OCTOGON

MANUAL

FKMB

COMPACT LEVEL LIMIT SWITCH

Operating manual



Document	Version	Date	Applies to
Operating manual	V00x	11/2026	FKMB, capacitive, flange DN100, potential-free change-over

This operating manual describes safety, mounting, electrical connection, calibration and adjustment, fail-safe mode, technical data and dimensions of the FKMB compact level limit switch.

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1 General

1.1 Safety warnings

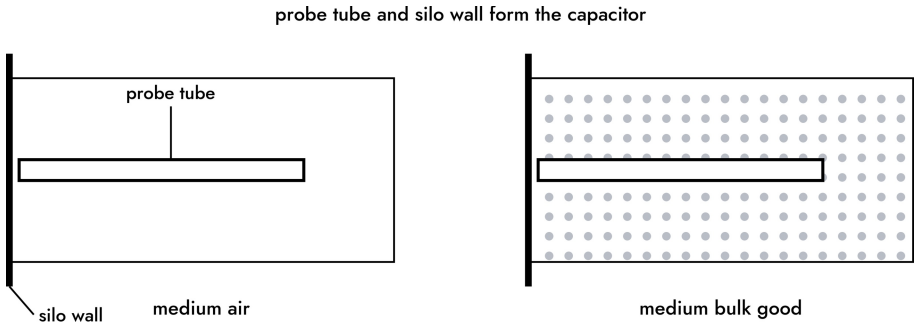
Warning General: When mounting, initiating and operating this level limit value switch the safety precautions and regulations have to be observed. Only staff with a corresponding qualification should work with the level limit value switch. A non-observance of the safety regulations may cause serious injuries and/or damages. Check before initial operation the suitability of the level limit value switch for this area of application. The technical data of this manual have to be followed.

1.2 Device

Feature	Version
Design	compact level limit switch for bulk solids in silos
Measurement	capacitive against the silo wall
Output	1 potential-free change-over contact
Process connection	flange DN100
Manufacturer type	FUELL

1.3 Measuring principle

With air between probe tube and silo wall the capacitor has a given capacitance. Bulk material with a higher dielectric constant raises it, the charging time grows, and the electronics switch the relay when the adjusted limit is reached.



Probe tube and silo wall form the capacitor

2 Mounting

2.1 Installation

Filling the silo

The filling stream should not be directed onto the probe.

Angle of material flow

Note the angle of material flow or the outlet funnel when determining the measuring point or probe length.

Distance between probes

If more than one probe is mounted in a silo then a minimum distance of 0,5 m must be allowed for in order to avoid mutual interferences.

Heat insulation

With high silo temperatures: insulate the outside silo wall to avoid exceeding the maximum permissible temperature of the level switch housing. This insulation also prevents condensation near the things built in and so reduces build-up and the danger of error switching.

Installation in the open

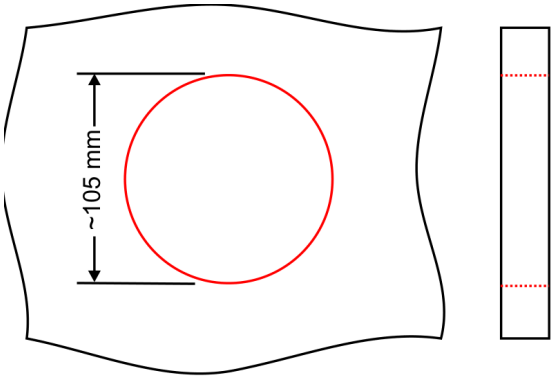
A protective sun cover protects the level switch with the aluminium housing from excessive temperatures and from condensation which may form in the housing due to large temperature variations.

Installation in a building

Install an easily accessible power switch in the proximity of the device. Mark the power switch as a disconnector for the device.

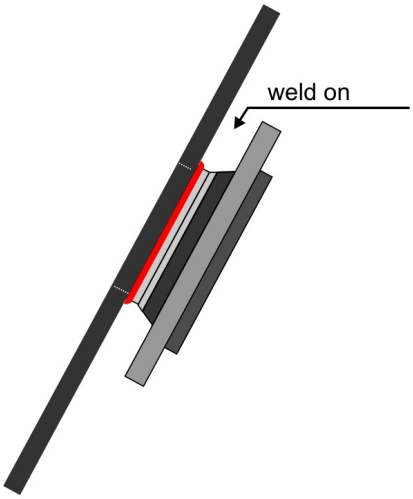
2.2 Mounting

Step 1

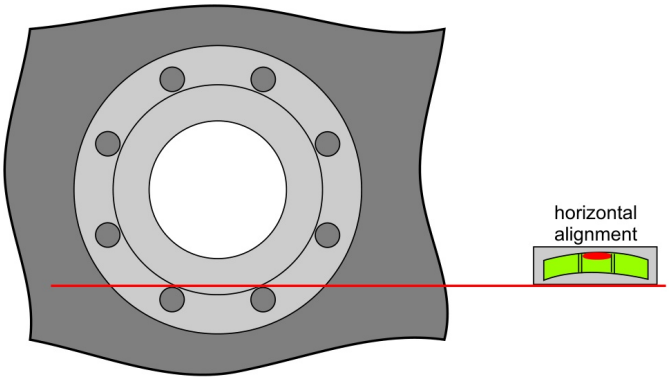


Cut out a hole with diameter of approx. 105 mm in the silo wall (take care that the location is suitable for the device).

Step 2



Remove the mating flange off the level limit value switch and weld on above the hole.

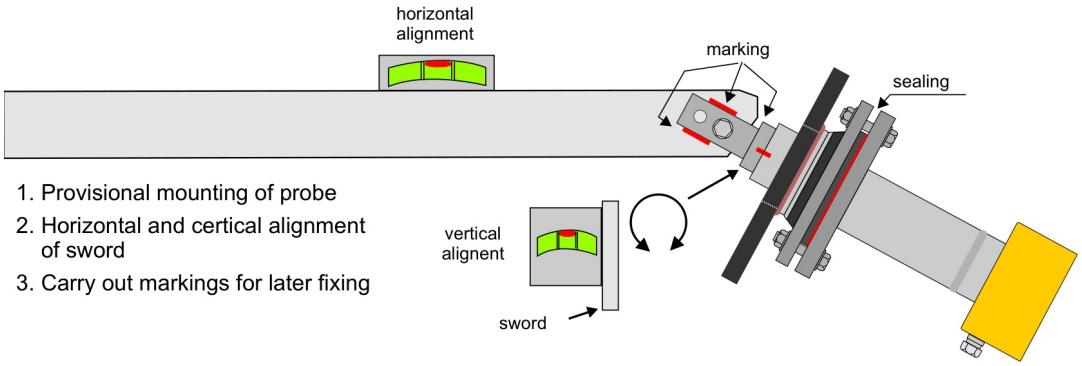


Step 3

Warning The electronic insert has to be removed for the later welding. Otherwise the electronics can be destroyed.

1. Open enclosure.
2. Release screws (2) and lift carrier with electronic insert.
3. Release screws (3) and put aside the carrier with the electronic insert.

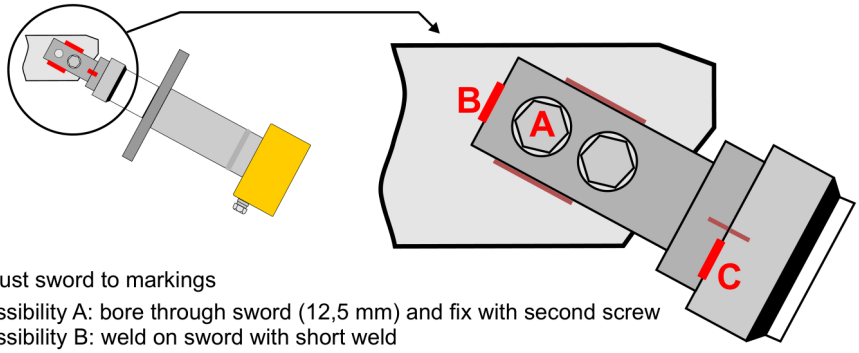
Step 4



1. Provisional mounting of probe
2. Horizontal and certical alignment of sword
3. Carry out markings for later fixing

Step 5

Warning The electronic insert has to be removed for the later welding. Otherwise the electronics can be destroyed. See description step 3.

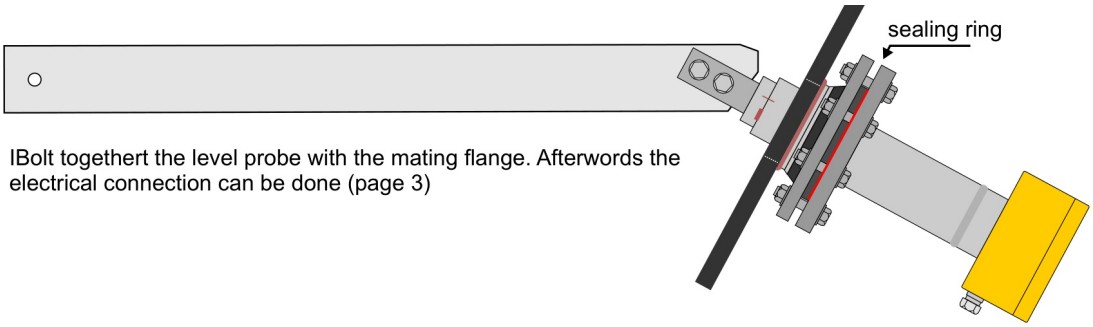


1. Adjust sword to markings
2. Possibility A: bore through sword (12,5 mm) and fix with second screw
   Possibility B: weld on sword with short weld
3. Weld on rotating sword support with short weld on probe carrier (C)

Step 6

Mount back carrier with electronic insert reverse to step 3.

Step 7



IBolt togethert the level probe with the mating flange. Afterwords the electrical connection can be done (page 3)

Afterwards the electrical connection can be done (chapter 3).

3 Electrical connection

3.1 General information

Load limit values

Note the limit values of the loads to which you want to connect the level switch. Exceeding the load can destroy the electronic insert (e.g. the relay point).

Fuse

Ensure that the rating of the fine-wire fuse corresponds to the maximum load to be connected. The fine-wire fuse does not protect the electronic insert of the level switch.

Diameter of wiring

Because of the small currents used, only small diameter cabling is required. Low-cost cabling with diameters of 0,5 mm² to maximum 1,5 mm² is recommended.

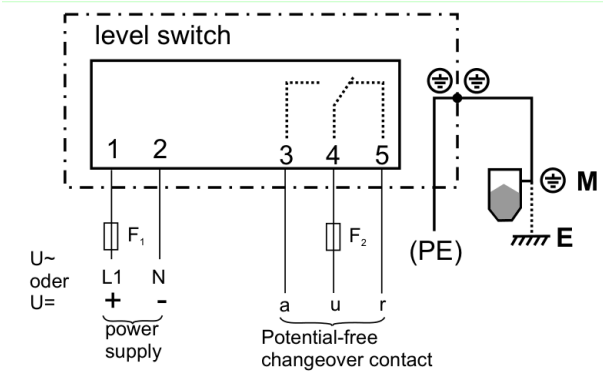
Grounding

The level switch must be grounded to give reliable operation free from interference. This is done by either connecting it to a grounded silo with metal or reinforced concrete walls or else to the earth conductor PE. If a counter electrode is connected to a silo made of plastic material then there must be a short ground connection from the level switch to the counter electrode.

Explosion protection

All local regulations and instructions given in certificates must be observed especially in regard to the creation of an equipotential plane (earth bonding).

3.2 Connection



Connection of the level switch

Sign	Meaning
U~	21 V ... 250 V
U=	20 V ... 200 V (in non hazardous area)
U=	20 V ... 125 V (in hazardous area)
F1	fine-wire fuse, 200 mA, semi-time lag (recommended)
F2	fine-wire fuse to protect the relay point, load dependant
M	ground connection to silo or to counter electrode
E	grounding

3.3 Relay point for load

The load is connected over a potential free relay point (changeover contact). The relay contact breaks the connection between terminal 3 and terminal 4 on level alarm or with a power failure.

3.4 Protection against voltage peaks and short circuit

Protect the relay point by connecting a spark barrier to instruments with high inductance. A fine-wire fuse (load dependant) can protect the relay point if short circuit occurs.

4 Calibration and adjustment

4.1 Adjustment

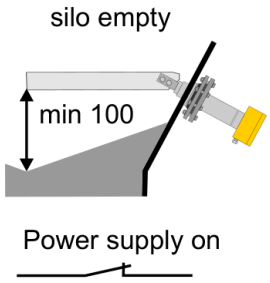
For calibrating the level electronics should be adjusted to the capacitance value of the capacitor formed by the probe and wall of the silo (steel wall). The rotary switches and adjusting elements for calibration are on the electronic insert in the housing.

Danger – electrical power Directly beside these calibration elements are the power connections with voltages up to 250 V. Only use screwdriver which has insulation as far as the blade or else tape over the terminals with insulating tape before calibration.

Operating elements on the electronic insert:

- rotary switch for fail-safe mode
- rotary switch for probe length
- adjusting elements for capacitance, fine and coarse
- LED to indicate switching mode

For capacitance calibration the silo must be empty or the level of material must be at least 100 mm below the probe. Turn on the power supply.

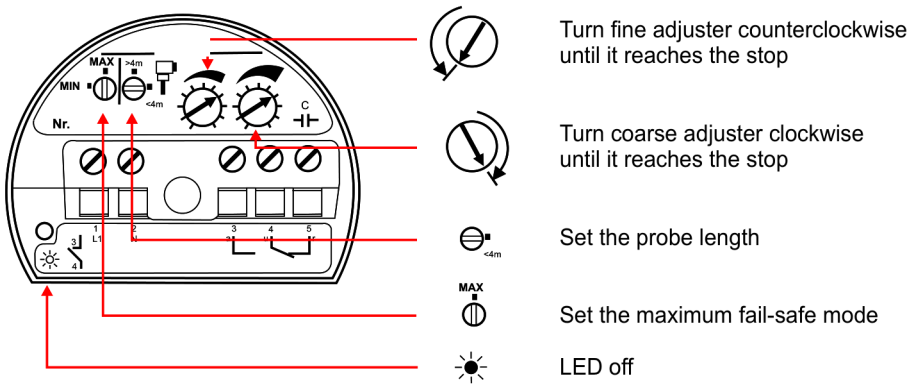


Silo empty, power supply on

Attention Ensure that no water gets into the housing while calibrating.

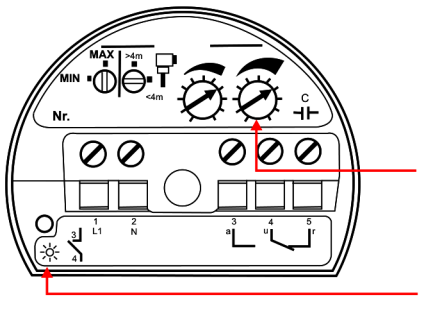
Carry out the calibration according the next diagrams.

4.2 Capacitance calibration, initial settings



These initial settings must be done before the capacitance calibration.

4.3 Capacitance calibration, coarse

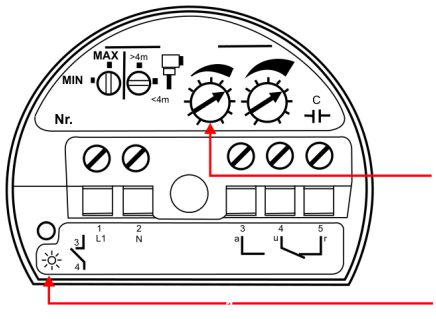


Turn the coarse adjuster
- slowly -
counterclockwise

until

the LED lights up

4.4 Capacitance calibration, adjust



Turn the fine adjuster
- slowly -
clockwise

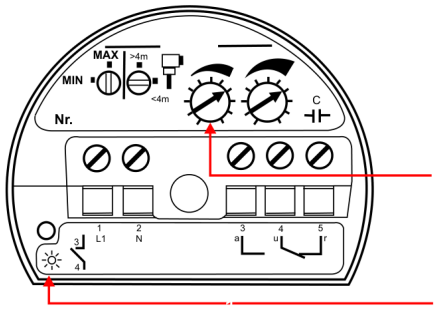
until

LED goes out

When using products that cause build-up turn the fine adjuster further clockwise by approx. 2 index marks.

Attention Capacitance calibration must be carried out both slowly and carefully.

4.5 Adjustment for material characteristics



Turn the fine adjuster
clockwise
through

Material characteristics (bulk solid)		Turn the fine adjuster clockwise through
Low dielectric constant, low conductivity	no build-up	approx. 1 division
Low dielectric constant, low conductivity	with build-up	approx. 1 to 2 divisions
High dielectric constant, high conductivity	no build-up	approx. 2 to 4 divisions
High dielectric constant, high conductivity	with build-up	approx. 4 to 6 divisions

Accurate adjustment ensures high switching reliability.

When the probe is covered with non-conductive bulk solid having a low dielectric constant, then the electronic only switches when the probe is completely covered with the material. The degree of covering depends on the calibration. Turning the fine calibrating element clockwise causes the level electronics to become less sensitive.

4.6 Function control

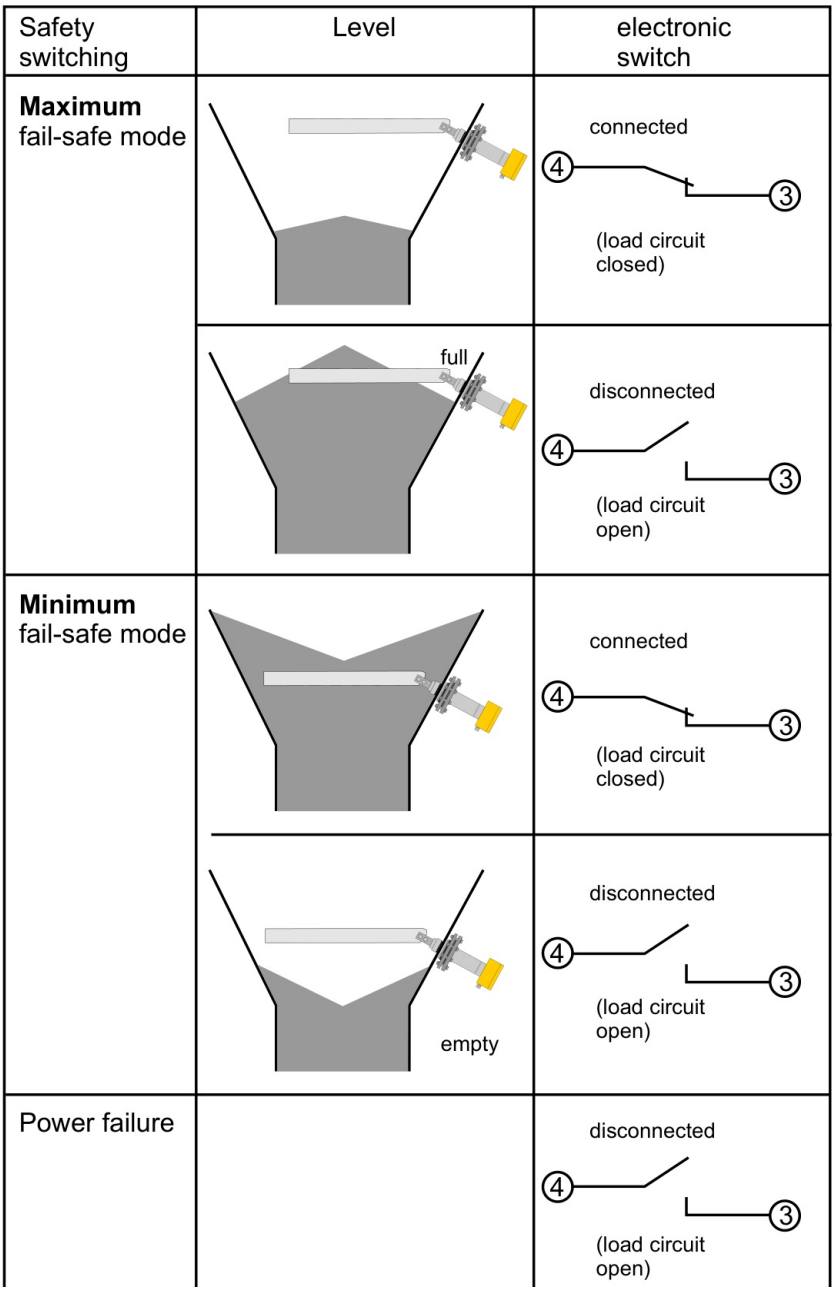
With the probe uncovered touch the central retaining screw of the electronic insert with screwdriver, holding it by the insulated handle. This simulates the bulk solid covering the probe. The LED indicates a change of status. This is only a function control test of the instrument. Please also check for the correct operation for limit detection by filling and emptying the silo at the installation point.

5 Fail-safe mode

The built-in feature for minimum and maximum fail-safe switching allows the level switch to be used in all applications requiring high operational safety.

- Maximum fail-safe: the current is blocked if the probe is covered or the power supply fails.
- Minimum fail-safe: the current circuit is blocked if the probe is uncovered or the power supply fails.

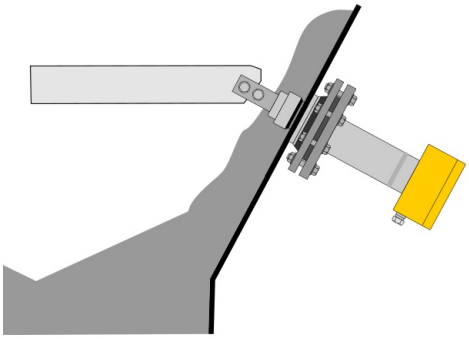
A red LED on the electronic insert indicates switching status.



Fail-safe mode: level and switching state (terminals 3 and 4)

5.1 Build-up

If the medium causes a build-up, it is possible to take this into consideration when adjusting the electronic insert (see section 4.5). As a rule the electronic insert can compensate it.



6 Technical data

6.1 Input

Feature	Value
Measurement	capacitive
Medium	sand, gravel, lime, plaster, cement, pumice, dolomite, kaolin, glass aggregate, flour, moulding sand, crushed ore, grain, aluminium shavings, sugar beet chips, fodder and similar bulk solids
Dielectric constant	> 2.5
Initial capacitance	adjustable to approx. 400 pF
Measuring frequency	approx. 770 kHz for short probes up to 4 m · approx. 450 kHz for long probes
Switching range	0 ... 0.5 m
Switching delay	approx. 0.5 s

6.2 Output

Feature	Value
Relay	1 change-over contact, potential free
Contact rating, AC	250 V AC / 4 A / 1000 VA / 500 VA (cos phi = 0.7)
Contact rating, DC	100 V DC / 4 A / 100 W
Operating life	> 10^5 switchings at maximum contact load
Switching delay	additional 1.5 s
Status indication	red LED

6.3 Power supply

Feature	Value
Supply voltage	20 ... 125 V DC in a hazardous area · 20 ... 200 V DC outside · 21 ... 250 V AC, 50/60 Hz
Current consumption	5 mA maximum (eff.)
Peak inrush current	200 mA maximum, 5 ms maximum
Pulse current	50 mA maximum, 5 ms maximum
Pulse frequency	approx. 1.5 s

6.4 Mechanics and process

Feature	Value
Enclosure	diecast aluminium
Probe	steel tube 1″, zinc plated, 1000 mm
Carrier	Pythagoras ceramic Ø 65 × 283 mm
Probe angle	90 … 180°, adjustable
Process connection	flange DN100/114 DIN 2633 C22.8 with 8 screws M16 × 60 and sealing; mating flange DN100 DIN 2527 RSt 37.2 to weld onto the silo wall; other versions customized
Range of pressure	probe PN10 · flange PN16 · system pressure 10 bar maximum
Cable entry	up to 2.5 mm² through 1 × M 20 × 1.5
Protection class	IP 65
Weight	approx. 20 kg

6.5 Ambient conditions and adjustment

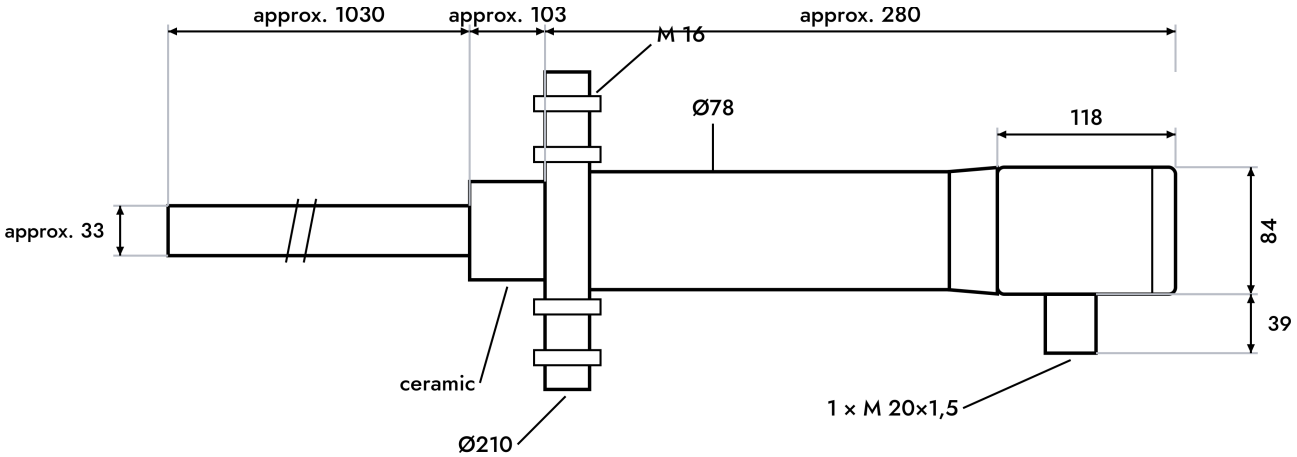
Feature	Value
Temperature	in the silo 0 … +400 °C · ambient –20 … +60 °C · storing –40 … +85 °C
Adjustment	rotary switch for fail-safe mode, rotary switch for probe length, adjusting elements for capacitance fine and coarse, and an LED indicating the switching state — all inside the enclosure

6.6 Accessories

Feature	Value
Mating flange	DN100 DIN 2527 RSt 37.2, to weld onto the silo wall
Customized model	process connection and probe to specification, on request

For concrete silos a counter electrode of grating takes the place of the steel wall.

7 Dimensions



Dimensions in mm. Drawn by octogon from the manufacturer document; the dimensioned values are taken from it, the outline is schematic and the lengths are not to scale — the probe tube is broken, as in the manufacturer drawing.