VALVES & FILTERS

QVF
PROCESS PLANT COMPONENTS

P 303 e.1
Introduction
QVF valves can be relied upon to require minimum maintenance and to provide maximum reliability in service. They are widely used in the chemical, pharmaceutical and allied industries together with other applications such as food and drink production, dye works and electroplating. This is because of the special properties of borosilicate glass 3.3, PTFE, PFA, ceramic and tantalum plus the fact that borosilicate glass 3.3 is an approved and proven material of construction for pressure vessels.

Reference should also be made in this context to the extreme reliability of the improved, strong and high-duty coupling system used for all components. This is achieved throughout the whole range of nominal sizes by the use of the safety buttress end which has been designed specifically by taking into account the properties of the material combined with a reliable flange system.

The complete range of standard valves is described on the following pages. Non-standard versions can also be supplied to special order where indicated in the product description.

A detailed listing of all valves by «Description» and «Catalogue Reference» can be found in the «Index».

Detailed information on a number of the topics referred to in the following pages can be found in Section 1 »Technical Information«.

Metric grid modular system
The valves described in this section comply with EN 12585 “Pipeline and Fittings, Compatibility and Interchangeability” and are conceived as a modular system. The only exceptions to this are »RKP..« non-return valves and »FVT..« butterfly valves. The basic unit of measurement is 25 mm and all component dimensions are a multiple of this basic length. The resultant metric grid system facilitates trouble-free design and installation of systems with these components.

In addition valves and fittings (please see Section 2 »Pipeline Components«) in the same nominal size always have the same limb length, therefore the valves can be interchanged with bends, tee pieces etc. This means that any modifications which may be required to existing pipelines can be carried out quickly and easily.

TA Luft compliant double seal
The German national clean air regulations known as “TA Luft” came into force in 1986. They indicate the maximum permissible limits for dust, vapour or gaseous emissions from processing, transporting or transferring materials in powder, liquid or gaseous form. They also include regulations relating to the sealing of valves and require a secondary seal in types incorporating bellows seals.

A comparable ordinance containing additional information on procedures and instrumentation for the checking of emissions was published four years later by the United States Environmental Protection Agency (EPA).

All hand operated borosilicate glass 3.3/PTFE valves are, therefore, fitted with a secondary seal in addition to the basic bellows seal. Pneumatically actuated on/off valves and control valves alone are available in two alternative versions. Butterfly valves and ball valves are fitted with a secondary seal.
GMP compliant installations
The use of valves and the layout of interconnecting pipeline incorporating valves when designing plant and equipment complying with GMP regulations, calls for special care in both the planning and selection of the components, together with the materials of construction used for them. Borosilicate glass 3.3 has a number of special properties that are highly valued in the pharmaceutical industry, and these, in conjunction with PTFE materials (bellows, linings) approved in accordance with the FDA catalogue, ensure that any build-up of unwanted deposits is avoided in areas which come in contact with the product. A design without any dead space, which ensures that components drain fully and can be cleaned easily and effectively, is achieved in many valves by their shape and the way they are installed. Where the external surfaces of these components have to comply with clean room requirements, appropriate stainless steel coupling and support material can be supplied (please see Section 9 »Couplings« and Section 10 »Structures and Supports«).

We would be happy to advise you on the basis of the regulatory requirements applicable to a particular case, and the guidelines drawn up by us, for the design of GMP compliant plant.

Coated valves
Damage to borosilicate glass 3.3 valves resulting from accidental external causes cannot be entirely excluded, especially in the smaller nominal sizes. This is primarily due to the relatively rigorous conditions prevalent in production plants and applies especially where no additional protection is provided in the form of insulation.

Our answer to this problem is to provide borosilicate glass 3.3 valve bodies with a Sectrans transparent coating. This can be applied irrespective of the shape of the component and it provides additional protection without having any adverse effect on visual monitoring of the process.

A glass fibre reinforced polyester coating providing a higher level of protection can also be supplied on request. This does have a slightly adverse effect on the transparency of the glass, making it translucent and not transparent.

Permissible operating conditions
While the maximum permissible operating temperature for borosilicate glass 3.3 valve bodies is generally 200 °C (Δ:T = 180 K) and their maximum permissible operating pressure is the same as for pipeline components of the same nominal size, the incorporation of bellows imposes certain restrictions and the maximum permissible operating pressure for the complete valve is somewhat lower. When the valves are used in plant applications this is unlikely to be a problem since the maximum permissible operating pressure of the plant as a whole is governed by the components with the largest nominal size. Detailed information on this and the operation of jacketed valves can be found in Section 1 »Technical Information«.

Valves with PTFE bellows suitable for higher permissible operating pressures can also be supplied on request.

Where different operating conditions apply to individual valves, the relevant details are provided in the respective product description.
The design (bellows plug and seat shape) of the manually operated valves described below is such that they can be used both as on/off valves and for the coarse regulation of liquid flow, for example in pump delivery lines. If required, on/off valves can also be supplied in the DN100 and DN150 nominal sizes but without regulating cone.

Manually operated control valves can be found on page 3.13 and on/off and control valves with pneumatic actuators are described from page 3.10 and 3.14.

These valves only act as regulating valves when the direction of flow is towards the cone.

### Straight Through Valves

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ON/OFF VALVES WITH REGULATING PLUG

Angle Valves

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DRAIN VALVES

These valves have a hose connector at the outlet so that a hose can be connected to them easily and securely. The internal diameter of the hoses should be as indicated in the table below to avoid fixing and leakage problems.

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VENT VALVES

These valves are ideal for venting plant operating under vacuum, at atmospheric pressure or at low positive pressure (up to 0.5 bar g). In all other cases we recommend the use of the drain valves as described on page 3.5.

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JACKETED ON/OFF VALVES

In addition to pipe sections and pipeline fittings (see Section 2 »Pipeline Components«) jacketed valves with regulating plug can also be supplied for pipeline systems involving temperature control. Further versions of the valves described here are also available on request.

These jackets are one-piece and sealed at both ends. They are designed to ensure that the critical area in particular, i.e. the valve seat, can be maintained at a given temperature. The less critical pipe ends can be heated separately by a suitable method.

Details of the permissible operating conditions for the inner and outer area can be found in Section 1 »Technical Information«.

The branches on the jacket are of the safety buttress end type. If they are aligned horizontally and if long hoses or heavy hoses are connected to them, we recommend 90° hose connectors to reduce the bending moment on the branches.

In the case of the DN 15 angle valves the branches on the jacket are positioned turned through 90° to the front (DN 1) and back (DN 3) respectively.

Borosilicate glass 3.3 and metal hose connectors can be found in Section 2 »Pipeline Components« and hoses in Section 9 »Couplings«.
### VALVES & FILTERS

#### JACKETED ON/OFF VALVES

**Straight Through Valves**

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[Diagram of jacketed on/off valves]
LOADING VALVES

These valves are used to maintain a constant pressure and are recommended for use after dosing pumps. They may, however, also be used on occasions with centrifugal pumps (in this application it is more usual to use an orifice plate).

They can thus be used to deliver liquids safely, into or out of a vacuum, for example. Their use as by-pass valves in conjunction with dosing pumps prevents the build-up of an unacceptably high pressure in the event of the pressure-side pipeline being inadvertently closed off.

Unlike manually operated types, this valve has a spring the tension of which can be changed by means of a screwdriver. It can be adjusted to any setting between 0.2 bar g and the maximum permissible operating pressure of the valve.

If no pressure setting is specified on the order, valves are supplied set to approx. 0.2 bar g.

Care should be taken when operating these valves to ensure that the sum of the setting pressure and the pressure drop in the valve does not exceed the maximum permissible operating pressure of the pipeline.

Loading valves should not be used as pressure relief valves as they do not have the necessary approval for such applications.

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BALL-TYPE NON-RETURN VALVES

The function of these valves is to ensure that flow in vertical pipelines can only be in one direction. The PTFE seat, ball and retaining plate provide excellent corrosion resistance.

Where there is an increased requirement for freedom from leakage these valves can be supplied on request with an O-ring gasket.

Ball-type non-return valves are not suitable for use as a long-term shut-off function.

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TYPE RK NON-RETURN VALVES

Unlike PTFE flap type non-return valves (please see below), this version provides a large free cross-section even in small nominal sizes and consequently ensures low pressure drop. It is suitable for liquids and installation in horizontal and vertical pipelines.

The PTFE flaps are mounted on tantalum hinges which must be located at the top when installed in horizontal lines.

If required we can supply a version with drain branch and an eccentric design which is used with a «PRE..» (please see Section 2 «Pipeline Components»).

Flap-type non-return valves are not suitable for use to provide a long-term shut-off function.

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TYPE RKP NON-RETURN VALVES

These PTFE flap-type non-return valves are only available in larger nominal sizes (please see also type «RK..» non-return valves above). They can be fitted in horizontal or vertical pipelines using longer coupling bolts. No additional gaskets are required.

The PTFE flaps are mounted on tantalum hinges which must be located at the top when installed in horizontal lines.

The maximum permissible operating temperature for these flap-type non-return valves is 130 °C. The permissible operating pressure is the same as for pipeline components of the same nominal size.

The valve body is manufactured from carbon filled PTFE.

Flap-type non-return valves are not suitable for use to provide a long-term shut-off function.

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PNEUMATICALLY ACTUATED ON/OFF VALVES

These valves consist of the valve body and bellows plug used in our manually operated straight through and angle valves combined with either a Kämmer or Samson pneumatic diaphragm actuator. If required, pneumatically actuated on/off valves can also be supplied in the DN 100 and DN 150 nominal sizes.

All the types specified below are available in two versions, the only difference being the type of seal to atmosphere provided. Thus catalogue reference »PVS25 /..« for example describes a valve with single seal (between the valve body and the diaphragm actuator), while catalogue reference »PVS25S /..« applies to a valve with a double seal in accordance with TA-Luft (an additional spindle seal in the intermediate flange below the yoke rods as a precaution in case the bellows ruptures. Please see also page 3.2). In this case the Kämmer actuator must also be fitted with intermediate flange and yoke rods.

To provide a means of supporting the valves a »KK50-5« structure fitting (please see Section 10 »Structures & Supports«) is provided on one of the yoke rods to facilitate attachment to the support structure. In the case of valves without yoke rods (Kämmer actuator with single seal) a special support is part of the supply.

The required supply pressure is 2.5 bar g for all actuators and this should not be exceeded by more than 10%.

When ordering please add »1« to the catalogue reference for »spring to open« and »2« for »spring to close«.

If required Samson actuators can be supplied with the following additional built-on features:

- Limit switch with built-in inductive proximity switches in accordance with EN 50227/IEC 61934 hazardous area, type EEx ia IIC T6 to indicate if the valve is open or closed.
- 3/2 way solenoid valve, hazardous area type EEx ia IIC T6 (24 V DC).

Kämmer actuators can be supplied with the following additional built-on features on request:

- Inductive proximity switches in accordance with EN 50227/IEC 61934 hazardous area type EEx ia IIC T6, to indicate if the valve is open or closed. This is fitted into a housing mounted on top of the actuator (Dimension H increases by 70 mm).
- 3/2 way solenoid valve hazardous area type EEx me IIC T6 (24 V DC)
### PNEUMATICALLY ACTUATED ON/OFF VALVES

#### Straight Through Valves with Samson Actuator

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VALVES & FILTERS

PNEUMATICALLY ACTUATED ON/OFF VALVES

Angle Valves with Samson Actuator

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<td>593</td>
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Angle Valves with Kämmer Actuator

<table>
<thead>
<tr>
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<tr>
<td>25</td>
<td>150</td>
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<td>215</td>
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</tr>
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<td>PEM40/...</td>
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<td>205</td>
<td>150</td>
<td>493</td>
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<td>80</td>
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<td>409</td>
<td>PEM80/...</td>
</tr>
<tr>
<td>80</td>
<td>300</td>
<td>200</td>
<td>590</td>
<td>PEM80S/...</td>
</tr>
</tbody>
</table>
CONTROL VALVES

Like the pneumatically actuated control valves specified on pages 3.14 and 3.15, the manually operated control valves listed below are supplied exclusively as angle type. They can be retrofitted for pneumatic operation.

All the kvs values indicated for valves of a given nominal size (please see table) can be achieved by changing the PTFE plug/seat combination. A choice of linear or equal percentage characteristic curves are available.

The control ratio to VDI / VDE 2173 is 25 : 1 in all cases. The valve stroke is 10 mm for DN 25 nominal size valves and 15 mm for all other sizes.

When ordering please add the code number for the required kvs value and the type of the characteristic curve required, (please see table below) to the catalogue reference.

Available kvs-values

The «kvs value» is a typical figure indicating the flow of water in m³/h at 20 °C with a pressure drop of Δp=1 bar through the fully opened valve.

<table>
<thead>
<tr>
<th>DN</th>
<th>Operating characteristic</th>
<th>kvs value m³/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Code for operating characteristic</td>
<td>01 03 05 07 09 11 13 15 17 19</td>
</tr>
<tr>
<td></td>
<td>Equal Percent.</td>
<td>01 03 05</td>
</tr>
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<td></td>
<td>Linear</td>
<td>02 04 06</td>
</tr>
<tr>
<td>40</td>
<td>Code for operating characteristic</td>
<td>01 03 05</td>
</tr>
<tr>
<td></td>
<td>Equal Percent.</td>
<td>02 04 06</td>
</tr>
<tr>
<td></td>
<td>Linear</td>
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</tr>
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<td>Code for operating characteristic</td>
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</tr>
<tr>
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<td>Equal Percent.</td>
<td>02 04 06</td>
</tr>
<tr>
<td></td>
<td>Linear</td>
<td>02 04 06</td>
</tr>
</tbody>
</table>

Catalogue reference key

PRV25 05

Code for operating characteristic and kvs value (see table above)

Control valve type

CONTROL VALVES

Hand Control Valves

<table>
<thead>
<tr>
<th>DN</th>
<th>L</th>
<th>L1</th>
<th>H</th>
<th>Reference</th>
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<tbody>
<tr>
<td>25</td>
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<td>167</td>
<td>170</td>
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<td>PRV40/...</td>
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<td>50</td>
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<td>192</td>
<td>205</td>
<td>PRV50/...</td>
</tr>
</tbody>
</table>
PNEUMATICALLY ACTUATED CONTROL VALVES

These valves consist of the valve body and bellows plug used in our manually operated control valves combined with either a Kämmer or Samson diaphragm actuator. Both are fitted as standard with an an attached electro-pneumatic I/P positioner of hazardous area type EEx ia IIC T6.

All the types specified below are available in two versions, the only difference being the type of seal to atmosphere provided. Thus catalogue reference »PRS25 /..«, for example, describes a valve with single seal (between the valve body and the diaphragm actuator), while catalogue reference »PRS25S /..« applies to a valve with a double seal in accordance with TA-Luft (additional spindle seal in the intermediate flange below the yoke rods as a precaution in case the bellows ruptures, please see also page 3.2).

To provide a means of supporting the valves a »KK50-5« structure fitting (please see Section 10 »Structures & Supports«) is provided on one of the yoke rods to facilitate attachment to the support structure.

Samson diaphragm actuators can also be supplied with HART or PROFIBUS positioners.

The required supply pressure is 2.5 bar g for all actuators and this should not be exceeded by more than 10 %.

When ordering please add the suffixes to the catalogue reference as indicated in the catalogue reference key. Suffixes for the required kVS value and the type of characteristic curve required can be found on page 3.13.

If required the positioners fitted to Samson actuators can be supplied with the following additional features:
- Built-in 3 / 2 way solenoid valve, hazardous area type EEx ia IIC T6 (24 V DC).
- Built-in inductive proximity switches in accordance with EN 50227/IEC 61934, hazardous area type EEx ia IIC T6 to indicate if the valve is open or closed.
- Built-in analogue position transmitter, hazardous area type EEx ia IIC T6 (4-20 mA). Please note that this can only be supplied in place of the proximity switches detailed above.
- Built-in pressure regulator.

Kämmer actuators can be supplied with the following additional built-on features on request:
- Inductive proximity switches in accordance with EN 50227/IEC 61934, hazardous area type EEx ia IIC T6, to indicate if the valve is open or closed. These are fitted into a housing mounted on top of the actuator (Dimension H increases by 70 mm).
- 3 / 2 way solenoid valve hazardous area type EEx me IIC T6 (24 V DC)

Catalogue Reference Key

PRS25 05 1

Valve operation: 1 = Spring to open
2 = Spring to close

Code for operating characteristic and kVS value (see table on page 3.13)

Control valve type
### PNEUMATICALLY ACTUATED CONTROL VALVES

#### Control Valves with Samson Actuator

<table>
<thead>
<tr>
<th>DN</th>
<th>D</th>
<th>d1</th>
<th>L</th>
<th>L1</th>
<th>H</th>
<th>Reference</th>
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<td>150</td>
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<td>27</td>
<td>150</td>
<td>180</td>
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<td>150</td>
<td>190</td>
<td>418</td>
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<td>150</td>
<td>190</td>
<td>453</td>
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---

### PNEUMATICALLY ACTUATED CONTROL VALVES

#### Control Valves with Kämmer Actuator

<table>
<thead>
<tr>
<th>DN</th>
<th>D</th>
<th>d1</th>
<th>L</th>
<th>L1</th>
<th>H</th>
<th>Reference</th>
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</thead>
<tbody>
<tr>
<td>25</td>
<td>150</td>
<td>27</td>
<td>100</td>
<td>164</td>
<td>445</td>
<td>PRM25/...</td>
</tr>
<tr>
<td>25</td>
<td>150</td>
<td>27</td>
<td>100</td>
<td>164</td>
<td>445</td>
<td>PRM25S/...</td>
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<td>40</td>
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<td>150</td>
<td>180</td>
<td>584</td>
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<td>586</td>
<td>PRM40S/...</td>
</tr>
<tr>
<td>50</td>
<td>205</td>
<td>27</td>
<td>150</td>
<td>190</td>
<td>594</td>
<td>PRM50/...</td>
</tr>
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<td>205</td>
<td>27</td>
<td>150</td>
<td>190</td>
<td>596</td>
<td>PRM50S/...</td>
</tr>
</tbody>
</table>
 **PRESSURE RELIEF VALVES**

These valves are officially tested and approved for gases and vapours. They are direct operating and spring-loaded proportional (normal) pressure relief valves with a proven glass/PTFE seat/plug combination and are used to protect plant and equipment against exceeding the stated and/or approved operating pressure in accordance with the actual guidelines for pressure equipment. They can, however, also be used with pipeline and plant not subject to these regulations (where lower operating pressures or vacuum apply).

Before delivery, each valve is durably marked with the component reference «TÜV-SV...-590·do·D/G·w·p» issued by the TÜV test institute. In this reference: ...indicates the year of the applicable test report, 590 the test number, do the smallest flow diameter in mm, D/G the approval for gases and vapours, $w$ the discharge coefficient and p the setting pressure in bar.g.

For lower duties, we can also supply a DN 50 ball valve for a blow-off pressure of 20 mbar.

When ordering, please indicate the catalogue reference and the required blow-off pressure in bar g.

The setting pressure can only be changed by specialist personnel (e.g. by QVF). The valve must then be resealed and the model label altered.

To ensure that they function properly, pressure relief valves must always be installed vertically. Support fittings are available for this purpose.

### Technical Data

<table>
<thead>
<tr>
<th>DN</th>
<th>DN1</th>
<th>DN2</th>
<th>L</th>
<th>L1</th>
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<tr>
<td>25</td>
<td>50</td>
<td>80</td>
<td>150</td>
<td>125</td>
<td>325</td>
<td>SVF25/50</td>
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<tr>
<td>50</td>
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<td>100</td>
<td>150</td>
<td>150</td>
<td>395</td>
<td>SVF50/80</td>
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<td>150</td>
<td>150</td>
<td>200</td>
<td>225</td>
<td>480</td>
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**Minimum flow diameter**

<table>
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<tr>
<th>DN</th>
<th>Minimum flow diameter $d_o$ (mm)</th>
<th>Minimum flow cross section $A_o$ (mm$^2$)</th>
<th>Discharge coefficient $w$</th>
<th>Set pressure range (bar g)</th>
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<tbody>
<tr>
<td>25</td>
<td>25</td>
<td>490</td>
<td>0.44</td>
<td>0.26-1.51</td>
</tr>
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<td>50</td>
<td>50</td>
<td>1960</td>
<td>0.10</td>
<td>0.11-0.25</td>
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<td>50</td>
<td>50</td>
<td>1960</td>
<td>0.19</td>
<td>0.18-1.39</td>
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<tr>
<td>100</td>
<td>100</td>
<td>7850</td>
<td>0.17</td>
<td>0.07-1.18</td>
</tr>
</tbody>
</table>
ADJUSTABLE OVERFLOW VALVES

These valves are recommended for adjusting the interface in separators (e.g. in liquid-liquid extraction) azeotropic column heads or similar units. Level adjustment is infinitely variable and is by means of a PTFE tube fitted with sealing lips that can be moved up and down inside a precision bore glass tube.

Maximum possible throughputs (based on water and measured without any head in the input) are indicated in the table below.

Horizontal separators with sealed-in adjustable overflow valve can be found in Section 4 »Vessels & Stirrers«.

<table>
<thead>
<tr>
<th>DN</th>
<th>DN1</th>
<th>d</th>
<th>L</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
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<td>15</td>
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<td>100</td>
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<td>78</td>
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<td>40</td>
<td>15</td>
<td>25</td>
<td>150</td>
<td>265</td>
<td>90</td>
<td>435</td>
<td>78</td>
<td>470</td>
<td>OF40</td>
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<td>50</td>
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<td>150</td>
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<td>75</td>
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<td>330</td>
<td>120</td>
<td>555</td>
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<td>580</td>
<td>OF80</td>
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Technical Data

<table>
<thead>
<tr>
<th>DN</th>
<th>Maximum flow rate (l/h)</th>
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<td>25</td>
<td>600</td>
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<td>40</td>
<td>900</td>
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<tr>
<td>50</td>
<td>1600</td>
</tr>
<tr>
<td>80</td>
<td>3200</td>
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</tbody>
</table>

BOTTOM OUTLET VALVES

These valves close from below against an integral sealed-in glass seat eliminating dead space i.e. falling stem valves, which is important in such applications as stirred vessels and reaction vessels. The sealed-in glass seat can be incorporated in spherical and cylindrical vessels (please see Section 4 »Vessels & Stirrers«).

For pneumatically actuated bottom outlet valves, please see page 3.18.

Versions which seal from above can also be supplied on request i.e. rising stem. With these valves a special inverted valve seat is required which must be specified when ordering the vessel. The plug is fitted from inside the vessel after the valve is attached to the bottom outlet.

The »BAS40« is a short form valve, designed for use in spherical and cylindrical vessels which have short bottom outlets.

In the case of spherical and cylindrical vessels which have longer bottom outlets, because they are jacketed or are for use in oil baths, the »BAL40« long version should be used.

<table>
<thead>
<tr>
<th>DN</th>
<th>DN1</th>
<th>d1</th>
<th>L</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>H</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
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<td>35</td>
<td>85</td>
<td>105</td>
<td>75</td>
<td>35</td>
<td>165</td>
<td>BAS40</td>
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<td>40</td>
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<td>35</td>
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<td>105</td>
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<td>35</td>
<td>165</td>
<td>BAL40</td>
</tr>
</tbody>
</table>
PNEUMATICALLY ACTUATED BOTTOM OUTLET VALVE

This valve combines the valve body and bellows plug of the »BAS 40« manually operated bottom-outlet valve with a Samson pneumatic diaphragm actuator. The length of travel of the sealing plug below the seat is 15 mm and this therefore leaves the entire flow cross-section free. The valve can be set to close or to open as required in the event of a breakdown of the compressed air supply (please see below).

These valves are designed specifically for use with spherical or cylindrical vessels (see Section 4 »Vessels & Stirrers«) or immersion heat exchangers (see Section 5 »Heat Exchangers«) which have an integral glass-seat sealed into the bottom outlet. In the case of spherical and cylindrical vessels this feature can be incorporated on request.

To provide a means of supporting the valves a »KK50-5« structure fitting (please see Section 10 »Structures & Supports«) is provided on one of the yoke rods to facilitate attachment to the support structure.

Pneumatic actuators from other manufacturers, a long version based on the »BAL 40« and versions sealing from above can also be supplied on request. In the latter case the bellows plug has to be fitted from inside the vessel.

The supply pressure required is 2.5 bar g and this should not be exceeded by more than 10 %.

When ordering please add a »1« to the catalogue reference if the »spring-to-open« fail-safe version is required or a »2« for »spring-to-close«.

If required the actuators can be supplied with the following additional built-on features:

- Limit switch with built-in inductive proximity switches in accordance with EN 50227/IEC 61934, hazardous area type EEx ia IIC T6, to indicate if the valve is open or closed.
- 3/2 way solenoid valve, hazardous area type EEx ia IIC T6 (24 V DC).

The following table provides a summary of the valve dimensions:

<table>
<thead>
<tr>
<th>DN</th>
<th>DN1</th>
<th>D</th>
<th>d1</th>
<th>d2</th>
<th>L</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>H</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>25</td>
<td>168</td>
<td>35</td>
<td>27</td>
<td>85</td>
<td>105</td>
<td>75</td>
<td>35</td>
<td>378</td>
<td>BASP40/...</td>
</tr>
</tbody>
</table>

The diagram illustrates the dimensions and the components of the valve.
THREE WAY FLOW CHANGE VALVES

With normal three way valves it is possible to close both outlets at the same time by mistake which can result in the build-up of excess pressure in the line and also in the plant itself. The valve described here provides a safe solution to this problem since the design ensures that free flow through the valve is never impeded.

The use of a three way flow change valve is recommended when a plant is operated batchwise, under vacuum, and needs to be vented at regular intervals. In such circumstances one outlet is connected to the vacuum pump and the other (in reverse direction of flow) is used for venting purposes.

As in the case of on-off and control valves (please see page 3.10 and 3.14) three way flow change valves can be supplied with pneumatic actuators.

<table>
<thead>
<tr>
<th>DN</th>
<th>L</th>
<th>L1</th>
<th>H</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>100</td>
<td>160</td>
<td>232</td>
<td>PVW25</td>
</tr>
<tr>
<td>40</td>
<td>150</td>
<td>220</td>
<td>270</td>
<td>PVW40</td>
</tr>
</tbody>
</table>
GAS MIXING VALVES

These valves are used to feed gas into bubble columns without internals and reaction vessels. The gas enters through holes drilled radially at the narrowest cross-section of the PTFE jet and the flow of liquid causes it to shear off into very fine bubbles. This also ensures uniform distribution in the liquid even when used with large reaction vessels or similar equipment.

The liquid and gas throughput ratio can be selected within wide limits with the valve fully opened. This is achieved by appropriate adjustment of the gas feed pressure, selection of an appropriate diameter for the gas inlet holes or changing the liquid flow rate. It is also possible to vary the ratio of the two flow rates to each other by adjusting the setting of the control cone.

A wide range of measurements have been carried out for the water/air system and graphs recording the results of these are available on request. A summary of these curves can be seen in the diagram below.

The diameter of the gas inlet holes can be freely selected between 0.5 and 1.5 mm in 1/10 mm increments.

When ordering, the required gas inlet hole diameter (please see below) should be added to the catalogue reference.

The specification of the centrifugal pump is determined by the liquid throughput on the one hand and the pressure drop in the valve and back pressure resulting from the column of liquid behind the valve on the other hand.

These valves should not be used as cut-off valves due to the risk of distortion of the gas inlet holes.

![Graph showing gas throughput (air, 20 °C) versus liquid throughput (water, 20 °C)]

- Aspiration rate
- Input pressure 0.2 bar
- Input pressure 0.4 bar
- $\dot{V}_W =$ Water throughput
- $\dot{V}_A =$ Air throughput
- Referred to max. throughput (see technical data)

Gas throughput (air, 20 °C) versus liquid throughput (water, 20 °C)
GAS MIXING VALVES

Technical Data

The throughputs for water and gas refer to a pressure drop of 2 bar in the valve and were measured with an input pressure (air) of 0.4 bar g and a hole diameter of 1.5 mm.

<table>
<thead>
<tr>
<th>Valve size</th>
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<th>50</th>
</tr>
</thead>
<tbody>
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<td>bar.g</td>
<td>3.5</td>
<td>3.5</td>
<td>3.0</td>
</tr>
<tr>
<td>Throughput</td>
<td>Water l/h</td>
<td>1000</td>
<td>2000</td>
<td>4000</td>
</tr>
<tr>
<td></td>
<td>Air Nm/h</td>
<td>2.3</td>
<td>8.0</td>
<td>13.0</td>
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</table>

<table>
<thead>
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<th>DN2 Gas</th>
<th>L</th>
<th>L1</th>
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<tbody>
<tr>
<td>25</td>
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</table>
### SAMPLING VALVES

These valves are void of dead space and are designed for installation in horizontal pipelines. They are used to take samples from plant and other equipment. There are two different versions (please see below and page 3.23) which should be selected according to whether they are to operate under positive or atmospheric pressure or alternatively, under vacuum.

The two-part sampling flange below the outlet neck has a PPH feed pipe fitted inside it and has a GL 45 screw thread (usual with laboratory glass ware). It will, therefore, accept a laboratory bottle (which is included in the supply), for example. It can also be vented via a hole provided in the flange. To evacuate the bottle when taking samples from a vacuum, this hole is fitted with a three-way valve (G 1/4 connection).

When taking samples from a vacuum, the vessels used (e.g. laboratory bottles) must be suitable for use under vacuum.

#### Sampling Valves for Atmospheric and Positive Pressure

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SAMPLING VALVES

Sampling Valves for Vacuum

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<td>228</td>
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</table>

DIAPHRAGM VALVES

The design of these valves differs from that of our normal valves and provides great benefits where GMP requirements have to be met. The PTFE diaphragm seals on a fire-polished glass weir and, when installed vertically, the valve can be emptied fully via the pipeline it is connected to.

<table>
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<th>Reference</th>
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</thead>
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<tr>
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</tbody>
</table>
BALL VALVES

As a result of the careful selection of materials which ensures that they meet the corrosion resistance standards expected of our products, these ball valves, which close with a gas-tight seal, represent an excellent complement to the rest of our range of glass valves. They are used in every type of application where full bore flow, i.e. low pressure drop, is an important requirement. In addition, they offer the benefit of short operating travel.

All the various versions have the common features of ceramic ball (Al₂O₃), PFA-sheathed stainless steel operating spindle and PTFE sealing ring (various designs). Body materials, mating ends (with or without coupling components) and the sealing arrangements for the operating spindle vary.

All bodies (except »KH..«), coupling flanges and hand levers are epoxy resin coated.

Support fittings are available which consider the installation options for these components.

The maximum permissible operating temperature for all versions is 180 °C. The maximum permissible operating pressure is the same in each case as for the corresponding size borosilicate glass 3.3 pipeline.

BALL VALVES

Ball Valves with Borosilicate Glass 3.3 Body

This version has a borosilicate glass 3.3 body and connecting ends (please see above for data on materials of construction applicable to all versions). This design is particularly suitable for liquids containing solids.

The operating spindle is sealed by means of a PTFE-sheathed O-ring and requires no maintenance.

<table>
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</table>
BALL VALVES

Compact Ball Valves with Spheroidal Graphite Cast Iron/PFA Body

A feature of these compact ball valves with body and connecting flanges made of spheroidal graphite cast iron/PFA (please see on page 3.24 for data on materials of construction applicable to all versions) is their short overall length. They are ideal for direct installation in borosilicate glass 3.3 between components with safety buttress ends. Appropriately drilled type »CRSSE...« adaptor flanges (please see section 9 »Couplings«), inserts, bolts etc. should be ordered separately.

The operating spindle is sealed by means of a self-adjusting, maintenance-free stuffing box.

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<td>125 x 4 x M8</td>
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PNEUMATICALLY ACTUATED BALL VALVES

All the manually operated ball valves described above can be supplied with NORBRO single-action actuators. Their spring return action can be set at will as a safety feature to either »spring to open« or »spring to close«.

Technical data and installation dimensions of these ball valves are the same as for the manually operated version.

The actuators themselves and the fitting kits used conform to ISO standards. Support fittings are available which consider the installation options for these components.

If required, we can also supply actuators with a lower number of springs for lower air supply pressures, double-action NORBRO actuators or actuators by other manufacturers.

Compressed air is required at 5.5 bar g for single-action actuators with the full number of springs.

To avoid the sudden build-up of high surface pressure between the ball and operating spindle at the start of the opening or shutting action, we recommend the incorporation of air flow controls in the supply line to the actuator.

When ordering please add a »1« to the catalogue reference if the »spring-to-open« fail-safe version is required or a »2« for »spring-to-close«.

The »spring to open« setting can be changed to »spring to close« and vice-versa by changing the position of the operating spindle in the actuator by 90°.

If required, two inductive proximity detectors of hazardous area type EEx ia IIIC T6 to indicate on/off can be supplied for the actuators.
PNEUMATICALLY ACTUATED BALL VALVES

Ball Valves with Borosilicate Glass 3.3 Body

<table>
<thead>
<tr>
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Compact Ball Valves with Spheroidal Graphite Cast Iron/PFA Body

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BUTTERFLY VALVES

These valves, which close with a gas-tight seal, complement our ball valve range (please see pages 3.24 to 3.26) in the larger bores. The combination of materials of construction selected ensures that they also meet the corrosion resistance standards expected of our products. They are used not only where there is a requirement for full bore flow, i.e. low pressure drop, and short operating travel, but also absence of dead space and short overall length.

In reaction units they can be used to separate the distillation overhead gear and reaction vessel when it is intended to operate the latter for periods at higher pressure.

These butterfly valves comprise essentially a PFA-sheathed stainless steel disk/operating spindle unit, a two-part PFA / spheroidal graphite cast iron body, a maintenance-free, self-adjusting operating spindle seal together with a hand lever and an integral earthing strap for static electricity discharge purposes. The body and hand lever are epoxy resin coated.

As a result of their virtually equal percentage characteristic curve in the 20° to 80° opening angle range, flap valves can also be used as control valves. The seal between the disk and body lining is concentric and it makes a soft seal.

Support fittings are available which consider the installation options for these components.

Butterfly valves nominal size DN 50 are supplied as standard with a hand lever with fixed intermediate settings. Larger valves are supplied with a geared handwheel. All sizes can, however, be supplied with pneumatic actuators if required.

These butterfly valves can also be used for connections to glassed steel branches. The corresponding sets of adaptors have to be ordered separately (see Section 9 »Couplings«).

The maximum permissible operating temperature is 190 °C at -0,5/+4 bar g and 120 °C at -1/+4 bar g.

If required, butterfly valves can be supplied with an additional secondary seal (stuffing box), alarm connection and proximity switch (»valve closed« indicator).

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PIPELINE FILTERS

Our proven pipeline filters with ceramic elements (please see also «Dirt Traps» on page 3.29) are recommended for the removal of very fine impurities from liquid or gas streams in glass pipeline systems. They are supplied as standard in grain size 30 with an average pore diameter of 40 µm. Other grain sizes and materials are also available upon request.

The degree of contamination can be observed clearly at all times through the borosilicate glass 3.3 body provided the product permits it. The assembly is designed for ease of cleaning or replacement of the filter element.

The graphs below provide pressure drop data (based on water) for the various sizes. They refer to clean filter elements.

Pressure drop versus throughput (water, 20 °C) with grain size 30

<table>
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DIRT TRAPS

These angled seat filters with PTFE insert are designed for use in pipeline systems. They are used to protect equipment, e.g. pumps with magnetic coupling, against damage by abrasive contents or other impurities (please see also »Pipeline Filters« on page 3.28).

Dirt traps can be supplied as coarse filters, i.e. with 2 mm diameter holes in the PTFE cylinder, or as fine filters. In the latter case a PTFE filter sleeve with a mesh size of 100, 300 or 500 µm is fitted over the support cylinder. The graphs below provide pressure drop data (based on water) for the various sizes. They refer to clean filter inserts.

The degree of contamination can be observed clearly through the borosilicate glass 3.3 body provided the product permits it.

When ordering fine filters, the mesh size (please see above) should be added to the catalogue reference. The mentioned pressure drop is related to a maximum temperature of 180 °C.

Pressure drop versus throughput (water, 20 °C)

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