Type 3291 Valve · ANSI version
In combination with actuators,
e.g. SAMSON Type 3271 or Type 3277 Pneumatic Actuator
Note on these mounting and operating instructions

These mounting and operating instructions assist you in mounting and operating the device safely. The instructions are binding for handling SAMSON devices.

➔ For the safe and proper use of these instructions, read them carefully and keep them for later reference.

➔ If you have any questions about these instructions, contact SAMSON’s After-sales Service Department (aftersalesservice@samson.de).

The mounting and operating instructions for the devices are included in the scope of delivery. The latest documentation is available on our website at www.samson.de > Service & Support > Downloads > Documentation.

Definition of signal words

⚠️ DANGER
Hazardous situations which, if not avoided, will result in death or serious injury

⚠️ WARNING
Hazardous situations which, if not avoided, could result in death or serious injury

⚠️ NOTICE
Property damage message or malfunction

ℹ️ Note
Additional information

☀️ Tip
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1 Safety instructions and measures

Intended use
The SAMSON Type 3291 Globe Valve in combination with an actuator (e.g. Type 3271 or Type 3277 Pneumatic Actuator) is designed to regulate the flow rate, pressure or temperature of liquids, gases or vapors. The valve with its actuator is designed to operate under exactly defined conditions (e.g. operating pressure, process medium, temperature). Therefore, operators must ensure that the control valve is only used in applications that meet the specifications used for sizing the valve at the ordering stage. In case operators intend to use the control valve in other applications or conditions than specified, contact SAMSON. SAMSON does not assume any liability for damage resulting from the failure to use the valve for its intended purpose or for damage caused by external forces or any other external factors.

⇒ Refer to the technical data and nameplate for limits and fields of application as well as possible uses.

Reasonably foreseeable misuse
The control valve is not suitable for the following applications:

− Use outside the limits defined during sizing and by the technical data
− Use outside the limits defined by the valve accessories mounted on the control valve

Furthermore, the following activities do not comply with the intended use:

− Use of non-original spare parts
− Performing service and repair work not described in these instructions

Qualifications of operating personnel
The control valve must be mounted, started up, serviced and repaired by fully trained and qualified personnel only; the accepted industry codes and practices are to be observed. According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible hazards due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.
Safety instructions and measures

Personal protective equipment
We recommend checking the hazards posed by the process medium being used (e.g. GESTIS (CLP) hazardous substance database).

- Provide protective equipment (e.g. safety gloves, eye protection) appropriate for the process medium used.
- Wear hearing protection when working near the valve.
- Check with the plant operator for details on further protective equipment.

Revisions and other modifications
Revisions, conversions or other modifications to the product are not authorized by SAMSON. They are performed at the user’s own risk and may lead to safety hazards, for example. Furthermore, the product may no longer meet the requirements for its intended use.

Safety devices
Upon supply air or control signal failure, the valve moves to its fail-safe position (see section 3.1). The fail-safe action of the actuator is the same as its direction of action and is specified on the nameplate of SAMSON actuators (see actuator documentation).

Warning against residual hazards
To avoid personal injury or property damage, plant operators and operating personnel must prevent hazards that could be caused in the control valve by the process medium, the operating pressure, the signal pressure or by moving parts by taking appropriate precautions. They must observe all hazard statements, warning and caution notes in these mounting and operating instructions, especially for installation, start-up, and service work.

We also recommend checking the hazards posed by the process medium being used (e.g. GESTIS (CLP) hazardous substance database).

- Observe safety measures for handling the device as well as fire prevention and explosion protection measures.

Responsibilities of the operator
The operator is responsible for proper operation and compliance with the safety regulations. Operators are obliged to provide these mounting and operating instructions as well as the referenced documents to the operating personnel and to instruct them in proper operation. Furthermore, the operator must ensure that operating personnel or third persons are not exposed to any danger.
Responsibilities of operating personnel

Operating personnel must read and understand these mounting and operating instructions as well as the referenced documents and observe the hazard statements, warning and caution notes specified in them. Furthermore, the operating personnel must be familiar with the applicable health, safety and accident prevention regulations and comply with them.

Referenced standards and regulations

The control valves comply with the requirements of the European Pressure Equipment Directive 2014/68/EU. Valves with a CE marking have an EU declaration of conformity, which includes information about the applied conformity assessment procedure. This EU declaration of conformity is included in the Appendix of these instructions (see section 10.2).

Non-electric valve versions whose bodies are not lined with an insulating material coating do not have their own potential ignition source according to the risk assessment stipulated in EN 13463-1: 2009, section 5.2, even in the rare incident of an operating fault. Therefore, such valve versions do not fall within the scope of Directive 2014/34/EU.

➔ For connection to the equipotential bonding system, observe the requirements specified in section 6.4 of EN 60079-14 (VDE 0165 Part 1).

Referenced documentation

The following documents apply in addition to these mounting and operating instructions:

- Mounting and operating instructions for mounted actuator, e.g. EB 8310-X for SAMSON Type 3271 and Type 3277 Actuators
- Mounting and operating instructions for mounted valve accessories (positioner, solenoid valve etc.)
- AB 0100 for tools, tightening torques and lubricant
- For oxygen service: Manual H 01
1.1 Notes on possible severe personal injury

⚠️ DANGER

Risk of bursting in pressure equipment.
Valves and pipelines are pressure equipment. Improper opening can lead to valve components bursting.

➤ Before starting any work on the valve, depressurize all plant sections concerned as well as the valve.
➤ Drain the process medium from all the plant sections concerned as well as the valve.
➤ Wear personal protective equipment.

1.2 Notes on possible personal injury

⚠️ WARNING

Crush hazard arising from moving parts.
The control valve contains moving parts (actuator and plug stems), which can injure hands or fingers if inserted into the valve.

➤ Do not insert hands or fingers into the yoke while the valve is in operation.
➤ While working on the control valve, disconnect and lock the pneumatic air supply as well as the control signal.

Risk of personal injury when the actuator vents.
While the valve is operating, the actuator may vent during closed-loop control or when the valve opens or closes.

➤ Install the control valve in such a way that the actuator does not vent at eye level.
➤ Use suitable silencers and vent plugs.
➤ Wear eye protection when working in close proximity to the control valve.
**WARNING**

**Risk of personal injury due to preloaded springs.**
Valves in combination with pneumatic actuators with preloaded springs are under tension. These control valves with SAMSON pneumatic actuators can be identified by the long bolts protruding from the bottom of the actuator.

➔ Before starting any work on the actuator, relieve the compression from the preloaded springs (see associated actuator documentation).

**Risk of personal injury due to residual process medium in the valve.**
While working on the valve, residual process medium can escape and, depending on its properties, may lead to personal injury, e.g. (chemical) burns.

➔ If possible, drain the process medium from all the plant sections concerned and the valve.

➔ Wear protective clothing, safety gloves, and eyewear.

**Risk of burn injuries due to hot or cold components and pipelines.**
Depending on the process medium, valve components and pipelines may get very hot or cold and cause burn injuries.

➔ Allow components and pipelines to cool down or heat up.

➔ Wear protective clothing and safety gloves.
Safety instructions and measures

1.3 Notes on possible property damage

⚠️ NOTICE

Risk of valve damage due to contamination (e.g. solid particles) in the pipeline.
The plant operator is responsible for cleaning the pipelines in the plant.
- Flush the pipelines before start-up.
- Observe the maximum permissible pressure for valve and plant.

Risk of valve damage due to unsuitable medium properties.
The valve is designed for a process medium with defined properties.
- Only use the process medium specified for sizing the valve.

Risk of leakage and valve damage due to excessively high or low tightening torques.
Observe the specified torques on tightening control valve components. Excessively tightened torques lead to parts wearing out quicker. Parts that are too loose may cause leakage.
- Observe the specified tightening torques (► AB 0100).

Risk of valve damage due to the use of unsuitable tools.
Special tools are available for certain work on the valve (e.g. replacing the packing).
- Only use tools approved by SAMSON (► AB 0100).

ℹ️ Note

No special tools are required to replace the seat and plug.

Risk of valve damage due to the use of unsuitable lubricants.
The lubricants to be used depend on the valve material. Unsuitable lubricants may corrode and damage the valve surface.
- Only use lubricants approved by SAMSON (► AB 0100).
2 Markings on the control valve

2.1 Valve nameplate

1...5 PED (Pressure Equipment Directive), "Art. 4, Abs. 3"
   ID of the notified body, fluid group and category
6 Type designation
8 Material
9 Year of manufacture
10 Valve size: NPS
11 Pressure rating: CL (Class)
12 Order no. with modification index
   For after-sales service orders: AA prefix
13 Position in order
   For after-sales service orders: configuration ID
14 Flow coefficient: \( C_v \)
15 Characteristic:
   %: equal percentage
   Lin: linear
   mod-lin: modified linear
   NO/NC: on/off service
16 Seat-plug seal:
   ME: metal
   HA: carbide metal
   ST: Stellite® facing
   KE: ceramic
   PT: soft seal with PTFE
   PK: soft seal with PEEK
17 Seat code (trim material). See section 2.3.
18 Pressure balancing: B
19 Flow divider/perforated plug:
   1: Flow divider ST 1
   LK: Perforated plug
20 Country of origin

Fig. 1: Valve nameplate
The nameplate (80) is affixed to the yoke (see Fig. 2).

![Fig. 2: Nameplate on the yoke](image)

### 2.2 Actuator nameplate

See associated actuator documentation.

### 2.3 Material number

The seat and plug of the valves have an article number written on them. Specifying this article number, you can contact us to find out which material is used. Additionally, a seat code is used to identify the trim material. This seat code is specified on the nameplate (17 on nameplate). For more details on the nameplate, see section 2.1.
3 Design and principle of operation

The Type 3291 Globe Valve with clamped seat is preferably combined with a SAMSON Type 3271 or Type 3277 Pneumatic Actuator (see Fig. 3). It can also be combined with other actuators.

The seat (4), plug with plug stem (5) and seat retainer (124) are installed in the body (1). The seat is inserted into the seat bridge. The seat and seat retainer are clamped into place by tightening the body nuts (14). In versions with flow divider, it takes over the function as a seat retainer, i.e. the seat (4) is clamped in place by the flow divider (62).

The plug stem is connected to the actuator stem (A7) by the stem connector clamps (A26/27) and is sealed by a spring-loaded V-ring packing or an adjustable high-temperature packing.

The springs (A10) in the pneumatic actuator are located either above or below the diaphragm (A4) depending on the selected failsafe action (see section 3.1). A change in the signal pressure acting on the diaphragm causes the plug to move.

The process medium flows through the valve in the direction indicated by the arrow on the body in the flow-to-open (FTO) direction. A rise in signal pressure causes the force acting on the diaphragm in the actuator to increase. The springs are compressed. Depending on the selected direction of action, the actuator stem retracts or extends. As a result, the plug position in the seat changes, which together with the seat retainer's contour, determines the released cross-section and the flow rate as well.
Fig. 3: Type 3291 Valve with Type 3271 Pneumatic Actuator
3.1 Fail-safe positions
The fail-safe position depends on the actuator's direction of action. Depending on how the compression springs are arranged in the pneumatic actuator, the valve has two different fail-safe positions:

**Actuator stem extends (FA)**
When the signal pressure is reduced or the air supply fails, the springs move the actuator stem downward and close the valve. The valve opens when the signal pressure is increased enough to overcome the force exerted by the springs.

**Actuator stem retracts (FE)**
When the signal pressure is reduced or the air supply fails, the springs move the actuator stem upwards and open the valve. The valve closes when the signal pressure is increased enough to overcome the force exerted by the springs.

3.2 Versions

**Insulating section and bellows seal**
The modular design allows an insulating section or metal bellows to be fitted to the standard valve version.

**Actuators**
In these instructions, the preferable combination with a Type 3271 or Type 3277 Pneumatic Actuator is described. The pneumatic actuator (with or without handwheel) can be replaced by another pneumatic actuator in a different size, but with the same travel.

⇒ Observe the maximum permissible actuator force. See section 3.3.

---

**i Note**
If the travel range of the actuator is larger than the travel range of the valve, the spring assembly in the actuator must be preloaded so that the travel ranges match. See associated actuator documentation.

The basic pneumatic actuator can be replaced by a pneumatic actuator with additional handwheel or by an electric actuator.

3.3 Technical data
The nameplates on the valve and actuator provide information on the control valve version. See section 2.1 and the associated actuator documentation.

---

**i Note**
More information is available in Data Sheet ► T 8072-1.
## Design and principle of operation

**Table 1: Technical data for Type 3291**

<table>
<thead>
<tr>
<th>Material</th>
<th>Cast steel A352 LCC</th>
<th>Cast steel A216 WCC</th>
<th>Cast steel A217 WC6</th>
<th>Cast stainless steel A351 CF3M</th>
<th>A351 CF8M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve size</td>
<td>NPS ½ to 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure rating</td>
<td>Class 150 to 900</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of connection</td>
<td>Flanges</td>
<td>All ANSI versions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Welding ends</td>
<td>According to ANSI B16.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seat-plug seal</td>
<td>Metal seal · Soft seal · High-performance metal seal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Characteristic</td>
<td>Equal percentage · Linear · Quick opening</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rangeability</td>
<td>50:1</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Compliance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Temperature ranges** in °F (°C) · Permissible operating pressures according to pressure-temperature diagrams (see Information Sheet ▶ T 8000-2)

<table>
<thead>
<tr>
<th>Body without insulating section</th>
<th>14 to 428 (–10 to +220) · Up to 660 (350) with high-temperature packing depending on material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body with insulating section</td>
<td></td>
</tr>
<tr>
<td>Insulating section</td>
<td>−51 to +649 (−46 to +343)</td>
</tr>
<tr>
<td>Bellows seal</td>
<td>−51 to +649 (−46 to +343)</td>
</tr>
<tr>
<td>Valve plug 1)</td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>Metal seal</td>
</tr>
<tr>
<td>Soft seal</td>
<td>−325 to +428 (−196 to +220)</td>
</tr>
<tr>
<td>Balanced with PTFE ring</td>
<td>−40 to +428 (−40 to +220) · Lower temperatures on request</td>
</tr>
<tr>
<td>Balanced with graphite ring</td>
<td>−40 to +842 (−40 to +450)</td>
</tr>
<tr>
<td>Leakage class according to ANSI/FCI 70-2</td>
<td></td>
</tr>
<tr>
<td>Valve plug</td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>Metal seal</td>
</tr>
<tr>
<td>Soft seal 2)</td>
<td></td>
</tr>
<tr>
<td>Balanced, metal seal</td>
<td>Standard: IV (with PTFE or graphite ring) · High-performance metal seal: V (only with PTFE ring)</td>
</tr>
</tbody>
</table>

1) Only in combination with suitable body material
2) On request
Design and principle of operation

Noise emission

SAMSON is unable to make general statements about noise emission as it depends on the valve version, plant facilities and process medium.

⚠️ WARNING ⚠️
Risk of hearing loss or deafness due to loud noise.
Wear hearing protection when working near the valve.

Dimensions and weights

Table 2 and Table 3 provide a summary of the dimensions and weights of the standard version of Type 3291 Valve. The lengths and heights in the dimensional drawings are shown on p. 20.

<table>
<thead>
<tr>
<th>Valves</th>
<th>NPS</th>
<th>½</th>
<th>1</th>
<th>1½</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length L (Class 150)</td>
<td>Flanges RF/welding ends (schedule 80)</td>
<td>in</td>
<td>7.25</td>
<td>7.25</td>
<td>8.75</td>
<td>10.00</td>
<td>11.75</td>
<td>13.88</td>
<td>17.75</td>
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<tr>
<td></td>
<td></td>
<td>mm</td>
<td>184</td>
<td>184</td>
<td>222</td>
<td>254</td>
<td>298</td>
<td>352</td>
<td>451</td>
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<tr>
<td></td>
<td></td>
<td>mm</td>
<td>197</td>
<td>235</td>
<td>267</td>
<td>311</td>
<td>365</td>
<td>464</td>
<td>546</td>
</tr>
<tr>
<td>Length L (Class 300)</td>
<td>Flanges RF/welding ends (schedule 80)</td>
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<td>7.50</td>
<td>7.75</td>
<td>9.25</td>
<td>10.50</td>
<td>12.50</td>
<td>14.50</td>
<td>18.62</td>
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<tr>
<td></td>
<td></td>
<td>mm</td>
<td>190</td>
<td>197</td>
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<td>267</td>
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<td>368</td>
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<td></td>
<td>Flanges RTJ</td>
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<td>334</td>
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<td>8.00</td>
<td>8.25</td>
<td>9.88</td>
<td>11.25</td>
<td>13.25</td>
<td>15.50</td>
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<tr>
<td></td>
<td></td>
<td>mm</td>
<td>203</td>
<td>210</td>
<td>251</td>
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<td>340</td>
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<td>248</td>
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<td>340</td>
<td>397</td>
<td>511</td>
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<tr>
<td>Length L (Class 900)</td>
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<td>8.50</td>
<td>10.00</td>
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<td></td>
<td>Flanges RTJ</td>
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### Design and principle of operation

<table>
<thead>
<tr>
<th>Valve</th>
<th>NPS</th>
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<tr>
<td>H4</td>
<td>Class 150 to 600</td>
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<td>5.98</td>
<td>5.98</td>
<td>6.46</td>
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<td>8.74</td>
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<td>242</td>
<td>337</td>
<td>410</td>
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<td></td>
<td>Class 900</td>
<td>in</td>
<td>7.32</td>
<td>7.32</td>
<td>7.68</td>
<td>9.88</td>
<td>8.74</td>
<td>9.53</td>
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<td>337</td>
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<td></td>
<td>mm</td>
<td>240</td>
<td>240</td>
<td>240</td>
<td>240</td>
<td>240</td>
<td>240</td>
<td>395</td>
<td>395</td>
</tr>
<tr>
<td></td>
<td>1000 cm²</td>
<td>in</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>11.61</td>
<td>11.61</td>
<td>11.61</td>
<td>15.55</td>
</tr>
<tr>
<td></td>
<td>mm</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>295</td>
<td>295</td>
<td>295</td>
<td>395</td>
<td>395</td>
</tr>
<tr>
<td></td>
<td>1400-60 cm²</td>
<td>in</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>11.61</td>
<td>11.61</td>
<td>11.61</td>
<td>15.55</td>
</tr>
<tr>
<td></td>
<td>mm</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>295</td>
<td>295</td>
<td>295</td>
<td>395</td>
<td>395</td>
</tr>
<tr>
<td></td>
<td>1400-120 cm²</td>
<td>in</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>18.90</td>
<td>18.90</td>
<td>18.90</td>
</tr>
<tr>
<td></td>
<td>mm</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>480</td>
<td>480</td>
<td>480</td>
<td>480</td>
</tr>
<tr>
<td></td>
<td>2800 cm²</td>
<td>in</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>18.90</td>
<td>18.90</td>
<td>18.90</td>
</tr>
<tr>
<td></td>
<td>mm</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>480</td>
<td>480</td>
<td>480</td>
<td>480</td>
</tr>
<tr>
<td>H2</td>
<td>Class 150</td>
<td>in</td>
<td>1.97</td>
<td>2.36</td>
<td>3.15</td>
<td>3.54</td>
<td>3.94</td>
<td>6.30</td>
<td>8.66</td>
</tr>
<tr>
<td></td>
<td>mm</td>
<td>50</td>
<td>60</td>
<td>80</td>
<td>90</td>
<td>100</td>
<td>160</td>
<td>220</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>Class 300 to 600</td>
<td>in</td>
<td>2.34</td>
<td>2.76</td>
<td>3.54</td>
<td>3.94</td>
<td>4.72</td>
<td>7.09</td>
<td>9.25</td>
</tr>
<tr>
<td></td>
<td>mm</td>
<td>60</td>
<td>70</td>
<td>90</td>
<td>100</td>
<td>120</td>
<td>180</td>
<td>235</td>
<td>270</td>
</tr>
<tr>
<td></td>
<td>Class 900</td>
<td>in</td>
<td>2.76</td>
<td>3.15</td>
<td>3.94</td>
<td>4.33</td>
<td>4.72</td>
<td>7.09</td>
<td>9.25</td>
</tr>
<tr>
<td></td>
<td>mm</td>
<td>70</td>
<td>80</td>
<td>100</td>
<td>110</td>
<td>120</td>
<td>180</td>
<td>235</td>
<td>270</td>
</tr>
</tbody>
</table>
Design and principle of operation

Table 3: Weights for Type 3291

<table>
<thead>
<tr>
<th>Valve without actuator (approx.)</th>
<th>NPS</th>
<th>½</th>
<th>1</th>
<th>1½</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 150 and 300</td>
<td>lbs</td>
<td>34</td>
<td>39</td>
<td>50</td>
<td>88</td>
<td>137</td>
<td>181</td>
<td>465</td>
<td>1003</td>
</tr>
<tr>
<td></td>
<td>kg</td>
<td>15.5</td>
<td>17.5</td>
<td>22.5</td>
<td>40</td>
<td>62</td>
<td>82</td>
<td>211</td>
<td>455</td>
</tr>
<tr>
<td>Class 600</td>
<td>lbs</td>
<td>49</td>
<td>62</td>
<td>82</td>
<td>146</td>
<td>231</td>
<td>311</td>
<td>772</td>
<td>1224</td>
</tr>
<tr>
<td></td>
<td>kg</td>
<td>22</td>
<td>28</td>
<td>37</td>
<td>66</td>
<td>105</td>
<td>141</td>
<td>350</td>
<td>555</td>
</tr>
<tr>
<td>Class 900</td>
<td>lbs</td>
<td>77</td>
<td>90</td>
<td>134.5</td>
<td>218</td>
<td>271</td>
<td>362</td>
<td>860</td>
<td>1456</td>
</tr>
<tr>
<td></td>
<td>kg</td>
<td>35</td>
<td>41</td>
<td>61</td>
<td>99</td>
<td>123</td>
<td>164</td>
<td>390</td>
<td>665</td>
</tr>
</tbody>
</table>

Dimensional drawings

Type 3291 Valve with flanges

Type 3291 Valve with welding ends

Note

For more dimensions and weights refer to the Data Sheet T 8072-1.
The associated actuator documentation applies to actuators, e.g. for SAMSON actuators:
- T 8310-1 for Type 3271 and Type 3277 Actuators up to 750 cm² actuator area
- T 8310-2 for Type 3271 Actuator with 1000 cm² actuator area and larger
- T 8310-3 for Type 3271 Actuator with 1400-60 cm² actuator area
- T 8312 for Type 3273 Hand-operated Actuator
4 Measures for preparation

After receiving the shipment, proceed as follows:

1. Check the scope of delivery. Compare the shipment received against the delivery note.
2. Check the shipment for transportation damage. Report any damage to SAMSON and the forwarding agent (refer to delivery note).

4.1 Unpacking

*Note*
Do not remove the packaging until immediately before installing the valve into the pipeline.

Proceed as follows to lift and install the valve:

1. Remove the packaging from the valve.
2. Dispose of the packaging in accordance with the valid regulations.

*NOTICE*
Risk of valve damage due to foreign particles entering the valve.
The protective caps fitted on the valve's inlet and outlet prevent foreign particles from entering the valve and damaging it. Do not remove the protective caps until immediately before installing the valve into the pipeline.

4.2 Transporting and lifting

*DANGER*
Hazard due to suspended loads falling. Stay clear of suspended or moving loads.

*WARNING*
Risk of lifting equipment tipping and risk of damage to lifting accessories due to exceeding the rated lifting capacity.
– Only use approved lifting equipment and accessories whose minimum lifting capacity is higher than the weight of the valve (including actuator, if applicable).
– Refer to section 3.3 or Data Sheet T 8072-1 for weights.

*WARNING*
Risk of personal injury due to the control valve tipping.
– Observe the valve's center of gravity.
– Secure the valve against tipping over or turning.
Measures for preparation

4.2.1 Transporting

The control valve can be transported using lifting equipment (e.g. crane or forklift).

- Leave the control valve in its transport container or on the pallet to transport it.
- Observe the transport instructions.

Transport instructions

- Protect the control valve against external influences (e.g. impact).
- Do not damage the corrosion protection (paint, surface coatings). Repair any damage immediately.
- Protect the control valve against moisture and dirt.
- The permissible transportation temperature of standard control valves is –20 to +65 °C (–4 to +149 °F).

Contact SAMSON’s After-sales Service department for the transportation temperatures of other valve versions.

4.2.2 Lifting

To install a large valve into the pipeline, use lifting equipment (e.g. crane or forklift) to lift it.

Lifting instructions

- Secure slings against slipping.
- Make sure the slings can be removed from the valve once it has been installed into the pipeline.
Measures for preparation

- Prevent the control valve from tilting or tipping.
- Do not leave loads suspended when interrupting work for longer periods of time.
- Make sure that the axis of the pipeline is always horizontal during lifting and the axis of the plug stem is always vertical.
- Make sure that the additional sling between the lifting eyelet and rigging equipment (hook, shackle etc.) does not bear any load when lifting valves larger than NPS 6. The sling only protects the control valve from tilting while being lifted. Before lifting the control valve, tighten the sling.

Fig. 4: Lifting points on the control valve: with flanges and additional lifting eyelet on the actuator (left) · With welding ends (right)
Version with flanges
1. Attach one sling to each flange of the body and to the rigging equipment (e.g. hook) of the crane or forklift (see Fig. 4).
2. **NPS 6 and larger:** Attach another sling to the lifting eyelet on the actuator and to the rigging equipment.
3. Carefully lift the control valve. Check whether the lifting equipment and accessories can bear the weight.
4. Move the control valve at an even pace to the site of installation.
5. Install the valve into the pipeline (see section 5.2.3).
6. Check whether the flanges are bolted tight and the valve in the pipeline holds.
7. Remove slings.

Version with welding ends
1. Attach one sling to each welding end and to the rigging equipment (e.g. hook) of the crane or forklift (see Fig. 4).
2. Secure the slings attached to the body against slipping using a connector.
3. **NPS 6 and larger:** Attach another sling to the lifting eyelet on the actuator and to the rigging equipment.
4. Carefully lift the control valve. Check whether the lifting equipment and accessories can bear the weight.
5. Move the control valve at an even pace to the site of installation.
6. Install the valve into the pipeline (see section 5.2.3).
7. After installation in the pipeline, check whether the weld seams hold.
8. Remove connector and slings.

**Tip**

We recommend using a hook with safety latch (see Fig. 4). The safety latch prevents the slings from slipping during lifting and transporting.
4.3 Storage

**NOTICE**
Risk of valve damage due to improper storage.
- Observe storage instructions.
- Avoid long storage times.
- Contact SAMSON in case of different storage conditions or long storage periods.

**Note**
We recommend regularly checking the control valve and the prevailing storage conditions during long storage periods.

**Storage instructions**
- Protect the control valve against external influences (e.g. impact).
- Do not damage the corrosion protection (paint, surface coatings). Repair any damage immediately.
- Protect the control valve against moisture and dirt. Store it at a relative humidity of less than 75 %. In damp spaces, prevent condensation. If necessary, use a drying agent or heating.
- Make sure that the ambient air is free of acids or other corrosive media.
- The permissible storage temperature of standard control valves is −20 to +65 °C (−4 to +149 °F).

**Special storage instructions for elastomers**
Elastomer, e.g. actuator diaphragm
- To keep elastomers in shape and to prevent cracking, do not bend them or hang them up.
- We recommend a storage temperature of 15 °C (59 °F) for elastomers.
- Store elastomers away from lubricants, chemicals, solutions and fuels.

**Tip**
SAMSON's After-sales Service department can provide more detailed storage instructions on request.

4.4 Preparation for installation

Proceed as follows:

- Flush the pipelines.

**Note**
The plant operator is responsible for cleaning the pipelines in the plant.

- Check the valve to make sure it is clean.
- Check the valve for damage.
Check to make sure that the type designation, valve size, material, pressure rating and temperature range of the valve match the plant conditions (size and pressure rating of the pipeline, medium temperature etc.).

For steam applications, make sure that the pipelines are dry. Moisture will damage the inside of the valve.

Check any mounted pressure gauges to make sure they function.

When the valve and actuator are already assembled, check the tightening torques of the bolted joints. Components may loosen during transport.
5 Mounting and start-up
SAMSON valves are delivered ready for use. In special cases, the valve and actuator are delivered separately and must be assembled on site. The procedure to mount and start up the valve are described in the following.

⚠️ NOTICE
Risk of valve damage due to excessively high or low tightening torques.
Observe the specified torques on tightening control valve components. Excessively tightened torques lead to parts wearing out quicker. Parts that are too loose may cause leakage.
Observe the specified tightening torques (☞ AB 0100).

⚠️ NOTICE
Risk of valve damage due to the use of unsuitable tools.
Special tools are available for certain work on the valve (e.g. replacing the packing). Only use tools approved by SAMSON (☞ AB 0100).

5.1 Mounting the actuator onto the valve
Proceed as described in the actuator documentation if the valve and actuator have not been assembled by SAMSON.

Versions with V-port plug
Each V-port plug has three V-shaped ports. Depending on the valve size, the size of the symmetrically arranged V-shaped ports varies. The process medium in the valve flows through the V-shaped ports as soon as the plug is lifted out of the seat (i.e. the valve opens).

1. Before mounting the actuator, determine which V-shaped port is uncovered first when the plug is lifted out of the seat.

Tip
Usually, this is the largest V-shaped port.

2. On mounting the actuator, make sure that the V-shaped port uncovered first faces toward the valve outlet.

⚠️ NOTICE
Medium flow obstructed due to incorrect installation of the V-port plug.
To achieve the best flow conditions inside the valve, the V-port plug must always be installed with the largest port facing toward the valve outlet.
Make sure the V-port plug is installed correctly.
Mounting and start-up

### 5.2 Installing the valve into the pipeline

#### 5.2.1 Checking the installation conditions

**Pipeline routing**

The inlet and outlet lengths vary depending on the process medium. To ensure the control valve functions properly, follow the installation instructions given below:

- Observe the inlet and outlet lengths (see Table 4). Contact SAMSON if the valve conditions or state of the medium process deviate.
- Install the valve free of stress and so that vibrations are absorbed. Read instructions in Mounting position and Support or suspension.
- Install the valve allowing sufficient space to remove the actuator and valve or to perform service and repair work on them.

### Mounting position

Generally, we recommend installing the valve with the actuator in the upright position on top of the valve.

In the following versions, the valve must be installed with the actuator on top:

- Valves in NPS 4 and larger
- Valves with insulating section for low temperatures below –10 °C (14 °F)

For other mounting positions, contact SAMSON’s After-sales Service department.

### Support or suspension

Depending on the valve version and mounting position, the control valve and pipeline must be supported or suspended. The plant engineering company is responsible in this case.

### Notice

Premature wear and leakage due to insufficient support or suspension.

In the following versions, the control valve must be supported or suspended:

- Valves that are not installed with the actuator in the upright position on top of the valve.

Attach a suitable support or suspension to the valve.

### Vent plug

Vent plugs are screwed into the exhaust air ports of pneumatic and electropneumatic devices. They ensure that any exhaust air that forms can be vented to the atmosphere (to

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**Note**

- Remove the mounted actuator before mounting the other actuator (see associated actuator documentation).
- Preloading the actuator springs increases the thrust of a pneumatic actuator and reduces the travel range of the actuator (see associated actuator documentation).
### Mounting and start-up

#### Table 4: Inlet and outlet lengths

<table>
<thead>
<tr>
<th>State of process medium</th>
<th>Valve conditions</th>
<th>Inlet length a</th>
<th>Outlet length b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas</td>
<td>Ma ≤ 0.3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>0.3 ≤ Ma ≤ 0.7</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Vapor</td>
<td>Ma ≤ 0.3 1)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>0.3 ≤ Ma ≤ 0.7 1)</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Saturated steam (percentage of condensate &gt; 5 %)</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Liquid</td>
<td>Free of cavitation/w &lt; 10 m/s</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Cavitation producing noise/w ≤ 3 m/s</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Cavitation producing noise/3 &lt; w &lt; 5 m/s</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Critical cavitation/w ≤ 3 m/s</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Critical cavitation/3 &lt; w &lt; 5 m/s</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Liquid, with flashing</td>
<td>–</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Multi-phase</td>
<td>–</td>
<td>10</td>
<td>20</td>
</tr>
</tbody>
</table>

1) No saturated steam
avoid excess pressure in the device). Furthermore, the vent plugs allow air intake to prevent a vacuum from forming in the device.

- Locate the vent plug on the opposite side to the workplace of operating personnel.
- On mounting valve accessories, make sure that they can be operated from the workplace of the operating personnel.

**Note**
The workplace of operating personnel is the location from which the valve, actuator and any mounted valve accessories can be accessed to operate them.

### 5.2.2 Additional fittings

**Strainer**
We recommend installing a SAMSON Type 2 Strainer upstream of the valve. It prevents solid particles in the process medium from damaging the valve.

**Bypass and shut-off valves**
We recommend installing a shut-off valve both upstream of the strainer and downstream of the valve and installing a bypass line. The bypass ensures that the plant does not need to be shut down for service and repair work on the valve.

**Insulation**
Only insulate control valves with insulating section or bellows seal up to the bonnet flange of the valve body for medium temperatures below 0 °C (32 °F) and above 220 °C (428 °F).

Do not insulate valves mounted to comply with NACE MR0175 requirements and which have nuts and bolts that are not suitable for sour gas environments.

**Test connection**
Versions with bellows seal fitted with a test connection (G 1/8) at the top flange allow the sealing ability of the bellows to be monitored.

Particularly for liquids and vapors, we recommend installing a suitable leakage indicator (e.g. a contact pressure gauge, an outlet to an open vessel or an inspection glass).

**WARNING**
Risk of personal injury due to pressurized components and process medium escaping under pressure.
Do not loosen the screw of the test connection while the valve is in operation.

**Safety guard**
To reduce the crush hazard arising from moving parts (actuator and plug stem), a safety guard can be installed.

**Noise emission**
Trims with flow dividers can be used to reduce noise emission (see T 8081).
Mounting and start-up

5.2.3 Installing the control valve

Version with flanges

1. Close the shut-off valve in the pipeline while the valve is being installed.

2. Remove the protective caps from the valve ports before installing the valve.

3. Lift the valve using suitable lifting equipment to the site of installation (see section 4.2.2). Observe the flow direction through the valve. The arrow on the valve indicates the direction of flow.

4. Make sure that the correct flange gaskets are used.

5. Bolt the pipe to the valve free of stress.

6. Depending on the field of application, allow the valve to cool down or heat up to reach ambient temperature before start up.

7. Slowly open the shut-off valves in the pipeline after the valve has been installed.

8. Check the valve to ensure it functions properly.

Version with welding ends

1. Proceed as described for Version with flanges (steps 1 to 3).

2. Completely retract the actuator stem to protect the plug from sparks during welding.

3. Weld the valve free of stress into the pipeline.

4. Proceed as described for Version with flanges (steps 6 to 8).

5.3 Quick check

SAMSON valves are delivered ready for use. To test the valve’s ability to function, the following quick checks can be performed:

Tight shut-off

1. Close the valve.

2. Slowly open the shut-off valve in the pipeline.

Risk of valve damage due to a sudden pressure increase and resulting high flow velocities.

Slowly open the shut-off valve in the pipeline during start-up.

3. Check the valve for leakage (visual inspection).

Travel motion

The movement of the actuator stem must be smooth.

⇒ Open and close the valve, observing the movement of the actuator stem.
Mounting and start-up

- Apply the maximum and minimum control signals to check the end positions of the valve.
- Check the travel reading at the travel indicator scale.

**Fail-safe position**

- Shut off the signal pressure line.
- Check whether the valve moves to the fail-safe position.

**Adjustable packing**

**NOTICE**

Risk of valve damage due to the use of unsuitable tools.
A special tool is required for Form HT packings (▶ AB 0100).

**Tip**

A label on the yoke (60) indicates whether an adjustable packing is installed.

1. Tighten the threaded bushing gradually (by turning it clockwise) until the packing seals the valve.

**NOTICE**

Risk of valve damage due to the threaded bushing tightened too far.
Make sure that the plug stem can still move smoothly after the threaded bushing has been tightened.

2. Open and close the valve several times.

3. Check the valve for leakage (visual inspection).
4. Repeat steps 1 and 2 until the packing completely seals the valve.

**Note**

If the adjustable packing does not seal properly, contact SAMSON's After-sales Service department.

**Pressure test**

During the pressure test, make sure the following conditions are met:
- Retract the plug stem to open the valve.
- Observe the maximum permissible pressure for valve and plant.

**Note**

The plant operator is responsible for performing the pressure test. SAMSON’s After-sales Service department can support you to plan and perform a pressure test for your plant.
Operation

6 Operation

Immediately after completing mounting and start-up (see section 5), the valve is ready for use.

⚠️ WARNING
 Crush hazard arising from moving parts (actuator and plug stem). 
Do not insert hands or fingers into the yoke while the valve is in operation.

⚠️ WARNING
 Risk of personal injury when the actuator vents. 
Wear eye protection when working in close proximity to the control valve.

⚠️ NOTICE
 Operation disturbed by a blocked actuator or plug stem. 
Do not impede the movement of the actuator or plug stem by inserting objects into their path.

6.1 Working in manual mode

Valves fitted with actuators with a handwheel can be manually closed or opened in case of supply air failure.

→ For normal closed-loop operation, move the handwheel to the neutral position.
7 Servicing

The control valve is subject to normal wear, especially at the seat, plug and packing. Depending on the operating conditions, check the valve at regular intervals to prevent possible failure before it can occur.

Tip

SAMSON’s After-sales Service department can support you to draw up an inspection plan for your plant.

Danger

Risk of bursting in pressure equipment. Valves and pipelines are pressure equipment. Improper opening can lead to bursting of the valve.
– Before starting any work on the valve, depressurize all plant sections concerned as well as the valve.
– Drain the process medium from all the plant sections concerned and from the valve.
– Wear personal protective equipment.

Warning

Risk of personal injury due to residual process medium in the valve.
While working on the valve, residual process medium can escape and, depending on its properties, may lead to personal injury, e.g. (chemical) burns.
Wear protective clothing, safety gloves and eyewear.

Warning

Risk of burn injuries due to hot or cold components and pipeline. Valve components and the pipeline may become very hot or cold. Risk of burn injuries.
– Allow components and pipelines to cool down or heat up.
– Wear protective clothing and safety gloves.

Notice

Risk of valve damage due to incorrect servicing or repair. Service and repair work must only be performed by trained staff.

Notice

Risk of valve damage due to excessively high or low tightening torques. Observe the specified torques on tightening control valve components. Excessively tightened torques lead to parts wearing out quicker. Parts that are too loose may cause leakage.
Observe the specified tightening torques (AB 0100).

Notice

Risk of valve damage due to the use of unsuitable tools. Special tools are available for certain work on the valve (e.g. replacing the packing). Only use tools approved by SAMSON (AB 0100).
7.1 Preparing the valve for servicing

1. Put the control valve out of operation (see section 9.1).
2. Remove the valve from the pipeline (see section 9.2).

7.2 Checking facings

As part of the service work (section 7.3 to 7.8), check the facings at the valves. Fig. 5 shows all the facings at the valve.

- Make sure that the facings are free of dirt and not damaged.

7.3 Replacing the gaskets

Risk of control valve damage due to incorrect service or repair.

The gaskets can only be replaced when all the following conditions are met:
- The valve does not have a balanced plug.
- The valve does not have a bellows seal.

To replace the gaskets in other valve versions, contact SAMSON's After-sales Service department.

The following gaskets are installed and must be exchanged:
- Gasket (17)
- Shim (125)
- Seat retainer gasket (126)

- Measure how many shims (125) and gaskets (126) are required as described in section 7.6.
- Make sure that the gaskets are free of dirt and not damaged.
- Make sure that the inserted gaskets rest with their entire surface on the facing.
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DF 1</td>
<td>Facing between the seat retainer gasket (127) and body (1)</td>
</tr>
<tr>
<td>DF 2</td>
<td>Facing between the seat (4) and seat retainer gasket (127)</td>
</tr>
<tr>
<td>DF 3</td>
<td>Facing between the seat retainer (124) and body (1)</td>
</tr>
<tr>
<td>DF 4</td>
<td>Facing between the shim (125) and seat retainer gasket (127)</td>
</tr>
<tr>
<td>DF 5</td>
<td>Facing between the gasket (17) and shim (125)</td>
</tr>
<tr>
<td>DF 6</td>
<td>Facing between the gasket (17) and body (1)</td>
</tr>
<tr>
<td>DF 7</td>
<td>Facing between the seat (4) and plug (5)</td>
</tr>
<tr>
<td>DF 8, DF 9</td>
<td>Facings between the bonnet (2) or insulating section (21) and gasket (17)</td>
</tr>
<tr>
<td>DF 10</td>
<td>Facings between the V-ring packing (16) and packing chamber in the bonnet (2) or insulating section (21)</td>
</tr>
</tbody>
</table>

Fig. 5: *Facings at the valve*
Servicing

The servicing of versions with the standard bonnet (2) is described in following. The same procedure applies to versions with insulating section (21).

1. Undo the body nuts (14) gradually in a criss-cross pattern.
2. Lift the actuator, yoke (60), bonnet (2) and plug with plug stem (5) off the body (1).
3. Remove the gasket (17), shims (125) and gaskets (126).
4. Carefully clean the facings (DF 3, DF 4, DF 5, DF 6, DF 8 and DF 9).
5. Measure how many gaskets (126) are required as described in section 7.6. Insert new gaskets (126) into the groove of the seat retainer (124). See Fig. 6.
6. Measure how many shims (125) are required as described in section 7.6. Place the new shims (125) on the gaskets (126). See Fig. 7.

**NPS 6 and larger**: place the gaskets (126) and shims (125) in alternating order into the groove of the seat retainer (124).

Make sure the shims do not touch the facing (DF 6) of the body anywhere.

7. Insert the new gasket (17) into the groove of the seat retainer (124) and body (1). See Fig. 8.
8. Place the actuator, yoke (60), bonnet (2) and plug stem with plug (5) onto the body. Make sure that an opening of the
Fig. 9: Type 3291 Valve: with standard bonnet (left) · With insulating section (right)
seat retainer (124) faces toward the valve outlet.

Version with V-port plug: place the bonnet onto the valve body, making sure that the largest V-shaped port of the V-port plug and the opening on the seat retainer face toward the valve outlet. See section 5.1.

9. Firmly press the plug (5) into the seat (4). Fasten down the bonnet (2) with the body nuts (14). See section 7.7.

7.4 Replacing the packing

⚠️ NOTICE
Risk of control valve damage due to incorrect service or repair.
The packing can only be replaced when all the following conditions are met:
− The valve does not have a balanced plug.
− The valve does not have a bellows seal.
− The standard, Form HT or ADSEAL packing is installed in the valve.
To replace the packing in other valve versions, contact SAMSON’s After-sales Service department.

Standard packing (PTFE)
1. Remove the actuator from the valve. See associated actuator documentation.
2. Unscrew the castellated nut (92) and take the yoke (60) off the bonnet (2).
3. Undo the body nuts (14) gradually in a criss-cross pattern.
4. Lift the bonnet (2) and plug with plug stem (5) off the body (1).
5. Replace the gaskets (see section 7.3).
6. Unthread the stem connector nut (9) and lock nut (10) from the plug stem.
7. Unscrew the threaded bushing (8).
8. Pull the plug with plug stem (5) out of the bonnet (2).
9. Pull all the packing parts out of the packing chamber using a suitable tool.
10. Renew damaged parts. Carefully clean the facing (DF 10) in the packing chamber.
11. Apply a suitable lubricant to all the packing parts and to the plug stem (5).
12. Slide the plug with plug stem (5) into the bonnet (2).
13. Make sure that the seat (4) and seat retainer (124) are still clamped correctly on the body.
14. Place the bonnet (2) together with the plug stem and plug (5) onto the body. Make sure that an opening of the seat retainer (124) faces toward the valve outlet.
Version with V-port plug: place the bonnet (2) onto the valve body, making sure that the largest V-shaped port of the V-port plug and the opening on the seat retainer face toward the valve outlet. See section 5.1.
15. Carefully slide the packing parts over the plug stem into the packing chamber using a suitable tool. Observe the proper sequence (see Fig. 10).
The number of spacers (18, 19) varies depending on the nominal valve size.

---

**Fig. 10:** Packing: standard (left) · Form HT (middle) · ADSEAL (right)
16. Firmly press the plug (5) into the seat (4). Fasten down the bonnet (2) with the body nuts (14). See section 7.7.

17. Screw in the threaded bushing (8) and tighten it. Observe tightening torques.

18. Place yoke (60) on the bonnet (2) and fasten tight using the castellated nut (92).

19. Loosely screw the lock nut (10) and stem connector nut (9) onto the plug stem.


21. Adjust lower or upper signal bench range. See associated actuator documentation.

**Form HT packing**

⚠️ **NOTICE**

* Damage to the packing (Form HT) through the use of lubricant. The Form HT packing contains graphite. Do not use any lubricant during the installation of this packing.

1. Proceed as described in Standard packing (PTFE), steps 1 to 16. Do not use any lubricant.

2. To compress the packing, tighten the packing until reaching the metal stop using a suitable tool.

3. Remove tool.

4. Proceed as described in Standard packing (PTFE), steps 17 to 21.

5. Stroke the plug stem (5) up and down around ten times to all the packing to settle.

**ADSEAL packing**

1. Proceed as described in Standard packing (PTFE), steps 1 to 14.

2. Carefully slide the packing parts over the plug stem into the packing chamber using a suitable tool. Observe the proper sequence (see Fig. 10).

3. Slide the seals (15.2) over the plug stem. Insert the wire of the red spacer ring (15.1) into the groove of the retaining ring. Slide the retaining ring over the plug stem.

4. Insert the red spacer ring (15.1) between the threaded bushing (8) and retaining ring. See Fig. 10.

5. Proceed as described in Standard packing (PTFE), steps 16 to 21.

**7.5 Replacing the seat and plug**

⚠️ **NOTICE**

* Risk of control valve damage due to incorrect service or repair. Seat and plug can only be replaced when all the following conditions are met:

- The valve does not have a balanced plug.
- The valve does not have a bellows seal.
- The standard, Form HT or ADSEAL packing is installed in the valve.

To replace seat and plug in other valve versions, contact SAMSON’s After-sales Service department.
NOTICE
Risk of damage to the facing of the seat and plug due to incorrect service or repair. Always replace both the seat and plug.

Note
In versions with flow divider, it takes over the function as a seat retainer (124), i.e. the seat (4) is clamped in place by the flow divider (62).

1. Remove the actuator from the valve. See associated actuator documentation.
2. Unscrew the castellated nut (92) and take the yoke (60) off the bonnet (2).
3. Undo the body nuts (14) gradually in a criss-cross pattern.
4. Lift the bonnet (2) and plug with plug stem (5) off the body (1).
5. Remove gaskets and replace with new ones (see section 7.3), if necessary.
6. Unthread the stem connector nut (9) and lock nut (10) from the plug stem.
7. Unscrew the threaded bushing (8).
8. Pull the plug with plug stem (5) out of the bonnet (2).
9. Pull all the packing parts out of the packing chamber using a suitable tool.
   We recommend replacing the packing as well. See section 7.4.
10. Make sure that the guide bushing (7) is not damaged. If necessary, replace the guide bushing using a suitable tool.
11. Remove the seat (4) and seat retainer (124).
12. Remove the gasket (127).
13. Carefully clean the facings (DF 1, DF 2, DF 3 and DF 7).
14. Insert a new gasket (127) into the seat bridge.
15. Carefully place the new seat (4) in the body (1) and use the seat retainer (124) to clamp it into position. Align the seat retainer in such a way that an opening faces toward the valve outlet.
16. Insert gaskets (see section 7.3).
17. Slide the new plug with plug stem (5) into the bonnet (2).
18. Place the bonnet (2) together with the plug stem and plug (5) onto the body.
   Version with V-port plug: place the bonnet (2) onto the valve body, making sure that the largest V-shaped port of the V-port plug faces toward the valve outlet. See section 5.1.
19. Carefully slide the packing parts over the plug stem into the packing chamber using a suitable tool. Observe the proper sequence (see Fig. 10).
20. Firmly press the plug (5) into the seat (4). Fasten down the bonnet (2) with the body nuts (14). See section 7.7.
21. Screw in the threaded bushing (8) and tighten it. Observe tightening torques.
22. Place yoke (60) on the bonnet (2) and fasten tight using the castellated nut (92).
23. Loosely screw the lock nut (10) and stem connector nut (9) onto the plug stem.
Fig. 11: Type 3291 Valve with Type 3271 Pneumatic Actuator

25. Adjust lower or upper signal bench range. See associated actuator documentation.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Body</td>
</tr>
<tr>
<td>2</td>
<td>Bonnet</td>
</tr>
<tr>
<td>4</td>
<td>Seat</td>
</tr>
<tr>
<td>5</td>
<td>Plug (with plug stem)</td>
</tr>
<tr>
<td>8</td>
<td>Threaded bushing (packing nut)</td>
</tr>
<tr>
<td>10</td>
<td>Lock nut</td>
</tr>
<tr>
<td>14</td>
<td>Body nut</td>
</tr>
<tr>
<td>15</td>
<td>Packing</td>
</tr>
<tr>
<td>17</td>
<td>Body gasket</td>
</tr>
<tr>
<td>60</td>
<td>Yoke assembly</td>
</tr>
<tr>
<td>92</td>
<td>Castellated nut</td>
</tr>
<tr>
<td>124</td>
<td>Seat retainer</td>
</tr>
<tr>
<td>125</td>
<td>Spacer ring</td>
</tr>
<tr>
<td>126</td>
<td>Seat retainer gasket</td>
</tr>
<tr>
<td>127</td>
<td>Seat bridge gasket</td>
</tr>
<tr>
<td>A4</td>
<td>Diaphragm</td>
</tr>
<tr>
<td>A7</td>
<td>Actuator stem</td>
</tr>
<tr>
<td>A8</td>
<td>Ring nut</td>
</tr>
<tr>
<td>A10</td>
<td>Spring</td>
</tr>
<tr>
<td>A26/27</td>
<td>Stem connector clamps</td>
</tr>
<tr>
<td>S</td>
<td>Signal pressure connection</td>
</tr>
</tbody>
</table>
7.6 Determining the number of gaskets required

The following gaskets are installed and must be exchanged:
- Gasket (17)
- Shim (125)
- Seat retainer gasket (126)

Determining height H1

H1 is the height between the facing of the seat retainer (124) and the facing of the body (1). See Fig. 12.

1. Measure H1 at three places evenly distributed around the circumference of the body.
2. Write down the measured values 1 to 3 in Table 5. Calculate the average value and enter it as \( H_{1\text{actual}} \).
3. Calculate the difference \( \Delta H \) from the target dimension \( H_{1\text{target}} \) and actual dimension \( H_{1\text{actual}} \) and write it down.

Table 5: Determining height H1 · Dimensions in mm

<table>
<thead>
<tr>
<th>NPS</th>
<th>( H_{1\text{target}} )</th>
<th>( H_1 ) (value 1)</th>
<th>( H_1 ) (value 2)</th>
<th>( H_1 ) (value 3)</th>
<th>( H_{1\text{actual}} )</th>
<th>( \Delta H = H_{1\text{target}} - H_{1\text{actual}} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ to 1</td>
<td>4.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1½</td>
<td>5.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>9.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>10.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Determining height H2

H2 is the height of the new gasket(s) (126) at the seat retainer (124). See Fig. 13.

1. Measure H2 at three places evenly distributed around the circumference.
2. Write down the measured values 1 to 3 in Table 6. Calculate the average value and enter it as $H_{2\text{actual}}$.
3. Insert the gasket (126). See section 7.3.

---

**Table 6: Determining height H2 - Dimensions in mm**

<table>
<thead>
<tr>
<th>Gasket number (one gasket up to NPS 4, two gaskets for NPS 6 or larger)</th>
<th>$H_2$ (value 1)</th>
<th>$H_2$ (value 2)</th>
<th>$H_2$ (value 3)</th>
<th>$H_{2\text{actual}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Selecting the shims

$t_{\text{total}}$ is the height of the required shims.

1. Calculate the height $t_{\text{total}}$ based on the previously determined values (see Table 5 and Table 6) and enter it into Table 7.

2. Insert shims (125). See section 7.3.

**Note**

Use only one shim and one gasket to compensate for the height difference in valves up to NPS 4. Install two shims and two gaskets in alternating order in valves larger than NPS 6.

Table 7: Selecting the shims

<table>
<thead>
<tr>
<th>NPS</th>
<th>Height T</th>
<th>Tolerance</th>
<th>Ideal height $t_{\text{total}}$</th>
<th>No. of shims</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ to 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1½</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>$6.1 - \Delta H - H_{\text{actual}}$</td>
<td>-0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>$12.1 - \Delta H - H_{\text{actual_total}}$</td>
<td>-0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7.7 Tightening the body nuts

WARNING
Risk of valve damage due to excessively high or low tightening torques. Observe the specified torques on tightening control valve components. Excessively tightened torques lead to parts wearing out quicker. Parts that are too loose may cause leakage. Observe the specified tightening torques (► AB 0100).

It is not enough to just tighten the body nuts (14) once as the gasket (126) underneath the shim (125) yields. On tightening the body nuts on the bonnet (2) or insulating section (21), proceed as follows:

1. Tighten the body nuts gradually in a crisscross pattern (applying half of the specified tightening torque).
2. Tighten the body nuts in a crisscross pattern several times until no further rotary motion occurs.
3. Tighten the body nuts gradually in a crisscross pattern (applying 75% of the specified tightening torque).
4. Tighten the body nuts in a clockwise pattern with the full tightening torque.

Fig. 15: Sequence to be followed to tighten the body nuts

7.8 Completion of servicing activities

► After completing servicing, put the valve back into operation (see section 5).

7.9 Preparation for return shipment

Defective valves can be returned to SAMSON for repair. Proceed as follows to return devices to SAMSON:

1. Put the control valve out of operation (see section 9).
2. Decontaminate the valve. Remove any residual process medium.
3. Fill in the Declaration on Contamination, which can be downloaded from our website at ► www.samson.de > Services > Check lists for after sales service > Declaration on Contamination.
Servicing

4. Send the valve together with the filled-in form to your nearest SAMSON subsidiary. SAMSON subsidiaries are listed on our website at www.samson.de > Contact.

7.10 Ordering spare parts and operating supplies

Contact your nearest SAMSON subsidiary or the SAMSON After-sales Service department for information on spare parts, lubricants and tools.

Spare parts
See section 10.3 for details on spare parts.

Lubricant
Details on suitable lubricants can be found in the document AB 0100.

Tools
Details on suitable tools can be found in the document AB 0100.
8 Malfunctions

Depending on the operating conditions, check the valve at certain intervals to prevent possible failure before it can occur. Operators are responsible for drawing up an inspection plan.

**Tip**

SAMSON’s After-sales Service department can support you to draw up an inspection plan for your plant.

### 8.1 Troubleshooting

<table>
<thead>
<tr>
<th>Malfunction</th>
<th>Possible reasons</th>
<th>Recommended action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuator or plug stem does not move on demand.</td>
<td>Actuator blocked</td>
<td>Check attachment. Unblock the actuator.</td>
</tr>
<tr>
<td></td>
<td>Signal pressure too low</td>
<td>Check the signal pressure. Check the signal pressure line for leakage.</td>
</tr>
<tr>
<td>Actuator or plug stem does not move through the whole range.</td>
<td>Signal pressure too low</td>
<td>Check the signal pressure. Check the signal pressure line for leakage.</td>
</tr>
<tr>
<td>The valve leaks to the atmosphere (fugitive emissions).</td>
<td>The packing is defective.</td>
<td>Replace the packing. See section 7.4.</td>
</tr>
<tr>
<td>Version with adjustable packing [1]: packing not tightened correctly.</td>
<td>See section 5.3, Adjustable packing.</td>
<td>See section 5.3, Adjustable packing. If the packing leaks continuously, replace the packing (see section 7.4) or contact SAMSON’s After-sales Service department.</td>
</tr>
<tr>
<td>Flange joint loose or gasket worn out.</td>
<td>Check the flange joint.</td>
<td>Replace the gasket as described in section 7.3.</td>
</tr>
</tbody>
</table>
8.2 Emergency action

Upon supply air or control signal failure, the valve moves to its fail-safe position (see section 3.1).

The plant operator is responsible for emergency action to be taken in the plant.

In the event of a valve malfunction:

1. Close the shut-off valves upstream and downstream of the control valve to stop the process medium from flowing through the valve.

2. Check the valve for damage. If necessary, contact SAMSON’s After-sales Service department.

Putting the valve back into operation after a malfunction

- Slowly open the shut-off valves. Allow the process medium to slowly flow into the valve.

### Malfunctions

<table>
<thead>
<tr>
<th>Malfunction</th>
<th>Possible reasons</th>
<th>Recommended action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased flow through closed valve (seat leakage)</td>
<td>Dirt or other foreign particles deposited between the seat and plug.</td>
<td>Shut off the section of the pipeline and flush the valve.</td>
</tr>
<tr>
<td>Valve trim is worn.</td>
<td></td>
<td>Replace the seat and plug (see section 7.5).</td>
</tr>
<tr>
<td>Gasket (127) underneath the seat bridge is worn out.</td>
<td></td>
<td>Replace gasket as described in section 7.3.</td>
</tr>
<tr>
<td>Gasket (126) at the seat retainer (124) or flow divider (62) is worn out.</td>
<td></td>
<td>Replace gasket as described in section 7.3.</td>
</tr>
</tbody>
</table>

1) A label on the yoke (60) indicates whether an adjustable packing is installed.

i Note
Contact SAMSON’s After-sales Service department for malfunctions not listed in the table.
9 Decommissioning and disassembly

**DANGER**
Risk of bursting in pressure equipment. Valves and pipelines are pressure equipment. Improper opening can lead to bursting of the valve.
- Before starting any work on the valve, depressurize all plant sections concerned as well as the valve.
- Drain the process medium from all the plant sections concerned as well as the valve.
- Wear personal protective equipment.

**WARNING**
Risk of personal injury due to residual process medium in the valve. While working on the valve, residual process medium can escape and, depending on its properties, may lead to personal injury, e.g. (chemical) burns. Wear protective clothing, safety gloves and eyewear.

**WARNING**
Risk of burn injuries due to hot or cold components and pipeline. Valve components and the pipeline may become very hot or cold. Risk of burn injuries.
- Allow components and pipelines to cool down or heat up.
- Wear protective clothing and safety gloves.

9.1 Decommissioning
To decommission the control valve for service and repair work or disassembly, proceed as follows:
1. Close the shut-off valves upstream and downstream of the control valve to stop the process medium from flowing through the valve.
2. Completely drain the pipelines and valve.
3. Disconnect and lock the pneumatic air supply to depressurize the actuator.
4. If necessary, allow the pipeline and valve components to cool down or heat up.

9.2 Removing the valve from the pipeline

**Version with flanges**
1. Put the control valve out of operation (see section 9.1).
2. Unbolt the flange joint.
3. Remove the valve from the pipeline (see section 4.2).

**Version with welding ends**
1. Put the control valve out of operation (see section 9.1).
2. Cut the pipeline in front of the weld seam.
3. Remove the valve from the pipeline (see section 4.2).
9.3 Removing the actuator from the valve

See associated actuator documentation.

9.4 Disposal

- Observe local, national and international refuse regulations.
- Do not dispose of components, lubricants and hazardous substances together with your other household waste.
10 Annex

10.1 After-sales service

Contact SAMSON's After-sales Service department for support concerning service or repair work or when malfunctions or defects arise.

E-mail

You can reach the After-sales Service Department at aftersalesservice@samson.de.

Addresses of SAMSON AG and its subsidiaries

The addresses of SAMSON AG, its subsidiaries, representatives and service facilities worldwide can be found on the SAMSON website or in all SAMSON product catalogs.

Required specifications

Please submit the following details:

- Order number and position number in the order
- Type, model number, nominal size and valve version
- Pressure and temperature of the process medium
- Flow rate in cu.ft/min or m³/h
- Type and bench range of the actuator (e.g. 0.2 to 1 bar)
- Is a strainer installed?
- Installation drawing

10.2 Certificates

The EU declaration of conformity is provided on the next page.
Modul/Module H / N° CE-0062-PED-H-SAM 001-16-DEU

SAMSON erklärt in alleiniger Verantwortung für folgende Produkte:

<table>
<thead>
<tr>
<th>Gerät/Devices</th>
<th>Bauart/Series</th>
<th>Type/Type</th>
<th>Ausführung/Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Durchgangsventil/Globe Valve</td>
<td>240</td>
<td>3241</td>
<td>DIN, Gehäuse GG/Cast iron-Body ab DN150, Gehäuse GG/Sph. gr. Iron-Body ab DN150, Fluide/Fluids G2, L1, L2</td>
</tr>
<tr>
<td>Dreiwegeventil/Three-way Valve</td>
<td>240</td>
<td>3244</td>
<td>DIN, Gehäuse GG ab DN150, Gehäuse GG/Sph. gr. Iron-Body ab DN150, Fluide/Fluids G2, L1, L2</td>
</tr>
<tr>
<td>Dreiwegeventil/Three-way Valve</td>
<td>250</td>
<td>3256</td>
<td>ANSI, Gehäuse GG ab DN200 PN16, Gehäuse GG/Sph. gr. Iron-Body ab DN200 PN16, Fluide/Fluids</td>
</tr>
<tr>
<td>Dreiwegeventil/Three-way Valve</td>
<td>250</td>
<td>3258</td>
<td>DIN, alle Fluide Fluids</td>
</tr>
<tr>
<td>Dreiwegeventil/Three-way Valve</td>
<td>250</td>
<td>3259</td>
<td>DIN, alle Fluide Fluids</td>
</tr>
<tr>
<td>Dreiwegeventil/Three-way Valve</td>
<td>280</td>
<td>3284</td>
<td>DIN, alle Fluide Fluids</td>
</tr>
<tr>
<td>Dreiwegeventil/Three-way Valve</td>
<td>290</td>
<td>3281</td>
<td>ANSI, alle Fluide Fluids</td>
</tr>
<tr>
<td>Dreiwegeventil/Three-way Valve</td>
<td>290</td>
<td>3284</td>
<td>ANSI, alle Fluide Fluids</td>
</tr>
<tr>
<td>Schrägsitzventil/Bevel-Valve</td>
<td>---</td>
<td>3381</td>
<td>DIN/ANS, alle Fluide Fluids, Einzeldrosselscheibe mit Anschweißende Single attenuation plate with welding end</td>
</tr>
<tr>
<td>Drosselschalldämpfer/Stencher</td>
<td>3381</td>
<td>3381-1</td>
<td>DIN/ANS, alle Fluide Fluids, Einzeldrosselscheibe mit Anschweißende Single attenuation plate with welding end</td>
</tr>
<tr>
<td>Dreiwegeventil/Three-way Valve</td>
<td>250</td>
<td>3256</td>
<td>ANSI, alle Fluide Fluids</td>
</tr>
<tr>
<td>Dreiwegeventil/Three-way Valve</td>
<td>250</td>
<td>3258</td>
<td>ANSI, alle Fluide Fluids</td>
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<tr>
<td>Dreiwegeventil/Three-way Valve</td>
<td>250</td>
<td>3259</td>
<td>ANSI, alle Fluide Fluids</td>
</tr>
<tr>
<td>Dreiwegeventil/Three-way Valve</td>
<td>500</td>
<td>3591</td>
<td>ANSI, alle Fluide Fluids</td>
</tr>
<tr>
<td>Regelventil/Control valve</td>
<td>---</td>
<td>3595</td>
<td>ANSI, NPS 4 Cl 900 und NPS 12 Cl 600, alle Fluide Fluids</td>
</tr>
</tbody>
</table>

1) Gase nach Art. 4 Abs. 1 Pkt. c i.e. zweiter Gedankenstrich/Gases acc. to Article 4, Section 1 Subsection c.i second indent
2) Flüssigkeiten nach Art. 4 Abs. 1 Pkt. c.ii/Liquids acc. to Article 4, Section 1 Subsection c.ii

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Angewandtes Konformitätsbewertungsverfahren für Fluide nach Art. 4 Abs. 1/ Applied Conformity Assessment Procedure for fluids according to Article 4(1)

Angewandte technische Spezifikation/Technical Standards applied: DIN EN12516-2; DIN EN12516-3; ASME B16.34

Hersteller/Manufacturer: SAMSON AG, Weismüllerstraße 3, 60314 Frankfurt am Main, Germany

Frankfurt am Main, 15. Dezember 2016/15 December 2016

Klaus Hörschken
Zentralabteilungsleiter/Head of Central Department
Entwicklung Ventile und Antriebe/R&D, Valves and Actuators

Dr. Michael Heß
Zentralabteilungsleiter/Head of Central Department
Technischer Vertrieb/Technical Sales

SAMSON AKTIENGESELLSCHAFT
Weismüllerstraße 3  60314 Frankfurt am Main

Telefon: 069 4009-0 · Telefax: 069 4009-1507
E-Mail: samson@samson.de

Revision 03

© mit den gesetzlichen Änderungen
10.3 Spare parts

Shims (125)

The shims are delivered as a set of seven shims with varying thickness (ranging from 0.7 to 1.25 mm).

Tip

Contact SAMSON’s After-sales Service department if you have any questions concerning the suitability of shim material.

Table 8: Item numbers to order shims

<table>
<thead>
<tr>
<th>Shim material</th>
<th>NPS</th>
<th>Item no.</th>
<th>Shim material</th>
<th>NPS</th>
<th>Item no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4404/A240 316L</td>
<td>½ to 1</td>
<td>1120-3074</td>
<td>2.4819/B574 N10276</td>
<td>½ to 1</td>
<td>1120-3311</td>
</tr>
<tr>
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<td>1½</td>
<td>1120-3075</td>
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<td>1½</td>
<td>1120-3312</td>
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<tr>
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<td>2</td>
<td>1120-3076</td>
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<td>8</td>
<td>1120-3136</td>
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<td>8</td>
<td>1120-3317</td>
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<tr>
<td>1.4301/A240 304</td>
<td>½ to 1</td>
<td>1120-3095</td>
<td>2.4610/B574 N06455</td>
<td>½ to 1</td>
<td>1120-3387</td>
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<tr>
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<td>1½</td>
<td>1120-3096</td>
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<td>1120-3137</td>
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<td>1120-3393</td>
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</table>
List of valve spare parts

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<thead>
<tr>
<th></th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Body</td>
</tr>
<tr>
<td>2</td>
<td>Bonnet</td>
</tr>
<tr>
<td>3</td>
<td>Yoke</td>
</tr>
<tr>
<td>4</td>
<td>Seat</td>
</tr>
<tr>
<td>5</td>
<td>Plug (with plug stem)</td>
</tr>
<tr>
<td>6</td>
<td>Nut</td>
</tr>
<tr>
<td>7</td>
<td>Guide bushing</td>
</tr>
<tr>
<td>8</td>
<td>Threaded bushing (packing nut)</td>
</tr>
<tr>
<td>9</td>
<td>Stem connector nut</td>
</tr>
<tr>
<td>10</td>
<td>Lock nut</td>
</tr>
<tr>
<td>11</td>
<td>Spring</td>
</tr>
<tr>
<td>12</td>
<td>Washer</td>
</tr>
<tr>
<td>13</td>
<td>Stud bolt</td>
</tr>
<tr>
<td>14</td>
<td>Body nut</td>
</tr>
<tr>
<td>15</td>
<td>Packing</td>
</tr>
<tr>
<td>16</td>
<td>V-ring packing</td>
</tr>
<tr>
<td>17</td>
<td>Body gasket</td>
</tr>
<tr>
<td>19</td>
<td>Bushing</td>
</tr>
<tr>
<td>21</td>
<td>Insulating section</td>
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<tr>
<td>22</td>
<td>Bellows seal</td>
</tr>
<tr>
<td>24</td>
<td>Guide bushing</td>
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<td>26</td>
<td>Label</td>
</tr>
<tr>
<td>27</td>
<td>Flange</td>
</tr>
<tr>
<td>28</td>
<td>Clamping ring</td>
</tr>
<tr>
<td>29</td>
<td>Plug for version with bellows seal</td>
</tr>
<tr>
<td>31</td>
<td>Washer</td>
</tr>
<tr>
<td>32</td>
<td>Bolt</td>
</tr>
<tr>
<td>33</td>
<td>Nut</td>
</tr>
<tr>
<td>34</td>
<td>Screw</td>
</tr>
<tr>
<td>37</td>
<td>Plug stem with metal bellows</td>
</tr>
<tr>
<td>39</td>
<td>Gasket (bonnet)</td>
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<tr>
<td>42</td>
<td>Screw plug (test connection)</td>
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<tr>
<td>43</td>
<td>Seal</td>
</tr>
<tr>
<td>44</td>
<td>Ring (pressure balancing)</td>
</tr>
<tr>
<td>45</td>
<td>Gasket (pressure balancing)</td>
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<tr>
<td>46</td>
<td>Gasket (pressure balancing)</td>
</tr>
<tr>
<td>47</td>
<td>Support (pressure balancing)</td>
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<tr>
<td>48</td>
<td>Hexagon screw (pressure balancing)</td>
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<td>Hexagon screw (pressure balancing)</td>
</tr>
<tr>
<td>50</td>
<td>Washer (pressure balancing)</td>
</tr>
<tr>
<td>51</td>
<td>Guide ring (several guides only for version with graphite seal)</td>
</tr>
<tr>
<td>52</td>
<td>Ring (pressure balancing)</td>
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<tr>
<td>53</td>
<td>Retaining ring (pressure balancing)</td>
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<td>Yoke assembly</td>
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<td>Nameplate</td>
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<td>Grooved pin</td>
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<td>Screw</td>
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<td>Hanger</td>
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<td>84</td>
<td>Travel indicator scale</td>
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<td>85</td>
<td>Screw</td>
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<td>Protective cap</td>
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<td>Castellated nut</td>
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<td>Bellows cover</td>
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<td>Snap ring</td>
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<td>124</td>
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<td>125</td>
<td>Spacer ring</td>
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<tr>
<td>126</td>
<td>Seat retainer gasket</td>
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<tr>
<td>127</td>
<td>Seat bridge gasket</td>
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</tbody>
</table>

Support (pressure balancing)