

# Technical Information

## Silopilot FMM50

### Electromechanical Level Measuring System



The simple and easy-to-understand level meter for all bulk solids and fluids

#### Application

- Measuring principle independent of physical properties like mass density
- Measuring of level in bunkers and silos with powdered, fine or coarse grain bulk solids or in vessels containing liquids

#### Device properties

- Level measurements up to 90 m
- Process temperatures up to +230 °C (+446 °F)
- Process pressure up to 300 kPa (3 bar) absolute
- Use in aggressive atmospheres, for example acidic or caustic vapours possible
- Separation layer detection in fluids possible with suitable sensing weights

#### Your benefits

- Suitable for process conditions where typical ultrasonic or radar level meter fail to work dependably
- Precise detection of the level (accuracy of  $\pm 5$  cm or  $\pm 1$  pulse)
- Compact transmitter with 0/4 - 20 mA current output as well as further free programmable signal outputs (for example counter pulse)
- Quick menu-guided local operation using a 4-line text display
- Fully electronic digital minimum fail-safe control, therefore no running down of the sensor weight into the silo outlet and no risk to the conveying systems





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
## Document information

### Document conventions









### Safety symbols

Symbol	Meaning
	<b>DANGER!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
	<b>WARNING!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	<b>CAUTION!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
	<b>NOTICE!</b> This symbol contains information on procedures and other facts which do not result in personal injury.



### Electrical symbols

Symbol	Meaning	Symbol	Meaning
	Direct current		Alternating current
	<b>Protective ground connection</b> A terminal which must be connected to ground prior to establishing any other connections.		<b>Ground connection</b> A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

### Symbols for certain types of information

Symbol	Meaning
	<b>Allowed</b> Indicates procedures, processes or actions that are allowed.
	<b>Preferred</b> Indicates procedures, processes or actions that are preferred.
	<b>Forbidden</b> Indicates procedures, processes or actions that are forbidden.
	<b>Tip</b> Indicates additional information.
	<b>Reference to documentation</b> Refers to the corresponding device documentation.
	<b>Reference to page</b> Refers to the corresponding page number.
	<b>Reference to graphic</b> Refers to the corresponding graphic number and page number.
	Visual inspection

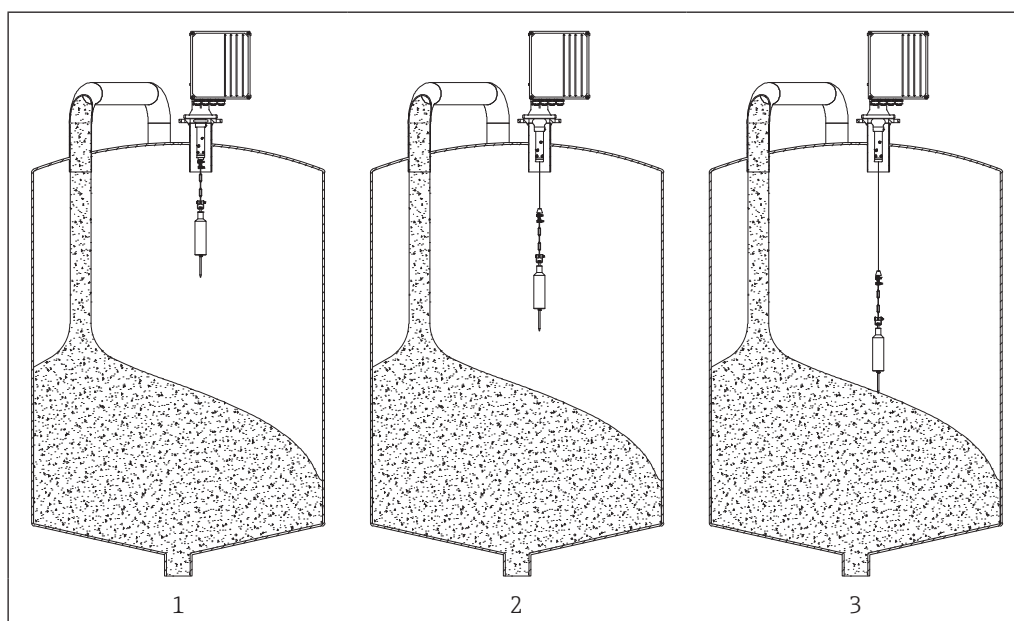
Symbols in graphics

Symbol	Meaning	Symbol	Meaning
1, 2, 3 ...	Item numbers	1., 2., 3. ...	Series of steps
A, B, C ...	Views	A-A, B-B, C-C ...	Sections
	Hazardous area		Safe area (non-hazardous area)

## Function and system design

### Measuring principle

A measuring tape, loaded with a sensing weight, is lowered into the bunker or silo (2). When the weight meets the surface of the product the tension on the measuring tape is relaxed (3) and this is detected by the device electronics.



 1 Measuring principle

The measured value is transmitted to the 0/4 - 20 mA current output. The sensing weight now runs back up to the start position (1) and the measured value is retained until the next measurement is performed.

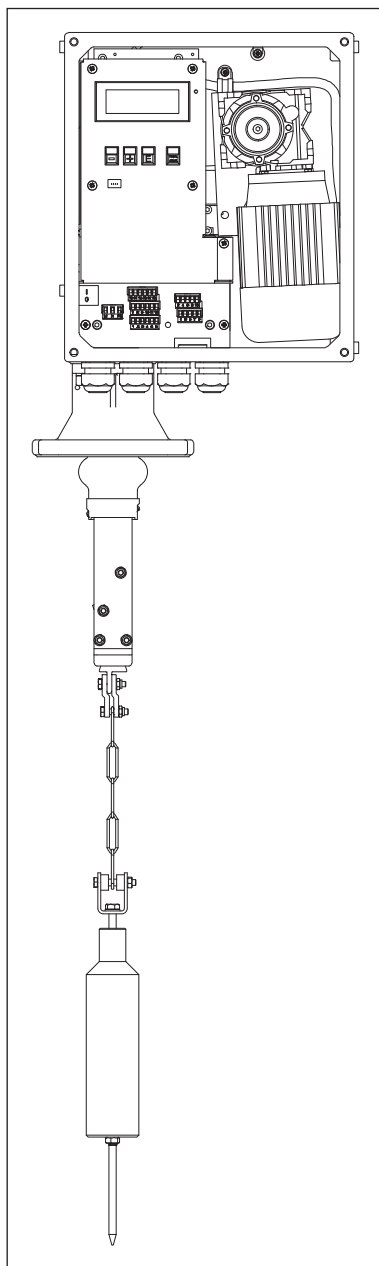
During the entire measuring process (lowering and hoisting of the sensing weight) the device can also transmit pulses (relay output) corresponding to the length of the measuring tape, which can be recorded by a control unit or by an electromechanical counter.

Both individual measurements and periodic measurement sequences can be performed. The measurement can then be initiated manually (for example external start button) or periodically (for example programmed function of the device).

The unit is delivered with default values for the maximum measuring range according to the unit configuration (see ordering information). The menu-guided programming using the 4-line text display assures easy and fast adjustment to the bunker or silo geometry.

### Measuring system

The FMM50 is a compact transmitter with integrated microprocessor-controlled electronics, various in- and outputs (→  7, 8) are provided. The device can be adapted to different applications by choosing one of the suitable sensing weights (→  14).



2 FMM50 with open electronic side

#### Type of housing and materials

Compact, Aluminium, optional coated

#### Sensing weights (→ 14) and materials

- Steel, optional with umbrella Polyester
- Stainless steel 316TI, optional with umbrella Polyester
- Plastic PVC

#### Configuration

Operation via 4-line local display with plain and help texts

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#### Safety

We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

Security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

# Input

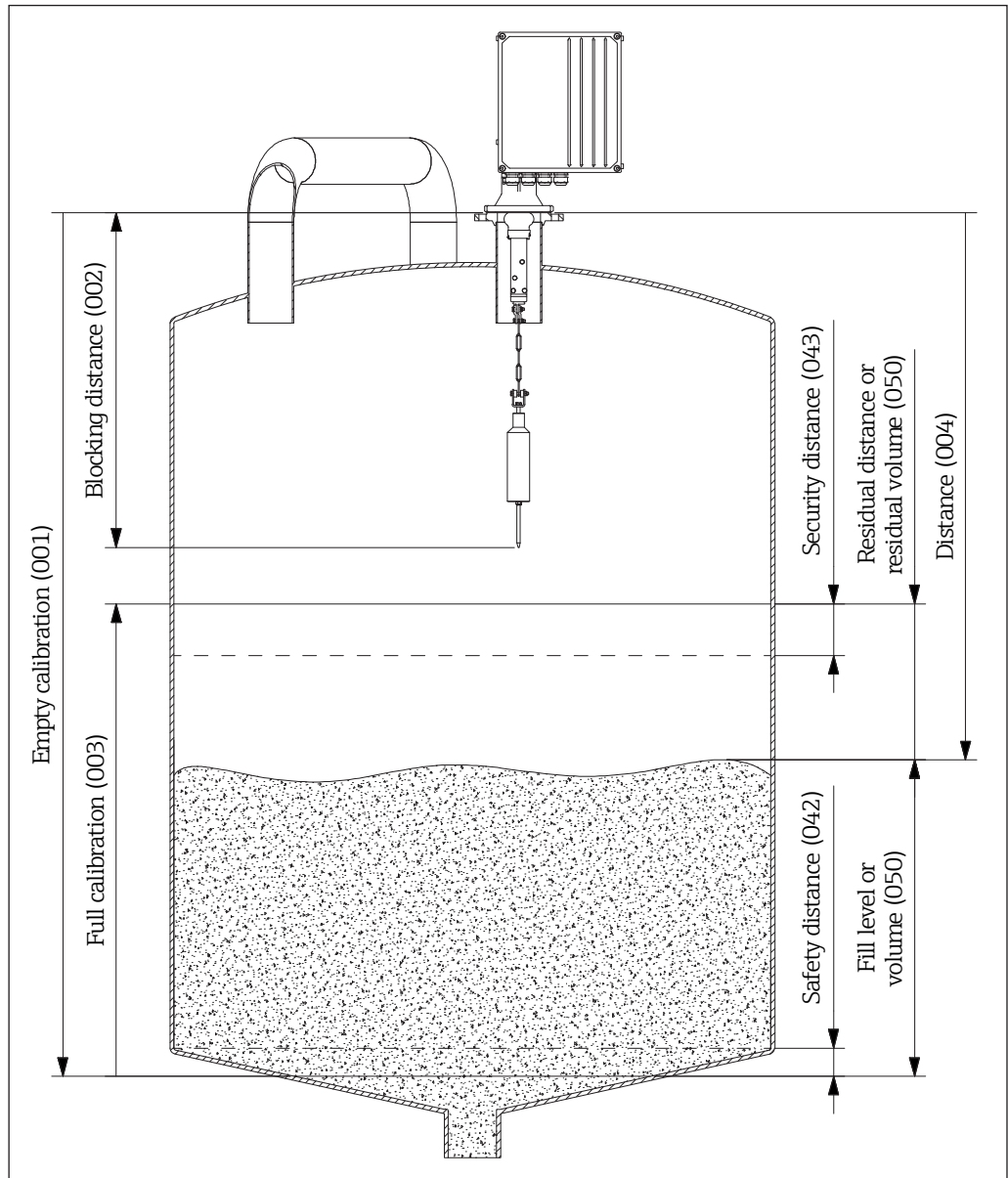
**Measured variable**

**Measured process variables**

The measured value is the distance between the flange of the Silopilot minus a blocking distance and the surface of the product.

**Calculated process variables**

The filling level is computed taking into account the fixed given calibration values, for example the empty calibration (height of the silo). The filling level can be converted to other values as desired, for example volume or mass, by the application of linearization.



3 Adjustment values of the FMM50

**Measuring range**

Max. 90 m

The highest measurable point is given by the blocking distance (see figure "Measuring principle") plus a minimum descent length of 20 cm. This maximum length must be considered on input of the maximum measuring range (full calibration).

**Blocking distance**

The blocking distance (BD) depends on the wiper length and the selected sensing weight.

Sensing weight	Wiper 230 mm	Wiper 500 mm	Wiper 1000 mm
B, C, D, E, L	0.80 m	1.10 m	1.60 m
G	1.20 m	1.50 m	2.00 m
J	0.86 m	1.16 m	1.66 m
M, N	0.65 m	0.95 m	1.45 m

**NOTICE**

The individual value for the blocking distance is preset on delivery and only needs to be adjusted when changing the sensing weight for example, the relevant input option can be found in the menu.

**Input signal**

Remote operation possible via two inputs, each input can be assigned as either active or passive and is therefore usable.

 The device is available with an optional external start button (→ 21), which is connected to the passive signal input 1.

**Active inputs**

- Connection of an external voltage
- Input voltage range: 12...24 VDC
- Input polarity: Normally open or normally closed
- Start pulse length: min. 200 ms

**Passive inputs**

- Connection of an external command device, for example switch/button, relay contact
- Contact rating: max. 0.3 W / 30 VDC
- Input polarity: Normally opened or normally closed
- Start pulse length: min. 200 ms

**Operating frequency**

**Measuring cycle**

Min. 1 minute

**NOTICE**

- Please observe the minimum time (TM) for one measuring cycle with the device according to the measuring range and the ambient temperature (→ 12).
- This minimum time must be taken into account in all types of measuring.
- We recommend not to go below a time of 5 minutes for one measuring cycle.

**Tape run speed**

The speed of the tape is between 0.21 m/s and 0.35 m/s.

# Output

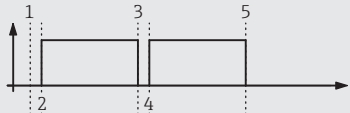

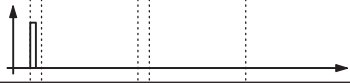
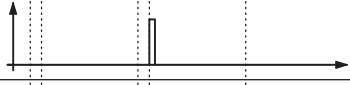
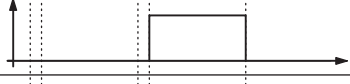
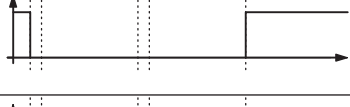
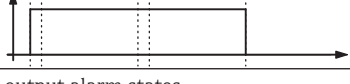
## Output signal

### Current output

- 0/4-20 mA (active, 0-20 mA / 4-20 mA programmable)
- max. 22 mA

### Relay output

- Number: 2 (optional 6)
- Contact rating: 250 VAC, 6 A
- Contact material: silver-cadmium-oxide, gold-flashed

Programmable relais functions		
Measuring cycle		1 Start of measuring cycle (time or event triggered) 2 Sensing weight moves down 3 Medium surface detected (measurand generated) 4 Sensing weight moves up 5 End of measuring cycle
Counter pulse		emits pulses equivalent to the length of the rolled-out tape
Reset pulse		pulse before new measurement, for example reset of an external counter
Tape reverse		indication of the lower tape direction reversal
Ascent of sensing weight		indication of ascent of the tape, for example fade-out the counter pulses
Upper end position of sensing weight		indication of upper end position, for example end of measurement
Measurement active		indication of an active measurement, for example lock of filling equipment
Alarm	output alarm states	
Maintenance interval	notice to maintain the device	
Limit value	output level limit value (Note: A selected threshold with associated hysteresis applies for all relays, individual settings for each relay are not possible.)	

## Signal on alarm

Malfunction signal can be called up via the following interfaces.

### Local indication

- Error symbol
- Error code with text indication

### Current output

- Minimum: minimum current value  $\leq 3.6$  mA (4-20 mA) or 0 mA (0-20 mA)
- Maximum: maximum current value + 10% ( $\approx 22$  mA)
- Programmable: current value 0-22 mA
- Hold: last valid current value

### Relay output

- Alarm function

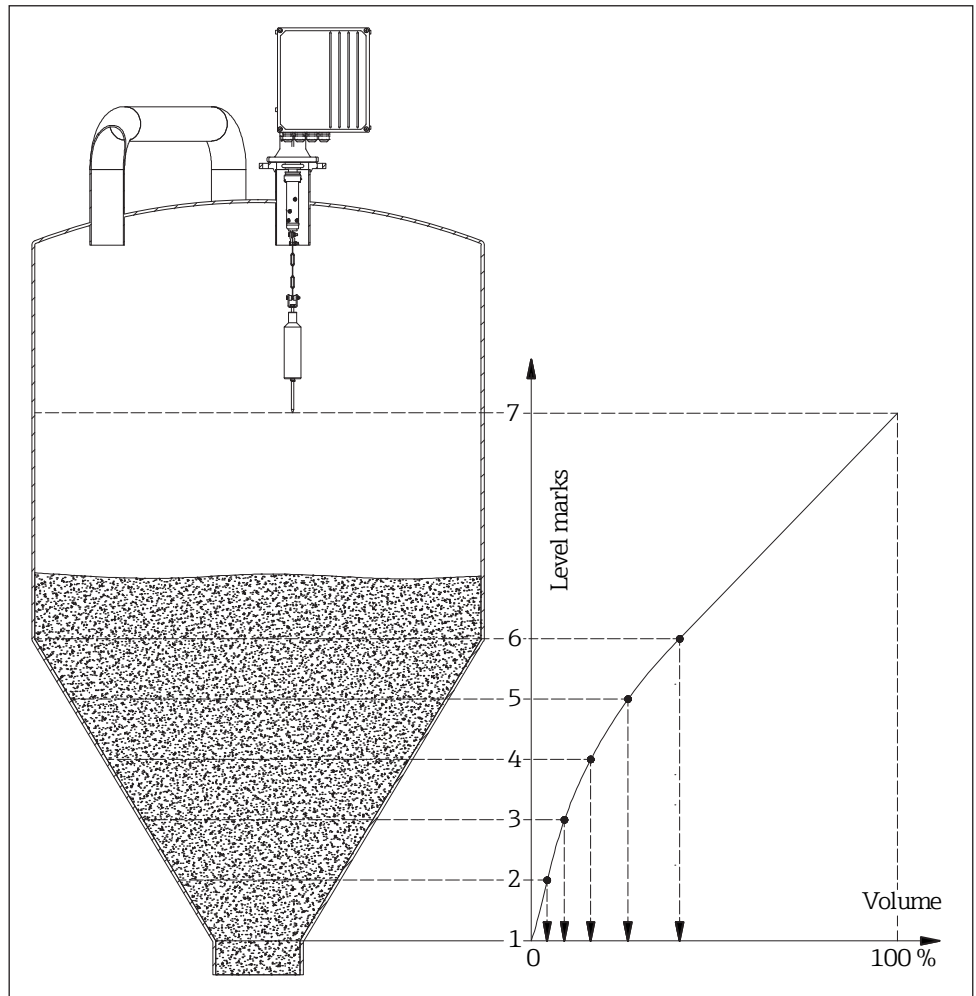
## Load

Load of the current output: max. 600  $\Omega$



**Linearisation**

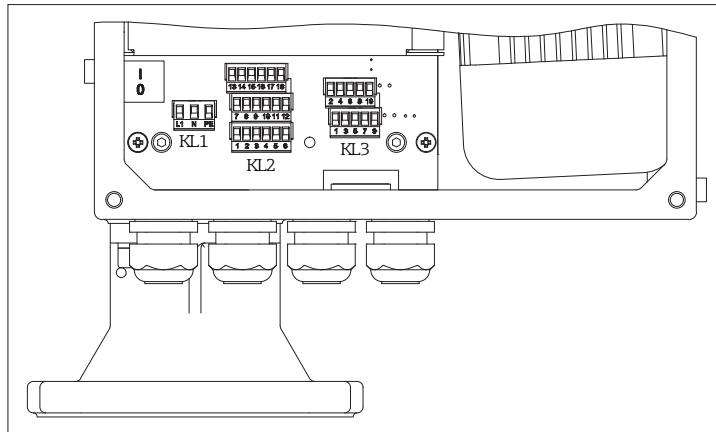
The linearisation function of the device facilitates conversion of the measured value into engineering units such as cubic metres or hectolitres. If the filling level is not uniformly proportional to the volume within the set measuring range, then a linearization curve can be entered using a maximum of 32 reference values.



4 Linearisation

## Power supply

### Terminal assignment



5 Terminals of the FMM50

Ordering code	Terminal assignment		
Power supply - option 1, 2	1.1	L1 (~)	Power supply
	1.2	N (~)	
	1.3	PE (≐)	
Output - option A, B	2.1		Relay 1
	2.2		
	2.3		
	2.4		Relay 2
	2.5		
	2.6		
Output - option B	2.7		Relay 3
	2.8		Relay 4
	2.9		
	2.10		
	2.11		Relay 5
	2.12		
	2.13		
	2.14		Relay 6
	2.15		
	2.16		
	2.17		
	without	3.1	(+)
3.2		(-)	
3.3		(+)	Input 2, active
3.4		(-)	
3.5			Input 1, passive
3.6			
3.7			Input 2, passive
3.8			
3.9		(+)	Current output
3.10		(-)	

The rest position matches with the position of the relays without power supply, this represents the alarm condition if the function "alarm" is selected.

- Supply voltage**
- 180-253 VAC, 50/60 Hz (ordering code "**power supply**", option 1)
  - 90-127 VAC, 50/60 Hz (ordering code "**power supply**", option 2)

**NOTICE**

- When using the public powers supply, install an easily accessible power switch in the proximity of the instrument. Mark the power switch as a disconnecter for the instrument (EN/IEC 61010).
- You should use a fuse to protect the power supply against short-circuit.

- Power consumption**
- Max. 230 VA (ordering code "**ambient temperature**", option A or C)
  - Max. 250 VA (ordering code "**ambient temperature**", option B or D)

- Power supply failure**
- Configuration is retained in the device memory.
  - The current error is shifted into the last error function.

**Potential equalization**

**Requirements**

- The potential matching should be connected up to the outer grounding terminal of the device.
- For an optimum electromagnetic compatibility, the potential matching line should be as short as possible.
- The recommended minimum cable cross-section is 2.5 mm<sup>2</sup>.
- The device's potential matching should be included in the local potential matching.



For devices intended for use in hazardous locations, please observe the guidelines in the Ex documentation (XA).

- Terminals**
- Max. 2.5 mm<sup>2</sup> (power supply)
  - Max. 1.5 mm<sup>2</sup> (signal inputs, relay outputs, current output)

- Cable entries**
- M25 x 1.5
  - Cable gland non-hazardous area:
    - Material: plastic
    - Color: grey
    - Clamping range: 9...17 mm
  - Cable gland ATEX:
    - Material: plastic
    - Color: black
    - Clamping range: 9...13 mm
  - Number:
    - 4 pieces (ordering code "**additional equipment**", option 1)
    - 3 pieces (ordering code "**additional equipment**", option 2)

- Cable specification**
- Minimum requirement: cable temperature range ≥ ambient temperature
  - Standard installation cable is sufficient for signal inputs, relay outputs and current output.

## Performance characteristics

**Measured value resolution** ■ ± 5 cm or ± 1 pulse (irrespective of the selected measuring range)

**Maximum measured error** The maximum measured error is identical with the measured value resolution (± 5 cm or ± 1 pulse, irrespective of the selected measuring range).

**Influence of ambient temperature**

- Please observe the minimum time ( $T_M$ ) for one measuring cycle with the device according to the measuring range (MR) and the ambient temperature ( $T_A$ ).
- This minimum time must be taken into account in all types of measuring.

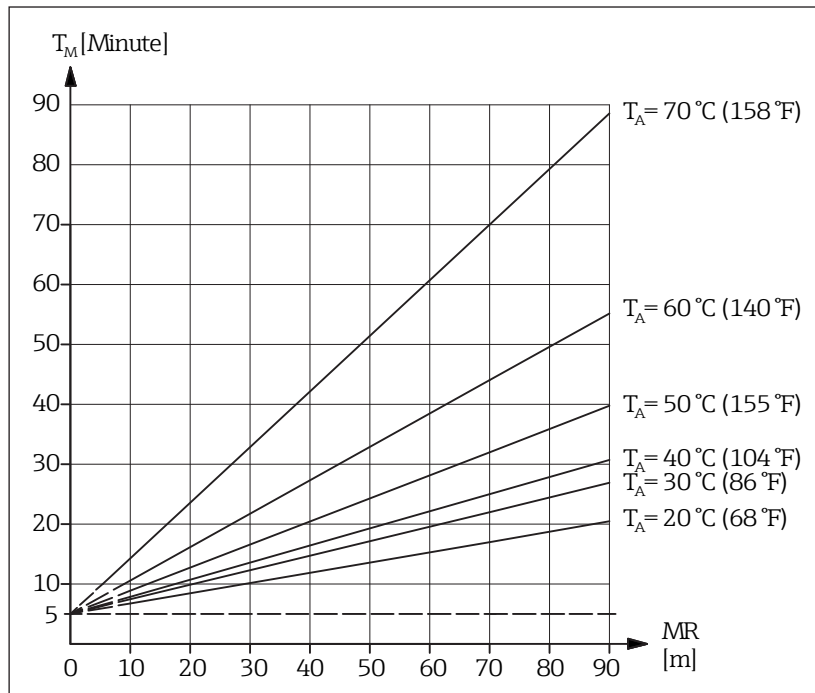


Fig. 6 Influence of ambient temperature

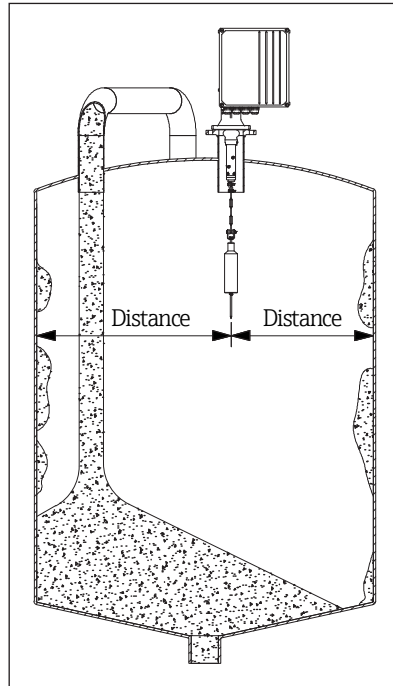
### NOTICE

We recommend not to go below a time of 5 minutes for one measuring cycle.

## Installation

### Mounting location

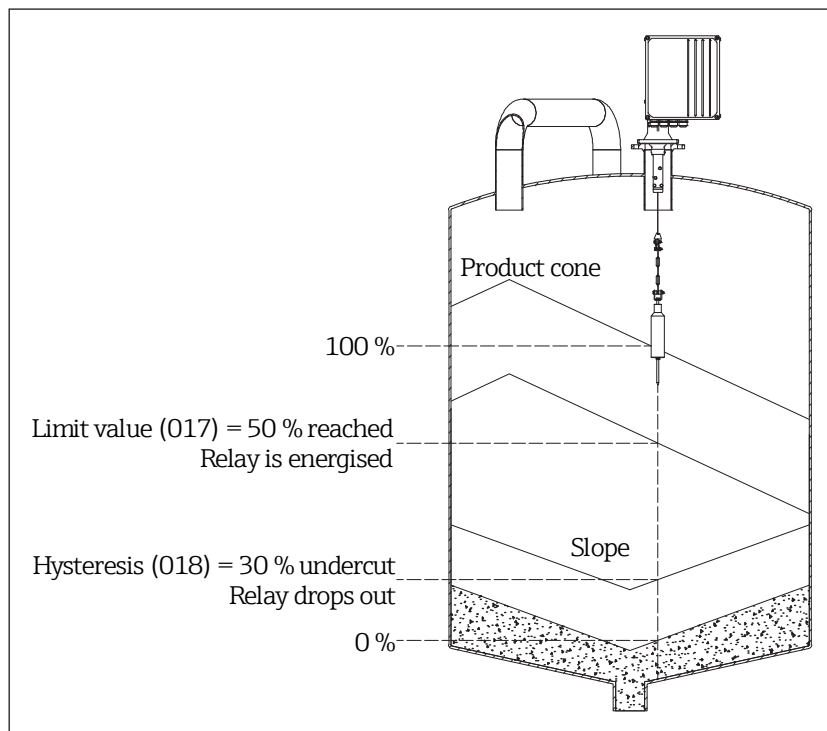
- Select a mounting location on the bunker or silo such that product falling inside during filling, or accumulations of product collapsing inward, cannot cover the sensing weight nor damage the measuring tape.
- The measuring path should not pass too close to any internal fixtures or struts, so that the measuring tape will not brush against them if the sensing weight swings around.
- Select the length of the tape wiper such that the sensing weight is outside of the mounting flange.



7 Mounting location - Distances

### NOTICE

Take due account of the shape and location of the product inflow cone and the outflow funnel within the vessel.



8 Mounting location - Measurement processing

**Orientation**

The device is best mounted on a counter flange DN100 PN16 (connection dimensions according to EN 1092-1) or a flange having the same connection dimensions. The counter flange must be mounted exactly horizontal so that the device can also be mounted horizontally onto it (maximum angle of inclination 2 °). There are suitable process adapters for the device available (→ 1525).



A suitable installation aid (bubble level) can be found inside the devices with coated housing which, with the electronics cover opened, can be used for alignment.

**Installation instructions**

- When installing outside, fit the protection hood (available as spare part) or install a weather protection roof.
- Normal weights, umbrella weights and bag weights (→ 1518) can be passed through the DN100 mounting flange into the bunker/silo. When using larger sensing weights, such as cage weights, bell weights, floats and some bag-type weights, access provision must be present in the construction of the bunker/silo for installation of these weights.
- When installing in bunkers/silos with heavy dust loadings, a slight positive pressure can be generated at the device by connecting a compressed air line to its mounting flange (airflow quantity as required). There is a G1/4 female connection provided for this purpose at the device flange.

**Selection sensing weights**

When selecting the sensing weight the following points should be considered:

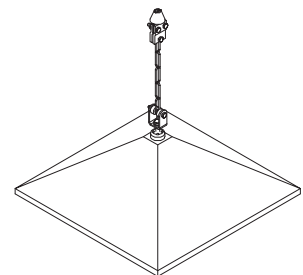
- The sensing weight may not sink into the product nor be diverted by contact with the product cone during the measuring procedure.
- The sensing weight must be suited for the chemical characteristics of the product and the temperature within the bunker/silo.
- Special types for your individual applications are available on request.
- Dimensions → 1518

**Normal weight** (ordering code "sensing weight", option B or C)

- Application: For coarse bulk solids, for example coals, ores or stones and granulates.
- Material: Steel or stainless steel
- Weight: 3.5 kg
- The spike can be taken off.

**Umbrella weight** (ordering code "sensing weight", option D or E)

- Application: For very light and loose bulk solids, for example flour or coal-dust. The umbrella weight has a large square surface area which prevents it from sinking deeply into the product.
- Materials: Steel or stainless steel, polyester
- Weight: 3.9 kg (option D) / 3.8 kg (option E)
- Maximum permissible temperature: +150 °C (+302 °F)
- When folded closed, the weight can be passed through the DN100 mounting flange into the bunker.
- The umbrella has a large, square area, preventing it from being immersed in the bulk solids.

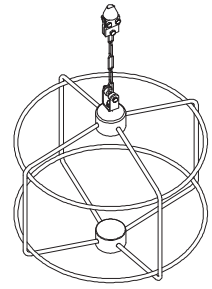
**Bag weight** (ordering code "sensing weight", option G)

- Application: In bunkers to which for example mills are connected down-stream. The bag contains whichever product is contained within the bunker.
- Materials: Bag made of polyester, all metal parts made from stainless steel.
- Weight: 0.25 kg (empty) / 3.5 kg (filled)
- Maximum permissible temperature: +150 °C (+302 °F)
- Bind the bag closed at the top so that the contents cannot fall out if the bag tips over on the slope of a product cone.



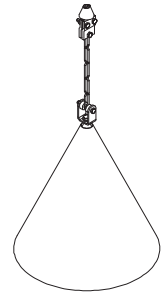
**Cage weight** (ordering code "sensing weight", option J)

- Application: For fine bulk solids in silos with relatively small outlet openings that must not be blocked by a sensing weight which has broken free. Also suitable for high temperatures for which a bag may not be used.
- Material: Stainless steel 316Ti
- Weight: 3.5 kg
- The weight could become lodged over the product outlet, but would allow the bulk solid to pass through. Since the cage weight cannot enter a conveyor system (for example cellar wheel feeder or screw conveyor), no damage can result.



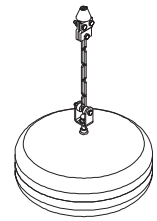
**Bell weight** (ordering code "sensing weight", option L)


- Application: For light and loose bulk solids; especially where higher temperatures and particular characteristics preclude the use of an umbrella weight.
- Material: Stainless steel 316Ti
- Weight: 4.3 kg



**Oval float** (ordering code "sensing weight", option M or N)

- Application: For liquids, for example fuel oil, also for granulates.
- Material: Hard PVC (maximum permissible temperature: 0...+60 °C (+32...+140 °F)) or stainless steel 316Ti
- Weight: The float must be filled with product to a total weight of 3.5 kg.
- Use of the oval float made of hard PVC in the "Dust ignition-proof" version is not permitted!
- Utilization of the oval float is permissible for process pressures 0.8...1.1 bar absolute.



 If the bunker/silo has a downstream crushing or milling system, we recommend using the electrical signal function "tape breakage" or the use of a cage weight to avoid damaging the system in the event of the sensing weight breaking free.

**Special installation**

**Protection hood**

A minimum space of 400 mm above the unit is necessary to remove the protection hood (→ 25).

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## Environment

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**Ambient temperature range****Measuring device**

Ambient temperature at the measuring device:

- -20...+70 °C (-4...+158 °F)
- -40...+70 °C (-40...+158 °F) using the self-regulating device heater

**Local display**

- -20...+70 °C (-4...+158 °F)
- The readability of the display may be impaired at temperatures outside the temperature range.

If operating outdoors:

Avoid direct sunlight, particularly in warm climatic regions.



Weather protection covers can be ordered from Endress+Hauser:  
see "Accessories" section → 25

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**Storage temperature**

-40...+80 °C (-40...+176 °F)

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**Degree of protection**

- IP 67 (with closed housing)
- IP 65 (with closed housing and when using the external start button)
- IP 20 (with open housing)

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**Electromagnetic compatibility (EMC)**

- Interference emission in accordance with EN 61326, class B operating equipment
- Interference immunity in accordance with EN 61326, Appendix A (industrial sector)
- Normal installation cable is sufficient for the wiring.

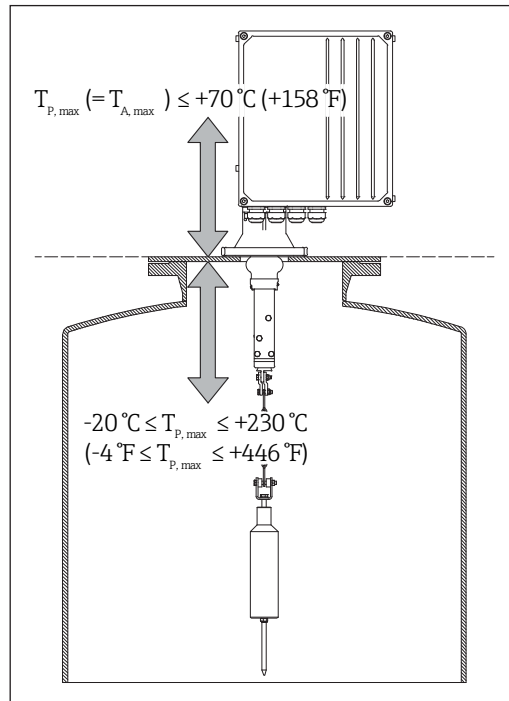


## Process

### Process temperature range

- -20...+70 °C (-4...+158 °F), ordering code "**process temperature**", option 1
- -20...+150 °C (-4...+302 °F), ordering code "**process temperature**", option 2
- -20...+230 °C (-4...+446 °F), ordering code "**process temperature**", option 3

The maximum process temperature at the unit from the bottom of the adaptor flange upwards is +70 °C (+158 °F). In the presence of higher process temperatures in the vicinity of the mounting location, suitable installation provisions must be utilized to assure these temperature guidelines.



9 Permissible ambient temperatures at the FMM50

An extension for the process connection can be used to separate the device from the higher process temperatures. The maximum allowed temperature of +70 °C (+158 °F) can be met through this. The required length of the connection nozzle is dependant on the actual process and ambient conditions.

- i** We recommend the following minimum length of the process connection nozzle:
  - Min. 500 mm at process temperatures up to 150 °C (+302 °F)
  - Min. 1000 mm at process temperatures up to 230 °C (+446 °F)
- i** Suitable process adapter extensions with a length of 790 mm for use with 1000 mm wiper are available as accessory (→ 25).
- i**
  - When using process nozzles longer than 230 mm (length of the standard wiper), optional larger wipers should be considered (see order code).
  - Alternatively, the length of the chain between tape border and sensing weight can be increased, corresponding parts are available as an accessory (→ 25).

### Process pressure range

- 80...110 kPa (0.8...1.1 bar) absolute (ordering code "**process pressure**", option 1)
- 80...300 kPa (0.8...3.0 bar) absolute (ordering code "**process pressure**", option 2)

### Heating

It is recommended that at ambient temperatures below 0 °C (+32 °F) a device with integrated heater is chosen (ordering code "**Ambient temperature**", option **B** and **D**).

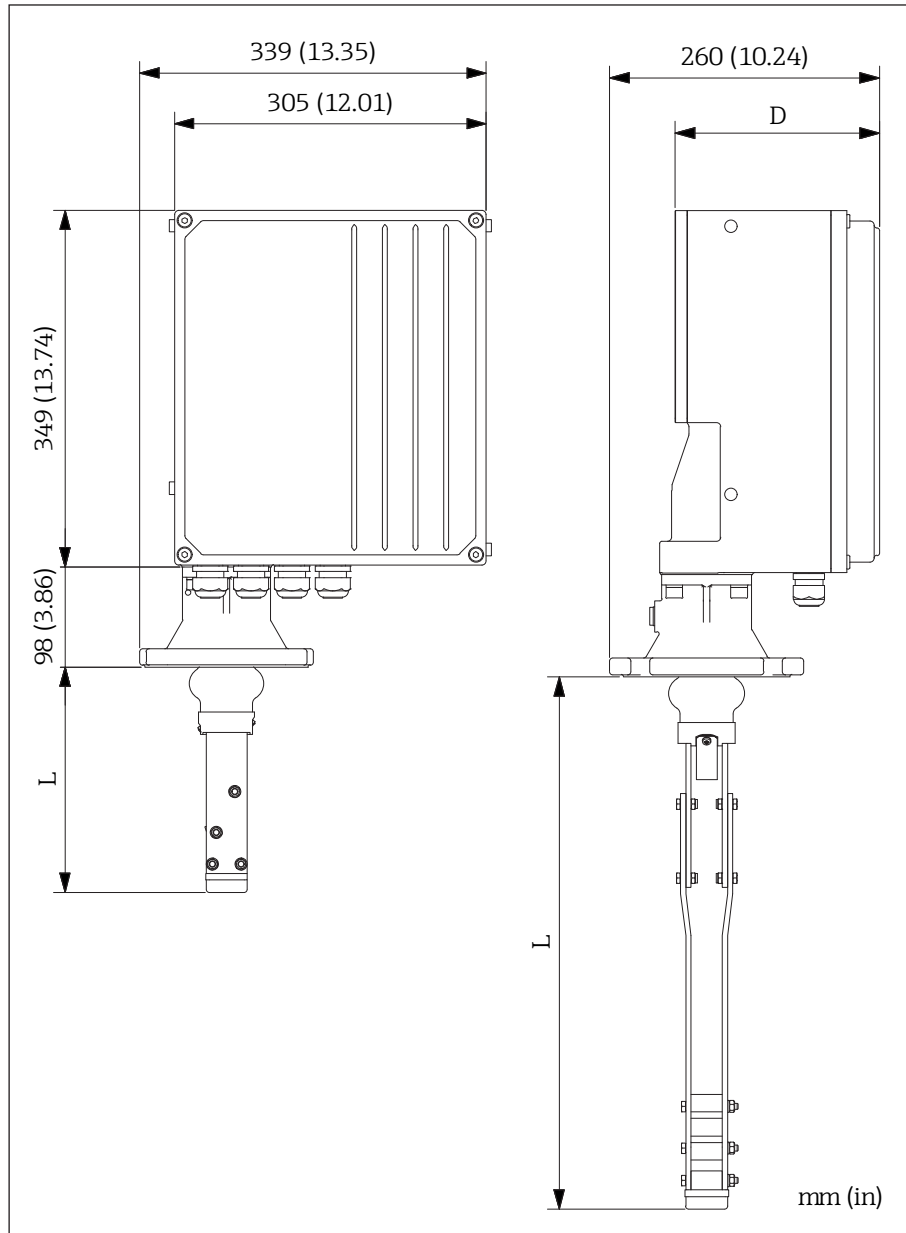
### Vibrations

Due to the layout, the device should not be exposed to vibration. The pendular motion of the motor combined with vibrations can lead to erratic triggering of the tape switch and therefore to faulty measurements.

## Mechanical construction

### Dimensions

### Housing



10 Housing dimensions

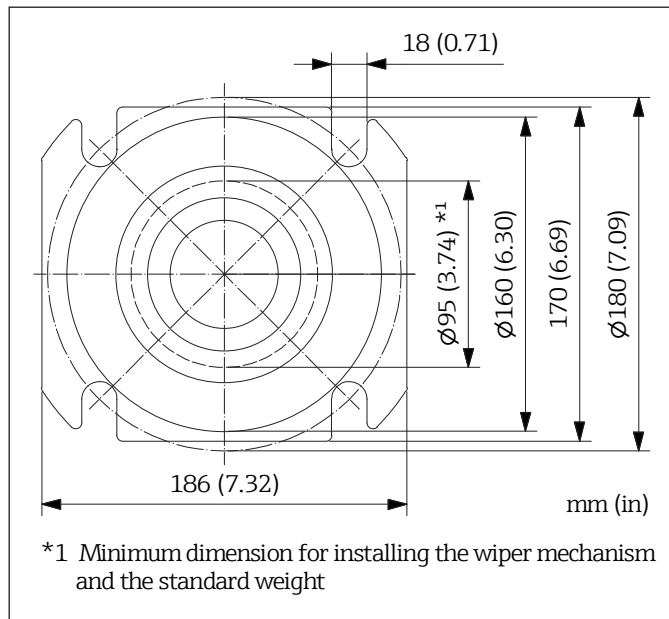
The wiper length (L) depends on the selected maximum nozzle height:

Ordering code "maximum connection height; wiper"	L
A, B	225 mm (8.86 in)
C, D	515 mm (20.28 in)
E, F	1015 mm (39.96 in)

The housing depth (D) depends on the selected process pressure:

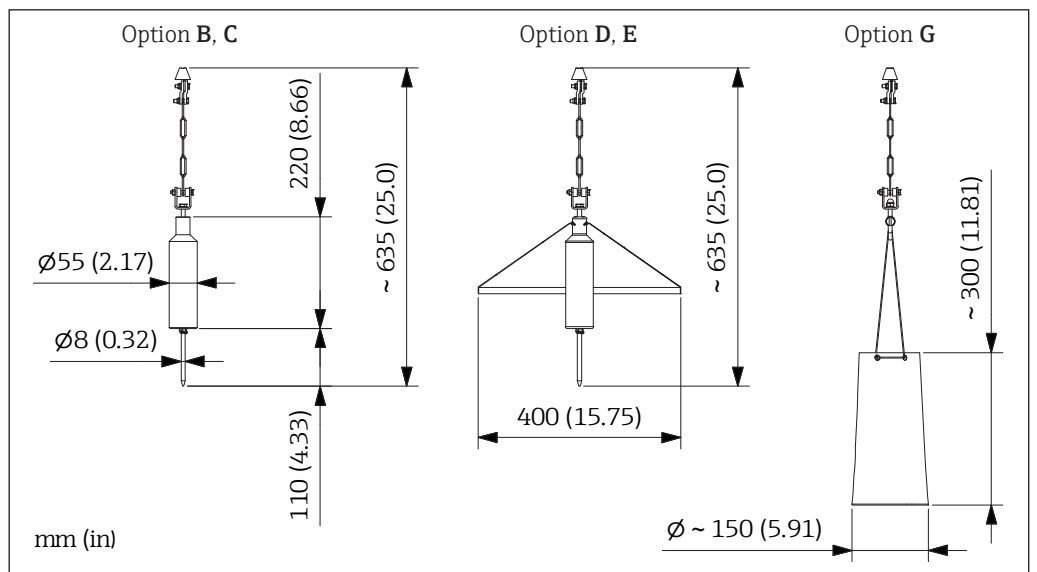
- Ordering code "process pressure", option 1: 196 mm (7.72 in)
- Ordering code "process pressure", option 2: 211 mm (8.31 in)

Process connection

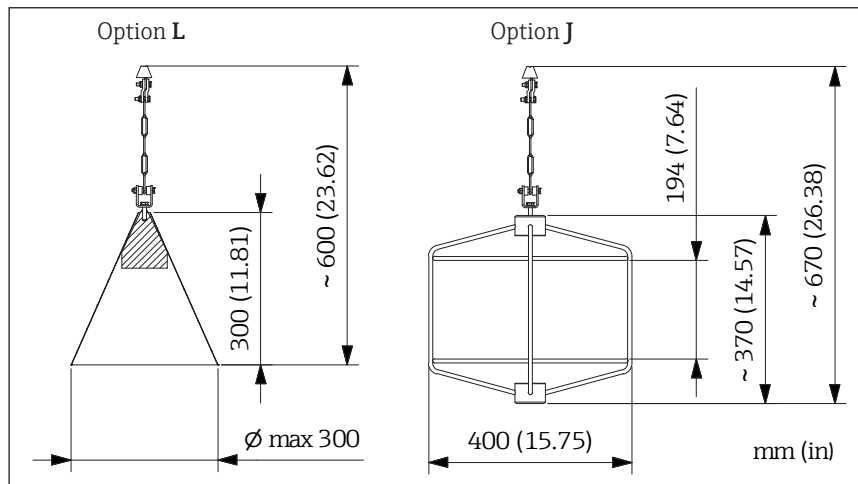


11 Dimensions of the process connection

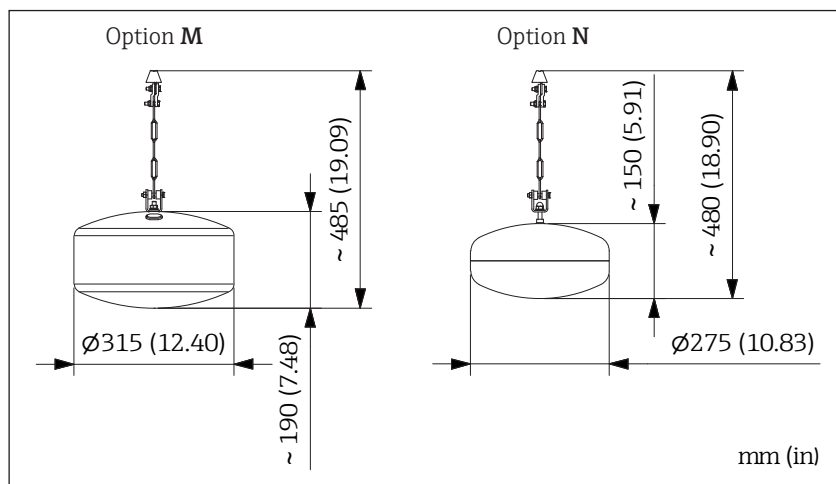
Sensing weights



12 Dimensions of sensing weights - Standard (with umbrella) and medium bag



▣ 13 Dimensions of sensing weights - Bell and cage



▣ 14 Dimensions of sensing weights - Oval float

**Weight**

- 22...28 kg (depends on the selected type of device, without sensing weight)
- Sensing weights → ▣ 14

**Materials**

- Housing: Aluminum (optional coated, RAL 5012 and RAL 7035)
- Wiper:
  - Alu/Steel or
  - Stainless steel
- Tape: Stainless steel
- Sensing weights → ▣ 14

**Process connection**

- Flange
- Hole dimensions DN100 PN16 according to EN 1092-1

## Operability

### Operating concept

#### Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnostics
- Expert level

#### Quick and safe commissioning

- Menu guidance with brief explanations of the individual parameter functions

#### Reliable operation




- Operation in the following languages: English, German, French, Japanese
- Help texts in the selected language

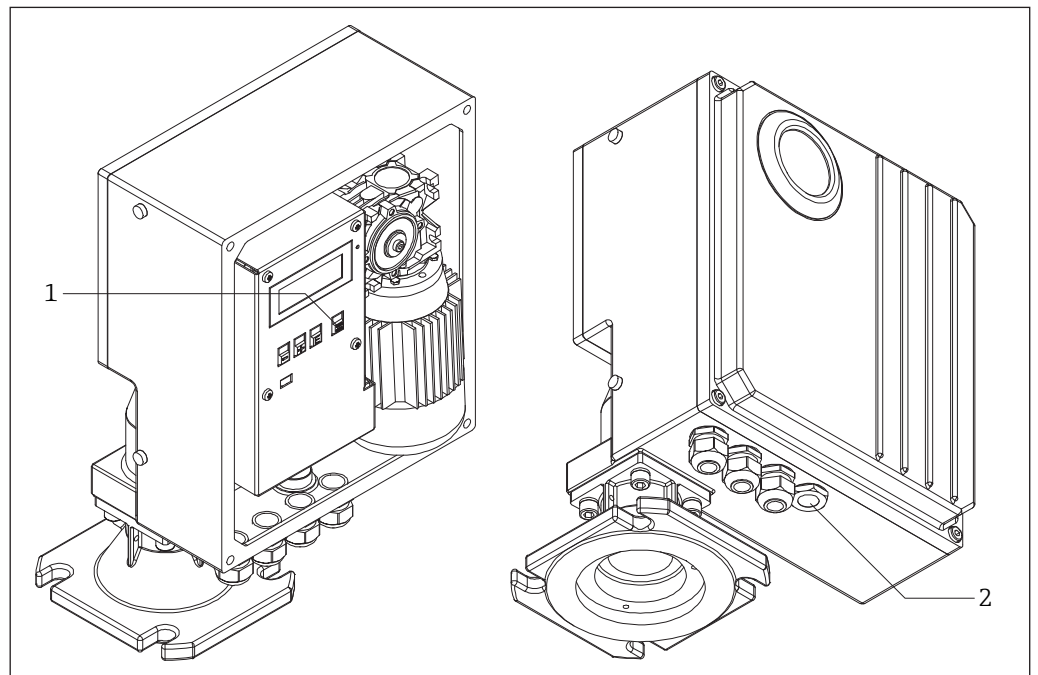
#### Efficient diagnostics increase measurement availability

- Display of the current and the last error
- Help texts for every occurring error
- Various simulation options

### Local operation

#### Operating elements

- Local operation (parameterization) with 3 push buttons: , , 
- Local operation (start measuring) with one push button (1), optional with external start button (2), ordering code "additional equipment", option 2

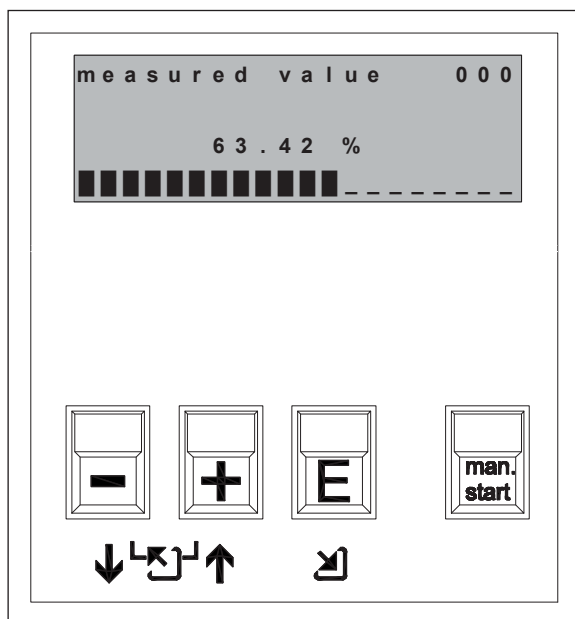


 15 Manual start of measurement

- 1 Internal start push button
- 2 External start push button (optional)

#### Display elements

- 4-line display
- 20 characters per line
- Display contrast adjustable by using a key combination
- Display of measurand numeric and graphic
- Permitted ambient temperature for the display:  $-20...+60\text{ }^{\circ}\text{C}$  ( $-4...+140\text{ }^{\circ}\text{F}$ ), the readability of the display may be impaired at temperatures outside the temperature range.



16 Display and operation elements

#### Languages

- English
- German
- French
- Japanese

## Certificates and approvals

#### CE approval

The measuring system is in conformity with the statutory requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

#### Ex approval

The measuring device is certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.

 The separate Ex documentation (XA) containing all the relevant explosion protection data is available from your Endress+Hauser sales center and as a download from [www.endress.com](http://www.endress.com).

#### Other standards and guidelines

- EN 60529  
Degrees of protection by housing (IP code)
- EN 61010-1  
Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.
- IEC/EN 61326  
Interference emissions (Equipment class B) and interference resistance (Attachment A - industrial systems)
- IEC/EN 60079-0  
Explosive atmospheres - Part 0: Equipment - General requirements
- IEC/EN 60079-31  
Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"

## Ordering information

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### Product structure

Detailed ordering information is available from the following sources:

- In the Product Configurator on the Endress+Hauser website: [www.endress.com](http://www.endress.com) → Select your country → Products → Select measuring technology, software or components → Select the product (picklists: measurement method, product family etc.) → Device support (right-hand column): Configure the selected product → The Product Configurator for the selected product opens.
- From your Endress+Hauser Sales Center: [www.addresses.endress.com](http://www.addresses.endress.com)



#### **Product Configurator - the tool for individual product configuration**

- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format

### Scope of delivery

The scope of delivery includes a minimum of the FMM50 in one cardboard box. Depending on the ordering code the following additional parts are supplied:

- Sensing weight (option **J**, **L** and **M** in one separate cardboard box)
- Wiper extension 500/1000 mm in one separate cardboard box

### User-specific settings

As a service, the device can be programmed according to the customers specification during assembly, in this case the following form must be completed and added to the order.

# User-specific settings



People for Process Automation

The order option for Silopilot FMM50 with user-specific settings requires that all necessary parameters and options are mentioned. Wherever informations are missing, default values will be used. This completed form must be supplied with every order.

Order code: **FMM50** - 

--	--	--	--	--	--	--	--	--	--	--	--

## Settings basic setup, display and system parameters

001 empty calibr. _____ m/ft/in	003 full calibration _____ m/ft/in	020 meas. type <input type="checkbox"/> <b>single cycle</b> <input type="checkbox"/> periodical	021 time interval _____ [022]	022 time unit <input type="checkbox"/> <b>h</b> <input type="checkbox"/> min.	023 normal/short <input type="checkbox"/> <b>normal</b> <input type="checkbox"/> short	024 service interv. _____
028 run up length _____ m/ft/in	060 language <input type="checkbox"/> <b>English</b> <input type="checkbox"/> Deutsch <input type="checkbox"/> Français <input type="checkbox"/> ニホソゴ	061 back to home _____ s (default: 100)	062 no. decimals <input type="checkbox"/> X <input type="checkbox"/> X.X <input type="checkbox"/> <b>X.XX</b> <input type="checkbox"/> X.XXX	080 tag no. _____ (max. 16 digits)	083 distance unit <input type="checkbox"/> <b>m</b> <input type="checkbox"/> ft <input type="checkbox"/> in	

## Settings inputs and current output

010 input 1 <input type="checkbox"/> <b>not used</b> <input type="checkbox"/> bolting <input type="checkbox"/> start measurement	011 polarity input 1 <input type="checkbox"/> NC contact <input type="checkbox"/> <b>NO contact</b>	012 input 2 <input type="checkbox"/> <b>not used</b> <input type="checkbox"/> bolting <input type="checkbox"/> start measurement	013 polarity input 2 <input type="checkbox"/> NC contact <input type="checkbox"/> <b>NO contact</b>
030 current mode <input type="checkbox"/> <b>normal</b> <input type="checkbox"/> magnify	031 0/4 mA value _____ [056]	032 20 mA value _____ [056]	033 current range <input type="checkbox"/> <b>4-20 mA</b> <input type="checkbox"/> 0-20 mA

## Settings relay outputs

014 relay 1 <input type="checkbox"/> <b>alarm</b> <input type="checkbox"/> service interval <input type="checkbox"/> counter pulses <input type="checkbox"/> reset pulse <input type="checkbox"/> running up <input type="checkbox"/> top position <input type="checkbox"/> measuring <input type="checkbox"/> threshold <input type="checkbox"/> band return	01A relay 2 <input type="checkbox"/> alarm <input type="checkbox"/> <b>service interval</b> <input type="checkbox"/> counter pulses <input type="checkbox"/> reset pulse <input type="checkbox"/> running up <input type="checkbox"/> top position <input type="checkbox"/> measuring <input type="checkbox"/> threshold <input type="checkbox"/> band return	01B relay 3 <input type="checkbox"/> alarm <input type="checkbox"/> service interval <input type="checkbox"/> counter pulses <input type="checkbox"/> reset pulse <input type="checkbox"/> running up <input type="checkbox"/> top position <input type="checkbox"/> <b>measuring</b> <input type="checkbox"/> threshold <input type="checkbox"/> band return	01C relay 4 <input type="checkbox"/> alarm <input type="checkbox"/> service interval <input type="checkbox"/> counter pulses <input type="checkbox"/> reset pulse <input type="checkbox"/> running up <input type="checkbox"/> top position <input type="checkbox"/> measuring <input type="checkbox"/> <b>threshold</b> <input type="checkbox"/> band return	01D relay 5 <input type="checkbox"/> alarm <input type="checkbox"/> service interval <input type="checkbox"/> counter pulses <input type="checkbox"/> <b>reset pulse</b> <input type="checkbox"/> running up <input type="checkbox"/> top position <input type="checkbox"/> measuring <input type="checkbox"/> threshold <input type="checkbox"/> band return	01E relay 6 <input type="checkbox"/> alarm <input type="checkbox"/> service interval <input type="checkbox"/> counter pulses <input type="checkbox"/> reset pulse <input type="checkbox"/> running up <input type="checkbox"/> top position <input type="checkbox"/> measuring <input type="checkbox"/> threshold <input type="checkbox"/> <b>band return</b>
015 pulse value _____ (default: 1)	016 pulse length _____ ms (default: 50)	017 limit value _____ % (default: 60)	018 hysteresis _____ % (default: 3)	019 reset pulse _____ ms (default: 300)	

## Safety settings and linearization

040 output on alarm <input type="checkbox"/> <b>MIN (0/3.6mA)</b> <input type="checkbox"/> MAX (22mA) <input type="checkbox"/> hold <input type="checkbox"/> user-specific	041 output on alarm _____ mA	042 safety distance _____ [083]	043 security distance _____ [083]	044 in security distance <input type="checkbox"/> <b>warning</b> <input type="checkbox"/> alarm
045 in safety distance <input type="checkbox"/> <b>warning</b> <input type="checkbox"/> alarm	050 level/volume <input type="checkbox"/> <b>level CU</b> <input type="checkbox"/> ullage CU <input type="checkbox"/> level DU <input type="checkbox"/> ullage DU	051 linearization <input type="checkbox"/> <b>linear</b> <input type="checkbox"/> manually *1  *1 you need to enter manually a linearization curve	056 customer unit <input type="checkbox"/> % <input type="checkbox"/> ft <sup>3</sup> <input type="checkbox"/> kg <input type="checkbox"/> m <input type="checkbox"/> t <input type="checkbox"/> ft <input type="checkbox"/> m <sup>3</sup> <input type="checkbox"/> in	057 max. scale _____ [056]

Note:

- The bold marked options are the default values.
- Settings like "\_\_\_\_\_ [123]" relate to the option you select in function 123.

ad042000en/07.17



## Accessories

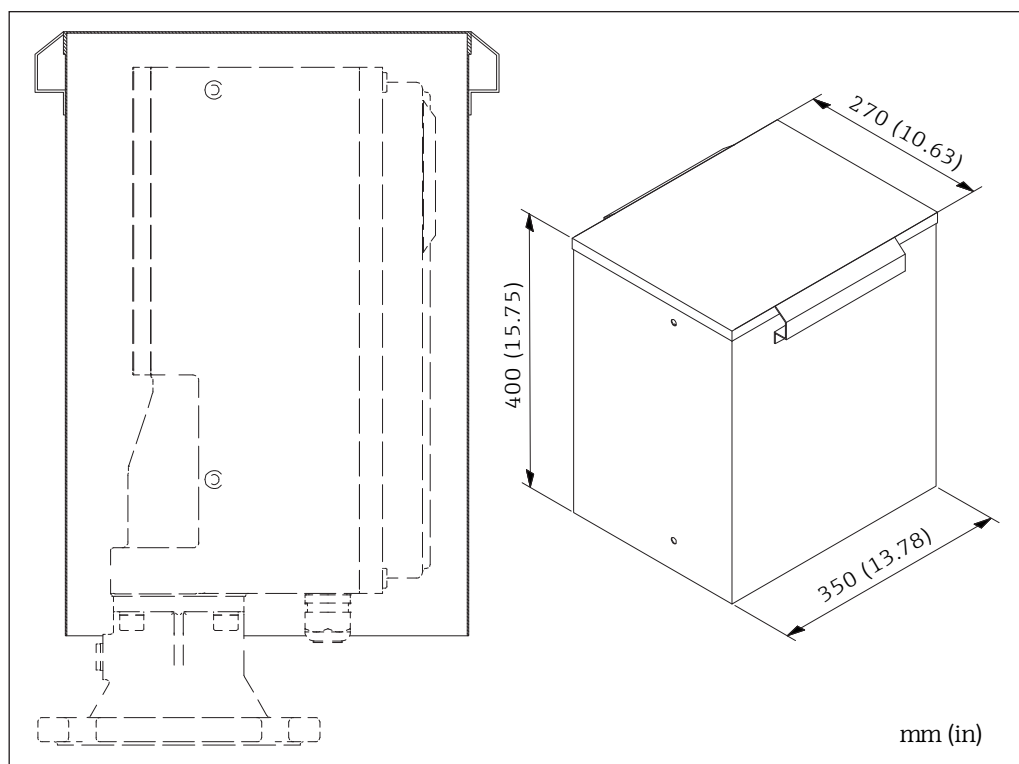
Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: [www.endress.com](http://www.endress.com).

### Devcie-specific accessories

#### Protection hood

A protective hood is available for mounting the measuring device outdoors.

- Order code: 52027964
- Material: Stainless steel 304
- Weight: 7.5 kg
- The delivery contains suitable mounting bolts.



 17 Protection hood

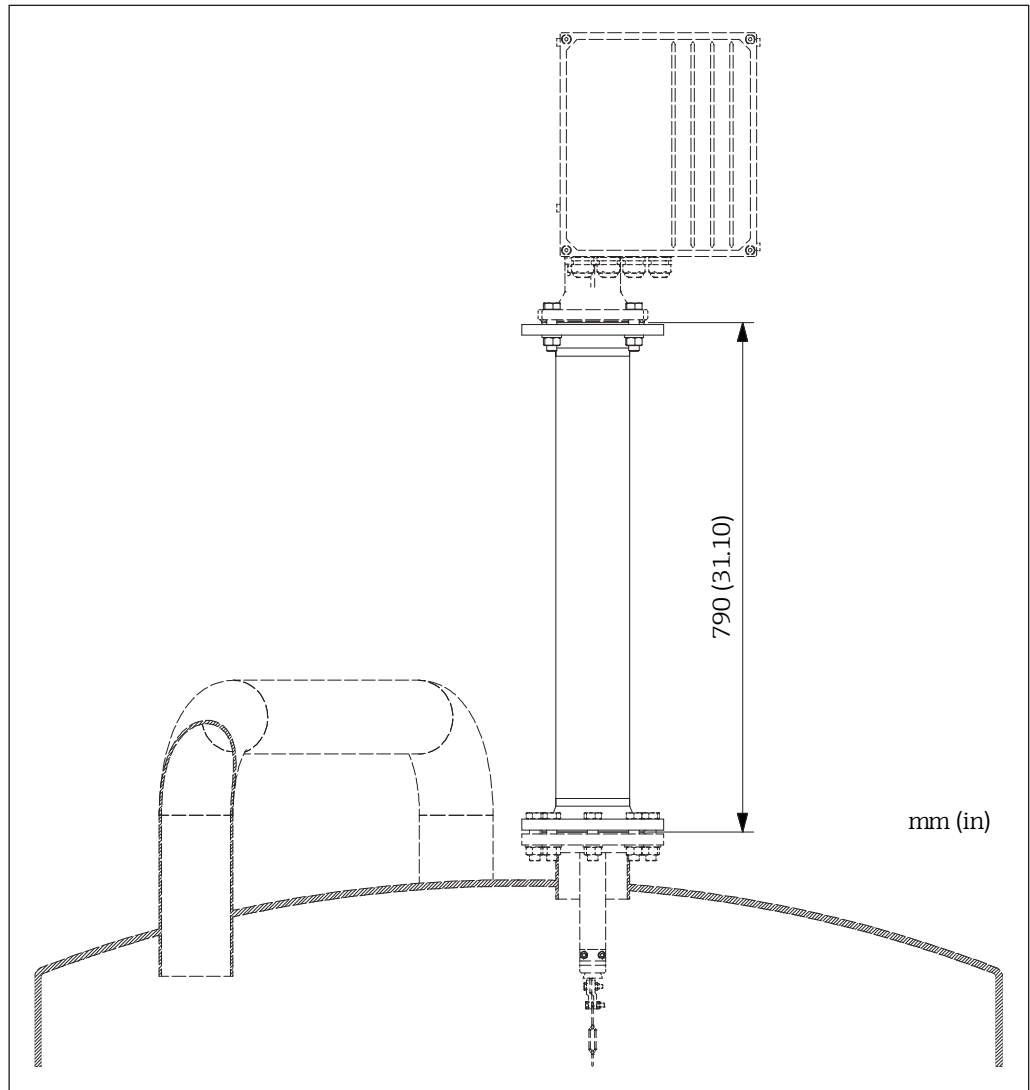


The protective hood is simply fitted over the device once installed and fastened with four screws.

**Process adapter extension**

If process temperatures are between +150 °C (+302 °F) and +230 °C (+446 °F), the following process adapter extensions can be used to reduce the temperature when using the 1000 mm wiper extension:

- Order code: 52028083
- Material: Stainless steel 316Ti
- Weight: 16 kg
- The delivery contains four suitable bolts and nuts to secure the measuring device to the process adapter extension.



18 Process adapter extension

**Adapter flange**

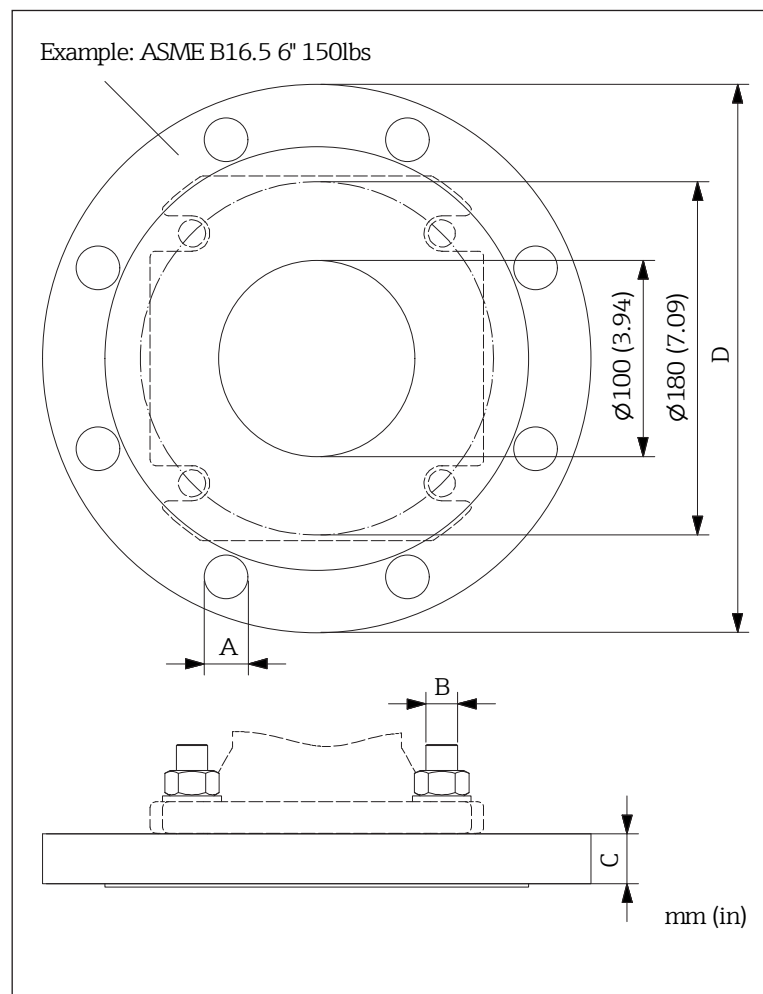
The following adapter flanges can be used to adapt to existing process connections:

- Order code:
  - 71301820 DN150, PN16, EN1092-1, stainless steel 316Ti
  - 71301821 DN150, PN16, EN1092-1, steel
  - 71301822 DN200, PN16, EN1092-1, stainless steel 316Ti
  - 71301824 DN200, PN16, EN1092-1, steel
  - 71301811 6", 150lbs, ASME B16.5, stainless steel 316Ti
  - 71301815 6", 150lbs, ASME B16.5, steel
  - 71301816 8", 150lbs, ASME B16.5, stainless steel 316Ti
  - 71301817 8", 150lbs, ASME B16.5, steel

▪ Dimensions (mm/in) and weights:

	A	B	C	D	Weight
71301820	8x	M16	22/0.87	285/11.22	9 kg
71301821	22/0.87				
71301822	12x	M16	24/0.94	340/13.4	15 kg
71301824	22/0.87				
71301811	8x	UNC	25.4/1	279.4/11	10 kg
71301815	22.4/0.88	5/8"			
71301816	8x	UNC	28.6/1.13	342.9/13.5	18 kg
71301817	22.4/0.88	5/8"			

▪ The delivery contains four suitable nuts to secure the measuring device to the adapter flange.



19 Adapter flange

**i** The adapter flange is mounted between the process connection of the device and the application. As the flange is not very high, the clearance needed for the device is only marginally increased.

**Adapter flange with studs for higher pressure ratings**

The following adapter flanges can be used to adapt to existing process connections:

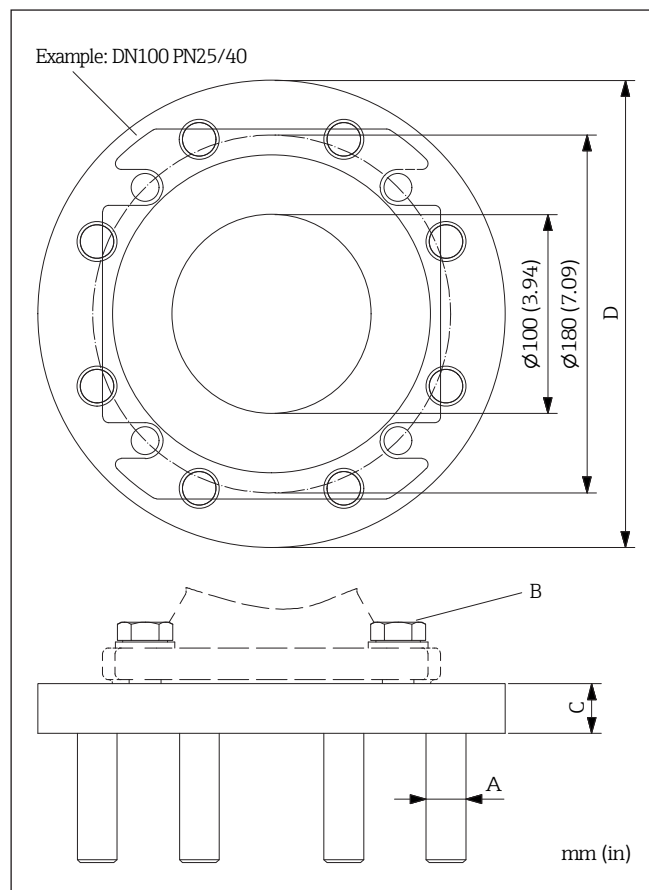
■ Order code:

- 71301826 DN100, PN25/40, EN1092-1, stainless steel 316Ti
- 71301829 DN100, PN25/40, EN1092-1, steel
- 71301831 4", 300lbs, ASME B16.5, stainless steel 316Ti
- 71301833 4", 300lbs, ASME B16.5, steel
- 71301834 4", 600lbs, ASME B16.5, stainless steel 316Ti
- 71301835 4", 600lbs, ASME B16.5, stainless steel

■ Dimensions (mm/in) and weights:

	A	B	C	D	Weight
71301826	8x M22	M16	25/0.98	235/9.25	7 kg
71301829					
71301831	8x UNC 3/4"	UNC 5/8"	31.8/1.25	254/10	11 kg
71301833					
71301834	8x UNC 7/8"	UNC 5/8"	38.1/1.5	273.1/10.75	16 kg
71301835					

■ The delivery contains four suitable nuts to secure the measuring device to the adapter flange.



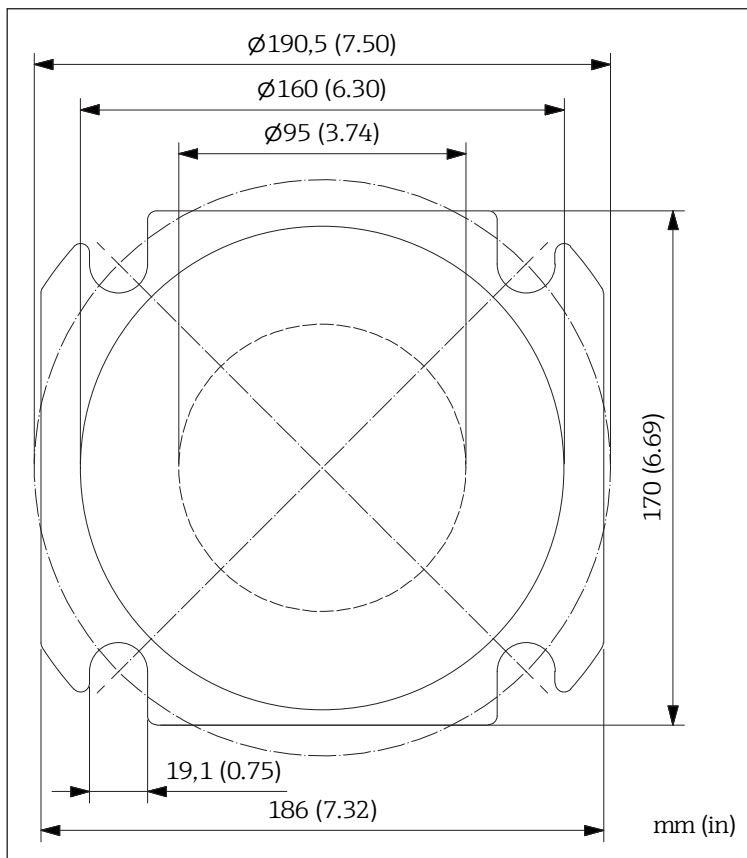
20 Adapter flange with studs for higher pressure ratings

**i** The adapter flange is mounted between the process connection of the measuring device and the application.

**Process adapter as replacement for the standard adapter**

The standard process adapter can be replaced by one of the following to adapt to existing process connections:

- Order code:  
 71301870      150lbs, RF 4", ASME, Aluminium  
 71301872      150lbs, RF 4", ASME, Aluminium coated



21 Process adapter as replacement for the standard adapter

**i** The standard process adapter ( $\rightarrow$  18) can be easily replaced by releasing four screws.

**Process adapters for smaller nominal diameters**

The following process adapters can be used to adapt to existing process connections with smaller nominal diameters (< DN100):

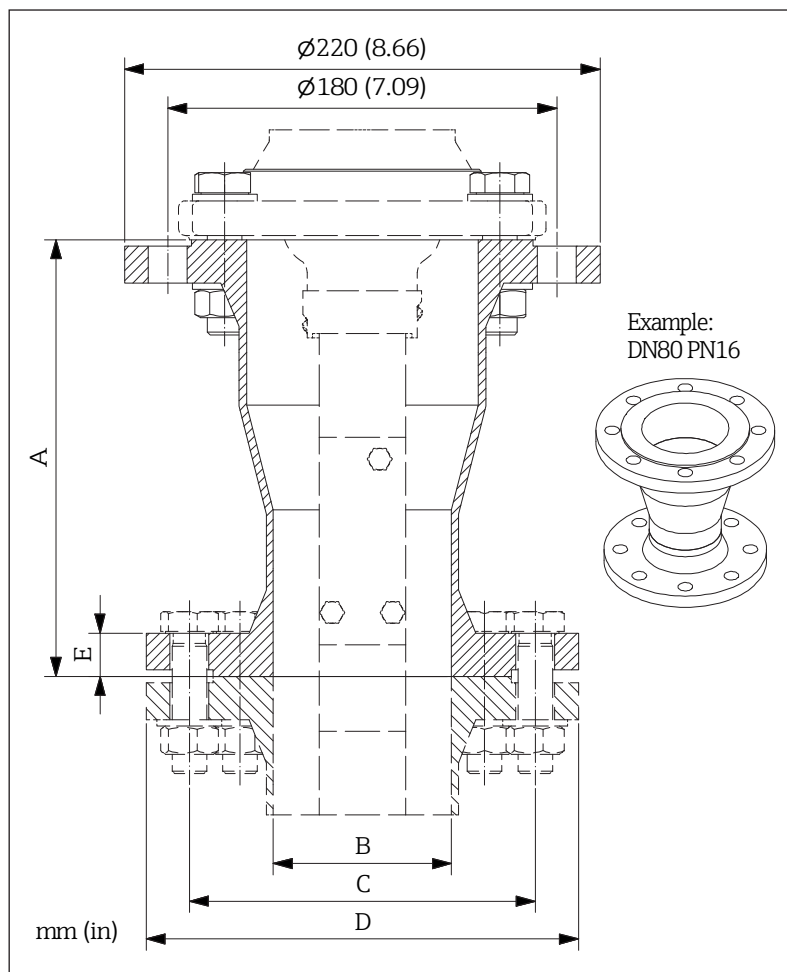
■ Order code:

- 71301837 DN50, PN16, EN1092-1, stainless steel 316Ti
- 71301839 DN50, PN16, EN1092-1, steel
- 71301841 DN65, PN16, EN1092-1, stainless steel 316Ti
- 71301843 DN65, PN16, EN1092-1, steel
- 71301844 DN80, PN16, EN1092-1, stainless steel 316Ti
- 71301857 DN80, PN16, EN1092-1, steel
- 71301858 2", 150lbs, ASME B16.5, stainless steel 316Ti
- 71301859 2", 150lbs, ASME B16.5, steel
- 71301861 3", 150lbs, ASME B16.5, stainless steel 316Ti
- 71301864 3", 150lbs, ASME B16.5, steel
- 71301867 4", 150lbs, ASME B16.5, stainless steel 316Ti
- 71301868 4", 150lbs, ASME B16.5, steel

■ Dimensions (mm/in) and weights:

	A	B	C	D	E	Weight
71301837	400/ 15.75	54,5/ 2.15	125/ 4.92	165/ 6.50	18/ 0.71	10.5 kg
71301839						
71301841	400/ 15.75	70,3/ 2.77	145/ 5.71	185/ 7.28	18/ 0.71	11 kg
71301843						
71301844	200/ 7.87	82,5/ 3.25	160/ 6.30	200/ 7.87	20/ 0.79	10 kg
71301857						
71301858	420/ 16.54	52,6/ 2.07	120,7/ 4.75	152,4/ 6.00	19,1/ 0.75	11 kg
71301859						
71301861	220/ 8.66	78/ 3.07	152,4/ 6.00	190,5/ 7.50	23,9/ 0.94	11.5 kg
71301864						
71301867	128/ 5.04	102,4/ 4.03	190,5/ 7.50	228,6/ 9.00	23,9/ 0.94	12.5 kg
71301868						

- The delivery contains four suitable screws with nuts to secure the measuring device to the process adapter.



22 Process adapters for smaller nominal diameters

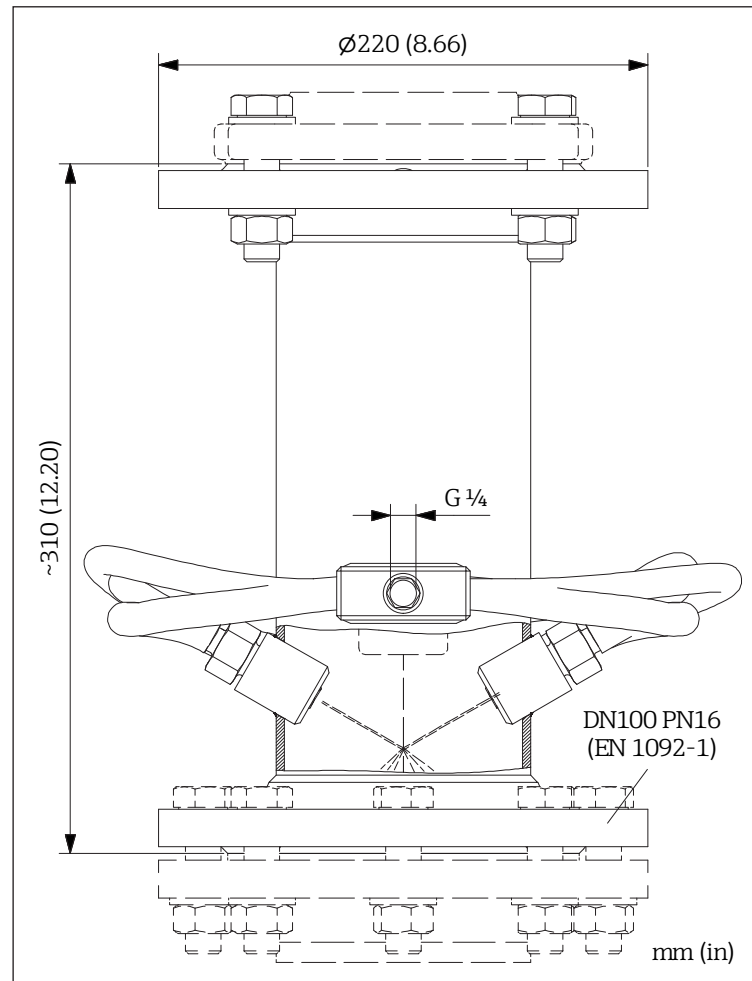
**NOTICE**

To prevent incorrect measurements if the sensing weight swings, the lower edge of the wiper should protrude out of the reduced area (diameter B).

**Process adapter with spray water cleaning**

The following process adapter can be used with spray water cleaning to prevent any damage from chemical substances that can enter the measuring device via the measuring tape:

- Order code: 71301886
- Material: Stainless steel 316Ti
- Weight: 15 kg
- The delivery includes four suitable screws with nut to secure the measuring device to the process adapter.



23 Process adapter with spray water cleaning

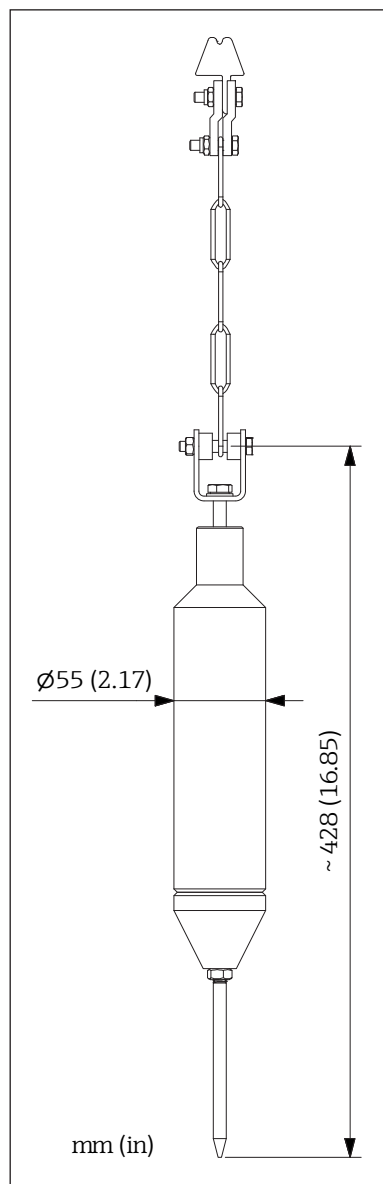
- i
  - The process adapter is mounted between the process connection of the measuring device and the application.
  - Filtered water only should be used for spray water cleaning as otherwise the nozzles could clog.
  - The amount of water needed is between 1 l/min (1 bar) and 3 l/min (6 bar).



**Sensing weight for interface measurement in liquids with a significant difference in density**

One of the following sensing weights can be used for interface measurement in liquids with a significant difference in density:

- Order code:  
 71301873      Stainless steel 316Ti  
 71301875      Stainless steel 316Ti, coated
- Weight: 4 kg



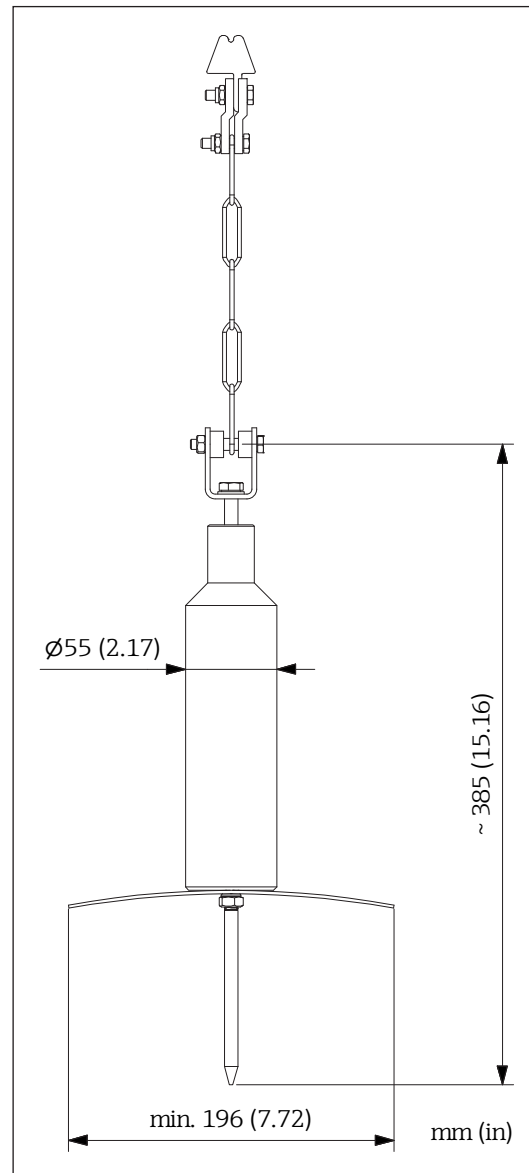
24 Sensing weight for HD interface measurement

**i** The sensing weight can be easily replaced by releasing a screw.


**Sensing weight for interface measurement in liquids with a minor difference in density**

One of the following sensing weights can be used for interface measurement in liquids with a minor difference in density:

- Order code:  
71301876      Stainless steel 316Ti  
71301877      Stainless steel 316Ti, coated
- Weight: 4 kg



 25 Sensing weight for LD interface measurement

 The sensing weight can be easily replaced by releasing a screw.

**Chain to increase the block distance**

The following chain can increase the block distance by a maximum distance of 2 m in the event of longer connections which the sensing weight should not enter into:

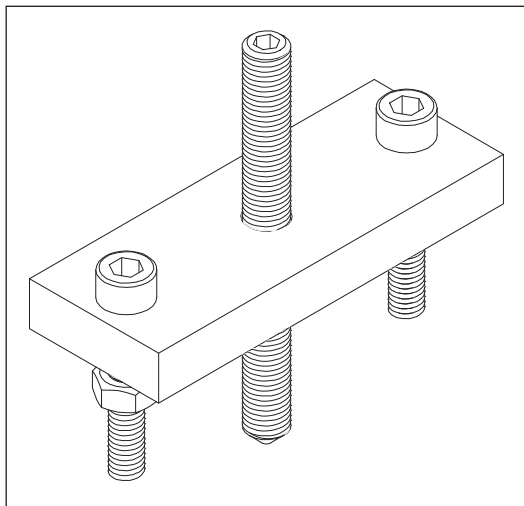
- Order code: 71301880
- Material: Stainless steel 316
- Length: 2 m
- Weight: 0.3 kg
- The chain can be shortened as required.

**Devicie-specific tools**

**Removal tool**

Using this puller tool and a 5 mm Allen key, the motor-gearbox-unit and tape spool can be removed easily for replacement.

- Order code: 71001353
- Weight: 0.25 kg

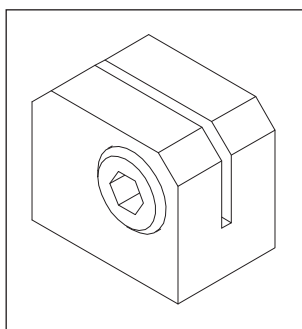


26 Removal tool

**Tape stopper**

Using the tape stopper and a 6 mm Allen key, the measuring tape can be secured inside the spool compartment, safeguarding against accidental roll-off when replacing the motor-gearbox-unit.

- Order code: 71001352
- Weight: 0.1 kg



27 Tape stopper

**Documentation**

 For an overview of the scope of the associated Technical Documentation, refer to the W@M Device Viewer : Enter the serial number from the nameplate ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer))

**Standard documentation**

Operating Instructions for Silopilot FMM50  
Documentation code: BA00286F

**Supplementary device-dependent documentation**

Safety Instructions ATEX  
Documentation code: XA00425F

[www.addresses.endress.com](http://www.addresses.endress.com)

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