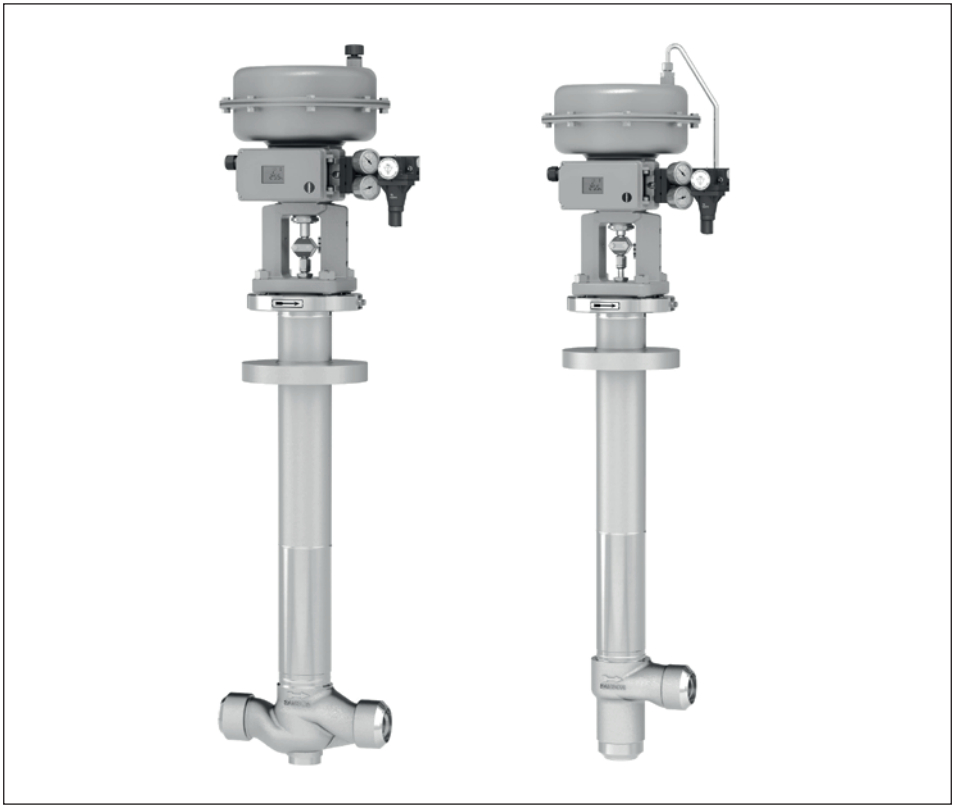
SAFETY MANUAL

SH 8093 EN

Translation of original instructions



Type 3248 Valve

Edition November 2022

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

Purpose of this manual

The Safety Manual SH 8093 contains information relevant for the use of the Type 3248 Globe or Angle 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 8093 on how to install and start-up the device.*

➔ *Observe the warnings and safety instructions written in the Mounting and Operating Instructions EB 8093.*

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 SAMSON website.

Type 3248 Globe or Angle Valve

▶ T 8093:	Data sheet for standard version
▶ EB 8093:	Mounting and operating instructions for standard version
▶ TV-SK 9616 ▶ TV-SK 9986 ▶ TV-SK 10008 ▶ TV-SK 20024	Dimensions and weights for versions other than the standard version (available on request)

For oxygen service

▶ H 01	Manual

Note

In addition to the valve documentation, observe the technical documentation for the actuator.

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1 Scope

1.1 General

The SAMSON Type 3248 Globe and Angle 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 or gases in cryogenic applications. For this purpose, the valves can be welded into vacuum-insulated pipelines or cold boxes.

1.2 Use in safety-instrumented systems

The 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) 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 in order to achieve the safety integrity level.

Tip

The diagnostic coverage can be increased and, as a result, the probability of failure on demand reduced by mounting a positioner with diagnostic capabilities on the control valve.

1.3 Versions and ordering data

Valves 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.

1.4 Mounting

The valve and actuator are normally delivered already assembled by SAMSON.

2 Technical data

Table 1: *Technical data for Type 3248 Cryogenic Valve (DIN version)*

Body style	**Globe valve**	**Angle valve**					
Body material	Steel [1]	Steel [1]	Alumi-num [1]	Steel [2]	Alumi-num [2]	Alumi-num [2]	Alumi-num [2]
Valve size	DN 25 to 150	DN 25 to 150	DN 25 to 150	DN 25 to 150	DN 25 to 100	DN 150	DN 200
Pressure rating	PN 16 to 100	PN 16 to 100	PN 16 to 40	PN 63 to 100	PN 10 to 63	PN 10 to 63	PN 10 to 40
Type of connection	Welding ends						
Seat-plug seal	Metal seal · Soft seal · High-performance metal seal						
Characteristic	Equal percentage or linear						
Rangeability	50:1 up to DN 50 30:1 for DN 80 to 150						
Temperature range	–196 to +65 °C · Down to –273 °C on request						
	Permissible temperature range at the (optional) RFID tag: –40 to +85 °C						
Leakage class according to IEC 60534-4	Metal seal: IV · Soft seal: VI · High-performance metal seal: V						
RFID tag (optional)	Application range according to the technical specifications and the explosion protection certificates. Documents ▶ www.samsongroup.com > Service & Support > Electronic nameplate						
Conformity	CE · UK CA · EAC						
More information	EB/T 8093			TV-SK 10008			

[1] Standard version
[2] Other versions other than the standard version

Table 2: *Materials for Type 3248 Cryogenic Valve (DIN version)*

Valve		**Globe valve**	**Angle valve**	
Valve body		1.4308	1.4308	EN AW-5083
Seat [1]		CrNiMo steel /Monel® · 1.4409 on request		
Plug [1]	Metal seal	CrNiMo steel/Monel®		
	Soft seal	Seal ring made of PTFE with glass fiber		
V-ring packing		PTFE with carbon or pure PTFE		
Cryogenic extension bonnet, metal bellows, bushings, plug stem		CrNiMo steel		

[1] Seats and plugs without soft seal also with Stellite® facing · Plug up to seat bore 48 made of solid Stellite® available.

Table 3: *Technical data for Type 3248 Cryogenic Valve (ANSI version)*

Body style	Globe valve				Angle valve
Valve size	NPS 1 to 6 [1) 2)]	NPS 1 to 6 [1) 2)]	NPS ½ to 6 [2)]	NPS ½ to 6 [2)]	NPS 1 to 6 [1) 2)]
Pressure rating	Class 150 to 300	Class 600	Class 150 to 300	Class 600	Class 150 to 600
End connection Welding ends	Socket weld ends NPS 1 to 2 Butt weld ends NPS 3 to 6		Butt weld ends ASME B16.25		Butt weld ends
Seat-plug seal	Metal seal · Soft seal · High-performance metal seal				
Characteristic	Equal percentage or linear				
Rangeability	50:1 up to NPS 2 · 30:1 for NPS 3 to 6				
Temperature range	–321 to +149 °F (–196 to +65 °C) · Up to –425 °F (–254 °C) on request				
	Perm. temperature range at the (optional) RFID tag: –40 to +185 °F (–40 to +85 °C)				
Leakage class according to ANSI/FCI 70-2	Metal seal: IV · Soft seal: VI · High-performance metal seal: V				
RFID tag (optional)	Application range according to the technical specifications and the explosion protection certificates. Documents ▶ www.samsongroup.com > Service & Support > Electronic nameplate				
Conformity	CE · UKCA · EAC				
More information	EB/T 8093-1 [1)] TV-SK 9986/9616 [2)]		TV-SK 20024		EB/T 8093-1 [1)] TV-SK 9616 [2)]

1) Standard version
2) Other versions other than the standard version

Table 4: *Materials for Type 3248 Cryogenic Valve (ANSI version)*

Valve		Globe valve	Angle valve
Valve body		A351 CF8 · A351 CF3M on request	
Seat [1)]		CrNiMo steel	
Plug [1)]	Metal seal	CrNiMo steel	
	Soft seal	Seal ring made of PTFE with glass fiber	
V-ring packing		PTFE with carbon or pure PTFE	
Cryogenic extension bonnet, metal bellows, bushings, plug stem		CrNiMo steel	

1) Seats and plugs without soft seal also with Stellite® facing · Plug up to seat bore 48 made of solid Stellite® available.

3 Safety-related functions

3.1 Safety-related fail-safe action

The 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.

3.2 Fail-safe action

The signal pressure is normally applied to the actuator. The actuator is vented upon demand as part 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 actuator's direction of action (see the associated actuator documentation), the valve has one of the following fail-safe positions:

– "Actuator stem extends" fail-safe action: in the event of emergency, the springs move the actuator stem downward and close the valve.
– "Actuator stem retracts" fail-safe action: in the event of emergency, the springs move the actuator stem upward and open the valve.

Tip

The nameplate of SAMSON electric actuators provides details on the fail-safe action of the actuator.

3.3 Protection against unauthorized changes to the configuration

The 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.

4 Installation and start-up

We recommend mounting the valve at an angle between 15 and 25° to the horizontal plane.

Tip

We recommend checking the installation and start-up using a checklist. Examples of such checklists are included in the SAMSON brochure WA 236 (Functional safety of globe valves, rotary plug valves, ball valves and butterfly valves).

5 Required conditions

WARNING

Risk of malfunction due to incorrect selection or wrong installation and operating conditions.

➔ *Only use valves in safety-instrumented systems if the necessary conditions in the plant are fulfilled.*

Tip

We recommend checking the necessary conditions using a checklist. Examples of such checklists are included in the SAMSON brochure WA 236 (Functional safety of globe valves, rotary plug valves, ball valves and butterfly valves).

The following applies to the Type 3248 Valve for oxygen service:

Oxygen is a hazardous substance, which reacts quickly, leading to combustion and explosions. Contact with cryogenic gases causes severe frostbite and cold burns (cryogenic burns). Operating personnel must be trained for these applications. Unqualified operating personnel expose themselves and others to an increased risk of injury.

➔ Operating personnel is trained for oxygen service and aware of the hazards in applications involving oxygen or cryogenic gases.

Note

Instructions and information on how to safely handle devices for oxygen service can be found in the Manual ▶ H 01.

Tip

All SAMSON staff receives appropriate training before performing any activities in connection with oxygen service. SAMSON's After-sales Service also offers such training courses for service staff to allow them to learn how to handle devices for the above listed applications correctly and safely.

5.1 Selection

- ➔ The suitability of the entire control valve assembly (valve, actuator and valve accessories) for the intended use (pressure, temperature) has been checked.
- ➔ The valve materials are suitable for the process medium.
- ➔ The actuator is correctly sized based on the required transit time and thrust.
- ➔ The valve is only used for pure process media that do not contain any solids.
- ➔ Only use valves that are suitable and marked for oxygen service (details on the markings specified in the Manual ▶ H 01.

5.2 Mechanical and pneumatic installation

- ➔ The valve is installed properly into the pipeline as described in the Mounting and Operating Instructions EB 8093 and the actuator is mounted on it. Valve accessories are mounted correctly.
- ➔ The recommended mounting angle between 15 and 25° to the horizontal plane is observed.
- ➔ 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 (stem extends or retracts).
- ➔ The tightening torques (e.g. for the flanged joints) are observed.
- ➔ A strainer is not installed upstream of the valve.

5.3 Operation

➔ The plug stem is not blocked.

➔ The medium flow through the valve is not blocked.

➔ The valve is only used in operating conditions that meet the specifications used for sizing at the ordering stage.

5.4 Maintenance

➔ Maintenance is only performed by fully trained, qualified operating personnel.

➔ Only original parts are used for spare parts.

➔ Service work is performed as described in the section on servicing or maintenance in the associated Mounting and Operating Instructions EB 8093.

Tip

Contact SAMSON's After-sales Service concerning any work not described in the Mounting and Operating Instructions EB 8093.

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6 Proof testing (routine 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.*

To test the safety-instrumented function 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

We 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).

The following applies to oxygen service:

⚠ DANGER

Risk of explosion or fire through the presence of oxygen.

Oxygen is classified as a hazardous substance. A risk of explosion exists for pressurized plants. Oxygen accelerates combustion. Even slightly higher oxygen concentrations lead to rapid and intense combustion.

➔ Remove ignition sources.

➔ Avoid sparking.

➔ Make sure the cleanliness meets the requirements specified in the standards for oxygen service.

➔ Avoid oxygen enrichment.

➔ Only allow qualified operating personnel to work.

➔ Wear personal protective equipment.

➔ Observe the instructions in the material safety data sheet (MSDS). If necessary, contact the oxygen supplier to obtain an MSDS.

Frostbite and severe burn injuries through contact with liquid oxygen.

The temperature of liquid oxygen is –183 °C at atmospheric pressure. Skin contact with liquid oxygen causes severe frostbite and cold burns (cryogenic burns). Severe cryogenic burns can be fatal.

➔ Do not touch liquid oxygen.

➔ Wear cold-resistant safety gloves and protective equipment.

Damage to health through inhaling high concentrations of oxygen.

Inhaling high concentrations of oxygen can cause adverse health effects (e.g. dizziness, nausea, impaired vision, hearing defects, impaired balance and unconsciousness). The presence of an oxygen-enriched atmosphere cannot be detected by human senses.

➔ Avoid oxygen enrichment.

➔ Leave the oxygen-enriched environment. Move to fresh air.

➔ Use oxygen measuring equipment.

➔ Wear a respirator for applications with gaseous oxygen.

⚠ WARNING

Risk of injury due to incorrect handling of oxygen.

Operating personnel must be trained for oxygen service. Unqualified operating personnel expose themselves and others to an increased risk of injury.

➔ Operating personnel must be sufficiently trained and be made aware of the hazards occurring in oxygen service.

➔ Do not enter the hazardous area without prior permission and without appropriate training.

➔ Wear clean personal protective equipment that is suitable for the purpose.

➔ Do not allow the control valve and the components to become contaminated. Pay attention to cleanliness.

6.1 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 due to 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 elastomers, 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.*

6.2 Function testing

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

Note

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

6.3 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 fail-safe position within the required time.
4. "Actuator stem extends" fail-safe action: check whether the maximum permissible leakage is observed.

   ➔ **For oxygen service:**

   Perform the leak test using clean, dry, oil-free compressed air or nitrogen.

Safety-instrumented function of valve accessories:

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

7 Repairs

Only perform the work on the valve described in the Mounting and Operating Instructions EB 8093.

NOTICE

Safety-instrumented function will be impaired if repair work is performed incorrectly.

➔ *Only allow trained staff to perform service and repair work.*

8 Safety-related data

The Type 3248 Valve is suitable for use in safety-instrumented systems according to IEC 61508 and IEC 61511. It is suitable for use in safety-instrumented systems up to SIL 2 (single device) and SIL 3 (redundant configuration) according to IEC 61508. Evidence is provided based on the experience in the field (proven-in-use).

Safety-related data

λ_{safe}	1744 FIT
$\lambda_{dangerous,\ undetected}$	118 FIT
$\lambda_{dangerous,\ detected}$	0 FIT
$PFD_{avg.}$ with annual test	5.2×10^{-4}
HFT (Hardware Fault Tolerance)	0
DC (Diagnostic Coverage)	0
Device type	A
Safe failure fraction (SFF)	94 %
$MTBF_{total}$	58
$MTBF_{dangerous}$	970
SC (systematic capability)	3

1 FIT = 1 failure per 10^9 hours

Useful lifetime

According to IEC 61508-2, section 7.4.9.5, a useful lifetime of eight to twelve years can be assumed. Other values can be used based on the user's previous experience (prior use).

Intended use

See Mounting and Operating Instructions EB 8093

Safety-related assumptions

In case of emergency, the springs in the actuator cause the valve to move its fail-safe position.

Requirements

– Short mean time to repair compared to the average rate of demand.
– Normal exposure to industrial environment and fluids is assumed.
– The user is responsible for ensuring that the device is used as intended.

SH 8093 EN

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