# Высокочистые пластиковые мембранные клапаны 600HP/677HP/690HP
# Технические характеристики


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# High Purity Diaphragm Valve, Plastic

## Construction

The 600 HP 2/2 way valve has a low maintenance piston actuator which can be controlled by inert gases. It has a stroke limiter, a manual override and an integral optical position indicator as standard. Normally Closed, Normally Open and Double Acting control functions are available.

## Features

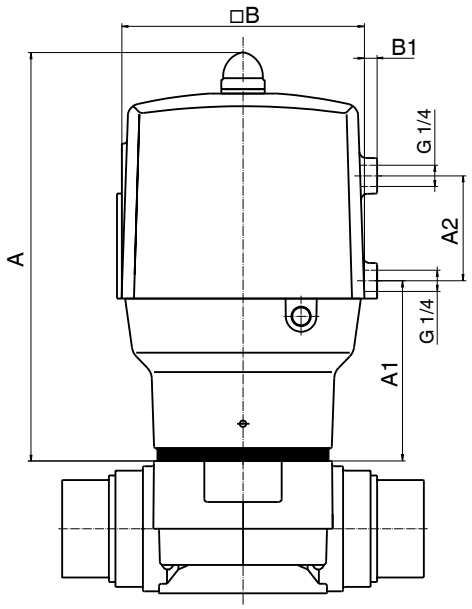
- Suitable for inert and corrosive* liquid and gaseous high purity media
- All medium wetted parts and the housing are made of high quality plastic materials
  - Valve body: PFA-Inliner/PVDF-Outliner (carbon-filled)
  - Diaphragm material: PTFE/EPDM
  - Actuator: PP glass fibre reinforced
- Control connection in flow direction as standard, therefore installation in restricted spaces possible
- Manufactured under cleanroom conditions

## Advantages

- Good $K_V$ value
- Minimal deadleg
- Optional flow direction, will seal in either flow direction up to full working pressure
- Due to its design particularly suitable for polishing agents and slurries
- Optional mounting position
- Optional accessories
- - Electrical position indicator with microswitches or proximity switches - Pneumatic or electro-pneumatic positioners
  - Control air adapter for pilot valves according to Namur

* see information on working medium on page 2

## Actuator dimensions [mm / inch]




| DN | A | A1 | A2 | □ B | B1 |
|---|---|---|---|---|---|
| 40 | 192 / 7.56 | 93 / 3.66 | 65 / 2.56 | 125 / 4.92 | 9 / 0.35 |
| 50 | 230 / 9.06 | 110 / 4.33 | 65 / 2.56 | 150 / 5.91 | 8 / 0.31 |

**600HP**

## Technical data

### Working medium

Corrosive, inert, gaseous and liquid media which have no negative impact on the physical and chemical properties of the body and diaphragm material.

### Working temperature

Max. 90°C (194°F), higher temperatures upon request

depending on working pressure

### Control medium

Inert gases

Required control pressure — see table below

Max. perm. temperature of control medium — 40°C

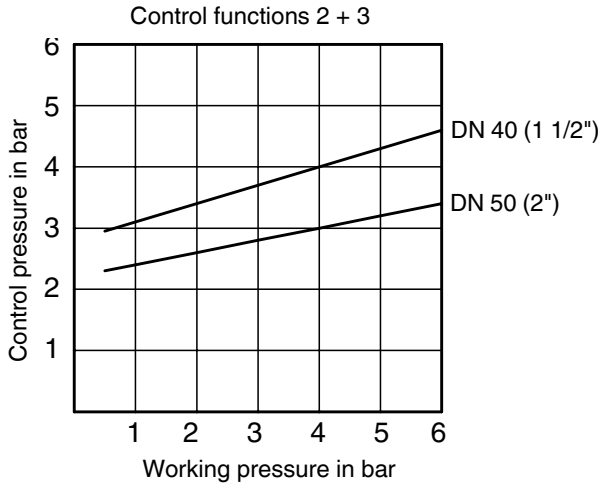
### Ambient temperature

60°C (140°F)

| Nominal size | Control function 1 | | Control functions 2+3 | | Kv value | Cv value | Weight |
|---|---|---|---|---|---|---|---|
| | Operating pressure | Control pressure | Working pressure | Control pressure | [$m^3/h$] | [US gal/min] | [kg] |
| 1 1/2” pipe DN 40 | 0 - 6 bar | 5 - 6 bar | 0 - 6 bar | max. 5 bar* | 25.0 | 29.3 | 4.3 |
| 2” pipe DN 50 | | | | | 46.0 | 53.8 | 7.4 |

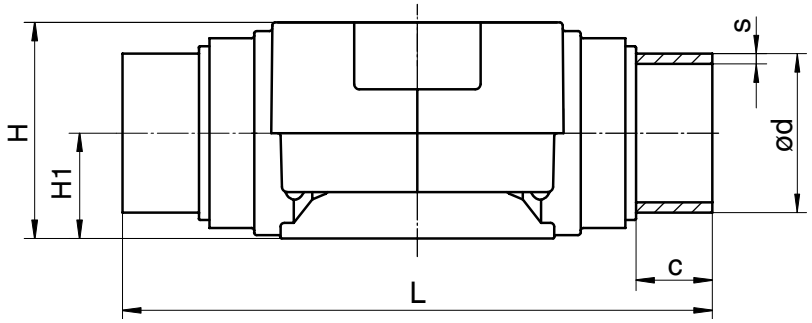
All pressures are given as gauge pressures.. *see diagram below

### Control pressure characteristic DN 40 (1 1/2”) and DN 50 (2”)




## Body dimensions [mm / inch]

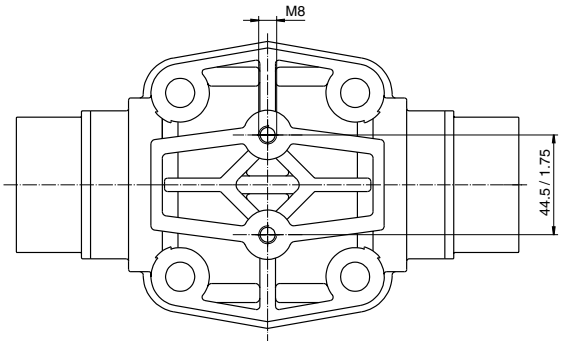
### Imperial butt weld spigots , connection code 30




| DN | NPS | H1 | L | H | ød | c | Weight [kg] |
|---|---|---|---|---|---|---|---|
| 40 | 1 1/2” | 23.2 | 194 | 63.2 | 48.3 | 35 | 0.50 |
| 50 | 2” | 23.2 | 224 | 63.2 | 60.3 | 40 | 0.57 |

## Dimensions [mm / inch]

### Mounting holes DN 40 (1 1/2”) und DN 50 (2”)




### Order data

| Nominal size | Code |
|---|---|
| 1 1/2” pipe DN 40 | 40 |
| 2” pipe DN 50 | 50 |

| Body configuration | Code |
|---|---|
| Straight through | D |

| Connection | Code |
|---|---|
| Imperial butt weld spigots (DIN length) | 30 |

| Valve body material | Code |
|---|---|
| PFA-Inliner/PVDF-Outliner (carbon filled) | 23 |

| Diaphragm material | Code |
|---|---|
| PTFE/EPDM | 5E |

| Control function | Code |
|---|---|
| Normally closed | 1 |
| Normally open | 2 |
| Double acting (upon request) | 3 |

| Operator version | Code |
|---|---|
| Actuator size 3/N (DN 40) | 3/N |
| Actuator size 4/N (DN 50) | 4/N |

| High Purity design | Code |
|---|---|
| High Purity | HP |

| Order example | 600 | 50 | D | 30 | 23 | 5E | 1 | 4/N | HP |
|---|---|---|---|---|---|---|---|---|---|
| Type | 600 | | | | | | | | |
| Nominal size (code) | | 50 | | | | | | | |
| Body configuration (code) | | | D | | | | | | |
| Connection (code) | | | | 30 | | | | | |
| Valve body material (code) | | | | | 23 | | | | |
| Diaphragm material (code) | | | | | | 5E | | | |
| Control function (code) | | | | | | | 1 | | |
| Antriebsausführung (Code) | | | | | | | | 4/N | |
| High Purity design (code) | | | | | | | | | HP |

## Other HP valves

**677 HPW**

***CleanStar® C60***

***CleanStar® C60/C67***

***CleanStar® C67***

# High Purity diaphragm valve, plastic

## Construction

The 677 HP 2/2-way valve has a low maintenance manual operator. It is equipped with an ergonomically designed handwheel and an integral optical position indicator. The medium wetted parts are made of PFA or PVDF (body) and PTFE (shut off diaphragm).

## Features

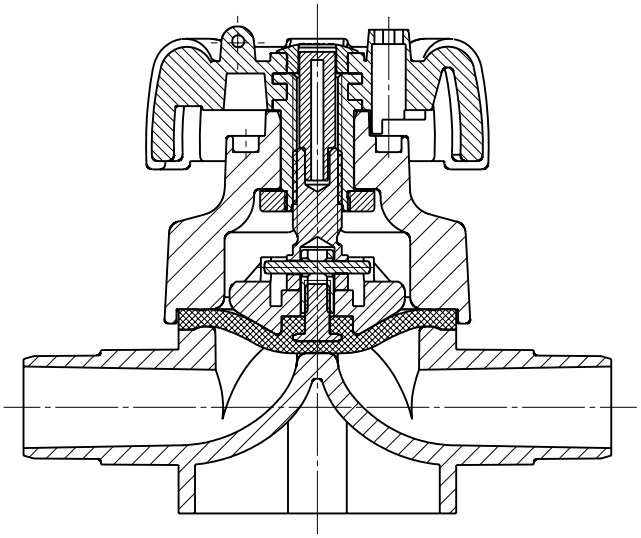
- Suitable for inert and corrosive* liquid and gaseous media, particularly high purity media
- All medium wetted parts and the housing are made of high-grade plastic.
- Operator: Glass fibre reinforced PP
- Nominal sizes DN 15 - DN 100 / NPS 1/2“ - NPS 4“
- Standard optical position indicator
- Assembled, tested and packaged under class 100 cleanroom conditions

## Advantages

- High $K_V$ value
- Minimal deadleg
- Optional flow direction, will seal in either flow direction up to full operating pressure
- Due to its design (diaphragm valve, i. e. soft flow deviation) particularly suitable for polishing agents and slurries
- Optional installation position
- Optional accessories
  - Electrical position indicator
  - Locking device

* see information on working medium on page 2

## Sectional view



**677 HP**

# Technical data

## Working medium

Corrosive, inert, gaseous and liquid media which have no negative impact on the physical and chemical properties of the body and diaphragm material.

## Working medium temperature

| | |
|---|---|
| Valve body PVDF | -20 to 120 °C |
| Valve body PFA | -10 to 90 °C |

The permissible operating pressure depends on the working medium temperature

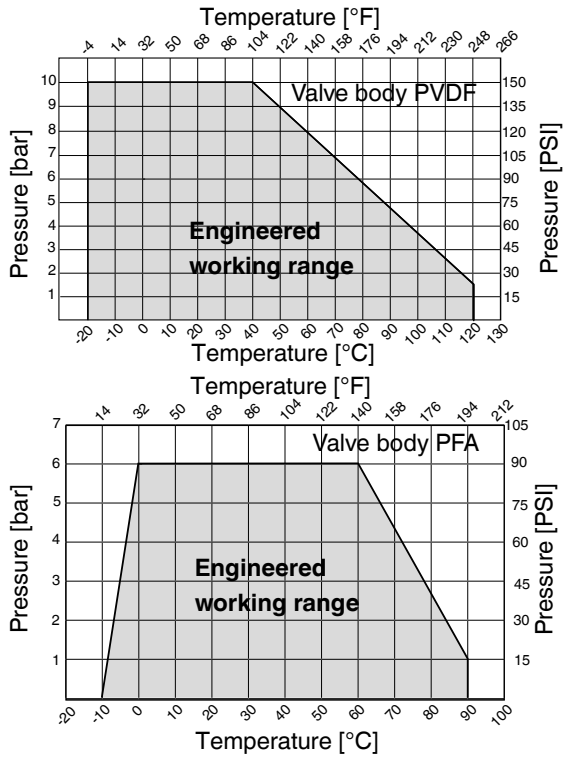
## Ambient temperature

| | |
|---|---|
| Valve body PVDF, PFA | -10 to 60 °C |

## Operating pressure

| | |
|---|---|
| Valve body PVDF | max. 10 bar applied upstream |
| Valve body PFA | max. 6 bar applied upstream |

## Temperature / pressure diagram




### Information on the use of diagram

The temperature / pressure diagram is only an orientation aid. The data refer to water as a working medium. A change of operating conditions or other media may result in deviations. In case of doubt it is advisable to test the behavior of the material under the definitive operating conditions by means of a test installation.

## Kv values / Weight - 2/2-way valves

| DN | Kv value [l/min] | Cv value [USgal/min] | Weight [kg] |
|---|---|---|---|
| 15 | 93 | 6.51 | 0.7 |
| 20 | 137 | 9.59 | 0.7 |
| 25 | 175 | 12.25 | 0.7 |
| 32 | 300 | 21.00 | 1.4 |
| 40 | 417 | 29.19 | 1.4 |
| 50 | 767 | 53.69 | 2.4 |
| 65 | 1300 | 91.00 | 7.3 |
| 80 | 2000 | 140.00 | 7.3 |
| 100 | 3150 | 220.50 | 9.0 |

The above values are valid for both flow directions. All pressures are gauge pressures. Operating pressure values were determined with static operating pressure applied on one side of a closed valve. Sealing at the valve seat and atmospheric sealing is ensured for the given values. Information on operating pressures applied on both sides and for high purity media on request. Kv values determined acc.to IEC 534 standard. inlet pressure 6 bar. Δp 1 bar.
PVC-U valve body and soft elastomer diaphragm.

## Kv values - T valves

| DN2 Pipe | DN1 Spigot | Kv value [l/min] | Cv value [USgal/min] |
|---|---|---|---|
| 15 | 15 | 80 | 5.60 |
| 20 | 15 | 82 | 5.74 |
| 20 | 20 | 114 | 7.98 |
| 25 | 15 | 83 | 5.81 |
| 25 | 20 | 117 | 8.19 |
| 25 | 25 | 148 | 10.36 |
| 32 | 15 | 85 | 5.95 |
| 32 | 25 | 153 | 10.71 |
| 32 | 32 | 385 | 26.95 |
| 40 | 15 | 87 | 6.09 |
| 40 | 20 | 122 | 8.54 |
| 40 | 25 | 150 | 10.50 |
| 40 | 40 | 500 | 35.00 |
| 50 | 15 | 93 | 6.51 |
| 50 | 20 | 133 | 9.31 |
| 50 | 25 | 157 | 10.99 |
| 50 | 32 | 397 | 27.79 |
| 50 | 40 | 505 | 35.35 |
| 50 | 50 | 540 | 37.80 |
| 65 | 32 | 340 | 23.80 |
| 65 | 50 | 550 | 38.50 |
| 80 | 15 | 87 | 6.09 |
| 80 | 20 | 132 | 9.24 |
| 80 | 25 | 145 | 10.15 |
| 80 | 32 | 327 | 22.89 |
| 80 | 40 | 441 | 30.87 |
| 80 | 50 | 552 | 38.64 |
| 100 | 32 | 327 | 22.89 |
| 100 | 40 | 441 | 30.87 |
| 100 | 50 | 552 | 38.64 |

## Pressure / temperature correlation

| Temperature [°C] | | -30 | -20 | -10 | 0 | 5 | 10 | 20 | 25 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Valve body material** | | **Permissible operating pressure [bar]** | | | | | | | | | | | | | | | | | |
| PVDF | Code 20 | - | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 8.9 | 7.9 | 6.8 | 5.9 | 4.5 | 3.1 | 2.1 | 1.5 |
| PFA | Code 23 | - | - | - | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 4.5 | 2.8 | 1 | - | - | - |

Data for extended temperature ranges on request. Please note that the ambient temperature and medium temperature generate a combined temperature at the valve body which must not exceed the above values.

## Order data

| Body configuration | Code |
|---|---|
| 2/2-way | D |
| T body (only valve body material PVDF) | T |

| Connection | Code |
|---|---|
| Spigots for IR butt welding | 20 |
| Spigots for IR butt welding, BCF | 28 |
| Imperial butt weld spigots | 30 |

| Valve body material | Code |
|---|---|
| PVDF | 20 |
| Inliner PFA / outliner PVDF, carbon-filled | 23 |

| Diaphragm material | Code |
|---|---|
| PTFE / EPDM | 5E |
| PTFE / EPDM | 52 |

| Control function | Code |
|---|---|
| Manually operated | 0 |
| Manually operated with lockable handwheel | L |

| Operator version | Code |
|---|---|
| Thread for mounting of electrical position indicator 1215 | Z |

### Additional order data for T valves

| DN 2 (main) | Code |
|---|---|
| DN 15 | 15 |
| DN 20 | 20 |
| DN 25 | 25 |
| DN 32 | 32 |
| DN 40 | 40 |
| DN 50 | 50 |
| DN 65 | 65* |
| DN 80 | 80* |
| DN 100 | 100* |
| * only connection 2 code 20 | |

| Connection 2 | Code |
|---|---|
| Spigots for IR butt welding | 20 |
| Spigots for IR butt welding, BCF | 28 |

| High Purity version | Code |
|---|---|
| High Purity | HP |

| Order example | 677 | 50 | D | 30 | 23 | 5E | 0 | Z | - | - | HP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | 677 | | | | | | | | | | |
| Nominal size | | 50 | | | | | | | | | |
| Body configuration (code) | | | D | | | | | | | | |
| Connection (code) | | | | 30 | | | | | | | |
| Valve body material (code) | | | | | 23 | | | | | | |
| Diaphragm material (code) | | | | | | 5E | | | | | |
| Control function (code) | | | | | | | 0 | | | | |
| Operator version (code) | | | | | | | | Z | | | |
| T body: DN 2 (main) (code) | | | | | | | | | - | | |
| T body: Connection 2 (code) | | | | | | | | | | - | |
| High Purity version (code) | | | | | | | | | | | HP |

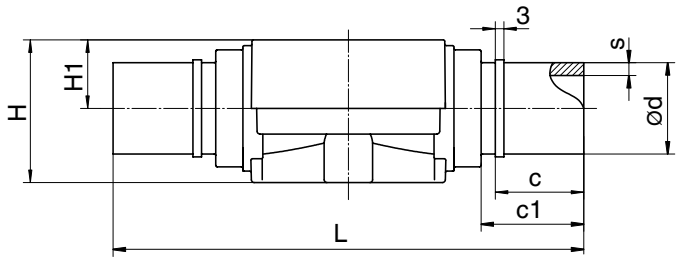
### Overview of valve bodies for 677 HP

| Body configuration | 2/2-way | | | T body |
|---|---|---|---|---|
| Connection code | 20 | 28* | 30 | 28 |
| Material code | 20 | 20 | 23 | 20 |
| Nominal size | 65 - 100 | 15 - 50 | 40, 50 | 15 - 50 |
| Diaphragm material (code) | 52 / 5E** | 5E | 5E | 5E |
| High Purity version (code) | HP | HP | HP | HP |

* without thread for mounting of electrical position indicator **DN 15 - 50

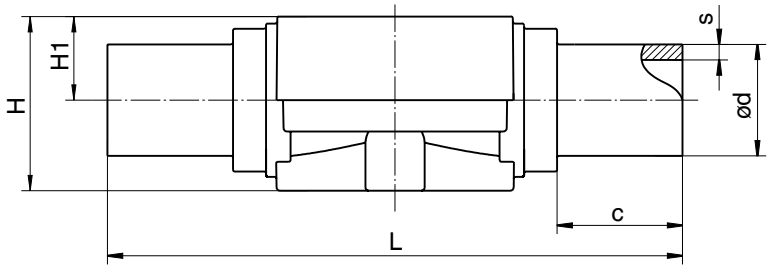
## Body dimensions - 2/2-way valves [mm]

### Spigots for IR butt welding, BCF, connection code 28
### Valve body material: PVDF (code 20)




| DN | L | H | H1 | ød | c | c1 | s | Weight [kg] |
|---|---|---|---|---|---|---|---|---|
| 15 | 154 | 50 | 24 | 20 | 31 | 37 | 1.9 | 0.24 |
| 20 | 154 | 50 | 24 | 25 | 31 | 37 | 1.9 | 0.25 |
| 25 | 154 | 50 | 24 | 32 | 31 | 37 | 2.4 | 0.26 |
| 32 | 194 | 74 | 34 | 40 | 40 | 46 | 2.4 | 0.65 |
| 40 | 194 | 74 | 34 | 50 | 40 | 46 | 3.0 | 0.66 |
| 50 | 224 | 82 | 42 | 63 | 40 | 46 | 3.0 | 1.10 |

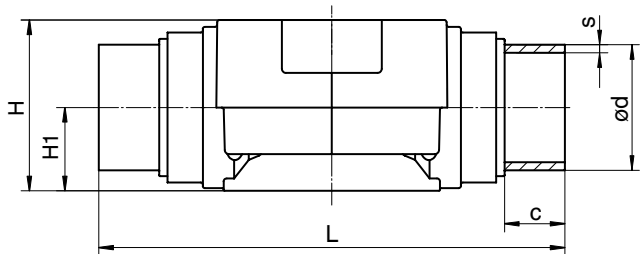
### Spigots for IR butt welding, connection code 20
### Valve body material: PVDF (code 20)




| DN | L | H | H1 | ød | s | c | Weight [kg] |
|---|---|---|---|---|---|---|---|
| 65 | 284 | 117.0 | 62.0 | 75 | 3.6 | 43 | 3.57 |
| 80 | 300 | 117.0 | 62.0 | 90 | 4.3 | 51 | 3.30 |
| 100 | 340 | 140.0 | 75.0 | 110 | 5.3 | 59 | 4.00 |

## Body dimensions - 2/2-way valves [mm]

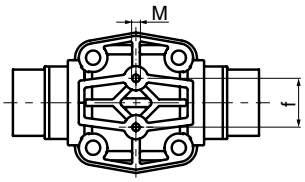
### Imperial butt weld spigots , connection code 30
### Valve body material: Inliner PFA / outlier PVDF, carbon-filled (code 23)



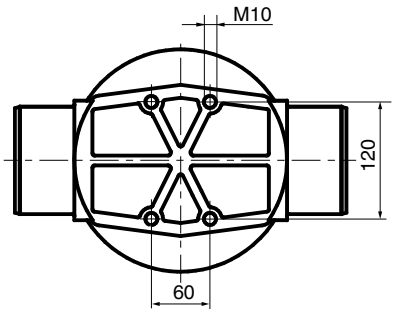

| DN | NPS | H1 | L | H | ød | c | Weight [kg] |
|---|---|---|---|---|---|---|---|
| 40 | 1 1/2” | 23.2 | 194 | 63.2 | 48.3 | 35 | 0.50 |
| 50 | 2” | 23.2 | 224 | 63.2 | 60.3 | 40 | 0.57 |

## Valve body mounting dimensions [mm]

| DN | M | f |
|---|---|---|
| 15 - 25 | M6 | 25.0 |
| 32 | M6 | 25.0 |
| 40 - 50 | M8 | 44.5 |
| 65 | M8 | 44.5 |
| 80 | M12 | 100.0 |
| 100 | see drawing | |



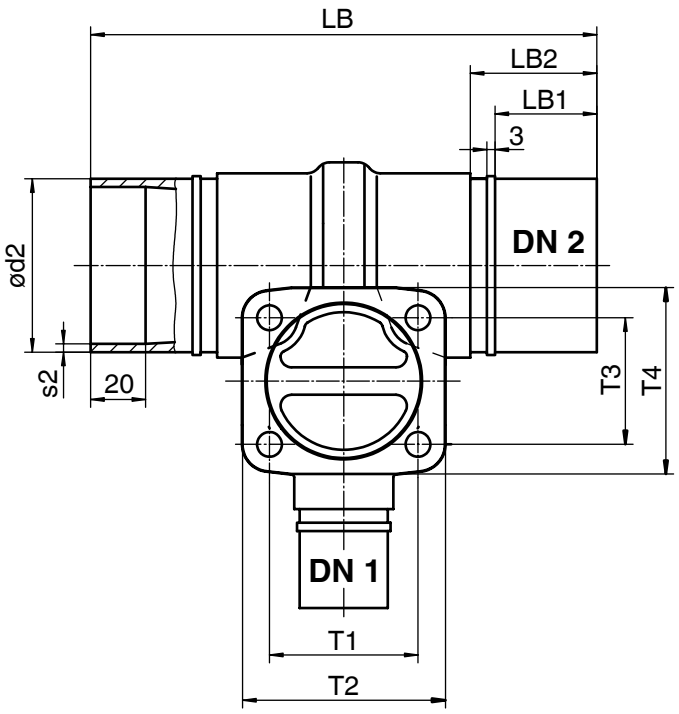

DN 15 - 80




DN 100

## Body dimensions - T valves [mm]

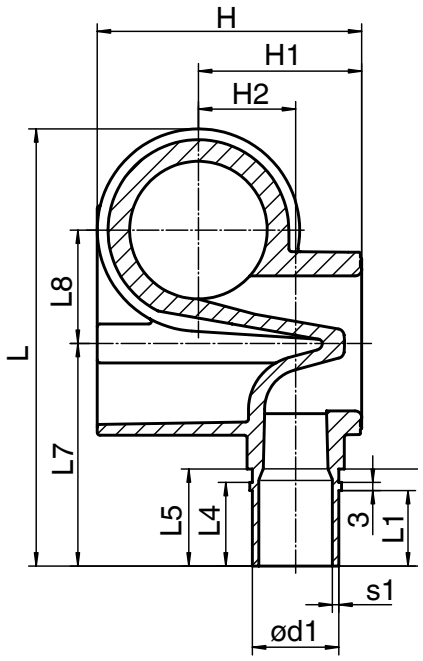
### Spigots for IR butt welding, BCF, connection code 28
### Valve body material: PVDF (code 20)




| DN2 | DN1 | ø d2 | s2 | LB | LB1 | Lb2 | T1 | T2 | T3 | T4 |
|---|---|---|---|---|---|---|---|---|---|---|
| Pipe | Spigot | | | | | | | | | |
| 15 | 15 | 20 | 1.9 | 166 | 28 | 36 | 54 | 74 | 46 | 68 |
| 20 | 15 | 25 | 1.9 | 166 | 28 | 36 | 54 | 74 | 46 | 68 |
| 25 | 15 | 32 | 2.4 | 166 | 28 | 36 | 54 | 74 | 46 | 68 |
| 32 | 15 | 40 | 2.4 | 184 | 37 | 46 | 54 | 74 | 46 | 68 |
| 40 | 15 | 50 | 3.0 | 184 | 37 | 46 | 54 | 74 | 46 | 68 |
| 50 | 15 | 63 | 3.0 | 184 | 37 | 46 | 54 | 74 | 46 | 68 |
| 80 | 15 | 90 | 4.3 | 196 | - | 51 | 54 | 74 | 46 | 68 |
| 20 | 20 | 25 | 1.9 | 166 | 28 | 36 | 54 | 74 | 46 | 68 |
| 25 | 20 | 32 | 2.4 | 166 | 28 | 36 | 54 | 74 | 46 | 68 |
| 40 | 20 | 50 | 3.0 | 184 | 37 | 46 | 54 | 74 | 46 | 68 |
| 50 | 20 | 63 | 3.0 | 184 | 37 | 46 | 54 | 74 | 46 | 68 |
| 80 | 20 | 90 | 4.3 | 196 | - | 51 | 54 | 74 | 46 | 68 |
| 25 | 25 | 32 | 2.4 | 166 | 28 | 36 | 54 | 74 | 46 | 68 |
| 32 | 25 | 40 | 2.4 | 194 | 37 | 46 | 54 | 74 | 46 | 68 |
| 40 | 25 | 50 | 3.0 | 194 | 37 | 46 | 54 | 74 | 46 | 68 |
| 50 | 25 | 63 | 3.0 | 194 | 37 | 46 | 54 | 74 | 46 | 68 |
| 65 | 25 | 75 | 3.6 | 196 | - | 46 | 54 | 74 | 46 | 68 |
| 80 | 25 | 90 | 4.3 | 196 | - | 51 | 54 | 74 | 46 | 68 |
| 32 | 32 | 40 | 2.4 | 194 | 37 | 46 | 54 | 74 | 46 | 68 |
| 50 | 32 | 63 | 3.0 | 235 | 37 | 46 | 82 | 128 | 78 | 110 |
| 80 | 32 | 90 | 4.3 | 254 | - | 51 | 82 | 128 | 78 | 110 |
| 40 | 40 | 50 | 3.0 | 194 | 37 | 46 | 82 | 74 | 78 | 68 |
| 50 | 40 | 63 | 3.0 | 235 | 37 | 46 | 82 | 128 | 78 | 110 |
| 80 | 40 | 90 | 4.3 | 254 | - | 51 | 82 | 128 | 78 | 110 |
| 50 | 50 | 63 | 3.0 | 235 | 37 | 46 | 82 | 128 | 78 | 110 |
| 65 | 50 | 75 | 3.6 | 254 | - | 46 | 82 | 128 | 78 | 110 |
| 80 | 50 | 90 | 4.3 | 254 | - | 51 | 82 | 128 | 78 | 110 |
| 100 | 32 | 110 | 5.3 | 274 | - | 62 | 82 | 128 | 78 | 110 |
| 100 | 40 | 110 | 5.3 | 274 | - | 62 | 82 | 128 | 78 | 110 |
| 100 | 50 | 110 | 5.3 | 274 | - | 62 | 82 | 128 | 78 | 110 |

## Body dimensions - T valves [mm]

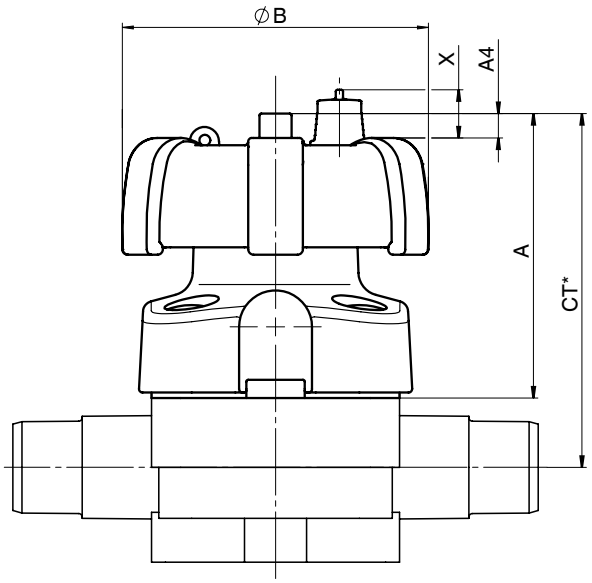
### Spigots for IR butt welding. BCF, connection code 28
### Valve body material: PVDF (code 20)




| DN2 | DN1 | ø d1 | s1 | L | L1 | L2 | L4 | L5 | L7 | L8 | H | H1 | H2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe | Spigot | | | | | | | | | | | | |
| 15 | 15 | 20 | 1.9 | 130 | 28 | 36 | 32 | 36 | 83 | 25 | 63 | 42 | 17 |
| 20 | 15 | 20 | 1.9 | 130 | 28 | 36 | 32 | 36 | 83 | 25 | 63 | 42 | 17 |
| 25 | 15 | 20 | 1.9 | 130 | 28 | 36 | 32 | 36 | 83 | 25 | 63 | 42 | 17 |
| 32 | 15 | 20 | 1.9 | 140 | 28 | 36 | 32 | 36 | 83 | 30 | 75 | 42 | 24 |
| 40 | 15 | 20 | 1.9 | 163 | 28 | 36 | 32 | 36 | 83 | 42 | 98 | 60 | 36 |
| 50 | 15 | 20 | 1.9 | 163 | 28 | 36 | 32 | 36 | 83 | 42 | 98 | 60 | 36 |
| 80 | 15 | 20 | 1.9 | 186 | 28 | 36 | 32 | 36 | 83 | 51 | 127 | 75 | 50 |
| 20 | 20 | 25 | 1.9 | 130 | 28 | 36 | 32 | 36 | 83 | 25 | 63 | 42 | 17 |
| 25 | 20 | 25 | 1.9 | 130 | 28 | 36 | 32 | 36 | 83 | 25 | 63 | 42 | 17 |
| 40 | 20 | 25 | 1.9 | 163 | 28 | 36 | 32 | 36 | 83 | 42 | 98 | 60 | 36 |
| 50 | 20 | 25 | 2.4 | 163 | 28 | 36 | 32 | 36 | 83 | 42 | 98 | 60 | 36 |
| 80 | 20 | 25 | 2.4 | 186 | 28 | 36 | 32 | 36 | 83 | 51 | 127 | 75 | 50 |
| 25 | 25 | 32 | 2.4 | 130 | 28 | 36 | 32 | 36 | 83 | 25 | 63 | 42 | 17 |
| 32 | 25 | 32 | 2.4 | 140 | 28 | 36 | 32 | 36 | 83 | 30 | 75 | 49 | 24 |
| 40 | 25 | 32 | 2.4 | 163 | 28 | 36 | 32 | 36 | 83 | 42 | 98 | 60 | 36 |
| 50 | 25 | 32 | 2.4 | 163 | 28 | 36 | 32 | 36 | 83 | 42 | 98 | 60 | 36 |
| 65 | 25 | 32 | 2.4 | 186 | 28 | 36 | 32 | 36 | 83 | 51 | 127 | 75 | 50 |
| 80 | 25 | 32 | 2.4 | 186 | 28 | 36 | 32 | 36 | 83 | 51 | 127 | 75 | 50 |
| 32 | 32 | 40 | 2.4 | 205 | 37 | 46 | 35 | 46 | 118 | 47 | 107 | 67 | 30 |
| 50 | 32 | 40 | 2.4 | 205 | 37 | 46 | 35 | 40 | 118 | 47 | 107 | 67 | 30 |
| 80 | 32 | 40 | 2.4 | 226 | 37 | 46 | 35 | 40 | 118 | 56 | 140 | 88 | 50 |
| 40 | 40 | 50 | 3.0 | 205 | 37 | 46 | 35 | 46 | 118 | 47 | 107 | 67 | 30 |
| 50 | 40 | 50 | 3.0 | 205 | 37 | 46 | 35 | 40 | 118 | 47 | 107 | 67 | 30 |
| 80 | 40 | 50 | 3.0 | 226 | 37 | 46 | 35 | 40 | 118 | 56 | 140 | 88 | 50 |
| 50 | 50 | 63 | 3.0 | 205 | 37 | 46 | 40 | 46 | 118 | 47 | 107 | 67 | 30 |
| 65 | 50 | 63 | 3.0 | 226 | 37 | 46 | 33 | 40 | 118 | 56 | 140 | 88 | 50 |
| 80 | 50 | 63 | 3.0 | 226 | 37 | 46 | 33 | 40 | 118 | 56 | 140 | 88 | 50 |
| 100 | 32 | 40 | 2.3 | 238 | 37 | 46 | 40 | 46 | 137 | 45 | 133 | 77 | 39 |
| 100 | 40 | 50 | 3.0 | 238 | 37 | 46 | 40 | 46 | 137 | 45 | 133 | 77 | 39 |
| 100 | 50 | 63 | 3.0 | 238 | 37 | 46 | 40 | 46 | 137 | 45 | 133 | 77 | 39 |

## Dimensions [mm]

### Operator dimensions




* CT = A + H1
(see body dimensions)

| DN | ø B | A | A4 approx. | X* | Weight [kg] |
|---|---|---|---|---|---|
| 15 - 25 | 90 | 79 | 8 | 14 | 0.4 |
| 32 - 40 | 114 | 99 | 10 | 8 | 0.6 |
| 50 | 140 | 119 | 12 | 9 | 1.0 |
| 65 - 80 | 214 | 167 | 26 | 27 | 3.8 |
| 100 | 214 | 219 | 34 | 27 | 5.1 |

* only for control function code L

### Instrumentation


1215 electrical
position indicator
ATEX

# High Purity diaphragm valve, plastic

## Construction

The 690HP diaphragm valve has a low maintenance membrane actuator which can be controlled by air or inert gases. Normally Closed (NC), Normally Open (NO) and Double Acting (DA) control functions are available. All medium wetted parts and the actuator housing are made of high-grade plastic materials which can be selected to suit the application.

## Features

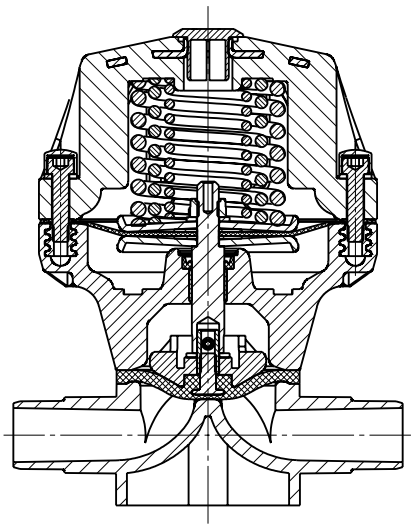
- Suitable for inert and corrosive* liquid and gaseous media, particularly high purity media
- All medium wetted parts and the housing are made of high-grade plastic
  - Valve body: PFA inliner/PVDF outliner (carbon-filled) or PVDF, depending on the connection
  - Diaphragm material: PTFE/EPDM
- Control connection positioned in-line with flow direction as standard, thus installable in restricted spaces
- Manufactured under cleanroom conditions

## Advantages

- Compact, lightweight construction and high performance
- High $K_V$ value
- Minimal deadleg
- Proven long life membrane actuator
- Leak detection hole
- Simple diaphragm replacement
- Optional accessories
  - Electrical position indicators with microswitches or proximity switches
  - Positioners and process controllers

* see information on working medium on page 2

## Sectional view



**690HP**

# Technical data

## Working medium

Corrosive, inert, gaseous and liquid media which have no negative impact on the physical and chemical properties of the body and diaphragm material.

## Working medium temperature

| | |
|---|---|
| Valve body PP / PP-H | 5 to 80 °C |
| Valve body PVDF | -10 to 80 °C |
| Dependent on the operating pressure | |

## Ambient temperature

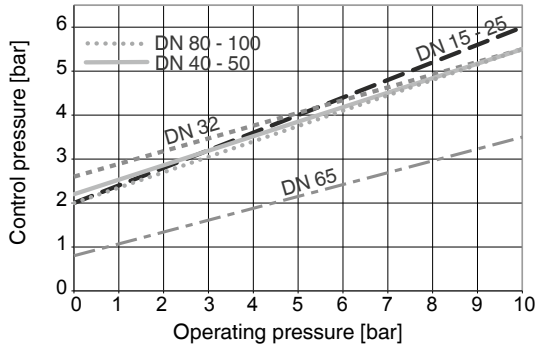
| | |
|---|---|
| Valve body PP / PP-H | 5 to 50 °C |
| Valve body PVDF | -5 to 50 °C |

## Control / operating pressure [bar]

| | | Operating pressure | | Control pressure | |
|---|---|---|---|---|---|
| DN | NPS | Diaphragm | | Control function | |
| | | EPDM/FPM | PTFE | 1 | 2 and 3 |
| 15-25 | 1/2"- 1" | 0 - 10 | 0 - 6 | 4.5 - 7.0 | max. 6.0 |
| 32-50 | 1 1/4" - 2" | 0 - 10 | 0 - 6 | 4.5 - 7.0 | max. 5.5 |
| 65 | 2 1/2" | 0 - 10 | 0 - 6 | 5.5 - 7.0 | max. 5.0 |
| 80 | 3" | 0 - 8 | 0 - 6 | 5.0 - 7.0 | max. 5.5 |
| 100 | 4" | 0 - 6 | 0 - 4 | 5.5 - 7.0 | max. 5.5 |

## Control pressure characteristic

Control function 2 and 3




The above values are valid for both flow directions. All pressures are gauge pressures. Operating pressure values were determined with static operating pressure applied on one side of a closed valve. Sealing at the valve seat and atmospheric sealing is ensured for the given values. Information on operating pressures applied on both sides and for high purity media on request.

## Control medium

| | |
|---|---|
| Inert gases | |
| Max. permissible temperature of control medium | 40 °C |
| Filling volume (control function 1) | |
| DN 15 - 25 | 0.17 $dm^3$ |
| DN 32 - 40 | 0.38 $dm^3$ |
| DN 50 | 1.10 $dm^3$ |
| DN 65 - 100 | 2.50 $dm^3$ |

## Kv values / Weight - 2/2-way valves

| DN | Kv value [l/min] | Weight [kg] |
|---|---|---|
| 15 | 93 | 0.7 |
| 20 | 137 | 0.7 |
| 25 | 175 | 0.7 |
| 32 | 300 | 1.4 |
| 40 | 417 | 1.4 |
| 50 | 767 | 2.4 |
| 65 | 1300 | 7.3 |
| 80 | 2000 | 7.3 |
| 100 | 3150 | 9.0 |

## Kv values - T valves

| DN2 | DN1 | Kv value | DN2 | DN1 | Kv value |
|---|---|---|---|---|---|
| Pipe | Spigot | [l/min] | Pipe | Spigot | [l/min] |
| 15 | 15 | 80 | 50 | 40 | 505 |
| 20 | 15 | 82 | 50 | 50 | 540 |
| 20 | 20 | 114 | 65 | 32 | 340 |
| 25 | 15 | 83 | 65 | 50 | 550 |
| 25 | 20 | 117 | 80 | 15 | 87 |
| 25 | 25 | 148 | 80 | 20 | 132 |
| 32 | 15 | 85 | 80 | 25 | 145 |
| 32 | 25 | 153 | 80 | 32 | 327 |
| 32 | 32 | 385 | 80 | 40 | 441 |
| 40 | 15 | 87 | 80 | 50 | 552 |
| 40 | 20 | 122 | 100 | 15 | 87 |
| 40 | 25 | 150 | 100 | 20 | 132 |
| 40 | 40 | 500 | 100 | 25 | 145 |
| 50 | 15 | 93 | 100 | 32 | 327 |
| 50 | 20 | 133 | 100 | 40 | 441 |
| 50 | 25 | 157 | 100 | 50 | 552 |
| 50 | 32 | 397 | | | |

Kv values determined acc.to IEC 534 standard, inlet pressure 6 bar, Δp 1 bar, PVC-U valve body and soft elastomer diaphragm.

## Pressure / temperature correlation for plastic

| Temperature in °C (plastic body) | | -20 | -10 | ±0 | 5 | 10 | 20 | 25 | 30 | 40 | 50 | 60 | 70 | 80 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Valve body material | | Permissible operating pressure in bar | | | | | | | | | | | | |
| PP-H | Code 70 / 71 | - | - | - | 10.0 | 10.0 | 10.0 | 10.0 | 8.5 | 7.0 | 5.5 | 4.0 | 2.7 | 1.5 |
| PVDF | Code 20 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 9.0 | 8.0 | 7.0 | 6.3 | 5.4 | 4.7 |

Data for extended temperature ranges on request. Please note that the ambient temperature and medium temperature generate a combined temperature at the valve body which must not exceed the above values.

## Order data

| Body configuration | Code |
|---|---|
| 2/2-way | D |
| T body | T |

| Connection | Code |
|---|---|
| Spigots DIN for socket solvent cementing/welding | 0 |
| Spigots for IR butt welding | 20 |
| Spigots for IR butt welding, BCF | 28 |

| Valve body material | Code |
|---|---|
| PVDF | 20 |
| Inliner PP-H natural / outliner PP reinforced | 70 |
| Inliner PP-H grey / outliner PP reinforced | 71 |

| Diaphragm material | Code |
|---|---|
| PTFE/EPDM | 52 |
| PTFE/EPDM | 5E |

| Control function | Code |
|---|---|
| Normally closed (NC) | 1 |
| Normally open (NO) | 2 |
| Double acting (DA) | 3 |

| Actuator size | Code |
|---|---|
| Actuator size 1/N (DN 15-25) | 1/N |
| Actuator size 2/N (DN 32,40) | 2/N |
| Actuator size 3/N (DN 50) | 3/N |
| Actuator size 4/N (DN 65-80) | 4/N |
| Actuator size 5/N (DN 100) | 5/N |

### Additional order data for T valves

| DN 2 (main) | Code |
|---|---|
| DN 15 | 15 |
| DN 20 | 20 |
| DN 25 | 25 |
| DN 32 | 32 |
| DN 40 | 40 |
| DN 50 | 50 |
| DN 65 | 65* |
| DN 80 | 80* |
| DN 100 | 100* |
| * only connection 2 code 20 | |

| Connection 2 | Code |
|---|---|
| Spigots for IR butt welding | 20 |
| Spigots for IR butt welding, BCF | 28 |

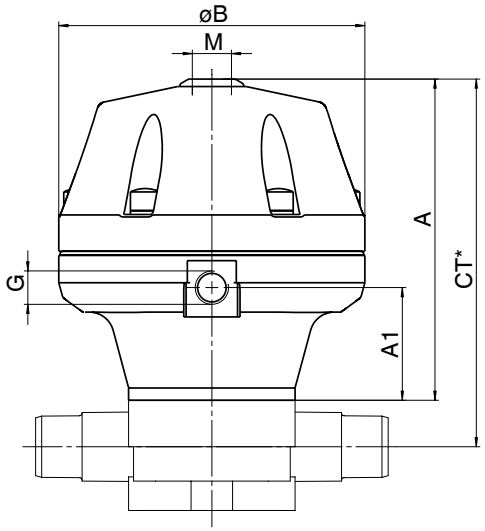
| High Purity version | Code |
|---|---|
| High Purity | HP |

| Order example | 690 | 20 | D | 20 | 20 | 52 | 1 | 2/N | - | - | HP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | 690 | | | | | | | | | | |
| Nominal size | | 20 | | | | | | | | | |
| Body configuration (code) | | | D | | | | | | | | |
| Connection (code) | | | | 20 | | | | | | | |
| Valve body material (code) | | | | | 20 | | | | | | |
| Diaphragm material (code) | | | | | | 52 | | | | | |
| Control function (code) | | | | | | | 1 | | | | |
| Actuator size (code) | | | | | | | | 2/N | | | |
| T body: DN 2 (main) (code) | | | | | | | | | - | | |
| T body: Connection 2 (code) | | | | | | | | | | - | |
| Version (code) | | | | | | | | | | | HP |

| Overview of valve bodies for 690HP | | | | | |
|---|---|---|---|---|---|
| **Body configuration** | **2/2-way** | | | | **T body** |
| **Connection code** | **0** | **20** | | **28** | **28** |
| **Material code** | **70, 71** | **20** | **70 , 71** | **20** | **20** |
| Nominal size | 15 - 50 | 65 - 100 | 15 - 50 | 15 - 50 | 15 - 50 |
| Diaphragm material (code) | 52 / 5E | 52 / 5E* | 52 / 5E | 52 / 5E | 5E |
| * DN 15 - 50 | | | | | |

## Actuator dimensions [mm]

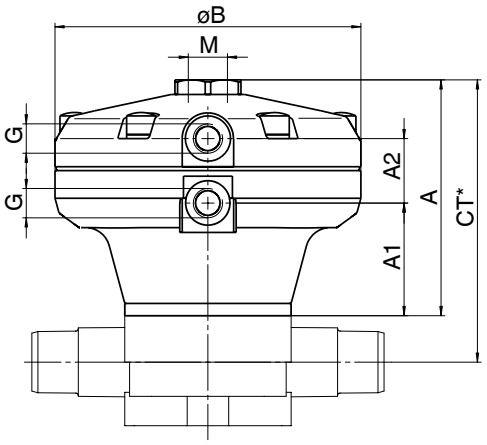
### Control function 1




| DN | øB | A | A1 | G | M |
|---|---|---|---|---|---|
| 15 - 25 | 125 | 131 | 47 | G 1/4 | M16x1 |
| 32 - 40 | 155 | 177 | 75 | G 1/4 | M16x1 |
| 50 | 210 | 215 | 90 | G 1/4 | M16x1 |
| 65 - 80 | 260 | 280 | 127 | G 1/4 | M22x1.5 |
| 100 | 260 | 307 | 149 | G 1/4 | M22x1.5 |

### Control function 2 and 3

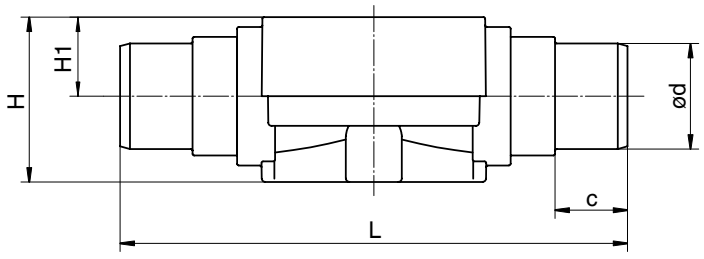
* CT = A + H1 (see body dimensions)




| DN | ø B | A | A1 | A2 | G | M |
|---|---|---|---|---|---|---|
| 15 - 25 | 125 | 98 | 47 | 27 | G 1/4 | M16x1 |
| 32 - 40 | 155 | 135 | 75 | 27 | G 1/4 | M16x1 |
| 50 | 210 | 164 | 90 | 29 | G 1/4 | M16x1 |
| 65 - 80 | 260 | 226 | 127 | 41 | G 1/4 | M22x1.5 |
| 100 | 260 | 263 | 149 | 46 | G 1/4 | M22x1.5 |

## Body dimensions - 2/2-way valves [mm]

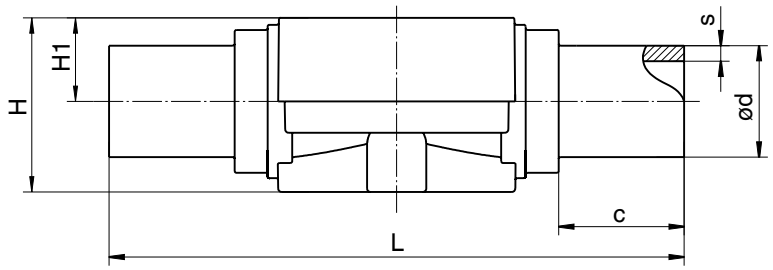
### Spigots, connection code 0
### Inliner PP-H (code 70 / 71)




| DN | NPS | H1 | L | H | ød | c | Weight [kg] |
|---|---|---|---|---|---|---|---|
| 15 | 1/2” | 10.0 | 124 | 36.0 | 20 | 18 | 0.12 |
| 20 | 3/4” | 12.0 | 144 | 38.0 | 25 | 19 | 0.13 |
| 25 | 1” | 13.0 | 154 | 39.0 | 32 | 22 | 0.16 |
| 32 | 1 1/4” | 15.0 | 174 | 41.0 | 40 | 32 | 0.22 |
| 40 | 1 1/2” | 23.2 | 194 | 63.2 | 50 | 26 | 0.50 |
| 50 | 2” | 23.2 | 224 | 63.2 | 63 | 33 | 0.57 |

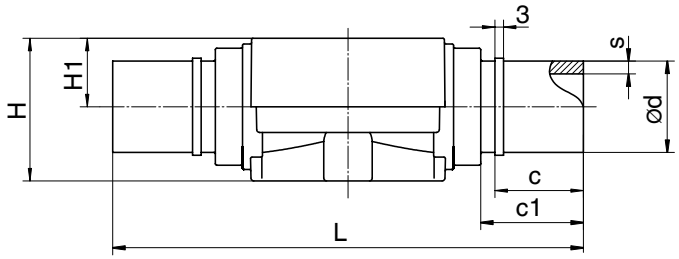
## Body dimensions - 2/2-way valves [mm]

### Spigots for IR butt welding, connection code 20
### Valve body material: PVDF (code 20), inliner PP-H (code 70 / 71)




| DN | L | H | H1 | ød | s | | c | Weight [kg] |
|---|---|---|---|---|---|---|---|---|
| | | | | | Material code | | | |
| | | | | | 20 | 70 / 71 | | |
| 15 | 154 | 36.0 | 10.0 | 20 | 1.9 | 1.9 | 33 | 0.10 |
| 20 | 154 | 38.0 | 12.0 | 25 | 1.9 | 2.3 | 33 | 0.12 |
| 25 | 154 | 39.0 | 13.0 | 32 | 2.4 | 2.9 | 33 | 0.14 |
| 32 | 174 | 41.0 | 15.0 | 40 | 2.4 | 3.7 | 33 | 0.18 |
| 40 | 194 | 63.2 | 23.2 | 50 | 3.0 | 4.6 | 33 | 0.40 |
| 50 | 224 | 63.2 | 23.2 | 63 | 3.0 | 5.8 | 33 | 0.47 |
| 65 | 284 | 117.0 | 62.0 | 75 | 3.6 | - | 43 | 3.57 |
| 80 | 300 | 117.0 | 62.0 | 90 | 4.3 | - | 51 | 3.30 |
| 100 | 340 | 140.0 | 75.0 | 110 | 5.3 | - | 59 | 4.00 |

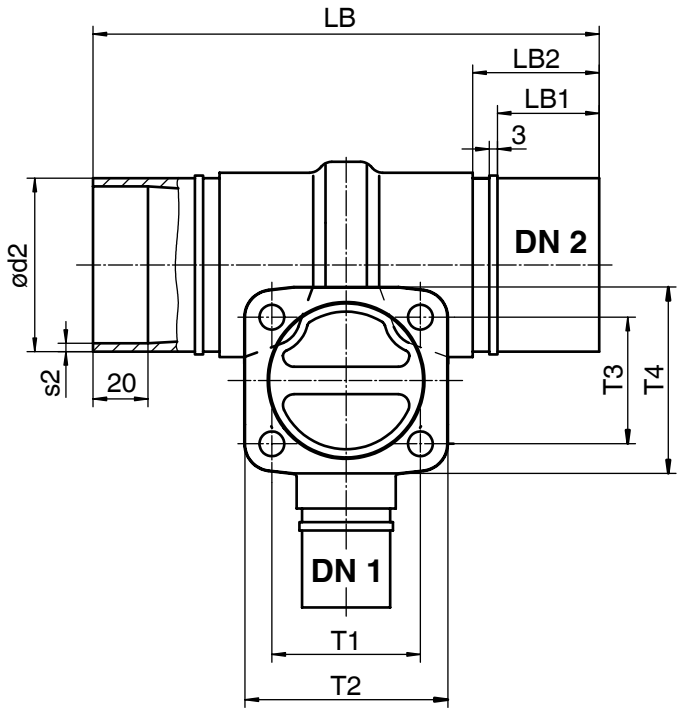
### Spigots for IR butt welding, BCF, connection code 28
### Valve body material: PVDF (code 20)




| DN | L | H | H1 | ød | c | c1 | s | Weight [kg] |
|---|---|---|---|---|---|---|---|---|
| 15 | 154 | 50 | 24 | 20 | 31 | 37 | 1.9 | 0.24 |
| 20 | 154 | 50 | 24 | 25 | 31 | 37 | 1.9 | 0.25 |
| 25 | 154 | 50 | 24 | 32 | 31 | 37 | 2.4 | 0.26 |
| 32 | 194 | 74 | 34 | 40 | 40 | 46 | 2.4 | 0.65 |
| 40 | 194 | 74 | 34 | 50 | 40 | 46 | 3.0 | 0.66 |
| 50 | 224 | 82 | 42 | 63 | 40 | 46 | 3.0 | 1.10 |

## Body dimensions - T valves [mm]

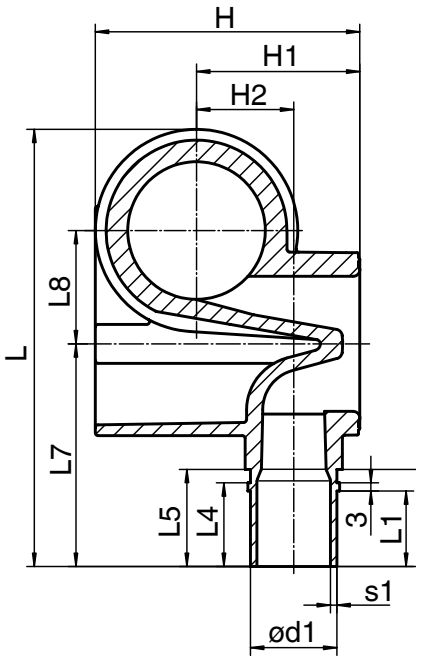
### Spigots for IR butt welding, BCF, connection code 28
### Valve body material: PVDF (code 20)




| DN2 | DN1 | ø d2 | s2 | LB | LB1 | Lb2 | T1 | T2 | T3 | T4 |
|---|---|---|---|---|---|---|---|---|---|---|
| Pipe | Spigot | | | | | | | | | |
| 15 | 15 | 20 | 1.9 | 166 | 28 | 36 | 54 | 74 | 46 | 68 |
| 20 | 15 | 25 | 1.9 | 166 | 28 | 36 | 54 | 74 | 46 | 68 |
| 25 | 15 | 32 | 2.4 | 166 | 28 | 36 | 54 | 74 | 46 | 68 |
| 32 | 15 | 40 | 2.4 | 184 | 37 | 46 | 54 | 74 | 46 | 68 |
| 40 | 15 | 50 | 3.0 | 184 | 37 | 46 | 54 | 74 | 46 | 68 |
| 50 | 15 | 63 | 3.0 | 184 | 37 | 46 | 54 | 74 | 46 | 68 |
| 80 | 15 | 90 | 4.3 | 196 | - | 51 | 54 | 74 | 46 | 68 |
| 20 | 20 | 25 | 1.9 | 166 | 28 | 36 | 54 | 74 | 46 | 68 |
| 25 | 20 | 32 | 2.4 | 166 | 28 | 36 | 54 | 74 | 46 | 68 |
| 40 | 20 | 50 | 3.0 | 184 | 37 | 46 | 54 | 74 | 46 | 68 |
| 50 | 20 | 63 | 3.0 | 184 | 37 | 46 | 54 | 74 | 46 | 68 |
| 80 | 20 | 90 | 4.3 | 196 | - | 51 | 54 | 74 | 46 | 68 |
| 25 | 25 | 32 | 2.4 | 166 | 28 | 36 | 54 | 74 | 46 | 68 |
| 32 | 25 | 40 | 2.4 | 194 | 37 | 46 | 54 | 74 | 46 | 68 |
| 40 | 25 | 50 | 3.0 | 194 | 37 | 46 | 54 | 74 | 46 | 68 |
| 50 | 25 | 63 | 3.0 | 194 | 37 | 46 | 54 | 74 | 46 | 68 |
| 65 | 25 | 75 | 3.6 | 196 | - | 46 | 54 | 74 | 46 | 68 |
| 80 | 25 | 90 | 4.3 | 196 | - | 51 | 54 | 74 | 46 | 68 |
| 32 | 32 | 40 | 2.4 | 194 | 37 | 46 | 54 | 74 | 46 | 68 |
| 50 | 32 | 63 | 3.0 | 235 | 37 | 46 | 82 | 128 | 78 | 110 |
| 65 | 32 | 75 | 3.6 | 254 | - | 46 | 82 | 128 | 78 | 110 |
| 80 | 32 | 90 | 4.3 | 254 | - | 51 | 82 | 128 | 78 | 110 |
| 40 | 40 | 50 | 3.0 | 194 | 37 | 46 | 82 | 74 | 78 | 68 |
| 50 | 40 | 63 | 3.0 | 235 | 37 | 46 | 82 | 128 | 78 | 110 |
| 80 | 40 | 90 | 4.3 | 254 | - | 51 | 82 | 128 | 78 | 110 |
| 50 | 50 | 63 | 3.0 | 235 | 37 | 46 | 82 | 128 | 78 | 110 |
| 65 | 50 | 75 | 3.6 | 254 | - | 46 | 82 | 128 | 78 | 110 |
| 80 | 50 | 90 | 4.3 | 254 | - | 51 | 82 | 128 | 78 | 110 |
| 100 | 32 | 110 | 5.3 | 274 | - | 62 | 82 | 128 | 78 | 110 |
| 100 | 40 | 110 | 5.3 | 274 | - | 62 | 82 | 128 | 78 | 110 |
| 100 | 50 | 110 | 5.3 | 274 | - | 62 | 82 | 128 | 78 | 110 |

## Body dimensions - T valves [mm]

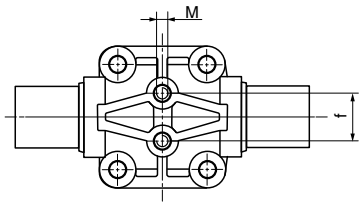
### Spigots for IR butt welding, BCF, connection code 28
### Valve body material: PVDF (code 20)



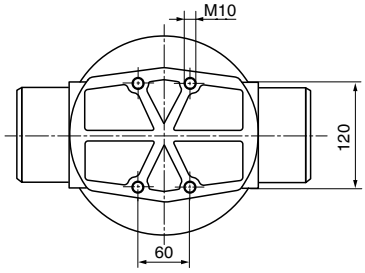

| DN2 | DN1 | ø d1 | s1 | L | L1 | L2 | L4 | L5 | L7 | L8 | H | H1 | H2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe | Spigot | | | | | | | | | | | | |
| 15 | 15 | 20 | 1.9 | 130 | 28 | 36 | 32 | 36 | 83 | 25 | 63 | 42 | 17 |
| 20 | 15 | 20 | 1.9 | 130 | 28 | 36 | 32 | 36 | 83 | 25 | 63 | 42 | 17 |
| 25 | 15 | 20 | 1.9 | 130 | 28 | 36 | 32 | 36 | 83 | 25 | 63 | 42 | 17 |
| 32 | 15 | 20 | 1.9 | 140 | 28 | 36 | 32 | 36 | 83 | 30 | 75 | 42 | 24 |
| 40 | 15 | 20 | 1.9 | 163 | 28 | 36 | 32 | 36 | 83 | 42 | 98 | 60 | 36 |
| 50 | 15 | 20 | 1.9 | 163 | 28 | 36 | 32 | 36 | 83 | 42 | 98 | 60 | 36 |
| 80 | 15 | 20 | 1.9 | 186 | 28 | 36 | 32 | 36 | 83 | 51 | 127 | 75 | 50 |
| 20 | 20 | 25 | 1.9 | 130 | 28 | 36 | 32 | 36 | 83 | 25 | 63 | 42 | 17 |
| 25 | 20 | 25 | 1.9 | 130 | 28 | 36 | 32 | 36 | 83 | 25 | 63 | 42 | 17 |
| 40 | 20 | 25 | 1.9 | 163 | 28 | 36 | 32 | 36 | 83 | 42 | 98 | 60 | 36 |
| 50 | 20 | 25 | 2.4 | 163 | 28 | 36 | 32 | 36 | 83 | 42 | 98 | 60 | 36 |
| 80 | 20 | 25 | 2.4 | 186 | 28 | 36 | 32 | 36 | 83 | 51 | 127 | 75 | 50 |
| 25 | 25 | 32 | 2.4 | 130 | 28 | 36 | 32 | 36 | 83 | 25 | 63 | 42 | 17 |
| 32 | 25 | 32 | 2.4 | 140 | 28 | 36 | 32 | 36 | 83 | 30 | 75 | 49 | 24 |
| 40 | 25 | 32 | 2.4 | 163 | 28 | 36 | 32 | 36 | 83 | 42 | 98 | 60 | 36 |
| 50 | 25 | 32 | 2.4 | 163 | 28 | 36 | 32 | 36 | 83 | 42 | 98 | 60 | 36 |
| 65 | 25 | 32 | 2.4 | 186 | 28 | 36 | 32 | 36 | 83 | 51 | 127 | 75 | 50 |
| 80 | 25 | 32 | 2.4 | 186 | 28 | 36 | 32 | 36 | 83 | 51 | 127 | 75 | 50 |
| 32 | 32 | 40 | 2.4 | 205 | 37 | 46 | 35 | 46 | 118 | 47 | 107 | 67 | 30 |
| 50 | 32 | 40 | 2.4 | 205 | 37 | 46 | 35 | 40 | 118 | 47 | 107 | 67 | 30 |
| 65 | 32 | 40 | 2.4 | 226 | 37 | 46 | 35 | 40 | 118 | 56 | 140 | 88 | 50 |
| 80 | 32 | 40 | 2.4 | 226 | 37 | 46 | 35 | 40 | 118 | 56 | 140 | 88 | 50 |
| 40 | 40 | 50 | 3.0 | 205 | 37 | 46 | 35 | 46 | 118 | 47 | 107 | 67 | 30 |
| 50 | 40 | 50 | 3.0 | 205 | 37 | 46 | 35 | 40 | 118 | 47 | 107 | 67 | 30 |
| 80 | 40 | 50 | 3.0 | 226 | 37 | 46 | 35 | 40 | 118 | 56 | 140 | 88 | 50 |
| 50 | 50 | 63 | 3.0 | 205 | 37 | 46 | 40 | 46 | 118 | 47 | 107 | 67 | 30 |
| 65 | 50 | 63 | 3.0 | 226 | 37 | 46 | 33 | 40 | 118 | 56 | 140 | 88 | 50 |
| 80 | 50 | 63 | 3.0 | 226 | 37 | 46 | 33 | 40 | 118 | 56 | 140 | 88 | 50 |
| 100 | 32 | 40 | 2.3 | 238 | 37 | 46 | 40 | 46 | 137 | 45 | 133 | 77 | 39 |
| 100 | 40 | 50 | 3.0 | 238 | 37 | 46 | 40 | 46 | 137 | 45 | 133 | 77 | 39 |
| 100 | 50 | 63 | 3.0 | 238 | 37 | 46 | 40 | 46 | 137 | 45 | 133 | 77 | 39 |

## Valve body mounting dimensions [mm]

| DN | M | f |
|---|---|---|
| 15 - 25 | M6 | 25.0 |
| 32 | M6 | 25.0 |
| 40 - 50 | M8 | 44.5 |
| 65 | M8 | 44.5 |
| 80 | M12 | 100.0 |
| 100 | see drawing | |




DN 15 - 80




DN 100

## Compensating/mounting plates

GEMÜ 10411041

## Pilot valve

334
Pilot solenoid valve
Plastic


Архангельск (8182)63-90-72
Астана (7172)727-132
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Липецк (4742)52-20-81
Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Тверь (4822)63-31-35
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Ярославль (4852)69-52-93

Киргизия (996)312-96-26-47 Казахстан (772)734-952-31 Таджикистан (992)427-82-92-69

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