

# Operating Instructions

## NK21 | Conductive level control switch

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## 1 Safety instructions

### 1.1 General

This manual contains detailed information about the product and instructions for its installation, operation and maintenance. Operators and other technical personnel responsible for the equipment must read this thoroughly before attempting to install or operate this equipment. A copy of this manual must always be kept accessible at the place of work for reference by concerned personnel.

Chapter 1 (sections 1.2 through 1.7) contains general as well as specific safety instructions. Chapters 1 through 11, covering topics ranging from intended purpose of the equipment to its final disposal, also include important points relating to safety. Overlooking or ignoring any of these safety points can endanger humans and animals, and possibly cause damage to other equipment.

### 1.2 Personnel qualification

Personnel responsible for installation, operation, maintenance and inspection of this product must have the qualifications, training and experience necessary to carry out such work on this type of equipment.

### 1.3 Risks of disregarding safety instructions

Disregarding safety instructions, use of this product for purposes for which it is not intended, and/or operation of this product outside the limits specified for any of its technical parameters, can result in harm to persons, the environment, or the plant on which it is installed. Fischer Mess- und Regeltechnik GmbH will not be responsible for consequences in such circumstances.

### 1.4 Safety instructions for operators

Safety instructions for the proper use of this product must be followed. This information must be available at all times by personnel responsible for installation, operation, maintenance and inspection of this product. Adequate steps must be taken to prevent the occurrence of hazardous conditions that can be caused by electric energy and the convertible energy of the process media. Such conditions can, for example, be the result of improper electrical or process connections. Detailed information is available in relevant published norms (DIN EN, UVW in Germany; and equivalents in other countries), industrial standards such as DVGW, Ex-, GL-, VDE guidelines, as well as regulations of the local authorities (e.g., EVUs in Germany).



## 1.5 Modification forbidden

Modification or other technical alteration of the product is not permissible. This also applies to the use of unauthorized spare parts for repair / maintenance of the product. Any modifications to this product, if and as necessary, should be done only by Fischer Mess- und Regeltechnik GmbH.

## 1.6 Operational restrictions

The operational reliability of the product is guaranteed only when used for intended purposes. The product must be selected and configured for use specifically with defined process media. The limiting values of operating parameters, as given in the product specification sheet, must never be crossed.

## 1.7 Safety considerations during installation and maintenance

The safety instructions given in this manual, existing national regulations relating to accident prevention, and the internal safety rules and procedures of the user organization regarding safety during installation, operation and servicing must all be followed meticulously.

It is the responsibility of the users to ensure that only suitably qualified and experienced technical personnel are used for installation, operation and servicing of this equipment.

## 2 Intended applications

The level control switch NK21 is suited for the level detection in containers with electrically conductive and non-conductive media. It operates according to the principle of conductive measuring and is therefore suited for conductive media only.

Due to its construction, the level control switch can be used also for critical media with e.g. solid particles, low density or high viscosity.

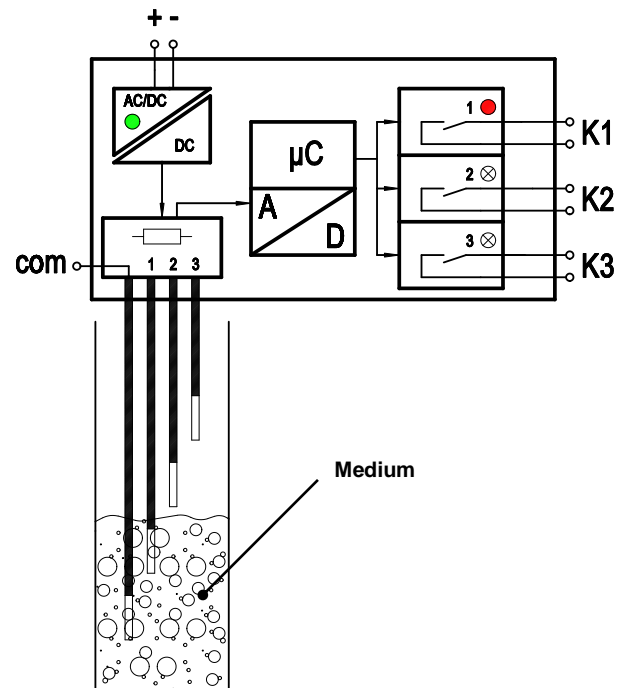
The NK21 can be used to monitor three fill levels and due to the integrated electronics no additional electrode relays are required.

The level control switch is suited for numerous measurement and control tasks like e.g.

- Level controls
- Overflow safety device
- Dry run protection

## 3 Product description and functions

### 3.1 Functional scheme



### 3.2 Principles of operation

The device has three measuring probes (electrodes) and a common probe (com) that can also be connected to the container if required. The probe lengths can be optionally shortened and therefore adapted to the process.

At the electrodes there is a low AC voltage. If these are moistened by the conductive medium, a current starts to flow that is analyzed by the integrated electronics. The threshold limit (resistance range of the medium) can be adjusted in 10 steps by the user.

Three PhotoMOS contacts are available as output signal the switching function of which (see wiring diagram) can be set at the plant. The switching status is indicated by light emitting diodes.

Supply voltage, measuring circuit and outputs are electrically isolated from each other. The model with non-floating contact (5-pin plug) has the output bonded to the + potential of the supply voltage. Therefore the outputs are no longer electronically isolated from the supply. The electrical isolation from the measuring circuit is given for all models.

## 4 Installation

Appropriate measures have to be taken by the installer of the tank installation in which the conductive fill level probe is used in order to ensure general safety during installation and maintenance

Pulsating impacts from the installation on the tank itself might cause functional impairment of the instrument.

### 4.1 Process connection

- By authorized and qualified specialized personnel only.
- The connection must be effected for the intended mechanical process connection only. See also purchase order indicator on the identification plate.
- Approved only for operation in tank installations with operating pressures up to 16 bar.
- Check the suitability of the instrument for the media that is to be measured.

As standard the instrument comes with a thread socket G 1½ for the mounting in a mounting flange. Optionally a PVC nut is available as accessory.

The instrument is suited only for vertical installation and, if possible, should be mounted at the highest point of the tank.

A distance of at least 10 mm between tank bottom and probe end should be observed because of possible formation of sediment or eventual tank movement (e.g. during transport).

#### 4.1.1 Shortening the electrodes

If the probes were not ordered with the exact length, the rods can be shortened by the user. The rods must not be dismantled for this as their functioning might be impaired like this. While shortening ensure that the isolation does not suffer any damage. Afterwards the isolation at the rod ends has to be removed to at least 100 mm.

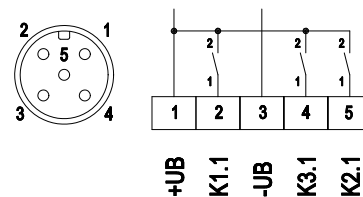
### 4.2 Electrical connection

- By authorized and qualified specialized personnel only.
- The instrument must be connected electrically in accordance with the relevant VDE guidelines and the guidelines of the local EVU.
- Isolate the installation before starting with the connection.
- Install the consumer-adapted fuses.

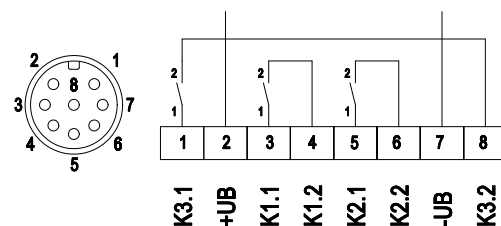
The nominal supply voltage and the permissible range can be found in the technical data. The connection is effected with a conventional M12 plug connector (IEC 61076-2-101).

The contacts are available in two switch modes (see below). The respective model can be determined easily using the number of pins of the M12 plug as reference.

Non-floating contact (5-pin)



Floating contact (8-pin)



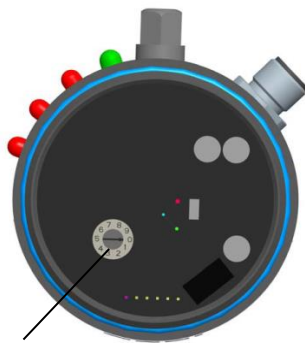
## 5 Commissioning

All electrical supply, operating and measuring lines and the pressure connections must have been correctly installed before commissioning. All connecting pipes must be laid in a way that ensures that no mechanical forces act on the instrument.

- The relevant installation regulations for tank installations have to be observed for the correct mechanical installation.
- The required safety measures have to be checked by the installer of the tank installation to ensure safety during installation, maintenance and inspection.

### 5.1 Setting of sensitivity:

The sensitivity (resistance range of the medium) can be adjusted with a 10-step selector switch.



Selector switch

Setting	Sensitivity
0	5 kΩ
1	7 kΩ
2	10 kΩ
3	14 kΩ
4	19 kΩ
5	25 kΩ
6	32 kΩ
7	40 kΩ
8	50 kΩ
9	60 kΩ

Hysteresis is about 1.5 kΩ.

The setting is effected based on experience respectively knowledge about the conductance of the medium. If this data is not available, it has to be determined experimentally.

The effective surface of the reference electrode (com) can be significantly increased for metal containers by connecting the container to the com port of the probe. This reduces the contact resistance to the medium.

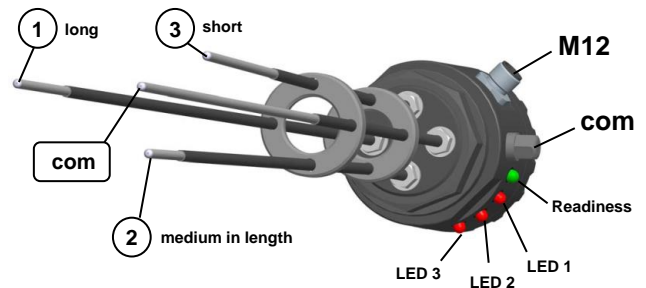
## 6 Operation

As soon as the power supply is on, the green LED lights up. This signals the operational readiness of the level control switch.

### 6.1 Normal operation

The com rod is the reference electrode and always has to be in contact with the medium as otherwise no measuring can take place.

Each rod (1-3) has a contact (K1-K3) and a LED (1-3) assigned to. As soon as a rod is moistened by the medium, the respective contact switches as the respective LED lights up. However, this only happens if the resistance of the medium is below the set sensitivity. When the fill level of the medium rises, the contacts switch in sequence of the rod lengths (1-2-3).



### 6.2 Error mode

Due to the consistency of the medium, caused by contamination or similar, there might be an incorrect current conduction between a rod and the com rod, although the fill level does not moisten the respective rod.

In this case the level control switch signals the error by causing the respective LED to flash.

Error mode is only possible as long as the com rod is moistened by the medium. If this is not the case, the error cannot be evaluated and therefore cannot be displayed.

Clean the rods to resolve the error.

The following tables show the different operating statuses for the make contact and the break contact function.

**Key:**

- m Rod covered with **m**edium (damped)
- s Contact **s**witched
- o LED is **o**n
- f LED **f**lashes

**6.3 Break contact function**

com	Rod 1	Rod 2	Rod 3	K 1	K 2	K 3	LED 1	LED 2	LED 3
<b>Normal operation</b>									
m	m				s	s	o		
m	m	m				s	o	o	
m	m	m	m			s	o	o	o
<b>Error mode</b>									
m		m	m	s				f	f
m	m		m		s		f		f
m			m	s	s				f
m		m		s		s		f	
<b>Error cannot be evaluated</b>									
	m	m							
	m		m						
		m	m						

**6.4 Make contact function**

com	Rod 1	Rod 2	Rod 3	K 1	K 2	K 3	LED 1	LED 2	LED 3
<b>Normal operation</b>									
m	m			s			o		
m	m	m		s	s		o	o	
m	m	m	m	s	s	s	o	o	o
<b>Error mode</b>									
m		m	m	s				f	f
m	m		m		s		f		f
m			m	s	s				f
m		m		s		s		f	
<b>Error cannot be evaluated</b>									
	m	m							
	m		m						
		m	m						

**7 Maintenance**

The instrument is inherently maintenance-free.

However, to ensure reliable operation and maximize the operating life of the instrument, it is recommended that the instrument, its external electrical and process connections, and external connected devices be regularly inspected, e.g.:

- Check the display.
- Check the switching function in connection with secondary components.
- Check all pressure connections for leak-tightness.
- Check the integrity of all electrical connections of the instruments.

Inspection and test schedules depend on operating and site conditions. The operating manuals of other equipment to which the differential pressure transmitter is connected must be read thoroughly to ensure that all of them work correctly when connected together.

**8 Transport**

The product must be protected against shock and vibration during transport. It must therefore be properly packed, preferably in the original factory packaging, whenever it is to be transported.

**9 Service**

Any defective devices or devices with missing parts should be returned to Fischer Mess- und Regeltechnik GmbH. For quick service contact our service department.



Remaining medium in and on dismantled measuring instruments may cause danger to persons, environment and equipment.

Take reasonable precautions! Clean the instrument thoroughly if necessary.

**10 Accessories**

PVC nut G1 1/2" with female thread.

**11 Disposal**

Protect your environment!



Use the product in accordance with relevant regulations. Please be aware of environmental consequences of disposal at the end of the product's life, and take care accordingly.

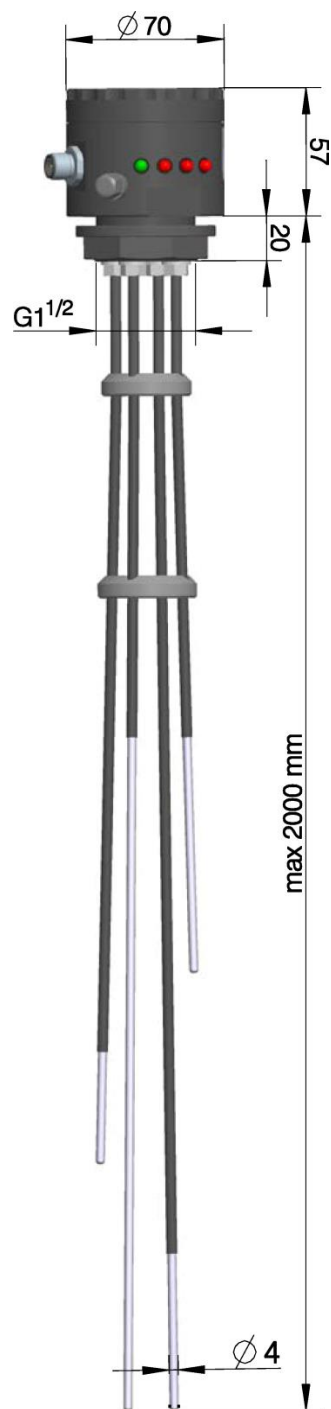
## 12 Technical specifications

<b>General</b>		
Permissible ambient temperature	-10°C to +70°C	
Permissible medium temperature	60°C	
Max. operating pressure	16bar	
Connection thread	G1½"	
Protection class	IP 68	
Max. probe length	2000mm (please state rod lengths on ordering)	
Measuring frequency	120Hz	
Measuring voltage	max. 5 V AC (at the electrode rods)	
Sensitivity	5-60 kOhm (can be adjusted in steps)	→
Hysteresis	1.5 kOhm	
Min. conductivity of the medium	2µS/cm	
<b>Electrical connection</b>		
Operating voltage +U <sub>B</sub>	24 VAC/VDC ±15% (electrically isolated from the measuring circuit)	
Max. current consumption	ca. 50mA	
Test voltage	1kV	
<b>Outputs</b>		
3 PhotoMOS relays		
Contact function	Break contact / make contact (programmable at the plant)	
Reference potential	Non-floating (+U <sub>B</sub> )   Floating	
M12 plug (IEC 61076-2-101)	5-pin   8-pin	
Max. switching voltage	24 VAC/VDC ±15%   30 VAC/VDC	
Max. switching current	200mA	
R <sub>ON</sub>	< 1 Ohm (thermally protected)	
<b>Material</b>		
Casing	Polyoxymethylene (POM)	
Material: electrodes	stainless steel 1.4404	
Electrode coating	Kynar® shrink-fit tubing	

Step	[kΩ]
0	5
1	7
2	10
3	14
4	19
5	25
6	32
7	40
8	50
9	60

### 13 Dimensioned drawings



## 14 Ordering code

### Conductive level control switch

NK21 

9	R	y	y	y	y		9	0	0	0	0
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**Construction**

Electrodes with Kynar® shrink-fit tubing.....> 9

**Casing lead**

Plastic casing with male thread G1½ .....> R

**Installation length** (from sealing surface max. 2000 mm)

Rod No. 1 \_\_\_\_mm.....> y

Rod No. 2 \_\_\_\_mm .....> y

Rod No. 3 \_\_\_\_mm.....> y

Rod No. 4 \_\_\_\_mm.....> y

(kindly always indicate)

**Contact function** (PHOTO MOS relay)

Break contact (non-floating) .....> 1

Make contact (non-floating) .....> 2

Break contact (floating) .....> 3

Make contact (floating) .....> 4

**Operating voltage**

24 VAC/VDC ±15% .....> 9

### 14.1 Accessories

Article	Description
01002154	PVC nut G1 1/2" with female thread



## 15 Declaration of conformity

**developing** solutions

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### EG-Konformitätserklärung

Wir erklären in alleiniger Verantwortung, dass nachstehend genannte Produkte

### EC Declaration of Conformity

We declare under our sole responsibility that the products mentioned below

### Konduktiver Niveauschalter / Conductive Level Switch

**NK21 #####**

gemäß gültigem Datenblatt übereinstimmen mit den

as specified by the current data sheet complies with

#### EMV-Richtlinien

2004/108/EG (EMV)

#### EMC-directives

2004/108/EC (EMC)

Die Produkte wurden entsprechend der folgenden Normen geprüft (Störfestigkeit für Industriebereich, Störaussendung für Wohnbereich):

DIN EN 61326-1:2006-10  
DIN EN 61326-2-3:2007-05  
DIN EN 61010-1:2002-08

The products were tested in compliance with the following standard (Interference immunity for industrial environments, interface emission for residential environments)

DIN EN 61326-1:2006-10  
DIN EN 61326-2-3:2007-05  
DIN EN 61010-1:2002-08

Die Geräte werden gekennzeichnet mit:

The devices bear the following marking:



Bad Salzufen, 21.06.10  
(Ort, Datum / place, date)

  
(rechtsverb. Unterschrift / legally authorized signature)

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Geschäftsführer/Manag. Dir.:  
Günter B. Godde





