

SH 14

Translation of original instructions



Butterfly valve BR 14a / BR 14b / BR 14b eco+ /
BR 14b-Type HD / BR 14c / BR 14e /
BR 14p-Type PSA / BR 14t






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1. GENERAL


1.1 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
	Note	Additional information
	Tip	Recommended action

1.2 Purpose of this manual

The Safety Manual SH 14 contains information relevant for the use of the BR 14a, BR 14b, BR 14b eco+, BR 14b-Type HD, BR 14c / BR 14e, BR 14p-Type PSA and BR 14t Butterfly 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	<p><i>Risk of malfunction due to incorrect installation or start-up of the device.</i></p> <p>Refer to the mounting and operating instructions ► EB 14... or operating instructions ► BA 14b-01 on how to install and start-up the device.</p> <p>Observe the warnings and safety instructions written in the mounting and operating instructions or operating instructions.</p>
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1.3 Further documentation

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

Butterfly valves

- Data sheet BR 14a ► TB 14a
- Data sheet BR 14b / BR 14c ► TB 14b
- Data sheet BR 14b eco+ ► TB 14b-eco+
- Data sheet BR 14b-Type HD ► DB 14b-07
- Data sheet BR 14e ► TB 14e
- Data sheet BR 14p-Type PSA ► DB 14p-01
- Data sheet BR 14t ► TB 14t
- Operating instructions, valve actuated
BR 14a, BR 14b, BR 14b eco+, BR 14b-Type HD, BR 14c,
BR 14e, BR 14p-Type PSA and BR 14t ► BA 14b-01
- Mounting and operating instructions BR 14a ► EB 14a
- Mounting and operating instructions BR 14b / BR 14b eco+ / BR 14c ► EB 14b
- Mounting and operating instructions BR 14b-Type HD ► EB 14b-07
- Mounting and operating instructions BR 14e ► EB 14e
- Mounting and operating instructions BR 14p-Type PSA ► EB 14p-01
- Mounting and operating instructions BR 14t ► EB 14t
- Functional safety of globe valves, rotary plug valves,
ball valves and butterfly valves ► WA 236



In addition to the valve documentation, observe the documentation for the actuator and valve accessories.

2. SCOPE

2.1 General

The BR 14a, BR 14b, BR 14b eco+, BR 14b-Typ HD, BR 14c, BR 14e, BR 14p-Typ PSA, BR 14t butterfly valve in combination with an actuator (e.g. BR 30a or BR 31a pneumatic Quarter-turn actuator) is designed to regulate the flow rate, pressure or temperature of liquids, gases or vapors.

2.2 Use in safety-instrumented systems

The butterfly valve can be used in safety-instrumented systems according to IEC 61508 and IEC 61511. The butterfly 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.



The architecture and the interval between proof tests must be considered concerning the safety integrity level.



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

Valve combined with actuators with travel stop and/or handwheel 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 secured, e.g. with sealing wax.

2.4 Mounting


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


2.5 Direction of flow

Type	14a	14b / 14c	14b eco+	14b-Typ HD	14e	14p-Typ PSA	14t
Direction of flow							

3. TECHNICAL DATA


Table 1: DIN version


Type	14a	14b / 14c	14b eco+	14b - Type HD
Nominal size	DN 80 ... 500	DN 50 ... 800	DN 50 ... 500	DN 80 ... 400
Nominal pressure	PN 10	PN 10 ... 40	PN 10 ... 16	PN 10 ... 40
Material ¹⁾	Special material	1.4408 / 1.0619 / 1.4571 / 1.0570	1.0619 / 1.4408	1.0619 / 1.4408
Design	Lug-Type / Wafer-Type			
Seat-plug seal	Soft seal · Metallic seal			
Heating jacket	On request			
Compliance				
Temperature ranges Permissible operating pressures acc. to pressure-temperature diagrams see data sheet ▶ TB 14a, ▶ TB 14b, ▶ TB 14b eco+ or ▶ DB 14b-07				
Body	-10 ... +200°C	-60 ... +350°C	-60 ... +300°C	-196 ... +550°C
Leakage class				
Direction of flow A	Soft seal	on request (depending on pressure and temperature)	A acc. to DIN EN 12266-1, P12, up to 200°C	
	Metallic seal	on request (depending on pressure and temperature)	IV - VI acc. to DIN EN 1349	VI acc. to DIN EN 1349
Direction of flow B	Soft seal	A acc. to DIN EN 12266-1, P12	on request (depending on pressure and temperature)	A acc. to DIN EN 12266-1, P12
	Metallic seal	-	on request (depending on pressure and temperature)	

Type	14e	14p - Type PSA	14t
Nominal size	DN 50 ... 600	DN 80 ... 400	DN 80 ... 500
Nominal pressure	PN 10 ... 40	PN 10 ... 40	PN 10 ... 40
Material ¹⁾	1.4571 / 1.4581	1.0619 / 1.4408	1.0619 / 1.4408
Design	Lug-Type / Wafer-Type		
Seat-plug seal	Soft seal · Metallic seal		
Heating jacket	On request		
Compliance			
Temperature ranges Permissible operating pressures acc. to pressure-temperature diagrams see data sheet ▶ TB 14e, ▶ DB 14p-01 or ▶ TB 14t			
Body	-10 ... +200°C	-20 ... +180°C	-196 ... +550°C
Leakage class			
Direction of flow A	Soft seal	-	A acc. to DIN EN 12266-1, P12
	Metallic seal	-	-
Direction of flow B	Soft seal	-	A acc. to DIN EN 12266-1, P12
	Metallic seal	-	VI acc. to DIN EN 1349

¹⁾ Other materials optionally available

Table 2: ANSI-Version

Type	14a	14b / 14c	14b eco+	14b - Type HD
Nominal size	NPS 3 ... 20	NPS 2 ... 32	NPS2 ... 20	NPS 3 ... 16
Nominal pressure	cl150	cl150 / 300	cl150	cl150 / 300
Material ¹⁾	Special material	A351 CF8M / A216 WCB / A240 Gr. 316L / A516 Gr.70	A216 Gr. WCB / A351 CF8M	A216 WCB / A351 CF8M
Design	Lug-Type / Wafer-Type			
Seat-plug seal	Soft seal · Metallic seal			
Heating jacket	On request			
Compliance				
Temperature ranges Permissible operating pressures acc. to pressure-temperature diagrams see data sheet ▶ TB 14a, ▶ TB 14b, ▶ TB 14b eco+ or ▶ DB 14b-07				
Body	-10 ... +200°C	-60 ... +350°C	-60 ... +300°C	-196 ... +550°C
Leakage class				
Direction of flow A	Soft seal	on request (depending on pressure and temperature)	A acc. to DIN EN 12266-1, P12, up to 200°C	
	Metallic seal	on request (depending on pressure and temperature)	IV - VI acc. to DIN EN 1349	VI acc. to DIN EN 1349
Direction of flow B	Soft seal	A acc. to DIN EN 12266-1, P12	on request (depending on pressure and temperature)	A acc. to DIN EN 12266-1, P12
	Metallic seal	-	on request (depending on pressure and temperature)	

Type	14e	14p - Type PSA	14t
Nominal size	NPS2 ... 8	NPS3 ... 16	NPS3 ... 20
Nominal pressure	cl150 / 900	cl150 / 300	cl150 / 300
Material ¹⁾	A216 WCB	A216 WCB / A351 CF8M	A216 WCB / A351 CF8M
Design	Lug-Type / Wafer-Type		
Seat-plug seal	Soft seal · Metallic seal		
Heating jacket	On request		
Compliance			
Temperature ranges Permissible operating pressures acc. to pressure-temperature diagrams see data sheet ▶ TB 14e, ▶ DB 14p-01 or ▶ TB 14t			
Body	-10 ... +200°C	-20 ... +180°C	-196 ... +550°C
Leakage class			
Direction of flow A	Soft seal	-	A acc. to DIN EN 12266-1, P12
	Metallic seal	-	-
Direction of flow B	Soft seal	-	A acc. to DIN EN 12266-1, P12
	Metallic seal	-	VI acc. to DIN EN 1349

¹⁾ Other materials optionally available

4. SAFETY-RELATED FUNCTIONS

4.1 Safety-related fail-safe action

The butterfly valve, in combination with a pneumatic 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 actuator. The actuator is vented upon demand of the safety-instrumented function. As soon as the actuator is vented (signal pressure = atmospheric pressure), the spring forces cause the actuator stem to move to the fail-safe position. The 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:


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

4.3 Protection against unauthorized changes to the configuration



The butterfly 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 butterfly 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 butterfly valve.

 <i>Tip</i>	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	<i>Risk of malfunction due to incorrect selection or wrong installation and operating conditions.</i> Only use butterfly valves in safety-instrumented systems after the necessary conditions in the plant have been fulfilled.
 <i>Tip</i>	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 control valve assembly (valve, actuator, valve accessories) for the intended use (pressure, temperature) has been checked.
- ⇒ The valve materials are suitable for the process medium.
- ⇒ The design of the 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 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 for BR 14a, BR 14b, BR 14b eco+, BR 14b-Typ HD, BR 14c, BR 14e, BR 14p-Typ PSA und BR 14t (e.g. for the flanged joints) are observed see ► BA 14b-01 or ► EB 14... .
- ⇒ The end connection of the pipeline is aligned with the butterfly valve's end connections and their ends have parallel planes. Connection flanges that are not parallel can damage the butterfly valve and lead to increased operating torques!
- ⇒ A strainer must be installed when the process medium contains solids which could block the valve.



WARNING

*The flow of the process medium is blocked by the strainer for a valve with "FO"!
Butterfly valves with "FO" fail-safe action must not be fitted with a strainer.*

6.3 Operation

- ⇒ The plug stem is not blocked.
- ⇒ The medium flow through the butterfly valve is not blocked.
- ⇒ The butterfly 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


Contact PFEIFFER concerning any work not described in the section on servicing or maintenance in the associated valve documentation.

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

 NOTICE	<i>Risk of malfunction due to the use of unauthorized parts. Only use original parts to replace worn parts.</i>
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9. FUNCTION TESTING

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

 Info	Record any faults in the butterfly valve and inform PFEIFFER of them in writing.
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9.1 Safety-related fail-safe action


1. Supply the actuator with the signal pressure to allow the valve to move to the end position (completely open or closed).
2. Disconnect the signal pressure. This must cause the valve to move to its fail-safe position.
3. Check whether the 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 valve described in the valve documentation.

 NOTICE	<i>Fail-safe action impaired due to incorrect repair.</i> Service and repair work must only be performed by trained staff.
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11. CUSTOMER REQUEST FORM FOR SIL APPLICATIONS

 Tip	The following form helps to collect relevant information for SIL applications.
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KUNDENABFRAGE DOKUMENTATIONSAUFTRAG FÜR SIL

CUSTOMER REQUEST DOCUMENTATION FOR SIL



PFEIFFER Chemie-Armaturenbau GmbH
Classification: Public

Kunde / customer:

Datum / date: 21. May 2022

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

Armatur / valve: BR / type 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:
Inlet and outlet pressure
- Temperatur:
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. [barg] max. [barg]
For the actuator design we need the air supply

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