

## OVERFILL PROTECTION SYSTEM

Type 76/NB 220



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## 1 Features of Overfill Protection System Type 76/NB 220

Type 76/NB 220 Overfill Protection System, which has been certified in accordance with the German Water Resources Act (,WHG'), is a self-contained safety system that is designed to prevent storage tanks and process tanks from being overfilled by monitoring them constantly.

It can be used in all storage tanks containing liquids which are subject to the Water Resources Act (see Section 7 "Technical data") (in storage tanks with a capacity of over 1,000 litres) because the monitoring of such tanks by an overfill protection system is stipulated by law in some countries.

This overfill protection system consists of a level detector inside the tank and a wall-mounted transducer with alarm unit and switching output.

The alarm unit integrated into the transducer emits visual and audible signals, depending on the operating state, e.g. if a certain level is reached.

The transducer can be easily set as required to match the particular size of tank. The entire overfill protection system is maintenance-free.

## 2 Safety instructions

Type 76/NB 220 Overfill Protection System is used to monitor liquids in storage tanks and process tanks. Use the overfill protection system solely for this purpose. The manufacturer accepts no liability for any damage resulting from abnormal use.

The overfill protection system has been developed, manufactured and tested in accordance with the state of the art and the recognised rules of safety engineering. Nevertheless, it may constitute hazards. Therefore, please observe the following safety instructions.

Never perform any modifications, attachments or conversions on the system without obtaining prior consent from the manufacturer.

Installation, operation and maintenance of the overfill protection system may only be performed by skilled, authorised personnel. The Overfill Protection System may only be installed and serviced by experienced electricians. Expert knowledge must be acquired through regular training.

Operators, setters and maintenance technicians must observe all the relevant safety regulations. This also applies to the local safety and accident prevention regulations which are not listed in these Operating Instructions.

During installation of the level detector the sensor may only be located in a strong current of gas if it is provided with a sleeve to protect against increased movement of gas.

The transducer must be installed in closed rooms or in a housing conforming to protection class IP 54.

After completion of installation and when changing the storage liquid an expert from the specialised contractor or user must conduct a test to ensure that the equipment has been installed correctly and is operating properly.

Electric circuits for horns and lamps which cannot be wired up as closed circuits must be easy to check to make sure they are in good working order.

Before putting into operation all the devices belonging to the Overfill Protection System must be checked to ensure that they have been connected up correctly and are operating properly. The power supply, including that of downstream equipment, must also be checked.

Parts of the Overfill Protection System which are not checked must meet the certification requirements for overfill protection systems.

The specialised contractor or user of the overfill protection systems may only use such parts of the system without a test symbol as comply with the General Building Standards and the Special Building Standards of the Building and Testing Standards for overfill protection systems.

If auxiliary power fails (if limits are exceeded) or if there is discontinuity in the cables connecting the various parts of the system, overfill protection systems must report the fault or indicate the maximum tank level.

The safety instructions contained in this manual are highlighted as follows:



***If you fail to observe these safety instructions, there will be a risk of an accident or the Type 76/NB 220 Overfill Protection System may be damaged.***



***Useful information to ensure that the Overfill Protection System operates properly or make your work easier.***

### 3 Design and operation

The Type 76/NB 220 Overfill Protection System consists of a level detector and a transducer with a binary output. The Type NB 220 QS and NB 220 QSF transducers also have an alarm unit with visual and audible signal generators.

The switching signal is fed to the annunciator or the control device with actuator direct or via a signal amplifier if necessary (see Fig. 1).

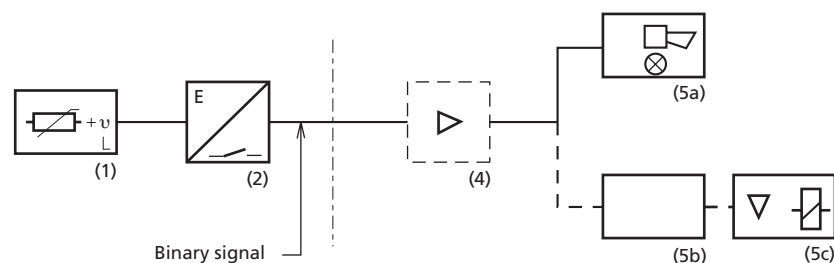


Fig. 1: Layout of the Overfill Protection System

#### Level detector Type 76

The transducer consists of a sensor (encapsulated PTC resistor) and a probe tube which can be adjusted for height with the aid of a clampable screw body (see Figs. 2a/2b and Section 4 "Installation").

The level of the liquid is detected by the encapsulated PTC resistor taking the form of an adjustable resistor at the threshold point of the level detector, the resistance of which is directly proportional to temperature (see Figs. 2a and 2b).

Since liquids conduct heat better than gases, the PTC resistor heats up in the air or gas-filled space. When the PTC resistor is immersed in liquid, e.g. if the level of liquid has been reached, it cools down and the resistance drops. The signal current is limited in such a way that during immersion the PTC resistor cannot warm up again. In a gaseous environment the temperature rise time of the PTC resistor is between 15 seconds (at an ambient temperature of +80°C) and two minutes (at an ambient temperature of -25°C).

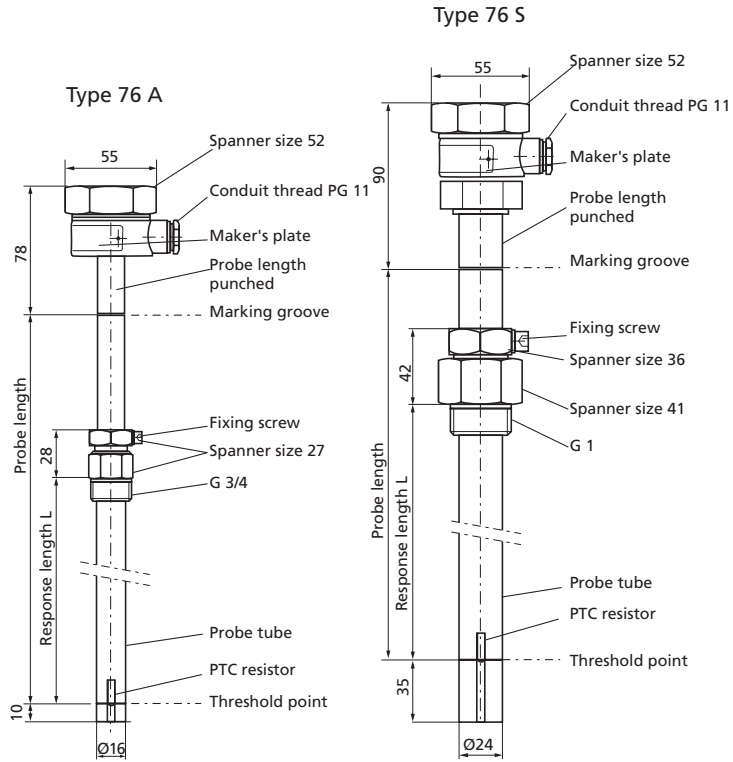


Fig. 2a: Type 76 A and Type 76 S level detectors

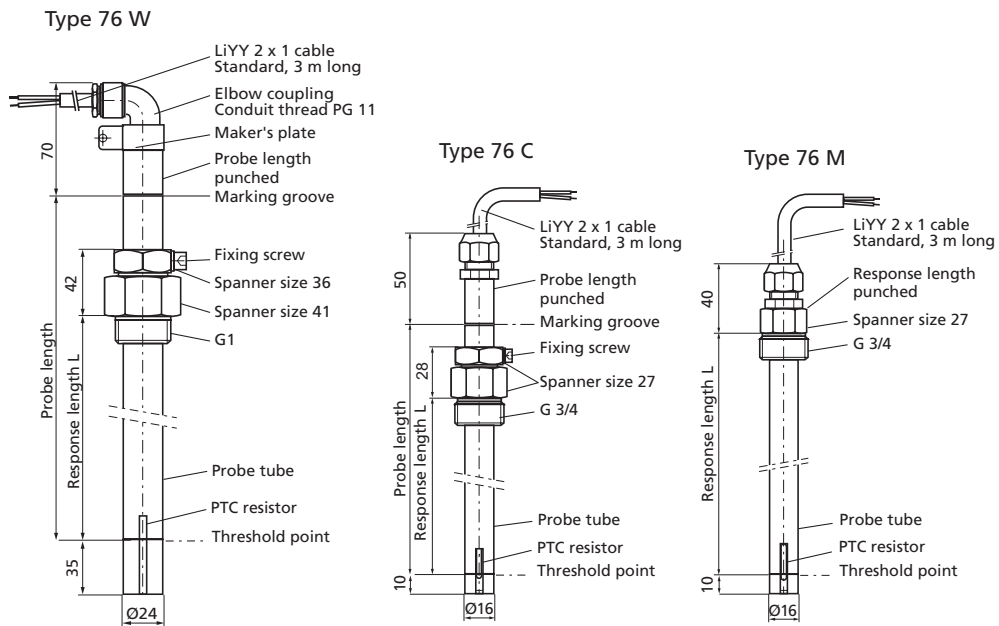


Fig. 2b: Type 76 W, Type 76 C and Type 76 M level detectors

Apart from the standard version (A), Type 76 transducer is also available in other versions (S/W/C/M) (see Figs. 2a and 2b). In addition, all the level detectors can be supplied in two different temperature ranges:

A = probe tube dia. 16 mm, thread G 3/4

S = probe tube dia. 24 mm, thread G 1

W = probe tube dia. 24 mm, thread G 1, cable end 3 m (standard)

C = probe tube dia. 16 mm, thread G 3/4, cable end 3 m (standard)

M = probe tube dia. 16 mm, thread G 3/4, cable end 3 m (standard)

No marks = Temperature of liquid  $-25^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$

H = Temperature of liquid  $-25^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$

The level detectors have a clampable screw-in body (G 1 and G 3/4) with which the particular response length can be set for the respective tank by sliding the probe tube inside the screw-in body (see Figs. 2a/2b and Section 4 "Installation"). This does not apply to Type 76 M where the probe tube is fixed to the inside of the screw-in body.

## Transducer Type NB 220

The transducer consists of an electronic analysing processor for the PTC resistor of the level detector, a floating change-over contact for connection to a control system or a power factor and an additional alarm unit and signal lamps/buttons in the housing.

The analysing processor converts the changes in the resistance of the PTC resistor into relay switching operations with a binary signal output. A relay drops out if the PTC resistor cools down, if there is a power failure, if there is a short circuit, if the circuit is open or if an appliance fuse blows. If there is a power failure or the fuse blows, the green Operation pilot lamp ("Betrieb") indicating that the transducer is ready for operation goes out. If a control unit is connected, the filling procedure can be discontinued by closing an actuator or switching off a pump.

There are three different versions of the Type NB 220 transducer available (H/QS/QSF). Type NB 220 H is the standard version. Type NB 220 QS is provided with an integrated acknowledgement unit. Type NB 220 QSF also has a test button (see Fig. 3).

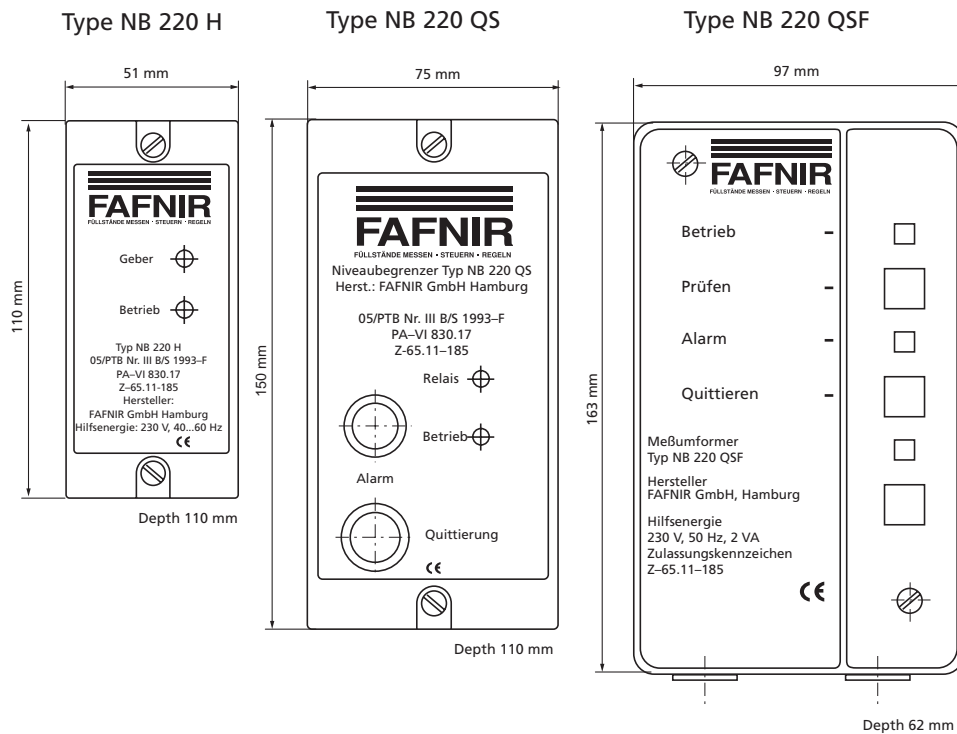


Fig. 3: Type NB 220 H, Type NB 220 QS and Type NB 220 QSF transducers

### Type NB 220 H transducer

With the Type NB 220 H transducer a relay drop-out is indicated by the yellow Sensor lamp ("Geber") going out (see Fig. 3).

### Type NB 220 QS transducer

With the Type NB 220 QS transducer a relay drop-out is indicated by the yellow Sensor lamp ("Geber") going out, an audible signal and a visual signal. The audible signal can be cancelled by pressing the Acknowledge button ("Quittierung"). The visual signal (red "Alarm" lamp) remains on for the time being and goes out if the level detector emerges or a fault has been remedied (short circuit, open circuit between the level detector and the transducer). The Overfill Protection System is primed again when the red lamp goes out (see Fig. 3).



*The above-mentioned alarm indicators can also be connected externally.*

### Type NB 220 QSF transducer

The Type NB 220 QSF transducer has an integrated scanner which constantly monitors operation of the PTC resistor. The properties of the PTC resistor, e.g. temperature rise and drop characteristics, are checked several times per second without affecting the live measuring process. The test function ensures that any PTC resistors which are no longer operating reliably on account of external influences (corroded sensor sleeve) are immediately detected and reported by causing the Overfill Protection System to respond. Since the power fed to the PTC resistor via the scanner is regulated accurately, maximum operating reliability and service life are guaranteed.

A relay drop-out is also indicated at the transducer by means of an audible signal and a visual signal. The audible signal can be cancelled by pressing the Acknowledge button ("Quittierung"). The visual signal (red "Alarm" lamp) remains on for the time being and goes out if the level detector emerges or a fault has been remedied (short circuit, open circuit between the level detector and the transducer). The Overfill Protection System is primed again when the red lamp goes out (see Fig. 3).



*The above-mentioned alarm indicators can also be connected externally.*

## 4 Installation



*During all work on the Overfill Protection System always observe the national safety and accident prevention regulations as well as all the safety instructions in this manual.*



*When setting up and operating the Overfill Protection System it is the regulations contained in the German Appliance Safety Act, the generally recognised rules of engineering and these operation instructions which apply.*



*During installation the sensor may only be located in a strong current of gas if it is provided with a sleeve to protect against increased movement of gas.*



*The transducer must be installed in closed rooms or in a housing with IP 54 protection.*

Position the level detector in the tank so that neither splashes of liquid nor an excessively high flow of gas can cause the Overfill Protection System to respond prematurely. The level detector should be as perpendicular as possible in order to prevent residual liquid from dripping off the sensor.

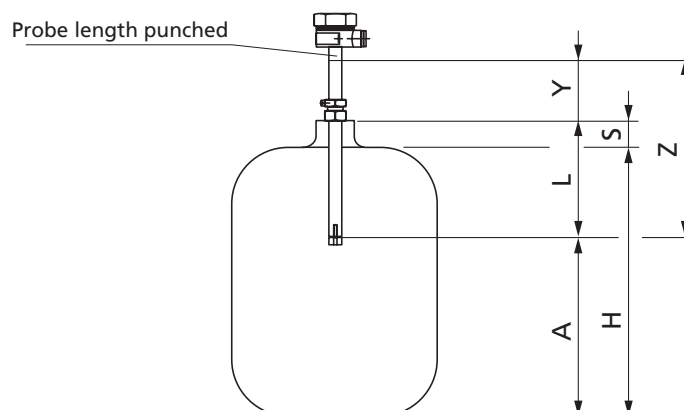


Fig. 4: Alignment dimensions of the level detector

With the permissible degree of filling in the tank you define the response level of the Overfill Protection System (see Fig. 4).



*The permissible degree of filling is calculated in accordance with the German Technical Rules for Combustible Liquids TRbF 280, para. 2.2. Take the operating delay time into account (see Section 7 "Technical data").*

The respective probe length (Z) is permanently marked with a punch above the marking groove at the top of the probe. It is the distance between the marking groove and the threshold point of the level detector (see Fig. 4).

To set the response length (L) as the distance between the hexagonal support of the screw-in body and the marking groove on the protective sleeve of the sensor at the bottom of the level detector, proceed as follows (see Fig. 4):

- Calculate the response length (L) depending on the tank dimensions and the response level (A).  
 $L = (H - A) + S$
- Set the calculated response length (L) on the level detector.



*Once the level detector has been fitted, the setting of response length (L), using the reference dimension (Y) (= distance between the marking groove at the top of the probe tube and the hexagonal support of the screw-in body) and the punched probe length (Z), can be checked to make sure it is correct, without removing the sensor.*  
 $L = Z - Y$

To fix the probe tube in place proceed as follows:

- Tighten up the stuffing box screw of the screw-in body and lock it by tightening up the lock screw.
- Provide the screw-in thread with suitable, resistant sealing material and screw it into the special tank sleeve.



*Since the response length (L) of the Type 76 M level detector cannot be varied (probe tube is fixed inside the screw-in body), this dimension has to be calculated and specified using the tank dimensions and the accurately calculated response length (A) before placing the order. The response length is permanently marked with a punch on the screw-in body of the level detector.*

The wiring between the level detector and the transducer must be performed with 2 x 1 mm<sup>2</sup> or 2 x 1.5 mm<sup>2</sup> cable. The length of cable must not be more than 500 m in the case of 1 mm<sup>2</sup> and 750 m in the case of 1.5 mm<sup>2</sup>.

Type 76 W, Type 76 C and Type 76 M level detectors are provided with a 2 x 1 mm<sup>2</sup> cable end, 3 m long as standard. The cable connection must be made via a suitable terminal box or inside the transducer direct.

The transducer is designed for wall mounting. To install more than one Overfill Protection System with a common alarm function it can be mounted in a control cabinet.

For the connections required to install the respective transducer please refer to the wiring diagrams in Fig. 5.

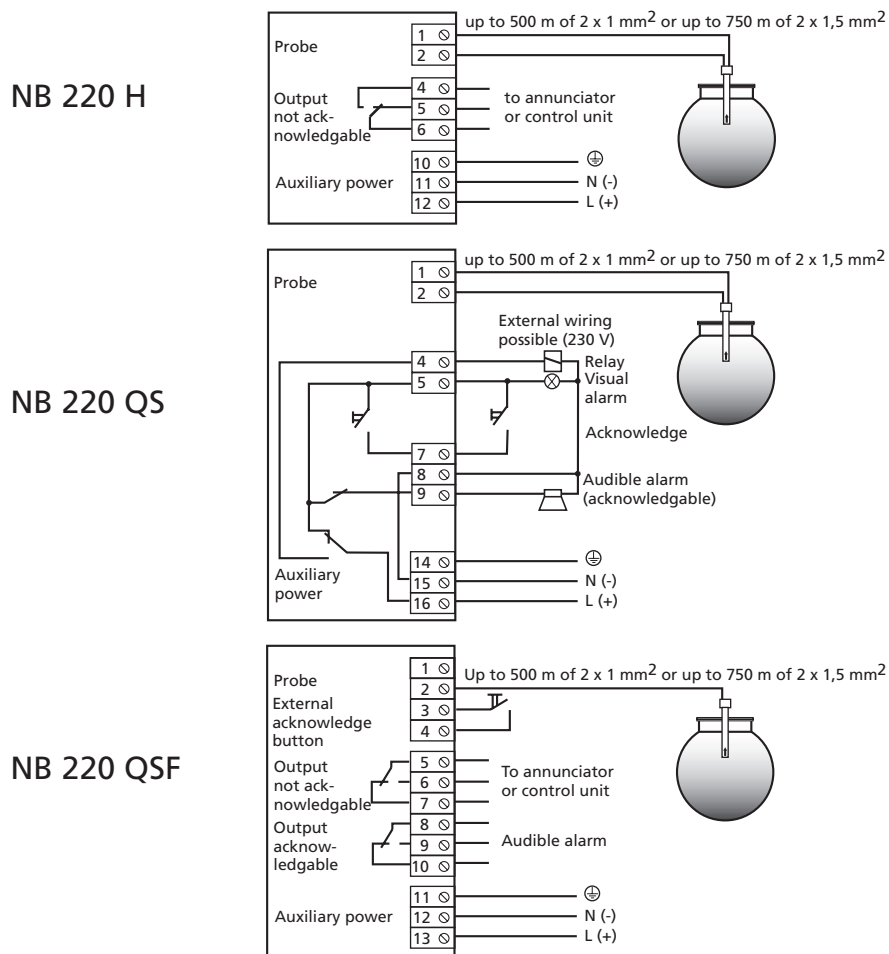


Fig. 5: Wiring diagram – Type NB 220 H, Type NB 220 QS and Type NB 220 QSF transducers

The transducer can be installed outside frost-proof rooms under atmospheric temperature conditions if it is fitted in a housing with at least IP 54 protection.

Before putting the system into operation check all the devices in the Overfill Protection System to make sure they have been connected up correctly and are operating properly. Also check the electricity supply, including that to the downstream devices. Observe the appropriate operating instructions for the respective devices.

## 5 Regular testing



*Check the Overfill Protection System at regular intervals, but at least once a year, to ensure that it is in good working order. It is the user's responsibility to choose the type of test and the intervals.*



*Type NB 220 QSF transducer can be checked to make sure that it is working properly by pressing the "Test" button (see next section "Type NB 220 QSF transducer").*

Perform the test in such a way that evidence is provided that the Overfill Protection System operates properly when all its components interact with one another.

This interaction takes place when the response level is reached during a filling procedure. If it is not practicable to fill up to response level, the level detector must be made to respond by means of a suitable simulation of the level or the physical measuring effect.

If the level detector/transducer is otherwise identified as being in good working order (excluding faults hindering its function), the test can also be carried out by simulating the corresponding output signal.



*For further information about methods of testing, please refer to VDI/VDE Guideline 2180, Sheet 4.*

### Testing Type NB 220 QSF transducer

Operation of the Overfill Protection System can be tested with the aid of the Test button ("Prüfen") integrated into the Type NB 220 QSF transducer.

Keep the Test button ("Prüfen") pressed. After a maximum of two seconds the "Alarm" lamp should have lit up red with an audible signal. After the heating time the Overfill Protection System is primed again.

If after pressing the button no alarm signal is triggered, or only one, the Overfill Protection System must be tested immediately.

## 6 Fault diagnosis

If there is a power failure, the green Operation lamp ("Betrieb") on the transducer will go out.

If device fuses blow or there is a short circuit in the signal cable between the level detector and the transducer, the relay in the transducer will drop out and switch the downline circuit. If a relay drops out, the Overfill Protection System responds in the same way as if the response level had been reached.



***On the Type 220 QS transducer external annunciators and control units must be placed between terminals 4 and 8 of the device to monitor the supply of auxiliary power in accordance with the certification rules for overfill protection systems (see Fig. 5).***

## 7 Technical data

### Level detector Type 76

Temperature range:	Media: -25°C to +50° C, -25°C to +80° C
Pressure range:	0 to 2 bar
Media compatibility:	<p>For combustible liquids: Diesel fuel (DIN 51 601); light fuel oil (DIN 51 603, Part 1) used transmission oils and engine oils; hexanol 1; aceto-acetic ethyl ester (aceto-acetic ester); acrylic acid-2-ethyl hexyl ester (2-ethyl hexyl acrylate); cyclohexyl acetate; benzaldehyde; aceto-acetic methyl ester; nitrobenzene; 1.2-dichlorobenzene; 2.4-dimethylaniline (N,N-dimethylaniline); n-octanol (n-octyl alcohol); diethyl oxalate; aniline</p> <p>For non-combustible, water-contaminating liquids: Unused engine oils, transmission oils, hydraulic fluids; transformer oils; vegetable oils; anti-freeze; oil/water mixtures (e.g. drilling oils and lubricating oils); detergent/water mixtures; perchlorethylene, per- and trichlorethylene, as well as comparable liquids with an equivalent thermal conductivity</p> <p>Materials of the parts coming into contact with media: brass: 2.0332 stainless steel: 1.4301 to 1.4571 (DIN 17440) spring steel: 1.248, galvanised (DIN 17222) solder: L-Sn 40 Pb Viton: FPM Linear polyester: Ultradur</p>
Immersion switch delay:	< 2 seconds
Temperature rise time/ release time at ambient temp.:	< 2 min at -25 °C, < 15 sec at +80 °C
Housing protection:	IP 67

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## Transducer Type NB 220

Auxiliary power:	
NB 220 H/QSF	24 V, 110 V, 230 V, 50 Hz or 24 V DC
NB 220 QS	230 V, 50 Hz
Power input:	4 VA / 6 W
Ambient temperature: -25 °C to +60 °C	
Housing protection:	IP 40
Outputs:	
NB 220 H	1 floating change-over contact AC: < 250 V; < 4 A, $\cos\varphi > 0.7$ ; 500 VA max. DC: < 250 V; < 0.25 A, 50 W max.
NB 220 QS	Pump, sol. valve, etc.: 230 V, 50 Hz, 50 W max. External lamp: 230 V, 50 Hz, 100 W max. External acknowledge button: 230 V, 50 Hz External horn: 230 V, 50 Hz, 50 W max.
NB 220 QSF	1 floating change-over contact, not acknowledgeable 1 floating change-over contact, acknowledgeable AC: < 250 V; < 4 A, $\cos\varphi > 0.7$ ; 500 VA max. DC: < 250 V; < 0.25 A, 50 W max.
(acknowledge circuit)	Voltage < 12.6 V, current < 20 mA, power < 60 mW
Inputs:	Level detector input: two-core, no polarisation, max. cable length 750 m for 1.5 mm <sup>2</sup>
Dimensions:	
NB 220 H	110 x 50 x 110 mm <sup>2</sup>
NB 220 QS	150 x 75 x 110 mm <sup>2</sup>
NB 220 QSF	163 x 97 x 62 mm <sup>2</sup>

