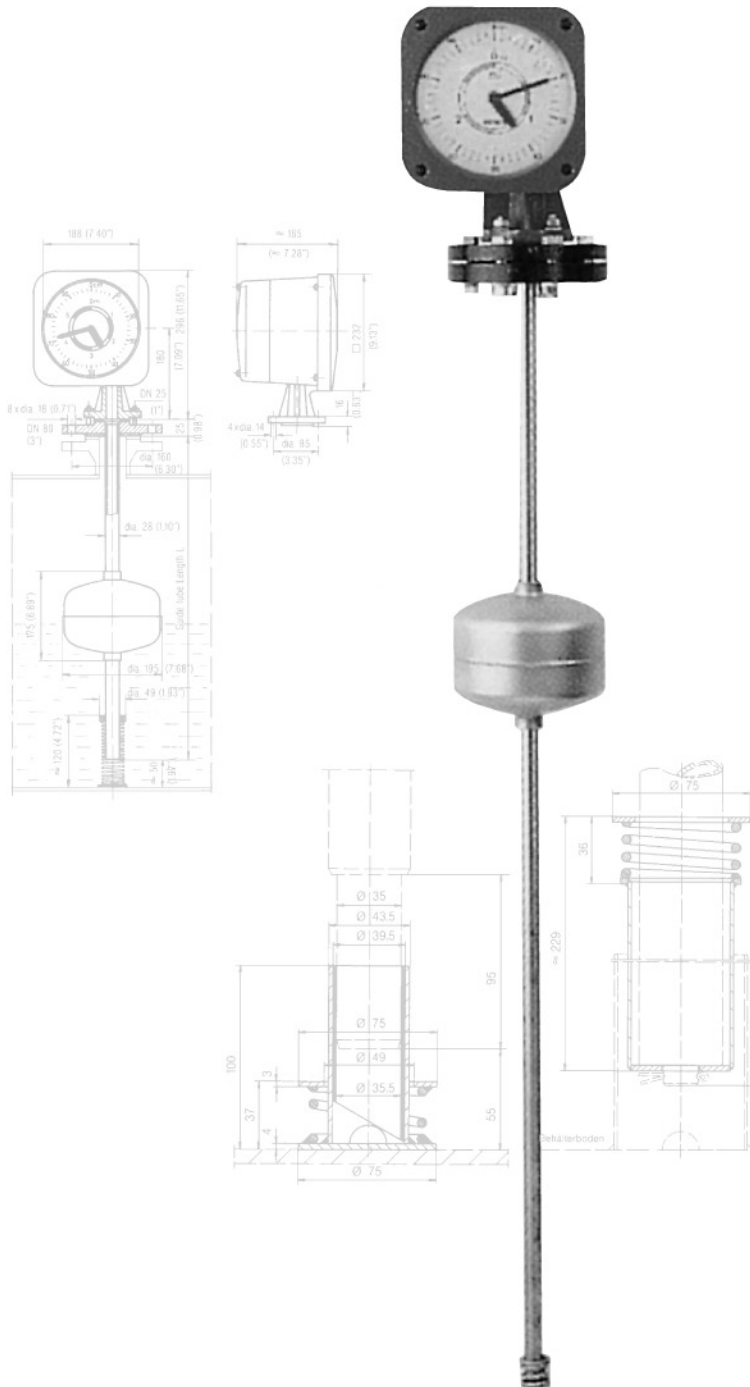


## Installation and operating instructions Liquid level instrument

### BM 51



Variable area flowmeters

Vortex flowmeters

Flow controllers

Electromagnetic flowmeters

Ultrasonic flowmeters

Mass flowmeters

**Level measuring instruments**

Communications technology

Engineering systems & solutions

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### Product liability and guarantee

The BM 51 level gauge is suited specifically, for measuring liquid levels in open-topped or pressurized vessels and tanks. Their use in hazardous areas is subject to special regulations.

### 1. Brief description

The BM 51 level gauge is used for measuring liquid levels in open-topped or pressurized vessels and tanks. It can be equipped with electrical limit switches or with an electrical or pneumatic data teletransmission system.

#### Scope of supply

- Indicator housing with follower magnet and complete set of parts for connection to the mounting flange (1 gasket, 4 screw bolts, 4 washers, 4 nuts)
- Float
- Guide tube with connection flange

### 1.2 Official approvals

Application	Approved by	Instrument version	Certification mark
<b>Only with explosion protection</b> In stationary storage tanks for flammable, water-endangering liquids of dangerous-materials classes AI, AII and B (excl. CS <sub>2</sub> ), float and guide tube in Zone 0	Physikalisch-Technische Bundesanstalt (PTB)	BM 51/.../Z0 BM 51/.../P/Z0 BM 51/.../K/Ex/Z0 BM 51/.../ES/Ex/Z0	PTB-Nr. III B/S 1167 PTB-Nr. III B/S 1932 PTB-Nr. Ex-83/2014 PTB-Nr. Ex-83/2014
<b>Overflow protection with explosion protection</b> In stationary storage tanks (not pressure vessels**) for flammable, water-endangering liquids of dangerous-materials classes AI, AII and B (excl. CS <sub>2</sub> ), float and guide tube in Zone 0	PTB	BM 51/.../K-F/Ex/Z0 BM 51/.../ES-F/Ex/Z0 BM 51/.../P-F/Z0	PTB-Nr. Ex-83/2055 F PTB-Nr. Ex-87/2073 F PTB-Nr. III B/S 1933 F
<b>Overflow protection without explosion protection</b> In stationary storage tanks (not pressure vessels**) for flammable, water-endangering liquids of dangerous-materials class A III	PTB	BM 51/.../K-F/WB BM 51/.../ES-F/WB BM 51/.../P-F/WB	PTB-Nr. III B/S 1816 F PTB-Nr. III B/S 1934 F PTB-Nr. III B/S 1933 F
<b>Only with explosion protection</b> in stationary storage vessels for flammable, water-endangering liquids, certification applicable in Europe and Federal Republic of Germany (excl. VbF zones)	BASEEFA	BM 51/.../ES/Ex BM 51/.../K/Ex	BAS-No.: Ex 832330 BAS-No.: Ex 832330
<b>Overflow protection without explosion protection</b> In stationary storage tanks (not pressure vessels**) for non-flammable, water-endangering liquids	Institut für Bautechnik (IfBT)	BM 51/.../K-F/WN BM 51/.../ES-F/WN BM 51/.../P-F/WN	Approval Notice PA-VI 810.13 Approval Notice PA-VI 810.28 Approval Notice PA-VI 810.23
<b>Overflow protection for cargo tanks</b> Approved for water, lubricating oil, fuel oil, diesel oil, heavy oil, gas oil, bulk oil and cargoes of all dangerous-materials classes and categories on Class GL vessels	Germanischer Lloyd	BM 51/.../K	Certification No. 89775 HH

\* Meaning of symbols

K = Limit contacts	Ex = Explosion-protected equipment
ES = Electrical signal output	Z0 = Use in Zone 0, for water-endangering, flammable liquids
P = Pneumatic signal output	WN = for water-endangering, non-flammable liquids
F = Part of overflow protection system	WB = for water-endangering, flammable liquids AIII

\*\* max. operating pressure is 3 bar

#### Note:

Certified devices are not standard versions! Deviations in design and technical data are possible!

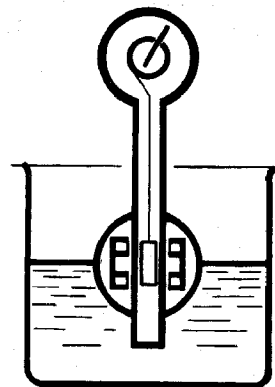
Responsibility as to suitability and intended use of these variable-area flowmeters rests solely with the operator.

Improper installation and operation of the flowmeters may render guarantee void.

In addition, the "General Conditions of Sale" which form the basis of purchase order contracts are applicable.

### 1.1 Measuring principle

A float with built-in magnet system is guided on a non-magnetic tube. It follows the liquid level in the vessel, thereby causing the magnet system to move the follower magnet inside the tube. Changes in level are transmitted via a flexible wire cable to a measuring drum. The weight of the follower magnet is balanced by a spring motor. System operation is thus non-interacting. The indicating device and teletransmission system are actuated by the measuring drum via a toothed gearing.



## 2. Installation

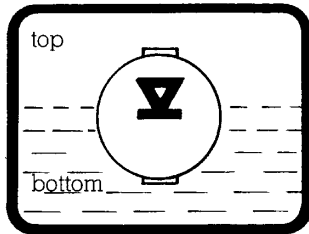
The float guide tube forms a gas-tight and pressure-resistant partition between the liquid chamber and the magnetic data transmission system.

The float is designed for a specified liquid and specified operating conditions. Its depth of immersion is determined by its weight and the density of the liquid, and is marked at the appropriate level by an inverted triangle.

- Before installation, remove stoppers and protective covers from the indicator housing flange and the guide tube connecting flange.
- If possible, do not install during rain or snowfalls.
- Use compressed air or a special pump to remove moisture (condensation).
- Position gasket on mounting flange.
- Remove limit stop:
  - CrNi steel 1.4571: secured with split pin
  - PTFE: screwed to guide tube
  - Polypropylene (PP): secured with hexagon socket screw
- Insert guide tube through mounting flange into the tank.
- Appropriately refit and secure limit stop, depending on type.

On the PTFE and PP versions, the limit stop must be screwed down firmly to form a tight seal; the product should not seep into the guide tube.

**Right side up:** identification plate shows "top" and "bottom", red triangle inverted.

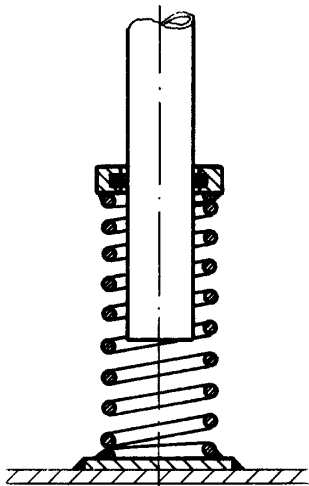


On versions where the pipe diameter of the vessel flange is bigger than the float diameter, the float can first be fitted to the guide tube and then both inserted through the mounting flange into the tank.

### Tank bottom attachment for guide tube

If the level gauge is to be installed in ships or where moving liquid levels in general are concerned, a tank bottom attachment is recommended to prevent buckling of tubes in excess of 3 m length. The bottom attachment of guide tubes longer than 3 m is officially required for level gauges used in Zone "O" categories.

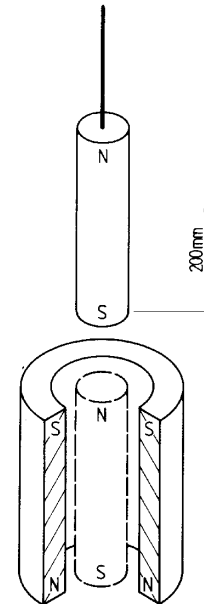
Weld the tube attachment to the tank bottom in alignment with the connecting flange.



Allow for vertical and horizontal play of the guide tube.

## 3. Start-up

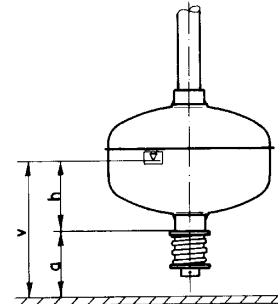
- Place indicator housing on its side on a firm support on a level with the connecting flange.
- Place gasket on the connecting flange.
- Thread the wire cable through the hole in the follower magnet and knot the end.
- Attach a rope clamp to act as lift limiter approx. 200 mm above the follower magnet.
- Pay off wire cable uniformly from the measuring drum against the force of the spring motor, and lower the follower magnet down into the guide tube.
  - Polarity of follower magnet: north at top, south at bottom; vice versa for float ring magnet.
- Accordingly, like poles (repelling one another) meet first.
  - Lift follower magnet approx. 200 mm and let it fall freely through the repelling magnet system. It will then be held by the magnet system in the float.
  - To check: greater resistance should be noticed when tugging on the wire cable, or when turning the measuring drum if the level gauge is of the built-in type. The magnetic bonding force is approx. 0.9 kg.
- Do not bend or damage the wire cable in any way.
- Position the indicator housing on the guide tube flange and screw it down.
  - The wire cable is kept taut by the spring motor.



### Presetting dimension "V"

The indicator system cannot indicate "0" m level in empty tanks because allowance must be made for the depth of immersion of the float and the limit stop on the guide tube.

Presetting dimension "V" is the distance between the red triangle on the float and the bottom of the tank.



$$V = a + h$$

a = distance between tank bottom and top edge of limit stop on guide tube

h = float's depth of immersion

Dimension "a" will be specified in the tank drawing or must be measured in the tank.

Immersion depth "h" is marked on the float (refer to Section 2. Installation), or can be read off from the relevant float chart (Section 6) "depth of immersion vs. product density".

## Adjustment of the measuring system

- Make sure that the float is resting against the limit stop of the guide tube in the empty tank.
- Determine presetting dimension "V".
- Remove the large "centimetre" hand.
- Set via slip coupling the small "metre" hand to presetting dimension "V" on the metre scale.
- Replace "centimetre" hand, set to presetting dimension, and tighten the fixing screw.
- Check movement of the hands on the scale by lifting the float.
- Remove stick-on labels from float and guide tube (contamination of liquid).
- Seal and screw down both housing covers.
- Screw down front cover – with notch at bottom.

## Level gauges for low-temperature installations

For installations operating below 0°C, the air in the guide tube and indicator housing must be replaced by nitrogen, otherwise condensed moisture from the air would cause the follower magnet to freeze fast in the guide tube.

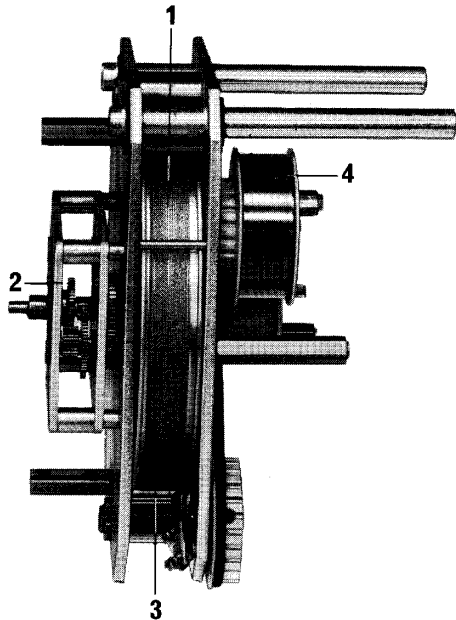
- Insert a hose down to the bottom of the guide tube.
- Flush first the tube then the housing with nitrogen.
- To absorb residual moisture, place a bag of silica gel in the indicator housing before sealing and screwing down.

When flushing the level gauge with nitrogen, make sure that the applied internal pressure of max. 0.05 bar (0.005 MPa) is not exceeded.

## 4. Maintenance

After approx. 1 year's operation, lubricate the journals in the indicator system and the windings of the spring motor with resin- or acid-free oil.

If liquids are contaminated or contain solids with a settling tendency, clean the guide tube and float slide at regular intervals to ensure free movement of the float.



### BM 51 measurement mechanism without auxiliary gearing

- 1 Measuring drum
- 2 Pointer gearing
- 3 Spindle for cable guide
- 4 Spring motor

## 5. Options (ES..., P..., K...)

All level gauges can be fitted with optional equipment. Actuation is transmitted via an auxiliary gearing from the measurement mechanism to the transducer or limit switches.

## 5.1 Electrical signal output ...ES

The KINAX 5W1 angle-of-rotation transducer (make: Camille Bauer) is built into the indicator housing to convert liquid level data into an impressed current of 0(4) to 20 mA.

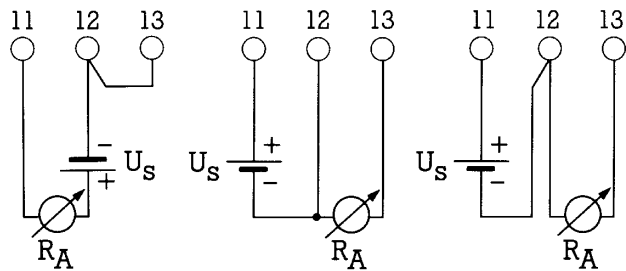
The KINAX 5W1 is also suitable for use in hazardous areas if powered by an intrinsically safe circuit.

In terms of explosion protection, the KINAX 5W1 angle-of-rotation transducer functions like a passive dipole. It may be installed in hazardous areas providing the power supply is obtained from a voltage source with certified intrinsically safe circuit.

The supply power must be a DC voltage that can be drawn from an existing DC source or from power supply units (rectifier, transducer feeder unit).

All instruments powered by the measuring circuit (indicators, recorders) to be series-connected and must not exceed the maximum load of the angle-of-rotation transducer.

### Connection diagrams



4 to 20 mA

2-wire circuit

0 to 20 mA

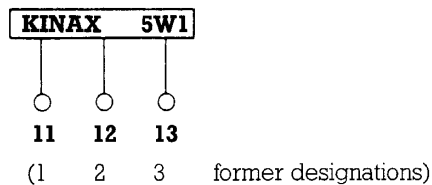
3-wire circuit

0 to 20 mA

4-wire circuit

$U_s$  supply voltage  
 $R_A$  external resistance

### KINAX 5W1 connection terminals

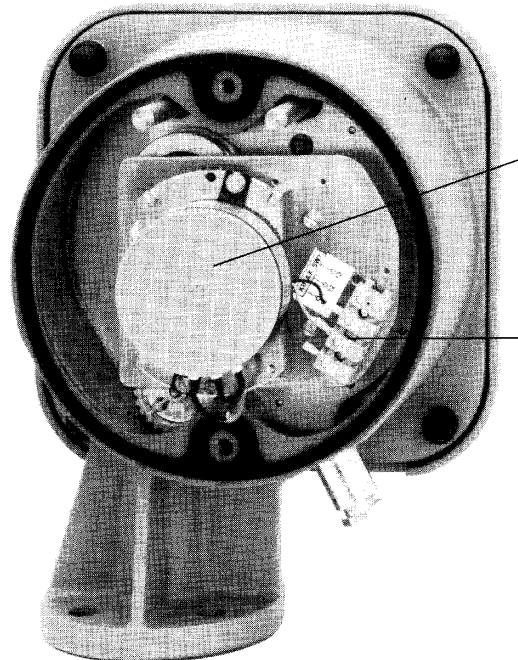


### Adjustment of the electrical signal output

1. Instrument required: 0 to 20 mA milliammeter.
2. Set presetting dimension "V".
3. Connect angle-of-rotation transducer as shown in the circuit diagram together with a local indicating instrument, and switch on.
4. The angle-of-rotation transducer has, as ordered, been factory-set to 0–100 % measuring range. These values are not identical with the full-scale range (e.g. measuring range 0 to 3.8 m, but full-scale range 6.0 m).

	at 0 to 20 mA	at 4 to 20 mA
0% $\triangleq$ 0 m	0 mA	4 mA
10% $\triangleq$ 0,38 m	2 mA	5,6 mA
50% $\triangleq$ 1,9 m	10 mA	12 mA
100% $\triangleq$ 3,8 m	20 mA	20 mA

5. At the mounting location, the full-scale range must be adjusted to harmonize with the electrical full-scale range.
6. Remove indicator housing from the guide tube connecting flange.
7. Pull the wire cable with follower magnet out of the guide tube and slowly wind it up onto the measuring drum (thereby cancelling the magnetic bond between the two magnets).
8. At 100% measured-value indication, the output signal of the transducer must be exactly 20.0 mA. If not, loosen the two fixing screws on the angle-of-rotation transducer and turn the complete transducer until a precise 20.0 mA reading is obtained. Retighten screws.
9. Do not readjust the two potentiometers in the angle-of-rotation transducer. These have been factory set and paint-locked.
10. Electrical adjustment of the full-scale range means that the zero is automatically correct, since full-scale range and zero were set during factory calibration.
11. Lower the wire cable with magnet down through the guide tube to re-establish the magnetic bond with the float magnet system.
12. Replace indicator housing.  
This completes the adjustment procedure.



#### BM 51/...ES

- 1 Angle-of-rotation transducer
- 2 Terminal strips

#### Technical data

##### Angle-of-rotation transducer KINAX 5W1

Power supply	12 to 36 V DC max. 22 V for hazardous-area operation
Power consumption	approx. 25 mA
Self-inductance	2 mH
Self-capacitance	15 nF
Ambient temperature	-25 °C to +60 °C
3- or 4-wire connection	0 to 5 mA, max. 2400 ohms 0 to 10 mA, max. 1700 ohms 0 to 20 mA, max. 850 ohms
2-wire connection	4 to 20 mA, max. 600 ohms
Linearity	< ± 1 % bei I max.
Temperature effect	< 0.5 %/10 °C
Power supply effect	< 0.2 %
Dependence on external resistance	< 0.2 % at Δ R <sub>A</sub> max.
Repeatability	± 0.2 %
Max. external resistance 2-wire connection	$R_A = \frac{U_B [V] - 12 [V]}{I_A [mA]} [k\Omega]$
3- and 4-wire connection	$R_A = \frac{U_B [V] - 5,3 [V]}{I_A [mA]} - 0,335 [k\Omega]$
	U <sub>B</sub> = power supply I <sub>A</sub> = max. output current

#### 5.2 Pneumatic signal output ...P

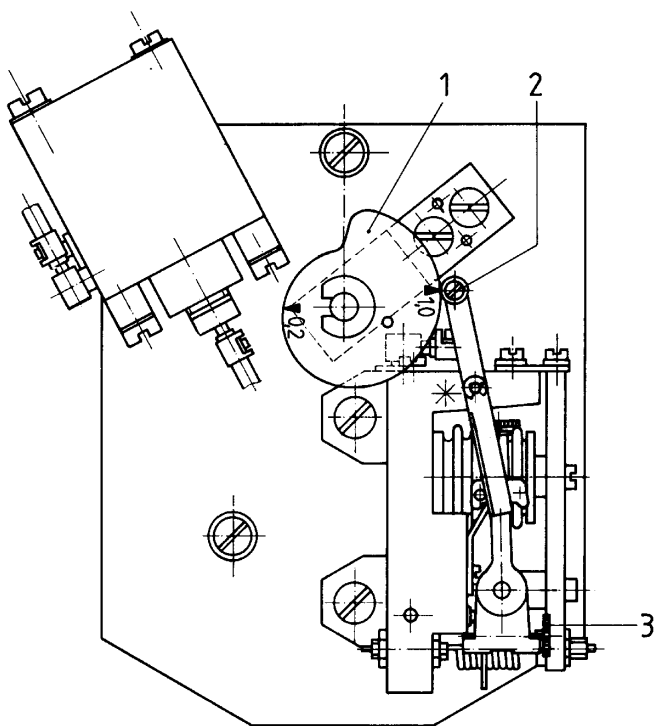
The WT 80 pneumatic transmitter with VR 80 amplifier is used to convert the measured liquid level into a pneumatic signal. Activation is via cam disc.

##### Start-up

- Use only clean, oil- and moisture-free air to operate the transmitter.
- Blow out air lines before connecting up.
- Initial air feed pressure should be 1.4 bar; there must not be any noticeable drop in pressure when the measuring system is fully modulated (100 % values).
- Leak-tightness: pressure test, check screw connections with leak indicator spray.

##### Adjustment of the pneumatic signal output

1. Instrument required: Class 0.2 precision pressure gauge, connected to the signal output of the unit. Connect up feed air supply.
2. Set presetting dimension "V".
3. Remove indicator housing.
4. Pull the wire cable out of the guide tube and allow it to wind up slowly on the measuring drum up to the full-scale value (thus cancelling the magnetic bond between float magnet system and follower magnet).  
  
The signal output must amount to exactly 0.1 MPa (1.0 bar) and 0.02 MPa (0.2 bar), resp. If not, undo fastening on cam disc, and align the mark on the cam disc with the adjacent bearing. Secure the cam disc. Fine adjustment by way of the zero adjusting screw.
5. Do not alter any other adjusting screws on the lever system or transmitter; these have been factory-set and paint-locked.
6. Pneumatic adjustment of the full-scale range means that the zero is automatically correct, since full-scale range and zero were set precisely during factory calibration.
7. Pay off the wire cable and lower follower magnet down through guide tube to form a bond with the float magnet system.
8. Replace indicator housing.  
This completes the adjustment procedure.



1. Cam disc
2. Thrust bearing
3. Zero adjusting screw

#### Technical data

#### Pneumatic transmitter WT 80

Supply air pressure	0.14 MPa ± 0.01 MPa (1.4 bar ± 0.1 bar)
Air consumption	480 l/h
Air capacity	1800 l/h
Output	0.02 to 0.1 MPa (0.2 to 1.0 bar [3 to 15 psi])
Linearity	± 0.5%
Hysteresis	0.25%
Sensitivity	0.1%
Ambient temperature	-25 °C to +70 °C
Temperature effect	0.03 %/°C
Inlet pressure dependence	0.2%/0.01 MPa (0.1 bar)
Load characteristic at 0.06 MPa (0.6 bar)	1.2% at 300 l/h 3% at 600 l/h
Connections	Ermeto 6

#### 5.3 Limit switches TG 22

Up to 4 TG 22 electrical limit switches can be installed in the BM 51 level gauge to signal specific levels.

The TG 22 is a slot initiator of the type SJ 3.5-N manufactured by Pepperl & Fuchs. These are matched for transistor amplifiers with intrinsically-safe control circuit to NAMUR and DIN 19234. Transistor amplifiers WE/Ex-1 for one and WE/Ex-2 for two control circuits are available from stock.

#### Adjustment

The limit values at which an electrical signal is to be initiated are freely selectable.

- Signalling is effected by slotted discs which dip into a slot initiator.
- The slotted discs can be turned relative to each other when the measuring drum is in locked position.
- Annunciators (Hima, Pepperl & Fuchs, Siemens etc.) are required for signal evaluation. WE/Ex switching relays made by Pepperl & Fuchs, control circuit in protection category (Ex) iG5, 500 VA, 4 A, 250 V relay output switching capacity, are supplied as standard equipment for these and for the hazardous-duty version.
- To set the operating point, first set the operating point on the indicating system (raise the float or reel in the cable). To do this, remove indicator housing from the guide tube.

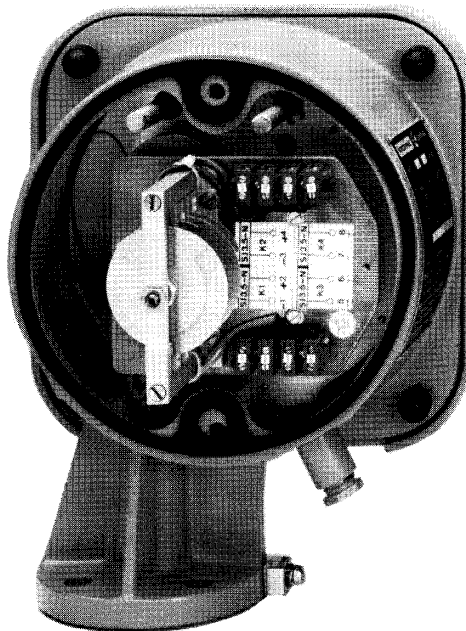
- Lock measuring drum or secure wire cable.
- Turn slotted discs to the operating point. Operating point is located precisely in the middle of the slot initiator. If necessary, check with connected relay.
- This completes the adjustment procedure.
- Lower follower magnet down through the guide tube until it links up with the float magnet.
- Replace indicator housing.

#### Action

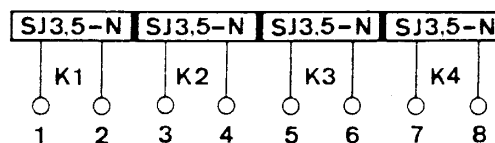
TG 22 consists of a slot initiator and separately mounted transistor amplifier. Dipping of the slotted disc into the slot initiator causes damping of the electrical resonant circuit and triggering of the switching pulse.

The TG 22 is also suitable for use in conjunction with hazardous-duty systems, but the transistor amplifier must be installed outside the hazardous area; alternatively, use (Ex)3n G5 type of enclosure.

#### BM 51.../K4...



#### Connection diagram



#### Limit switches

1. K 1 Terminals 1,2
2. K 2 Terminals 3,4
3. K 3 Terminals 5,6
4. K 4 Terminals 7,8

#### Technical data

#### Limit switch TG 22

Rated voltage	8 V DC
Power consumption	
Active area clear	≧ 3 mA
Active area obscured	≧ 1 mA
Self-inductance	160 μH
Self-capacitance	40 nF
Ambient temperature	-25 °C to +100 °C (for hazardous-duty systems max. 60 °C)

Electrical characteristics in conformity with DIN 19234 and NAMUR

## 5.4 Isolation switching amplifier WE 77

### AC-version

WE 77/Ex1  
WE 77/Ex2

### DC-version

WE 77/Ex1-G  
WE 77/Ex2-G

The isolation switching amplifiers consist of a power pack, transistor switching amplifier and output stage.

## Electrical connection TG 24 and WE 77

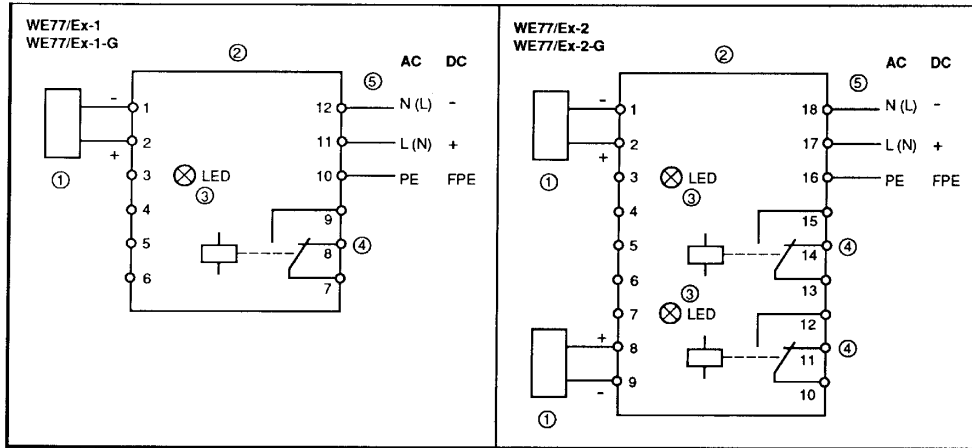
WE 77/Ex 1, WE 77/Ex 1-G feature one and WE 77/Ex2, WE 77/Ex2-G two intrinsically safe control circuits in conformity with DIN 19234 and NAMUR.

Connection diagrams

- ① Sensor (Initiator)
- ② Isolation switching amplifier
- ③ LED lights when "relay is active"
- ④ Relay output
- ⑤ Supply power – AC: 230 (220), 120 V AC  
– DC: 15 to 70 V DC

### Function shown

- High resistance operation with open-circuit monitoring (for changeover of mode, see table below)
- Relay deenergized (inactive)



### Adjustment of WE 77

Various modes of operation are possible by transposing the wire jumpers as specified in the Table. "Relay active" is signalled by an LED.

Function	AC - Version		DC - Version		Input		Output	Input		Output	
	WE77/Ex1	WE77/Ex2	WE77/Ex1-G	WE77/Ex2-G	Initiator	mech. switch	Relay	Initiator	mech. switch	Relay	
without open-circuit monitoring	1st function	Link between term. 3 + 4	Links between term. 2 + 3 7 + 8	Switch pos. 2 Link between term. 1 + 3	Switch pos. 2 Links between term. 1 + 3 7 + 9						
	2nd function	Link between term. 4 + 5	Links between term. 3 + 4 6 + 7	Switch pos. 1 Link between term. 1 + 3	Switch pos. 1 Links between term. 1 + 3 7 + 9						
with open-circuit monitoring	Circuit okay	without link	without links	Switch pos. 1 without link	without links						
	Circuit interrupted	without link	without links	Switch pos. 1 without link	without links						

## Technical data

	<b>AC version</b> WE 77/Ex 1 WE 77/Ex 2	<b>DC version</b> WE 77/Ex 1-G WE 77/Ex 2-G
<b>Power supply</b>		
Standard	230 V AC $^{+6\%}_{-10\%}$ (220 V AC $^{+10\%}_{-15\%}$ ), 120 V AC $^{+5\%}_{-15\%}$	
Special versions	45 to 65 Hz 24, 42, 110, 127 V AC	15 to 70 V DC
Power consumption	approx. 3.5 VA	max. 6.3 W
<b>Input</b> intrinsically safe to ...		
Protection category	DIN 19234 or NAMUR [EEx ia] II C or [EEx ib] II C	DIN 19234 or NAMUR [EEx ia] II C or [EEx ib] II C
PTB No.	Ex - 79/2043 X	Ex - 81/2146 X
Open-circuit voltage	8 V AC (13.5 V AC *)	8 V DC (12.7 V DC *)
Short-circuit current	8 mA (31 mA *)	8 mA (21 mA *)
Safe external inductance*/capacitance*	3 mH/230 nF 31 mH/609 nF	2 mH/370 nF 70 mH/800 nF
[EEx ia] II C	} values per circuit	} values per circuit
[EEx ib] II C		
<b>Output</b> non-intrinsically safe		
Number of switches	WE 77/Ex 1: 1 changeover contact WE 77/Ex 2: 2 changeover contact	WE 77/Ex 1-G: 1 changeover contact WE 77/Ex 2-G: 2 changeover contact
Contact rating	AC: 4 A/250 V/500 A/cos $\varphi = 0.7$	DC: 220 V/0.1 A; 60 V/0.6 A; 24 V/4 A
<b>Display "relay active"</b>		
	with LED	with LED
<b>Housing</b>		
Material	plastic NORYL SE 0, self extinguishing	
Fixing	snap-on mounting on 35 mm (1.38") standard rail to DIN 46277 or screw fixing, dimensions to DIN 43603	
Connection	self-opening binding posts, max. cross-section 2*1.5 mm <sup>2</sup> (2*14 AWG)	
Type of protection	IP 20, to DIN 40050; equivalent to NEMA 1	
Environment category	HUE, to DIN 40040 ambient temperature -25 to +60 °C (-13 °F to +140 °F)	

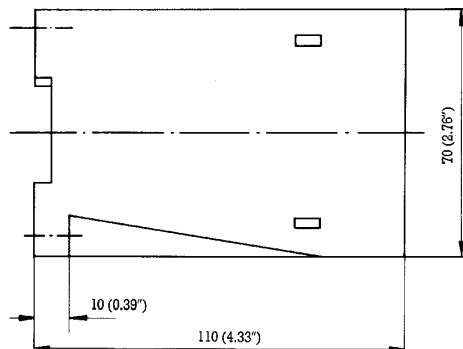
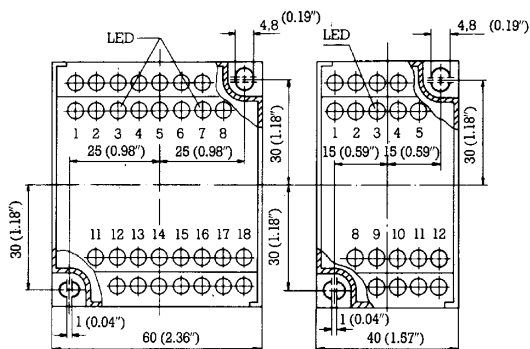
\* max. values for operation in hazardous-duty systems

If mechanical switches are connected, connect a 10-kohm resistor across the input.

## Dimensions

### WE/Ex-1

### WE/Ex-2





## 6. Float selection

Select float as a function of pressure, temperature and density of the product. Also select the material of construction to suit the application in question.

Float		Operating conditions					Stock number
No.	Shape	Dimensions (mm)	Material	Max. operating pressure MPa (bar) 20 °C	Product* temperature °C min. max.	Min. density kg/l	
1	Disk	dia. 195 × 185 *1	stainless steel 1.4571	0.6 ( 6)	- 160 + 400	0.5	2.02236.00
2	Ball	dia. 197 × 1.0	stainless steel 1.4571	1.5 (15)	- 160 + 400	0.55	8.09772.00
3	Cylinder	dia. 190 × 180	polypropylene**	0.4 ( 4)	+ 10 + 60	0.4	8.08704.02
4	Cylinder	dia. 140 × 211	PVC**	0.4 ( 4)	- 40 + 60	0.5	8.04813.03
5	Cylinder	dia. 140 × 200	hard glass**	0.3 ( 3)	- 50 + 200	0.9	8.08298.00

\* If used in hazardous areas, please note data specified in the Certificate of Conformity.

\*\* Not suitable for use in hazardous areas.

**Note:** The specified operating pressure applies to 20 °C.  
Float test pressure = Operating pressure \* 1.3.  
(Hazardous duty units = Operating pressure \* 1.5).

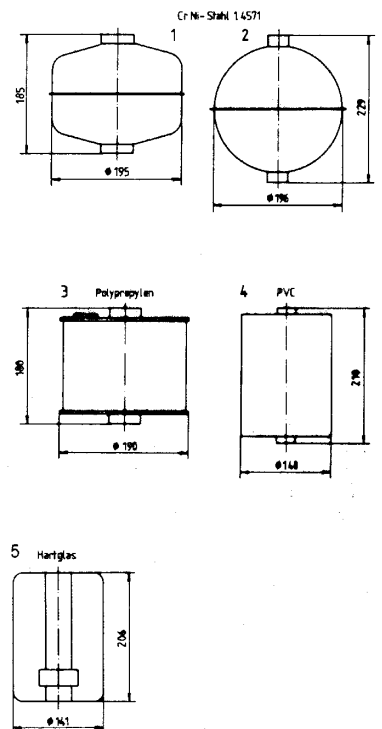
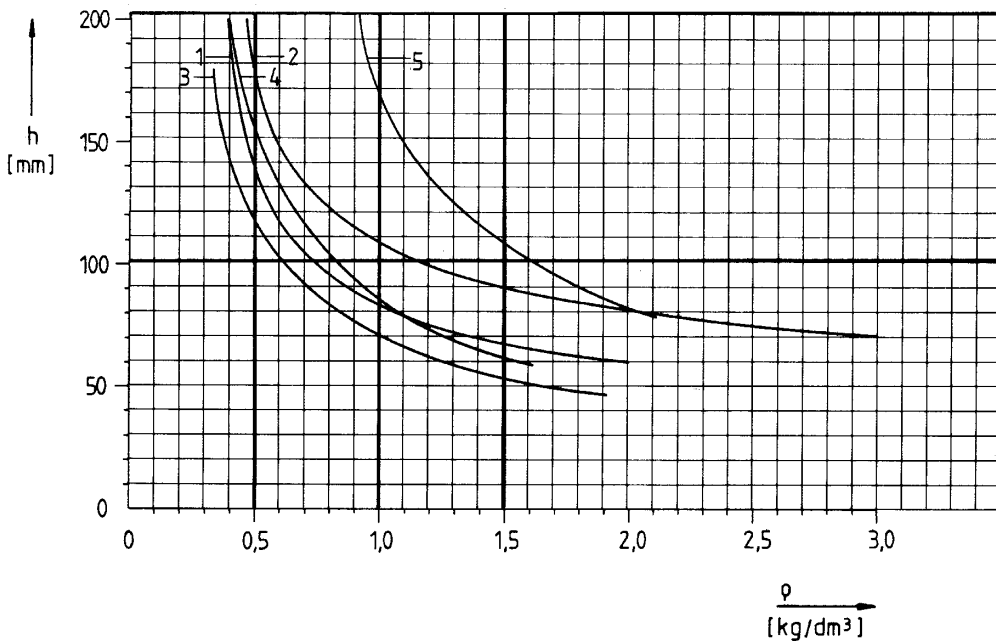
**Note:** The float operating pressure should be equal to the vessel test pressure. If the vessel test pressure is higher than the float operating pressure, remove the float before testing the vessel. Refer to instrument nameplate for float operating pressure.

### Floats

Each float is designed and constructed for the specified liquid product and given operating conditions.

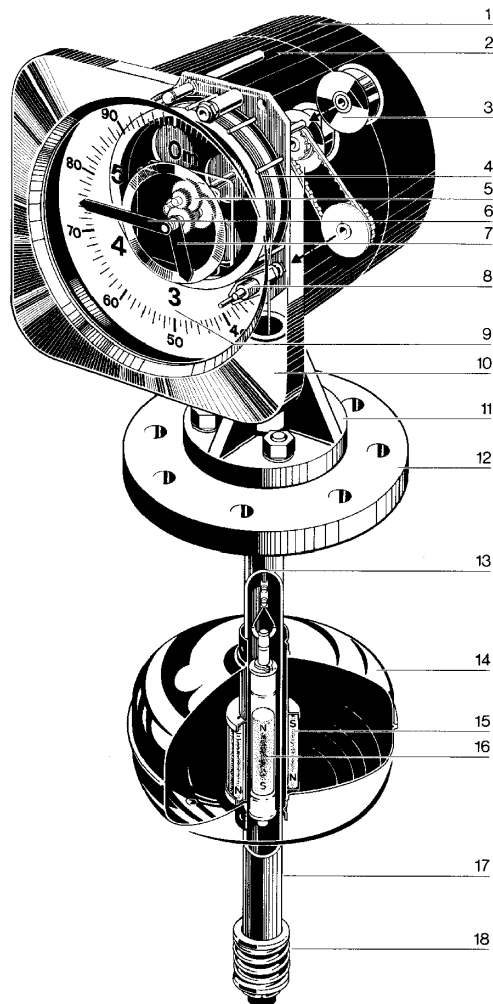
### Float graphs

The graphs show the depth of immersion "h" for each float as a function of the product density "ρ".



## 7. Level gauge components

- |                          |                      |
|--------------------------|----------------------|
| 1 Cover, rear            | 10 Cover with window |
| 2 Housing                | 11 Mounting flange   |
| 3 Spring motor           | 12 Connecting flange |
| 4 Measuring drum         | 13 Wire cable        |
| 5 Gear unit              | 14 Float             |
| 6 Centimetre hand, large | 15 Magnet system     |
| 7 Metre hand, small      | 16 Follower magnet   |
| 8 Cable guide            | 17 Guide tube        |
| 9 Scale                  | 18 Limit stop        |



## 8. Changing the wire cable

1. Disconnect flanged connection between indicator housing and guide tube.
2. Pull wire cable and magnet out of the guide tube. (If follower magnet has become detached: fetch wire end and magnet out with a special catching device obtainable from our Service Dept.) Reel in wire cable using the spring motor up to the end stop.
3. Remove both housing covers, both pointer hands, and the dial face. Disconnect any rear-mounted electrical/pneumatic lines.
4. Pay off wire cable from the measuring drum against the force of the spring motor up to the end stop.
5. Turn the measuring drum until the knotted end of the wire is visible through the hole in the baseplate. Secure measuring drum against turning.
6. Pull out the knot using pincers or a hook and cut it off. Remove rest of wire from measuring drum.
7. Slide the leading end of the new wire cable through the cable guide and thread it from outside through the small hole in the measuring drum. Then pull it through the hole in the baseplate, tie a knot in the end and cut off excess wire. Pull the knot back to the end stop in the measuring drum. Release the measuring drum.
8. The force of the spring motor will automatically wind the wire cable onto the measuring drum. Guide the cable by hand to avoid looping.
9. Wind an adequate length of cable onto the measuring drum (one full turn = 0.4 m).
10. When a sufficient length of cable has been wound up, pull cable through the cable guide, attach a rope clamp and cut off cable 0.5 m behind the clamp. Secure measuring gearing by tightening both screws in the indicator housing.
11. Thread the end of the cable outwards through the flange and attach the follower magnet.
12. For partially filled tanks, proceed as described in Section 3. Start-up. Measure current liquid level with a yardstick and transfer this reading to the indicator. For empty tanks, proceed as described under Presetting Dimension "V" and Adjustment of Measuring System.
13. Place indicator housing on guide tube and screw down.
14. Replace both indicator housing covers.

### Instrument versions

Designation	Guide tube
<b>BM 51/RR</b> Standard	St. steel 1.4571, tube dia. 28 × 2 mm Flange DN 80, PN 16, St. steel 1.4571
<b>BM 51/NR</b> Standard	St. steel 1.4571, tube dia. 28 × 2 mm Flange DN 80, PN 16, steel
<b>BM 51/N-PTFE</b> Polytetrafluorethylene	St. steel 1.4301, tube dia. 28 × 2 mm with PTFE liner, 3 mm Flange DN 80, PN 16, steel, PTFE gasket
<b>BM 51/N-PP</b> Polypropylene	St. steel 1.4301, tube dia. 28 × 2 mm with PP tube, flange DN 80, PN 16, steel with PP gasket
<b>BM 51/M</b> Marine	St. steel 1.4301, tube dia. 28 × 2 mm Flange DN 80, PN 16, steel

**9. Technical data**

<b>Instrument type</b>	<b>BM 51 level gauge</b>
<b>Measuring range</b>	max. 6 m
<b>Product</b>	Liquids, incl. liquefied gases
Viscosity	≤ 100 MPa · s
Solids	≤ 100 g/l
Particle size	≤ 200 µm dia.
<b>Accuracy</b>	± 3 mm of measured value
<b>Operating data*</b>	
Max. pressure	0.6 MPa (6 bar), special version: 1.5 MPa (15 bar)
Product density	0.5 bis 3.0 kg/l
Ambient temperature	– 60 to + 120 °C, PP version: max. + 60 °C
Product temperature	– 160 to + 400 °C
	Note restrictions imposed by built-in options!
<b>Indication</b>	
Design	Circular scale, 160 mm dia.
Scale marks	(m) and (cm) marks Special version: (m <sup>3</sup> ) or (%) marks
<b>Connection</b>	
Standard	Flange DN 80, PN 16, to DIN 2527
Special version	other DN, flanges to DIN 2512 and other standards
<b>Housing</b>	
Material	Grey cast iron
Enclosure to DIN 40050	IP 56

\* Note: Allow for operating data of floats!