



DIN 4754



IEC 61508

SIL



Ex II 2G Ex ib c IIC T6 Gb

Ex II 2D Ex tb c IIIC T80 °C Db



RoHS III
COMPLIANT



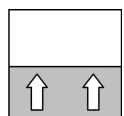
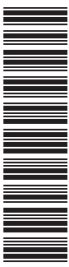
Operating manual

NK10 ... H

Fill Level Limiter

for use in explosive areas
Gas explosion protection Zone 1 and 2
Dust explosion zone 21 and 22

09005112 • BA_EN_NK10_H • Rev. ST4-L • 12/24



Masthead

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Subject to technical amendments.



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Version history

Rev. ST4-A 01/15	Version 1 (first edition)
Rev. ST4-B 06/16	Version 2 (correction)
Rev. ST4-C 04/17	Version 4 (dimensional drawings changed)
Rev. ST4-D 11/18	Version 5 (dimensional drawing/DNV-GL/CE declaration changed)
Rev. ST4-E 01/19	Version 6 (order codes optional information (SIL))
Rev. ST4-F 12/20	Version 7 (new SIL certificate)
Rev. ST4-G 01/21	Version 8 (new DIN CERTCO certificate)
Rev. ST4-H 04/21	Version 9 (corrections to SIL)
Rev. ST4-J 12/22	Version 10 (certificates updated)
Rev. ST4-K 08/23	Version 11 (note on DGR, modification of technical data, declaration of conformity, illustration of flanges added)
Rev. ST4-L 12/24	Version 12 (applied standards, certificates and declarations of conformity updated)

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1 Safety guidelines

1.1 General

This operating manual contains basic instructions for the installation, operation and maintenance of the device that must be followed without fail. It must be read by the installer, the operator and the responsible specialist personnel before installing and commissioning the device.

This operating manual is an integral part of the product and therefore needs to be kept close to the instrument in a place that is accessible at all times to the responsible personnel.

The following sections, in particular instructions about the assembly, commissioning and maintenance, contain important information, non-observance of which could pose a threat to humans, animals, the environment and property.

The instrument described in these operating instructions is designed and manufactured in line with the state of the art and good engineering practice.

1.2 Personnel Qualification

The instrument may only be installed and commissioned by specialized personnel familiar with the installation, commissioning and operation of this product.

Specialized personnel are persons who can assess the work they have been assigned and recognize potential dangers by virtue of their specialized training, their skills and experience and their knowledge of the pertinent standards.

For explosion-proof models the specialized personnel must have received special training or instruction or be authorized to work with explosion-proof instruments in explosion hazard areas.

1.3 Risks due to Non-Observance of Safety Instructions

Non-observance of these safety instructions, the intended use of the device or the limit values given in the technical specifications can be hazardous or cause harm to persons, the environment or the plant itself.

The supplier of the equipment will not be liable for damage claims if this should happen.

1.4 Safety Instructions for the Operating Company and the Operator

The safety instructions governing correct operation of the instrument must be observed. The operating company must make them available to the installation, maintenance, inspection and operating personnel.

Dangers arising from electrical components, energy discharged by the medium, escaping medium and incorrect installation of the device must be eliminated. See the information in the applicable national and international regulations.

Please observe the information about certification and approvals in the Technical Data section.

The instrument must be decommissioned and secured against inadvertent re-operation if a situation arises in which it must be assumed that safe operation is no longer possible. Reasons for this assumption could be:

- evident damage to the instrument
- failure of the electrical circuits
- longer storage outside the approved temperature range.
- considerable strain due to transport

Repairs may be carried out by the manufacturer only.

A professional single conformity inspection as per DIN EN 61010, section 1, must be carried out before the instrument can be re-commissioned. This inspection must be performed at the manufacturer's location. Correct transport and storage of the instrument are required.

1.5 Unauthorised Modification

Modifications of or other technical alterations to the instrument by the customer are not permitted. This also applies to replacement parts. Only the manufacturer is authorised to make any modifications or changes.

1.6 Inadmissible Modes of Operation

The operational safety of this instrument can only be guaranteed if it is used as intended. The instrument model must be suitable for the medium used in the system. The limit values given in the technical data may not be exceeded.

The manufacturer is not liable for damage resulting from improper or incorrect use.

1.7 Safe working practices for maintenance and installation work

The safety instructions given in this operating manual, any nationally applicable regulations on accident prevention and any of the operating company's internal work, operating and safety guidelines must be observed.

The operating company is responsible for ensuring that all required maintenance, inspection and installation work is carried out by qualified specialized personnel.

1.8 Pictogram explanation



DANGER

Type and source of danger

This indicates a **direct** dangerous situation that could lead to death or **serious injury** (highest danger level).

1. Avoid danger by observing the valid safety regulations.



WARNING

Type and source of danger

This indicates a **potentially** dangerous situation that could lead to death or **serious injury** (medium danger level).

1. Avoid danger by observing the valid safety regulations.



CAUTION

Type and source of danger

This indicates a **potentially** dangerous situation that could lead to slight or serious injury, damage or **environmental pollution** (low danger level).

1. Avoid danger by observing the valid safety regulations.



NOTICE

Note / advice

This indicates useful information of advice for efficient and smooth operation.

2 Product and functional description

2.1 Delivery scope

- NK10 according to specification (see order code)
- Operating Manual
- Safety manual for SIL version

2.2 Intended use

The NK10 fill level limiter is used in thermo-technical and process plants as a safeguard against the fill level falling below the lowest permissible level. As a limiter the device conforms to the requirements of DIN 4754.

NOTICE! With regard to the Pressure Equipment Directive, the device is designed for static loading. The maximum pressures and temperatures are documented in the technical data.

The devices in this series are...

- type-tested in compliance with DIN 4754
- certified to DNVGL-CG-0339
- Functional safety as per IEC 61508
- certified to directive 2014/68/EU
- certified to directive 2014/34/EU



WARNING

for use in explosive areas

The respective installation instructions must be observed for every application case.

If used in potentially explosive areas Zone 1 and 2 and/or Zone 21 and 22, the conditions in the sections 'Electrical connection' and 'Technical data' must always be observed.



2.3 Use in safety-related systems (SIL)

The unit can be used in safety-related systems.


For use in safety-related systems according to 'Functional Safety' (SIL), the correct function of the safety function must be proven. The necessary key figures, safety instructions, assembly and maintenance instructions can be found in the Safety Manual (SHB).

The safety manual is available for download at www.fischermesstechnik.de.

2.4 Explosion hazard area classification


The fill level limiter NK10 ... H can be used in areas at risk of explosion from flammable gases or vapours Zone 1 and Zone 2.

The identification as per Directive 2014/34/EU is:

 II 2 G Ex ib c IIC T6 Gb

The fill level limiter NK10 ... H can be used in areas at risk of explosion from flammable dust Zone 21 and Zone 22.

The identification as per Directive 2014/34/EU is:

 II 2 D Ex tb c IIIC T80 °C Db



⚠ WARNING

Installation regulations

The respective installation instructions must be observed for every application case.

2.5 Function diagram

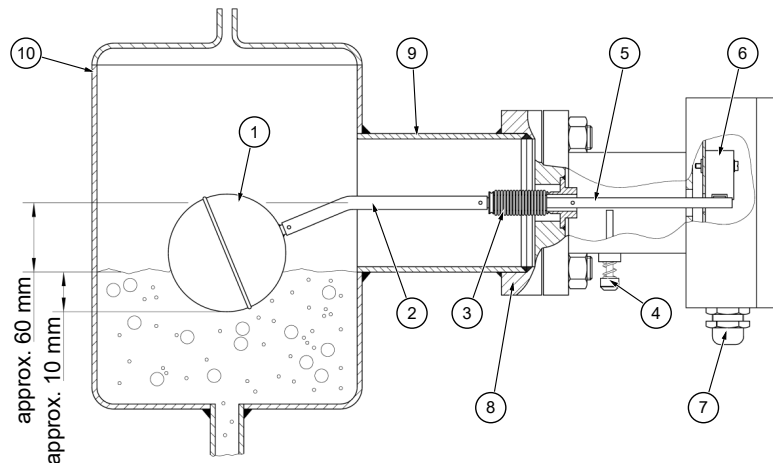


Fig. 1: Function diagram

1	Swimmer	2	Swimmer rod
3	Metal bellows	4	Test button
5	Switch lever	6	Micro-switch S1
7	Cable screw connection	8	Flange and counter-flange
9	Welding socket	10	Tank

2.6 Design and mode of operation

The swim system of the fill level limiter is contained in the fluid-filled reservoir (expansion tank). The swimming motions generated by changes in the fill level are transmitted directly to the micro-switch S1 by a swimmer rod sealed in a stainless-steel bellows. The fulcrum of the swimmer rod is located outside of the pressure chamber.

There is also a test button outside the pressure chamber with which a function check as per DIN 4754-3 can be run without lowering the fill level. When pressed, the body of the swimmer is moved against its buoyancy.

The factory default switching point of micro-switch S1 is set so that it switches when the swimmer rod is horizontal. The optional warning switch S2 switches approx. 2.5 mm before S1.

The fill level height at which switching is triggered depends on the density of the heat carrier. The lowest density at which a secure function is guaranteed is 0.6 kg/dm³.

When the medium has a density of 1.0 kg/dm³, the switching level is approx. 60mm below the middle of the flange or socket.

3 Installation and assembly

3.1 Safety guidelines



⚠ WARNING

Non-observance of the following safety instructions

Non-observance of the following safety instructions can lead to a dangerous situation, fatal injuries, serious bodily harm or damage.

1. Avoid all risks by observing the following safety instructions.

DANGER! Falling objects

The operator must ensure that any falling objects cannot collide with the installed unit.

Steps must be taken to prevent

1. sparks being generated on impact.
2. the protection class of the casing is no longer guaranteed.

This can be realised by attaching protective covers, casings etc.

DANGER! Installation regulations

During installation and assembly, the application of specific installation regulations in the respective permits must be observed ⁽¹⁾.

The information in the safety manual must be observed in connection with equipment with functional safety.

3.2 Valid range

**0.8 to 1.1 bar abs
-20°C to 60°C**

The EC type test is based on atmospheric conditions of 0.8 to 1.1 bar abs and ambient or medium temperatures of -20°C to 60°C. If the pressure and temperature levels differ, the operator needs to document the suitability in the explosion protection document.

3.3 Process connection

The process connection may be realised by authorized and qualified specialized personnel.

The unit is set ex-works for horizontal installation. Only this installation position is allowed.

Dangers caused by pressure on the instrument are to be prevented with suitable measures.

The flange and/or process connections are designed for a working temperature of max. 400 °C and a working pressure of max. 20 bar.



⚠ CAUTION

The data of the flange used may be lower.

Please check the actual data in the technical data section.

There are a range of flanges and welded hexagon nipples with which the device can be installed on-site. Take care that the side of the device marked **TOP** faces upwards when being installed.

NOTICE! Please check:

- The swimmer must be able to move freely in the vertical direction!
- Test the switching function using the test button.

⁽¹⁾ see Attachment

3.4 Electrical connections

- By authorized and qualified specialized personnel only.
- When connecting the unit, the national and international electro-technical regulations must be observed.
- Disconnect the system from the mains, before electrically connecting the device.
- Install the consumer-adapted fuses.
- Do not connect the connector if strained.

The instrument may only be installed and commissioned by specialized personnel familiar with the installation, commissioning and operation of this product.

Specialized personnel are persons who can assess the work they have been assigned and recognize potential dangers by virtue of their specialized training, their skills and experience and their knowledge of the pertinent standards.

For explosion-proof models, the specialized personnel must have received special training or instruction or be authorized to work with explosion-proof instruments in explosive areas.

The installed cables and wires must be tested with a reduced tensile force (25%) in compliance with Section A.3.1 of the standard EN 60079-0 and may only be used for permanent installation of operating equipment of Group II. The operator must ensure that the cables are connected with clamps accordingly.

Information from the manufacturer of the cable screw connection

Cable screw connection	M16 x 1.5
Cable diameter	5 ... 10 mm
Tightening torque	5 Nm (clockwise tight)
Key width	20

Information from the manufacturer of the connecting terminals

Permissible conductor cross-section	AWG 22 ... AWG 12
Rated cross-section	2.5 mm ²
Clamping screw	M2.5
Tightening torque	0.4 Nm (clockwise tight)

When laying the electrical supply lines, ensure that no short circuit between the electrical conductors and the surroundings can occur.

A locking and unlocking system as per DIN 4754-3 must be incorporated, if the device is used as a fill level limiter. This safety system must conform to DIN 50156 / VDDE 0116.

3.4.1 Intrinsically safe power circuits

For use in areas at risk of explosion, instruments must be connected to certified, intrinsically safe electricity circuits. The following are the limit values with which the operating equipment can be operated. Compare these to the information in the attached EC type testing certificate.

Contact power circuit	In ignition protection type intrinsic safety EEx ib IIC
Max. voltage	$U_i = 30V$
Max. current	$I_i = 160 \text{ mA}$
Max. output	$P_i = 800 \text{ mW}$
	The effective inner inductances and capacitances are negligible.

The intrinsically safe power circuits are safely galvanically separated from each other.

Recommend circuit breakers:

These separation switch devices are available as accessories.

Type	Description	Operating voltage
MTL 5011 B	1-channel for contact	20 ... 35 V DC
MTL 5015	2-channels for contact	20 ... 35 V DC
KFA6-SR2- Ex1.WKFA6-SR2- Ex1.W	1-channel for contact	230 V AC
KFA6-SR2- Ex1.WKFA6-SR2- Ex1.W	2-channels for contact	230 V AC

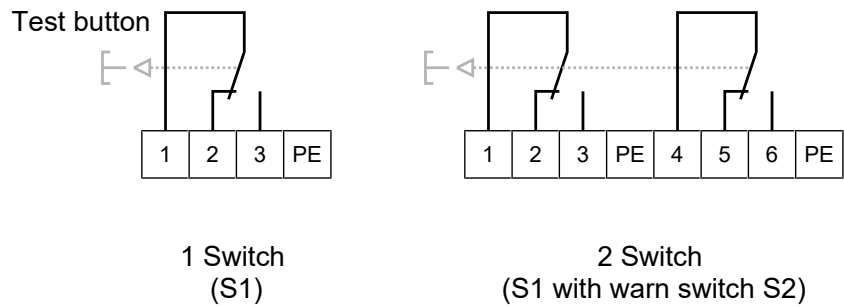


Fig. 2: Circuit diagram

Ground connection

Connect the device to the earth to equalise the potential. The outer earth connection is designed for 6.0 mm² single-wire and 4.0 mm² fine-wire conductors. The potential must be equalised in every application case.

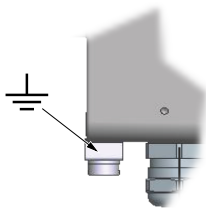


Fig. 3: Ground connection

4 Commissioning

4.1 Safety guidelines



WARNING

Faulty device

The instrument must be decommissioned and secured against inadvertent re-operation if a situation arises in which it must be assumed that safe operation is no longer possible.

▷ Reasons for this assumption could be:

1. Visible damage to the device.
2. Failure of the electrical function.
3. Long storage at temperatures over 85°C.
4. Considerable strain due to transport.

▽ Repairs may be carried out by the manufacturer only. A professional single conformity inspection as per DIN EN 61010, Part 1, must be carried out before the instrument can be re-commissioned. This inspection must be performed at the manufacturer's location. Correct transport and storage of the instrument are required.

4.2 Generalities

All electrical supply, operating and measuring lines and the pressure connections must have been correctly installed before starting operation and the flange connections must have been correctly made. All supply lines are arranged so that there are no mechanical forces acting on the device.

NOTICE! Leak test

The leak tightness of the flange connection must be tested in the course of the system leak tests.

4.3 Function test

There is a test button outside the pressure chamber with which a function check as per DIN 4754-3 can be made without lowering the fill level. When pressed, the body of the swimmer is moved against its buoyancy.

The factory default switching point of switch S1 (clamps 1, 2, 3) is set so that it switches when the swimmer rod is horizontal. The optional warning switch S2 switches ca. 2.5 mm before S1.

Check the function of the unit:

- Check the switching function (with the aid of the test button) in combination with the following components.
- Check the swimmer via the buoyancy behaviour after pressing the test button.

If the result of the function test is negative, the fill level limiter must be taken out of operation and the process must be kept safe by other means.

5 Servicing

5.1 Maintenance



WARNING

Dust deposits

The device must be cleaned with a damp cloth at regular intervals to prevent heat build-up. Cleaning intervals depend on the amount of local dust.

Trapped heat can cause the maximum allowed surface temperature (T80°C) to be exceeded.

CAUTION! Observe the system safety and operating regulations.

The instrument is maintenance-free. However, to ensure the device's reliable operation and long service life, we recommend regularly inspecting the device for the following points:

- Check the switching function (with the aid of the test button) in combination with the following components.
- Check the seal tightness of the flange connection.
- Check the electrical connections (cable clamp connection).

The test must be carried out once a year or more frequently depending on the operating regulations and must be documented in writing.

The exact test cycles need to be adapted to the operating and environmental conditions. If several components of the unit interact, all operating instructions of the other units also need to be observed.

All defective or faulty devices should be sent directly to our repair department. Please coordinate all shipments with our sales department. Return the device in the original packaging or a suitable transport container.

5.2 Transport

The measuring device must be protected against impacts. It should be transported in the original packaging or a suitable transport container.

5.3 Service

All defective or faulty devices should be sent directly to our repair department. Please coordinate all shipments with our sales department.



WARNING

Process media residues

Process media residues in and on dismantled devices can be a hazard to people, animals and the environment. Take adequate preventive measures. If required, the devices must be cleaned thoroughly.

Return the device in the original packaging or a suitable transport container.

5.4 Disposal

Please help to protect the environment by always disposing of the work pieces and packaging materials in compliance with the valid national waste and recycling guidelines or reuse them.

6 Technical data

6.1 General

Please also observe the order code here.

6.2 Application conditions

**0.8 to 1.1 bar abs
-20°C to 60°C**

The EC type test is based on atmospheric conditions of 0.8 to 1.1 bar abs and ambient or medium temperatures of -20°C to 60°C. If the pressure and temperature levels differ, the operator needs to document the suitability in the explosion protection document.

Ambient temperature	-20 to +60 °C
Storage temperature	-20 to +85 °C
Atmospheric conditions	0.8 ... 1.1 bar abs
Max. allowed temperature of medium	Depends on model and zone
Min. temperature of medium	-20 °C
Spec. minimum density of the medium	$\rho = 0.6 \text{ kg/dm}^3$
Installation position	horizontal
Type of protection	IP 65 acc. to DIN EN 60529

Zone 1 and 2

Max. allowed temperature of medium	max. occurring surface temperature
------------------------------------	------------------------------------

The max. occurring surface temperature corresponds to the medium temperature. Temperature classes acc. to DIN EN 60079-14 and ignition temperatures need to be taken into account for the respective application. In order to avoid additional heating, the devices may not be exposed to additional direct sunlight during operation.

Temperature class	T1	T2	T3	T4	T5	T6
Max. surface temperature	450 °C	300 °C	200 °C	135 °C	100 °C	85 °C

Zone 21 and 22

Max. allowed temperature of medium	T80 °C
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If the medium temperatures exceed 80 °C, the operator must note the ignition temperatures of the relevant dusts.

Series

Version	Max. operating pressure	Max. temperature of medium
NK10 1 ...	20 bar	400°C
NK10 2 ...	20 bar	400°C
NK10 3 ...	10 bar	350°C
NK10 4 ...	16 bar	400°C
NK10 5 ...	16 bar	400°C
NK10 6 ...	20 bar	400°C
NK10 7 ...	20 bar	400°C
NK10 A ...	10 bar	350°C
NK10 B ...	20 bar	400°C
NK10 F ...	20 bar	400°C
NK10 G ...	20 bar	400°C
NK10 H ...	20 bar	400°C
NK10 K ...	6.5 bar	400°C
NK10 M ...	16 bar	400°C
NK10 N ...	16 bar	400°C
NK10 P ...	16 bar	400°C

6.3 Switch contacts

1 or 2 micro-switches with 1-pin changeover contact.



⚠ WARNING

Only for connection to certified intrinsically safe circuits in the ignition protection class Ex ib IIC.

Highest values per electricity circuit:

$U_i = 30 \text{ V}$

$I_i = 160 \text{ mA}$

$P_i = 800 \text{ mW}$

The intrinsically safe contact circuits are safely galvanically separated from each other and the earth potential.

6.4 Measurement accuracy

Switch hysteresis	approx. 6 mm
Switching point differential between S1 and S2 ⁽⁺⁾	max. 30 mm
Switching point differential on the medium surface	dependent on medium density

⁽⁺⁾ only for two micro-switches

6.5 Directives and certificates

Directives	DIN standards applied
ATEX Directive 2014/34/EU	DIN EN IEC 60079-0:2019-09
	DIN EN IEC 60079-0 Corrigendum 1:2021-04
	DIN EN 60079-11:2012-06
	DIN EN 60079-31:2014-12
	DIN EN ISO 80079-36:2016-12
	DIN EN ISO 80079-37:2016-12
Pressure Equipment Directive 2014/68/ EU	DIN EN 12516-2:2022-08
Low-Voltage Directive 2014/35/EU	DIN EN 61010-1:2020-03
RoHS Directive 2011/65/EU	DIN EN IEC 63000:2019-05
Further technical specifications applied ^{**)}	
Heat transfer systems	DIN 4754-3:2015-03
Examination	Certificate no.
EC type examination (Module B) in accordance with the Pressure Equipment Directive	0045/202/1403/P/01261/22/D/001(00)
EC type examination (Module B) according to the ATEX Directive	TÜV 07 ATEX 553595
DNV type examination	TA000020S
DIN CERTCO acc. to 4754-3	10F001
Functional safety pursuant to EN 61508 [*])	968/V 1298.00/22

^{*}) Only for devices with the order code for SIL (optional information).

^{**)} Not published in the EU Official Journal.

6.6 Construction design

Swimmer system	Stainless steel 1.4571
Metal bellows	Stainless steel 1.4571
Flange / counter-flange ^(*)	Stainless steel 1.0425 (P265GH) or 1.4571
Welded socket	St.35.8 [1.0345 (P235GH)]
Screws / nuts ^(x)	NK104 ... Nut made of C35E (1.1181) and stud made of 1.7709
	NK105 ... screws only made of 1.7218

^(*) Please note the material information in the dimensional drawings.

^(x) Only for version with welding connection

6.6.1 Dimensional drawings

All dimensions in mm unless otherwise stated

6.6.1.1 Version with welding connection

Version	Flange material		A	B	C [Ø]	D [square]	e
NK104	1.0425	P265GH	213	359	82.5	77.8 x 77.8	107
NK105	1.0425	P265GH	250	396	88.9	90.0 x 90.0	105

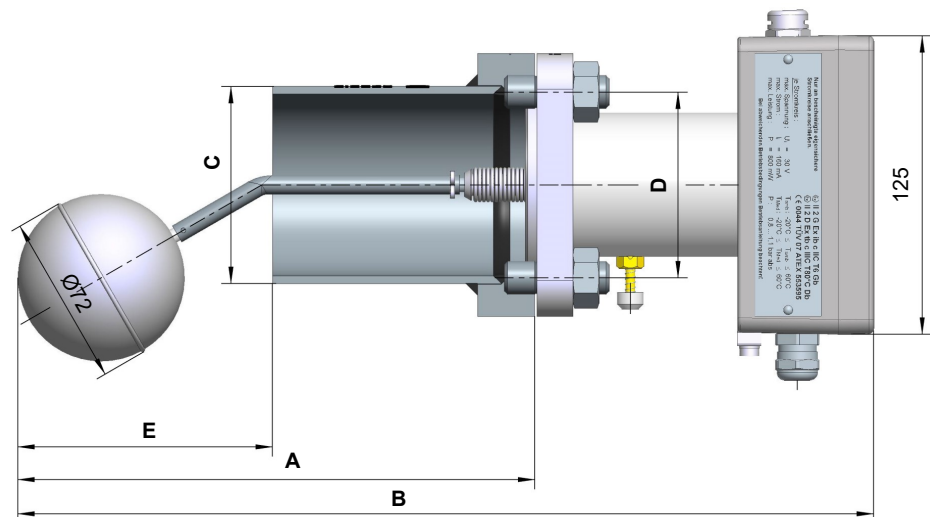


Fig. 4: Dimensional picture NK104 NK105

6.6.1.2 Flange DIN EN 1092-1 Type B1

Version	Flange material	Port	D [Ø]	LK [Ø]	B	b	d [Ø]	No. of holes
NK102	1.0425 P265GH	DN80 PN40	200	160	24	22	18	8
NK10G	1.4571 ---	DN80 PN40	200	160	24	22	18	8

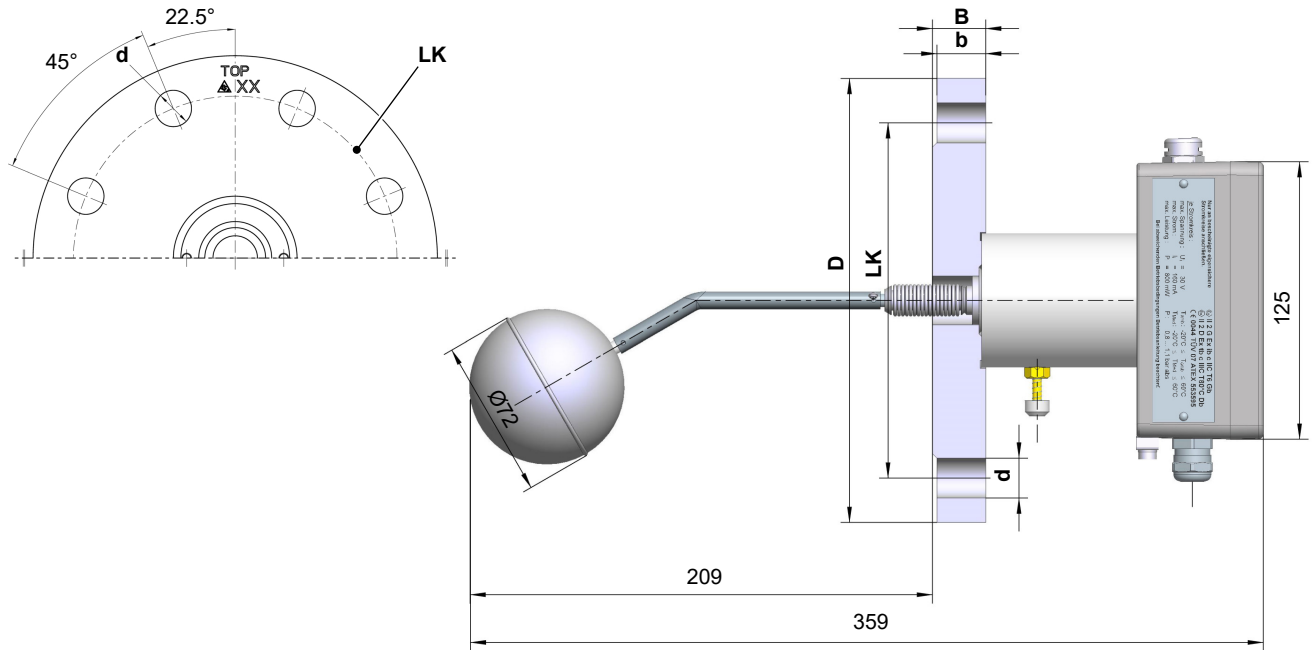


Fig. 5: Dimensional picture NK102 NK10G

Version	Flange material	Port	A	D [Ø]	LK [Ø]	B	b	d [Ø]	No. of holes
NK101	1.0425 P265GH	DN65 PN40	230	185	145	22	20	18	8
NK103	1.0425 P265GH	DN65 PN16	234	185	145	18	16	18	4
NK107	1.4571 ---	DN65 PN40	230	185	145	22	20	18	8

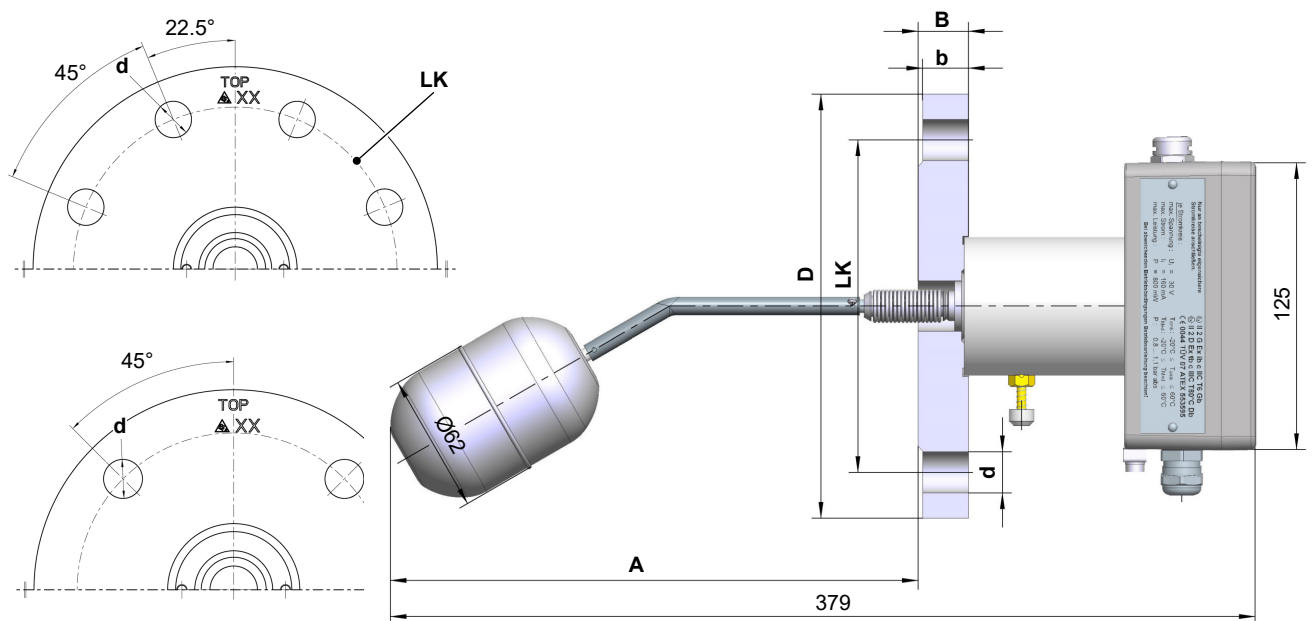


Fig. 6: Dimensional picture NK101 NK103 NK107

6.6.1.3 Flange DIN EN 1092-1 Type C

Version	Flange material	Port	D [Ø]	LK [Ø]	B	b	d [Ø]	No. of holes
NK10F	1.0425 P265GH	DN80 PN40	200	160	24	19.5	18	8

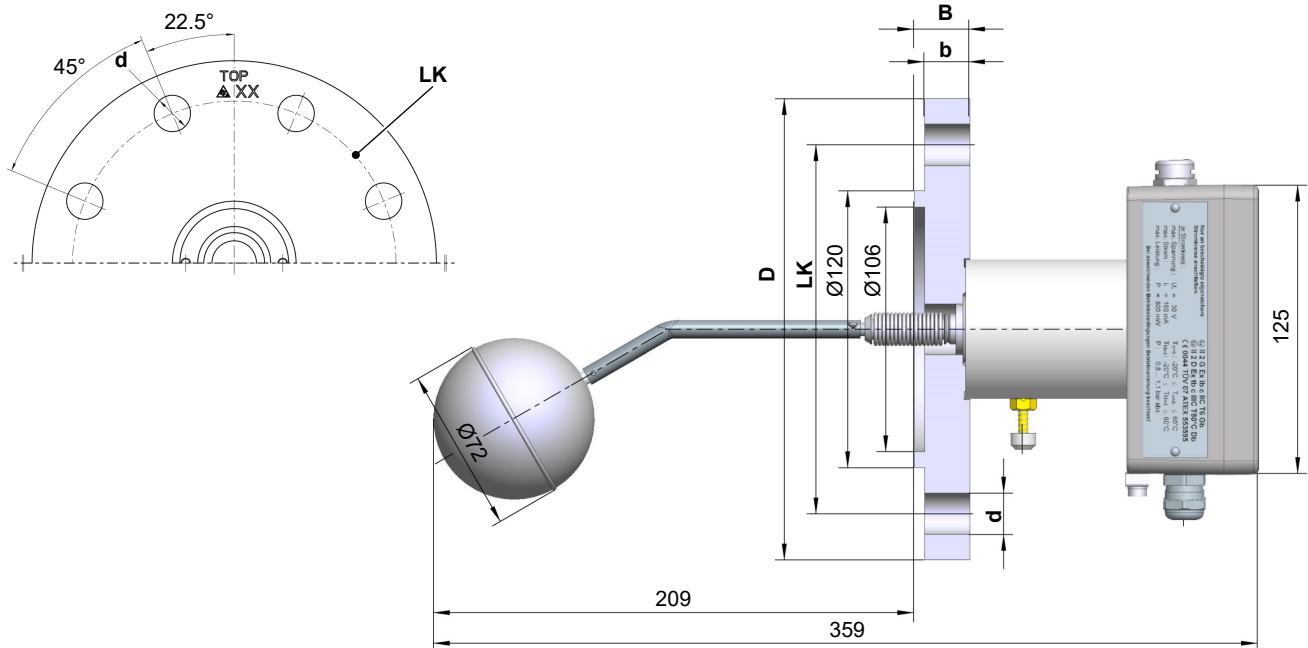


Fig. 7: Dimensional picture NK10F

Version	Flange material	Port	A	D [Ø]	LK [Ø]	B	b	d [Ø]	No. of holes
NK106	1.0425 P265GH	DN65 PN40	230	185	145	22	17.5	18	8
NK10A	1.0425 P265GH	DN65 PN16	234	185	145	18	13.5	18	4

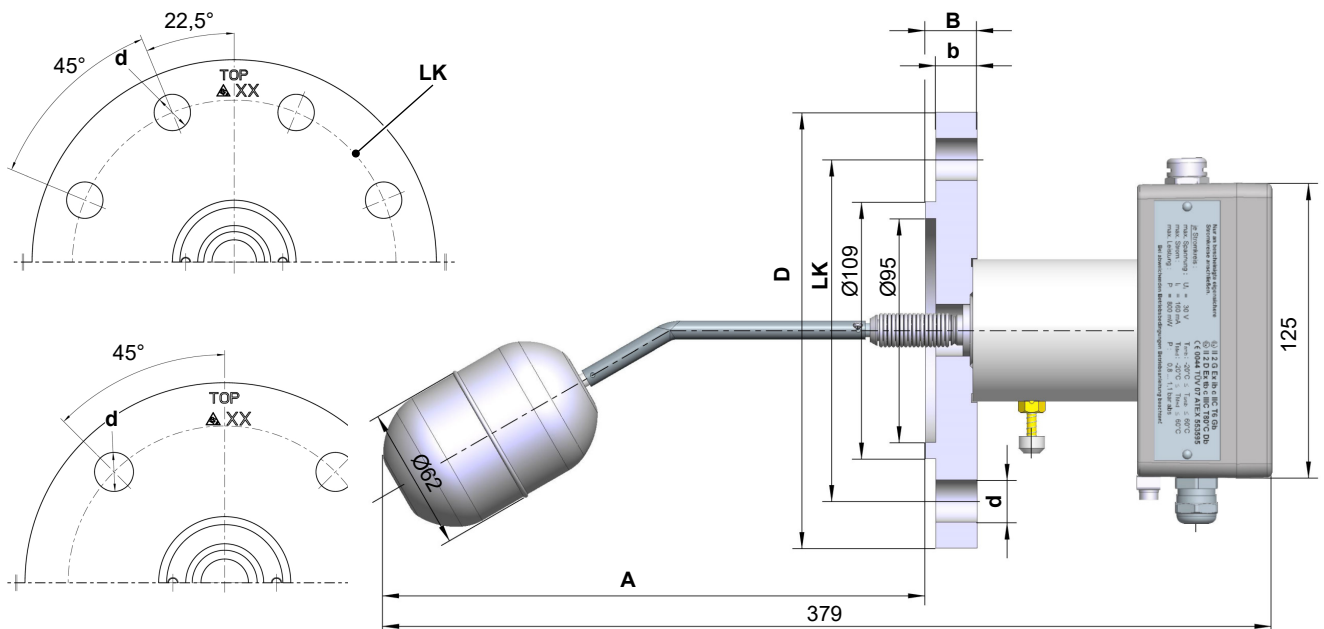


Fig. 8: Dimensional picture NK106 NK10A

6.6.1.4 Flange DIN EN 1092-1 Type G

Version	Flange material	Port	D [Ø]	LK [Ø]	B	b	d [Ø]	No. of holes
NK10H	1.4571 ---	DN80 PN40	200	160	24	22	18	8

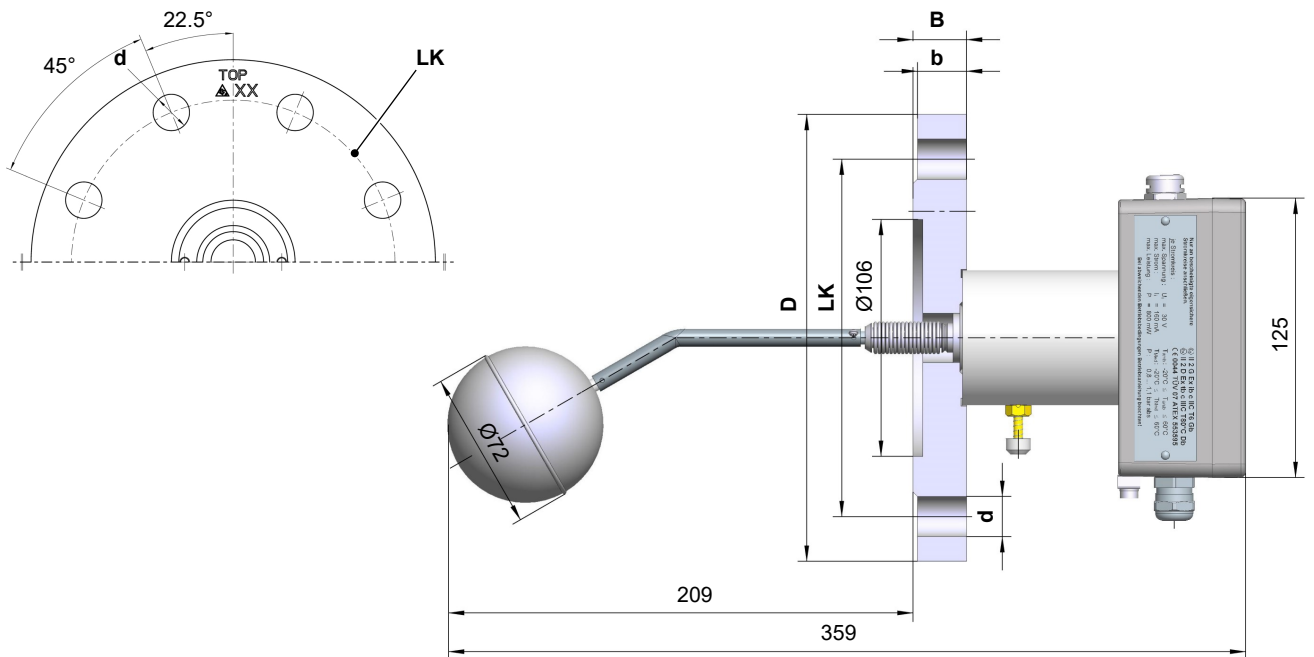


Fig. 9: Dimensional picture NK10H

6.6.1.5 Flange DIN EN 1092-1 Type D

Version	Flange material	Port	D [Ø]	LK [Ø]	B	b	d [Ø]	No. of holes
NK10B	1.0425 P265GH	DN65 PN40	185	145	22	20	18	8

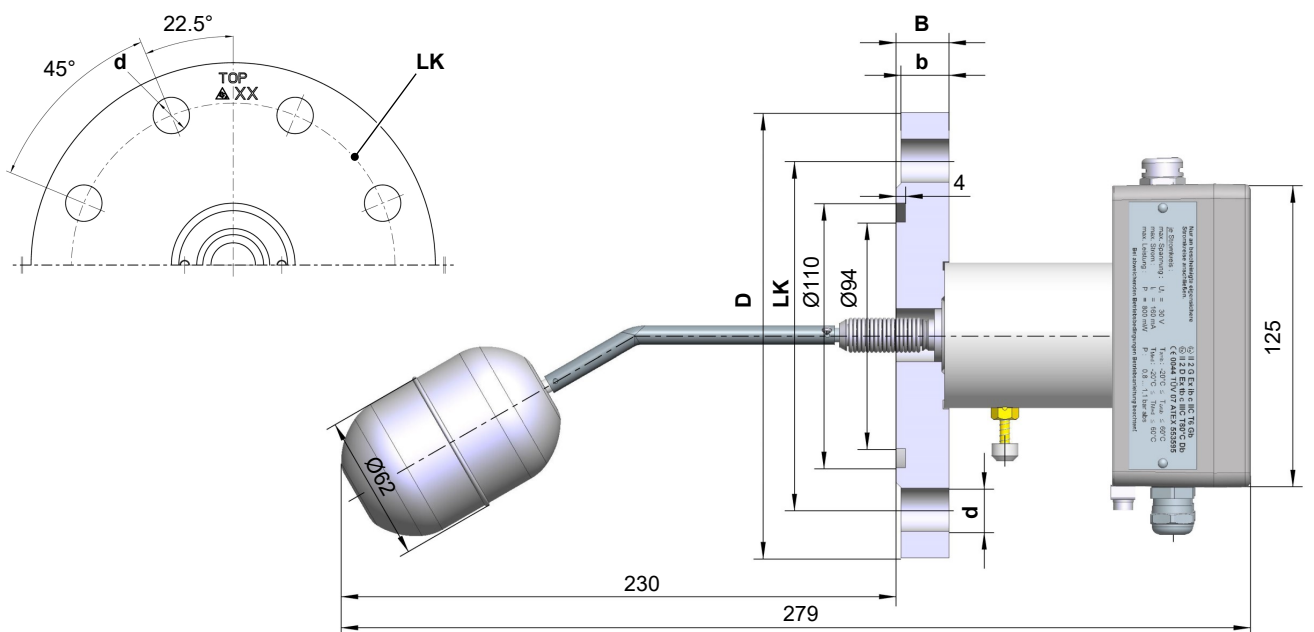


Fig. 10: Dimensional picture NK10B

6.6.1.6 Flange ANSI B16.5

Version	Flange material	Port	A	D [Ø]	LK [Ø]	B	b	d [Ø]	No. of holes
NK10K	1.0425 P265GH	3" 150 lbs	209	192.5	152.4	24	22.8	19.1	4
NK10N	1.0425 P265GH	3" 300 lbs	204	209.5	168.1	28.4	26.8	22.3	8
NK10P	1.0425 P265GH	4" 300 lbs	201	254	200.1	31.7	30.1	22.3	8

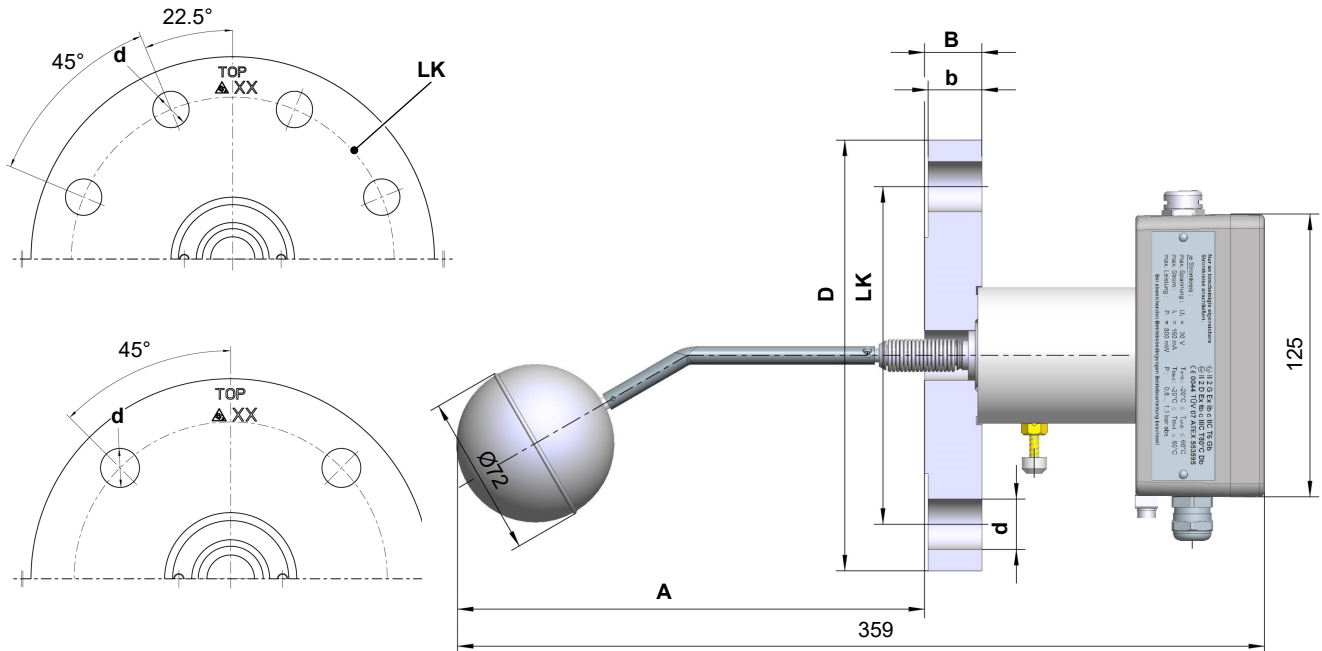


Fig. 11: Dimensional picture NK10K NK10N NK10P

Version	Flange material	Port	A	D [Ø]	LK [Ø]	B	b	d [Ø]	No. of holes
NK10M	1.0425 P265GH	2.5" 300 lbs	227	190.5	149.3	25.4	23.8	22.3	8

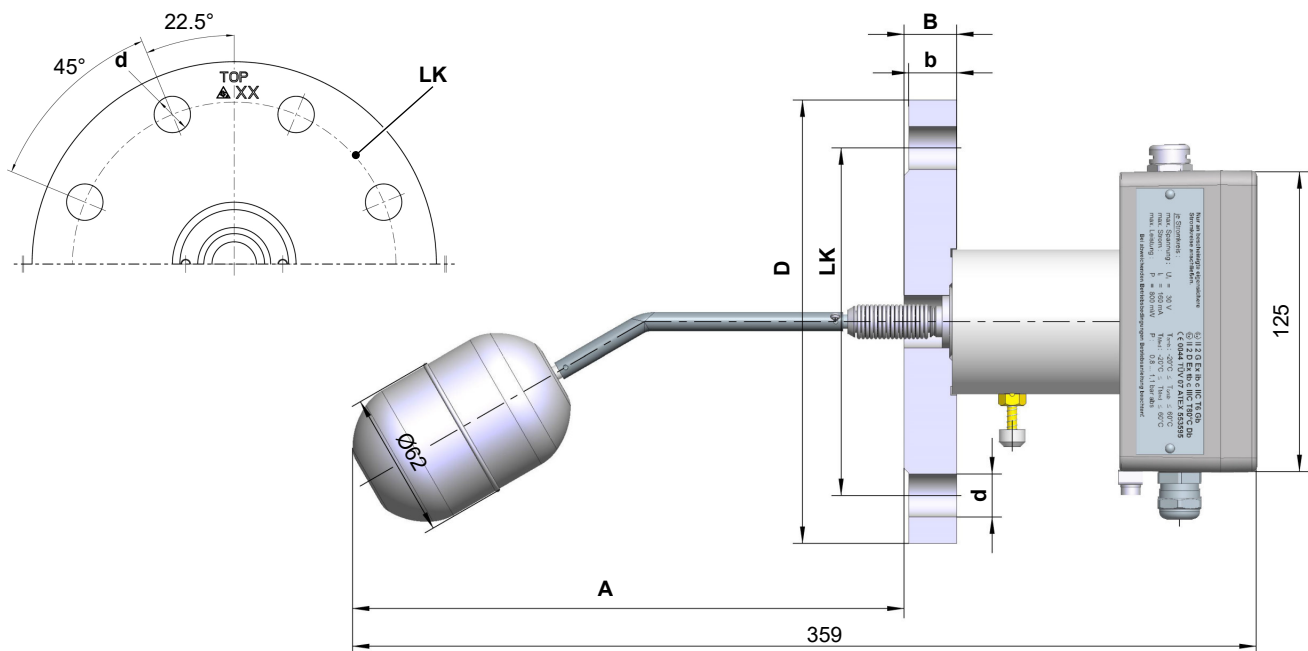
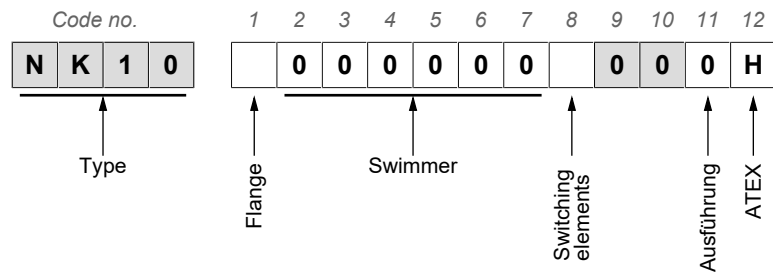


Fig. 12: Dimensional picture NK10M

7 Order Codes



[1]	Flange	material			
1	DIN EN 1092-1 Form B1	DN 65 PN40	1.0425	P265GH	
2	DIN EN 1092-1 Form B1	DN 80 PN40	1.0425	P265GH	
3	DIN EN 1092-1 Form B1	DN 65 PN16	1.0425	P265GH	
7	DIN EN 1092-1 Form B1	DN 65 PN40	1.4571	---	
g	DIN EN 1092-1 Form B1	DN 80 PN40	1.4571	---	
6	DIN EN 1092-1 Form C	DN 65 PN40	1.0425	P265GH	
A	DIN EN 1092-1 Form C	DN 65 PN16	1.0425	P265GH	
F	DIN EN 1092-1 Form C	DN 80 PN40	1.0425	P265GH	
B	DIN EN 1092-1 Form D	DN 65 PN40	1.0425	P265GH	
h	DIN EN 1092-1 Form G	DN 80 PN40	1.4571	---	

K	ANSI B16.5	3" 150 lbs	1.0425	P265GH
C	ANSI B16.5	2.5" 300 lbs	1.0425	P265GH
N	ANSI B16.5	3" 300 lbs	1.0425	P265GH
P	ANSI B16.5	4" 300 lbs	1.0425	P265GH

4	Welding connection	82.5 mm (S80)
5	Welding connection	88.9 mm (S90)

[2-7]	Swimmer
000000	Standard swimmer
#####	Special design on request

[8]	Switching Elements
1	1 micro-switch
2	2 micro-switch

[11]	Version
0	Standard
S	SIL

[12]	Approval
H	Gas explosion protection Zone 1 and Zone 2 Dust explosion protection Zone 21 and Zone 22

8 Attachments

8.1 Declaration of Conformity



(Translation) **CE**

EU Declaration of Conformity

For the product described as follows

Product designation **Level limiter**
Type designation **NK10 ... H**

it is hereby declared that it corresponds with the basic requirements specified in the following designated directives:

2014/35/EU	Low Voltage Directive
2014/34/EU	ATEX Directive
2014/68/EU	Pressure Equipment Directive
2011/65/EU	RoHS Directive
(EU) 2015/863	Delegated Directive amending Annex II to Directive 2011/65/EU

The products were tested in compliance with the following standards.

Low Voltage Directive (LVD)

DIN EN 61010-1:2020-03 EN 61010-1:2010 + A1:2019 + A1:2019/ AC:2019	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
--	--

Explosive atmospheres (ATEX)

DIN EN IEC 60079-0:2019-09 EN IEC 60079-0:2018 Correction 1 IEC 60079-0:2017/COR1:2020	Explosive atmospheres - Part 0: Equipment - General requirements
DIN EN 60079-11:2012-06 EN 60079-11:2012	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
DIN EN 60079-31:2014-12 EN 60079-31:2014	Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"
DIN EN ISO 80079-36:2016-12 EN ISO 80079-36:2016	Explosive atmospheres - Part 36: Non-electrical equipment for explosive atmospheres - Basic method and requirements
DIN EN ISO 80079-37:2016-12 EN ISO 80079-37:2016	Explosive atmospheres - Part 37: Non-electrical equipment for explosive atmospheres - Non-electrical type of protection constructional safety "c", control of ignition sources "b", liquid immersion "k"

Pressure Equipment Directive (PED)

DIN EN 12516-2:2022-08 EN 12516-2:2014+A1:2021	Industrial valves - Shell design strength - Part 2: Calculation method for steel valve shells
--	---

RoHS Directive (RoHS3)

DIN EN IEC 63000:2019-05 EN IEC 63000:2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances
--	--

Further applied technical specifications (not published in the Official Journal of the European Union):

DIN 4754-3:2015-03	Heat transfer installations working with organic heat transfer fluids - Part 1: Safety requirements
---------------------------	---

09010167 • CE_EN_NK10_H • Rev. ST4-C • 12/24

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Fig. 13: CE_EN_NK10_H_page1

The notified body for the ATEX Directive has issued the following certificate:

TÜV NORD CERT GmbH
NB 0044

TUV 07 A TEX 553595

EC type examination 93/9/EC

The notified body for the Pressure Equipment Directive has issued the following certificates:

TÜV NORD SYSTEM GmbH & Co. KG
NB 0045

Equipment part for use in a safety chain as a complete equipment part with category IV safety function:

0045/202/1403/Z/01261/22/D/001(00)

EC type examination 2014/68/EU (module B)

The product has been subjected to the conformity assessment procedures 'Internal production control' (Module A)

- and, in accordance with the Pressure Equipment Directive, a 'Type examination' (Module B) and 'Conformity to type based on quality assurance of the production process' (Module D/D1)
- and, in accordance with the ATEX Directive, a 'Type examination' (Module B) and 'Conformity to type based on quality assurance of the production process' (Module D).

The manufacturer is responsible for issuing this declaration of conformity with regard to the fulfilment of the essential requirements and the preparation of the technical documentation.

Manufacturer

FISCHER Mess- und Regeltechnik GmbH

Bielefelder Str. 37a
32107 Bad Salzuflen, Germany

Tel. +49 (0)5222 974 0

The devices bear the following marking:

CE 0044

⊕ II 2G Ex ib c IIC T6 Gb

⊕ II 2D Ex tb c IIIC T80 °C Db



Bad Salzuflen
07 Jan 2025

T. Malischewski
Managing Director



8.2 Type testing certificates

8.2.1 Pressurised Vessel Directive 2014/68/EU



ZERTIFIKAT CERTIFICATE

**EU-Baumusterprüfbescheinigung (Baumuster) - Modul B -
nach Richtlinie 2014/68/EU**
EU type-examination certificate (production type) - module B -
according to directive 2014/68/EU

Zertifikat-Nr.: 0045/202/1403/Z/01261/22/D/001(00)
Certificate No.:

Name und Anschrift des Herstellers: FISCHER Mess- und Regeltechnik GmbH
Name and address of manufacturer: Bielefelder Straße 37a
32107 Bad Salzuffen

Hiermit wird bescheinigt, dass das unten genannte Baumuster die Anforderungen der Richtlinie 2014/68/EU erfüllt.
We hereby certify that the type examination mentioned below fulfills the requirements of directive 2014/68/EU.

Prüfgrundlage: AD 2000
Test specification:

Prüfbericht-Nr.: 0045/202/1403/P/01261/D/22/001(00)
Test report No.:

Beschreibung des Baumusters (Druckgerät): Füllstandsbegrenzer Typ NK 10
Description of production type (pressure equipment): Baureihen,: NK101, NK 102, NK103, NK 104, NK105, NK106, NK 107, NK 10A, NK 10B, NK 10F, NK10G, NK10H, NK 10K, NK10M, NK10N, NP10P

Fertigungsstätte FISCHER Mess- und Regeltechnik GmbH
Place of manufacture: Bielefelder Straße 37a
32107 Bad Salzuffen

Gültig bis: 08/2032
Valid until:

Anlagen:
Attachment
--



Notifizierte Stelle 0045 für Druckgeräte
Notified Body 0045 for pressure equipment



Digital unterschrieben
von Kocielnik Bodo
Datum: 2022.12.13
15:34:37 +01'00'

TÜV NORD Systems GmbH & Co. KG, Große Bahnstraße 31, 22525 Hamburg

Kontakt / Contact:
E-Mail imruhrgebietost@tuev-nord.de
Tel./Phone +49 (0) 231/5186-0

Zur Verifizierung der Gültigkeit eines digital signierten Dokuments ist die Installation des TÜV NORD GROUP Stammzertifikats notwendig: <https://www.tuev-nord.de>, siehe Kunden-Login/Digitale Signatur
To verify the validity of a digitally signed document, an installation of the TÜV NORD GROUP root certificate is required: <https://www.tuev-nord.de/en/company>, see Customer Login/Digital Signature

B EU Baumuster Druckgerät und Baugruppe deu digital Rev. 3 / 08.20

Fig. 15: 8120501655 Type certificate NK 10 - 2022

8.2.2 ATEX Guideline 2014/34/EU

Translation

(1) **EC-Type Examination Certificate**

(2) Equipment and protective systems intended for use in potentially explosive atmospheres, **Directive 94/9/EC**



(3) **Certificate Number** TÜV 07 ATEX 553595

(4) for the equipment: Level limiter type NK 10.I

(5) of the manufacturer: **Fischer Mess- und Regeltechnik GmbH**

(6) Address: Bielefelder Straße 37 a
D-32107 Bad Salzuffen

Order number: 8000553595

Date of issue: 2007-05-16

- (7) This equipment or protective system and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.
- (8) The TÜV NORD CERT GmbH, notified body No. 0044 in accordance with Article 9 of the Council Directive of the EC of March 23, 1994 (94/9/EC), certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive. The examination and test results are recorded in the confidential report No. 07 203 553595.
- (9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 1127-1:1997	EN 50 014:1997 +A1+A2	EN 50 020:2002
EN 13 463-1:2001	EN 13 463-5:2003	
- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) This EC-type examination certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.
- (12) The marking of the equipment or protective system must include the following:

II 2 G EEx ib c IIC T6

TÜV NORD CERT GmbH, Langemarckstraße 20, 45141 Essen, accredited by the central office of the countries for safety engineering (ZLS), Ident. Nr. 0044, legal successor of the TÜV NORD CERT GmbH & Co. KG Ident. Nr. 0032

The head of the certification body

Schwedt

Hanover office, Am TÜV 1, 30519 Hanover, Fon +49 (0)511 986 1455, Fax +49 (0)511 986 1590

This certificate may only be reproduced without any change, schedule included.
Excerpts or changes shall be allowed by the TÜV NORD CERT GmbH

P17-F-011 06-06

page 1/3

Fig. 16: BMP_94-9-EG_EN_TÜV 07 ATEX 553595_page1



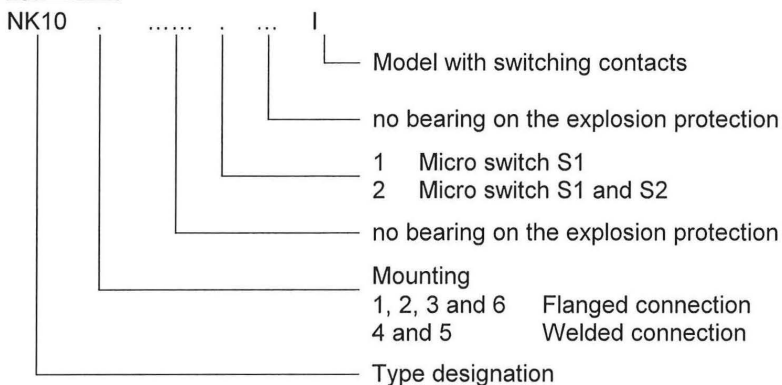
(13) **SCHEDULE**

(14) **EC-Type Examination Certificate No. TÜV 07 ATEX 553595**

(15) Description of equipment

The Level limiter type NK 10.I is to determine levels in pressureless and fluid-filled tanks. The above mentioned equipment consists of a float system and a housing with 1 or 2 micro switches connected to intrinsically safe circuits. Float activity by changes of the filling level trips the micro switches. A test switch located outside of the tank is to check the float activity. The above mentioned equipment is to mount horizontal to the tank by flanged or welded connection.

Type code



Technical Data

Permissible range of ambient resp. medium temperature	-20 °C to 60 °C
Permissible range of ambient resp. medium pressure	0,8 to 1,1 bar absolute

Electrical Data

Contact circuit in the type of protection Intrinsic Safety EEx ib IIC
 (Connections in the connection box;) only for connection to certified intrinsically safe circuits
 connections 1, 2, 3; 4, 5, 6) Maximum values per circuit:
 $U_i = 30 \text{ V}$
 $I_i = 160 \text{ mA}$
 $P_i = 800 \text{ mW}$
 The effective internal inductances and capacitances are negligibly small.

The intrinsically safe contact circuits are safe galvanically separated from each other and ground potential.

(16) Test documents are listed in the test report No. 07 203 553595.



Schedule EC-Type Examination Certificate No. TÜV 07 ATEX 553595

(17) Special conditions for safe use

none

(18) Essential Health and Safety Requirements

no additional ones



Translation

1. SUPPLEMENT

to Certificate No.	TÜV 07 ATEX 553595
Equipment:	Level limiter type NK 10.....H
Manufacturer:	Fischer Mess- und Regeltechnik GmbH
Address:	Bielefelder Straße 37 a 32107 Bad Salzuffen Germany
Order number:	8000421888
Date of issue:	2014-06-11

Amendments:

Amendments according to the EC-Type Examination Certificate TÜV 07 ATEX 553595:

The type code has changed from NK 10.....I to NK 10.....H. The „H“ stands for the use in explosion hazardous areas.



In the future, the a. m. equipment can be also operated in explosion hazardous areas with combustible dust.

In the future, the a. m. equipment is manufactured according the documents listed in the test report. The changes refer to the construction.

The below mentioned standards are considered.

All other data apply unchanged.

The marking changes as follows:

 II 2 G Ex ib c IIC T6 Gb
 II 2 D Ex tb c IIC T80 °C Db

The equipment incl. this supplement meets the requirements of these standards:

EN 60079-0:2012	EN 60079-11:2012	EN 60079-31:2009
EN 13463-1:2009	EN 13463-5:2011	

(16) The test documents are listed in the test report No. 14 203 123030.

(17) Special conditions for safe use

no additional ones

(18) Essential Health and Safety Requirements

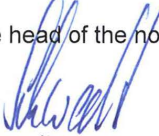
no additional ones



1. Supplement to Certificate No. TÜV 07 ATEX 553595

TÜV NORD CERT GmbH, Langemarckstraße 20, 45141 Essen, notified by the central office of the countries for safety engineering (ZLS), Ident. Nr. 0044, legal successor of the TÜV NORD CERT GmbH & Co. KG Ident. Nr. 0032

The head of the notified body


Schwedt

Hanover office, Am TÜV 1, 30519 Hannover, Tel.: +49 (0) 511 986-1455, Fax: +49 (0) 511 986-1590

8.2.3 DNV GL Certificate



TYPE APPROVAL CERTIFICATE

Certificate No:
TAA000020S
Revision No:
2

This is to certify:

That the Level Switches

with type designation(s)
NK10

Issued to

Fischer Meß- und Regeltechnik GmbH
Bad Salzuflen, Nordrhein-Westfalen, Germany

is found to comply with

DNV rules for classification – Ships, offshore units, and high speed and light craft

Application :

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV.

Location classes:

Temperature	B (-20 °C / 16h)
Humidity	B
Vibration	A
EMC	N/A
Enclosure	B (IP 55)

Issued at **Hamburg** on **2023-09-14**

This Certificate is valid until **2028-09-25**.

DNV local unit: **Essen**

Approval Engineer: **Holger Jansen**

for **DNV**



Digitally Signed By: Papanuskas, Joannis
Location: DNV GL SE Hamburg, Germany

Joannis Papanuskas
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid. The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Form code: TA 251

Revision: 2022-12

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Page 1 of 3

Fig. 21: DNVGL_TAA000020S_Page_1



Job Id: **262.1-029690-3**
 Certificate No: **TAA000020S**
 Revision No: **2**

Product description

Type: NK10

Float switch with functional test facility

Temperature medium: max. 400 °C (depending on the type)
 Nominal pressure: max. 20 bar (depending on the type)
 Output: 1 or 2 c/o – contact(s), rating 6 A, 250 Vac
 Material float: 1.4571
 Material flange: 1.4571 / 1.0425 (P265GH)
 Material welding tube: P235GH TC1

Order code: NK10x000000y0000z

Type NK101: flange DIN EN 1092-1 form B1 DN65 PN40 1.0425
 Type NK102: flange DIN EN 1092-1 form B1 DN80 PN40 1.0425
 Type NK103: flange DIN EN 1092-1 form B1 DN80 PN16 1.0425
 Type NK104: 82,5 mm welding tube (S80)
 Type NK105: 88,9 mm welding tube (S90)
 Type NK106: flange DIN EN 1092-1 form C DN65 PN40 1.0425
 Type NK107: flange DIN EN 1092-1 form B1 DN65 PN40 1.4571
 Type NK10A: flange DIN EN 1092-1 form C DN65 PN16 1.0425
 Type NK10B: flange DIN EN 1092-1 form D DN65 PN40 1.0425
 Type NK10F: flange DIN EN 1092-1 form C DN40 PN40 1.0425
 Type NK10G: flange DIN EN 1092-1 form B1 DN80 PN40 1.4571
 Type NK10H: flange DIN EN 1092-1 form G DN80 PN40 1.4571
 Type NK10K: flange - 3" - ANSI B16.5 - 150lbs - 1.0425
 Type NK10M: flange - 2,5" - ANSI B16.5 - 300lbs - 1.0425
 Type NK10N: flange - 3" - ANSI B16.5 - 300lbs - 1.0425
 Type NK10P: flange - 4" - ANSI B16.5 - 300lbs - 1.0425

y = 1: 1 c/o contact
 y = 2: 2 c/o contacts

z = H: Intended for use in potentially explosive atmospheres
 II 2 G Ex ib c IIC T6 Gb
 II 2 D Ex tb c IIIC T80 °C Db

Application/Limitation

The Type Approval covers hardware listed under Product description. When the hardware is used in applications to be classed by DNV, documentation for the actual application is to be submitted for approval by the manufacturer of the application system in each case. Reference is made to DNV rules for classification of ships Pt.4 Ch.9 Control and Monitoring Systems.

Ex-certification is not covered by this certificate. Application in hazardous area to be approved in each case according to the Rules and Ex-Certification/ Special Condition for Safe Use listed in valid Ex-certificate issued by a notified/recognized Certification Body.

Type Approval documentation

Data Sheet 09005536 DB_EN_NK10 Rev.ST4-J (12/22)
 Operating instruction 09005016 Rev. A (06/13)
 Drawing no. 07.010.00.21403.2 Rev. k, (2020-11-26); no. 07.010.00.20458.2 Rev. b, (2012-08-21);
 no. 07.010.02.00030.V Rev. a, (2009-09-30); FKV no.07721.V (2022-12-15)
 Part list no. 07.010.02.00088.V, (2012-11-19); no. 07.010.02.00030.V, (2012-05-14)
 Test report: paconsult no. 13-5195, (2013-07-25);
 Fischer no. 02.010.03.35896.V, 2013-08-26; no. 07.010.02.00030.V Rev. a (2009-09-30)
 Examination Certificate No. TÜV 07 ATEX 553595, (2007-05-16); 1. Supplement, (2014-06-11)
 Type Approval Assessment Report 2023-08-22

Fig. 22: DNVGL_TAA000020S_Page_2



Job Id: 262.1-029690-3
Certificate No: TAA000020S
Revision No: 2

Tests carried out

Applicable tests according to Class Guideline DNV-CG-0339, Edition August 2021.

Marking of product

The products to be marked with:

- manufacturer name
- type name
- serial number

Periodical assessment

The scope of the periodical assessment is to verify that the conditions stipulated for the type are complied with, and that no alterations are made to the product design or choice of systems, software versions, components and/or materials.

The main elements of the assessment are:

- Ensure that type approved documentation is available
- Inspection of factory samples, selected at random from the production line (where practicable)
- Review of production and inspection routines, including test records from product sample tests and control routines
- Ensuring that systems, software versions, components and/or materials used comply with type approved documents and/or referenced system, software, component and material specifications
- Review of possible changes in design of systems, software versions, components, materials and/or performance, and make sure that such changes do not affect the type approval given
- Ensuring traceability between manufacturer's product type marking and the type approval certificate

Periodical assessment is to be performed after 2 years and after 3.5 years. A renewal assessment will be performed at renewal of the certificate.

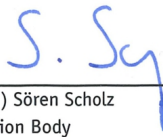
END OF CERTIFICATE

8.3 DIN CERTCO Certification DIN 4754-3



CERTIFICATE

Certificate holder	FISCHER Mess- und Regeltechnik GmbH Bielefelder Str. 37a 32107 Bad Salzuflen GERMANY
Product	Flow switches for heat transfer installations
Type, Model	NK10...
Testing basis	DIN 4754-3:2015-03 Zertifizierungsprogramm Strömungs- und Füllstandsicherungen (2016-01)
Mark of conformity	
Registration No.	10F001
Valid until	2025-10-31
Right of use	This certificate entitles the holder to use the mark of conformity shown above in conjunction with the specified registration number. See annex for further information.

2020-12-21

 Dipl.-Wi.-Ing. (FH) Sören Scholz
 Head of Certification Body





ANNEX


Page 1 of 1


Certificate	10F001 dated 2020-12-21
Technical Data	Measuring device: float system Transfer of measured values: values: mechanically by float rod with bellow Operating pressure: 6 bar, 10 bar and 16 bar (according to design) Ambient temperature: -10 °C to +70 °C Medium temperature: 350 °C and +400 °C (according to design) Rated voltage: 250 V AC, 5 A and DC 30 V, 0,4 A Installation position: horizontal
Testing laboratory/ Inspection body	TÜV Rheinland Industrie Service GmbH Am Grauen Stein 51105 Köln GERMANY
Test report(s)	FBW 1810/15 dated 2015-10-07 968/FI 1018.00/18 dated 2018-09-24 968/FI 1018.01/19 dated 2019-09-27968/FSP 2160.00/20 von 2020-11-25



8.4 SIL Certificate

Certificate



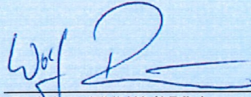


SIL/PL Capability
www.tuv.com ID 060000000

Nr./No.: 968/V 1298.00/22

Prüfgegenstand Product tested	Füllstandsbegrenzer Level Limiter	Zertifikatsinhaber Certificate holder	Fischer Mess- und Regelungstechnik GmbH Bielefelder Str. 37a 32107 Bad Salzuffen Germany
Typbezeichnung Type designation	NK10 / NK10 H		
Prüfgrundlagen Codes and standards	IEC 61508 Parts 1-2 and 4-7:2010		
Bestimmungsgemäße Verwendung Intended application	<p>Sicherheitsfunktion 1: Sicheres Schalten bei Erreichen des eingestellten Grenzwertes (Schalter S1)</p> <p>Sicherheitsfunktion 2: Sichere Vorwarnung bei Erreichen des eingestellten Grenzwertes (Schalter S2) - Option</p> <p>Die Füllstandsbegrenzer sind zur Verwendung in einem sicherheitsgerichteten System bis SIL 2 geeignet. Unter Berücksichtigung der mindestens erforderlichen Hardware-Fehlertoleranz von HFT = 1 können die Armaturen in redundanter Ausführung auch bis SIL 3 eingesetzt werden.</p> <p>Safety function 1: safe switching when the set limit value is reached (switch S1)</p> <p>Safety function 2: safe pre-warning when the set limit value is reached (switch S2) - option.</p> <p>The level limiter are suitable for use in a safety instrumented system up to SIL 2. Under consideration of the minimum required hardware fault tolerance HFT = 1 the valves may be used in a redundant architecture up to SIL 3.</p>		
Besondere Bedingungen Specific requirements	<p>Die Hinweise in der zugehörigen Installations- und Betriebsanleitung sowie des Sicherheitshandbuchs sind zu beachten.</p> <p>The instructions of the associated Installation, Operating and Safety Manual shall be considered.</p>		
<p>Zusammenfassung der Testergebnisse siehe Seite 2 des Zertifikates. Summary of test results see page 2 of this certificate.</p>			
<p>Der Ausstellung dieses Zertifikates liegt eine Evaluierung entsprechend dem Zertifizierungsprogramm CERT FSP1 V1.0:2017 in der aktuellen Version zugrunde, deren Ergebnisse im Bericht Nr. 968/V 1298.00/22 vom 08.08.2022 dokumentiert sind. Dieses Zertifikat ist nur gültig für Erzeugnisse, die mit dem Prüfgegenstand übereinstimmen.</p> <p>The issue of this certificate is based upon an evaluation in accordance with the Certification Program CERT FSP1 V1.0:2017 in its actual version, whose results are documented in Report No. 968/V 1298.00/22 dated 2022-08-08. This certificate is valid only for products, which are identical with the product tested.</p>			

TÜV Rheinland Industrie Service GmbH
Bereich Automation
Funktionale Sicherheit



Dipl.-Ing. (FH) Wolf Rückwart

Köln, 2022-08-11 Certificate Body Safety & Security for Automation & Grid

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Fig. 26: 968_V_1298_00_22_de_en_el_page_1

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Holder: Fischer Mess- und Regeltechnik GmbH
 Bielefelder Straße 37a
 D-32107 Bad Salzuffen
 Germany

Product tested: Level indicator / level limiter
 NK10 / NK10 H

Results of Assessment

Route of Assessment		2 _H / 1 _S
Type of Sub-system		Type A
Mode of Operation		Low Demand Mode
Hardware Fault Tolerance	HFT	0
Systematic Capability		SC 3

Safe switching when the set limit value is reached (switch S1)

Dangerous Failure Rate	λ_D	3.13 E-07 / h	313 FIT
Average Probability of Failure on Demand 1oo1	$PFD_{avg}(T_1)$	1.39 E-03	
Average Probability of Failure on Demand 1oo2	$PFD_{avg}(T_1)$	1.41 E-04	

Safe prewarning when the set limit value is reached (switch S2) - option

Dangerous Failure Rate	λ_D	3.13 E-07 / h	313 FIT
Average Probability of Failure on Demand 1oo1	$PFD_{avg}(T_1)$	1.39 E-03	
Average Probability of Failure on Demand 1oo2	$PFD_{avg}(T_1)$	1.41 E-04	

Assumptions for the calculations above: DC = 0 %, $T_1 = 1$ year, MRT = 72 h, $\beta_{1oo2} = 10$ %

High Demand Mode

In the opinion of the testing laboratory, the failure rates determined for the low demand mode can also be used for high demand mode applications up to a maximum demand rate of $n_{op} = 12$ / a. No failures due to wear are to be expected.

Origin of failure rates

The stated failure rates for low demand are the result of an FMEDA with tailored failure rates for the design and manufacturing process. Furthermore the results have been verified by qualification tests and field-feedback data. Failure rates include failures that occur at a random point in time and are due to degradation mechanisms such as ageing. The stated failure rates do not release the end-user from collecting and evaluating application-specific reliability data.

Periodic Tests and Maintenance

The given values require periodic tests and maintenance as described in the Safety Manual. The operator is responsible for the consideration of specific external conditions (e.g. ensuring of required quality of media, max. temperature, time of impact), and adequate test cycles.

Fig. 27: 968_V_1298_00_22_de_en_el_page_2

Notes

Notes



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