



Worcester 18/19 Series Modular Multi-Way Ball Valves



Experience In Motion

The Modular Approach To Flexibility

Flowserve Worcester's modular Series 18/19 multi-way valve addresses the need for diverting media through a number of flow paths.

Currently used extensively on a variety of chemical and food processes, the potential applications for this valve are extensive. When compared with a plug valve for example, the Series 18/19 offers numerous advantages, including bubble tight shut-off, long sealing life, extended temperature range, ease of maintenance, material range, no need for sealant etc.

The Series 18/19 is primarily of a firesafe design, complying with BS 5351 and is offered in both full and reduced bore, and with its four seat design, provides straight-through flow capability to minimise pressure drop. This unique valve design is based on a modular principle which offers almost unlimited flow permutations. In addition, the Series 18/19 can be offered as a high integrity valve for toxic media or with a retrofitted steam jacket.

Size Range

The Series 18/19 is available in sizes ranging from 15mm ($\frac{1}{2}$ " to 150mm (6") full bore and 20mm ($\frac{3}{4}$ " to 200mm (8") reduced bore.

Body Style

Series 18 - Side Entry Configuration (B18 = Full Bore, 18 = Reduced Bore) Series 19 - Bottom Entry Configuration (B19 = Full Bore, 19 = Reduced Bore)

Body Porting

The body is designed to allow for a maximum of 5 ports. An example of one such application is where the bottom entry port is used as the inlet, allowing the side entry ports to fill up to four separate tanks.

The design incorporates interchangeable inserts which allow the valve to be easily re-configured to suit customer requirements.

Applications

Applications vary from road tankers, heat exchangers and pulp grinding machines to remote undersea vehicles and ships' ballast systems. The valve can also be used for pig loading, as a compact 90° corner valve and for by-pass operations.

Typical media include chemicals, filtrates, fuel oil, hot water, air, fats, gasoline, chocolate mass, toothpaste, sugar, tobacco and others.

Flow Indication

The valve is designed with a stem assembly incorporating foolproof orientation of ball to stem and stem to indicator, thus providing external indication of ball position to verify correct operating sequence whether manual or actuated.

Pipe Connections

FLANGES

Another example of the modular flexibility of the Series 18/19 is the use of slip flanges which can accommodate ANSI/DIN and other standards up to and including Class 300 pressure rating. Furthermore, during installation, these flanges facilitate alignment of the valve in the pipework.

FACE TO FACE LENGTHS

The screwed insert design allows for most ANSI/DIN face to face lengths, as well as longer non-standard dimensions.

SCREWED AND WELD ENDS*

As a variation on the above, the Series 18/19 can be supplied with either female screwed ends (NPT and BSP variants), socket weld or butt weld ends to suit schedule pipe to BS 1600.

Balls

The parallel-ported ball is available in a variety of flow path configurations, for example 'L' port, 'T' port, double 'L' port or other designs. The problem of cross-contamination on diverter valves can be addressed by using a bottom-entry, three-flanged valve with an L-ported ball operated through 180°.

Seats

A range of seat materials, many of which are manufactured in-house by Worcester Controls, can be supplied to accommodate various media and pressure/temperature conditions.

Materials of Construction

While standard materials of construction are stainless steel or carbon steel, this valve can be manufactured in potentially any available wrought material to allow full compatibility with the pipework/process conditions.

Actuation

The introduction of Norbro's 180° Series 40R pneumatic actuator allows two or three position capability between 0 and 180°. This can also be achieved with Norbro's Series 75 electric actuator. Together with the ISO mounting platform on the valve, this provides for an easily assembled, yet fully integrated multi-way valve system.

*Please note, these are not available in all sizes, for further information on connection configuration, consult Flowserve Worcester Controls.

Application Limitations

Cross Contamination

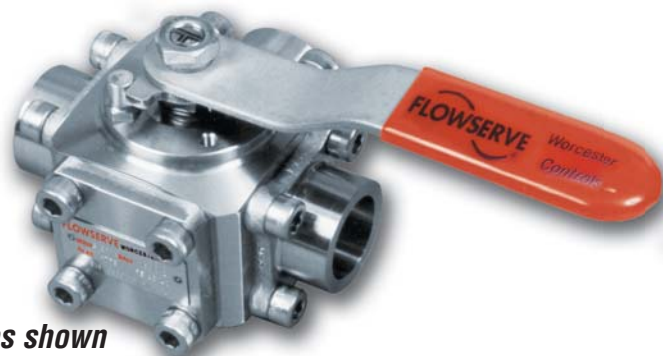
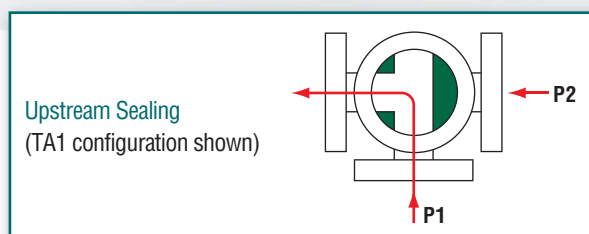
Due to the compact design of this valve, during its operation all three or four side ports will be open and therefore mixing of media between these ports will occur. Alternative designs are available to suit applications where cross contamination is unacceptable.

Upstream Sealing

There is a limitation to the differential pressure between the communicating ports P1 and the port which is closed to the flow P2 (see diagram) where $P2 > P1$. This differential pressure is based upon the seat material and the operating temperature of the valve. If differential pressures and temperatures in direction P2 exceed the limits of the upstream sealing graphs on page 11, media can pass the closed port and mix with P1. These applications should be referred to Flowserve Worcester Controls.



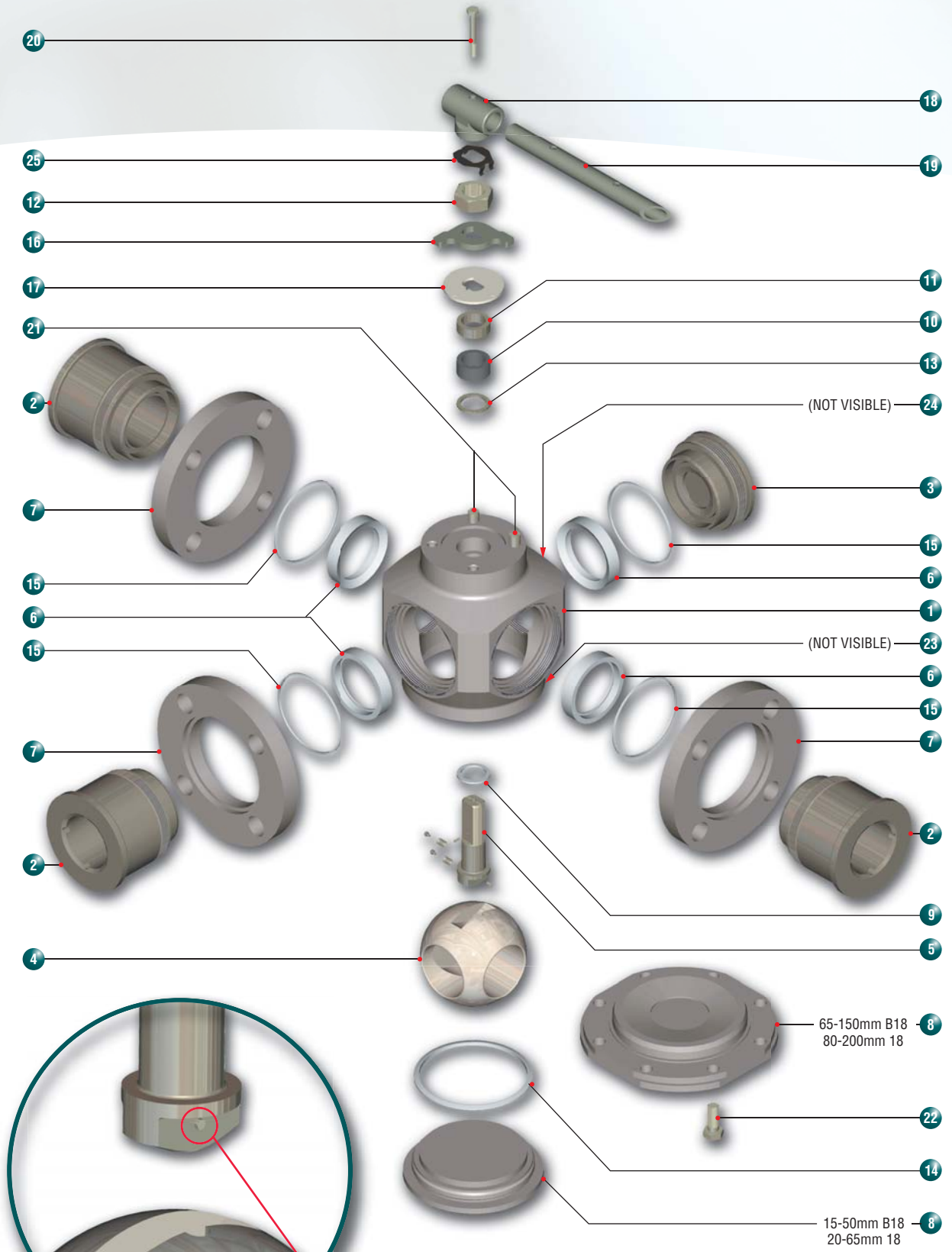
19 Series shown



18 Series shown

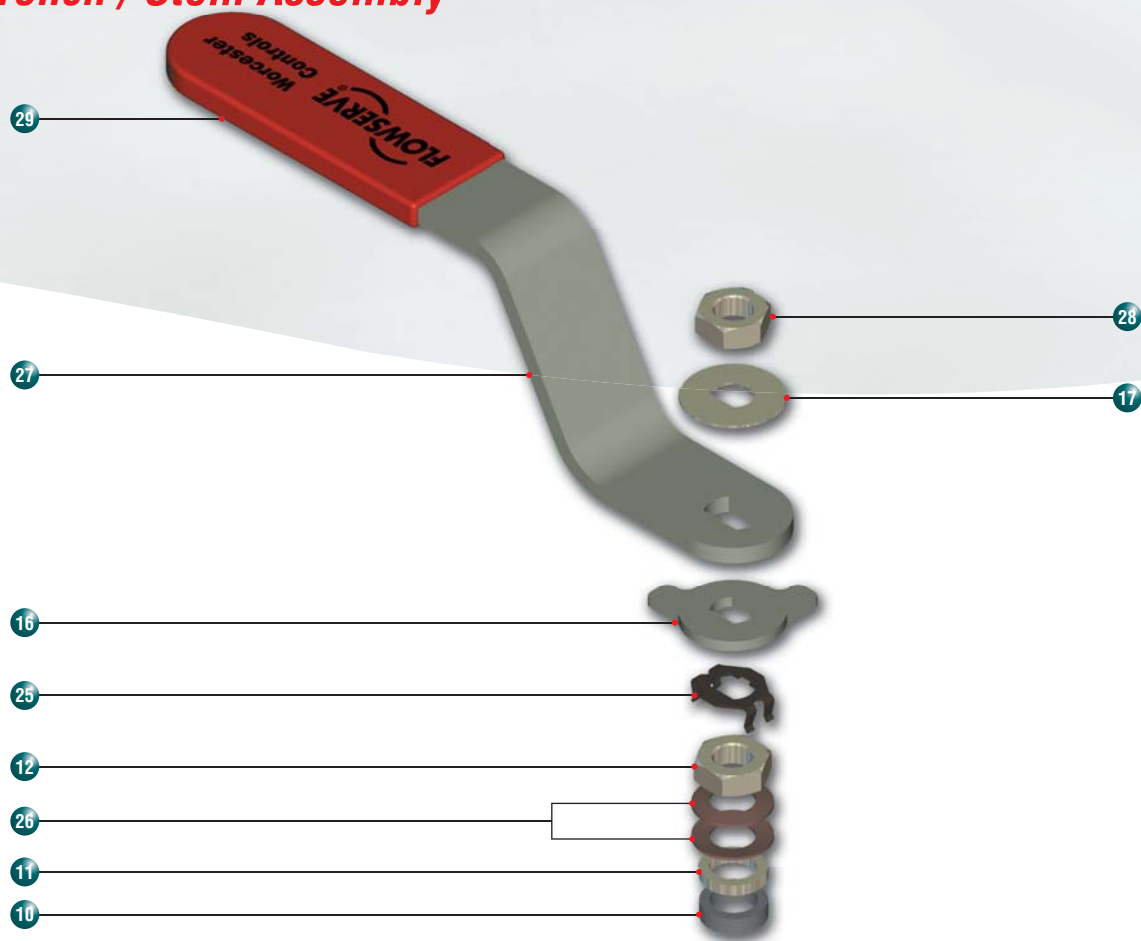
| Features | Benefits |
|------------------------------------|---|
| ● Foolproof stem assembly to ball | ● External indication of flow |
| ● Slip flanges | ● To simplify installation |
| ● Compact size | ● For space and weight saving |
| ● Ball/port variations | ● Maximum flow permutations |
| ● User-interchangeable flange/ends | ● To meet different system requirements |
| ● Screwed insert design | ● For variable face-to-face lengths |
| ● Range of seat materials | ● For varying media/systems conditions |
| ● Wrought body material options | ● To optimise system compatibility |
| ● Full bore porting | ● Greater flow efficiency |
| ● ISO mounting platform | ● For ease of automation |

18 / B18 Series



Detail showing stem location pin for correct orientation of ball to stem

15-25mm B18, 20-32mm 18 Wrench / Stem Assembly



Part / Materials List

| ITEM | DESCRIPTION | MATERIAL | ITEM | DESCRIPTION | MATERIAL |
|--|--|---|------|---|---|
| 1 | Body | Stainless Steel 316 Carbon steel BS 970 070M20 | 15* | Flange Port Insert Seal | Flexible Graphite |
| 2 | Flange Port Insert | Stainless Steel 316 Carbon steel BS 970 070M20 | 16 | Stop Plate | Stainless Steel 304 Carbon Steel BS 1449 CS4 |
| 3 | Blank Port Insert | Stainless Steel 316 Carbon steel BS 970 070M20 | 17 | Flow Indicator | Stainless Steel 321 |
| 4 | Ball | Stainless Steel 316 | 18 | Wrench Head | Malleable Iron Rustproofed |
| 5 | Stem | Stainless Steel 316 | 19 | Wrench Tube | Carbon Steel Rustproofed |
| 6* | Seat Ring | PTFE Virgin (T) Fluorofill (p) | 20 | Wrench Bolt | Stainless Steel BS EN ISO 3506 A4-80 |
| 7 | Slip Flange | Stainless Steel 316 Carbon steel EN 10083-1 | 21 | Stop Pin | Stainless Steel 316 Carbon Steel BS 970 220M07 |
| 8 | Ball Assembly Plate | Stainless Steel 316 Carbon steel EN 10083-1 | 22 | Hex Head Screw (65-150mm B18 80-200mm 18 only) | Stainless Steel BS EN ISO 3506 A4-80 Carbon Steel BS 3692 GR 8.8 |
| 9* | Stem Thrust Seal | PTFE 25% Glass Filled | 23 | Identification Plate | Stainless Steel 304 |
| 10* | Gland Packing (See Notes) | Flexible Graphite | 24 | Body Plate | Stainless Steel 304 |
| 11 | Gland | Stainless Steel 316 | 25 | Gland Nut Locking Clip | Spring Steel |
| 12* | Gland Nut | Stainless Steel 316 Carbon steel EN 10083-1 | 26* | Disc Springs (Only 15-25 B18 20-32mm 18) | Stainless Steel |
| 13 | Stem Locating Ring (65-15mm B18 80-200mm 18 only) | Stainless Steel 316 | 27 | Wrench (Only 15-25mm B18 20-32mm 18) | Carbon Steel Rustproofed |
| 14* | Ball Assembly Plate Seal | Flexible Graphite | 28 | Wrench Nut (Only 15-25mm B18 20-32mm 18) | Stainless Steel 316 |
| * Items marked thus denote component supplied in repair kit Notes: For 15-50mm (B18), 20-65mm (18) valves, one gland packing is used. For 65-150mm (B18), 80-200 (18) valves, two are used. | | | 29 | Wrench Sleeve (Only 15-25mm B18 20-32mm 18) | Vinyl Plastinol |








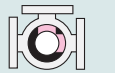




18/B18 Series Multi-Way Side Entry (Plan View)


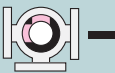










| 90° Options | | | | |
|-------------|----------|-----|-----|-----|
| 'L' Port | 'T' Port | | | |
| LA1 | TA1 | TA2 | TA3 | TA4 |
| | | | | |
| | | | | |










| 180° Options | | | | |
|--------------|----------|-----|-----|-----|
| 'L' Port | 'T' Port | | | |
| LB1 | TB1 | TB2 | TB3 | TB4 |
| | | | | |
| | | | | |
| | | | | |

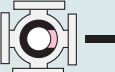
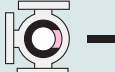
| 90° Options | | 180° Options | | 90° Options |
|-------------|----------|--------------|----------|--------------|
| 'T' Port | 'X' Port | 'T' Port | 'T' Port | 'L' Port 90° |
| TA5 | XA1 | LB2 | TB5 | LA2 |
| | | | | |
| | | | | |

19/B19 Series Multi-Way Bottom Entry (Plan View)

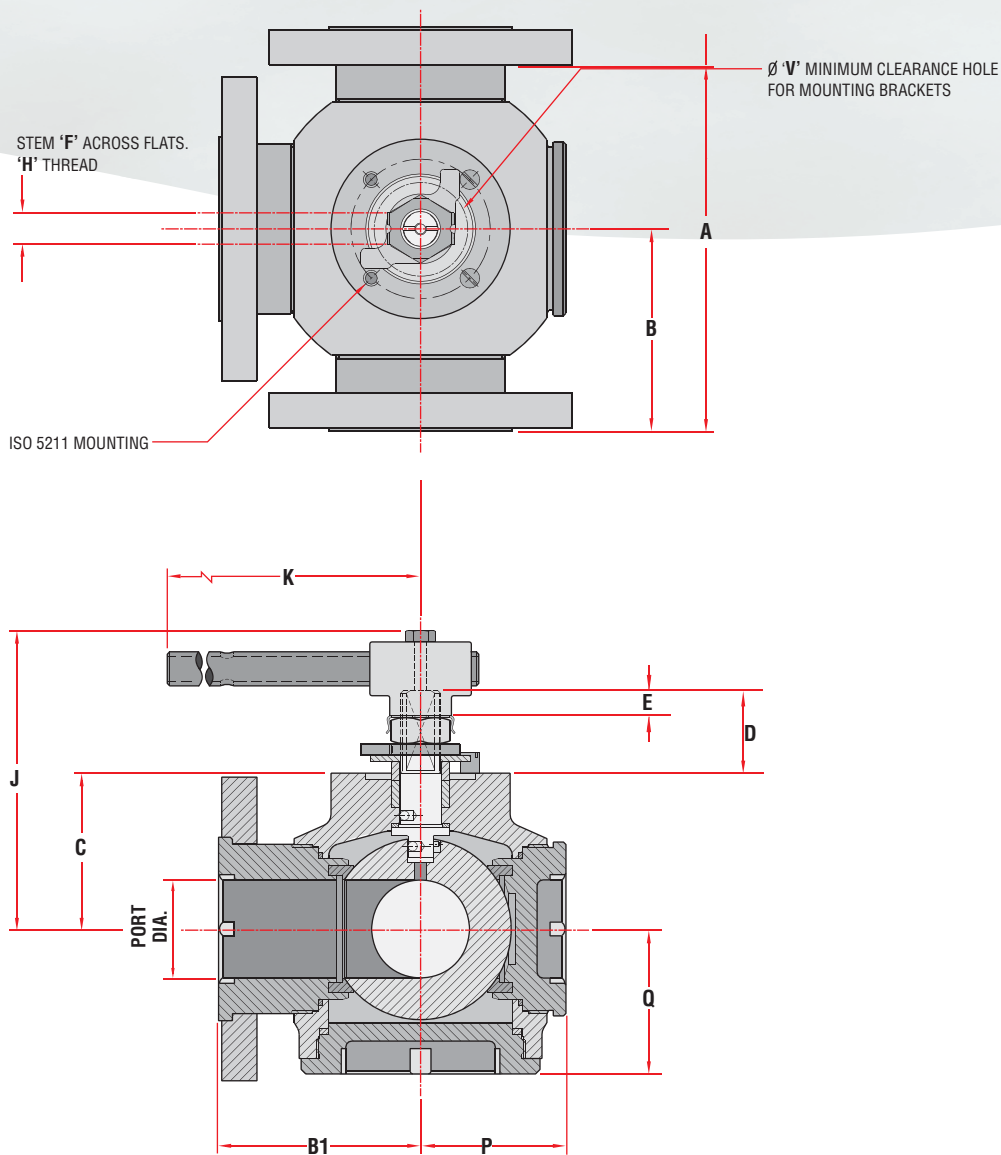
| 90° Options | | | |
|---|---|--|---|
| 'L' Port | | 'T' Port | |
| LA1 | LA2 | TA1 | TA2 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

| 180° Options | | | |
|---|---|---|---|
| 'T' Port | | | |
| TB1 | TB2 | TB3 | TB4 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

| 180° Options | | |
|---|---|---|
| 'L' Port | | |
| LB1 | LB2 | LB3 |
|  |  |  |
|  |  |  |
|  |  |  |

| 90° Options | |
|---|---|
| 'L' Port | |
| LD1 | LD2 |
|  |  |
| Each port in Sequence | Each port in Sequence |

Series 18/B18 (Side Entry)
40-50mm B18 - Full Bore
50-65mm 18 - Reduced Bore



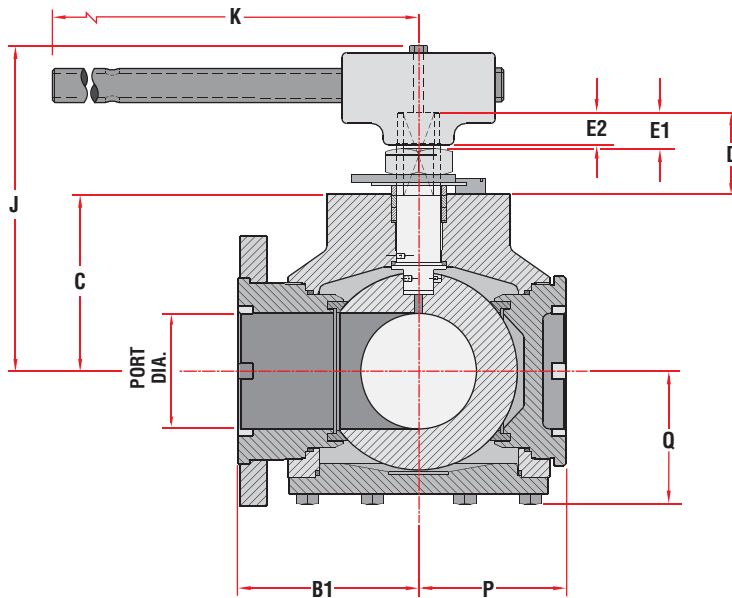
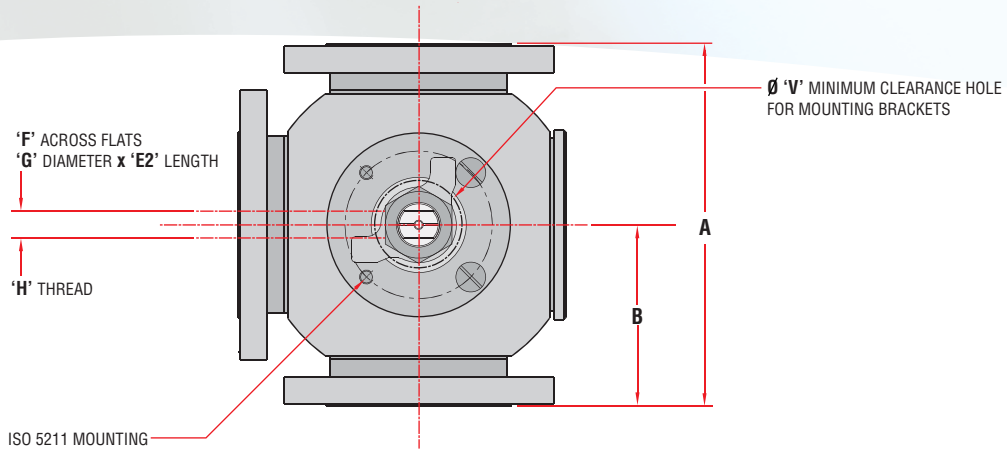
Valve Dimensions (Full Bore)

| VALVE SIZE B18 | VALVE SIZE 18 | PORT Ø MIN | FACE TO FACE OPTIONS | | | | | | | | | | C | D | E | STEM | | J | K | P | Q | V Ø | ISO 5211 Mounting | Approx. Weight Kg |
|-------------------|------------------|------------------|--------------------------------------|------------------------------|---------------------------------|--------------------------------------|------------------------------|---------------------------------|--------------------------------------|------------------------------|---------------------------------|--------------------------------------|--------------|------|----------------|------------------------------|-------|-------|------|------|------|--------|-------------------------|-------------------------|
| | | | A | | | B | | | B1 | | | | | | | F | H | | | | | | | |
| | | | CL150/ PN16 TABLE 19 COL. 8 | CL300 TABLE 19 COL. 12 | PN16 & PN40 DIN3202 F1 | CL150/ PN16 TABLE 19 COL. 8 | CL300 TABLE 19 COL. 12 | PN16 & PN40 DIN3202 F1 | CL150/ PN16 TABLE 19 COL. 8 | CL300 TABLE 19 COL. 12 | PN16 & PN40 DIN3202 F1 | CL150/ PN16 TABLE 19 COL. 8 | | | | CL300 TABLE 19 COL. 12 | A/F | | | | | | | |
| DN40 | DN50 | 37.0 | 165.0 | 190.0 | 200.0 | 82.5 | 95.0 | 100.0 | 82.5 | 105.5 | 100.0 | 69.6 68.8 | 42.8 40.4 | 10.6 | 14.00 13.85 | M20 X 1.5p | 136.5 | 225.0 | 58.3 | 64.3 | 53.5 | F07 | 12.0 | |
| DN50 | DN65 | 49.0 | 203.0 | 216.0 | 230.0 | 101.5 | 108.0 | 115.0 | 101.5 | 108.0 | 115.0 | 78.6 77.8 | 42.8 40.4 | 10.6 | 14.00 13.85 | M20 X 15.p | 145.5 | 225.0 | 73.1 | 72.8 | 53.5 | F07 | 19.5 | |

Series 18/B18 (Side Entry)

65-150mm B18 - Full Bore

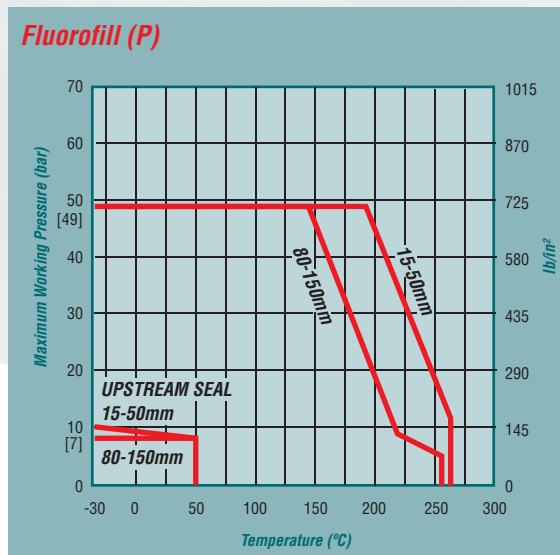
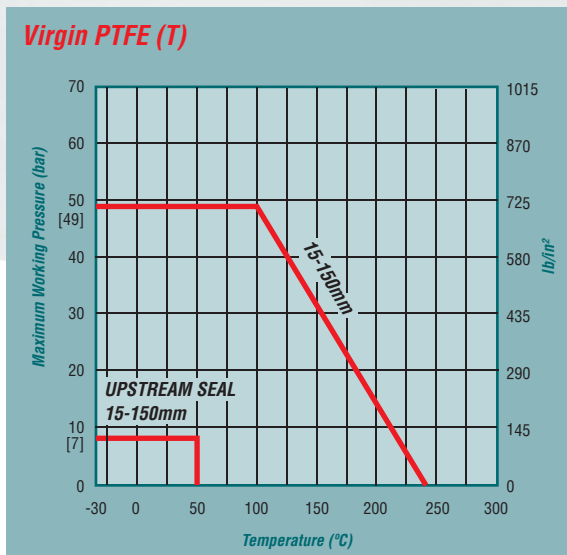
80-200mm 18 - Reduced Bore



Valve Dimensions (Full Bore)

| VALVE SIZE B18 | VALVE SIZE 18 | PORT Ø MIN | FACE TO FACE OPTIONS | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------------|------------------------------------|------------------------------------|-------------------------------------|------------------------------------|------------------------------------|-------------------------------------|------------------------------------|------------------------------------|-------------------------------------|------------------------------------|------------------------------------|----------------|--------|------|--------|-------|---------------|-------|--------|-------|--------|------|--------|-------------------------|-------------------------|
| | | | A | | | B | | | B1 | | | | | | | | | | | | | | | | |
| | | | CL150/ PN16 | CL300 | PN16 & PN40 | CL150/ PN16 | CL300 | PN16 & PN40 | CL150 | CL300 | PN16 & PN40 | C | D | E1 | E2 | F | STEM | | J | K | P | Q | V | ISO 5211 Mounting | Approx. Weight Kg |
| BS EN 558-2 TABLE 6 SERIES 12 | BS EN 558-2 TABLE 6 SERIES 4 | BS EN 558-1 TABLE 6 SERIES 1 | BS EN 558-2 TABLE 6 SERIES 12 | BS EN 558-2 TABLE 6 SERIES 4 | BS EN 558-1 TABLE 6 SERIES 1 | BS EN 558-2 TABLE 6 SERIES 12 | BS EN 558-2 TABLE 6 SERIES 4 | BS EN 558-1 TABLE 6 SERIES 1 | BS EN 558-2 TABLE 6 SERIES 12 | BS EN 558-2 TABLE 6 SERIES 4 | BS EN 558-1 TABLE 6 SERIES 1 | Ø | THREAD | Ø | THREAD | Ø | THREAD | Ø | THREAD | Ø | THREAD | Ø | THREAD | Ø | THREAD |
| DN65 | DN80 | 64.0 | 222.0 | 241.0 | 290.0 | 111.0 | 120.5 | 145.0 | 120.5 | 145.0 | 103.3 102.5 | 47.80 45.35 | 15.77 | 16.7 | 15.87 | 23.00 | 1"-14 UNS | 189.0 | 350.0 | 89.8 | 88.4 | 68.0 | F10 | 37.0 | |
| DN80 | DN100 | 75.0 | 241.0 | 283.0 | 310.0 | 120.5 | 141.5 | 155.0 | 120.5 | 141.5 | 113.3 112.5 | 47.80 45.35 | 15.77 | 16.7 | 15.87 | 23.00 | 1"-14 UNS | 199.0 | 350.0 | 105.2 | 97.8 | 68.0 | F10 | 47.0 | |
| DN100 | DN150 | 98.0 | 305.0 | 305.0 | 350.0 | 152.5 | 152.5 | 175.0 | 152.5 | 175.0 | 150.4 149.6 | 70.15 67.70 | 28.45 | 26.4 | 23.8 | 35.30 | 1½"-12 UNF | 280.4 | 850.0 | 125.3 | 112.3 | 82.0 | F12 | 83.0 | |
| DN150 | DN200 | 148.0 | 394.0 | 403.0 | 480.0 | 197.0 | 201.5 | 240.0 | 197.0 | 201.5 | 186.8 186.0 | 70.70 68.25 | 28.45 | 26.4 | 23.8 | 35.30 | 1½"-12 UNF | 317.4 | 850.0 | 163.0 | 175.7 | 82.0 | F12 | 168.0 | |

Pressure Temperature Ratings



Notes

- Both 90° and 180° can be actuated pneumatically or electrically.
- Alternative seat/seal materials are available.
- Installation, Operating and Maintenance Instructions are supplied with products and are also available on request.
- Some flanges have tapped bolt holes.
- If required, dissimilar flange materials to body can be supplied.
- Non preferred face to face dimensions can be accommodated.
- B18 Full bore series sizes quoted. For 18 series reduced bore, use one size up (i.e. 15mm B18 = 20mm 18)
- The bottom port of ½" to 2" B19 Series is a fabricated (welded) construction.

Flow Coefficients

| Valves Size (Full Bore) | | Straight Through Flow | | 90° Branch | | Double 'X' | |
|-------------------------|----|-----------------------|------|------------|-----|------------|-----|
| mm | in | Cv | Kv | Cv | Kv | Cv | Kv |
| 15 | ¼ | 10 | 9 | 6 | 5 | 4 | 3 |
| 20 | ½ | 24 | 21 | 14 | 12 | 8 | 7 |
| 25 | 1 | 44 | 38 | 25 | 22 | 16 | 14 |
| 40 | 1½ | 104 | 90 | 60 | 52 | 38 | 33 |
| 50 | 2 | 194 | 169 | 112 | 97 | 71 | 62 |
| 65 | 2½ | 311 | 269 | 180 | 156 | 124 | 107 |
| 80 | 3 | 449 | 390 | 259 | 196 | 160 | 139 |
| 100 | 4 | 820 | 713 | 474 | 412 | 280 | 243 |
| 150 | 6 | 1965 | 1708 | 1135 | 986 | 658 | 571 |

CV - Flow in US GPM Pressure - psi
Kv - Flow in M³/hr Pressure - bar

Standards of Compliance

| | |
|---|---|
| Testing | Valves are tested to the requirements of BS 6755 Part 1 in the downstream sealing mode and are firesafe to external leakage requirement of BS 6755 Part 2 |
| Face to Face Dimensions (of 2 opposing flanges on a 3-way valve) (See Note 6) | BS EN 558-2 Table 6 ISO 5752 - Table 6 ASME B16.10 - Tables 1 and 2 API 6D - Table 4.3 DIN 3202 - Table 5.1 |
| Flange dimensions (See Note 4) | BS EN 1759 Class 150/Class 300 BS EN 1092 PN 10/16/25/40 |

NOTE:

Stainless steel valves are CE Marked in accordance with the Pressure Equipment Directive 97/23/EC, conformity assessment Module H and are classified in Category III (not end of line duty). Carbon steel valves are classified as SEP (Sound Engineering Practice) and, in accordance with the Pressure Equipment Directive, are not CE Marked. These valves may be used within the limitations defined in Annex II of the Directive.

The Series 18/19



Non-Flanged Ends*

In addition to slip flanges, the Series 18/19 can be supplied with a variety of end connections including socket weld and butt weld to suit customer requirements, screwed ends threaded to BSP and NPT, as well as tri-clamp ends and others.

*Please note, these are not available in all sizes, for further information on connection configuration, consult Flowserve Worcester Controls.



High Integrity Option

This configuration incorporates Worcester's unique dual sealing 'Enviro-Safe' stem assembly specifically designed for use on toxic, polluting and expensive media.



Size Range

Shown here is the 150mm (6") full bore multi-way valve compared with the 20mm (¾") size.



Special Materials

The flexibility of this product is further enhanced by the variety of materials of construction which, amongst others, includes Nickel Aluminium Bronze (shown opposite), Hastelloy, Titanium, Duplex etc.



Special Adaptions

Special variants of the product, such as a bleed valve to facilitate draining, can be fitted to the valve. Other adaptations can be readily accommodated.



Actuated Multi-Way

To complement the Series 18/19 range, Norbro offer pneumatic and electric actuators which can provide both 90° and 180° operation as standard with other options available.

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Due to continuous development of our product range, we reserve the right to alter the dimensions and information contained in this leaflet as required. Information given in this leaflet is made in good faith and based upon specific testing but does not, however, constitute a guarantee.



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