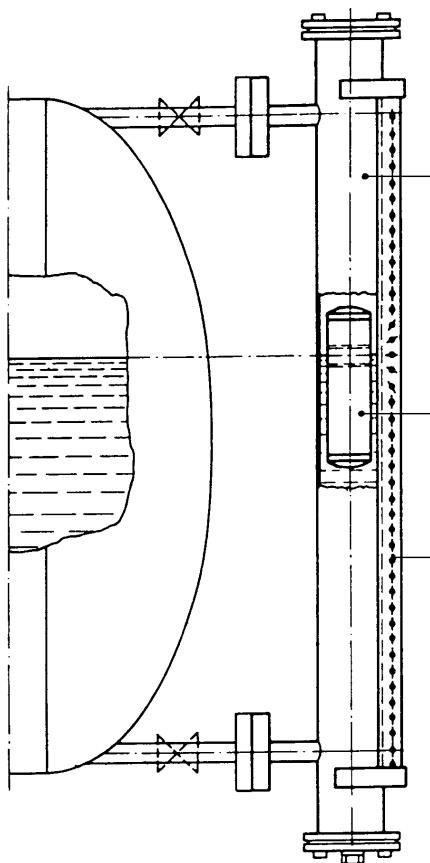


# Operating Instruction



## Mini Bypass Level Indicator

**Model: NBK-M**



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## 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.

These instruments are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

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## 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition. Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**What's included in the shipment:**

The standard delivery includes:

- Level Indicator model: NBK-M
- Operating Instructions

**Note:** If switches were ordered as an option, they will not be attached to the level indicator. They are packed inside the shipping container. Be sure to check the packaging for any extra items.

Please inspect the devices using the packing slip. All options are listed here.

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## 4. Regulation Use

Any use of the model: NBK-M which exceeds the manufacturers specification may invalidate its warranty. Therefore any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

The NBK-M Mini Bypass Level Indicator is used for continuous measurement, indication, and monitoring of liquids in tanks, vessels, reservoirs, basins etc. Information is displayed on a magnetically coupled roller indicator.

## 4.1. Bypass measuring tube system

The bypass tube is attached at the side of the vessel with a connecting flange or a threaded coupling. The installation position is always vertical. The NBK should only be used for liquids with the medium density specified on the nameplate. Otherwise the indication may be in error or the float may submerge and give no level indication. Vessel inner pressure and medium temperature should not exceed the specified maximum values, as this can lead to instrument damage or personnel injury. It is imperative to ensure that the level indicator wetted materials are chemically resistant to the liquid being measured.

Proper operation is also impaired by:

- High degree of soiling
- Solids
- Crystallization
- Ferrite particles

## 4.2. Adjustable setpoint switches (option)

The optional adjustable switches serve to signal a preset level.  
Important!

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**Attention !**

**Observe the maximum electrical ratings for the switches.**

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Maximum values	Standard contact	High temperature contact
Breaking capacity:	40 VA	80 VA
Switching current:	0.8 A	1 A
Switching voltage:	230 V	220 V

## 4.3. Variable Resistance Transducer (options..M & W..)

The optional remote electrical sensor converts the liquid level to a resistance value (Option W). A version of this transducer can also be supplied with an integral 4-20 mA transmitter (Option M).

**Please note max. medium and ambient temperatures.**

#### **4.4. Magnetostrictive Level Transmitter (option..T..)**

Remote level transmission can be achieved by mounting a magnetostrictive sensor outside the bypass tube. A continuous standard 4 to 20 mA signal is obtained with a built-in transmitter. This signal can then be displayed on analog or digital indicators, or taken as an input to a computer system.

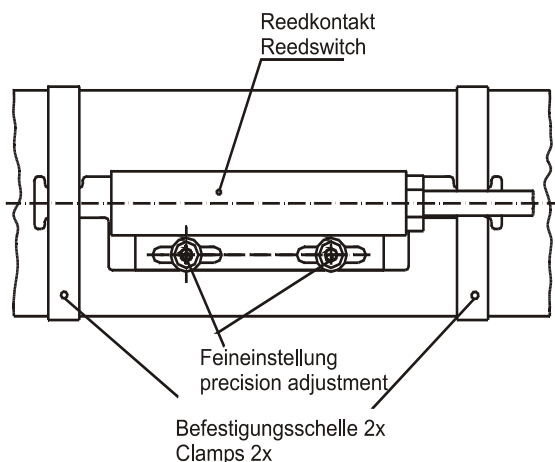
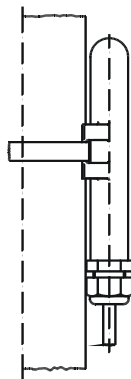
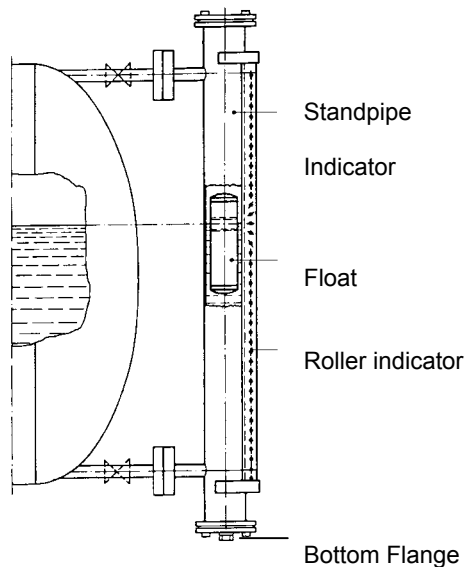
### **5. Operating Principle**

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The NBK-M is a bypass tube which is attached to the top and bottom of a vessel. The liquid level in the bypass tube will equalize with the liquid level in the vessel and will therefore correspond to the level in the vessel to which it is attached. A float with flush-encased magnet in the bypass tube follows the liquid level. The magnetic float activates a roller indicator that is externally attached. As the float passes by, the red/white rollers rotate through 180° about their own axis. Red indicates the actual level, whereas white means no level. The actual tank level is read at the red/white roller interface.

The float's magnetic field propagates in an annular fashion 360° around the periphery of the float. For this reason, the roller indicator, switches and level transducer can be mounted anywhere on the external portion of the bypass tube within the limits of float travel.

## 6. Mechanical Connection



Remove bottom flange from bypass tube, and insert the cylindrical float in the NBK bypass tube with the designation "TOP" at the top. Re-position the gasket and close the bottom flange again; firmly tighten the flange bolts. Mount and tighten the bypass tube to the vessel to be monitored with process connection and seal.

**Normally it is sufficient to fix the complete NBK with both process connections. However should the NBK be subjected to constant shock or strong vibrations it is recommended that the instrument is secured with rubber-damped pipe clamps.**

To allow for dis-assembly, cleaning and maintenance, the bypass tube should never be welded.

Mount and tighten the **magnetic roller indicator** - if not already mounted - on the bypass tube with the two accompanying clamps.

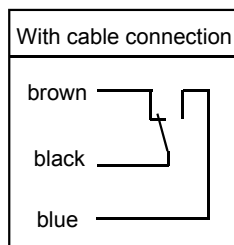
Mount and tighten the **Switches** - if supplied, on the bypass tube with the accompanying clamps. The roller indicators must be loosened so that the switch clamps can be inserted behind the roller indicator prior to tightening.

The switches may be adjusted on the bypass tube to meet the users set point requirement. The cable connection must point downwards. Tighten the switch clamps securely. The switch must be snug against the bypass tube. The switch may not function if a gap exists between the switch housing and bypass tube.

Mount and tighten **remote sensor** - if available and not already mounted - on the bypass tube with the supplied clamps. The cable terminal box is to situated at the top of the bypass tube assembly.

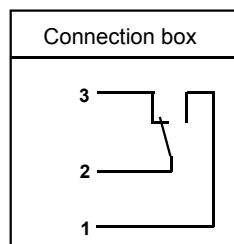
## 7. Electrical Connection

### 7.1. Switch (option)



Connect switch (if available) according to the diagram.

When switching inductive loads, such as, contactors, relays, etc, electrical limit values should not be exceeded (even for short periods) e.g. by voltage peaks. The use of a contact protection relay is recommended to avoid overloading the switches.



Valid regulations for hazardous areas and installation regulations, should be observed when installing the NBK level indicator in hazardous areas.

### 7.2. Resistive Level Transducer (option ..W..)

- Ensure that the electrical supply lines are de-energized.
- To avoid faults caused by electrical fields from other circuits, the cable should not be laid in conduits with power cables.
- Unscrew cover and pull supply lines through cable gland.
- Connect the transmitter to the electronics according to the following table.

	Transducer "top"	Transducer "bottom"	Variable Tap	
<b>Silicon cable</b>	White	brown	green	
<b>PVC cable</b>	White	brown	green	
<b>FEP cable</b>	Brown	blue	black	
<b>Terminal box</b>	Terminal 1	terminal 2	terminal 3	
<b>Internal*</b>	Yellow	red	black	

**\*Please note: The colors of internal cables are for internal connections only and therefore can only be seen in transducers with terminal box.**

When connecting transducer to a Kobold transmitter, for example models DFA, DST or DFM, please read the relevant operating instructions.

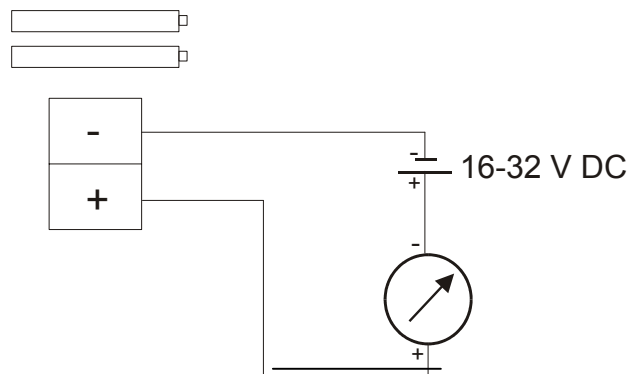
## Service in hazardous areas

To operate the transducer in hazardous areas, the measuring circuit must contain the appropriate intrinsic safety barrier to separate intrinsically safe circuits from non-intrinsically safe circuits. Specially designed liquid level transducers with a total resistance of 40 k Ohm are required for this purpose. Only the resistive transducer (option W) can be installed in hazardous locations. Resistive transducers with transmitter and the magnetostrictive transducers are not suitable for installation in hazardous locations.

**CAUTION: Installers must be familiar with all local and national codes concerning electrical device installation in hazardous locations.**

## 7.3. Resistive Level Transducer with Transmitter (option ..M..)

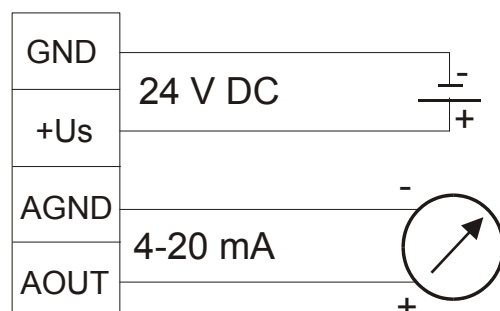
- Ensure that the electrical supply lines are de-energized.
- To avoid faults caused by electrical fields from other circuits, the cables should not be laid in conduits with power cables.
- Unscrew cover and pull supply lines through the cable gland.
- Connect the transmitter according to the terminal connection diagram below.





## 7.4. Magnetostrictive Pick-up with 4-wire Transmitter (option ..T..)

- Ensure that the electrical supply lines are de-energized.
- To avoid faults caused by electrical fields from other circuits, the cables should not be laid in conduits with power cables.
- Unscrew cover and pull the supply lines through the cable gland.
- Connect the transmitter according to the terminal connection diagram below.



## 8. Startup

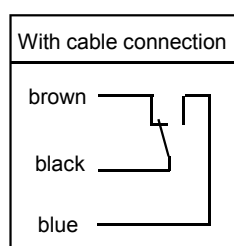
Fill vessel, and switch on the electrical controller, if present.  
The entering liquid lifts up the float and thus the coupled magnet actuator. The roller indicator indicates the liquid level.

### Commissioning of electrical reed switches

#### Function of switches

All switches have three connection poles (black (2), blue (3) and brown (1)).  
The black wire (2) is the common pole for both switching functions (N/C and N/O contact).

	<b>black (2) / blue (1)</b>	<b>black (2) / brown (3)</b>
float above	closed	open
float below	open	closed



The float must pass the switch once in both directions so that the switching function is in line with the wiring diagram and table on page 10.

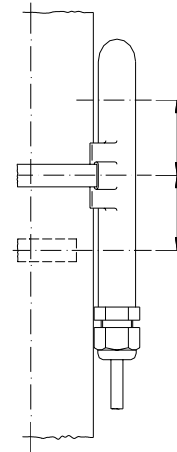
Note that the switch cable must point downwards.

These instructions are often ignored when an alarm lamp is connected and it is assumed that the switch is damaged.

When the switch has passed in both the directions, it is ready for operation and requires no maintenance.

## Hysteresis

Hysteresis is the difference between contact closing and opening points. A hysteresis of approximately 15 mm float movement is achieved by factory tuning of the float magnet and the contact.



## 9. Trouble Shooting

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### **Error: The tank is full but there is no indication**

- Check that the float is present in the system.
- If the float is present, check whether it is being blocked by foreign objects or dirt deposits.
- Check the op. SG of the float and the medium if the liquid density is too low for the float it will sink and not provide indication.

### **Error: The tank is full but the indication is too low.**

- Check that the density of the liquid is in accordance with the density prescribed on the indicator nameplate.
- Check that the float has been correctly installed.
- Check if dirt deposits in the over-head tube are blocking the float.

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## 10. Technical Information

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Bypass tube:	Ø 40 mm (1.57")
Material:	1.4571/316 SS
O-Ring (Ground flange):	Buna-N (other materials as options)
Operating pressure:	PN 6/16/40 (87/232/580 PSIG)
Service temperature:	to 120°C (250°F) with polypropylene rollers to 200°C (390°F) with ceramic rollers
Viscosity:	max. 200 centistoke
Max. measuring length:	to 3000 mm (120") one-piece
Total length:	according to measuring length, see dimension drawing
Float:	titanium, closed Special versions on request
PED 97/23/EG	Art. 3 § 3, Diagram 1, Gr. 1 No CE- mark

### **Limit contacts model NBK-R, NBK-REx**

Contact operation:	bistable changeover contact
Switching hysteresis:	approximately 15 mm
Switching capacity:	60 W/VA; 230 V <sub>AC/DC</sub> , 1.0 A (NBK-R)
Process temperature:	max. 100 °C (212°F)
Ambient temperature:	max. 75 °C (170°)
Protection type:	IP 67/NEMA 4X
Connection:	3 Ft. PVC cable
Case:	plastic

### **Limit contacts model NBK-RT200, NBK-RT400**

Contact operation:	bistable changeover contact
Switching hysteresis:	approximately 15 mm
Switching capacity:	80 VA; 250 V <sub>AC</sub> ; 1A
Process temperature:	RT200 = 200 °C / RT400 = 400 °C
Protection type:	IP 65 NEMA 4X
Design:	aluminium pressure casing, terminal connection

### **Resistive Level Transducer: Option...W...**

Total resistance:	approximately 5 kΩ
Measuring-circuit voltage:	max. 24 V <sub>DC</sub>
Measuring current:	max. 0.1 A
Medium temperature:	max. 200 °C (390°F)
Ambient temperature:	max. 130 °C (265°F)
Protection type:	IP 65 NEMA 4
Resolution:	±10 mm (0.4") for measuring length < 78" ±20 mm (0.8") for measuring length > 78"

### **Transmitter model: ...M...**

## **Resistance Transducer with 2-wire transmitter**

Output:	4-20 mA
Auxiliary power:	16-32 V <sub>DC</sub>
Load:	(U <sub>B</sub> -9 V) /0.02 A [ $\Omega$ ]
Medium temperature:	max. 130 °C (265°F)
Ambient temperature:	max. 80 °C (176°F)
Protection type:	IP 65/NEMA 4
Resolution:	$\pm 10$ mm (0.4") for measuring length < 78" $\pm 20$ mm (0.8") for measuring length >78"

## **Transmitter model: ...T...**

### **Magnetostrictive sensor with 4-wire transmitter**

Output:	4-20 mA
Load:	max. 500 $\Omega$
Max. length:	4000 mm (160")
Supply voltage:	24 V <sub>DC</sub> , max. 150 mA
Power consumption:	< 5 W (without load)
Accuracy:	$\pm 1$ mm
Medium temperature:	max. 120°C (250°F)
Ambient temperature:	max. 80°C (176°F)
Protection type:	IP 65/NEMA 4X

## 11. Order Codes

Model	Nominal Pressure	Connection	Nominal Diameter	Roller Indicator	Transmitter	Medium Density	Optionsn
<b>NBK-M</b>	1= PN 6 (not for ASME-Fl.)	F= DIN Flange	10= DN 10 (only for DIN Fl.)	0= without	0= without	8= from 0.8 g/cm <sup>3</sup>	0= without
	2= PN 16 (150 lbs)	A= ASME-Flange	15= DN 15, 1/2"	P= PP-rollers	T= magnetostrictive	1= from 1.0 g/cm <sup>3</sup>	...= (see list)
	3= PN 40 (300 lbs)	R= R-Thread	20= DN 20, 3/4"	K= ceramic rollers	W= resistive		
		N= NPT-Thread	25= DN 25, 1"		M= resistive with transmitter		
<b>NBK-R</b>	Standard limit contact						
<b>NBK-Rex</b>	Limit contact-Eex d IIC T6						
<b>NBK-RT200</b>	High-temperature contact max. 200 °C						

## 12. Maintenance

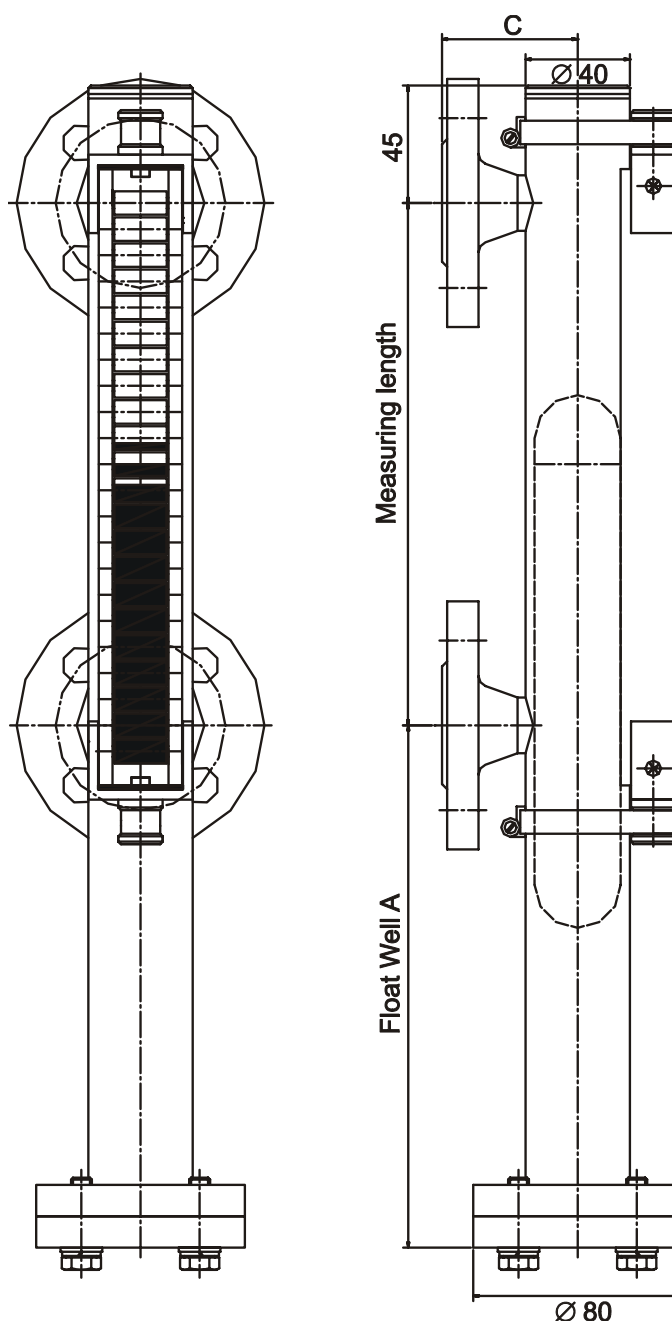
The drain plug should be opened now and again, to wash out any deposits in case the liquid to be measured contains dirt particles, which could settle in the bypass tube. If coatings have formed, the tank must be emptied or shut off; the lower cover flange must then be removed. The float should then be removed carefully from the vessel. The bypass tube can now be mechanically cleaned.

The inspection window for the roller indication is made of high-quality plexiglass (glass for high-temperature display). It should be cleaned with a suitable cleaning agent.

The indicator requires no further maintenance.

## 13. Dimensions

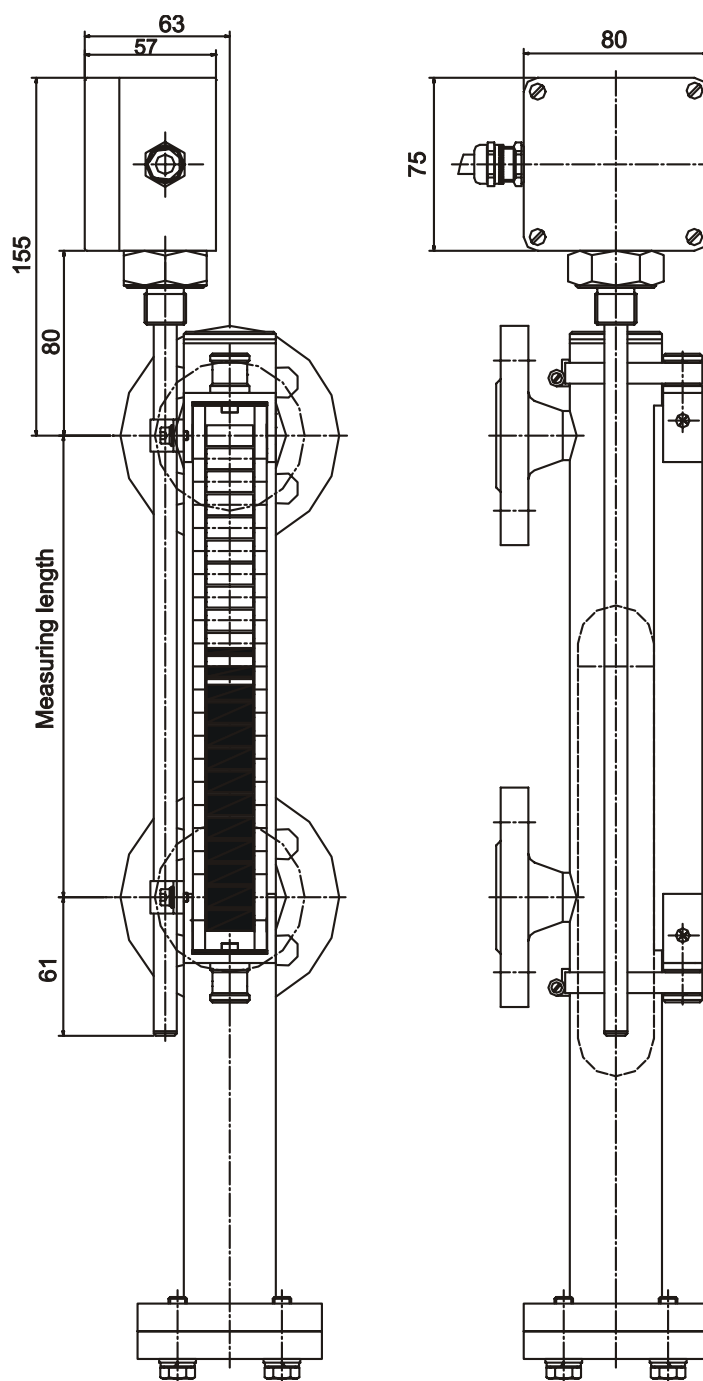
NBK-M with roller indication (millimeters)



Dimension C [mm] for DIN V-Flange

Model	DN 10	DN 15	DN 20	DN 25
PN 6	46	47	47	46
PN 16	53	52	53	49
PN 40	53	55	55	51

## NBK-M with roller indicator and magnetostrictive transmitter (millimeters)



### Dimension C [mm] for ASME V-Flange

Model	1/2"	3/4"	1"
150 lbs	46	47	47
300 lbs	53	52	53

Dimension C for R- or NPT thread: 60 mm

Dimension A:      Medium density 0,8 g/cm<sup>3</sup>: 285 mm  
                          Medium density 1,0 g/cm<sup>3</sup>: 180 mm

## 14. Options

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- B Display model ADI-B with bar graph, sturdy aluminum housing, mounted on bypass tube, for description, see brochure Z2
- C Display model ADI-K with bar graph and digital display, sturdy aluminum housing, mounted on bypass tube, for description, see brochure Z2
- D Display model ADI-D with digital display, sturdy aluminum housing mounted on bypass tube for description, see brochure Z2
- E1 Drain flange DN 15, stainless steel 1.4571
- E2 Drain flange DN 20, stainless steel 1.4571
- E3 Drain flange, ASME 1/2", stainless steel 1.4571
- E4 Drain flange, ASME 3/4", stainless steel 1.4571
- L1 Drain valve G 1/4, stainless steel 1.4571
- L2 Drain valve 1/4 NPT, stainless steel 1.4571
- H1 Rinsing connection DN 15/PN 16, top and bottom
- H2 Rinsing connection ASME 1/2", 150 lbs, top and bottom
- M1 Measuring scale to 200°C, aluminum backing, engraved scale
- M2 Measuring scale to 120°C, aluminum backing, polyester foil scale
- P Radiographic examination DIN 54111 T1
- Q Dye penetration test DIN 541152
- X Pressure test with water 1.5 x PN
- Z 3.1 B certificate as per EN 10204
- R1 Drain screw, bottom, G 1/4, PTFE gasket
- R2 Drain screw, bottom, 1/4 NPT, no gasket
- W1 O-ring material (bottom flange): Viton
- W2 O-ring material (bottom flange): silicone
- W3 O-ring material (bottom flange): PTFE
- W4 O-ring material (bottom flange): Kalrez/Chemraz