

Yo-Yo sensing level measurement

continuous level indication for bulk solids

LF

Appliance information

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Application (intended use)

MOLOSbob typ LF20 used for

continuous level measurement
in **silos, bunker and vessels.**

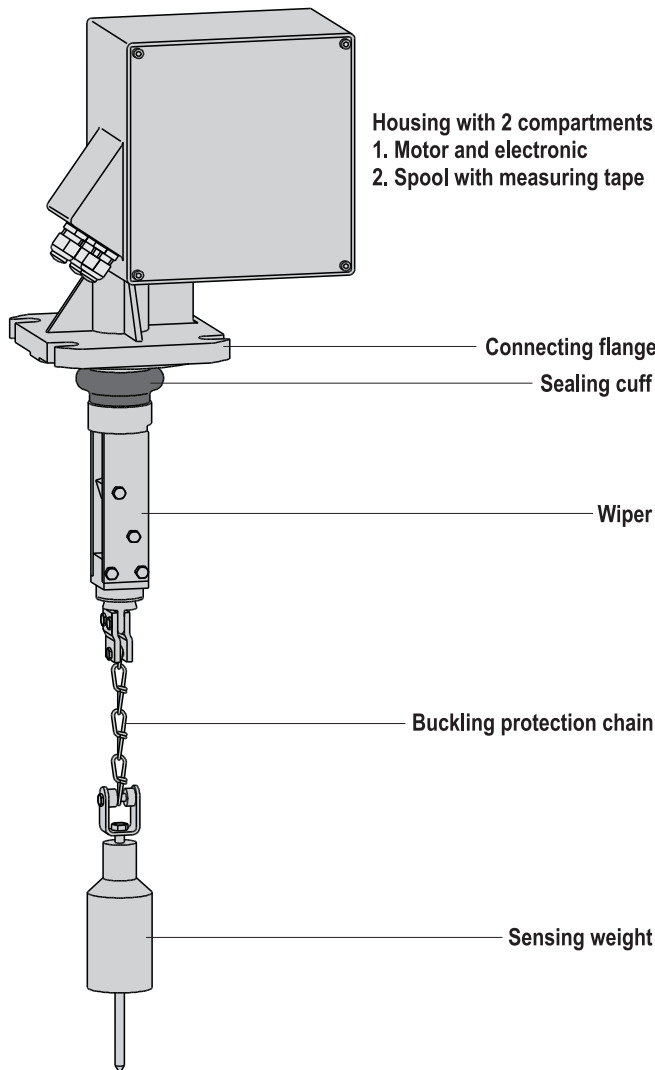
For all bulk goods with a minimum density of

0.02 t/m³.

Application in

all industry sectors processing bulk goods.

Construction



Sensing weight has to be suitable for the chemical characteristics of the bulk good and the process temperature within the bunker or silo.

Special designs for specific applications on request.

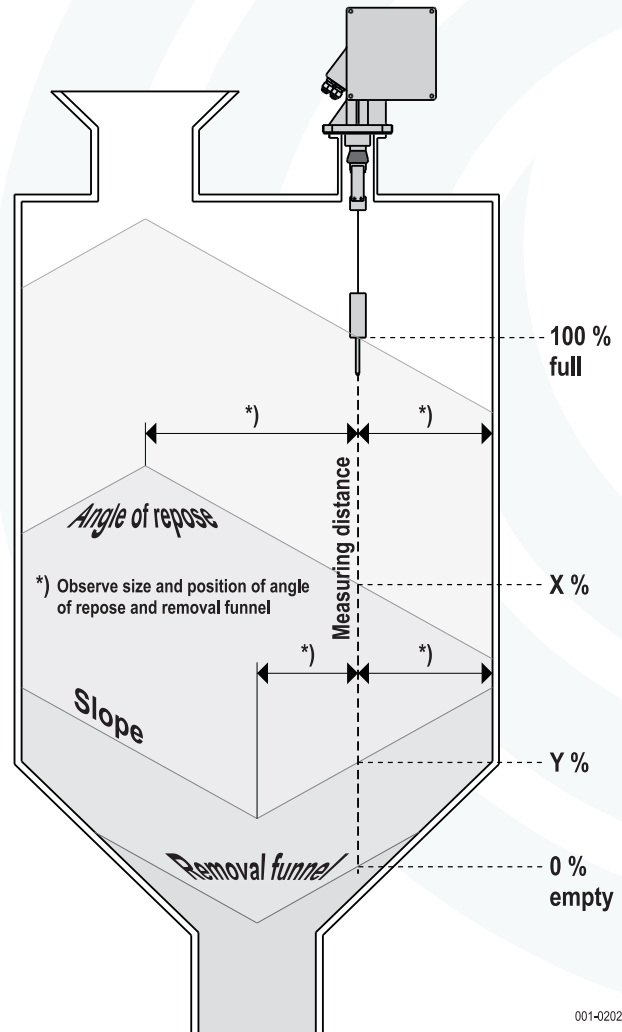
Function

A sensing weight is driven down into the silo or hopper with a stainless-steel tape. A 0/4-20 mA current output signal is given proportional to the measured distance from the top to the bulk good surface. This measured value corresponds to the filling height and is retained until the next measurement cycle starts.

Single measurements or periodic measurement procedures are possible. The measuring cycle can be started with an external contact (e.g. manual start button or PLC) or by the programmed function at the LF20.

As soon as the weight touches the surface, the tensile force on the tape decreases. This reduced tensile force is detected by the electronic of the MOLOSbob LF20, the lowering of the weight is stopped immediately and the sensing weight returns to the end position.

The sensing weight may not sink into the bulk good and not slide at the slope of the angle of repose or of the removal funnel.



During the up and down movement of the sensing weight the relay output of the LF20 can additionally emit pulses according to the length of the rolled out measuring tape. These pulses can be recorded by a process control system or an electro mechanical counter.

Technical data

| | | |
|---------------------|-------------------------------------|---------------------------------------|
| Materials | Housing | Aluminum die casting, coated RAL 7001 |
| | Housing lid | Aluminum AlMgSi1 |
| Process connection | Aluminum die casting | |
| | Tape | Stainless steel 301, modified |
| Wiper or | Aluminum/Steel | |
| | Stainless steel 304 | |
| Sensing weights | | |
| Normal weight 9.B | Steel | |
| Normal weight 9.C | Stainless steel 316Ti | |
| Umbrella 9.D | Polyester and steel | |
| Umbrella 9.E | Polyester and stainless steel 316Ti | |
| Medium bag 9.G | Polyester and stainless steel 316Ti | |
| Plastics weight 9.N | Plastics and steel ¹⁾ | |
| Weight | w/o sensing weight | 10 kg |
| | with sensing weight | 11.5 kg |

Dimensions 300 x 260 x 225 (HxBxD)

Angle of inclination max. 2°

Protection type **IP** IP67

Maintenance approx. after 45,000 measuring cycles

¹⁾ not available for use in potentially explosive atmospheres

Application data

| | | | |
|----------------------------|-----------------------------|----------------------------------|------------------------------|
| Ambient temperature | 7.D | -20 °C ... +60 °C (Standard) | T_{amb} |
| | with heater 7.E | -40 °C ... +60 °C ¹⁾ | |
| | ATEX-device with heater 7.E | -35 °C ... +60 °C | |
| Process temperature | 8.1 | -20 °C ... +70 °C (Standard) | T_(Process) |
| | 8.2 | -20 °C ... +150 °C ¹⁾ | |
| | with heater 7.E | -40 °C ... +70 °C ¹⁾ | |
| | ATEX-device with heater 7.E | -35 °C ... +70 °C | |
| Process pressure | | -0.5 bar ... 1 bar | p_(Process) |


¹⁾ not available for use in potentially explosive atmospheres


Technical measuring data


| | | |
|---------------------------------|-----|--|
| Tape length | 3.4 | 15 m |
| | 3.5 | 32 m |
| | 3.8 | 42 m |
| Tensile force | | max. 150 N |
| Tape run-off speed | | 0.16 ... 0.25 m/s |
| Measuring accuracy | | ± 2.5 cm or ± 1 Impuls (independent of selected measuring distance) |
| Highest measurable point | | Calculated from the block distance plus a minimum run-out length of 20 cm |

Note The individual value of the block distance is preset when delivered and has only to be adjusted when the sensing weight is replaced.

Elektrical data

| | | | |
|--------------------------|-----------------|--------------------------------------|---|
| Supply voltage | 5.1 | 90 ... 253 V (AC) 50-60 Hz | Supply  |
| | or 5.3 | 20 ... 28 V (DC) | |
| Power consumption | | AC = 150 VA DC = 150 W | |
| | with heater 7.E | AC = 170 VA DC = 170 W | |
| Terminal clamps | | max. 2.5 mm ² | |
| Cable entry | | 3x screwing M20x1.5 (6 ... 13 mm) | |

| | | |
|----------------------|---|---|
| Signal inputs |  | 2 available for external start or lock measurement |
| | active | Input voltage range of an external control 12 ... 24 V DC |
| | passive | Connection of an external command unit, e.g. switch, key, relay contact (Start pulse length: min. 200 ms) |

Signal output  **active** 0/4 ... 20 mA current output,
working resistance max. 600 Ω

Relay outputs optional 6.C 2 relay outputs (Standard)
2 additional relay outputs

Selectable relay functions

Counting pulse Pulses according tape length rolled out

Reset pulse Pulse before every new measurement
e.g. to reset an external counter

Gating of counting pulse Pulse during running up the sensing
weight, e.g. to hide counting pulses


Measurement active Pulse during active measuring cycle,
e.g. to lock a filling device in order to
protect the sensing weight from being
covered by medium

End of measurement Pulse when sensing weight reached
upper end position

Alarm Output of fault states

Service interval Information on required maintenance

Contact load  250 VAC, 6 A
Silver-cadmium-oxid contacts, gold plated

Optocoupler output  for counting pulse
(optional when 4 relay are selected)

Loading capacity U max. 30 V DC, I max. 10 mA

Break down information recallable via following interfaces

Local display Error symbol
Error code with plain text display

Current output State programmable:

Minimum

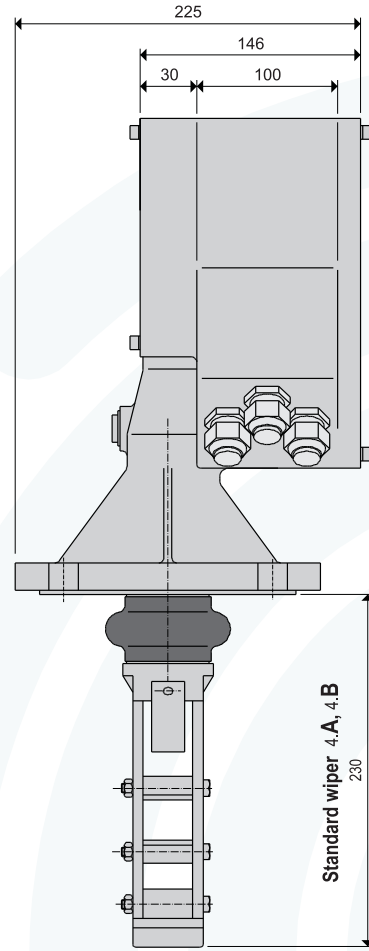
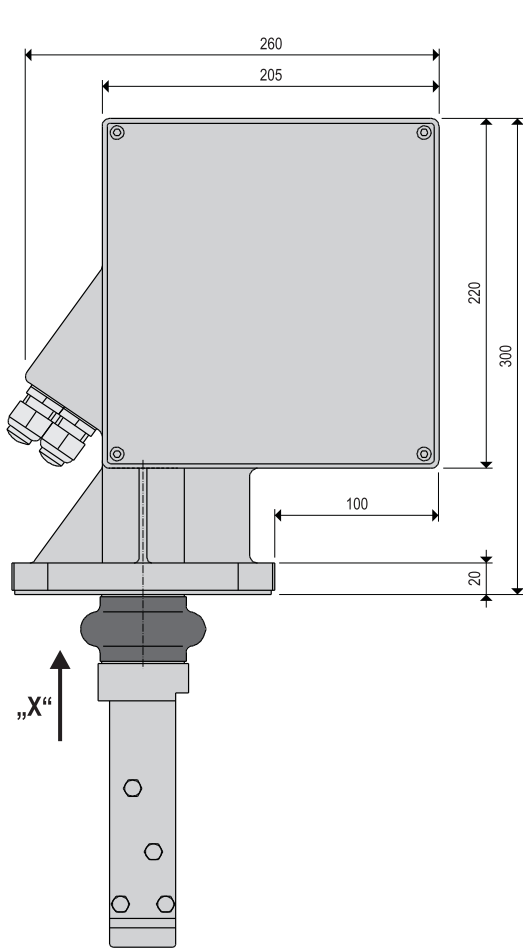
Current value ≤ 3.6 mA (4 - 20 mA) or
Current value 0 mA (0 - 20 mA)

Maximum

max. current value +10% (=22 mA)

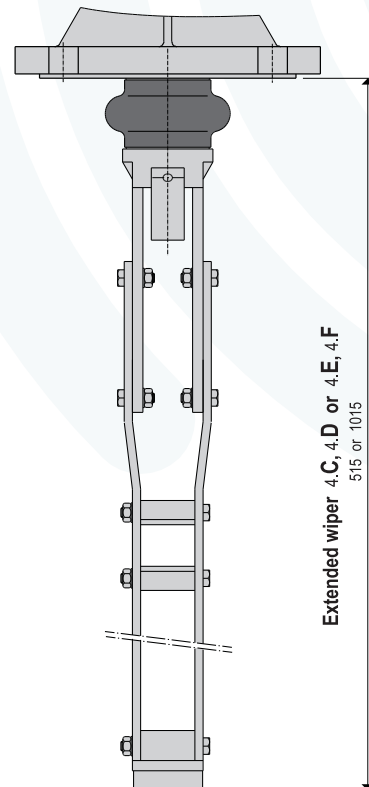
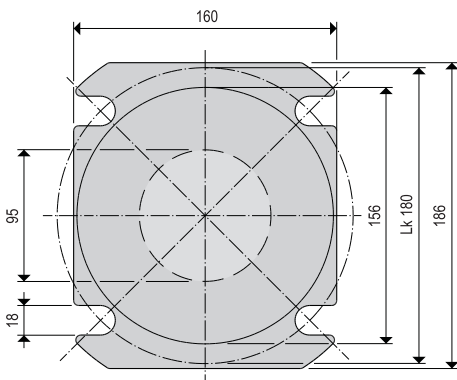
Relay output Alarm function

Dimensions



Process connection flange

View „X“



Sensing weights

9.B/9.C Normal sensing weight Steel/stainless steel
for temperatures up to +150 °C

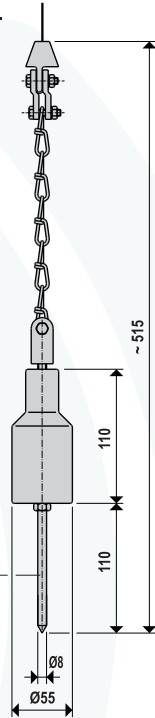
For granulates and compacted bulk solids.

Bulk density >0.3 t/m³

Angle of repose steep with spike
flat w/o spike

The spike avoids slipping or tilting of the sensor weight on a steep bulk surface.

Spike (screw-off)



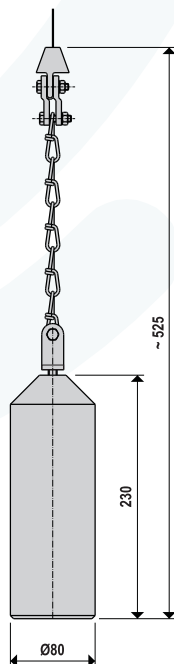
022-0207

9.N Plastic sensing weight PVC and steel
for temperatures up to +70 °C

For granulates and compacted bulk solids.

Bulk density >0.3 t/m³

Angle of repose flat



022-0209

► Not available for use in potentially explosive atmospheres.

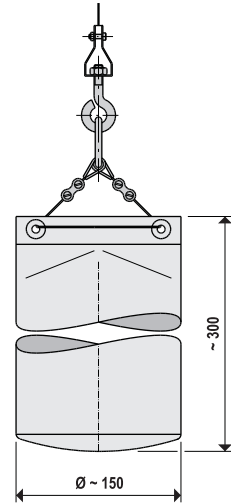
9.G Bag sensing weight Polyester and stainless steel
for temperatures up to +150 °C

For granulates and compacted bulk solids.

Bulk density >0.2 t/m³

Angle of repose flat

Avoids damage of outlet devices.



022-0208

The bag is filled with the respective medium stored in the bunker or silo.

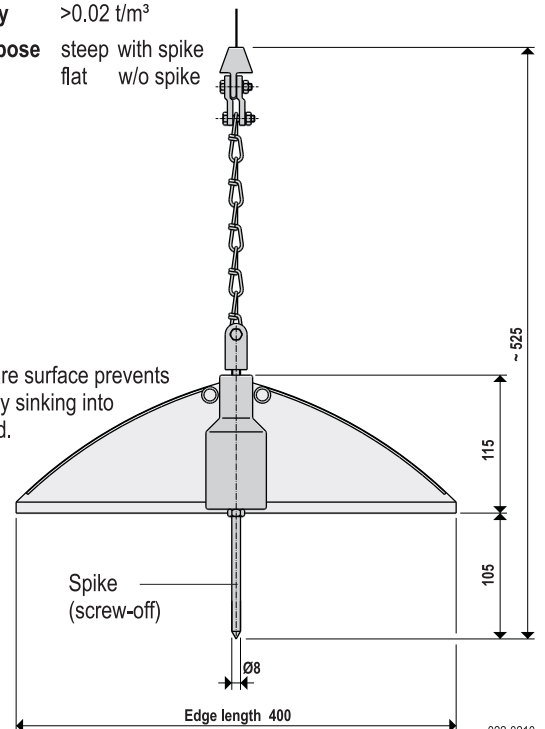
9.D/9.E Polyester umbrella with steel or stainless steel weight
for temperatures up to +150 °C

For very light and loose bulk solids.

Bulk density >0.02 t/m³

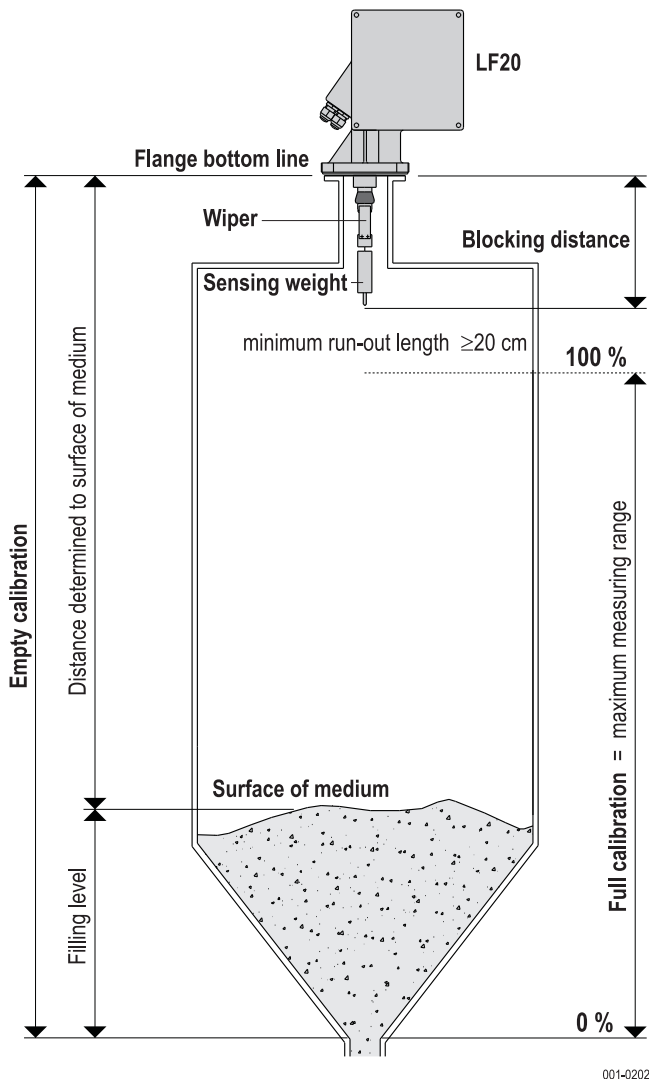
Angle of repose steep with spike
flat w/o spike

A large square surface prevents it from deeply sinking into the bulk solid.



022-0210

Measuring categories



The measured value is the distance between the flange bottom line and the surface of the medium minus the block distance. (see figure „measuring categories“) The filling level is calculated taking in account the calibration values entered, e.g. silo height.

Please select the minimum length of the wiper so that the sensing weight jut out of the mounting pipe.

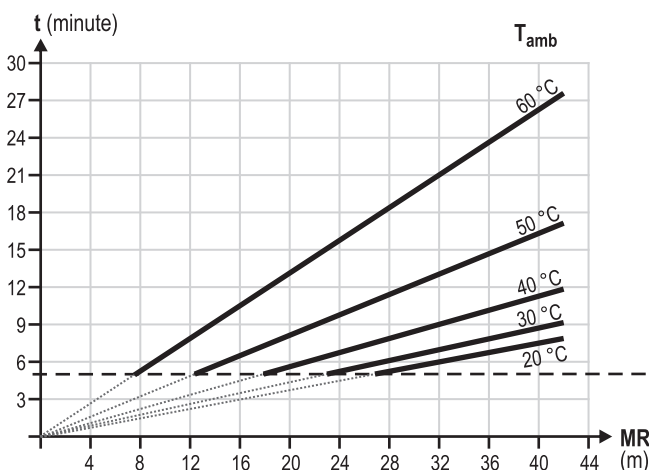
The block distance depends on the selected wiper and sensing weight.

| Sensing weight | Wiper 230mm | Wiper 500mm | Wiper 1000mm |
|--------------------|-------------|-------------|--------------|
| 9.B, 9.C, 9.D, 9.E | 0,72 m | 1,02 m | 1,52 m |
| 9.G | 1,22 m | 1,52 m | 2,02 m |
| 9.N | 0,72 m | 1,02 m | 1,52 m |

Different outputs can be selected:

- Filling level in distance
- Distance determined to surface of medium
- Filling level in volume
- Filling level in mass

Measuring cycle

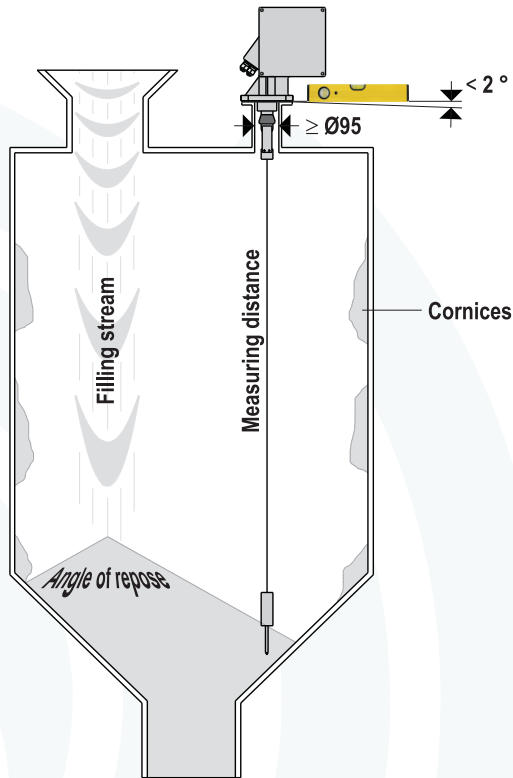


The minimum time (t_{minute}) for one measuring cycle (time between two measurements) is dependent on the ambient temperature (T_{amb}) and the measuring range (MR_{meter}) and must not be undershot in all types of measuring.

► **Non-observance of these instructions may lead to system malfunctions!**

minimum time (time interval) 5 minutes

Installation



Select the mounting location on the bunker or silo roof in such a way that falling product during filling or collapsing cornices cannot spill the sensing weight and cannot damage the measuring tape. If necessary the measuring procedure should be locked during filling process.

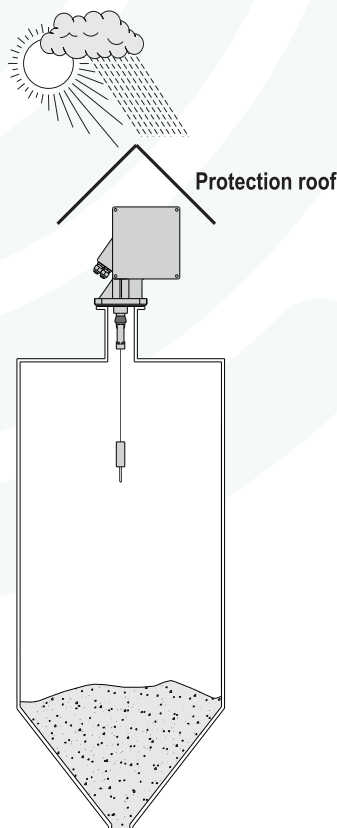
Install the device on a horizontal flange

DN100, Ø220, Lk180, 4x18.

Normal weights, plastic weights and umbrella weights can be passed into the bunker or silo via the DN100 flange. In case of using larger weights like a filled medium bag a constructional possibility at the bunker or silo (e.g. access hatch) has to be available in order to install these ones.

The measurement section should not run too close to internals and struts, so that the measuring tape does not touch them when sensing weight is swinging.

For use in bunkers/silos with severe dust emission a pressure air connector with an internal thread 1/4 is available in order to generate a slight over pressure at the tape roll chamber.



For use in external areas being exposed to climatic conditions we recommend the weather protection hood or an additional protection roof.

For ambient- and process temperatures from -20 °C ... -40 °C

use **option 7.E** „self-adjusting heating“

For tropical environments

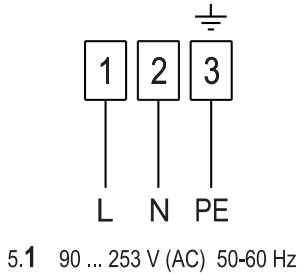
use **option 7.F** „extended climate resistance“

Electrical connection

For connection a basic installation cable is sufficient.

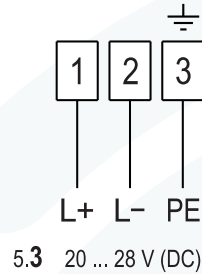
Supply voltage  **AC**

Circuit diagram - Terminal 1



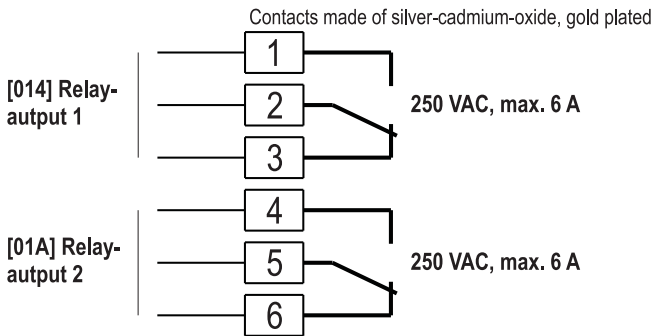
Supply voltage  **DC**

Circuit diagram - Terminal 1



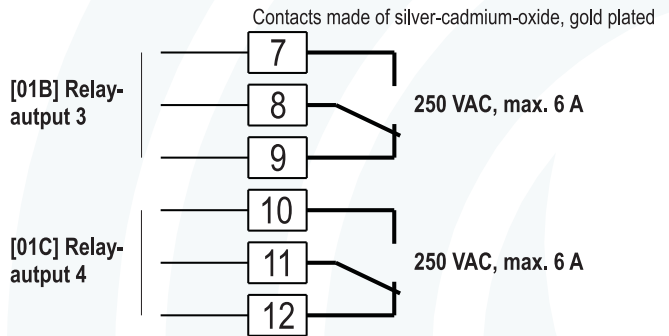
Relay output 

Circuit diagram - Terminal 2.1



Relay output  **optional 6.C**

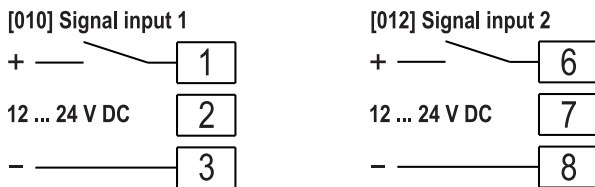
Circuit diagram - Terminal 2.2



The rest position matches with the position of the relays without power supply.
This represents the alert condition in case the function "alarm" is selected.

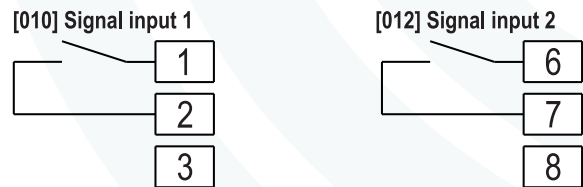
Signal inputs  **active** Pulse length ≥ 200 ms

Circuit diagram - Terminal 3.1 and 3.2



Signal inputs  **passive** Pulse length ≥ 200 ms

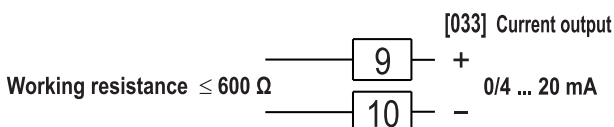
Circuit diagram - Terminal 3.1 and 3.2



The **signal inputs active** or **passive** can only be used alternatively.
A double connection from active and passive can not be used!

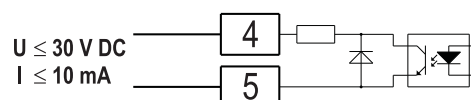
Current output 

Circuit diagram - Terminal 3.2



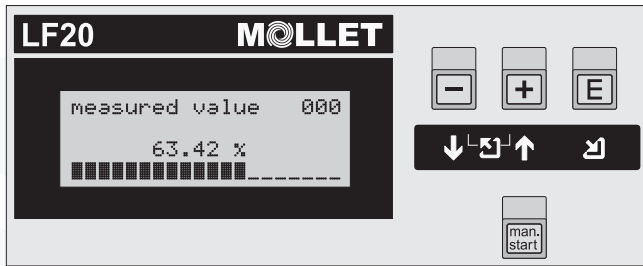
Optocoupler output  **optional 6.C**

Circuit diagram - Terminal 3.1



001-0203

Display - Programming - Operation



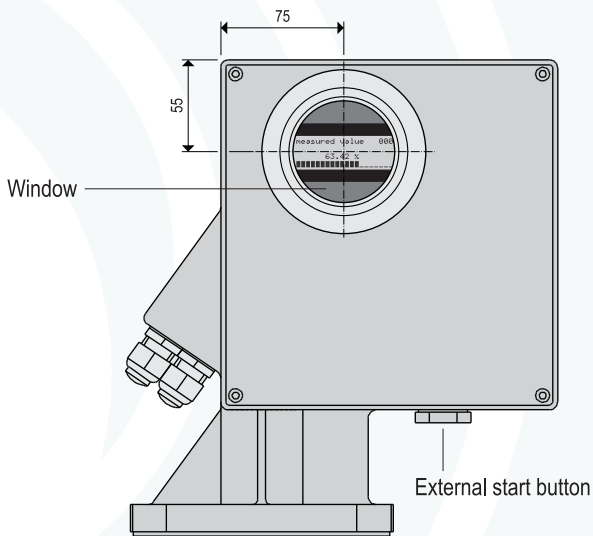
Display

During operation the actual measuring values are shown on the display.

Display

LCD 4-line display
20 characters per line
Contrast adjustable

optional 10.2 Window in housing lid enables external reading of measured values



Programming

Using the menu-guided display all factory set parameters can be adjusted with the three programming keys.

The menu comprises parameter groups and parameters.

Application parameters can be displayed and set in the different parameter groups.

The setting of all parameters is possible.

Programming keys



Operation

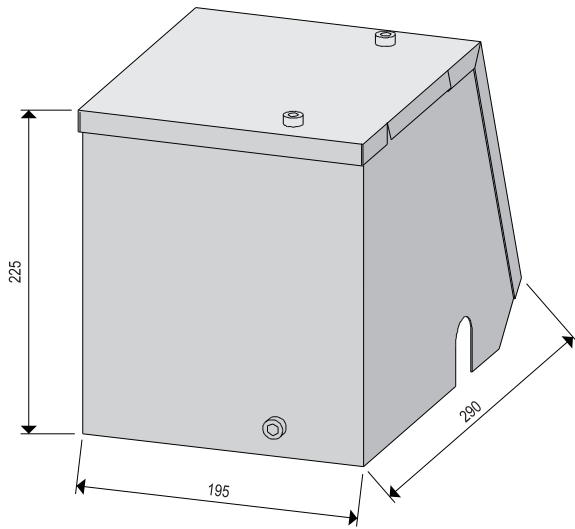
Start-button

Manuel start



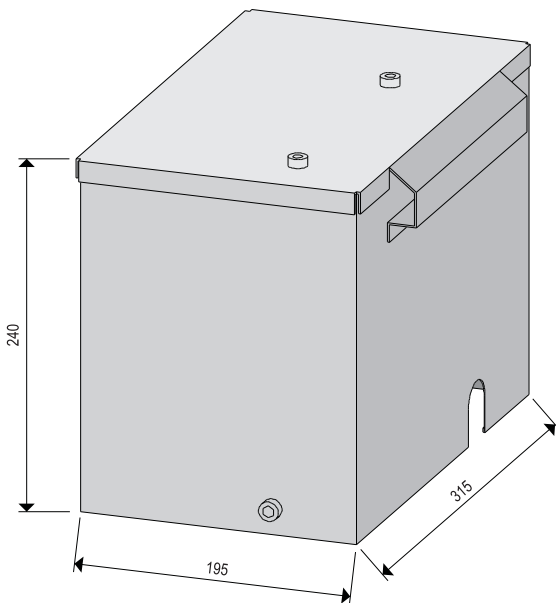
optional 10.2 external start button at the housing

Aluminum weather protection hood



| | |
|----------|------------------------------|
| Material | Aluminum AlMgSi1, eloxadized |
| Weight | 0,7 kg |
| Shipment | incl. installation screws |

Stainless steel weather protection hood



| | |
|----------|------------------------------|
| Material | Stainless steel 1.4301 (304) |
| Weight | 4,2 kg |
| Shipment | incl. installation screws |