SAFETY MANUAL

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

Issue June 2023

PFEIFFER Chemie-Armaturenbau GmbH · Hooghe Weg 41 · 47906 Kempen · Germany
Phone: +49 2152 2005-0 · Fax: +49 2152 1580
E-Mail: sales-pfeiffer-de@samsongroup.com · Internet: www.pfeiffer-armaturen.com

Contents

1	**GENERAL**	**4**
1.1	Definition of signal words	4
1.2	Purpose of this manual	4
1.3	Further documentation	4
2	**SCOPE**	**5**
2.1	General	5
2.2	Use in safety-instrumented systems	5
2.3	Versions and ordering data	5
2.4	Mounting	5
2.5	Direction of flow	5
3	**TECHNICAL DATA**	**6**
4	**SAFETY-RELATED FUNCTIONS**	**8**
4.1	Safety-related fail-safe action	8
4.2	Fail-safe action	8
4.3	Protection against unauthorized changes to the configuration	8
5	**INSTALLATION AND START-UP**	**8**
6	**REQUIRED CONDITIONS**	**8**
6.1	Selection	9
6.2	Mechanical and pneumatic installation	9
6.3	Operation	9
6.4	Maintenance	9
7	**PROOF TESTING**	**10**
8	**VISUAL INSPECTION TO AVOID SYSTEMATIC FAILURE**	**10**
9	**FUNCTION TESTING**	**10**
9.1	Safety-related fail-safe action	11
9.2	Safety-instrumented function of valve accessories	11
10	**REPAIRS**	**11**
11	**CUSTOMER REQUEST FORM FOR SIL APPLICATIONS**	**11**

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** and **BR 14p-Type PSA** 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***	***Risk of malfunction due to incorrect installation or start-up of the device.*** Refer to the mounting and operating instructions ▶ EB 14… or operating instructions ▶ BA 14b-01 on how to install and start-up the device. Observe the warnings and safety instructions written in the mounting and operating instructions or operating instructions.

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.

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

NOTICE	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** and **BR 14p-Typ PSA** 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.

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

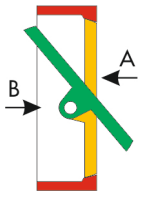
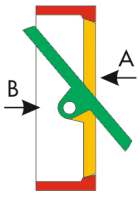
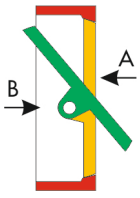
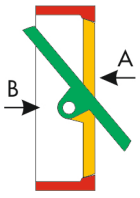
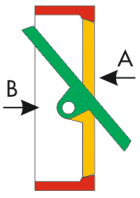
Valve combined with actuators with travel stop and/or handwheel are not suitable for use in safety-instrumented systems. All other versions are suitable for use in safety-instrumented systems.

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
Direction of flow						

3 TECHNICAL DATA

Table 1: *DIN version*

Type		**14a**	**14b / 14c**	**14b eco+**
Nominal size		DN 80 ... 500	DN 50 ... 800	DN 50 ... 500
Nominal pressure		PN 10	PN 10 ... 40	PN 10 ... 16
Material [1]		Special material	1.4408 / 1.0619 / 1.4571 / 1.0570	1.0619 / 1.4408
Design		Lug-Type / Wafer-Type		
Seat-plug seal		Soft seal · Metallic seal		
Heating jacket		On request		
Compliance		CE . EAC		
Temperature ranges Permissible operating pressures acc. to pressure-temperature diagrams see data sheet ▶ TB 14a, ▶ TB 14b or ▶ TB 14b eco+				
Body		-10 ... +200°C	-60 ... +350°C	-60 ... +300°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	
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		**14b - Type HD**	**14e**	**14p - Type PSA**
Nominal size		DN 80 ... 400	DN 50 ... 600	DN 80 ... 400
Nominal pressure		PN 10 ... 40	PN 10 ... 40	PN 10 ... 40
Material [1]		1.0619 / 1.4408	1.4571 / 1.4581	1.0619 / 1.4408
Design		Lug-Type / Wafer-Type		
Seat-plug seal		Soft seal · Metallic seal		
Heating jacket		On request		
Compliance		CE . EAC		
Temperature ranges Permissible operating pressures acc. to pressure-temperature diagrams see data sheet ▶ DB 14b-07, ▶ TB 14e or ▶ TB 14p				
Body		-196 ... +550°C	-10 ... +200°C	-20 ... +180°C
Leakage class				
Direction of flow **A**	Soft seal	A acc. to DIN EN 12266-1, P12, up to 200°C	-	A acc. to DIN EN 12266-1, P12
	Metallic seal	VI acc. to DIN EN 1349	-	-
Direction of flow **B**	Soft seal	A acc. to DIN EN 12266-1, P12	-	A acc. to DIN EN 12266-1, P12
	Metallic seal	on request (depending on pressure and temperature)	-	-

[1] Other materials optionally available

Table 2: *ANSI-Version*

Type		**14a**	**14b / 14c**	**14b eco+**
Nominal size		NPS 3 ... 20	NPS 2 ... 32	NPS2 ... 20
Nominal pressure		cl150	cl150 / 300	cl150
Material [1]		Special material	A351 CF8M / A216 WCB / A240 Gr. 316L / A516 Gr.70	A216 Gr. WCB / A351 CF8M
Design		Lug-Type / Wafer-Type		
Seat-plug seal		Soft seal · Metallic seal		
Heating jacket		On request		
Compliance		CE, EAC		
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
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	
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		**14b - Type HD**	**14e**	**14p - Type PSA**
Nominal size		NPS 3 ... 16	NPS2 ... 8	NPS3 ... 16
Nominal pressure		cl150 / 300	cl150 / 900	cl150 / 300
Material [1]		A216 WCB / A351 CF8M	A216 WCB	A216 WCB / A351 CF8M
Design		Lug-Type / Wafer-Type		
Seat-plug seal		Soft seal · Metallic seal		
Heating jacket		On request		
Compliance		CE, EAC		
Temperature ranges Permissible operating pressures acc. to pressure-temperature diagrams see data sheet ▶ DB 14b-07, ▶ TB 14e or ▶ TB 14p				
Body		-196 ... +550°C	-10 ... +200°C	-20 ... +180°C
Leakage class				
Direction of flow **A**	Soft seal	A acc. to DIN EN 12266-1, P12, up to 200°C	-	A acc. to DIN EN 12266-1, P12
	Metallic seal	VI acc. to DIN EN 1349	-	-
Direction of flow **B**	Soft seal	A acc. to DIN EN 12266-1, P12	-	A acc. to DIN EN 12266-1, P12
	Metallic seal	on request (depending on pressure and temperature)	-	-

[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.

 **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).

6 REQUIRED CONDITIONS

 **WARNING**	*Risk of malfunction due to incorrect selection or wrong installation and operating conditions.* Only use butterfly 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 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-Typ HD and, BR 14e (e.g. for the flanged joints) are observed see ▶ BA 14b-01 or for BR 14b, BR 14b eco+ and BR 14c see ▶ EB 14b as well as for BR 14p-Typ PSA see ▶ EB 14p.

⇨ 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	*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.
NOTICE	*Malfunction due to a non-observance of the required inspection requirements.* To test the fail-safe action properly, the following requirements must be met: – 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).

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	*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.

Info	Record any faults in the butterfly 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 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**	*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

 **Tip**	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:* 5. June 2023

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

PDF=1342

SH 14_EN
Issue June 2023
Specifications subject without notice