SAMSON

SAMSON

MANUAL

Competence in Functional Safety

Functional safety of globe
valves, rotary plug valves, ball valves and butterfly valves

SMART IN FLOW CONTROL.

SAMSON

AIR TORQUE · CERA SYSTEM · KT-ELEKTRONIK · LEUSCH
PFEIFFER · RINGO · SAMSOMATIC · STARLINE · VETEC

Founded in 1907, SAMSON has since become a worldwide leader in the manufacture of expertly engineered control valves.

SAMSON has over 50 subsidiaries, amongst them noted manufacturers of special valves.

With these subsidiaries, SAMSON is represented in over 80 countries to assist its customers on all continents.

Table of contents

1 Scope

Valves and the associated actuators are used to isolate pipelines in safety-instrumented systems. Alternatively, they can also be used for pressure relief, i.e. by completely opening valves.

2 Validity of this manual

This manual applies to control valves manufactured by the following companies within SAMSON:

- SAMSON AG
- LEUSCH GmbH Industriearmaturen
- PFEIFFER Chemie-Armaturenbau GmbH
- VETEC Ventiltechnik GmbH

Refer to the manufacturer's declarations in Appendix 1 of this manual for the valve models concerned.

The individual versions of the valves can be identified by their nameplates

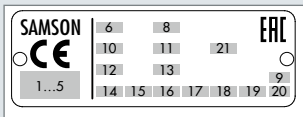


Fig. 1: *Valve nameplate*

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: DIN: DN · ANSI: NPS · JIS: DN … A/B
11	Pressure rating: DIN: PN · ANSI: CL · JIS: K
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: DIN: K_{VS} · ANSI: C_V · JIS: C_V
15	Characteristic: %: equal percentage · Lin: linear · NO/NC: quick opening
16	Seat/plug seal: ME: metal (see section 3.3) HA: carbide metal ST: Stellite® facing KE: ceramic PT: soft seal with PTFE PK: soft seal with PEEK
17	Seat code (trim material) · On request
18	Pressure balancing: DIN: D · ANSI: B · JIS: B
19	Flow divider: 1: St I · 3: St III
20	Country of origin
21	PSA version

The nameplate is stuck on the diaphragm casing. It includes all details required to identify the actuator:

2	Configuration ID
3	Serial number
4	Actuator area
5	Bench range in bar
6	Bench range in psi
7	Operating travel in mm
8	Operating range in bar
9	Operating range in psi
10	Permissible supply pressure p_{max} in bar
11	Permissible supply pressure p_{max} in psi
12	Symbol indicating fail-safe action
	Actuator stem extends (FA)
	Actuator stem retracts (FE)
	Manual override
14	Connecting thread
15	Diaphragm material
16	Date of manufacture

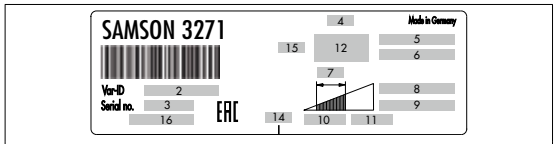


Fig. 1: *Nameplate*

Example of a nameplate for a Type 3241 Valve with Type 3271 or Type 3277 Pneumatic Actuator manufactured by SAMSON AG

3 Intended use of this manual

This manual is intended to assist planners and operators during the integration of control valves into a safety loop as part of the safety function and to enable them to safely operate control valves.

This manual contains information, safety-related data and warnings concerning the functional safety in accordance with IEC 61508 and concerning the application in the process industry in accordance with IEC 61511. It does not contain any particular details on other safety requirements, such as explosion protection or electrical safety.

Safety-instrumented systems are to be commissioned and maintained by qualified personnel only. Refer to the corresponding mounting and operating instructions of the valve.

4 General aspects of functional safety

4.1 Standards, terms and abbreviations

Abbreviation	Designation	Description
SIL	Safety Integrity Level	One of four discrete levels for specifying the safety integrity requirements of the safety functions to be allocated to the E/E/PE safety-related systems, where SIL 4 has the highest level of safety integrity and SIL 1 has the lowest.
MTBF	Mean Time Between Failures	Mean time between two failures
MTTR	Mean Time To Restoration	Mean time between the occurrence of a failure in a device or system and its repair
HFT	Hardware Fault Tolerance	Capability of a functional unit to continue executing the demanded function in case of faults or deviations.
λ_{sd}	Failure rate for all safe detected failures	
λ_{su}	Failure rate for all safe undetected failures	
λ_{dd}	Failure rate for all dangerous detected failures	
λ_{du}	Failure rate for all dangerous undetected failures	
SFF	Safe Failure Fraction	Fraction of non-hazardous failures, i.e. the fraction of failures without the potential to set the safety-related system to a dangerous or impermissible state.
PFD_{avg}	Average Probability of Failure on Demand	Average likelihood that a dangerous safety function failures occurs on demand.
T_I	Test Interval between life testing of the safety function	Average likelihood that a dangerous safety function failures occurs on demand.
Low demand mode	Low demand mode of operation	Low demand mode is where the frequency of demands for operation made on a safety-related system is no greater than one per year and no greater than twice the proof test frequency.

Abbreviation	Designation	Description
MooN	Voting "M out of N" (e. g. 2oo3)	Classification and description of the safety-related system regarding redundancy and the selection procedure used. • "N" indicates how often the safety function is carried out (redundancy). • "M" determines how many channels must work properly. Example: Pressure measurement in 1oo2 architecture A safety-instrumented system decides that a specified pressure limit has been exceeded if one of two pressure sensors reaches this limit. In a 1oo1 architecture, there is only one pressure sensor.
MooND	Voting "M out of N" with diagnostics	

Relevant standards

Norm	Designation
IEC 61508 Parts 1 to 7	Functional safety of electrical/electronic/programmable electronic safety-related systems
IEC 61511 Parts 1 to 3	Functional safety – Safety instrumented systems for the process industry sector
VDI 2180 Parts 1 to 5	Safeguarding of industrial process plants by means of process control engineering

Terms and definitions

Term	Definition
Dangerous failure	Failure with the potential to set the safety-related system to a dangerous or inoperative state.
Safety-related system	A safety-related system carries out the safety functions needed to establish or maintain a safe state, e.g. in a plant. Example: Pressure measuring instrument, logic unit (e.g. limit switch) and valve form a safety-related system.
Safety function	A defined function carried out by a safety-related system in order to establish or maintain a safe state of the plant, under consideration of a specified dangerous incident. Example: Pressure limit monitoring

4.2 Determining the safety integrity level

The achievable safety integrity level (SIL) is determined by the following safety-related data:

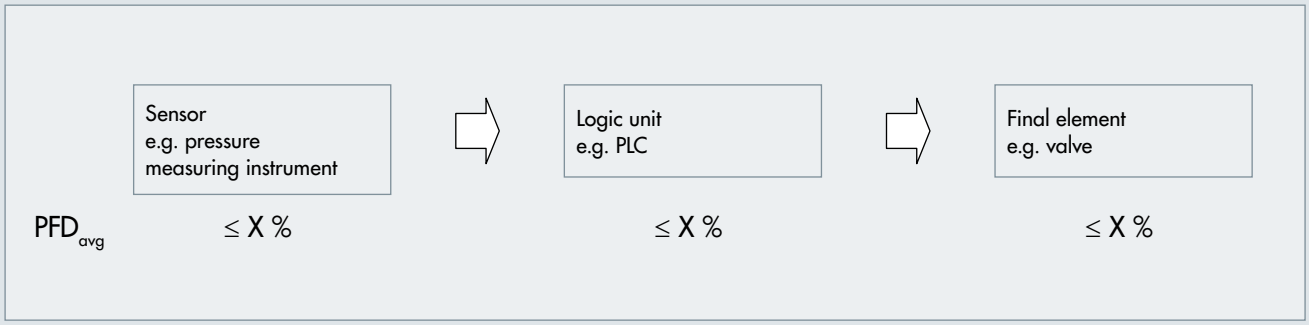
- Average probability of failure on demand (PFD_{avg})
- Hardware fault tolerance (HFT)
- Safe failure fraction (SFF)

The following table in accordance with IEC 61508 and IEC 61511 shows how the safety integrity level (SIL) depends on the average probability of failure on demand (PFD_{avg}). It is based on low demand mode of operation, i.e. the frequency of demands on a safety-related system is no greater than once per year.

Safety integrity level (SIL)	**PFDavg (low demand mode)**
4	$\geq 10^{-5}$ to $< 10^{-4}$
3	$\geq 10^{-4}$ to $< 10^{-3}$
2	$\geq 10^{-3}$ to $< 10^{-2}$
1	$\geq 10^{-2}$ to $< 10^{-1}$

PFD_{avg} in low demand mode of operation according to IEC 61508-1, Table 2

The sensor, logic unit and final element form a safety-related system that performs a safety function.



The average probability of failure on demand (PFD_{avg} = sum of sensor, logic unit and final element failures) must be within the range of the demanded safety integrity level (SIL) in case of demand as listed in the above table.

4.3 Hardware fault tolerance

In the process industry, the achievable SIL classes for sensors, final elements and non-programmable logic modules, such as isolating amplifiers and relays, are restricted in accordance with IEC 61511 as shown in the following table.

Safety integrity level (SIL)	Minimum required hardware failure tolerance (HFT)
1	0
2	1
3	2
4	Special requirements (refer to IEC 61508)

Minimum required hardware failure tolerance (HFT) according to IEC 61511-1, Table 6, for the process industry

The minimum required hardware failure tolerance can be decreased by one if the following requirements are met:

- The device is proven in use.

  ⇨ Take this into account when selecting devices!

- The device only allows process-relevant parameters to be set, e.g. measuring range, upscale or downscale function in case of failure.

  ⇨ Final elements do not have any configurable functions.

- The process-relevant parameters of the device are access-protected, e.g. by jumper or password.

  ⇨ Final elements do not have any configurable functions.

- The function requires a SIL less than 4.

A final element has a single-channel design, resulting in a hardware failure tolerance (HFT) = 0. This results in a single-channel application up to SIL 1 or up to SIL 2 for proven-in-use devices.

At least two redundant devices are required for SIL 3 with proven-in-use devices.
At least three redundant devices are required for SIL 3 without proven-in-use devices.

5 Intended use of control valves in safety-instrumented systems

Responsibility

The reliability of mechanical components is significantly affected by the operating conditions and, as a result, by systematic failures. This needs to be taken into account when selecting and sizing devices.

Safety-instrumented function

During normal operation, the signal pressure is applied to the pneumatic actuator. To meet the requirements of the safety-instrumented function, the actuator is usually vented by a solenoid valve. The force of the actuator springs moves the valve to its end position, i.e. the valve is either completely opened or closed.

The end position of the valve must not be impeded by mechanical equipment, such as travel stops or handwheels, under any circumstances.

When the signal pressure is applied to the actuator again, the valve moves to the corresponding position. If the actuator is to be locked after a case of demand, this must be ensured by the operator using suitable means.

Operator

Features of final elements

- Contact with the process media may cause systematic failure and, as a result, affect the safety-related availability of the safety-instrumented systems. The influence of specific process conditions must be analyzed and taken into account during sizing and maintenance.

  These conditions arise from process requirements. To rule out systematic failure, we recommend creating a loop data sheet according to the German standard VDI 2180-5, section 4 (recommendations for final elements).

Operator

In case of doubt, consult the manufacturer for valve sizing.

To reduce systematic failure, diverse redundancies may be advantageous (e.g. globe valve and ball valve).

Responsibility

- The joint use of a control valve within the safety loop by a control loop of a basic process control system makes it possible to increase the diagnostic coverage of the safety-instrumented system. This joint use can lead to additional risk. This aspect must be taken into account in the risk analysis.
- Online tests, such as the partial stroke test and other diagnostic processes integrated into the valve positioner, can be regarded as state-of-the-art test methods. They can be used to lengthen the proof test interval or to improve the safety margin (discovery of undetected systematic failures).

  VDI 2180-5, section 4 provides special instructions.

Avoiding systematic failure

To avoid systematic failure, the user must take into account the following application-specific factors besides the manufacturer specifications: — Operator

- Corrosion (destruction primarily of metals due to chemical and physical processes)
- Material fatigue, e.g. in bellows seals
- 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 elastomers, by exposure to light and heat)
- Chemical attack (organic materials, e.g. plastics or elastomers, which swell, leach out or decompose due to exposure to chemicals)

If **no** experience data exist for the devices used, a visual inspection of the safety equipment must be performed **after a short time in operation**.

5.1 General control valve requirements

Responsibility

For each application, the user must specify the following conditions: — Operator

- Maximum/minimum transit time OPEN ⇨ CLOSED or CLOSED ⇨ OPEN
- Permissible leakage rate
- Maximum/minimum supply pressure of the compressed air network
- Air capacity available in relation to pressure
  ⇨ Connecting pipe cross-sections must be adhered to.

— Manufacturer

Nominal size (connection length ≤ 2 m)				
	K_{VS} coefficient			
	0.16 · 0.32	1.4	4.3	–
	Connection			
Pressure (bar)	4	1 and 3	4	9
≥ 1.4	≥ DN 6	≥ DN 8	≥ DN 10	≥ DN 4
≥ 2.5	≥ DN 4	≥ DN 6	≥ DN 8	
≥ 6		≥ DN 4	≥ DN 6	
Note: A larger nominal size is needed when the connection length exceeds 2 m.				

Example: Connecting pipe cross-sections required for SAMSOMATIC Type 3963 Solenoid Valve

SAMSON uses calculation methods to predict the transit time and to size the pneumatic hook-up. SAMSON can support users in selecting devices on request. — Manufacturer

The seat shut-off performance (leakage rate) must be tested at regular intervals by — Operator

- performing plausibility checks while the process is running or
- measuring it on a leakage test bench.

The type of test depends on the application.

The external leakage (fugitive emissions) must be tested at regular intervals, e.g. by spraying with foaming agent.

The conditions depend on the process requirements.

5.2 Globe valve requirements

Responsibility

- If there is a risk of solids contained in the process medium causing blockage, a strainer must be fitted.

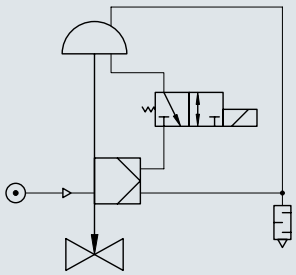
Operator

Safety equipment with fail-open action must <u>not</u> be operated with strainers.

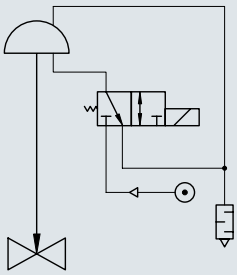
- To reduce friction, it is preferable to use spring-loaded stem packings. Adjustable stem packings are to be tightened by qualified staff only to prevent the stem from becoming blocked.

Operator

- To prevent corrosion of the actuator springs, measures must be taken to prevent water or moisture from entering the actuator. Such measures include fitting a venting pipe or air purging of the actuator's spring chamber.



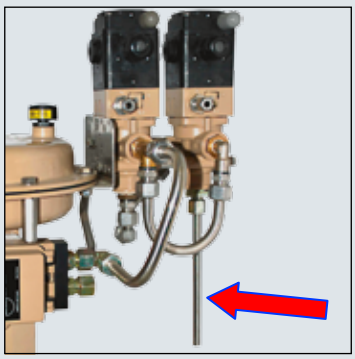
Example:
Control and quick-acting shut-off valve with air purging of the actuator's spring chamber



Example:
On-off valve with air purging of the actuator's spring chamber

- Suitable measures must be taken to ensure that the venting port of the solenoid valve is kept open.

Manufacturer/ operator



Example: Venting pipe on the solenoid valve

Responsibility

- It is essential to check the actuator forces to ensure that **the valve can overcome the process pressures to reach its fail-safe position**.
  This can be checked by the manufacturer if requested.

Manufacturer/ operator

- The actual actuator forces must not close the valve against a pressure which is 1.5 times above the nominal pressure (PN) of the plant or valve.
  If this actuator force restriction cannot be implemented, an excess pressure valve is necessary for valves connected in series to prevent that the permissible operating pressure is exceeded.

Example: Valves connected in series

- It is essential to observe the prescribed direction of flow (arrow on the valve body) of globe valves.

Operator

5.3 Ball valve requirements

Responsibility

- Note for ball valves that higher initial breakaway torques arise as the differential pressure of the process medium rises, requiring higher actuator torques.

Manufacturer

Differential pressure Δp (bar)			**0**	**3**	**6**	**10**	**16**	**40**
DN	M_{dmax} (Nm)	M_d (Nm)	M_{dl} (Nm)					
15	60	3	5	5	5	8	9	11
25	240	5	10	10	10	14	18	28
40	450	10	20	20	20	26	35	52
50	450	15	30	30	33	36	42	73
80	750	25	60	60	66	72	86	144
100	750	40	90	90	105	120	140	251
150	3160	60	120	120	160	210	290	450
Max. permissible torque, required torques and initial breakaway torques								

Example: Torque specifications for a ball valve

- Media, especially degreasing, swelling and fibrous media, may affect the torque.
- The operating conditions, e.g. switching interval and the medium temperature, have an effect on the torques.

Operator

- The mounting of the valve and actuator is of vital importance.

Manufacturer

- The permissible torques for the ball valve shaft, shaft adapter and bridge have been verified by the manufacturer. As a result, the max. torque of the actuator (air or spring torque) must not exceed these torques under any circumstances.
  The corresponding specifications in accordance with DIN EN ISO 5211/DIN EN 15081 (NAMUR Recommendation NE 14) must be observed

Flange type	F03	F04	F05	F07	F10	F12	F14	F16	F25	F30	F35	F40	F48	F60
Maximum torque of the attachment flanges (Nm)	32	63	125	250	500	1000	2000	4000	8000	16000	32000	63000	125000	250000

Maximum torque of the attachment flanges according to DIN EN ISO 5211

5.4 Butterfly valve requirements

Responsibility

- On sizing actuators for butterfly valves, note that the actuator must provide sufficient torque to overcome the breakaway torque and closing torque in closed position as well as the dynamic torque in open position.
- On mounting the actuator on the butterfly valve, the breakaway torque of the butterfly valve in relation to the differential pressure and the permissible torque of the butterfly valve shaft must be observed.

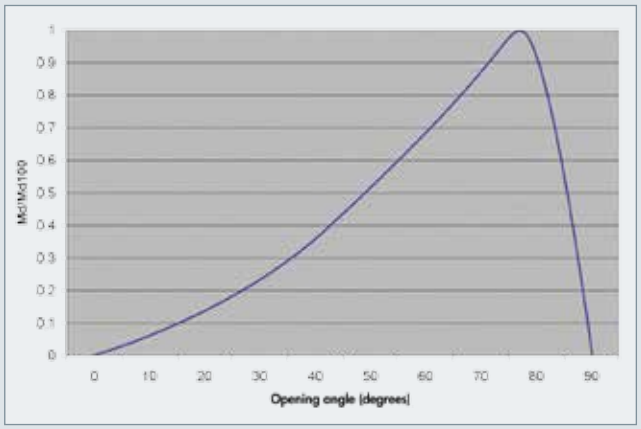
Manufacturer

Nominal size		Perm. torque M_{dmax} (Nm)	Perm. torque M_{dl} in Nm at a differential pressure Δp (bar)			
DN	NPS		0 bar	5 bar	10 bar	16 bar
80	3	280	40	43	45	51
100	4	280	48	54	59	67
150	6	505	91	106	114	157
200	8	785	190	219	269	288
250	10	785	320	364	433	480
300	12	1591	370	467	578	654
400	16	3215	690	903	1089	1239

Example: Required manufacturer specifications

- Note that high dynamic torques can arise at high differential pressures in the process medium, pushing open the butterfly disc.

Operator



Dynamic torque of butterfly valves in relation to the opening angle

- Media, especially degreasing, swelling and fibrous media, may affect the torque.
- The operating conditions, e.g. switching interval and the medium temperature, have an effect on the torques.
- The mounting of the valve and actuator is of vital importance.
- The permissible torques for the butterfly valve shaft, shaft adapter and bridge have been verified by the manufacturer. As a result, the max. torque of the actuator **(air or spring torque**) must **not** exceed these torques under any circumstances.
  The corresponding specifications in accordance with DIN EN ISO 5211/DIN EN 15081 (NAMUR Recommendation NE 14) must be observed. See section 5.3 on ball valve requirements.

Responsibility

Operator

Manufacturer

5.5 Rotary plug valve requirements

Responsibility

- On sizing actuators, note that the actuator must provide sufficient torque to overcome the closing torque in closed position as well as the dynamic torque in open position.
- Adjustable stem packings are to be tightened by qualified staff only to prevent the stem from becoming blocked. — Operator
- To prevent corrosion of the actuator springs, measures must be taken to prevent water or moisture from entering the actuator. Such measures include fitting a venting pipe or air purging of the actuator's spring chamber.
- The proper mounting of the valve onto the actuator is of vital importance. — Manufacturer
- The permissible torques for the valve shaft, shaft adapter and bridge have been verified by the manufacturer. As a result, the max. torque of the actuator **(air or spring torque)** must **not** exceed these torques under any circumstances.
  The corresponding specifications in accordance with DIN EN ISO 5211/DIN EN 15081 (NAMUR Recommendation NE 14) must be observed. See section 5.3 on ball valve requirements.

5.6 Proof tests and service life

- The proof test interval and the extent of the test lie within the operator's responsibility. This must be documented correspondingly. — Operator
- During the proof test, suitable means must be used to test the control valve to ensure its proper functioning. Worn components must be replaced by **original spare parts** from the manufacturer.
- The maximum service life must be specified.
- It is recommended to summarize the requirements of the proof test in a **checklist**. Refer to Appendix 2 for an example.

6 Installation, piping and wiring

6.1 Mechanical and pneumatic installation

Responsibility

- During mechanical and pneumatic installation, the mounting and operating instructions of the corresponding device must be observed.
  The pneumatic connection must only be connected to instrument air networks that meet the quality requirements in accordance with ISO 8573-1:2001, Class 3 or 4.

Operator

Compressed air quality according to ISO 8573-1		
Particle size and quantity	Oil content	Pressure dew point
Class 4	Class 3	Class 3
≤ 5 µm and 1000/m³	≤ 1 mg/m³	–20 °C or at least 10 K below the lowest ambient temperature to be expected

- The required minimum cross-sections of the supply air lines must be observed. Refer to section 5.1 (General control valve requirements).
  After mounting, the position of the filters or filter check valves on the valve accessories, e.g. pilot valves, must be checked and, if necessary, corrected.

Operator

Example: Pilot-controlled Ex i solenoid valve (SAMSOMATIC)

- The prescribed mounting position of the devices must be observed.
- Booster valve ports not connected by pipe or hose must be protected properly against dirt, water etc. from entering the device by using appropriate filters.

6.2 Electrical installation

Responsibility

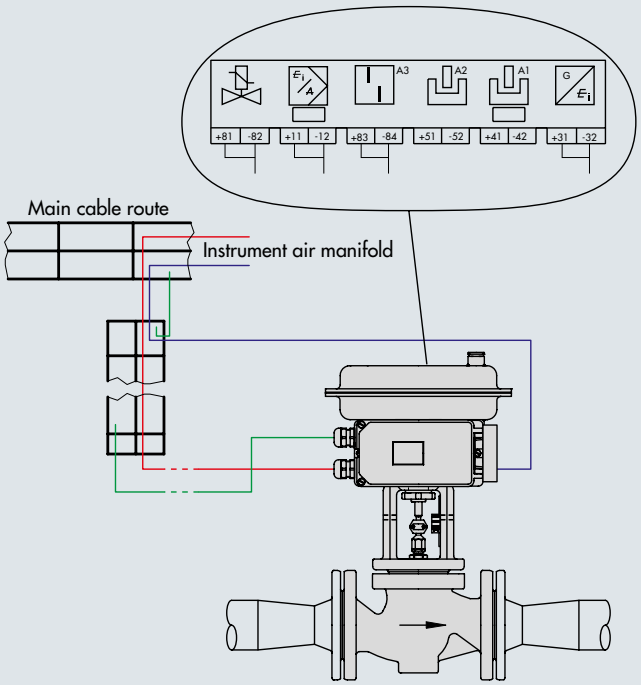
- Only cables with the prescribed outer diameter of the cable glands may be used. — Operator
- For EExi circuits the electrical cable data must comply with the data taken as the basis during planning.
- Cable glands and cover screws must be fastened tightly to ensure that the degree of protection is met.
- Only devices with suitable equipotential bonding may be connected.
- The installation regulations for the respective explosion protection measures must be observed.
- Prior to start-up, the voltage must be checked to ensure that it meets the permissible range.
- Prior to start-up, the necessary verifications (verification of intrinsic safety) must be available.
- The effect of disturbances to lines must be checked, especially
  – disturbance caused by EMC influences and
  – disturbance caused by capacitance influences when long lines are used (risk that a solenoid valve remains energized).
- The special conditions specified in the explosion protection certificates must be adhered to.

6.3 Installation of control valves

- Control valves must be installed free of stress and with low degrees of vibration. — Operator
- After installation, the flange joints must be checked for leaks.
- The pipeline must be rinsed prior to installing the control valve.

Responsibility

- To ensure the control valve functions properly, the pipeline must be designed to be straight and without any manifolds or disturbances for a distance of at least six times the pipe size (DN) upstream and downstream of the valve.
- It must be checked whether the mounting position of the control valve complies with the manufacturer's specifications (operating instructions).
- The devices used must be checked to ensure they are suitable for use under the prevailing ambient conditions (temperature, humidity etc.).
- While installing the control valves, sufficient space must be left to remove the valve for maintenance.
- The wiring and function of devices must be documented in a wiring plan.



Example: Wiring plan for a control valve with positioner, solenoid valve and limit signals

7 Applicable device documentation

Each control valve has a data sheet, mounting and operating instructions as well as a certificate of conformity in accordance with the European Pressure Equipment Directive (PED) 2014/68/EU and, if applicable, an explosion protection certificate. These documents are available in various languages on the Internet at www.samson.de, www.vetec.de, www.pfeiffer-armaturen.com and www.leusch.de.

8 Appendix 1 – Manufacturer's declarations

- Series 240 und 250 Globe Valves with Type 3271 and 3277 Pneumatic Actuators
  (valve manufacturer: SAMSON AG)
- Type LTR43 Butterfly Valve with actuator
  (valve manufacturer: LEUSCH GmbH Industriearmaturen)
- Series 1a and 1b Globe Valves with Type 3271 and 3277 Pneumatic Actuators
  (valve manufacturer: PFEIFFER Chemie-Armaturen GmbH)
- Series 20a and 20b Ball Valves with Series 31a Actuator
  (valve manufacturer: PFEIFFER Chemie-Armaturen GmbH
- Series BR 26d Ball Valve with Series 31a Actuator
  (valve manufacturer: PFEIFFER Chemie-Armaturen GmbH)
- Series 14b and 14c Butterfly Valves with Series 31a or 30 Actuators
  (valve manufacturer: PFEIFFER Chemie-Armaturen GmbH)
- Series 72 and 73 Rotary Plug Valves with Type AT, R and M Pneumatic Actuators
  (valve manufacturer: VETEC Ventiltechnik GmbH)

SMART IN FLOW CONTROL

SAMSON

HERSTELLERERKLÄRUNG

Für folgende Produkte

Stellventile der Bauart 240 und 250

Hiermit wird bestätigt, dass das o. g. Gerät für die Verwendung in sicherheitsgerichteten Systemen nach IEC 61508 und IEC 61511 einsetzbar ist.

Das Gerät ist geeignet für den Einsatz in sicherheitsgerichteten Anwendungen bis SIL 2 (einzelnes Gerät) und SIL 3 (redundante Verschaltung) gemäß IEC 61508.

Der Nachweis erfolgte auf der Basis der Betriebsbewährtheit (proven in use) kombiniert mit einer FMEA.

Sicherheitstechnische Kenndaten

$\lambda_{safe,\ undetected}$	860	FIT
$\lambda_{safe,\ detected}$	0	FIT
$\lambda_{dangerous,\ undetected}$	54.6	FIT
$\lambda_{dangerous,\ detected}$	0	FIT
PFD_{avg} bei jährlicher Prüfung	$2.4 \cdot 10^{-4}$	
HFT (Hardware Fault Tolerance)	0	
DC (Diagnostic Coverage)	0	
Gerätetyp	A	
SFF (Safe Failure Fraction)	94 %	
$MTBF_{gesamt}$	125 Jahre	
$MTBF_{dangerous,\ undetected}$	2090 Jahre	

1 FIT = 1 Ausfall pro 10^9 Stunden

Nutzbare Lebensdauer

Nach IEC 61508-2 Abschnitt 7.4.9.5 können acht bis zwölf Jahre angenommen oder ein Wert benutzt werden, der sich durch Betriebsbewährung des Anwenders ergibt.

Bestimmungsgemäße Verwendung

- Bedienungsanleitung
- Anforderung an Instrumentenluft-Qualität (Sicherheitshandbuch, soweit vorhanden)

MANUFACTURER'S DECLARATION

For the following products

Series 240 and 250 Valves

We hereby certify that the above mentioned device can be used in safety-instrumented systems according to IEC 61508 and IEC 61511.

The device is suitable for use in safety-instrumented systems up to SIL 2 (single device) and SIL 3 (redundant configuration) according to IEC 61508.

The evidence is based on prior use (proven in use) combined with an FMEA.

Safety-related data

$\lambda_{safe,\ undetected}$	860	FIT
$\lambda_{safe,\ detected}$	0	FIT
$\lambda_{dangerous,\ undetected}$	54.6	FIT
$\lambda_{dangerous,\ detected}$	0	FIT
PFD_{avg} with annual test	$2.4 \cdot 10^{-4}$	
HFT (Hardware Fault Tolerance)	0	
DC (Diagnostic Coverage)	0	
Device type	A	
Safe failure fraction (SFF)	94 %	
$MTBF_{total}$	125 years	
$MTBF_{dangerous,\ undetected}$	2090 years	

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/ proven-in-use).

Intended use

- Operating instructions
- Quality requirements for instrument air (safety manual if available)

SMART IN FLOW CONTROL

SAMSON

Sicherheitstechnische Annahmen

Im Störfall wird der Antrieb entlüftet, dadurch fährt das Ventil in die Sicherheitslage.

Hinweis

Durch Einsatz eines Stellungsreglers kann eine umfangreiche Diagnose auch im laufenden Betrieb durchgeführt werden. Damit kann sich je nach Einsatzfall ein Diagnosegrad (diagnostic coverage factor) für gefährliche Fehler von ≥ 70 % ergeben.

Voraussetzungen

Die Reparaturzeit ist klein gegenüber der mittleren Anforderungsrate. Durchschnittliche Beanspruchung in industrieller Umgebung durch Medien und Umgebungsbedingungen. Der Anwender ist für bestimmungsgemäßen Gebrauch verantwortlich.

Safety-related assumptions

In case of failure, the pneumatic actuator is vented, causing the valve to move to its fail-safe position.

Note

A positioner can be used to perform extensive diagnostics while the process is running. Depending on the application, this may result in a diagnostic coverage for dangerous failures of 70 % or higher.

Requirements

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

SAMSON AG

ppa. Michael Kleiner
Zentralabteilungsleiter
Vertrieb International
Head of Central Department
International Sales

i. V. Dirk Hoffmann
Zentralabteilungsleiter
Entwicklungsorganisation
Head of Central Department
R&D Organization

LEUSCH GmbH
Industriearmaturen

Herstellererklärung

Hiermit bestätigt die Firma

Manufacturer´s Declaration

The manufacturer

LEUSCH GmbH
Ziegeleistraße 10, 41472 Neuss
Germany

für Absperr-/Regelklappen der Bauart

hereby certifies that Series

LTR-43

und die dazugehörigen pneumatische Antriebe, dass die Geräte der o.g. Baureihen für die Verwendung in sicherheitsgerichteten Systemen nach IEC 61508 und IEC 61511 einsetzbar sind. Die Geräte sind geeignet für den Einsatz in sicherheitsgerichteten Anwendungen bis SIL 2 (einzelnes Gerät) und SIL 3 (redundante Verschaltung) gemäß IEC 61508.
Der Nachweis erfolgte auf der Basis der Betriebsbewährtheit (proven in use) kombiniert mit einer FMEDA.

on-off/control butterfly valves with the corresponding pneumatic actuators are suitable for use in safety-instrumented systems according to IEC 61508 and IEC 61511. The devices are suitable for use in safety-related applications up to S/L 2 (single device) and S/L 3 (redundant configuration) according to IEC 61508.
The evidence is based on proven in use combined with a FMEDA.

Sicherheitstechnische Kenndaten:			**Safety-related data:**		
Lambda safe undetected	7,36E-07	1/hr	Lambda safe undetected	7,36E-07	1/hr
Lambda safe detected	0		Lambda safe detected	0	
Lambda dangerous undetected	2,46E-07	1/hr	Lambda dangerous undetected	2,46E-07	1/hr
Lambda dangerous detected	0		Lambda dangerous detected	0	
PFD_{avg} bei jährlicher Prüfung	1,08E-03		PFD_{avg} with annual tests	1,08E-03	
HFT	0		HFT	0	
Gerätetyp	A		Device type	A	

Nutzbare Lebensdauer: Nach IEC 61508-2 7.4.7.4 können 8 - 12 Jahre angenommen werden oder ein Wert benutzt werden, der sich durch Betriebsbewährung des Anwenders ergibt.

Useful lifetime: According to IEC 61508-2, section 7.4.7.4 a useful lifetime of 8 to 12 years can be assumed. Other values can be used based on the experience of the user.

Daraus ergeben sich:			This results in:		
SFF	75%		Safe failure fraction (SFF)	75%	
$MTBF_{safe}$	116	Jahre	$MTBF_{safe}$	116	years
$MTBF_{dangerous}$	464	Jahre	$MTBF_{dangerous}$	464	years
DC (Diagnostic coverage)	0		Diagnostic coverage (DC)	0	

Bestimmungsgemäße Verwendung ist zu beachten:
- Bedienungsanleitung
- Anforderung an Instrumentenluft-Qualität (siehe Sicherheitshandbuch)

Intended use must be observed:
- operating instructions
- requirements for instrument air quality (see safety manual)

Sicherheitstechnische Annahme:
Im Störfall wird der Antrieb entlüftet, dadurch fährt das Ventil in die Sicherheitslage.

Safety-related assumptions:
In case of a failure the pneumatic actuator is vented, causing the valve to move to ist fail-safe position.

Hinweis:
Durch Einsatz eines Stellungsreglers kann eine umfangreiche Diagnose auch im laufenden Betrieb durchgeführt werden. Dabei kann sich je nach Einsatzfall ein Diagnosegrad (diagnostic coverage factor) für gefährliche Fehler von größer 70 % ergeben.

Note:
By using digital valve positioners, the user has access to extensive diagnostic functions also while the process is running. As a result the diagnostic coverage factor for dangerous failures can exceed 70% depending on the application.

Voraussetzungen:
- Die Reparaturzeit ist klein gegenüber der mittleren Anforderungsrate.
- Durchschnittliche Beanspruchung in industrieller Umgebung durch Medien und Umgebungsbedingungen.
- Der Anwender ist für den bestimmungsgemäßen Gebrauch verantwortlich.

Preconditions:
- The mean time to repair is short compared to the average rate of demand.
- Normal exposure to industrial environments and fluids.
- The user is responsible for ensuring that the device is used as intended.

J.Herrmann
Qualitätsbeauftragter / Quality Manager Datum / Date: 16.11.2009

T. Leusch
Geschäftsführer / Managing director Datum / Date: 16.11.2009

LEUSCH GmbH Industriearmaturen
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Amtsgericht Neuss · Handelsregister Nr. HRB 6338 · Geschäftsführer: Thomas Leusch Prokurist: Ulrich Leusch

PFEIFFER
Chemie-Armaturenbau GmbH

Pfeiffer
Chemie-Armaturenbau GmbH

Herstellererklärung

Hiermit bestätigt die Firma

Manufacturer´s Declaration

The manufacturer

PFEIFFER CHEMIE-ARMATURENBAU GMBH
Hooghe Weg 41, 47906 Kempen
Germany

für

hereby certifies that

Ventile/valves BR/Series 1a und/and 1b

dass die Geräte der o.g. Baureihen für die Verwendung in sicherheitsgerichteten System nach IEC 61508 und IEC 61511 einsetzbar sind. Die Geräte sind geeignet für den Einsatz in sicherheitsgerichteten Anwendungen bis SIL 2 (einzelnes Gerät) und SIL 3 (redundante Verschaltung) gemäß IEC 61508. Der Nachweis erfolgte auf der Basis der Betriebsbewährtheit (proven in use) kombiniert mit einer FMEDA. Bescheinigt wird hiermit SIL 2

with the corresponding pneumatic actuators are suitable for use in safety instrumented systems according to IEC 61508 and IEC 61511. The devices are suitable for use in safety-related applications up to SIL 2 (single device) and SIL 3 (redundant configuration) according to IEC 61508. The evidence is based on proven in use combined with a FMEDA. Device compliance with SIL 2 is hereby certified.

Sicherheitstechnische Kenndaten:

Lambda safe, undetected	2,0E-06	1/hr
Lambda safe, detected	0	
Lambda dangerous, undetected	1,3E-07	1/hr
Lambda dangerous, detected	**0**	
PFD (avg) bei jährlicher Prüfung	5,7E-04	
HFT	0	
Gerätetyp	A	

Safety-related data:

Lambda safe, undetected	2,0E-06	1/hr
Lambda safe, detected	0	
Lambda dangerous, undetected	1,3E-07	1/hr
Lambda dangerous, detected	0	
PFD (avg) with annual tests	5,7E-04	
HFT	0	
Device type	A	

Nutzbare Lebensdauer : Nach IEC 61508-2 7.4.7.4 können 8 - 12 Jahre angenommen werden oder ein Wert benutzt werden, der sich durch Betriebsbewährung des Anwenders ergibt.

Useful lifetime: According to IEC 61508-2 section 7.4.7.4 a useful lifetime of 8 – 12 years can be assumed. Other values can be used based on the user´s experience.

Daraus ergeben sich:

SFF	94%	
$MTBF_{gesamt}$	53	Jahre
$MTBF_{dangerous}$	880	Jahre
DC (Diagnostic coverage)	0	

This results in:

Safe failure fraction (SFF)	94%	
$MTBF_{total}$	53	years
$MTBF_{dangerous}$	880	years
Diagnostic coverage (DC)	0	

Bestimmungsgemäße Verwendung ist zu beachten:
- Bedienungsanleitung
- Anforderung an Instrumentenluft-Qualität
(siehe Sicherheitshandbuch)

Intended use must be observed:
-Operation instructions
-Requirements for the instrument air quality
(see safety manual)

Sicherheitstechnische Annahme:
Im Störfall wird der Antrieb entlüftet, dadurch fährt das Ventil in die Sicherheitsstellung. (Falls Antrieb montiert).

Safety-related assumptions:
In case of failure, the pneumatic actuator is vented, causing the valve to move to its fail-safe position (if actuator is mounted).

Hinweis:
Durch Einsatz eines Stellungsreglers kann eine umfangreiche Diagnose auch im laufenden Betrieb durchgeführt werden. Damit kann sich je nach Einsatzfall ein Diagnosegrad (diagnostic coverage factor) für gefährliche Fehler von größer 70 % ergeben.

Note:
By using digital valves positioners, the user has access to extensive diagnostic functions also while the process is running. As a result the diagnostic coverage factor for dangerous failures can exceed 70% depending on the application.

Voraussetzungen:
Die Reparaturzeit ist klein gegenüber der mittleren Anforderungsrate. Durchschnittliche Beanspruchung in industrieller Umgebung durch Medien und Umgebungsbedingungen. Der Anwender ist für bestimmungsgemäßen Gebrauch verantwortlich.

Preconditions:
The mean time to repair is short compared to the average rate of demand. Normal exposure to industrial environments and fluids. The user is responsible for ensuring that the device is used as intended.

Dieter van den Eeden
Qualitätssicherung/Quality Assurance
Datum: 22.01.10

Andre´ Schnepper
Vertriebsleitung/Sales Management
Date: 22.01.2010

PFEIFFER Chemie-Armaturenbau GmbH
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Eingetragen beim Amtsgericht Krefeld, HRB Nr. 9000
Geschäftsführer: Dipl.-Ing. Lorenz Stolzenberg,
Prokuristen: Sigrid Arzberger, Dr. Jörg Kiesbauer

PFEIFFER
Chemie-Armaturenbau GmbH

Pfeiffer
Chemie-Armaturenbau GmbH

Herstellererklärung

Hiermit bestätigt die Firma

Manufacturer´s Declaration

The manufacturer

PFEIFFER CHEMIE-ARMATURENBAU GMBH
Hooghe Weg 41, 47906 Kempen
Germany

für

hereby certifies that

Kugelhähne/ball valves BR/Series 20a und/and 20b

dass die Geräte
der o.g. Baureihen für die Verwendung in sicherheitsgerichteten System nach IEC 61508 und IEC 61511 einsetzbar sind.
Die Geräte sind geeignet für den Einsatz in sicherheitsgerichteten Anwendungen bis SIL 2 (einzelnes Gerät) und SIL 3 (redundante Verschaltung) gemäß IEC 61508.
Der Nachweis erfolgte auf der Basis der Betriebsbewährtheit (proven in use) kombiniert mit einer FMEDA.
Bescheinigt wird hiermit SIL 2

with the corresponding pneumatic actuators are suitable for use in safety instrumented systems according to IEC 61508 and IEC 61511.
The devices are suitable for use in safety-related applications up to SIL 2 (single device) and SIL 3 (redundant configuration) according to IEC 61508.
The evidence is based on proven in use combined with a FMEDA.
Device compliance with SIL 2 is hereby certified.

Sicherheitstechnische Kenndaten:			Safety-related data:		
Lambda safe, undetected	1,3E-06	1/hr	Lambda safe, undetected	1,3E-06	1/hr
Lambda safe, detected	0		Lambda safe, detected	0	
Lambda dangerous, undetected	1,2E-07	1/hr	Lambda dangerous, undetected	1,2E-07	1/hr
Lambda dangerous, detected	0		Lambda dangerous, detected	0	
PFD (avg) bei jährlicher Prüfung	5,4E-04		PFD (avg) with annual tests	5,4E-04	
HFT	0		HFT	0	
Gerätetyp	A		Device type	A	

Nutzbare Lebensdauer : Nach IEC 61508-2 7.4.7.4 können 8 - 12 Jahre angenommen werden oder ein Wert benutzt werden, der sich durch Betriebsbewährung des Anwenders ergibt.

Useful lifetime: According to IEC 61508-2 section 7.4.7.4 a useful lifetime of 8 – 12 years can be assumed. Other values can be used based on the user´s experience.

Daraus ergeben sich:			This results in:		
SFF	91%		Safe failure fraction (SFF)	91%	
$MTBF_{gesamt}$	83	Jahre	$MTBF_{total}$	83	years
$MTBF_{dangerous}$	920	Jahre	$MTBF_{dangerous}$	920	years
DC (Diagnostic coverage)	0		Diagnostic coverage (DC)	0	

Bestimmungsgemäße Verwendung ist zu beachten:
- Bedienungsanleitung
- Anforderung an Instrumentenluft-Qualität
(siehe Sicherheitshandbuch)

Intended use must be observed:
-Operation instructions
-Requirements for the instrument air quality
(see safety manual)

Sicherheitstechnische Annahme:
Im Störfall wird der Antrieb entlüftet, dadurch fährt das Ventil in die Sicherheitsstellung. (Falls Antrieb montiert).

Safety-related assumptions:
In case of failure, the pneumatic actuator is vented, causing the valve to move to its fail-safe position (if actuator is mounted).

Hinweis:
Durch Einsatz eines Stellungsreglers kann eine umfangreiche Diagnose auch im laufenden Betrieb durchgeführt werden. Damit kann sich je nach Einsatzfall ein Diagnosegrad (diagnostic coverage factor) für gefährliche Fehler von größer 70 % ergeben.

Note:
By using digital valves positioners, the user has access to extensive diagnostic functions also while the process is running. As a result the diagnostic coverage factor for dangerous failures can exceed 70% depending on the application.

Voraussetzungen:
Die Reparaturzeit ist klein gegenüber der mittleren Anforderungsrate. Durchschnittliche Beanspruchung in industrieller Umgebung durch Medien und Umgebungsbedingungen. Der Anwender ist für bestimmungsgemäßen Gebrauch verantwortlich.

Preconditions:
The mean time to repair is short compared to the average rate of demand. Normal exposure to industrial environments and fluids. The user is responsible for ensuring that the device is used as intended.

Dieter van den Eeden
Qualitätssicherung/Quality Assurance Datum: 22.01.10

Andre´ Schnepper
Vertriebsleitung/Sales Management Date: 22.01.2010

PFEIFFER Chemie-Armaturenbau GmbH
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Eingetragen beim Amtsgericht Krefeld, HRB Nr. 9000
Geschäftsführer: Dipl.-Ing. Lorenz Stolzenberg,
Prokuristen: Sigrid Arzberger, Dr. Jörg Kiesbauer

PFEIFFER
Chemie-Armaturenbau GmbH

Pfeiffer
Chemie-Armaturenbau GmbH

Herstellererklärung

Hiermit bestätigt die Firma

Manufacturer´s Declaration

The manufacturer

PFEIFFER CHEMIE-ARMATURENBAU GMBH
Hooghe Weg 41, 47906 Kempen
Germany

für

hereby certifies that

Kugelhähne/ball valves BR/Series 26d/s

dass die Geräte der o.g. Baureihen für die Verwendung in sicherheitsgerichteten System nach IEC 61508 und IEC 61511 einsetzbar sind. Die Geräte sind geeignet für den Einsatz in sicherheitsgerichteten Anwendungen bis SIL 2 (einzelnes Gerät) und SIL 3 (redundante Verschaltung) gemäß IEC 61508. Der Nachweis erfolgte auf der Basis der Betriebsbewährtheit (proven in use) kombiniert mit einer FMEDA. Bescheinigt wird hiermit SIL 2

with the corresponding pneumatic actuators are suitable for use in safety instrumented systems according to IEC 61508 and IEC 61511. The devices are suitable for use in safety-related applications up to SIL 2 (single device) and SIL 3 (redundant configuration) according to IEC 61508. The evidence is based on proven in use combined with a FMEDA. Device compliance with SIL 2 is hereby certified.

Sicherheitstechnische Kenndaten:			Safety-related data:		
Lambda safe, undetected	1,3E-06	1/hr	Lambda safe, undetected	1,3E-06	1/hr
Lambda safe, detected	0		Lambda safe, detected	0	
Lambda dangerous, undetected	1,2E-07	1/hr	Lambda dangerous, undetected	1,2E-07	1/hr
Lambda dangerous, detected	0		Lambda dangerous, detected	0	
PFD (avg) bei jährlicher Prüfung	5,4E-04		PFD (avg) with annual tests	5,4E-04	
HFT	0		HFT	0	
Gerätetyp	A		Device type	A	

Nutzbare Lebensdauer : Nach IEC 61508-2 7.4.7.4 können 8 - 12 Jahre angenommen werden oder ein Wert benutzt werden, der sich durch Betriebsbewährung des Anwenders ergibt.

Useful lifetime: According to IEC 61508-2 section 7.4.7.4 a useful lifetime of 8 – 12 years can be assumed. Other values can be used based on the user´s experience.

Daraus ergeben sich:			This results in:		
SFF	91%		Safe failure fraction (SFF)	91%	
$MTBF_{gesamt}$	83	Jahre	$MTBF_{total}$	83	years
$MTBF_{dangerous}$	920	Jahre	$MTBF_{dangerous}$	920	years
DC (Diagnostic coverage)	0		Diagnostic coverage (DC)	0	

Bestimmungsgemäße Verwendung ist zu beachten:
- Bedienungsanleitung
- Anforderung an Instrumentenluft-Qualität
(siehe Sicherheitshandbuch)

Intended use must be observed:
-Operation instructions
-Requirements for the instrument air quality
(see safety manual)

Sicherheitstechnische Annahme:
Im Störfall wird der Antrieb entlüftet, dadurch fährt das Ventil in die Sicherheitsstellung. (Falls Antrieb montiert).

Safety-related assumptions:
In case of failure, the pneumatic actuator is vented, causing the valve to move to its fail-safe position (if actuator is mounted).

Hinweis:
Durch Einsatz eines Stellungsreglers kann eine umfangreiche Diagnose auch im laufenden Betrieb durchgeführt werden. Damit kann sich je nach Einsatzfall ein Diagnosegrad (diagnostic coverage factor) für gefährliche Fehler von größer 70 % ergeben.

Note:
By using digital valves positioners, the user has access to extensive diagnostic functions also while the process is running. As a result the diagnostic coverage factor for dangerous failures can exceed 70% depending on the application.

Voraussetzungen:
Die Reparaturzeit ist klein gegenüber der mittleren Anforderungsrate. Durchschnittliche Beanspruchung in industrieller Umgebung durch Medien und Umgebungsbedingungen. Der Anwender ist für bestimmungsgemäßen Gebrauch verantwortlich.

Preconditions:
The mean time to repair is short compared to the average rate of demand. Normal exposure to industrial environments and fluids. The user is responsible for ensuring that the device is used as intended.

Dieter van den Eeden
Qualitätssicherung/Quality Assurance
Datum: 22.01.10

Andre´ Schnepper
Vertriebsleitung/Sales Management
Date: 22.01.2010

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Geschäftsführer: Dipl.-Ing. Lorenz Stolzenberg,
Prokuristen: Sigrid Arzberger, Dr. Jörg Kiesbauer

PFEIFFER
Chemie-Armaturenbau GmbH

Pfeiffer
Chemie-Armaturenbau GmbH

Herstellererklärung

Hiermit bestätigt die Firma

Manufacturer´s Declaration

The manufacturer

PFEIFFER CHEMIE-ARMATURENBAU GMBH
Hooghe Weg 41, 47906 Kempen
Germany

für

hereby certifies that

Klappen/butterfly valves BR/Series 14b/c

dass die Geräte
der o.g. Baureihen für die Verwendung in sicherheitsgerichteten System nach IEC 61508 und IEC 61511 einsetzbar sind.
Die Geräte sind geeignet für den Einsatz in sicherheitsgerichteten Anwendungen bis SIL 2 (einzelnes Gerät) und SIL 3 (redundante Verschaltung) gemäß IEC 61508.
Der Nachweis erfolgte auf der Basis der Betriebsbewährtheit (proven in use) kombiniert mit einer FMEDA.
Bescheinigt wird hiermit SIL 2

with the corresponding pneumatic actuators are suitable for use in safety instrumented systems according to IEC 61508 and IEC 61511.
The devices are suitable for use in safety-related applications up to SIL 2 (single device) and SIL 3 (redundant configuration) according to IEC 61508.
The evidence is based on proven in use combined with a FMEDA.
Device compliance with SIL 2 is hereby certified.

Sicherheitstechnische Kenndaten:

Lambda safe, undetected	1,4E-06	1/hr
Lambda safe, detected	0	
Lambda dangerous, undetected	1,3E-07	1/hr
Lambda dangerous, detected	0	
PFD (avg) bei jährlicher Prüfung	5,5E-04	
HFT	0	
Gerätetyp	A	

Safety-related data:

Lambda safe, undetected	1,4E-06	1/hr
Lambda safe, detected	0	
Lambda dangerous, undetected	1,3E-07	1/hr
Lambda dangerous, detected	0	
PFD (avg) with annual tests	5,5E-04	
HFT	0	
Device type	A	

Nutzbare Lebensdauer : Nach IEC 61508-2 7.4.7.4 können 8 - 12 Jahre angenommen werden oder ein Wert benutzt werden, der sich durch Betriebsbewährung des Anwenders ergibt.

Useful lifetime: According to IEC 61508-2 section 7.4.7.4 a useful lifetime of 8 – 12 years can be assumed. Other values can be used based on the user´s experience.

Daraus ergeben sich:

SFF	92%	
$MTBF_{gesamt}$	73	Jahre
$MTBF_{dangerous}$	910	Jahre
DC (Diagnostic coverage)	0	

This results in:

Safe failure fraction (SFF)	92%	
$MTBF_{total}$	73	years
$MTBF_{dangerous}$	910	years
Diagnostic coverage (DC)	0	

Bestimmungsgemäße Verwendung ist zu beachten:
- Bedienungsanleitung
- Anforderung an Instrumentenluft-Qualität
(siehe Sicherheitshandbuch)

Intended use must be observed:
-Operation instructions
-Requirements for the instrument air quality
(see safety manual)

Sicherheitstechnische Annahme:
Im Störfall wird der Antrieb entlüftet, dadurch fährt das Ventil in die Sicherheitsstellung. (Falls Antrieb montiert).

Safety-related assumptions:
In case of failure, the pneumatic actuator is vented, causing the valve to move to its fail-safe position (if actuator is mounted).

Hinweis:
Durch Einsatz eines Stellungsreglers kann eine umfangreiche Diagnose auch im laufenden Betrieb durchgeführt werden. Damit kann sich je nach Einsatzfall ein Diagnosegrad (diagnostic coverage factor) für gefährliche Fehler von größer 70 % ergeben.

Note:
By using digital valves positioners, the user has access to extensive diagnostic functions also while the process is running. As a result the diagnostic coverage factor for dangerous failures can exceed 70% depending on the application.

Voraussetzungen:
Die Reparaturzeit ist klein gegenüber der mittleren Anforderungsrate. Durchschnittliche Beanspruchung in industrieller Umgebung durch Medien und Umgebungsbedingungen. Der Anwender ist für bestimmungsgemäßen Gebrauch verantwortlich.

Preconditions:
The mean time to repair is short compared to the average rate of demand. Normal exposure to industrial environments and fluids. The user is responsible for ensuring that the device is used as intended.

Dieter van den Eeden
Qualitätssicherung/Quality Assurance
Datum: 22.01.10

Andre´ Schnepper
Vertriebsleitung/Sales Management
Date: 22.01.2010

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Eingetragen beim Amtsgericht Krefeld, HRB Nr. 9000
Geschäftsführer: Dipl.-Ing. Lorenz Stolzenberg.
Prokuristen: Sigrid Arzberger, Dr. Jörg Kiesbauer

Herstellererklärung
Manufacturer's Declaration

VETEC Ventiltechnik GmbH

zur Betriebsbewährung nach IEC 61508/61511
for proven-in-use according to 61508/61511

FB002.012

Hiermit bestätigt die Firma / The manufacturer

VETEC Ventiltechnik GmbH
Siemensstraße 12, D – 67346 Speyer
Germany

für Stellventile der Bauart / hereby certifies that Series

62, 72, 73, 82, 93

und die dazugehörigen pneumatischen Antriebe, dass die Geräte der o.g. Baureihen für die Verwendung in sicherheitsgerichteten Systemen nach IEC 61508 und IEC 61511 einsetzbar sind. Die Geräte sind geeignet für den Einsatz in sicherheitsgerichteten Anwendungen bis SIL 2 (einzelnes Gerät) und SIL 3 (redundante Verschaltung) gemäß IEC 61508. Der Nachweis erfolgte auf Basis der Betriebsbewährtheit (proven in use) kombiniert mit einer FMEDA. Das Ergebnis der Untersuchungen wurde von EXIDA verifiziert.

Control Valves with the corresponding pneumatic actuators are suitable for use in safety instrument systems according to IEC 61508 and IEC 61511. The devices are suitable for use in safety-related applications up to SIL 2 (single device) and SIL 3 (redundant configuration) according to IEC 61508.
The evidence is based on proven in use combined with FMEDA. The results were verified by EXIDA.

Sicherheitstechnische Kenndaten:

Lambda safe undetected	$6{,}7 * 10^{-7}$ 1/hr
Lambda safe detected	0
Lambda dangerous undetected	$1{,}7 * 10^{-7}$ 1/hr
Lambda dangerous detected	0
PFD (avg) bei jährl. Prüfung	$7{,}4 * 10^{-4}$
HFT	0
Gerätetyp	A

Nutzbare Lebensdauer: Nach IEC 61508-2 7.4.7.4 können 8–12 Jahre angenommen werden oder ein Wert benutzt werden, der sich durch Betriebsbewährung des Anwenders ergibt.

Daraus ergeben sich:

SFF	80%
$MTBF_{gesamt}$	136 Jahre
$MTBF_{dangerous}$	671 Jahre
DC (Diagnostic coverage)	0

Bestimmungsgemäße Verwendung ist zu beachten:
- Bedienungsanleitung
- Anforderung an Instrumentenluftqualität (Sicherheitshandbuch)

Sicherheitstechnische Annahme:
Im Störfall wird der Antrieb entlüftet, dadurch fährt das Ventil in die Sicherheitslage.

Hinweis:
Durch den Einsatz eines Stellungsreglers kann eine umfangreiche Diagnose auch im laufenden Betrieb durchgeführt werden. Damit kann sich je nach Einsatzfall ein Diagnosegrad (diagnostic coverage factor) für gefährliche Fehler von größer 70% ergeben.

Voraussetzungen:
Die Reparaturzeit ist klein gegenüber der mittleren Anforderungsrate. Durchschnittliche Beanspruchung in industrielle Umgebung durch Medien und Umgebungsbedingungen. Der Anwender ist für bestimmungsgemäßen Gebrauch verantwortlich.

Safety related characteristics:

Lambda safe undetected	$6{,}7 * 10^{-7}$ 1/hr
Lambda safe detected	0
Lambda dangerous undetected	$1{,}7 * 10^{-7}$ 1/hr
Lambda dangerous detected	0
PFD (avg) with annual tests	$7{,}4 * 10^{-4}$
HFT	0
Device type	A

Usable lifetime: According to IEC 61508-2 7.4.7.4 a useable lifetime of 8 to12 years can be assumed. Other values can be used based on the user's experience.

This results in:

SFF	80%
$MTBF_{total}$	136 years
$MTBF_{dangerousl}$	671 years
DC (Diagnostic coverage)	0

Intended use must be observed:
- Operating instructions
- Requirements for instrument air quality (see safety manual)

Safety related assumption:
In case of failure, the pneumatic actuator is vented, causing the valve to move to its fail-safe position.

Note:
By using digital valve positioners, the user has access to extensive diagnostic functions also while the process is running. As a result, the diagnostic coverage factor for dangerous failures can exceed 70% depending on the application.

Preconditions:
The mean time to repair is short to the average rate of demand. Normal exposure to industrial environment and fluids.
The user is responsible for ensuring that the device is used as intended.

Speyer, 19.Jan.2010 / 19-Jan-10

Bernhard Beier
QM – Beauftragter / QA - Responsible

Norbert Hock
Geschäftsführer / Managing director

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Sitz: Speyer
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26.01.2010

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9 Appendix 2 – Example of a checklist for a final element

Checklist for testing safety equipment							
Final element test						Yes	No
Is the tag documentation complete and up-to-date?						☐	☐
Are the connecting cables in good order?						☐	☐
Are the screw fittings in good order?						☐	☐
Is the labeling complete and in a readable state? Control room, on site, process control system and safety PLC						☐	☐
Are all connecting housings free of moisture, water, oil and dust? (solenoid valve, feedback etc.)						☐	☐
Are the actuator or solenoid valve free of corrosion? Paint finish in good order?						☐	☐
Visual inspection of the pneumatic system: Are all pneumatic connections in good order and leak-tight?						☐	☐
Are the bridges, yokes, stem connectors, fastening nuts free of corrosion and fastened properly?						☐	☐
Is the valve packing leak-tight? Are there any visible signs of the process medium?						☐	☐
Is the bellows seal/bellows monitoring still in good order?						☐	☐
Check of the exhaust ports of the solenoid valve						☐	☐
Fail-safe position check							
Open final element in process control system		Set to Manual and move				☐	☐
P&ID Fail Close		DCS	* Valve: Remove air hose at the air manifold while the valve is being moved!				
Loop		Valve					
Do the valve position and output signal match? Move valve to OPEN and CLOSED positions!						☐	☐
Does the actuator move smoothly to its operating position when the signal pressure is applied?						☐	☐
Is there any leakage at the actuator?						☐	☐
Does the actuator move smoothly to its fail-safe position when moved by the springs?						☐	☐
Valve transit time	N/A ☐	Time to open the valve sec.		Time to close the valve sec.			
Closing time Fail-close position	N/A ☐	Time allowed for the valve to move to its fail-safe position sec.		Valve closing time to fail-safe position sec.			
Permissible leakage rate	N/A ☐	Leakage rate allowed in fail-safe position 1/min, m³/min		Leakage rate measured in fail-safe position 1/min, m³/min			
To measure the leakage rate, the valve must be removed from the pipeline and tested in the workshop. Refer to DIN EN 12266-1 (A.4 Seat tightness) for the test procedures. The following table contains the permissible leakage rates. For control valves functioning as safety equipment, leakage can also be measured according to DIN EN 1349.							
Test medium	Leakage rate A	Leakage rate B	Leakage rate C	Leakage rate D	Leakage rate E	Leakage rate F	Leakage rate G
Liquid	Liquid No visible leaks found during test	0.01 *DN	0.03 *DN	0.1 *DN	0.3 *DN	1.0 *DN	2.0 *DN
Gas		0.3 *DN	3.0 *DN	30.0 *DN	300 *DN	3000 *DN	6000 *DN
The leakage rates only apply when room temperature prevails at the outlet side. "No visible leaks found during test" means no visible moisture or formation of drops or bubbles. This corresponds to a lower leakage rate than leakage rate B.							
Attach green label after the test has been completed.						☐	
Does repair work need to be performed on the system? If this is the case, write out a separate order.						☐	☐
Tester 1:		Tester 2:		Test date:		Signature:	

Checklist for testing safety equipment

Owner		Created/Revised by:	
Operation:	Plant:	Subplant:	Tag no.:
Operating state during test: Prüfung: Shutdown	PLC/DCS:	Tester:	Test date:
Fail-safe position:	SIL level:	Architecture:	Measuring principle:
Manufacturer:	Manufacturer model:	Body number/serial number/stamp number/ID:	
Site of installation:	Barrier medium:		+H551-14E2
Final element exists in the following SIL loops			
SIF no.:			
Commissioning test: ☐	Proof test: ☐	Revision test: ☐	
Final element test	……. years	Lockout test	……. years

- An assessment of the process and safety hazards in the plant and installation is necessary.

- Obtain a permit to work!

- Wear suitable protection for the work! Observe explosion protection regulations!
- The person performing the work is responsible for using the appropriate maintenance methods according to the recognized codes of practice as well as for using suitable and tested tools!
- The person performing the work bears the compulsory insurance during the work!

  This includes, for example, the safeguarding of the workplace against unauthorized access or against accidental contact with unprotected electrical installations while temporarily leaving the workplace.
- Take precautionary measures to protect the plant against external influences, such as weather or other damaging environmental influences.

Measuring equipment list:	
Type/Manufacturer/model:	Serial number:
Type/Manufacturer/model:	Serial number:
Type/Manufacturer/model:	Serial number:
Type/Manufacturer/model:	Serial number:
Type/Manufacturer/model:	Serial number:
Type/Manufacturer/model:	Serial number:

Tester 1:	Tester 2:	Test date:	Signature:

SAMSON

MANUAL

Competence in Functional Safety

● Production sites ● Subsidiaries

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