FLOWSERVE

# Worcester 18/19 Series
## Modular Multi-Way Ball Valves

*Experience In Motion*

# The Modular Approach To Flexibility

As part of Worcester's policy of continuous product development, the modular Series 18/19 multi-way valve has been introduced to satisfy 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 new, unique valve design is based on a modular principle which offers almost unlimited flow permutations. In addition, the Series 18/19 is offered as either a high integrity valve for toxic media, or with retro-fitting steam jackets.

## Size Range

The Series 18/19 is available in 17 sizes ranging from 15mm (½") to 150mm (6") full and reduced bore.

## Body Style

Series 18 - Side Entry Configuration (B18 = Full Bore, 18 = Reduced Bore)
Series 19 - Bottom Entry Configuration (B19 = Full Bore, 19 = Full 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 Series 18/19 can also be used for pig loading, as a compact 90º corner valve and for by-pass operations.

Typical media include chemicals, filtrates, fuel oil, hot water, air, fats, gasolene, chocolate mass, toothpaste, sugar, tobacco, photographic emulsion 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.

For further information, consult Worcester Controls.

## 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 180º (see below).

## Seats

A range of seat materials can be supplied to accommodate various media and pressure/temperature conditions. Worcester is probably unique in the British valve industry in manufacturing all its own soft seats, thereby retaining full control over quality.

## 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 now 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.

# Application Limitations

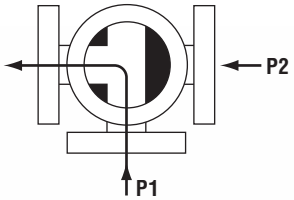
## Cross Contamination

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 cannot be tolerated.

## 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 Worcester Controls.

Upstream Sealing
(TA1 configuration shown)



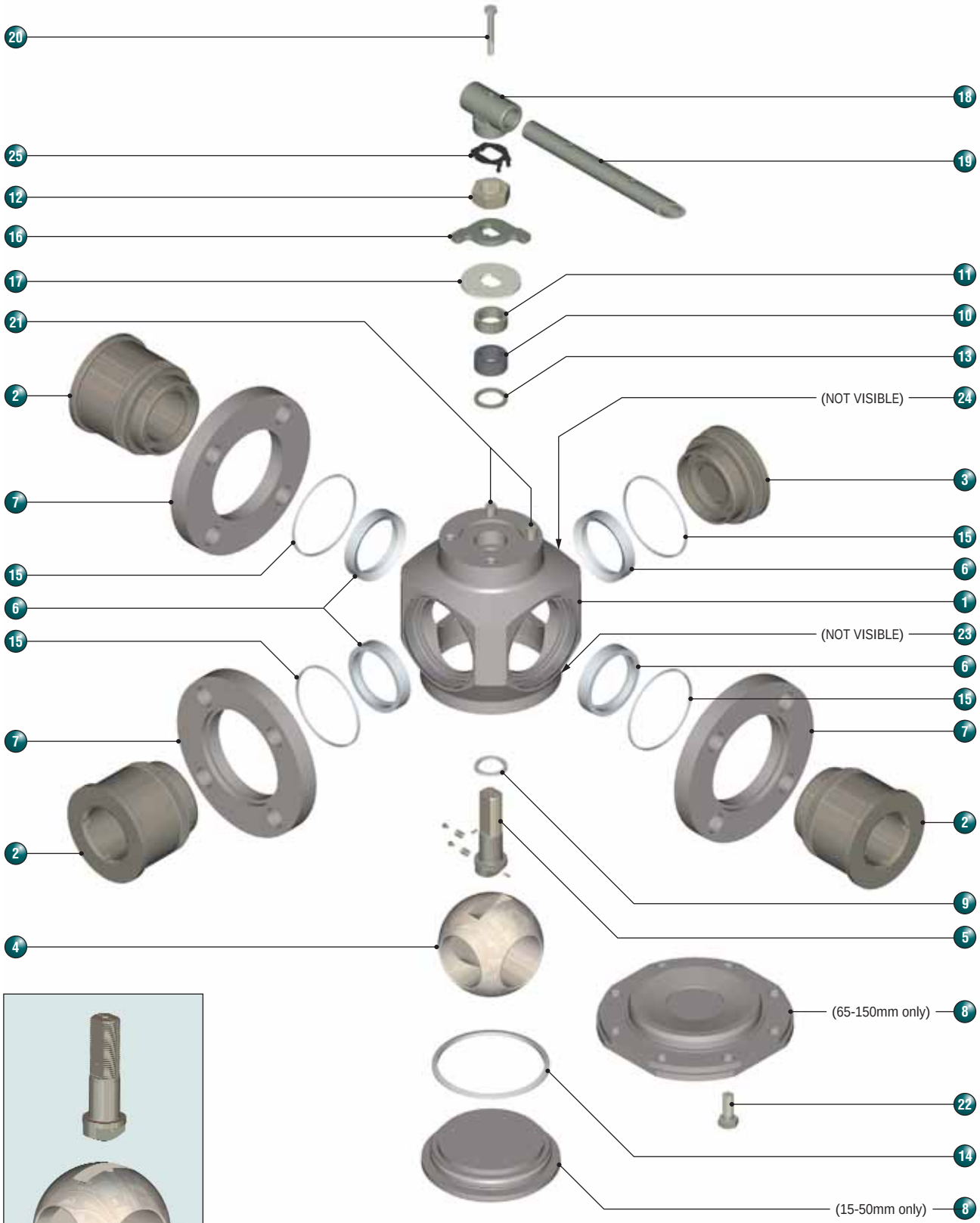


## Features

## Benefits

| 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 |

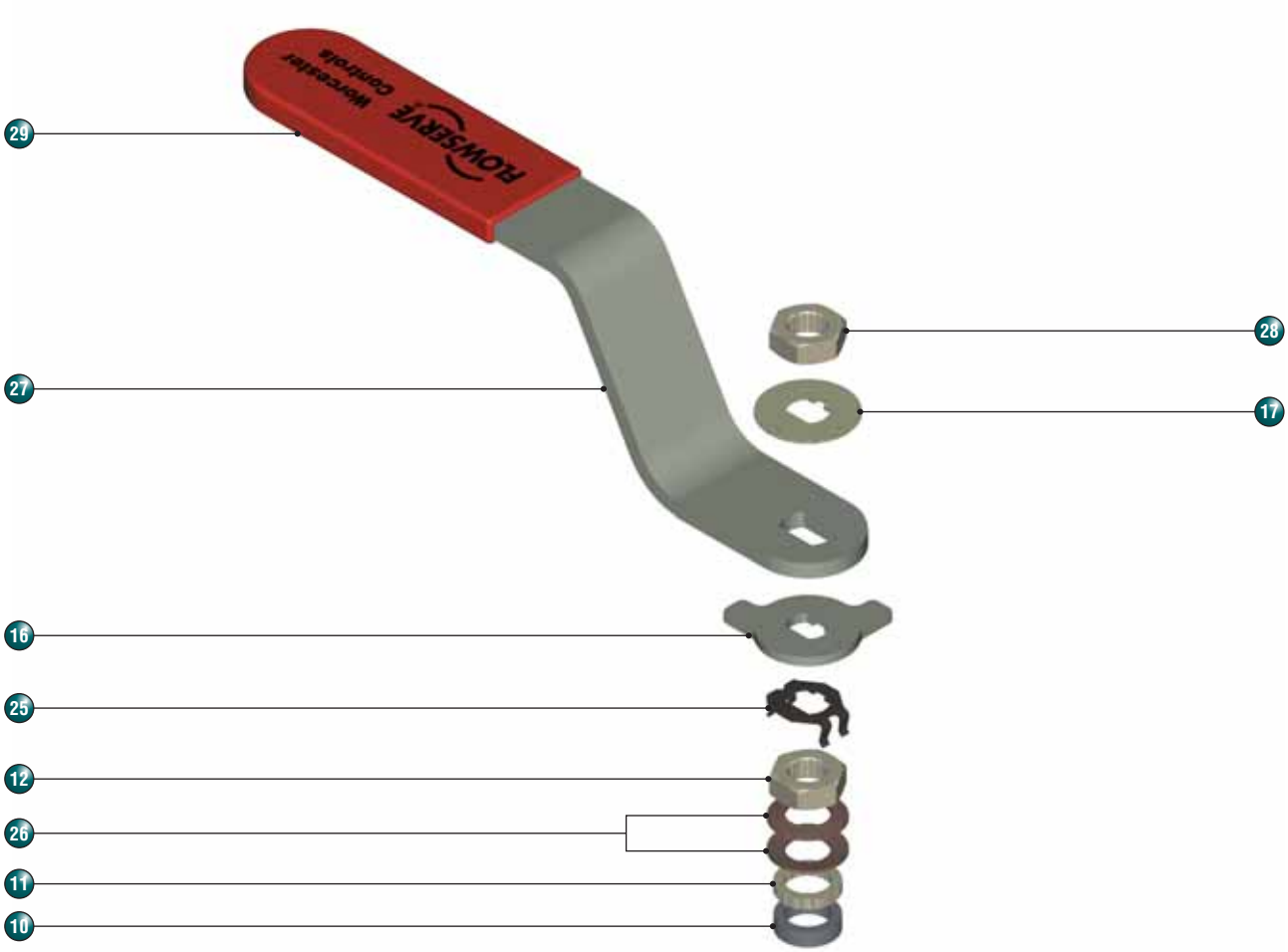
## B18 Series






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

## 15-25mm Wrench / Stem Assembly




## Part / Materials List

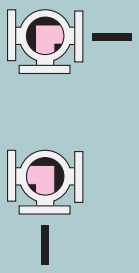
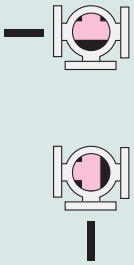
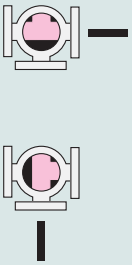
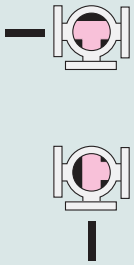
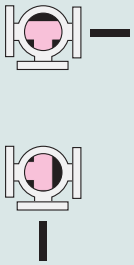
| ITEM | DESCRIPTION | MATERIAL |
|---|---|---|
| 1 | Body | Stainless Steel 316<br>Carbon Steel BS 970 070M20 |
| 2 | Flange Port Insert | Stainless Steel 316<br>Carbon Steel BS 970 070M20 |
| 3 | Blank Port Insert | Stainless Steel 316<br>Carbon Steel BS 970 070M20 |
| 4 | Ball | Stainless Steel 316 |
| 5 | Stem | Stainless Steel 316 |
| 6* | Seat Ring | PTFE Virgin (T)<br>Fluorofill (P) |
| 7 | Slip Flange | Stainless Steel 316<br>Carbon Steel BS 970 070M20 |
| 8 | Ball Assembly Plate | Stainless Steel 316<br>Carbon Steel BS 970 070M20 |
| 9* | Stem Thrust Seal | PTFE 25% Glass Filled |
| 10* | Gland Packing (See Notes) | Flexible Graphite |
| 11 | Gland | Stainless Steel 316 |
| 12* | Gland Nut | Stainless Steel 316<br>Carbon Steel BS 970 070M20 |
| 13 | Stem Location Ring<br>(80-150mm only) | Stainless Steel 316 |
| 14* | Ball Assembly Plate Seal | Flexible Graphite |

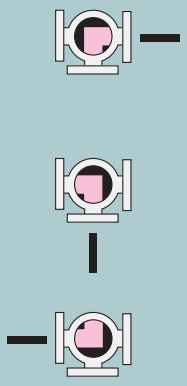
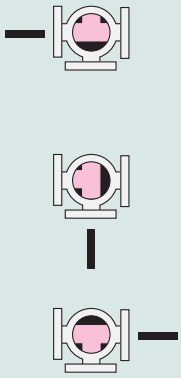
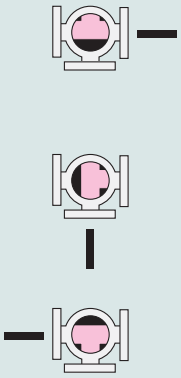
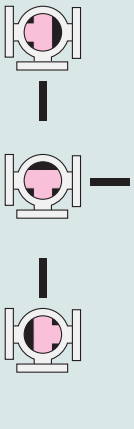
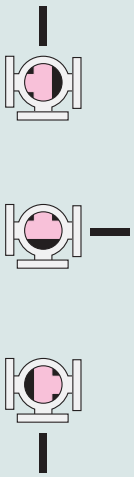
| ITEM | DESCRIPTION | MATERIAL |
|---|---|---|
| 15* | Flange Port Insert Seal | Flexible Graphite |
| 16 | Stop Plate | Stainless Steel 304<br>Carbon Steel BS 1449 CS4 |
| 17 | Flow Indicator | Stainless Steel 321 |
| 18 | Wrench Head | Malleable Iron Rustproofed |
| 19 | Wrench Tube | Carbon Steel Rustproofed |
| 20 | Wrench Bolt | Stainless Steel BS 6105 A4-80 |
| 21 | Stop Pin | Stainless Steel 316<br>Carbon Steel BS 970 220M07 |
| 22 | Hex Head Screw<br>(80-150mm only) | Stainless Steel BS 6105 A4-80<br>Carbon Steel BS 3692 GR 8.8 |
| 23 | Identification Plate | Stainless Steel 304 |
| 24 | Body Plate | Stainless Steel 304 |
| 25 | Gland Nut Locking Clip | Spring Steel |
| 26* | Disc Springs | Stainless Steel 302 |
| 27 | Wrench | Carbon Steel Rustproofed |
| 28 | Wrench Nut | Stainless Steel 316 |
| 29 | Wrench Sleeve | Vinyl Plastisol |

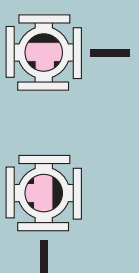
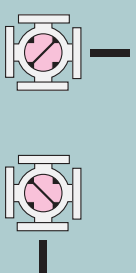
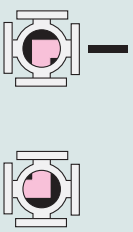
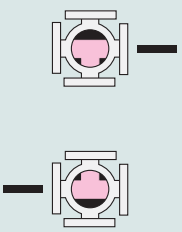
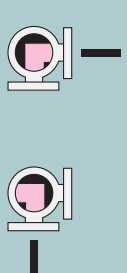
* Items marked thus denote component supplied in repair kit

**Notes:** For 15-50mm valves, one gland packing is used.
For 65-150mm valves, two are used.

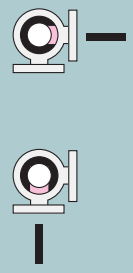
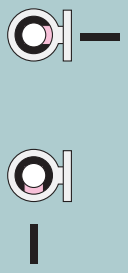
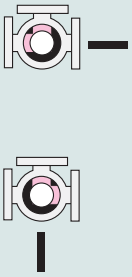
## *18 Series Multi-Way Side Entry (Plan View)*

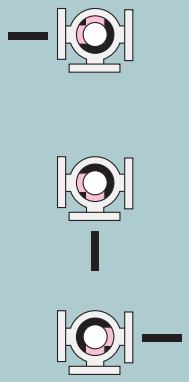
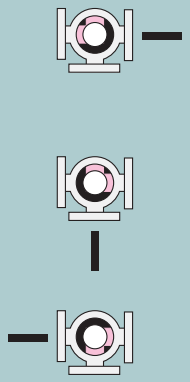
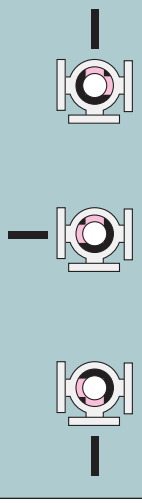
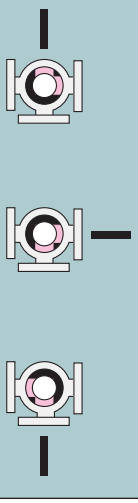
| 90° Options | | | | |
|---|---|---|---|---|
| 'L' Port | 'T' Port | | | |
| LA 1 | TA 1 | TA 2 | TA 3 | TA 4 |
|  |  |  |  |  |

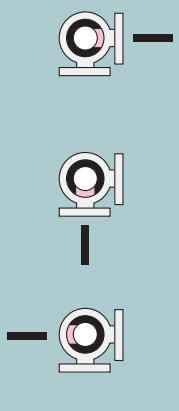
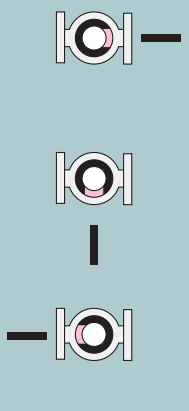
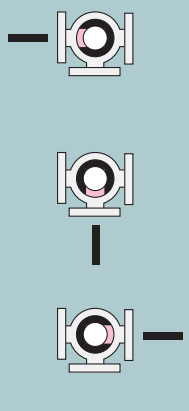
| 180° Options | | | | |
|---|---|---|---|---|
| 'L' Port | 'T' Port | | | |
| LB 1 | TB 1 | TB 2 | TB 3 | TB 4 |
|  |  |  |  |  |

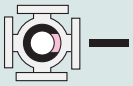
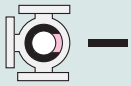
| 90° Options | | 180° Options | | 90° Options |
|---|---|---|---|---|
| 'T' Port | 'X' Port | 'L' Port | 'T' Port | 'L' Port 90° |
| TA 5 | XA 1 | LB 2 | TB 5 | LA 2 |
|  |  |  |  |  |

## 19 Series Multi-Way Bottom Entry (Plan View)

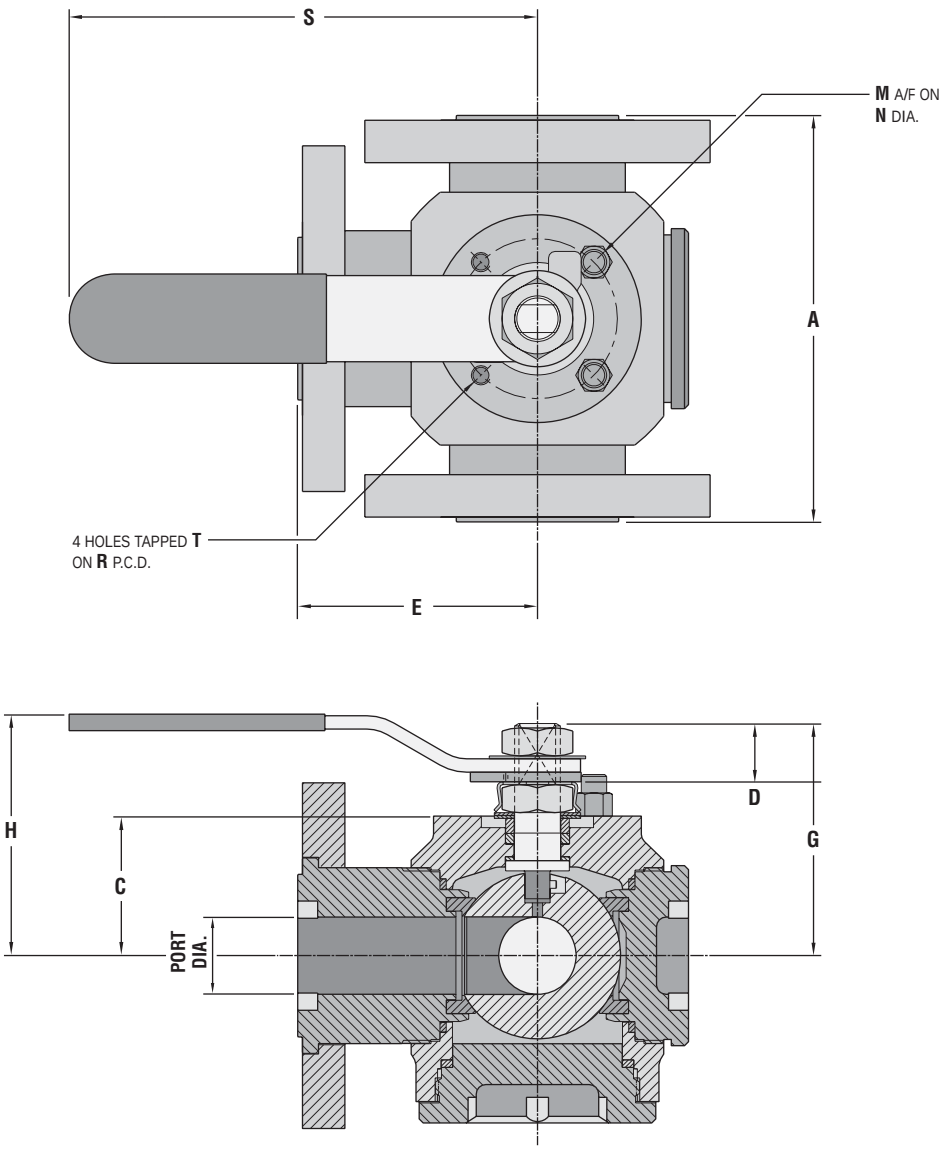
| 90° Options | | | |
|---|---|---|---|
| 'L' Port | | 'T' Port | |
| LA 1 | LA 2 | TA 1 | TA 2 |
|  |  |  |  |

| 180° Options | | | |
|---|---|---|---|
| 'T' Port | | | |
| TB 1 | TB 2 | TB 3 | TB 4 |
|  |  |  |  |

| 180° Options | | |
|---|---|---|
| 'L' Port | | |
| LB 1 | LB 2 | LB 3 |
|  |  |  |

| 360° Options | |
|---|---|
| 'L' Port | |
| LD 1 | LD 2 |
|  *Each Port in Sequence* |  *Each Port in Sequence* |

## *Series B18 (Side Entry)*
## *15-25mm*

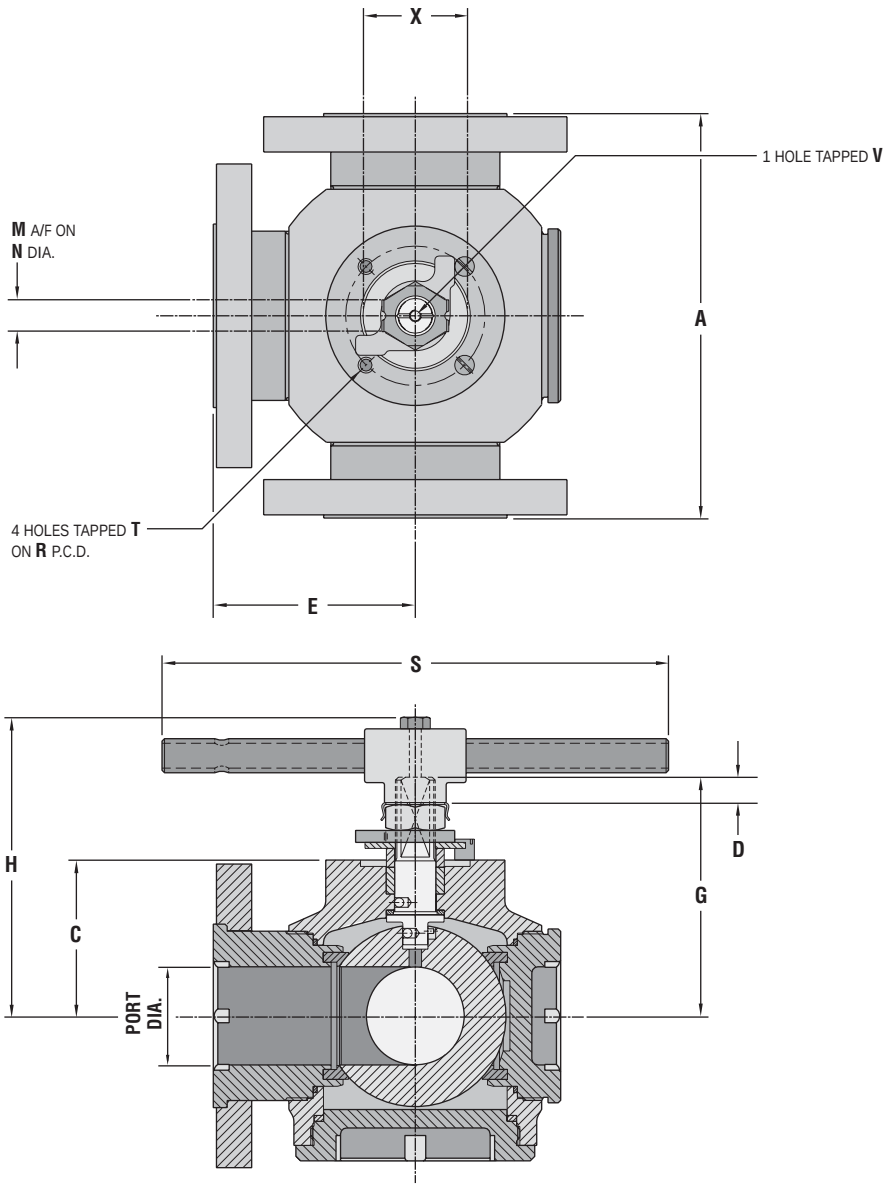



## *Valve Dimensions (Full Bore)*

| Valve Size | Port Dia. | A ANSI Cl. 150 | A ANSI Cl. 300 | A DIN | C | D Min. | E ANSI Cl. 150 | E ANSI Cl. 300 | E DIN | G | H | M Max. | N | R P.C.D. | S | T | Approx. Weight (kg) Cl. 150 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 12.5 | 108.0 | 140.0 | 130.0 | 29.7 | 15.0 | 70.0 | 70.0 | 65.0 | 53.0 | 112.0 | 7.54 | 11.1 | 42.0 | 167.0 | M5x 7.5DP | 5.0 |
| 20 | 17.0 | 117.0 | 152.0 | 150.0 | 34.2 | 15.0 | 58.5 | 76.0 | 75.0 | 57.5 | 116.5 | 7.54 | 11.1 | 42.0 | 167.0 | M5x 7.5DP | 6.0 |
| 25 | 24.0 | 127.0* | 165.0 | 160.0 | 43.6 | 18.2 | 75.0 | 82.5 | 80.0 | 72.6 | 117.9 | 8.71 | 14.3 | 50.0 | 193.0 | M6x 8.7DP | 7.0 |

* Indicates tapped holes in all flanges

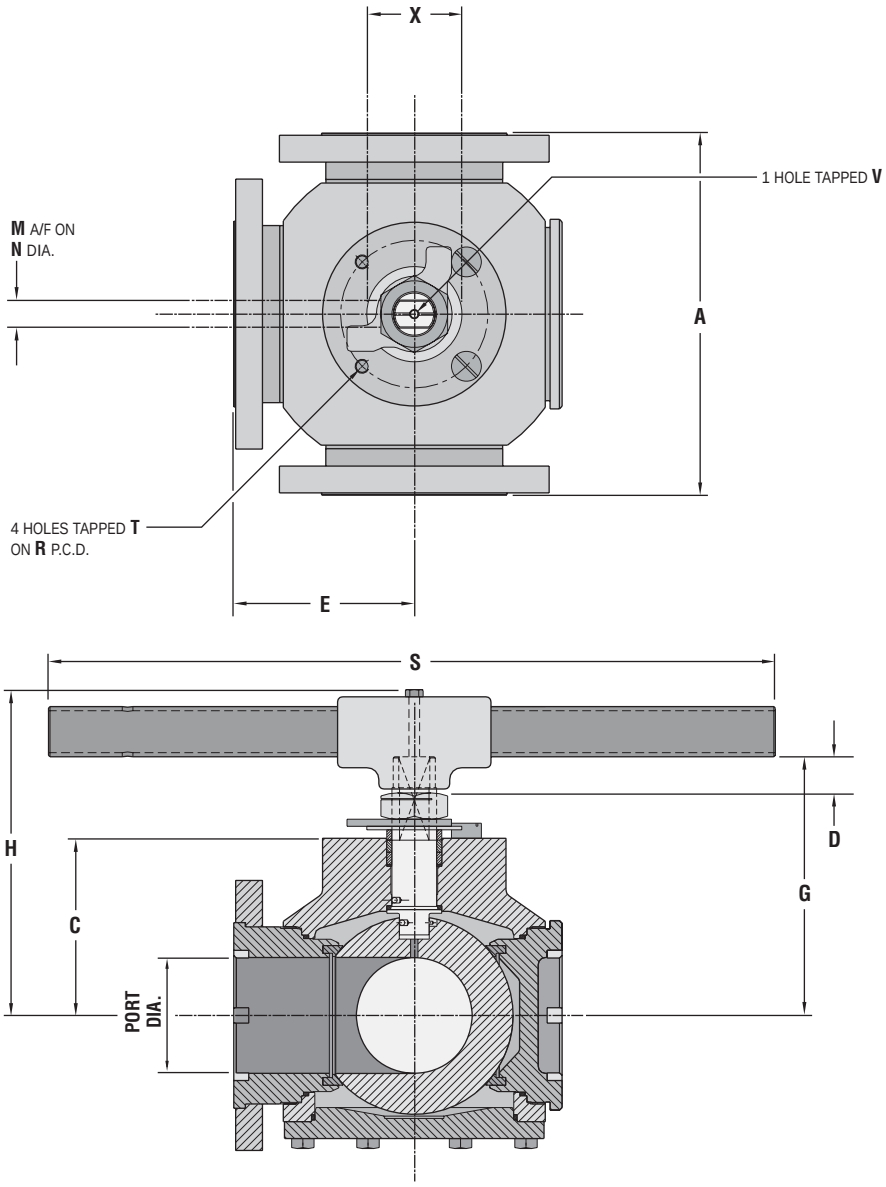
## Series B18 (Side Entry)
## 40-50mm




## Valve Dimensions (Full Bore)

| Valve Size | Port Dia. | A ANSI Cl. 150 | A ANSI Cl. 300 | A DIN | C | D Min. | E ANSI Cl. 150 | E ANSI Cl. 300 | E DIN | G | H | M Max. | N | R P.C.D. | S | T | V | X | Approx. Weight (kg) Cl. 150 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 37.0 | 165.0 | 190.0 | 200.0 | 69.2 | 11.1 | 82.5 | 105.0 | 100.0 | 110.9 | 138.8 | 14.0 | 20.0 | 70.0 | 256.0 | M8x 14DP | M6x 10DP | 52.5 | 12.0 |
| 50 | 49.0 | 203.0 | 216.0 | 230.0 | 78.2 | 11.1 | 101.5 | 108.0 | 115.0 | 119.8 | 147.7 | 14.0 | 20.0 | 70.0 | 256.0 | M8x 14DP | M6x 10DP | 52.5 | 19.0 |

## *Series B18 (Side Entry)*
## *65-150mm*



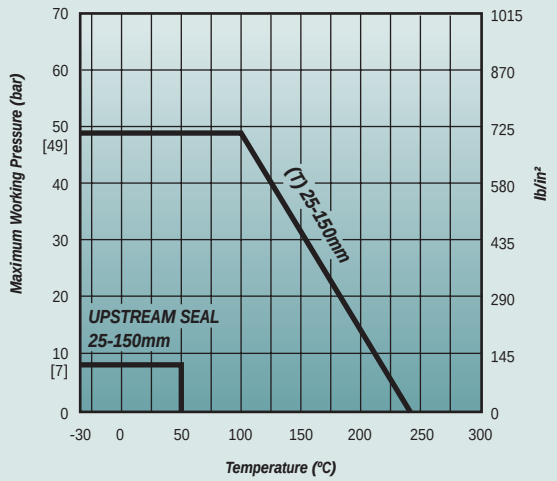

## *Valve Dimensions (Full Bore)*

| Valve Size | Port Dia. | A ANSI Cl. 150 | A ANSI Cl. 300 | A DIN | C | D Min. | E ANSI Cl. 150 | E ANSI Cl. 300 | E DIN | G | H | M Max. | N | R P.C.D. | S | T | V | X | Approx. Weight (kg) Cl. 150 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 65 | 64.0 | 222.0* | 241.0* | 290.0 | 102.9 | 26.0 | 120.0 | 130.0 | 145.0 | 149.6 | 190.0 | 15.82 | 23.0 | 102.0 | 400.0 | M10x 16DP | M6x 9DP | 67.0 | 30.0 |
| 80 | 75.0 | 241.0* | 283.0 | 310.0 | 112.9 | 20.0 | 120.5 | 141.5 | 155.0 | 159.6 | 200.0 | 15.82 | 23.0 | 102.0 | 400.0 | M10x 16DP | M6x 9DP | 67.0 | 47.0 |
| 100 | 98.0 | 305.0 | 305.0* | 350.0 | 150.0 | 32.7 | 152.5 | 175.0 | 175.0 | 219.0 | 275.0 | 23.75 | 36.0 | 125.0 | 916.0 | M12x 20DP | M8x 11DP | 81.0 | 84.0 |
| 150 | 148.0 | 394.0 | 403.0* | 480.0 | 187.0 | 32.7 | 197.0 | 201.5 | 240.0 | 256.0 | 312.0 | 23.75 | 36.0 | 125.0 | 916.0 | M12x 20DP | M8x 11DP | 81.0 | 160.0 |

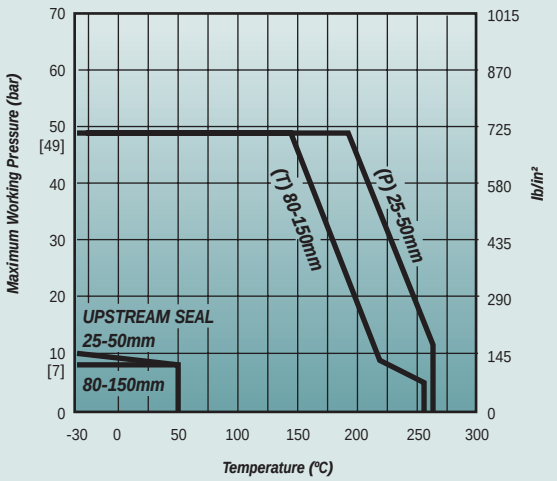
* Indicates tapped holes in all flanges

## Pressure Temperature Ratings

### Virgin PTFE (T)




### Fluorofill (P)




## Notes

1. Both 90º and 180º can be actuated pneumatically or electrically.
2. Alternative seat/seal materials are available.
3. Installation, Operating and Maintenance Instructions are available on request.
4. Some flanges have tapped bolt holes.
5. If required, dissimilar flange materials to body can be supplied.
6. Non preferred face to face dimensions can be accommodated.
7. All sizes shown are for full bore B18/19 Series valves. For reduced bore use one size down, i.e. 1" reduced bore use ¾" dimensions.
8. The bottom port of ½" to 2" B19 Series is a fabricated (welded) construction.

## Standards of Compliance

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

## Flow Coefficients

| Valve Size (Full Bore) | | Straight Through Flow | | 90° Branch | | Double 'L' | |
|---|---|---|---|---|---|---|---|
| mm | in | Cv | Kv | Cv | Kv | Cv | Kv |
| 25 | 1 | 44 | 38 | 25 | 22 | 16 | 14 |
| 40 | 1½ | 104 | 90 | 60 | 52 | 38 | 33 |
| 50 | 2 | 194 | 169 | 112 | 97 | 71 | 62 |
| 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

## The Series 18/19

### Butt Weld 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.

### 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.

### Aluminium Bronze

The flexibility of this product is further enhanced by the variety of materials of construction which, amongst others, includes 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 90º and 180º operation as standard with other options available.

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