

SH 51b

Translation of original instructions



BR 51b Shut-off ball valve






Edition September 2023

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1. GENERAL


1.1 Definition of signal words

	DANGER	<i>Hazardous situations which, if not avoided, will result in death or serious injury</i>
	WARNING	<i>Hazardous situations which, if not avoided, could result in death or serious injury</i>
	NOTICE	<i>Property damage message or malfunction</i>
	Note	<i>Additional information</i>
	Tip	<i>Recommended action</i>

1.2 Purpose of this manual

The Safety Manual **SH 51b** contains information relevant for the use of the **BR 51b** shut-off ball valve in safety-instrumented systems according to IEC 61508 and IEC 61511.


The safety manual is intended for planners, constructors, and operators of safety-instrumented systems.

 NOTICE	<i>Fehlfunktion durch falsch eingebautes oder in Betrieb genommenes Gerät!</i> Einbau und Inbetriebnahme gemäß der Einbau- und Bedienungsanleitung ► EB 51b vornehmen! Warn- und Sicherheitshinweise der Einbau- und Bedienungsanleitung beachten!
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1.3 Further documentation

The documents listed below contain descriptions of the start-up, functioning and operation of the valve. You can download these documents from the PFEIFFER website.

- Data sheet BR 51b ► **TB 51b**
- Mounting and operating instructions BR 51b ► **EB 51b**
- Functional safety of globe valves, rotary plug valves, ball valves and butterfly valves ► **WA 236**

 NOTICE	In addition to the ball valve documentation, observe the documentation for the actuator and valve accessories.
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2. SCOPE



2.1 General

The PFEIFFER BR 51b shut-off ball valve in combination with an actuator (e.g. BR 31a pneumatic rotary actuator) is designed to regulate the flow rate, pressure or temperature of liquids, gases or vapors. The ball valve can be used in block & bleed applications.

2.2 Use in safety-instrumented systems

The ball valve can be used in safety-instrumented systems according to IEC 61508 and IEC 61511. The valve can be used in safety-instrumented systems up to SIL 2 (single device) and SIL 3 (redundant configuration) on observing the requirements of IEC 61508.

The safety-instrumented function of the valve is to be regarded as a Type A element in accordance with IEC 61508-2.

 Note	The architecture and the interval between proof tests must be considered concerning the safety integrity level.
 Tip	Through the use of a positioner with diagnostic features on the control valve, the diagnostic coverage can be increased, and, as a result, the probability of failure on demand reduced.

2.3 Versions and ordering data

Ball valve combined with actuators with travel stop and/or handwheel as well as manual override are not suitable for use in safety-instrumented systems.

All other versions are suitable for use in safety-instrumented systems.


Actuators with adjustable limit stops are adjusted after adjustment against subsequent adjustment, e.g. with sealing wax, secured.

2.4 Mounting

The ball valve and actuator are normally delivered already assembled by PFEIFFER.

3. TECHNICAL DATA

Table 1: DIN and ANSI *version*

Type	DIN	ANSI
Nominal size	DN 15 ... 200	NPS½ ... 8
Nominal pressure	PN 10 ... 40	c150 / 300
Material ¹⁾	1.4408 / 1.4571	ASTM A351 CF8M
Face to face	DIN EN 558, row 1	ASME B 16.10
Type of connection	DIN EN 1092-1	ASME B16.5
Seat-ball seal	soft seal · metal seal ·	
Heating jacket	on request	
Compliance		
Temperature ranges Permissible operating pressures acc. to pressure-temperature diagrams, see Data sheet ▶ TB 51b		
Body	-60 °C ... +200 °C (-76 °F ... +392 °F)	
Leakage class acc. to DIN EN 12266-1, Test P12		
Metal seal	Test with water: Leakage rate A Test with gas: Leakage rate B	Test with water: Leakage rate A Test with gas: Leakage rate B
Soft seal	A	A

¹⁾ Other materials optionally available

4 SAFETY-RELATED FUNCTIONS

4.1 Safety-related functions

The ball valve, in combination with a pneumatic rotary actuator, controls the process medium flowing through it.

When the signal pressure acting on the actuator is changed, the springs in the actuator move the actuator stem downward or upward to close or open the valve.

The fail-safe action is triggered when no signal pressure is applied to the actuator.

4.2 Fail-safe action

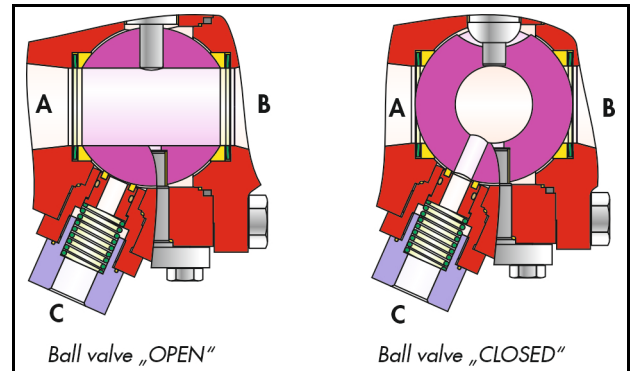
The signal pressure is normally applied to the pneumatic rotary actuator. The actuator is vented upon demand of the safety-instrumented function. As soon as the actuator is vented, the spring forces cause the actuator stem to move to the fail-safe position. The ball valve is completely open or completely closed.

Depending on the location of the pistons the actuators direction of action is either clockwise (CW) or counterclockwise (CCW).

Depending on the actuator's direction of action (see the associated actuator documentation), the valve has one of the following fail-safe positions:

- ⇒ **Ball valve with actuator "Spring closes":** When the air supply fails, the valve closes [**FC = Fail Close**]. The ball valve opens when the air control pressure increases acting against the force of the springs.
- ⇒ **Ball valve with actuator "Spring opens":** When the air supply fails, the valve opens [**FO = Fail Open**]. The valve closes when the air control pressure increases against the force of the springs.

Normally the valve is in the safety position „CLOSED“ e.g. The connection „A-B“ is then closed (blocked). The cavity between the integrated shut-offs is then relieved through the outlet port „C“ (bleed).




4.3 Protection against unauthorized changes to the configuration



The ball valve's fail-safe position depends on the mounted actuator's direction of action. The actuator's direction of action can be reversed. However, this is not possible while the process is running.

5 INSTALLATION AND START-UP

The ball valve is delivered ready to install and can be installed into the pipeline without the need for any additional installation work. Refer to the valve documentation on how to install and start-up the ball valve.

 Tip	PFEIFFER recommend checking the installation and start-up using a checklist. Examples of such checklists are included in VDI 2180-5 and the SAMSON brochure WA 236 (Functional safety of globe valves, rotary plug valves, ball valves and butterfly valves).
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6. REQUIRED CONDITIONS


 WARNING	Risk of malfunction due to incorrect selection or wrong installation and operating conditions. Only use ball valves in safety-instrumented systems after the necessary conditions in the plant have been fulfilled.
 Tip	PFEIFFER recommend checking the necessary conditions using a checklist. Examples of such checklists are included in VDI 2180-5 and the SAMSON brochure WA 236 (Functional safety of globe valves, rotary plug valves, ball valves and butterfly valves).

6.1 Selection

- ⇒ The suitability of the entire ball valve assembly (ball valve, actuator, valve accessories) for the intended use (pressure, temperature) has been checked.
- ⇒ The ball valve materials are suitable for the process medium.
- ⇒ The design of the ball valve is suitable for the required leak rate and for the indicated switching cycles.
- ⇒ The actuator is correctly sized based on the required transit time and thrust.
- ⇒ For the actuator design, the longest period of the non-operation must be specified and taken into account.

6.2 Mechanical and pneumatic installation

- ⇒ The ball valve is installed properly into the pipeline as described in the mounting and operating instructions and the actuator mounted on it. Valve accessories are mounted correctly.
- ⇒ The prescribed direction of flow is observed. The arrow on the valve indicates the direction of flow.
- ⇒ The control valve is configured with the correct fail-safe position (FC or FO).
- ⇒ The tightening torques (e.g. for the flanged joints) are observed, see mounting and operating instructions ► EB 51 b.
- ⇒ The end connection of the pipeline is aligned with the ball valve's end connections and their ends have parallel planes. Connection flanges that are not parallel can damage the ball valve and lead to increased operating torques!
- ⇒ A strainer must be installed when the process medium contains solids which could block the valve.


 WARNING	<p><i>The flow of the process medium is blocked by the strainer for a valve with "FO"!</i> Ball valves with "FO" fail-safe action must not be fitted with a strainer.</p>
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6.3 Operation

- ⇒ The plug stem is not blocked.
- ⇒ The medium flow through the valve is not blocked.
- ⇒ The valve is only used in applications that meet the specifications used for sizing at the ordering stage.



6.4 Maintenance

- ⇒ Maintenance is only performed by fully trained, qualified operating personnel.
- ⇒ Only original parts are used for spare parts.
- ⇒ Maintenance is performed as described in the section on servicing or maintenance in the associated valve documentation.


 Tip	<p>Contact PFEIFFER concerning any work not described in the section on servicing or maintenance in the associated valve documentation.</p>
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7. PROOF TESTING

The proof test interval and the extent of testing lie within the operator's responsibility. The operator must draw up a test plan, in which the proof tests and the interval between them are specified. We recommend summarizing the requirements of the proof test in a checklist.

 WARNING	<p><i>Risk of dangerous failure due to malfunction in the event of emergency (ball valve does not move to the fail-safe position).</i> Only use devices in safety-instrumented systems that have passed the proof test according to the test plan drawn up by the operator.</p>
 NOTICE	<p><i>Malfunction due to a non-observance of the required inspection requirements.</i> To test the fail-safe action properly, the following requirements must be met:</p> <ul style="list-style-type: none"> – Ball valve and actuator are assembled together properly. – The ball valve is installed properly into the plant.

Regularly check the safety-instrumented function of the entire SIS loop. The test intervals are determined, for example on calculating each single SIS loop in a plant (PFD_{avg}).

 Tip	<p>PFEIFFER recommend performing the proof tests based on a checklist. An example of such a checklist is included in the SAMSON brochure WA 236 (Functional safety of globe valves, rotary plug valves, ball valves and butterfly valves).</p>
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8 VISUAL INSPECTION TO AVOID SYSTEMATIC FAILURE

To avoid systematic failure, inspect the valve regularly. The frequency and the scope of the inspection lie within the operator's responsibility. Take application-specific influences into account, such as:

- ⇒ Blockage of plug stem
- ⇒ Corrosion (destruction primarily of metals due to chemical and physical processes)
- ⇒ Material fatigue
- ⇒ Wear induced by the process medium
- ⇒ Abrasion (material removed by solids contained in the process medium)
- ⇒ Medium deposits
- ⇒ Aging (damage caused to organic materials, e.g. plastics or elastomer, by exposure to light and heat)
- ⇒ Chemical attack (organic materials, e.g. plastics or elastomer, which swell, leach out or decompose due to exposure to chemicals)



Risk of malfunction due to the use of unauthorized parts.
Only use original parts to replace worn parts.

9. FUNCTION TESTING

Regularly check the safety function according to the test plan drawn up by the operator.



Record any faults in the valve and inform PFEIFFER of them in writing.

9.1 Safety-related fail-safe action

1. Supply the actuator with the signal pressure to allow the ball valve to move to the end position (completely open or closed).
2. Disconnect the signal pressure. This must cause the ball valve to move to its fail-safe position.
3. Check whether the ball valve reaches the end position within the required time.
4. Check whether the maximum permissible leakage is observed.

9.2 Safety-instrumented function of valve accessories

- ⇒ Check the safety-instrumented function of valve accessories. Refer to the associated safety manuals.

10. REPAIRS

Only perform the work on the ball valve described in the ball valve documentation.



Fail-safe action impaired due to incorrect repair.
Service and repair work must only be performed by trained staff

11. CUSTOMER REQUEST FORM FOR SIL APPLICATIONS



The following form helps to collect relevant information for SIL applications.

KUNDENABFRAGE DOKUMENTATIONSAUFTRAG FÜR SIL

CUSTOMER REQUEST DOCUMENTATION FOR SIL



PFEIFFER Chemie-Armaturenbau GmbH
Classification: Public

Kunde / customer:

Datum / date: 21. September 2023

Auftrags-Nr. / Anfrage:
Order no. / request

Armatur / valve: BR / BR

DN / NPS

PN / cl

Bitte stellen Sie uns für die Erstellung der SIL-Herstellererklärung folgende zusätzliche Informationen für jede Armatur zur Verfügung / For SIL - manufacturer declaration we ask for providing us following additional information for each valve:

- Medium:
Medium
- Eigenschaft des Mediums: schmierend / greasing nicht schmierend / sticking trocken / dry korrosiv / corrosive
Property of medium
 abrasiv / abrasive auskristallisierend / crystallizing polymerisierend / polymerizing
 feststoffhaltig / solids (hart / hard weich / soft schlammig / slurry faserig / fibrous
- Druck: [bar]
Inlet and outlet pressure
- Temperatur: [°C]
Medium temperature
- Dichtigkeitsklasse:
Tighten class
- Längste Dauer der Nichtbetätigung (betriebliche Anforderung) (Schaltzyklen pro Jahr)
Longest period of non-operation (operation mode) (quantity of cycles/year)
- Schaltzeit (wenn erforderlich): AUF [sec.] ZU [sec.]
Cycle time (if required) OPEN CLOSE
- Einbauort:
Location for installing (inside or outside)
- Einbaulage:
Installing orientation (horizontal or vertical)
- Betriebsart: kontinuierliche Fahrweise Batchfahrweise
Mode of operation continuous operating conditions changing operating
- Funktion des Stellgliedes: AUF/ZU Regel Sonstiges
Function of the valve ON/OFF Control Other
- Armaturen Isolierung: ja / yes / nein / no Isolierstärke in mm
Valve heat insulation insulation thickness
- Für die Antriebsauslegung benötigen wir den Zuluftdruck: min. [bar] max. [bar]
For the actuator design we need the air supply

Datum, Name und Unterschrift des Kunden _____
Date, name and sign of customer