nordstrom Dynamic Balance valves meet the requirements of API 6D and ANSI B16.34 as standard. Valves meeting API 6A and API 599 are also available. Typical industry standards are listed in the table below. Other standards can be considered upon request.

API 6D	Specification for pipeline valves
API 6A	Specification for wellhead equipment
API 599	Metal plug valves – flanged, threaded and welding ends
ASME B16.34	Valves – flanged, threaded and welding end
API 641	Industrial valves. Measurement, test and qualification procedures for fugitive emissions.
ASME B16.10	Face-to-face and end-to-end dimensions of valves
ASME B16.5	Pipe flanges and flanged fittings
API 598	Industrial valves. Testing of valves. Pressure tests, test procedures and acceptance criteria.
API 6FA	Specification for fire test for valves
NACE MR0175	Sulphide stress cracking-resistant metallic material for oilfield equipment
ISO 9001	Quality assurance approval standard
CSA Z245.15: 22	Specification for pipeline valves

Quality assurance, inspection and testing

Reliability in your critical applications, including the petrochemical and process industries, is assured by careful attention to quality. The entire Flowserve manufacturing process complies with EN ISO 9001 and API Q1 (ISO TS 29001), as well as rigorous internal standards and industry best practices. Documented quality procedures are regularly revised and updated in response to regular third-party system audits and customer assessments. All suppliers are assessed to ensure compliance with similarly exacting standards, informed by performance records and vendor ratings.

The latest CNC machining, CMM inspection and other technologies ensure you get superior machining accuracy from Nordstrom valves. Stringent control of all processes, including hard facing and anti-friction treatment, delivers uniformly high-quality, low-friction products. All manufacturing and assembly processes are monitored to ensure trouble-free installation, commissioning and very long service life.

Exhaustive testing at the component and final product stages ensures that every valve meets or exceeds performance levels that will safeguard your people, processes and the environment. At minimum, all tests are substantiated by EN 10204 3.1 certificates on pressure tests, NDTs and pressure-containing parts, and mechanical and chemical tests.

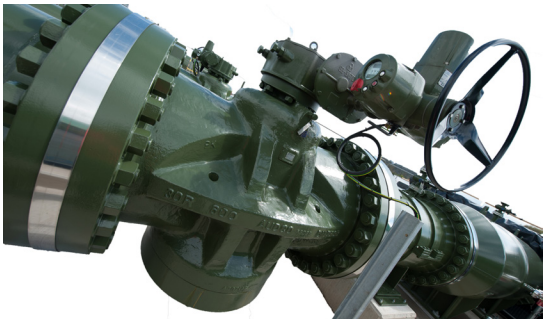
Images taken from page 8 and 9 of SRENTB000

Sample applications

Nordstrom Dynamic Balance valves should be selected whenever bubble tight shut-off (zero leakage) is needed and there is a concern about seat damage due to valves being opened against a full deferential pressure and/or the presence of solids or impurities in the process medium.

High-pressure gas isolation

Bubble-tight shut-off in challenging applications

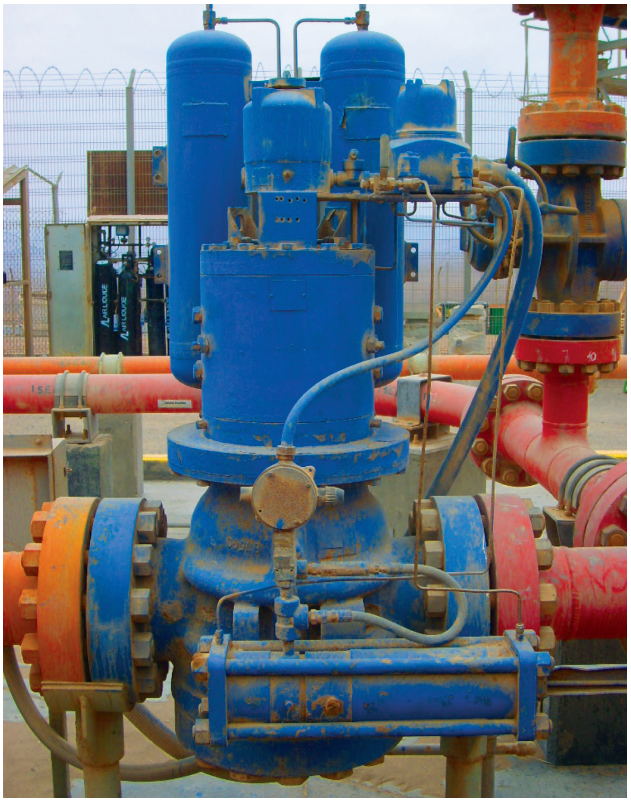


Kicker, vent and drain on scraper traps

Tight shut-off combined with limited throttling capabilities

Underground storage

Protected metal seating to resist impurities and give zero leakage, even on the highest pressures



Slurry isolation

Extremely abrasive services; a robust valve with no cavities

Bypass equalizing valves

To resist the erosion caused by full differential pressure openings on a transmission line, it will seal to protect the main line valve

Chapter 2

AUTOMATION

Plug valve operation

The pressure balance and low-friction features ensure that Nordstrom valves always turn with the lowest possible effort.

Torque figures

The manual operating mechanisms of all Nordstrom plug valves are sized to allow valve operation with a maximum effort of 350 N. A gearbox is always fitted when this effort cannot be obtained by using a lever.

The torque figures listed are the maximum turning efforts at the valve stem that will occur while opening the valve against full differential pressure. Nordstrom torque figures are based on actual test data and have been chosen to give a good approximation to a normally expected operating maximum torque, with the inclusion of an adequate safety factor.

Be aware that torque figures may change between different patterns or materials of construction. Line pressure has a direct effect on turning effort. For example, if the line pressure is reduced to zero, the torque at the stem will be approximately 75% of the figures shown for full differential pressure. There are many other factors which influence the valve torque, including the operating regime of the valve and the extent of any erosive or corrosive damage.

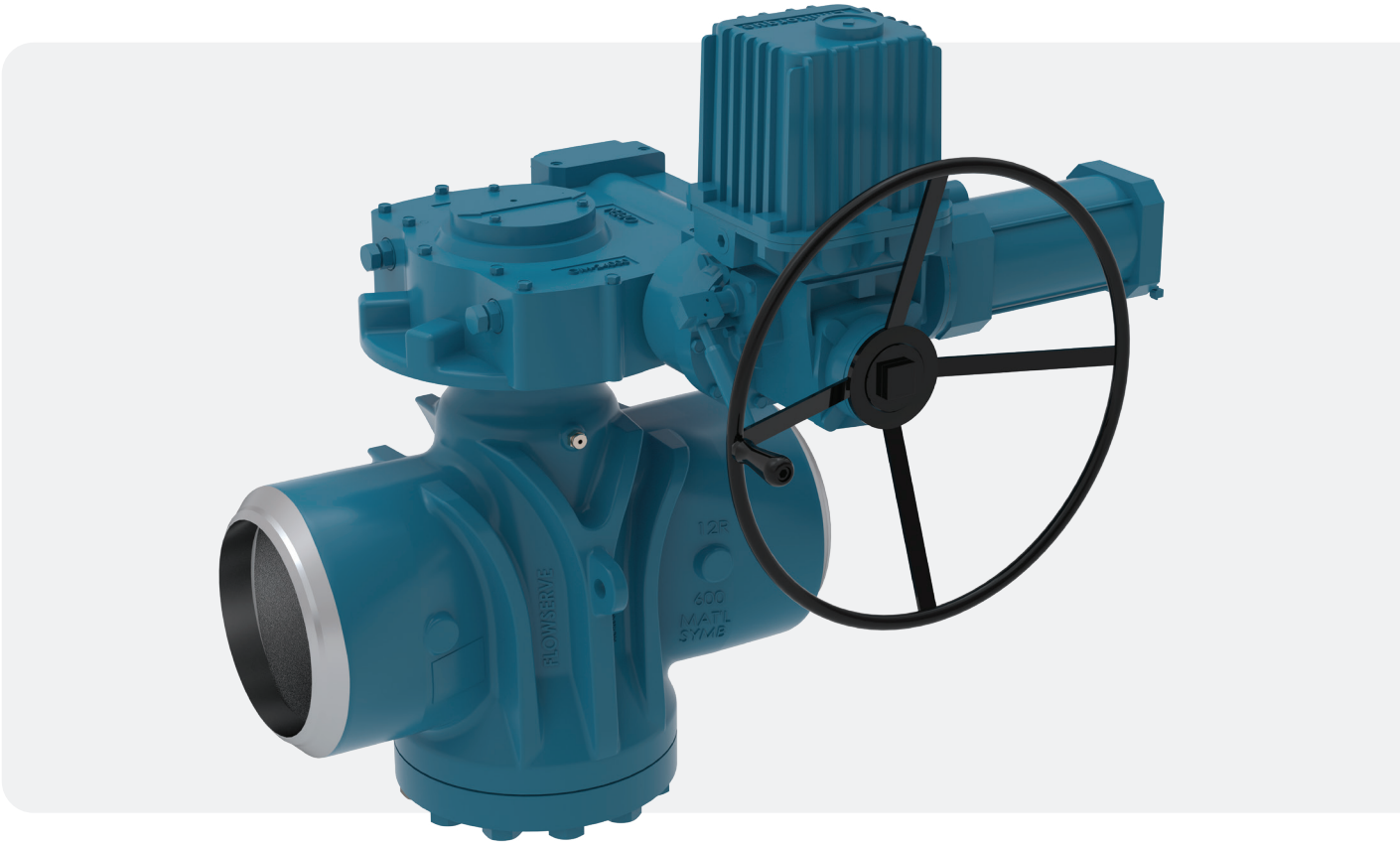
Always refer to Flowserve to know the exact torque figure of the valve supplied or request access to Nordstrom software NORDCALC.

Actuators

Due to the quarter-turn nature of the valve design, Nordstrom valves can easily be actuated by all the industry quarter-turn actuators, including electric, pneumatic, hydraulic, electro hydraulic, etc.

Nordstrom has years of experience with all major actuator manufacturers. We are pleased to offer a comprehensive valve package, including a Flowserve actuator and mounting package.

Alternatively, we source actuators to your specifications from leading actuator manufacturers around the world. Our plant has the facility to test most common types of actuators while mounted on the valve, giving peace of mind for the complete assembly. When sizing an actuator, a safety factor of at least 30% is always added to the expected operating torque figures to allow for variations in working conditions.



Actuators for Dynamic Balance valves

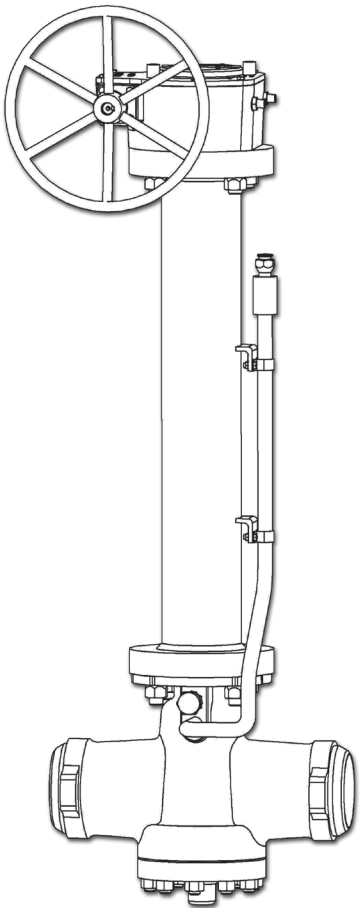
Nordstrom valves can supply hydraulic, pneumatic or electric power actuators for mechanical operation of Dynamic Balance valves. To obtain equipment in close conformance with customer requirements, the following information should be provided at the time of the inquiry:

1. Valve size and pressure class: If the power actuator is being ordered for field conversion, describe the actuator currently installed on the valve.
2. Minimum and maximum temperature valve will experience.
3. Fluid passing through valve.
4. Sealant currently being used.
5. Type of actuator desired:
   a. Hydraulic
   b. Pneumatic
   c. Electric
6. Maximum differential pressure across valve during operation.
7. Speed of operation required in minutes or seconds:
   a. To open
   b. To close
8. Frequency of operation.
9. For an electric operator, specify:
   a. AC or DC voltage
   b. Single- or three-phase
   c. Type of motor:
      1. Explosion-proof
      2. Weatherproof
      3. Other
   d. Frequency
10. If pneumatic or hydraulic actuator is desired, specify:
    a. Minimum and maximum pressure available.
    b. Operating medium:
       1. Gas
       2. Air
       3. Fluid (specify type)
    c. Accessory equipment desired:
       1. Filter
       2. Pump
       3. Control valving:
          a. Electrically operated
          b. Manually operated
          c. Pilot-operated
11. Position indicator (visual indicator on valves is standard):
    a. Remote reading:
       1. Selsyn
       2. Potentiometer
12. Full instrumentation to be furnished by:
    a. Flowserve Nordstrom Valves
    b. Others

Accessories

Extension columns

Valves for below-ground operation are available with elevated gear unit mounting, as shown. Extension can be made with the spindle length required to bring operator to surface. Extension columns in other configurations are available on request. Please contact Nordstrom Valves for more information.



Limit switches

We can include limit switches on all types of valves for both visual and electronic indication of the valve position. Please specify your requirements when ordering.

Special gearboxes

Special gearboxes can be provided; these can have different orientation drives for valves installed in difficult locations such as underground pits.

Locking devices

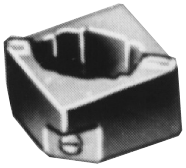
Locking and interlocking devices are available as options for all Nordstrom valves. They enable the gearbox or lever to be locked in either the OPEN or SHUT position. Please specify if these are required when ordering.

Other accessories

Nordstrom is used to handling specific requirements and we are flexible to accommodate non-standard demands. Please contact Flowserve for more information.

2-in. square adapters for Dynamic Balance and Super Nordstrom valves with obround wrench heads

Distance Across Flats of Obround Wrench Head on Valve*	Adapter Part No.
0.62	61291
16	
0.81	12180
21	
0.88	12181
22	
1.00	12183
25	
1.25	12185
32	
1.38	12186
35	

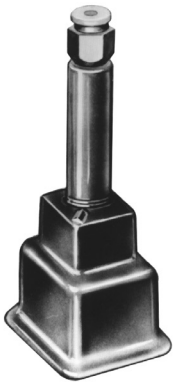


** See dimension "J" on valve dimension tables.*

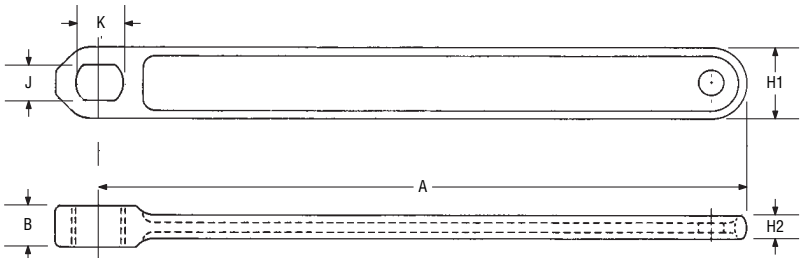
2-in. square adapters for Nordstrom steel valves with square stems

Distance Across Flats of Square Stem Head on Valve*	Adapter Part No.
1.75	1277
44	
2.00	None Required
51	

** See dimension "J" on valve dimension tables.*

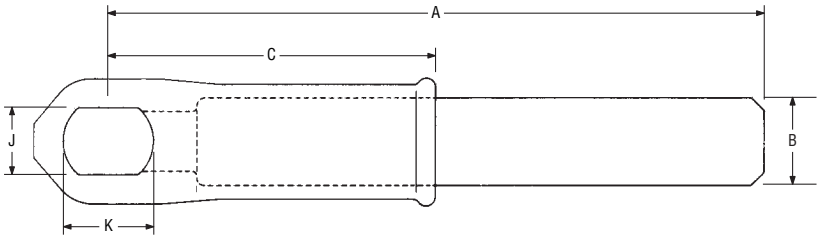


Cast wrench for Dynamic Balance valves



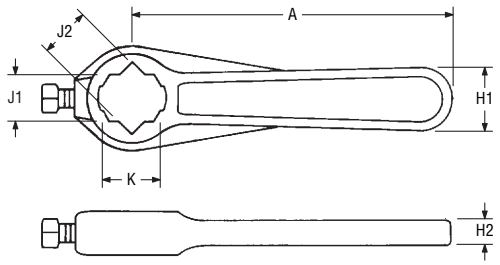
Size	Part #	Weight	A	B	H1	H2	J	K
DB-1	482014	0.9 kg	457 mm	23 mm	35 mm	11 mm	17 mm	22 mm
		2.0 lbs	18.0 in.	0.9 in.	1.4 in.	0.4 in.	0.655 in.	0.875 in.

Cast heads fitted with pipe handle for Dynamic Balance valves



Size	Part #	Weight	A	B Dia.	C	J	K
DB-2	482006	2 kg	686 mm	27 mm	102 mm	21 mm	29 mm
		3.7 lbs	27 in.	1.1 in.	4.0 in.	0.835 in.	1.13 in.
DB-3	482137	3 kg	914 mm	33 mm	119 mm	26 mm	37 mm
		6.8 lbs	36 in.	1.3 in.	4.7 in.	1.03 in.	1.44 in.
DB-4	482138	6 kg	1219 mm	49 mm	140 mm	33 mm	46 mm
		12.9 lbs	48 in.	1.9 in.	5.5 in.	1.28 in.	1.82 in.

Wrenches for valves with square or obround stems

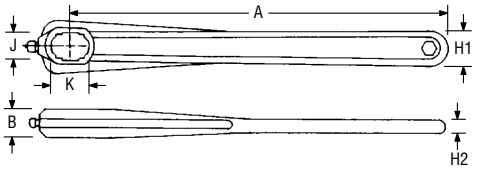


Top numerals are in millimeters and kilograms.

Bottom numerals are in inches and pounds.

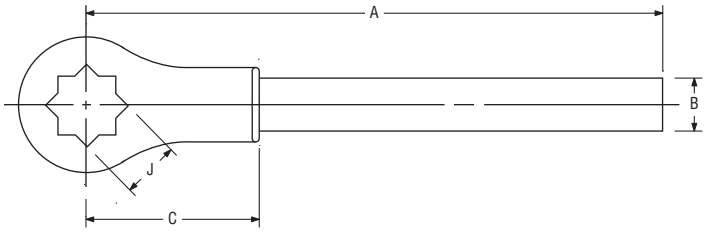
Size	Part #	Weight	A	H1	H2	J1	J2	K
SN-1	3001198	0.4 kg	178 mm	28 mm	10 mm	21 mm	22 mm	28 mm
		0.9 lbs	7.0 in.	1.1 in.	0.4 in.	0.81 in.	0.88 in.	1.10 in.
SN-2	3001197	0.8 kg	267 mm	38 mm	13 mm	25 mm	28 mm	36 mm
		1.7 lbs	10.5 in.	1.5 in.	0.5 in.	1.00 in.	1.10 in.	1.41 in.
SN-3	3001196	2.5 kg	635 mm	46 mm	15 mm	32 mm	38 mm	45 mm
		5.6 lbs	25.0 in.	1.8 in.	0.6 in.	1.25 in.	1.50 in.	1.79 in.

Wrenches for valves with obround stems



Size	Part #	Weight	A	B	H1	H2	J	K
L-9	15109	1.7 kg	445 mm	30 mm	46 mm	15 mm	32 mm	45 mm
		3.8 lbs	17.5 in.	1.2 in.	1.8 in.	0.6 in.	1.25 in.	1.79 in.
M-9	15110	2.5 kg	533 mm	33 mm	48 mm	15 mm	35 mm	50 mm
		21.0 in.	1.3 in.	1.9 in.	0.6 in.	1.38 in.	1.98 in.	50 mm

Wrenches for valves with square heads



Size	Part #	Weight	A	B (Dia.)	C	J
P-2	8889	3 kg	686 mm	43 mm	140 mm	47 mm
		6 lbs	27.0 in.	1.7 in.	5.5 in.	1.84 in.
T-2	8148	5 kg	914 mm	48 mm	170 mm	53 mm
		11 lbs	36.0 in.	1.9 in.	6.7 in.	2.09 in.
V-2	8890	8 kg	1219 mm	48 mm	178 mm	65 mm
		17 lbs	48.0 in.	1.9 in.	7.0 in.	2.56 in.

Locking devices for Dynamic Balance straightway valves

Valve Size/in.	½-¾-1 All Classes	1½-2 All Classes	2½-3 All Classes (Also size 4, Class 150-600)	4 ASME Class 900-2500 API 3000 and 5000 (Also sizes 6 and 8, ASME Class 150-600)
Yoke	482811	482814	482817	482820
Cover	482812	482815	482818	482821
Retaining Ring	908623	908624	927389	946031
Complete Assembly	482813	482816	482819	482822

Locking devices for Super Nordstrom valves

ASME Classes 150 (PN 20) and 300 (PN 50)

Size	NPS	½, ¾, 1	1¼ and 1½	2 and 2½	3	4
	DN	15, 20, 25	32 and 40	50 and 65	80	100
Part Description		Part Number				
Hood		497998	497999	498000	498001	498002
Yoke		497994	497995	497995	497996	497997
Retaining Ring		908624	927389	927389	952111	952112
Complete Assembly		498005	498006	498007	498008	498009

ASME Class 600 (PN 100)

Size	NPS	½, ¾, 1	1½	2
	DN	15, 20, 25	40	50
Part Description		Part Number		
Hood		497998	498003	498004
Yoke		497994	497995	497995
Retaining Ring		908624	927389	927389
Complete Assembly		498005	498010	498011

Locking devices for Nordstrom bolted gland valves

Size Number	NPS	6 and 8	12
	DN	150 and 200	300
Part Description		Part Number	
Hood		57630	57629
Locking Clip		45926	57613
Dart and Chain		57734	57734
Complete Assembly		58093	58092

Locking device for Super Nordstrom two-bolt cover valves

A – Plain locking device

Size	NPS	¾ and 1	1¼ and 2	3	4
	DN	20 and 25	32 and 50	80	100
Part Description		Part Number			
Hood		3001225	3001115	3001153	3001155
Chain Assembly		2753423	2753423	2753424	2753425
Complete Assembly		2752670	2752671	2752672	2753673

B – Combination reversible locking device and wrench

Size	NPS	¾ and 1	1¼ and 2	3	4
	DN	20 and 25	32 and 50	80	100
Part Description		Part Number			
Locking Wrench		2752770	3001165	2752771	2752772
Chain Assembly		2753426	2753427	2753428	2753429
Complete Assembly		2752861	2752862	2752863	2752864

Chapter 3

Materials

Standard design categories for Dynamic Balance valves

To streamline the ordering process, Flowserve has designated the following standard design categories for Dynamic Balance valves. When ordering, please indicate the letter code that best meets your requirements, along with complete service details.

Other design options may be available upon request. Contact your Flowserve customer service representative for assistance.

Category	Suitable Applications	Materials	Temperature Range
A	General API 6D and B16.34 service	Carbon steel	-29°C to 232°C (-20°F to 450°F)
	General API 6A service (NACE offshore construction only)	API Type 2	-17°C to 121°C (0°F to 250°F)
B	General low-temperature service	LCC	-46°C to 232°C (-50°F to 450°F)
C	Sour gas (NACE MR0175, API 6D and B16.34)	Carbon steel	-29°C to 232°C (-20°F to 450°F)
D	Low-temperature sour gas (NACE MR0175, API 6D and B16.34)	LLC	-46°C to 232°C (-50°F to 450°F)
E	Abrasive service	Carbon steel with hard-surfaced body and plug	-29°C to 232°C (-20°F to 450°F)
F	Moderately high-temperature service	Carbon steel with hard-surfaced body and plug (hot tested/elevated gearing)	232°C to 427°C (450°F to 800°F)
H	Low-temperature corrosion resistance and wetted parts	316 stainless steel with 17-4 PH drive train	-45°C to 232°C (-50°F to 450°F)
J	Moderately high-temperature corrosion resistance and wetted parts	316 stainless steel with 17-4 PH drive train (hot tested/elevated gearing)	232°C to 371°C (450°F to 700°F)
K	High-temperature corrosion resistance	316 stainless steel with Nitronic® 60 or 660 stainless steel stem, hard-surfaced body and plug (hot tested/elevated gearing)	371°C to 816°C (700°F to 1,500°F)

NACE construction valves for sour gas applications

The National Association of Corrosion Engineers (NACE) has published a report outlining acceptable materials for valves for sour service. The current outline is Publication MR0175, a guide to the manufacturers and users of valves based on the latest metallurgical knowledge. Most of our customers involved in this area of production also have their own specifications that may or may not be more stringent than the NACE publication. The reason for this is, of course, that the product varies from field to field and many different types of inhibitors are used.

The basic problem is that whenever even a small amount of hydrogen sulfide (H_2S) is encountered in natural gas or under oil pressure, a corrosion phenomenon may occur, known as hydrogen sulfide embrittlement or sulfide stress cracking. Actually, the steel part is absorbing hydrogen. This causes ductility, and when other stresses are added, may result in failure of the part. Currently, we know that some steels with yield strengths above 90,000 psi (621 MPa) and/or hardness greater than Rockwell 22 (235 Brinell) are subject to sulfide stress cracking. Failure below these limits is unlikely.

Because of a long history of reliability in numerous sour gas installations, Dynamic Balance valves can be supplied in conformance to standards enumerated in the NACE governing document on sour gas application.

In some cases, a more sophisticated construction may be required because of other corrosive elements in the flow stream. All major components are heat-treated to a controlled hardness of 22 or lower on the Rockwell C scale. In this construction, the plug is coated with electrolysis nickel to prevent galling.

Complete engineering details are available upon request.

Dynamic Balance plug valve metals

Carbon steel: Cast carbon steel used in Dynamic Balance valve bodies is a medium carbon steel, conforming to ASTM Specification A216, Grade WCC.

Each heat is rigidly controlled and recorded. The castings are marked to identify the heat used in each finished valve.

Steel plugs for carbon steel valves are made of a low-alloy steel, heat-treated to produce the proper balance between non-galling properties and the toughness required to resist the mechanical loads imposed in operating the valve.

Manganese-molybdenum alloy steel: (API Type 60K Specification – ASTM Specification A-487 Grade 4 Class C).

This alloy steel is used for body castings for 3000 MOP and higher Dynamic Balance valves for oilfield services, that must conform to API Specification 6A, covering Steel Valves for Drilling and Production Service.

Ferritic steel: Grade LCC Ferritic Steel, conforming to ASTM Specification A352, is basically a “killed” mild carbon steel that has good impact qualities at low temperatures.

This material is used generally for sub-zero temperatures to -46°C (-50°F) and must have a minimum average Charpy “V” notch impact strength of 15 foot-pounds at that temperature.

Type CF8M stainless steel: Analysis and properties corresponding to AISI Type 316 wrought stainless steel, and conforming to ASTM Specification A351, Grade CF8M.

Typical materials of construction — Dynamic Balance valves

Size 4 and smaller valves

Part Name	ASME and API 6D Valves				API 6A Valves
	Category A	Category B	Category C	Category D	Category C OS (4)
Adjusting Screw	Alloy Steel				
Adjusting Screw Cap	Carbon Steel				
Ball	Stainless Steel		K-500 Monel		
Body [1]	ASTM A216, Gr. WCC	ASTM A352, Gr. LCC	ASTM A216, Gr. WCC	ASTM A352, Gr. LCC	ASTM A487, Gr. 4N[3]
Bolting – Cover	ASTM A193, Gr. B7	ASTM A320, Gr. L7	ASTM A193, Gr. B7M	ASTM A320, GrL7M	ASTM A193 Gr. B7M[2]
Bolting – Gear Flange	ASTM A193, Gr. B7	ASTM A320, Gr. L7	ASTM A193, Gr. B7M	ASTM A320, Gr. L7M	ASTM A193 Gr. B7M
Bolting – Gland	ASTM A193, Gr. B7	ASTM A320, Gr. L7	ASTM A193, Gr. B7M	ASTM A320, Gr. L7M	ASTM A193 Gr. B7M[2]
Check Valve	Carbon Steel		Stainless Steel		
Cover [1]	Carbon Steel				Carbon Steel [3]
Diaphragm – Thick	Carbon Steel				
Diaphragm – Thin	Stainless Steel				
Equalizer	Alloy Steel		Alloy Steel .003 ENP		Alloy Steel [3] .003 ENP
Gasket	Graphite and Stainless Steel				
Gear Flange	Wrought Carbon Steel				Carbon Steel
Gland	Ductile Iron				Ductile Iron .003 ENP
Grease Fitting	Not Applicable				Stainless Steel
Nameplate	Stainless Steel				
Packing	Graphite and Fluoropolymer Compound				
Plug	Steel in size 6 and 8 ASME Class 1500, and size 10 and smaller Class 2500. ASTM A-48 iron in all other sizes and ASME pressure classes. Plugs have coating of low coefficient friction material.	Alloy Steel HRC 22 Max. .003 ENP			Alloy Steel [3] HRC 22 Max. .003 ENP
Retaining Ring	Carbon Steel				Carbon Steel .001 ENP
Sealant Fitting	Carbon Steel				
Spring	Stainless Steel		Inconel X-750		
Stem [1] (Gear-Operated)	Wrought Carbon or Low Alloy Steel		Alloy Steel HRC 22 Max.		Alloy Steel [3] HRC 22 Max.
Stem [1] (Wrench-Operated)	Stainless Steel		Stainless Steel		Stainless Steel [3] HRC 22 Max.
Stem Ring	Carbon Steel		Wrought Carbon Steel		
Stop Collar	Wrought Carbon Steel				Wrought Carbon Steel .001 ENP
Thrust Button	Nickel Steel		Wrought Carbon Steel		
Weatherseal – Cover	Neoprene				
Weatherseal – Stem	Buna-N				Polyurethane
Zinc Washer	Zinc				

[1] Category B and D valves are impact-tested to 20/15 ft-lb values.

[2] Plastic-coated.

[3] 100% hardness-tested.

[4] OS denotes offshore construction.

Size 6 and larger – non-pressure seal valves

Part Name	ASME and API 6D Valves			
	Category A	Category B	Category C	Category D
Adjusting Screw	Carbon Steel			
Adjusting Screw Cap	Carbon Steel			
Ball – Balance	Stainless Steel		K-500 Monel	
Ball – Thrust	Stainless Steel		K-500 Monel	
Ball-Retaining Washer	Stainless Steel			
Ball Seat – Thrust	Alloy Steel		Stainless Steel – Stellite Hardfaced	
Bearing (Thrust Washer)	Glass/PTFE Fiber Carbon Steel Backed		Glass/PTFE Fiber Stainless Steel Backed	
Body [1]	ASTM A216, Gr. WCC	ASTM A352, Gr. LCC	ASTM A216, Gr. WCC	ASTM A352, Gr. LCC
Bolting – Adj. Screw Cover	SAE Gr 5			
Bolting – Cover	ASTM A193, Gr. B7	ASTM A320, Gr. L7	ASTM A193, Gr. B7M	ASTM A320, Gr. L7M
Bolting – Gear Flange	ASTM A193, Gr. B7	ASTM A320, Gr. L7	ASTM A193, Gr. B7M	ASTM A320, Gr. L7M
Bolting – Gland	ASTM A193, Gr. B7	ASTM A320, Gr. L7	ASTM A193, Gr. B7M	ASTM A320, Gr. L7M
Bolting – Gland Retainer	ASTM A193, Gr. B7	ASTM A320, Gr. L7	ASTM A193, Gr. B7M	ASTM A320, Gr. L7M
Check Valve	Carbon Steel		Stainless Steel	
Cover [1]	Carbon Steel			
Diaphragm – Thick	Carbon Steel			
Diaphragm – Thin	Stainless Steel			
Equalizer	Alloy Steel		Alloy Steel .003 ENP	
Gasket – Adj. Screw Cover	ACCOPAC N 820D			
Gasket – Cover	Carbon Steel			
Gear Flange	Carbon Steel			
Gland – Gear-Operated	Gray Iron			
Gland – Wrench-Operated	Ductile Iron			
Gland Retainer	Carbon Steel			
Key	Carbon Steel			
Nameplate	Stainless Steel			
Packing	Graphite and Fluoropolymer Compound			
Plug	A48Gr45B/50B or Carbon Steel		Alloy Steel HRC 22 Max. .003 ENP	
Retaining Ring	Carbon Steel			
Sealant Fitting	Carbon Steel			
Spring	Stainless Steel		Inconel X-750	
Stem [1] (Gear-Operated)	Alloy Steel		Alloy Steel HRC 22 Max. .003 ENP	
Stem [1] (Wrench-Operated)	Stainless Steel		Stainless Steel Double Age Hardened	
Stem Ring	Carbon Steel			
Stop Collar	Wrought Carbon Steel			
Thrust Button	Wrought Carbon Steel			
Weatherseal – Cover	Neoprene			
Weatherseal – Stem	Buna-N			
Zinc Washer	Zinc			

[1] Category B and D valves are impact-tested to 20/15 ft-lb values.

Size 6 and larger – pressure seal valves

ASME and API 6D Valves				
Part Name	**Category A**	**Category B**	**Category C**	**Category D**
Adjusting Screw	Alloy Steel			
Adjusting Screw Cap	Carbon Steel			
Ball – Balance	Stainless Steel		K-500 Monel	
Ball-Retaining Washer	Stainless Steel			
Ball Seat – Thrust	Alloy Steel		Stainless Steel – Stellite Hardfaced	
Bearing (Thrust Washer, Stem)	Glass/PTFE Fiber Carbon Steel Backed		Glass/PTFE Fiber Stainless Steel Backed	
Body (1)	ASTM A216, Gr. WCC	ASTM A352, Gr. LCC	ASTM A216, Gr. WCC	ASTM A352, Gr. LCC
Bolting – Adj. Screw Cover	SAE Gr 5			
Bolting – Gear Flange	ASTM A193, Gr. B7	ASTM A320, Gr. L7	ASTM A193, Gr. B7M	ASTM A320, Gr. L7M
Bolting – Gland Retainer	ASTM A193, Gr. B7	ASTM A320, Gr. L7	ASTM A193, Gr. B7M	ASTM A320, Gr. L7M
Bolting – Packing Gland, Adjusting Screw	ASTM A193, Gr. B7	ASTM A320, Gr. L7	ASTM A193, Gr. B7M	ASTM A320, Gr. L7M
Check Valve	Carbon Steel		Stainless Steel	
Cover [1]	Carbon Steel			
Cover Retainer	Carbon Steel			
Equalizer	Alloy Steel		Alloy Steel .003 ENP	
Gasket – Cover	Carbon Steel			
Gasket – Pressure Seal	Carbon Steel			
Gland – Adjusting Screw	Gray Iron			
Gland – Stem Packing	Ductile Iron			
Gland Retainer	Carbon Steel			
Key	Carbon Steel			
Nameplate	Stainless Steel			
Packing – Adjusting Screw	(1) Braided Carbon Filament Yarn and (1) Graphite			
Packing – Stem	Graphite and Fluoropolymer Compound			
Pin – Spring Disc	Carbon Steel			
Plug	ASTM A48, Gr. 45B/50B or Carbon Steel		Alloy Steel HRC 22 Max. .003 ENP	
Sealant Fitting	Carbon Steel			
Ring – Spacer	Carbon Steel			
Ring – Split	Alloy Steel			
Spring – Plug	Stainless Steel		Inconel X-750	
Spring Disc	Alloy Steel			
Stem [1] (Gear-Operated)	Alloy Steel		Alloy Steel HRC 22 Max. .003 ENP	
Stem Ring	Carbon Steel			
Zinc Washer	Zinc			

[1] Category B and D valves are impact-tested to 20/15 ft-lb values.

Typical materials of construction — other valves

Super Nordstrom valves

Part Name	Standard Construction
Body	ASTM A105, Forg or ASTM A216, Gr. WCB
Cover	Carbon Steel
Plug and Stem	Carbon Steel
Gland	Carbon Steel
Cover Bolting	ASTM A193, Gr. B7
Packing	Compound of Graphite and TFE
Controlled-Dimension Washers	Stainless Steel
Spring	Stainless Steel
Gasket	Stainless Steel and Graphite
Stop Collar	Wrought Carbon Steel
Retainer Ring	Carbon Steel
Sealant Fitting	Carbon Steel
Check Valve	Carbon Steel
Weatherseal	Buna-N

Super Nordstrom two-bolt cover valves

Part Name	Standard Construction
Body	ASTM A216, Gr. WCB
Cover	Ductile Iron
Plug and Stem	Gray Iron
Cover Bolting	ASTM A449 SAE, Gr. 5
Spring	Stainless Steel
Cover Seal	Buna-N
Stem Seal	TFE
Weatherseal	Buna-N
Sealant Fitting	Carbon Steel
Check Valve	Carbon Steel

Nordstrom valves bolted gland

Part Name	Standard Construction
Body	ASTM A216, Gr. WCB
Cover	Carbon Steel
Plug and Stem	Gray Iron
Gland	Hi Elon Iron
Cover Bolting	ASTM A193, Gr. B7
Gland Bolting/Nuts	ASTM A193, Gr. B7 / ASTM A194 Gr. 2H
Gaskets	Sheet Gasket Material
Diaphragm	Stainless Steel
Gland/Stem Seals	Buna-N
Check Valve	Carbon Steel
Sealant Fitting	Carbon Steel

Hard-surfaced valves

For high-temperature and abrasive services, Dynamic Balance valves can be supplied with plug taper and body seat hard-surfaced with nickel or cobalt base alloys (standard design categories E, F and K). These materials provide a protective coating, having a low coefficient of friction for easier operation at elevated temperatures. With additional hard-surfacing in high-erosion areas, hard-surfaced Dynamic Balance valves provide excellent resistance to abrasion in coal, limestone, iron ore, copper ore and other water-carried slurries. For severe services, hard-surfacing extends valve life and improves valve performance significantly.

Nordstrom has extensive experience in applying hard-surfacing materials. Special vacuum furnaces keep the base metal of the plug in a controlled, heated atmosphere where the coating alloy can be fused to base metal with optimum adherence. Fully trained technicians take the hard-surfaced plugs and lap these into the matching bodies. Valve assembly at room temperature is made with dimension allowances to assure proper operation at elevated temperatures in actual services. A valve shell test is performed to prove pressure containment, and a seat test is performed with normal adjustment to prove the integrity of the seat. To prevent stress cracking of the hard-surfacing material, these tests are performed at the valve maximum operating pressure.

Chapter 4

DIMENSIONS

Super Nordstrom two-bolt cover plug valves

200 CWP – Figures 1942½, 1943½, 1943¼

Short pattern

200 CWP (13.8 bar)
400 psig (28 bar) test

Figure 1942½, sizes ¾, 1 and 1¼ (not shown)

Figure 1943¼, sizes 2, 3 and 4 (not shown)

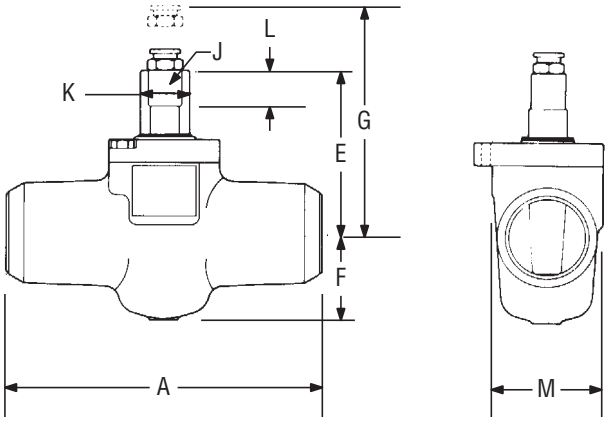


Figure 1943½, sizes 2, 3 and 4

Size	NPS	¾	1	1¼	2	3	4
	DN	20	25	32	50	80	100
End-to-end, buttwelding ends, Figure 1942½	A	4.50	4.50	5.00			
		114	114	127			
End-to-end, buttwelding ends, Figure 1943½	A				9.00	10.00	11.00
					229	254	279
End-to-end, flanged by weld end, Figure 1943¼					11.50	12.75	14.00
					292	324	356
Diameter of flange	C				6.00	7.50	9.00
					152	191	229
Center to top of stem	E	3.80	3.80	4.10	4.70	5.60	6.30
		97	97	104	119	142	160
Clearance required to remove sealant fitting	F	5.50	5.50	5.80	6.40	7.20	8.00
		140	140	147	163	183	203
Center to bottom of body	G	2.00	2.00	2.20	2.50	3.50	4.10
		51	51	56	64	89	104
Width of stem flats	J	0.81	0.81	1.00	1.00	1.25	1.25
		21	21	25	25	32	32
Diameter of stem	K	1.06	1.06	1.38	1.38	1.75	1.75
		27	27	35	35	44	44
Height of stem flats	L	0.90	0.90	1.00	1.00	1.30	1.30
		23	23	25	25	33	33
Extreme width of body	M	2.60	2.60	3.20	3.20	4.00	4.80
		66	66	81	81	102	122
Wrench size		SN-1	SN-1	SN-2	SN-2	L-9	SN-3
Weight (approx.), Figure 1942½		6	6	9			
		3	3	4			
Weight (approx.), Figure 1943½					15	29	45
					7	13	20
Weight (approx.), Figure 1943¼					22	41	63
					10	19	29

** Schedule 40 steel pipe welding ends are standard – other bores on request.*
All valve sizes use Sealant Stick B.
All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve.

Super Nordstrom plug valves

ASME Class 150 – Figure 1924, 1925, 1925½

Short pattern

ASME Class 150 (PN 20)

Figure 1925½, sizes 2, 3 and 4 (not shown)

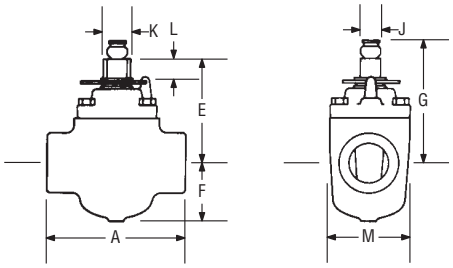


Figure 1924, sizes 2 and 3

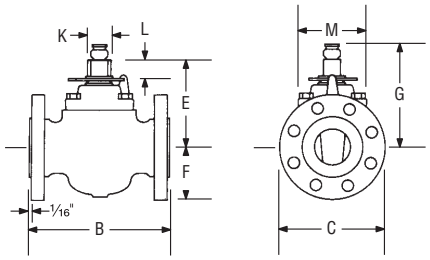


Figure 1925, sizes 1 to 4

Size	NPS	1	1½	2	2½	3	4
	DN	25	40	50	65	80	100
End-to-end, threaded, Figure 1924	A			7.25		10.00	
				184		254	
Face-to-face, flanged (raised face)	B	5.50	6.50	7.00	7.50	8.00	9.00
		140	165	178	191	203	229
End-to-end, buttwelding ends, Figure 1925½	A			10.50		13.00	14.00
				267		330	356
Diameter of flange	C	4.25	5.00	6.00	7.00	7.50	9.00
		108	127	152	178	191	229
Center to top of stem	E	4.50	5.20	5.40	5.40	6.40	7.00
		114	132	137	137	163	178
Clearance required to remove sealant fitting	G	7.00	7.70	7.90	7.90	8.90	9.50
		178	196	201	201	226	241
Center to bottom of body	F	2.20	2.60	3.00	3.00	4.00	4.40
		56	66	76	76	102	112
Width of stem flats	J	0.81	1.00	1.00	1.00	1.25	1.38
		21	25	25	25	32	35
Diameter of stem	K	1.09	1.41	1.41	1.41	1.78	1.98
		28	36	36	36	45	50
Height of stem flats	L	0.90	1.00	1.00	1.00	1.30	1.50
		23	25	25	25	33	38
Extreme width of body	M	3.3	3.8	4.2	4.2	4.8	5.5
		84	97	107	107	122	140
Number of tapped holes/size						2/.625	
Thread size UNC in flange*							
Wrench size		SN-1	SN-2	SN-2	SN-2	L-9	M-9
Weight (approx.), Figure 1924				25		50	
				11		23	
Weight (approx.), Figure 1925		15	21	31	45	61	78
		7	10	14	20	28	35
Weight (approx.), Figure 1925½				26		50	65
				12		23	29

All valve sizes use Nordstrom Sealant Stick B.
Lengths of Figure 1925 valves, sizes 2 and larger, are interchangeable with ASME Class 150 steel gate valves.
** Conforms to API 6D and is marked accordingly. All dimensions are approximate.*
For the most current dimensions, please request a drawing from Flowserve.

Super Nordstrom plug valves

ASME Class 300 – Figure 2024, 2025, 2025½

Short pattern

ASME Class 300
(PN 50)

Figure 2024½, sizes 2 to 4 (not shown)

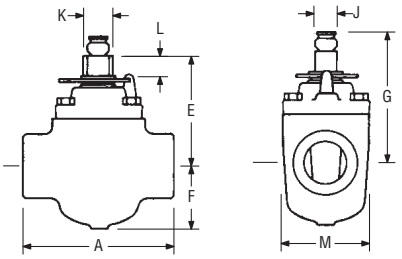


Figure 2024, sizes ½ to 3

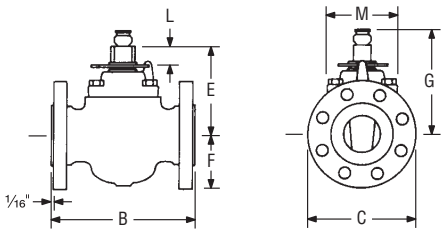


Figure 2025, sizes 1 to 4

Size	NPS	BW (½)	1	1¼	1½	2	2½	3	4
	DN	15 and 20	25	32	40	50	65	80	100
End-to-end, threaded, Figure 2024	A	4.25	4.50	5.50	5.50	7.25		10.00	
		108	114	140	140	184		254	
Face-to-face, flanged (raised face)	B		6.25		7.50	8.50	9.50	11.13	12.00
			159		191	216	241	283	305
End-to-end, buttwelding ends, Figure 2025½						10.50		13.00	14.00
						267		330	356
Diameter of flange	C		4.88		6.13	6.50	7.50	8.25	10.00
			124		156	165	191	210	254
Center to top of stem	E	4.1	4.5	5.2	5.2	5.4	5.4	6.4	7.0
		104	114	132	132	137	137	163	178
Clearance required to remove sealant fitting	G	6.6	7.0	7.7	7.7	7.9	7.9	8.9	9.5
		168	178	196	196	201	201	226	241
Center to bottom of body	F	1.9	2.2	2.6	2.6	3.0	3.0	4.0	4.4
		48	56	66	66	76	76	102	112
Width of stem flats	J	0.81	0.81	1.00	1.00	1.00	1.00	1.25	1.38
		21	21	25	25	25	25	32	35
Diameter of stem	K	1.09	1.09	1.41	1.41	1.41	1.41	1.78	1.97
		28	28	36	36	36	36	45	50
Height of stem flats	L	0.9	0.9	1.0	1.0	1.0	1.0	1.3	1.5
		23	23	25	25	25	25	33	38
Extreme width of body	M	3.3	3.3	3.8	3.8	4.2	4.2	4.8	5.5
		84	84	97	97	107	107	122	140
Wrench size		SN-1	SN-1	SN-2	SN-2	SN-2	SN-2	L-9	M-9
Weight (approx.), Figure 2024		9	13	18	18	25		50	
		4	6	8	8	11		23	
Weight (approx.), Figure 2025			18		28	39	57	77	105
			8		13	18	26	35	48
Weight (approx.), Figure 2025½						26		50	65
						12		23	29

All valve sizes use Nordstrom Sealant Stick B.
Lengths of Figure 2025 valves, sizes 1½ and larger, are interchangeable with ASME Class 300 steel gate valves. All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve.

Super Nordstrom plug valves

ASME Class 600 – Figure 2224

Regular pattern

ASME Class 600 (PN 100)

Figure 2224, sizes 1½ and 2 (not shown)

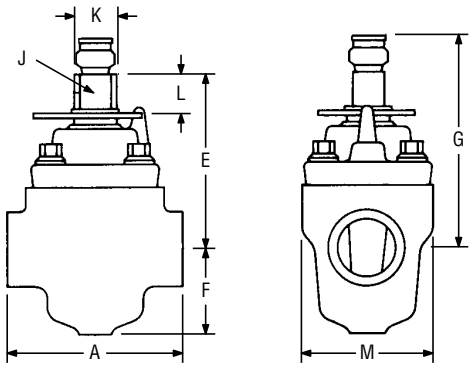


Figure 2224, sizes ½, ¾ and 1

Size	NPS	½ and ¾	1	1½	2
	DN	15 and 20	25	38	50
End-to-end, threaded, Figure 2224	A	4.25	4.50	5.75	7.25
		108	114	146	184
Center to top of stem	E	4.1	4.5	5.2	5.4
		104	114	132	137
Clearance required to remove sealant fitting	G	6.6	7.0	7.7	7.9
		168	178	196	201
Center to bottom of body	F	1.9	2.2	2.7	3.1
		48	56	69	79
Width of stem flats	J	0.81	0.81	1.00	1.00
		21	21	25	25
Diameter of stem	K	1.09	1.09	1.41	1.41
		28	28	36	36
Height of stem flats	L	0.9	0.9	1.0	1.0
		23	23	25	25
Extreme width of body	M	3.3	3.3	4.9	5.8
		84	84	124	147
Wrench size		SN-1	SN-1	SN-2	SN-2
Weight (approx.), Figure 2224		9	13	20	31
		4	6	9	14

All valve sizes use Nordstrom Sealant Stick B. All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve.

Nordstrom bolted gland plug valves

ASME Class 150 – Figure 4185½

ASME Class 150 (PN 20)

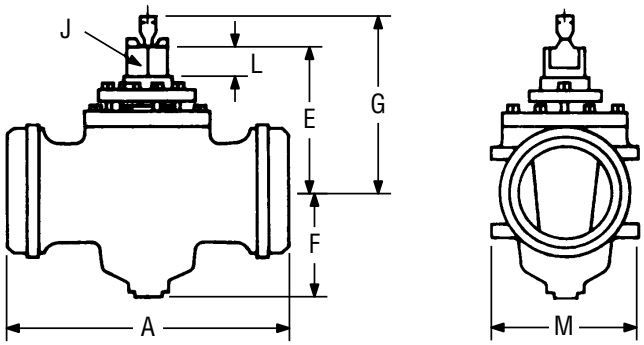


Figure 4185½, sizes 6, 8 and 12

Size	NPS	6	8
	DN	150	200
End-to-end, buttwelding ends, Figure 4185½	A	13.00	15.50
		330	394
Center to top of stem	E	9.60	11.80
		244	300
Clearance required to remove sealant fitting	G	13.30	16.60
		338	422
Center to bottom of body	F	6.00	7.30
		152	185
Width of stem flats	J	1.75	2.00
		44	51
Height of stem flats	L	1.80	2.00
		46	51
Extreme width of body	M	9.30	11.00
		236	279
Wrench size		P-2	T-2
Weight (approx.), Figure 4185½		121	189
		55	86

Size 6 valves use Nordstrom Sealant Stick D.
All other valve sizes use Sealant Stick G. All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve.

Nordstrom bolted gland plug valves

ASME Class 150 – Figure 4187½, 4189½

ASME Class 150 (PN 20)

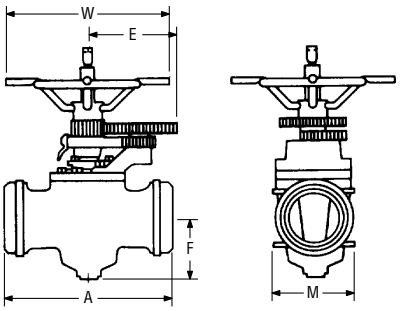


Figure 4187½, sizes 6, 8 and 12

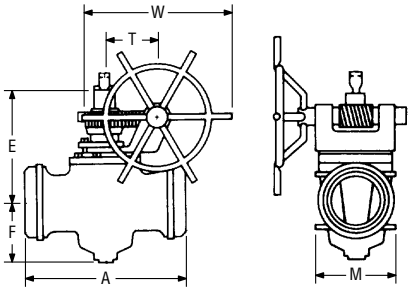


Figure 4189½, sizes 6, 8 and 12

Size	NPS	1	1½	2
	DN	150	200	300
End-to-end, welded, Figure 4187½, 4189½	A	13.00	15.50	20.00
		330	394	508
Center to top	E	11.3	13.3	16.1
		287	338	409
Center to bottom of body	F	6.0	7.3	10.3
		152	185	262
Clearance required to remove sealant fitting, Figure 4187½		20.4	24.8	27.6
		518	630	701
Clearance required to remove sealant fitting, Figure 4189½		15.0	18.1	21.0
		381	460	533
Extreme width of body	M	9.3	11.0	15.0
		236	279	381
Center to top of intermediate gear		10.9	12.4	15.8
		277	315	401
Center to top of handwheel, Figure 4187½		15.3	17.1	20.9
		389	434	531
Center of stem to outside of intermediate gear, Figure 4187½	R	10.7	10.7	14.4
		272	273	366
Center of port to center of handwheel, Figure 4189½		8.6	10.0	12.7
		218	254	323
Traverse centerline to center of worm shaft, Figure 4189½	T	5.3	5.3	7.4
		135	135	188
Longitudinal centerline to face of handwheel, Figure 4189½		9.9	9.9	13.4
		251	251	340
Diameter of handwheel, Figure 4187½	W	23.0	23.0	26.0
		584	584	660
Diameter of handwheel, Figure 4189½	W	20.0	20.0	26.0
		508	508	660
Number of turns to open, Figure 4187½		1.5	1.5	3.0
Number of turns to open, Figure 4189½		12.5	12.5	20
Weight (approx.), Figure 4187½		187	255	552
		85	116	250
Weight (approx.), Figure 4189½		191	259	556
		87	117	252

Size 6 valves use Nordstrom Sealant Stick D.
All other valve sizes use Sealant Stick G. All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 150 – Figure 1945, 1945½

Short pattern

ASME Class 150 (PN 20)

Figure 1945½, sizes 6 and 8 (not shown)

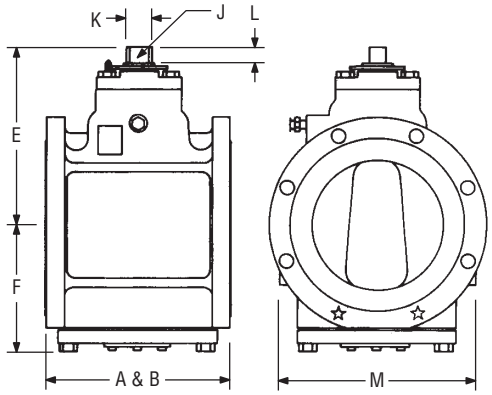


Figure 1945, sizes 2 to 8

Size	NPS	2	3	4	6	8
	DN	50	80	100	150	200
End-to-end, welding ends, Figure 1945½	A				18.00	20.50
					457	521
Face-to-face, flanged (raised face) (incl. 1/16 in. raised face), Figure 1945	B	7.00	8.00	9.00	10.50	11.50
		178	203	229	267	292
Diameter of flange	C	6.00	7.50	9.00	11.00	13.50
		152	191	229	279	343
Center to top	E	6.6	7.6	8.0	10.4	11.4
		168	193	203	264	290
Center to bottom of body	F	3.8	4.1	4.9	6.5	8.1
		97	104	124	165	206
Width of stem flats	J	0.81	1.00	1.00	1.25	1.25
		21	25	25	32	32
Diameter of stem	K	1.09	1.41	1.41	1.81	1.81
		28	36	36	46	46
Height of stem flats	L	1.0	1.1	1.1	1.2	1.2
		25	28	28	30	30
Extreme width of body	M	4.2	5.2	7.4	10.0	12.4
		107	132	188	254	315
Number of tapped holes/size			2/.625	2/.625	2/.750	2/.750
Thread size UNC in flange*			5/8-11	5/8-11	3/4-10	3/4-10
Wrench size		DB-2	DB-3	DB-3	DB-4	DB-4
Weight (approx.), Figure 1945		38	75	120	170	250
		17	34	54	77	113
Weight (approx.), Figure 1945½					180	280
					82	127

** Conforms to API 6D, paragraph 2.5c, and is marked accordingly. All dimensions are approximate. For the most current dimensions, please request a drawing from Flowserve.*

Dynamic Balance plug valves

ASME Class 150 – Figure 1949, 1949½

Short pattern

ASME Class 150 (PN20)

Figure 1949½, sizes 6 to 12 (not shown)

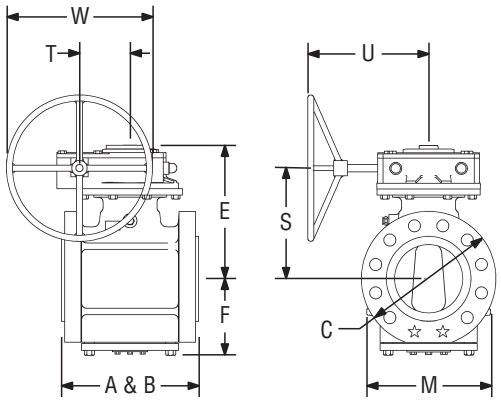


Figure 1949, sizes 6 to 12

Size		NPS	6	8	10	12
		DN	150	200	250	300
End-to-end, buttwelding ends, Figure 1949½		A	18.00	20.50	18*	19.75*
			457	521		502
Face-to-face, flanged (raised face)		B	10.50	11.50	13.00	14.00
			267	292	330	356
Diameter of flange		C	11.00	13.50	16.00	19.00
			279	343	406	483
Center to bottom of body		F	6.5	8.1	9.5	11.0
			165	206	241	279
Extreme width of body		M	10.0	12.4	14.0	16.0
			254	315	356	406
Number of tapped holes/size			2/.75	2/.75	2/.75	2/.875
Thread size UNC in flange*			(¾)-10	(¾)-10	(¾)-10	(⅞)-9
Wrench size						
Category A and C Gear Dimensions						
Center to top (gearing)		E	13.9	15.4	16.1	17.9
			354	391	408	453
Center of port to center of handwheel		S	11.6	12.5	12.8	14.6
			295	318	325	371
Longitudinal centerline to handwheel centerline		T	3.8	4.8	5.4	5.4
			97	123	137	137
Longitudinal centerline to face of handwheel		U	11.5	13.3	18.4	16.8
			293	337	468	425
Handwheel diameter/number of turns to open with gearing		W	10/12	10/16	20/46.3	12/46.3
			254	254	508	305
Weight (approx.), Figure 1949	lb		250	350	485	730
	kg		113	159	220	331
Weight (approx.), Figure 1949½	lb		260	380	445	640
	kg		118	172	202	290
Category B and D Gear Dimensions						
Center to top (gearing)		E	13.9	15.4	16.1	17.9
			354	391	408	453
Center of port to center of handwheel		S	11.6	12.5	12.8	14.6
			295	318	325	371
Longitudinal centerline to handwheel centerline		T	3.8	4.8	5.4	5.4
			97	123	137	137
Longitudinal centerline to face of handwheel		U	11.5	13.0	18.4	16.8
			293	329	468	425
Handwheel diameter/number of turns to open with gearing		W	10/12	12/16	20/46.3	12/46.3
			254	305	508	305
Weight (approx.), Figure 1949	lb		250	350	485	730
	kg		113	159	220	331
Weight (approx.), Figure 1949½	lb		260	380	485	640
	kg		118	172	220	290

** Conforms to API 6D, and is marked accordingly.*

For motorization, contact factory for correct gear model and valve outline dimensions.

For Category E, F, H, J and K valve gearing dimensions, contact factory.

For buried service and offshore applications, contact factory. All dimensions are approximate.

For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 150 – Figure 2445

Regular pattern

ASME Class 150 (PN20)

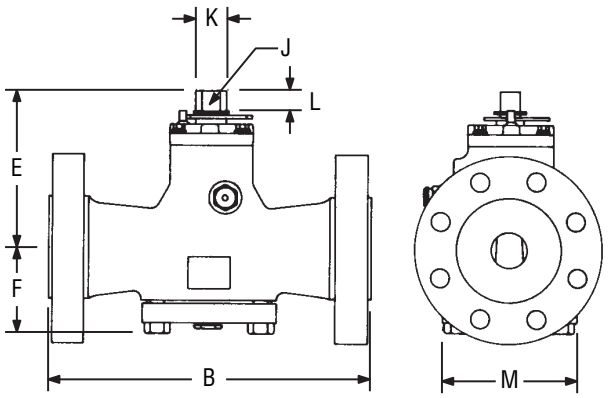


Figure 2445, sizes 6 and 8

Size	NPS	6	8
	DN	150	200
Face-to-face, flanged (raised face)	B	15.50	18.00
		394	457
Diameter of flange	C	11.00	13.50
		279	343
Center to top of stem	E	10.40	11.40
		264	290
Center to bottom of body	F	7.20	9.40
		183	239
Width of stem flats	J	1.25	1.25
		32	32
Diameter of stem	K	1.80	1.80
		46	46
Height of stem flats	L	1.20	1.20
		30	30
Extreme width of body	M	11.40	15.60
		290	396
Number of tapped holes/size			
Thread size UNC in flange*			
Wrench size		DB-4	DB-4
Weight (approx.), Figure 2445		240	430
		109	195

All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 150 – Figure 2449

Regular pattern

ASME Class 150 (PN20)

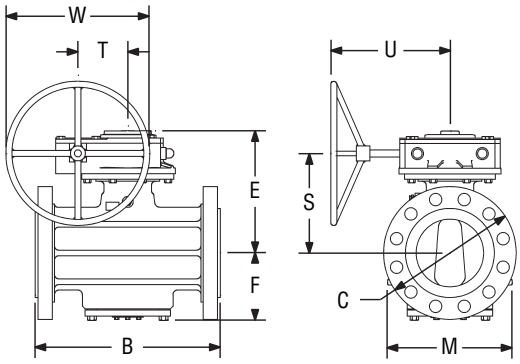


Figure 2449, sizes 6 to 12

Size		NPS	6	8	10	12
		DN	150	200	250	300
Face-to-face, flanged (raised face)		B	15.50 394	18.00 457	21.00 533	24.00 610
Diameter of flange		C	11.00 279	13.50 343	16.00 406	19.00 483
Center to bottom of body		F	7.20 183	9.40 239	11.00 279	12.80 325
Extreme width of body		M	11.40 290	15.60 396	18.10 460	20.60 523
Number of tapped holes/size						
Thread size UNC in flange*						
Wrench size						
Category A and C Gear Dimensions						
Center to top (gearing)		E	14.7 374	16.1 408	18.7 474	21.7 552
Center of port to center of handwheel		S	11.8 300	12.8 325	15.4 391	18.5 469
Longitudinal centerline to handwheel centerline		T	4.8 123	5.4 137	5.4 137	7.3 184
Longitudinal centerline to face of handwheel		U	13.3 337	16.8 425	16.8 425	18.5 471
Handwheel diameter/number of turns to open with gearing		W	10/16 254	12/46.3 305	12/46.3 305	12/78 305
Weight (approx.), Figure 2449	lb kg		420 191	625 283	1140 517	1725 782
Category B and D Gear Dimensions						
Center to top (gearing)		E	14.7 374	16.1 408	19.1 486	21.7 552
Center of port to center of handwheel		S	11.8 300	12.8 325	15.9 403	18.5 469
Longitudinal centerline to handwheel centerline		T	4.8 123	5.4 137	7.3 184	7.3 184
Longitudinal centerline to face of handwheel		U	13.0 329	16.8 425	19.8 504	19.8 504
Handwheel diameter/number of turns to open with gearing		W	12/16 305	12/46.3 305	16/78 406	16/78 406
Weight (approx.), Figure 2449	lb kg		420 191	625 283	1140 517	1725 782

** Conforms to API 6D, and is marked accordingly.*

For motorization, contact factory for correct gear model and valve outline dimensions.

For Category E, F, H, J and K valve gearing dimensions, contact factory.

For buried service and offshore applications, contact factory. All dimensions are approximate.

For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 150 – Figure 4149, 4149½, 4149¼

Venturi pattern

ASME Class 150 (PN20)

Figure 4149½, sizes 14 to 30 (not shown)

Figure 4149¼, sizes 14 and 16 (not shown)

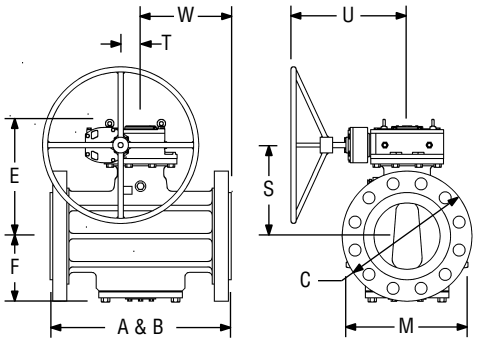


Figure 4149, sizes 14, 16, 18, 20, 24 and 30

Size		NPS	14	16	18	20	24	30
		DN	350	400	450	500	600	750
End-to-end, buttwelding ends, Figure 4149½		A	27.00	30.00	34.00	36.00	42.00	51.00*
			686	762	864	914	1067	1295
Face-to-face, flanged (raised face)		B	27.00	30.00	34.00	36.00	42.00	51.00*
			686	762	864	914	1067	1295
End-to-end, flanged by weld end, Figure 4149¼			27.00	30.00				
			686	762				
Diameter of flange		C	21.00	23.50	25.00	27.50	32.00	38.75
			533	597	635	699	813	984
Center to bottom of body		F	11.00	12.80	14.20	16.20	18.60	22.80
			279	325	361	411	472	579
Extreme width of body		M	18.00	20.60	22.30	23.50	30.00	38.00
			457	523	566	597	762	965
Number of tapped holes/size								
Thread size UNC in flange*								
Wrench size								
Category A and C Gear Dimensions								
Center to top (gearing)		E	18.7	21.7	22.1	24.9	27.0	33.9
			474	552	562	633	685	860
Center of port to center of handwheel		S	15.4	18.5	18.3	21.7	23.6	29.8
			391	469	466	550	600	758
Longitudinal centerline to handwheel centerline		T	5.4	7.3	8.3	7.3	10.2	4.3
			137	184	210	184	260	108
Longitudinal centerline to face of handwheel		U	16.8	18.5	20.9	19.8	25.0	27.4
			425	471	530	504	636	696
Handwheel diameter/number of turns to open with gearing		W	12/46.3	12/78	16/87	16/78	16/192	16/297
			305	305	406	406	406	406
Weight (approx.), Figure 4149	lb		1105	1740	2220	2485	4495	8300
	kg		501	789	1007	1127	2039	3765
Weight (approx.), Figure 4149½	lb		1050	1660	2025	2245	4145	7825
	kg		476	753	919	1018	1880	3549
Weight (approx.), Figure 4149¼	lb		1075	1695				
	kg		488	769				
Category B and D Gear Dimensions								
Center to top (gearing)		E	19.1	21.7	22.1	26.1	27.0	33.9
			486	552	562	663	685	860
Center of port to center of handwheel		S	15.9	18.5	18.3	22.3	23.6	29.8
			403	469	466	567	600	758
Longitudinal centerline to handwheel centerline		T	7.3	7.3	8.3	8.3	10.2	4.3
			184	184	210	210	260	108
Longitudinal centerline to face of handwheel		U	19.8	19.8	20.9	20.9	25.0	26.1
			504	504	530	530	636	663
Handwheel diameter/number of turns to open with gearing		W	16/78	16/78	16/87	16/87	16/192	12/297
			406	406	406	406	406	305
Weight (approx.), Figure 4149	lb		1205	1740	2220	2595	4495	8300
	kg		547	789	1007	1177	2039	3765
Weight (approx.), Figure 4149½	lb		1150	1660	2025	2355	4145	7825
	kg		522	753	919	1068	1880	3549
Weight (approx.), Figure 4149¼	lb		1175	1695				
	kg		533	769				

** Conforms to API 6D, and is marked accordingly.*

For motorization, contact factory for correct gear model and valve outline dimensions.

For Category E, F, H, J and K valve gearing dimensions, contact factory. All dimensions are approximate.

For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 300 – Figure 2045, 2045½, 2045¼

Short pattern

ASME Class 300 (PN50)

Figure 2045½, sizes 2 and 6 (not shown)

Figure 2045¼, sizes 2 to 4 (not shown)

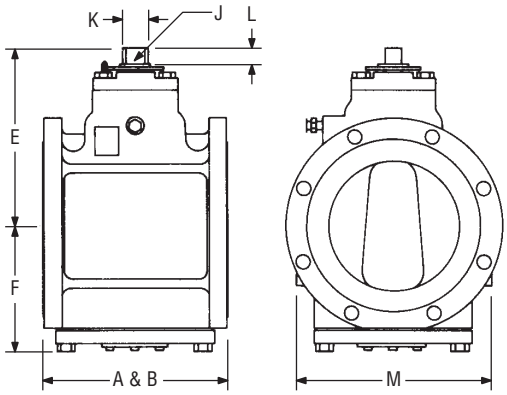


Figure 2045, sizes 2 to 6

Size	NPS	2	3	4	6
	DN	50	80	100	150
End-to-end, buttwelding ends, Figure 2045½	A	11.50*	14.00*	17.00*	18.00
		292.00	356.00	432.00	457.00
Face-to-face, flanged (raised face)	B	8.50	11.13	12.00	15.88
		216	283	305	403
End-to-end, flanged (ring joint)		9.12	11.75	12.62	
		232	298	321	
End-to-end, flanged by weld end, Figure 2045¼		11.19*	13.68*	16.56*	15.88*
		284	347	421	403
Diameter of flange	C	6.50	8.25	10.00	12.50
		165	210	254	318
Center to top of stem	E	6.6	7.6	8.0	10.3
		168	193	203	262
Center to bottom of body	F	3.8	4.1	4.9	6.5
		97	104	124	165
Width of stem flats	J	0.81	1.00	1.00	1.25
		21	25	25	32
Diameter of stem	K	1.09	1.41	1.41	1.78
		28	36	36	45
Height of stem flats	L	1.0	1.1	1.1	1.2
		25	28	28	30
Extreme width of body	M	4.2	5.2	7.4	11.0
		107	132	188	279
Wrench size		DB-2	DB-3	DB-3	DB-4
Weight (approx.), Figure 2045		46	82	134	244
		[21]	37	61	111
Weight (approx.), Figure 2045½		38	65	100	167
		[17]	29	45	76
Weight (approx.), Figure 2045¼		42	70	126	197
		19	32	57	89

** Conforms to API 6D, section 6.3, and is marked accordingly. All dimensions are approximate.*
For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 300 – Figure 2049, 2049½, 2049¼

Short pattern

ASME Class 300 (PN50)

Figure 2049½, sizes 3, 4, 6 and 8 (not shown)

Figure 2049¼, sizes 6 and 8 (not shown)

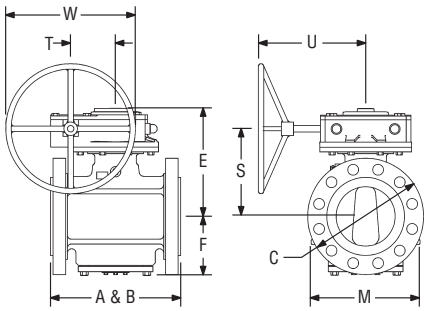


Figure 2049, sizes 3, 4, 6 and 8

Size		NPS	3	4	6	8
		DN	80	100	150	200
End-to-end, buttwelding ends, Figure 2049½		A	14.00*	17.00*	18.00	16.50*
			356	432	457	419
Face-to-face, flanged (raised face)		B	11.13	12.00	15.88	16.50
			283	305	403	419
End-to-end, flanged by weld end, Figure 2049¼			13.68*	16.56*	15.88*	16.50*
			347	421	403	419
End-to-end, flanged (ring joint)			11.75	12.62		
			298	321		
Diameter of flange		C	8.25	10.00	12.50	15.00
			210	254	318	381
Center to bottom of body		F	4.10	4.90	6.50	8.10
			104	124	165	206
Extreme width of body		M	5.20	7.40	11.00	14.00
			132	188	279	356
Number of tapped holes/size						
Thread size UNC in flange*						
Wrench size						
Category A and C Gear Dimensions						
Center to top (gearing)		E	10.6	11.1	13.9	15.4
			268	281	354	391
Center of port to center of handwheel		S	8.3	8.8	11.6	12.5
			210	223	295	318
Longitudinal centerline to handwheel centerline		T	3.4	3.4	3.8	4.8
			85	85	97	123
Longitudinal centerline to face of handwheel		U	11.0	11.0	11.5	13.0
			280	280	293	329
Handwheel diameter/number of turns to open with gearing		W	10/11	10/11	10/12	12/16
			254	254	254	305
Weight (approx.), Figure 2049	lb		145	185	330	460
	kg		66	84	150	209
Weight (approx.), Figure 2049½	lb		130	165	255	410
	kg		59	75	116	186
Weight (approx.), Figure 2049¼	lb				290	435
	kg				132	197
Category B and D Gear Dimensions						
Center to top (gearing)		E	10.6	11.1	13.9	15.4
			268	281	354	391
Center of port to center of handwheel		S	8.3	8.8	11.6	12.5
			210	223	295	318
Longitudinal centerline to handwheel centerline		T	3.4	3.4	3.8	4.8
			85	85	97	123
Longitudinal centerline to face of handwheel		U	11.0	11.0	11.5	14.2
			280	280	293	362
Handwheel diameter/number of turns to open with gearing		W	10/11	10/11	10/12	16/16
			254	254	254	406
Weight (approx.), Figure 2049	lb		145	185	330	460
	kg		66	84	150	209
Weight (approx.), Figure 2049½	lb		130	165	255	410
	kg		59	75	116	186
Weight (approx.), Figure 2049¼	lb				295	435
	kg				134	197

** Conforms to API 6D, and is marked accordingly.*

For motorization, contact factory for correct gear model and valve outline dimensions.

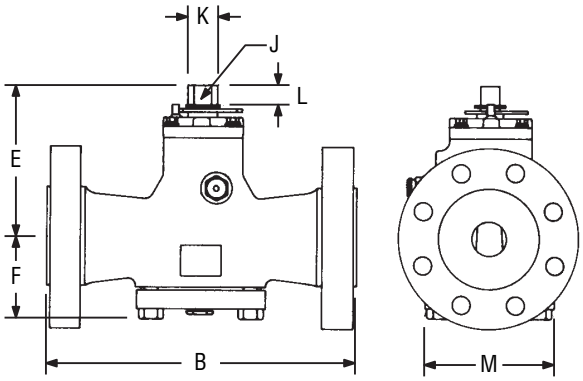
For Category E, F, H, J and K valve gearing dimensions, contact factory.

For buried service and offshore applications, contact factory. All dimensions are approximate.

For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 300 – Figure 2545



Regular pattern

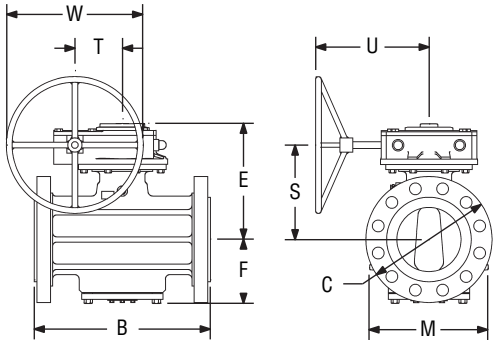
ASME Class 300 (PN50)

Size	NPS	1
	DN	150
Face-to-face, flanged (raised face)	B	15.88
		403
Diameter of flange	C	12.50
		318
Center to top of stem	E	10.90
		277
Center to bottom of body	F	7.20
		183
Width of stem flats	J	1.25
		32
Diameter of stem	K	1.78
		45
Height of stem flats	L	1.40
		36
Extreme width of body	M	11.40
		290
Wrench size		DB-4
Weight (approx.), Figure 2545		280
		127

All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 300 – Figure 2549



Regular pattern

ASME Class 300 (PN50)

Size		NPS	6	8	10	12
		DN	150	200	250	300
End-to-end, buttwelding ends, Figure 2049½		B	15.88 403	19.75 502	22.38 568	28.00 711
Face-to-face, flanged (raised face)		C	12.50 318	15.00 381	17.50 445	20.50 521
End-to-end, flanged by weld end, Figure 2049¼		E	13.00 330	13.00 330	13.00 330	13.00 330
End-to-end, flanged (ring joint)		F	7.20 183	9.40 239	11.00 279	12.80 325
Diameter of flange		M	11.40 290	15.60 396	18.10 460	22.10 561
Number of tapped holes/size						
Thread size UNC in flange*						
Wrench size						
Category A and C Gear Dimensions						
Center to top (gearing)		E	14.7 374	16.1 408	19.1 486	21.7 552
Center of port to center of handwheel		S	11.8 300	12.8 325	15.9 403	18.5 469
Longitudinal centerline to handwheel centerline		T	4.8 123	5.4 137	7.3 184	7.3 184
Longitudinal centerline to face of handwheel		U	13.3 337	16.8 425	18.5 471	19.8 504
Handwheel diameter/number of turns to open with gearing		W	10/16 254	12/46.3 305	12/78 305	16/78 406
Weight (approx.), Figure 2549	lb kg		370 168	650 295	1355 615	
Category B and D Gear Dimensions						
Center to top (gearing)		E	14.7 374	16.1 408	19.1 486	22.9 582
Center of port to center of handwheel		S	11.8 300	12.8 325	15.9 403	19.1 486
Longitudinal centerline to handwheel centerline		T	4.8 123	5.4 137	7.3 184	8.3 210
Longitudinal centerline to face of handwheel		U	13.0 329	16.8 425	19.8 504	20.9 530
Handwheel diameter/number of turns to open with gearing		W	12/16 305	12/46.3 305	16/78 406	16/87 406
Weight (approx.), Figure 2549	lb kg		370 168	650 295	1355 615	

For motorization, contact factory for correct gear model and valve outline dimensions.
For Category E, F, H, J and K valve gearing dimensions, contact factory.
For buried service and offshore applications, contact factory. All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 300 – Figure 4245, 4245½, 4245¼

Venturi pattern

ASME Class 300 (PN 50)

Figure 4245½, sizes 6 and 8 (not shown)

Figure 4245¼, sizes 6 to 8 (not shown)

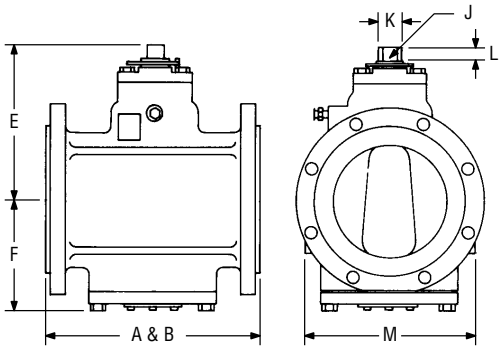


Figure 4245, sizes 6 to 8

Size	NPS	6	8
	DN		
End-to-end, buttwelding ends, Figure 4245½	A	18.00	20.50
		457.00	521.00
Face-to-face, flanged (raised face)	B	15.88	16.50
		403	419
End-to-end, flanged (ring joint)		16.50	17.12
		419	435
End-to-end, flanged by weld end, Figure 4245¼		16.94	18.50
		430	470
Diameter of flange	C	12.50	15.00
		318	381
Center to top of stem	E	9.60	10.70
		244	272
Center to bottom of body	F	5.80	7.20
		147	183
Width of stem flats	J	1.25	1.25
		32	32
Diameter of stem	K	1.78	1.78
		45	45
Height of stem flats	L	1.20	1.40
		30	36
Extreme width of body	M	9.00	12.00
		229	305
Wrench size		DB-4	DB-4
Weight (approx.), Figure 4245		201	318
		91	144
Weight (approx.), Figure 4245½		140	243
		64	110
Weight (approx.), Figure 4245¼		170	280
		77	127

All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 300 – Figure 4249, 4249½, 4249¼

Venturi pattern

ASME Class 300 (PN50)

Figure 4249½, sizes 6 to 24 (not shown)

Figure 4249¼, sizes 6 to 24 (not shown)

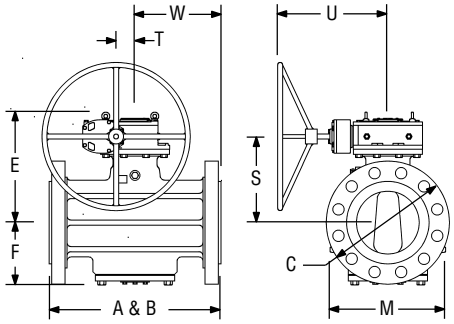


Figure 4249, sizes 6 to 24

Size		NPS	6	8	10	12	14	16	20	24
		DN	150	200	250	300	350	400	500	600
End-to-end, buttwelding ends, Figure 4249½		A	18.00	20.50	22.00	25.00	30.00	33.00	39.00	45.00
			457	521	559	635	762	838	991	1143
Face-to-face, flanged (raised face)		B	15.88	16.50	18.00	19.75	30.00	33.00	39.00	45.00
			403	419	457	502	762	838	991	1143
End-to-end, flanged by weld end, Figure 4249¼			16.94	16.50	20.00	22.38	30.00	33.00	39.00	45.00
			430	419	508	568	762	838	991	1143
End-to-end, flanged (ring joint)			16.50	17.12	18.62	20.38	30.62	33.62	39.75	45.80
			419	435	473	518	778	854	1010	1163
Diameter of flange		C	12.50	15.00	17.50	20.50	23.00	25.50	30.50	36.00
			318	381	445	521	584	648	775	914
Center to top of stem		E	11.90	11.90	11.90	11.90	11.90	11.90	11.90	11.90
			302	302	302	302	302	302	302	302
Center to bottom of body		F	5.80	7.20	9.40	10.40	11.00	12.80	17.10	19.90
			147	183	239	264	279	325	434	505
Extreme width of body		M	9.00	12.00	15.60	15.60	18.10	22.60	26.80	34.00
			229	305	396	396	460	574	681	864
Number of tapped holes/size										
Thread size UNC in flange*										
Wrench size										
Category A and C Gear Dimensions										
Center to top (gearing)		E	13.2	14.3	15.8	17.8	19.1	21.7	25.7	27.3
			336	364	402	451	486	552	652	692
Center of port to center of handwheel		S	10.9	12.0	12.9	14.5	15.9	18.5	22.3	23.9
			277	305	328	368	403	469	567	608
Longitudinal centerline to handwheel centerline		T	3.8	3.8	4.8	5.4	7.3	7.3	10.2	10.2
			97	97	123	137	184	184	260	260
Longitudinal centerline to face of handwheel		U	11.5	11.5	13.0	16.8	18.5	19.8	23.8	25.0
			293	293	329	425	471	504	604	636
Handwheel diameter/number of turns to open with gearing		W	10/12	10/12	12/16	12/46.3	12/78	16/78	12/192	16/192
			254	254	305	305	305	406	305	406
Weight (approx.), Figure 4249	lb		275	395	640	865	1345	1895	3745	5965
	kg		125	179	290	392	610	860	1699	2706
Weight (approx.), Figure 4249½	lb		215	320	515	695	1125	1555	3355	5365
	kg		98	145	234	315	510	705	1522	2434
Weight (approx.), Figure 4249¼	lb		245	360	575	775	1230	1725	3565	5665
	kg		111	163	261	352	558	782	1617	2570
Category B and D Gear Dimensions										
Center to top (gearing)		E	13.2	15.0	16.1	17.9	19.1	22.9	25.7	27.7
			336	380	408	454	486	582	652	703
Center of port to center of handwheel		S	10.9	11.7	12.8	14.6	15.9	19.1	22.3	23.6
			277	297	325	370	403	486	567	600
Longitudinal centerline to handwheel centerline		T	3.8	5.4	5.4	5.8	7.3	8.3	10.2	4.3
			97	137	137	146	184	210	260	108
Longitudinal centerline to face of handwheel		U	11.5	16.8	18.4	19.8	19.8	20.9	25.0	27.4
			293	425	468	502	504	530	636	696
Handwheel diameter/number of turns to open with gearing		W	10/12	12/46.3	20/46.3	12/57.5	16/78	16/87	16/192	20/297
			254	305	508	305	406	406	406	508
Weight (approx.), Figure 4249	lb		275	460	680	905	1345	2010	3745	6110
	kg		125	209	308	411	610	912	1699	2771
Weight (approx.), Figure 4249½	lb		215	385	555	735	1120	1670	3355	5510
	kg		98	175	252	333	508	757	1522	2499
Weight (approx.), Figure 4249¼	lb		245	420	615	820	1230	1840	3565	5810
	kg		111	191	279	372	558	835	1617	2635

** Conforms to API 6D, and is marked accordingly.*

Size 18 and 30 valves available on special order.

For motorization, contact factory for correct gear model and valve outline dimensions.

For Category E, F, H, J and K valve gearing dimensions, contact factory.

For buried service and offshore applications, contact factory. All dimensions are approximate.

For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 600 – Figure 2245, 2245½, 2245¼

Regular pattern

ASME Class 600 (PN 100)

Figure 2245½, sizes 2 to 4 (not shown)

Figure 2245¼, sizes 2 to 4 (not shown)

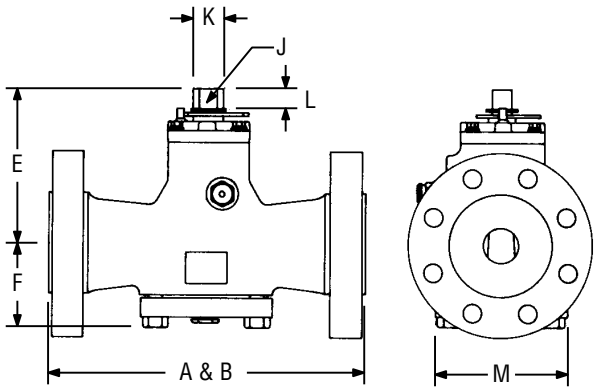


Figure 2245, sizes 1 to 4

Size	NPS	1*	2*	3*	4*
	DN	25	50	80	100
End-to-end, buttwelding ends, Figure 2245½	A		11.50	14.00	17.00
			292.00	356.00	432.00
Face-to-face, flanged (raised face)	B	8.50	11.50	14.00	17.00
		216	292	356	432
End-to-end, flanged (ring joint)		8.50	11.62	14.12	17.12
		216	295	359	435
End-to-end, flanged by weld end, Figure 2245¼			11.50	14.00	17.00
			292.10	355.60	431.80
Diameter of flange	C	4.88	6.50	8.25	10.75
		124	165	210	273
Center to top of stem	E	5.80	6.60	7.60	8.00
		147	168	193	203
Center to bottom of body	F	2.80	3.80	4.10	4.90
		71	97	104	124
Width of stem flats	J	0.62	0.81	1.00	1.00
		16	21	25	25
Diameter of stem	K	0.85	1.09	1.41	1.41
		22	28	36	36
Height of stem flats	L	0.90	1.00	1.10	1.10
		23	25	28	28
Extreme width of body	M	3.70	4.20	5.20	7.40
		94	107	132	188
Wrench size		DB-1	DB-2	DB-3	DB-3
Weight (approx.), Figure 2245		28	51	93	175
		13	23	42	79
Weight (approx.), Figure 2245½			40	65	113
			18	29	51
Weight (approx.), Figure 2245¼			46	79	144
			21	36	65

** Conforms to API 6D and is marked accordingly.*
All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 600 – Figure 2249, 2249½, 2249¼

Regular pattern

ASME Class 600 (PN100)

Figure 2249½, sizes 3 to 12 (not shown)

Figure 2249¼, sizes 3 to 12 (not shown)

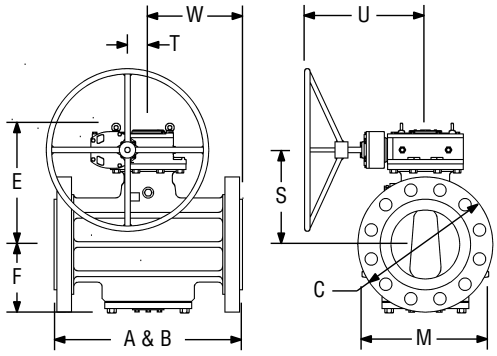


Figure 2249, sizes 3 to 12

Size		NPS	3	4	6	8	10	12
		DN	80	100	150	200	250	300
End-to-end, buttwelding ends, Figure 2249½		A	14.00	17.00	18.00*	20.50*	24.00*	28.00*
			356	432	457	521	610	711
Face-to-face, flanged (raised face)		B	14.00	17.00	22.00	26.00	31.00	33.00*
			356	432	559	660	787	838
End-to-end, flanged by weld end, Figure 2249¼			14.00	17.00	22.00	26.00	31.00	33.00*
			356	432	559	660	787	838
End-to-end, flanged (ring joint)			14.12	17.12	22.12	26.12	31.12	33.12*
			359	435	562	663	790	841
Diameter of flange		C	8.25	10.75	14.00	16.50	20.00	22.00
			210	273	356	419	508	559
Center to top of stem		E	9.10	9.10	9.10	9.10	9.10	9.10
			231	231	231	231	231	231
Center to bottom of body		F	4.20	5.00	6.80	9.40	10.70	13.20
			107	127	173	239	272	335
Extreme width of body		M	5.20	7.40	9.50	13.60	15.60	20.50
			132	188	241	345	396	521
Number of tapped holes/size								
Thread size UNC in flange*								
Wrench size								
Category A and C Gear Dimensions								
Center to top (gearing)		E	10.6	10.9	14.3	15.9	18.7	19.9
			268	276	363	403	475	506
Center of port to center of handwheel		S	8.3	8.5	11.4	12.6	15.4	16.7
			210	215	290	320	391	423
Longitudinal centerline to handwheel centerline		T	3.4	3.8	4.8	5.4	5.8	7.3
			85	97	123	137	146	184
Longitudinal centerline to face of handwheel		U	11.0	11.5	13.3	16.8	19.8	19.8
			280	293	337	425	502	504
Handwheel diameter/number of turns to open with gearing		W	10/11	10/12	10/16	12/46.3	12/57.5	16/78
			254	254	254	305	305	406
Weight (approx.), Figure 2249	lb		135	240	510	850	1295	1835
	kg		61	109	231	386	587	832
Weight (approx.), Figure 2249½	lb		125	180	320	580	915	1315
	kg		57	82	145	263	415	596
Weight (approx.), Figure 2249¼	lb		120	210	420	720	1105	1680
	kg		54	95	191	327	501	762
Category B and D Gear Dimensions								
Center to top (gearing)		E	10.6	10.9	14.3	15.9	19.0	21.1
			268	276	363	403	483	536
Center of port to center of handwheel		S	8.3	8.5	11.4	12.6	15.8	17.3
			210	215	290	320	401	440
Longitudinal centerline to handwheel centerline		T	3.4	3.8	4.8	5.4	7.3	8.3
			85	97	123	137	184	210
Longitudinal centerline to face of handwheel		U	11.0	11.5	13.0	16.8	19.8	20.9
			280	293	329	425	504	530
Handwheel diameter/number of turns to open with gearing		W	10/11	10/12	12/16	12/46.3	16/78	16/87
			254	254	305	305	406	406
Weight (approx.), Figure 2249	lb		135	240	510	850	1355	1945
	kg		61	109	231	386	615	882
Weight (approx.), Figure 2249½	lb		125	180	320	580	975	1425
	kg		57	82	145	263	442	646
Weight (approx.), Figure 2249¼	lb		120	210	420	720	1165	1790
	kg		54	95	191	327	528	812

** Conforms to API 6D, and is marked accordingly.*

For motorization, contact factory for correct gear model and valve outline dimensions.

For Category E, F, H, J and K valve gearing dimensions, contact factory.

For buried service and offshore applications, contact factory. All dimensions are approximate.

For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 600 – Figure 4749, 4749½, 4749¼

Venturi pattern

ASME Class 600 (PN 100)

Figure 4749½, sizes 6 to 30 (not shown)

Figure 4749¼, sizes 6 to 30 (not shown)

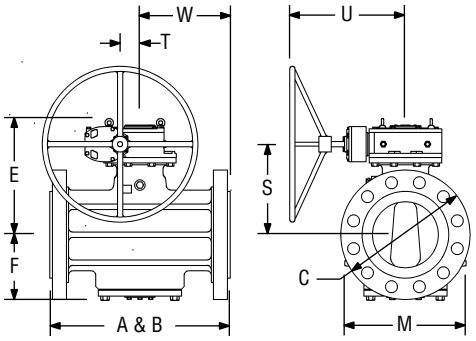


Figure 4749, sizes 6 to 30

Size		NPS	6	8	10	12	14	16	18	20	24
		DN	150	200	250	300	350	400	450	500	600
End-to-end, buttwelding ends, Figure 4749½		A	18.00*	20.50*	24.00*	28.00*	30.00*	33.00*	43.00	47.00	55.00
			457	521	610	711	762	838	1092	1194	1397
Face-to-face, flanged (raised face)		B	22.00	26.00	31.00	33.00	35.00	39.00	43.00	47.00	55.00
			559	660	787	838	889	991	1092	1194	1397
End-to-end, flanged by weld end, Figure 4749¼			22.00	26.00	31.00	30.50	32.50	36.00	43.00	47.00	55.00
			559	660	787	775	826	914	1092	1194	1397
End-to-end, flanged (ring joint)			22.12	26.12	31.12	33.12	35.12	39.12	43.12	47.25	55.38
			562	663	790	841	892	994	1095	1200	1407
Diameter of flange		C	14.00	16.50	20.00	22.00	23.75	27.00	29.25	32.00	37.00
			356	419	508	559	603	686	743	813	940
Center to top of stem		E	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
			305	305	305	305	305	305	305	305	305
Center to bottom of body		F	6.10	7.40	9.40	10.70	11.60	14.40	16.70	17.40	22.90
			155	188	239	272	295	366	424	442	582
Extreme width of body		M	8.20	10.20	13.60	15.60	18.20	21.30	31.80	27.20	42.00
			208	259	345	396	462	541	808	691	1067
Number of tapped holes/size											
Thread size UNC in flange*											
Wrench size											
Category A and C Gear Dimensions											
Center to top (gearing)		E	13.1	14.2	15.9	18.7	20.4	22.6	24.2	27.2	33.5
			333	361	403	475	519	575	614	690	850
Center of port to center of handwheel		S	10.8	11.3	12.6	15.4	17.2	25.0	20.8	23.1	29.4
			275	287	320	391	436	634	529	588	748
Longitudinal centerline to handwheel centerline		T	3.8	4.8	5.4	5.8	7.3	9.3	10.2	4.3	4.3
			97	123	137	146	184	235	260	108	108
Longitudinal centerline to face of handwheel		U	11.5	13.0	18.4	19.8	19.8	24.8	25.0	27.4	27.4
			293	329	468	502	504	629	636	696	696
Handwheel diameter/number of turns to open with gearing		W	10/12	12/16	20/46.3	12/57.5	16/78	16/96.7	16/192	16/297	16/297
			254	305	508	305	406	406	406	406	406
Weight (approx.), Figure 4749	lb		410	640	1060	1465	1915	2910	4855	5970	10515
	kg		186	290	481	665	869	1320	2202	2708	4770
Weight (approx.), Figure 4749½	lb		280	495	780	1065	1395	2010	4140	5020	9425
	kg		127	225	354	483	633	912	1878	2277	4275
Weight (approx.), Figure 4749¼	lb		345	575	920	1265	1655	2460	4510	5490	9970
	kg		156	261	417	574	751	1116	2046	2490	4522
Category B and D Gear Dimensions											
Center to top (gearing)		E	13.1	14.2	15.9	19.0	21.6	22.6	24.2	27.2	33.5
			333	361	403	483	549	575	614	690	850
Center of port to center of handwheel		S	10.8	11.3	12.6	15.8	17.8	25.0	20.8	23.1	29.4
			275	287	320	401	453	634	529	588	748
Longitudinal centerline to handwheel centerline		T	3.8	4.8	5.4	7.3	8.3	9.3	10.2	4.3	4.3
			97	123	137	184	210	235	260	108	108
Longitudinal centerline to face of handwheel		U	11.5	14.2	16.8	19.8	20.9	24.8	25.0	27.4	27.8
			293	362	425	504	530	629	636	696	705
Handwheel diameter/number of turns to open with gearing		W	10/12	16/16	12/46.3	16/78	16/87	16/96.7	16/192	16/297	20/297
			254	406	305	406	406	406	406	406	508
Weight (approx.), Figure 4749	lb		410	640	1060	1465	1915	2910	4855	6140	10515
	kg		186	290	481	665	869	1320	2202	2785	4770
Weight (approx.), Figure 4749½	lb		280	495	780	1125	1505	2055	4140	5220	9425
	kg		127	225	354	510	683	932	1878	2368	4275
Weight (approx.), Figure 4749¼	lb		345	575	920	1280	1765	2505	4510	5695	9970
	kg		156	261	417	581	801	1136	2046	2583	4522

** Conforms to API 6D, and is marked accordingly.*

Size 30 valve available on special order.

For motorization, contact factory for correct gear model and valve outline dimensions.

For Category E, F, H, J and K valve gearing dimensions, contact factory.

For buried service and offshore applications, contact factory. All dimensions are approximate.

For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 900 – Figure 2344, 2345, 2345½, 2345¼

Regular pattern

ASME Class 900 (PN 150)

Figure 2344, sizes 2 to 4 (not shown)

Figure 2345, sizes 3 and 4 only Figure 2345½, sizes 3 and 4 only (not shown)

Figure 2345¼, sizes 3 and 4 only (not shown)

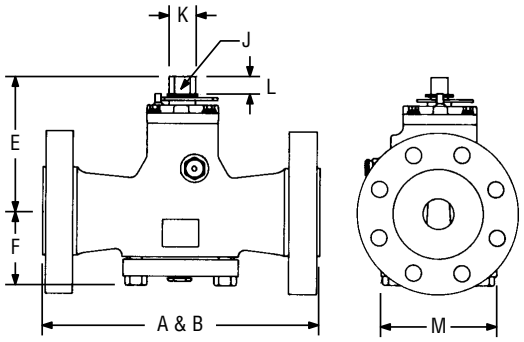


Figure 2345, sizes 3 and 4

Size	NPS	2	3	4
	DN	50	80	100
End-to-end, buttwelding ends, Figure 2344½	A		18.50*	21.50*
			470	546
Face-to-face, flanged (raised face)	B		15.00	18.00
			381	457
End-to-end, flanged (ring joint)			15.12	18.12
			384	460
Weight (approx.), Figure 2344		43	104	152
		20	47	69
End-to-end, threaded ends, Figure 2344		7.75	10.04	11.47
		197	255	291
Diameter of flange	C		9.50	11.50
			241	292
Center to top of stem	E	6.6	7.6	8.9
		168	193	226
Center to bottom of body	F	4.2	5.0	5.8
		107	127	147
Width of stem flats	J	0.81	1.00	1.25
		21	25	32
Diameter of stem	K	1.09	1.41	1.78
		28	36	45
Height of stem flats	L	1.0	1.1	1.4
		25	28	36
Extreme width of body	M	4.7	6.2	8.7
		119	157	221
Wrench size		DB-2	DB-3	DB-4
Weight (approx.), Figure 2344		43	104	152
		20	47	69
Weight (approx.), Figure 2345			146	240
			66	109
Weight (approx.), Figure 2345½			111	154
			50	70
Weight (approx.), Figure 2345¼			128	197
			58	89

All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 900 – Figure 2349, 2349½, 2349¼

Regular pattern

ASME Class 900 (PN150)

Figure 2349½, sizes 4 to 12 (not shown)

Figure 2349¼, sizes 4 to 12 (not shown)

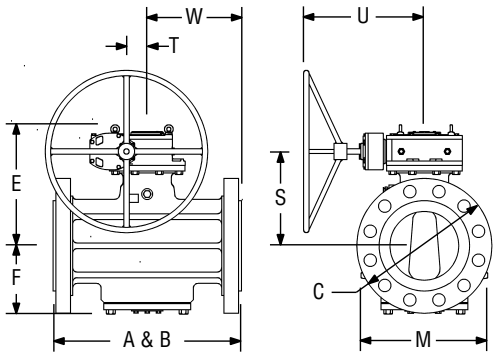


Figure 2349, sizes 3 to 12

Size		NPS	3	4	6	8	10	12
		DN	80	100	150	200	250	300
End-to-end, buttwelding ends, Figure 2349½		A	18.50*	21.50*	18.00*	20.50*	24.00*	38.00*
			470	546	457	521	610	965
Face-to-face, flanged (raised face)		B	15.00	18.00	24.00	29.00	33.00	38.00*
			381	457	610	737	838	965
End-to-end, flanged by weld end, Figure 2349¼			18.50*	21.50*	18.00*	29.00	33.00	38.00*
			470	546	457	737	838	965
End-to-end, flanged (ring joint)			15.12	18.12	24.12	29.12	33.12	38.12*
			384	460	613	740	841	968
Diameter of flange		C	9.50	11.50	15.00	18.50	21.50	24.00
			241	292	381	470	546	610
Center to top of stem		E	9.10	9.10	9.10	9.10	9.10	9.10
			231	231	231	231	231	231
Center to bottom of body		F	5.00	5.80	7.20	9.70	11.40	14.00
			127	147	183	246	290	356
Extreme width of body		M	6.20	8.70	10.00	15.40	15.60	23.90
			157	221	254	391	396	607
Number of tapped holes/size								
Thread size UNC in flange*								
Wrench size								
Category A and C Gear Dimensions								
Center to top (gearing)		E	10.6	12.0	14.1	15.9	19.0	23.0
			268	305	358	403	483	585
Center of port to center of handwheel		S	8.3	9.7	11.2	12.6	15.8	25.4
			210	247	284	320	401	645
Longitudinal centerline to handwheel centerline		T	3.4	3.8	4.8	5.4	7.3	9.3
			85	97	123	137	184	235
Longitudinal centerline to face of handwheel		U	11.0	11.5	13.0	16.8	19.8	24.8
			280	293	329	425	504	629
Handwheel diameter/number of turns to open with gearing		W	10/11	10/12	12/16	12/46.3	16/78	16/96.7
			254	254	305	305	406	406
Weight (approx.), Figure 2349	lb		190	300	575	1105	1505	3095
	kg		86	136	261	501	683	1404
Weight (approx.), Figure 2349½	lb		150	215	425	725	995	2745
	kg		68	98	193	329	451	1245
Weight (approx.), Figure 2349¼	lb		170	260	500	915	1255	2915
	kg		77	118	227	415	569	1322
Category B and D Gear Dimensions								
Center to top (gearing)		E	10.6	12.0	14.1	16.0	19.0	23.1
			268	305	358	406	483	586
Center of port to center of handwheel		S	8.3	9.7	11.2	12.7	15.8	19.7
			210	247	284	322	401	501
Longitudinal centerline to handwheel centerline		T	3.4	3.8	4.8	5.8	7.3	10.2
			85	97	123	146	184	260
Longitudinal centerline to face of handwheel		U	11.0	11.5	13.0	19.8	19.8	25.0
			280	293	329	502	504	636
Handwheel diameter/number of turns to open with gearing		W	10/11	10/12	12/16	12/57.5	16/78	16/192
			254	254	305	305	406	406
Weight (approx.), Figure 2349	lb		190	300	575	1150	1505	3260
	kg		86	136	261	522	683	1479
Weight (approx.), Figure 2349½	lb		150	215	425	765	995	2910
	kg		68	98	193	347	451	1320
Weight (approx.), Figure 2349¼	lb		170	260	500	955	1255	2995
	kg		77	118	227	433	569	1359

** Conforms to API 6D, and is marked accordingly.*

For motorization, contact factory for correct gear model and valve outline dimensions.

For Category E, F, H, J and K valve gearing dimensions, contact factory.

For buried service and offshore applications, contact factory. All dimensions are approximate.

For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 900 – Figure 4949, 4949½, 4949¼

Venturi pattern

ASME Class 900 (PN150)

Figure 4949½, sizes 16 and 20 (not shown)

Figure 4949¼, sizes 16 and 20 (not shown)

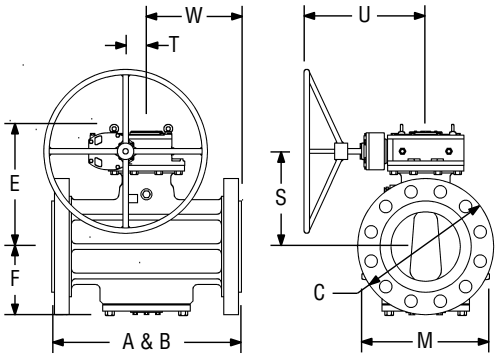


Figure 4949, sizes 16 and 20

Size		NPS	16	20
		DN	400	500
End-to-end, buttwelding ends, Figure 4949½		44.50	52.00 1130	52.00* 1321
Face-to-face, flanged (raised face)		44.50	52.00 1130	52.00 1321
End-to-end, flanged by weld end, Figure 4949¼		44.50	52.00 1130	52.00* 1321
End-to-end, flanged (ring joint)		44.88	52.50 1140	52.50* 1334
Diameter of flange		27.75	33.75 705	33.75 857
Center to bottom of body		17.10	19.00 434	19.00 483
Extreme width of body		30.30	31.00 770	31.00 787
Number of tapped holes/size				
Thread size UNC in flange*				
Category A and C Gear Dimensions				
Center to top (gearing)		E	24.1 611	33.5 850
Center of port to center of handwheel		S	20.7 527	29.4 748
Longitudinal centerline to handwheel centerline		T	10.2 260	4.3 108
Longitudinal centerline to face of handwheel		U	23.8 604	27.4 696
Handwheel diameter/number of turns to open with gearing		W	12/192 305	16/297 406
Weight (approx.), Figure 4949	lb kg		4570 2073	
Weight (approx.), Figure 4949½	lb kg		3805 1726	
Weight (approx.), Figure 4949¼	lb kg		4325 1962	
Category B and D Gear Dimensions				
Center to top (gearing)		E	24.1 611	33.5 850
Center of port to center of handwheel		S	20.7 527	29.4 748
Longitudinal centerline to handwheel centerline		T	10.2 260	4.3 108
Longitudinal centerline to face of handwheel		U	25.0 636	26.1 663
Handwheel diameter/number of turns to open with gearing		W	16/192 406	12/297 305
Weight (approx.), Figure 4949	lb kg		4570 2073	
Weight (approx.), Figure 4949½	lb kg		3805 1726	
Weight (approx.), Figure 4949¼	lb kg		4325 1962	

** Conforms to API 6D, and is marked accordingly. Size 18 and 24 valves available on special order.*
For motorization, contact factory for correct gear model and valve outline dimensions.
For Category E, F, H, J and K valve gearing dimensions, contact factory.
For buried service and offshore applications, contact factory. All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve

Dynamic Balance plug valves

ASME Class 1500 – Figure 3044, 3045, 3045½, 3045¼

Regular pattern

ASME Class 1500 (PN 250)

Figure 3044, sizes 1 to 4 (not shown)

Figure 3045½, size 4 (not shown)

Figure 3045¼, size 4 (not shown)

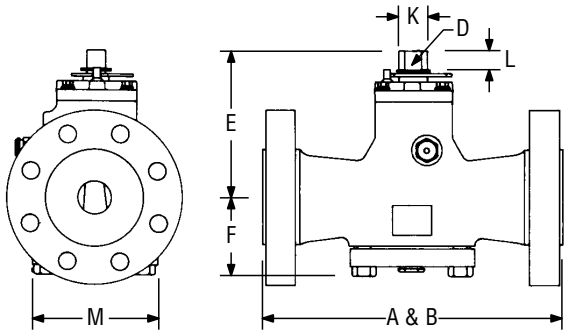


Figure 3045, sizes 1 to 4

Size	NPS	1	2	3	4
	DN	25	50	80	100
End-to-end, buttwelding ends, Figure 3045½	A			18.50	21.50
				470.00	546.00
Face-to-face, flanged (raised face)	B	10.00	14.50	18.50	21.50
		254	368	470	546
End-to-end, flanged (ring joint)		10.00	14.62	18.62	21.62
		254	371	473	549
End-to-end, flanged by weld end, Figure 3045¼				18.50	21.50
				470	546
End-to-end, threaded ends, Figure 3044**		5.00	7.75	10.00	11.50
		127	197	254	292
Diameter of flange	C	5.88	8.50	10.50	12.25
		149	216	267	311
Center to top of stem	E	5.80	6.60	7.60	8.90
		147	168	193	226
Center to bottom of body	F	2.80	4.20	5.00	5.80
		71	107	127	147
Width of stem flats	J	0.62	0.81	1.00	1.25
		16	21	25	32
Diameter of stem	K	0.85	1.09	1.41	1.78
		22	28	36	45
Height of stem flats	L	0.90	1.00	1.10	1.40
		23	25	28	36
Extreme width of body	M	3.70	4.70	6.20	8.70
		94	119	157	221
Wrench size		DB-1	DB-2	DB-3	DB-4
Weight (approx.), Figure 3045		40	98	181	300
		18	44	82	136
Weight (approx.), Figure 3045½					152
					69
Weight (approx.), Figure 3045¼					226
					103

** Size 1 valve conforms to ASME B16.34.*

*** Threaded end valves conform to MSS-SP-84. All dimensions are approximate. For the most current dimensions, please request a drawing from Flowserve.*

Dynamic Balance plug valves

ASME Class 1500 – Figure 3049, 3049½, 3049¼

Regular pattern

ASME Class 1500 (PN250)

Figure 3049½, sizes 3 to 10 (not shown)

Figure 3049¼, sizes 3 to 10 (not shown)

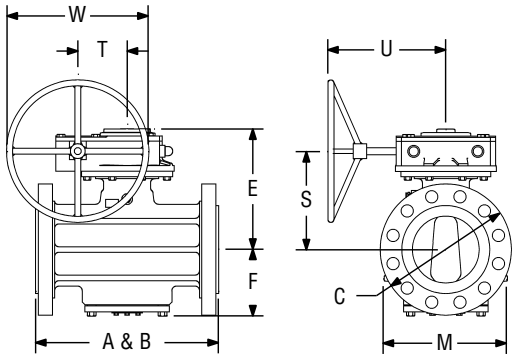


Figure 3049, sizes 2 to 10

Size		NPS	2	3	4	6	8	10
		DN	50	80	100	150	200	250
End-to-end, buttwelding ends, Figure 3049½		A		18.50	21.50	27.75	32.75	39.00
				470	546	705	832	991
Face-to-face, flanged (raised face)		B	14.50	18.50	21.50	27.75	32.75	39.00
			368	470	546	705	832	991
End-to-end, flanged by weld end, Figure 3049¼				18.50	21.50	27.75	32.75	39.00
				470	546	705	832	991
End-to-end, flanged (ring joint)			14.62	18.62	21.62	28.00	33.12	39.38
			371	473	549	711	841	1000
Diameter of flange		C	8.50	10.50	12.25	15.50	19.00	23.00
			216	267	311	394	483	584
Center to top of stem		E	7.70	7.70	7.70	7.70	7.70	7.70
			196	196	196	196	196	196
Center to bottom of body		F	4.20	5.00	5.80	9.00	11.50	14.30
			107	127	147	229	292	363
Extreme width of body		M	4.70	6.20	8.70	15.50	20.00	23.80
			119	157	221	394	508	605
Number of tapped holes/size			0.0	0.0	0.0	0.0	0.0	0.0
Thread size UNC in flange*			0.0	0.0	0.0	0.0	0.0	0.0
Category A and C Gear Dimensions								
Center to top (gearing)		E	8.4	10.4	12.4	16.2	19.2	26.1
			214	263	315	410	488	663
Center of port to center of handwheel		S	6.6	8.0	9.5	12.9	16.0	28.5
			167	202	241	328	406	723
Longitudinal centerline to handwheel centerline		T	2.7	3.8	4.8	5.4	7.3	9.3
			69	97	123	137	184	235
Longitudinal centerline to face of handwheel		U	8.6	11.5	13.0	16.8	19.8	24.8
			219	293	329	425	504	629
Handwheel diameter/number of turns to open with gearing		W	8/10	10/12	12/16	12/46.3	16/78	16/96.7
			203	254	305	305	406	406
Weight (approx.), Figure 3049	lb		125	230	380	930	1790	2770
	kg		57	104	172	422	812	1256
Weight (approx.), Figure 3049½	lb		85	135	235	720	1520	2315
	kg		39	61	107	327	689	1050
Weight (approx.), Figure 3049¼	lb		105	185	310	825	1655	2540
	kg		48	84	141	374	751	1152
Category B and D Gear Dimensions								
Center to top (gearing)		E	8.4	10.4	12.4	16.2	19.2	26.1
			214	263	315	410	488	663
Center of port to center of handwheel		S	6.6	8.0	9.5	12.9	16.0	28.5
			167	202	241	328	406	723
Longitudinal centerline to handwheel centerline		T	2.7	3.8	4.8	5.4	7.3	9.3
			69	97	123	137	184	235
Longitudinal centerline to face of handwheel		U	8.6	11.5	13.0	16.8	19.8	24.8
			219	293	329	425	504	629
Handwheel diameter/number of turns to open with gearing		W	8/10	10/12	12/16	12/46.3	16/78	16/96.7
			203	254	305	305	406	406
Weight (approx.), Figure 3049	lb		125	230	380	930	1790	2770
	kg		57	104	172	422	812	1256
Weight (approx.), Figure 3049½	lb		85	135	235	720	1520	2315
	kg		39	61	107	327	689	1050
Weight (approx.), Figure 3049¼	lb		105	185	310	825	1655	2540
	kg		48	84	141	374	751	1152

For motorization, contact factory for correct gear model and valve outline dimensions.
For Category E, F, H, J and K valve gearing dimensions, contact factory.
For buried service and offshore applications, contact factory. All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 1500 – Figure 6049, 6049½, 6049¼

Venturi pattern

ASME Class 1500 (PN250)

Figure 6049½, size 6 to 16 (not shown)

Figure 6049¼, size 6 to 16 (not shown)

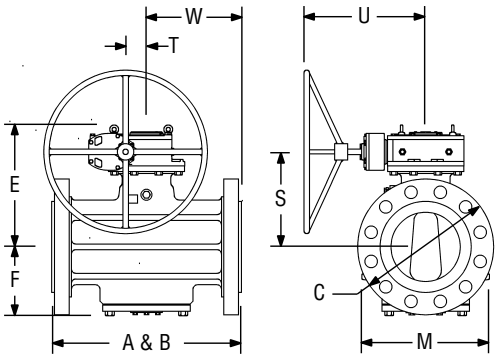


Figure 6049, size 6, 12 and 16 (worm or bevel gearing)

Size		NPS	6	12	16
		DN	150	300	400
End-to-end, buttwelding ends, Figure 6049½		A	27.75 705	44.50 1130	54.50* 1384
Face-to-face, flanged (raised face)		B	27.75 705	44.50 1130	54.50* 1384
End-to-end, flanged by weld end, Figure 6049¼			27.75 705	44.50 1130	54.50* 1384
End-to-end, flanged (ring joint)			28.00 711	45.12 1146	55.38* 1407
Diameter of flange		C	15.5 394	26.5 673	32.5 826
Center to bottom of body		F	7.6 193	14.3 363	17.9 455
Extreme width of body		M	11.2 284	23.8 605	31.8 808
Number of tapped holes/size			0.0	0.0	0.0
Thread size UNC in flange*			0.0	0.0	0.0
Wrench size			0.0	0.0	0.0
Category A and C Gear Dimensions					
Center to top (gearing)		E		26.1 663	25.5 647
Center of port to center of handwheel		S		28.5 723	21.4 544
Longitudinal centerline to handwheel centerline		T		9.3 235	4.3 108
Longitudinal centerline to face of handwheel		U		24.8 629	27.4 696
Handwheel diameter/number of turns to open with gearing		W		16/96.7 406	16/297 406
Weight (approx.), Figure 6049	lb kg			3860 1751	8270 3751
Weight (approx.), Figure 6049½	lb kg			2910 1320	6870 3116
Weight (approx.), Figure 6049¼	lb kg			3385 1535	7570 3434
Category B and D Gear Dimensions					
Center to top (gearing)		E		26.1 663	25.5 647
Center of port to center of handwheel		S		28.5 723	21.4 544
Longitudinal centerline to handwheel centerline		T		9.3 235	4.3 108
Longitudinal centerline to face of handwheel		U		24.8 629	27.4 696
Handwheel diameter/number of turns to open with gearing		W		16/96.7 406	16/297 406
Weight (approx.), Figure 6049	lb kg			3850 1746	8270 3751
Weight (approx.), Figure 6049½	lb kg			2900 1315	6870 3116
Weight (approx.), Figure 6049¼	lb kg			3375 1531	7570 3434

** Conforms to API 6D, and is marked accordingly.*

Size 20 and 24 valves available on special order.

For motorization, contact factory for correct gear model and valve outline dimensions.

For Category E, F, H, J and K valve gearing dimensions, contact factory.

For buried service and offshore applications, contact factory. All dimensions are approximate.

For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 2500 – Figure 20545, 20545½, 20545¼

Regular pattern

ASME Class 2500 (PN420)

Figure 20545½, sizes 2 and 4 (not shown)

Figure 20545¼, size 4 (not shown)

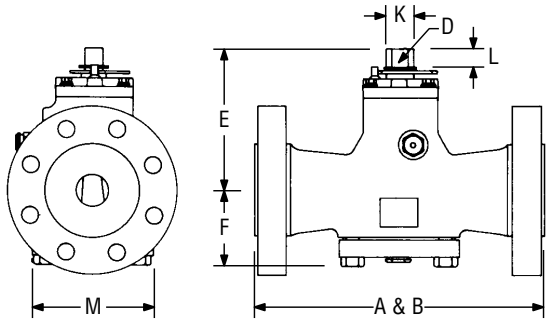


Figure 20545, sizes 2 to 4

Size	NPS	2	3	4
	DN	50	80	100
End-to-end, buttwelding ends, Figure 20545½	A	17.75*		26.50*
		451.00		673.00
End-to-end, flanged (ring joint)	B	17.75	23.00	26.88
		451	584	683
End-to-end, flanged by weld end, Figure 20545¼				26.50*
				673.10
Diameter of flange	C	9.25	12.00	14.00
		235	305	356
Center to top of stem	E	6.60	8.00	9.10
		168	203	231
Center to bottom of body	F	4.80	5.70	6.70
		122	145	170
Width of stem flats	J	0.81	1.00	1.25
		21	25	32
Diameter of stem	K	1.09	1.41	1.78
		28	36	45
Height of stem flats	L	1.00	1.10	1.40
		25	28	36
Extreme width of body	M	7.20	8.60	10.00
		183	218	254
Wrench size		DB-2	DB-3	DB-4
Weight (approx.), Figure 20545		152	302	500
		69	137	227
Weight (approx.), Figure 20545½		85		290
		39		132
Weight (approx.), Figure 20545¼				326
				148

** Conforms to API 6D, and is marked accordingly. All dimensions are approximate.*
For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 2500 – Figure 20549, 20549½, 20549¼

Regular pattern

ASME Class 2500 (PN420)

Figure 20549½, sizes 4, 6, 8* and 10* (not shown)*

Figure 20549¼,sizes 4, 6, 8* and 10* (not shown)*

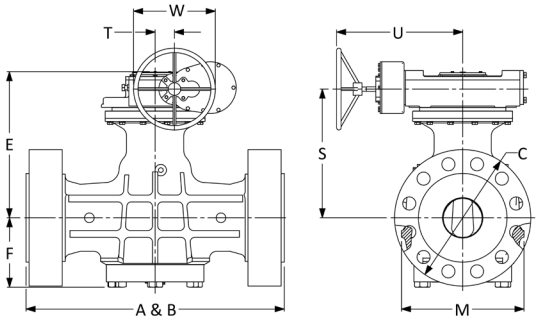


Figure 20549, sizes 2, 3, 4, 6, 8*, 10**

Size		NPS	2	3	4	6	8	10
		DN	50	80	100	150	200	250
End-to-end, buttwelding ends, Figure 20549½		A	17.75*		26.50*	36.00*	40.25*	50.00*
			451		673	914	1022	1270
End-to-end, flanged by weld end, Figure 20549¼					26.50*	36.25	40.25	50.25
					673	921	1022	1276
End-to-end, flanged (ring joint)			17.88	23.00	26.88	36.50	40.88	50.88
			454	584	683	927	1038	1292
Diameter of flange		C	9.25	12.00	14.00	19.00	21.75	26.50
			235	305	356	483	552	673
Center to bottom of body		F	4.80	5.70	6.70	9.60	11.80	13.50
			122	145	170	244	300	343
Extreme width of body		M	7.20	8.60	10.00	13.50	17.80	22.30
			183	218	254	343	452	566
Number of tapped holes/size								
Thread size UNC in flange*								
Wrench size								
Category A and C Gear Dimensions								
Center to top (gearing)		E	8.9	10.7	13.1	17.1	19.8	21.9
			226	273	331	433	504	556
Center of port to center of handwheel		S	7.0	8.4	10.1	13.8	16.6	24.2
			178	212	258	349	421	616
Longitudinal centerline to handwheel centerline		T	2.7	3.8	4.8	5.8	7.3	9.3
			69	97	123	146	184	235
Longitudinal centerline to face of handwheel		U	8.6	11.5	13.0	19.8	19.8	24.8
			219	293	329	502	504	629
Handwheel diameter/number of turns to open with gearing		W	8/10	10/12	12/16	12/57.5	16/78	16/96.7
			203	254	305	305	406	406
Weight (approx.), Figure 20549	lb		180	350	580	1420	2395	4110
	kg		82	159	263	644	1086	1864
Weight (approx.), Figure 20549½	lb		115		330	930	1840	3160
	kg		52		150	422	835	1433
Weight (approx.), Figure 20549¼	lb				455	1150	2150	3635
	kg				206	522	975	1649
Weight (approx.), Figure 20549 RJ	lb		180	350				
	kg		82	159				
Category B and D Gear Dimensions								
Center to top (gearing)		E	8.9	10.7	13.1	17.1	21.0	21.9
			226	273	331	433	534	556
Center of port to center of handwheel		S	7.0	8.4	10.1	13.8	17.2	24.2
			178	212	258	349	438	616
Longitudinal centerline to handwheel centerline		T	2.7	3.8	4.8	5.8	8.3	9.3
			69	97	123	146	210	235
Longitudinal centerline to face of handwheel		U	8.6	11.5	13.0	19.8	20.9	25.2
			219	293	329	502	530	639
Handwheel diameter/number of turns to open with gearing		W	8/10	10/12	12/16	12/57.5	16/87	20/96.7
			203	254	305	305	406	508
Weight (approx.), Figure 20549	lb		180	350	580	1420	2395	4110
	kg		82	159	263	644	1086	1864
Weight (approx.), Figure 20549½	lb		115		330	930	1950	3160
	kg		52		150	422	885	1433
Weight (approx.), Figure 20549¼	lb				455	1150	2260	3635
	kg				206	522	1025	1649
Weight (approx.), Figure 20549 RJ	lb		180	350				
	kg		82	159				

** Sizes 6, 8 and 10 on Figure 20549, 20549½ and 20549¼ have pressure seal bottom covers.*

** Conforms to API 6D, and is marked accordingly.*

For motorization, contact factory for correct gear model and valve outline dimensions.

For Category E, F, H, J and K valve gearing dimensions, contact factory.

For buried service and offshore applications, contact factory. All dimensions are approximate.

For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

ASME Class 2500 – Figure 9349, 9349½, 9349¼

Venturi pattern

ASME Class 2500 (PN420)

Figure 9349½, sizes 12 and 16 (not shown)

Figure 9349¼, sizes 12 and 16 (not shown)

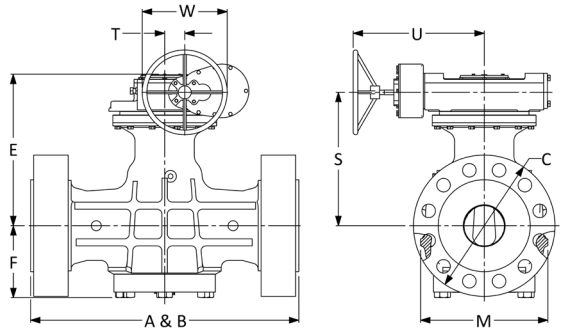


Figure 9349, sizes 12 and 16

Size		NPS	12	16
		DN	300	400
End-to-end, buttwelding ends, Figure 9349½		A	56.00*	65.00*
			1422	1651
End-to-end, flanged by weld end, Figure 9349¼			56.00	65.88*
			1422	1673
End-to-end, flanged (ring joint)			56.88	65.00*
			1445	1651
Diameter of flange		C	30.00	35.50*
			762	902
Center to bottom of body		F	16.40	22.10
			417	561
Extreme width of body		M	27.00	35.00
			686	889
Number of tapped holes/size				
Thread size UNC in flange*				
Wrench size				
Category A and C Gear Dimensions				
Center to top (gearing)		E	34.0	37.6
			862	954
Center of port to center of handwheel		S	29.9	33.5
			760	852
Longitudinal centerline to handwheel centerline		T	4.3	4.3
			108	108
Longitudinal centerline to face of handwheel		U	27.4	27.4
			696	696
Handwheel diameter/number of turns to open with gearing		W	16/297	16/297
			406	406
Weight (approx.), Figure 9349	lb		6100	11995
	kg		2767	5441
Weight (approx.), Figure 9349½	lb		4370	9695
	kg		1982	4398
Weight (approx.), Figure 9349¼	lb		5240	10845
	kg		2377	4919
Weight (approx.), Figure 9349 RJ	lb		6100	11995
	kg		2767	5441
Category B and D Gear Dimensions				
Center to top (gearing)		E	34.0	37.6
			862	954
Center of port to center of handwheel		S	29.9	33.5
			760	852
Longitudinal centerline to handwheel centerline		T	4.3	4.3
			108	108
Longitudinal centerline to face of handwheel		U	27.4	27.8
			696	705
Handwheel diameter/number of turns to open with gearing		W	16/297	20/297
			406	508
Weight (approx.), Figure 9349	lb		6100	11995
	kg		2767	5441
Weight (approx.), Figure 9349½	lb		4370	9695
	kg		1982	4398
Weight (approx.), Figure 9349¼	lb		5240	10845
	kg		2377	4919
Weight (approx.), Figure 9349 RJ	lb		6100	11995
	kg		2767	5441

** Conforms to API 6D, and is marked accordingly.*

*** Special flange design not addressed by API 6D*

For motorization, contact factory for correct gear model and valve outline dimensions.

For Category E, F, H, J and K valve gearing dimensions, contact factory.

For buried service and offshore applications, contact factory. All dimensions are approximate.

For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

API 3000 – Figure 76305 and API 5000 – Figure 76505

API 3000 and 5000 MOP

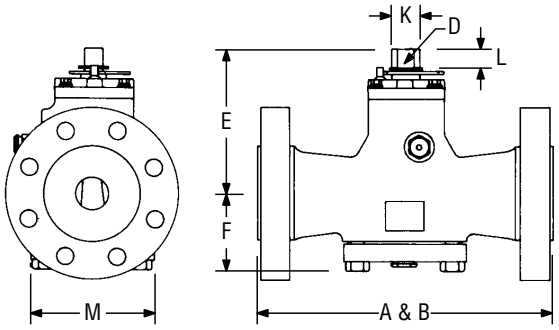


Figure 76305, sizes 2 1/16 to 4 1/16
Figure 76505, sizes 2 1/16 to 4 1/16

Size	NPS	Fig. No. 76305				Fig. No. 76505			
	DN	2 1/16	2 9/16	3 1/8	4 1/16	2 1/16	2 9/16	3 1/8	4 1/16
Face-to-face, flanged (including flat-faced ring joint), Figures 76305, 76505	B	14.62	16.62	15.12	18.12	14.62	16.62	18.62	21.62
		371	422	384	460	371	422	473	549
Diameter of flange	C	8.50	9.12	9.50	11.50	8.50	9.62	10.50	12.25
		216	232	241	292	216	244	267	311
Center to top of stem	E	6.6	7.6	7.6	8.9	6.6	8.0	8.0	9.1
		168	193	193	226	168	203	203	231
Center to bottom of body	F	4.4	5.0	5.0	5.8	4.4	4.6	4.6	5.7
		112	127	127	147	112	117	117	145
Width of stem flats	J	0.81	1.00	1.00	1.25	0.81	1.00	1.00	1.25
		21	25	25	32	21	25	25	32
Diameter of stem	K	1.09	1.41	1.41	1.78	1.09	1.41	1.41	1.78
		28	36	36	45	28	36	36	45
Height of stem flats	L	1.0	1.1	1.1	1.4	1.0	1.1	1.1	1.4
		25	28	28	36	25	28	28	36
Extreme width of body	M	4.7	6.2	6.2	8.7	5.5	7.9	7.9	8.7
		119	157	157	221	140	201	201	221
Number of tapped holes/size									
Thread size UNC in flange*									
Wrench size		DB-2	DB-3	DB-3	DB-4	DB-2	DB-3	DB-3	DB-4
Weight (approx.)		100	125	153	263	115	140	203	310
		45	57	69	119	52	64	92	141

All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve.

Dynamic Balance plug valves

API 5000 – Figure 76509

API 5000 MOP

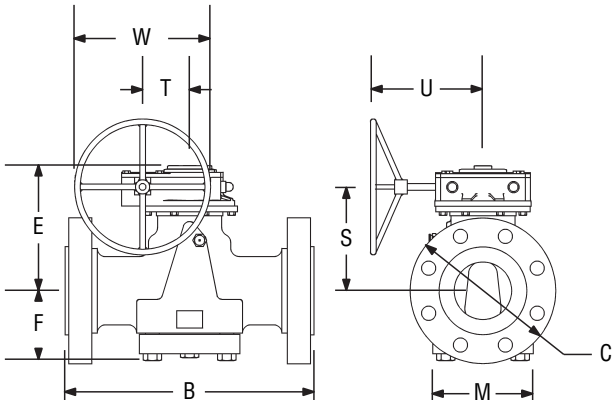


Figure 76509, size 4⅛

Size		NPS	2.06	2.56	3.13	4.06
		DN	2.06	2.56	3.13	4.06
End-to-end, flanged (ring joint)		B	14.62	16.62	18.62	21.62
			371	422	473	549
Diameter of flange		C	8.50	9.62	10.50	12.25
			216	244	267	311
Center to bottom of body		F	4.40	4.60	4.60	5.70
			112	117	117	145
Extreme width of body		M	5.50	7.90	7.90	8.70
			140	201	201	221
Number of tapped holes/size						
Thread size UNC in flange*						
Category A and C Gear Dimensions						
Center to top (gearing)		E	8.6		10.6	12.8
			219		268	325
Center of port to center of handwheel		S	6.8		8.2	9.9
			172		208	251
Longitudinal centerline to handwheel centerline		T	2.7		3.8	4.8
			69		97	123
Longitudinal centerline to face of handwheel		U	8.6		11.5	13.3
			219		293	337
Handwheel diameter/number of turns to open with gearing		W	8/10		10/12	10/16
			203		254	254
Weight (approx.), Figure 76509	lb		145			
	kg		66			
Category B and D Gear Dimensions						
Center to top (gearing)		E	8.6		10.6	12.8
			219		268	325
Center of port to center of handwheel		S	6.8		8.2	9.9
			172		208	251
Longitudinal centerline to handwheel centerline		T	2.7		3.8	4.8
			69		97	123
Longitudinal centerline to face of handwheel		U	8.6		11.5	13.0
			219		293	329
Handwheel diameter/number of turns to open with gearing		W	8/10		10/12	12/16
			203		254	305
Weight (approx.), Figure 76509	lb		145			
	kg		66			

For motorization, contact factory for correct gear model and valve outline dimensions.
For Category E, F, H, J and K valve gearing dimensions, contact factory.
For buried service and offshore applications, contact factory. All dimensions are approximate.
For the most current dimensions, please request a drawing from Flowserve.

Chapter 5

PRESSURE/TEMPERATURE DATA

Pressure temperature ratings — carbon steel valves

ASTM A105, ASTM A216 grade WCB and ASTM A216 grade WCC

Maximum operating temperatures

Dynamic Balance plug valves

Standard construction Dynamic Balance valves (Category A) are suitable for operation at the pressures and temperatures listed in the table up to a maximum temperature of 232°C (450°F). Special constructions are available for higher temperatures. Please refer to the design categories section of this technical bulletin. Specific recommendations are available from your customer service representative.

Super Nordstrom and Nordstrom plug valves

Super Nordstrom and Nordstrom ASME-rated valves are suitable for operation at the pressures and temperatures in the table up to a maximum of 177°C (350°F).

Super Nordstrom two-bolt cover plug valves

Super Nordstrom 200 CWP valves are suitable for operation from -29°C to 93°C (-20°F to 200°F).

Working pressure by rating number (bar)

Service Temperature	PN20		PN50		PN100		PN150		PN250		PN420	
°C	WCB	WCC	WCB	WCC	WCB	WCC	WCB	WCC	WCB	WCC	WCB	WCC
-29 to 38	19.7	20.0	51.0	51.7	102.0	103.4	153.1	155.1	255.5	258.6	425.4	430.9
50	19.2	19.0	50.1	51.7	100.2	103.4	150.2	155.1	250.4	258.6	417.3	430.9
100	17.9	17.9	46.5	51.7	93.1	103.4	139.6	155.1	232.7	258.6	387.8	430.9
120	16.9	16.9	45.9	51.0	91.9	101.9	137.8	152.9	229.5	254.8	382.5	424.7
150	15.9	15.9	45.2	50.3	90.7	100.3	135.8	150.7	226.1	251.0	377.1	418.5
200	13.8	13.8	43.8	48.6	87.6	97.2	131.0	145.8	218.6	243.4	364.0	405.4
232	12.8	12.8	42.6	47.2	85.2	94.5	127.4	141.7	212.6	236.4	354.1	393.7
250	11.7	11.7	41.4	45.9	82.7	91.7	123.8	137.6	206.5	229.3	344.1	382.0
300	9.7	9.7	37.9	41.7	75.5	83.4	113.1	125.1	188.6	208.6	314.4	347.5
350	8.4	8.7	36.1	40.5	73.9	80.9	110.9	121.4	184.8	202.2	308.0	336.8
375	7.6	7.6	36.9	39.3	73.4	78.3	110.3	117.6	183.7	195.8	306.1	326.1
400	6.6	6.6	34.8	34.8	69.6	69.6	104.1	104.1	173.7	173.7	289.6	289.6
425	5.5	5.5	28.3	28.3	56.9	56.9	85.2	85.2	142.0	142.0	236.5	236.5
450	4.7	4.7	20.5	20.5	41.4	41.4	60.1	60.1	100.2	100.2	166.9	166.9

Working pressure by classes (psig)

Service Temperature	150		300		600		900		1500		2500	
°F	WCB	WCC	WCB	WCC	WCB	WCC	WCB	WCC	WCB	WCC	WCB	WCC
-20 to 100	285	290	740	750	1480	1500	2220	2250	3705	3750	6170	6250
200	260	260	675	750	1350	1500	2025	2250	3375	3750	5625	6250
250	245	245	665	740	1333	1478	1998	2218	3328	3695	5548	6160
300	230	230	655	730	1315	1455	1970	2185	3280	3640	5470	6070
400	200	200	635	705	1270	1410	1900	2115	3170	3530	5280	5880
450	185	185	618	685	1235	1370	1848	2055	3083	3428	5135	5710
500	170	170	600	665	1200	1330	1795	1995	2995	3325	4990	5540
600	140	140	550	605	1095	1210	1640	1815	2735	3025	4560	5040
700	110	110	535	570	1065	1135	1600	1705	2665	2840	4440	4730
750	95	95	505	505	1010	1010	1510	1510	2520	2520	4200	4200
800	80	80	410	410	825	825	1235	1235	2060	2060	3430	3430

CAN/CSA Z245-15 ratings

Service Temperature	Working Pressure by Rating Number (kPa)					
°C	PN20	PN50	PN100	PN150	PN250	PN420
-29 to 120	19.00	49.60	99.30	148.90	248.20	413.70

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