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Technical Information

Silopilot M FMM50

Electromechanical Level Measuring System

Applications

The Silopilot M FMM50 is an electromechanical level measurement system. Depending on the sensing weight, the level in bunkers or silos can be measured – whether for dusty, fine or coarse – grained bulk products, or in tanks containing liquids.
According to the mechanical design of the Silopilot and the fittings, measurement in silos or tanks can be performed at operating temperatures up to 230°C and at operating pressures up to 3 bar absolute, or in aggressive atmospheres, e.g. acidic or caustic vapours.

The advantages at a glance

- Measurement of levels up to 70 m irrespective of the product characteristics.
- Accuracy of ±5 cm or ±1 pulse, therefore precise detection of the level
- Compact transmitter with 0/4 – 20 mA current output as well as further free programmable signal outputs, e.g. 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
- High performance three-phase engine (traction power up to 500N) using a single-phase supply voltage by employment of a converter, therefore simple electric supply
- Optional design with certification for application in areas subject to dust explosion hazard zones 20, 21 an 22 (measuring zone) or zones 21 and 22 (device zone), category 1/2D.

Endress+Hauser

People for Process Automation

TI395F/97/en/04.10

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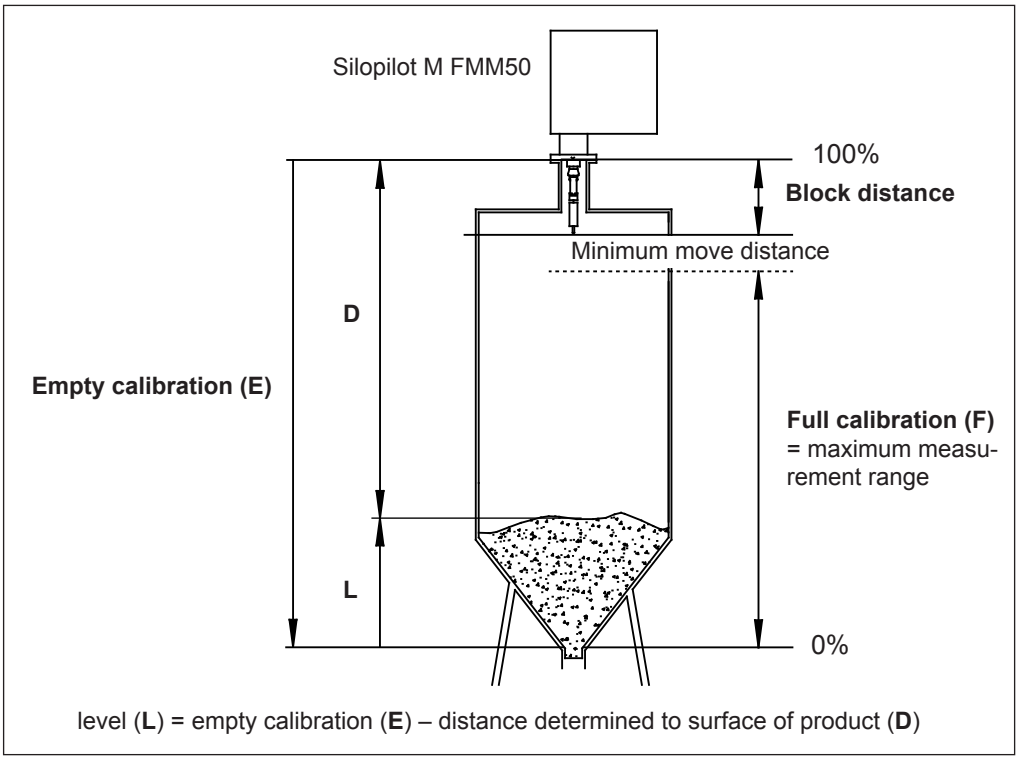
Function and system design

Measuring principle

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



Determination of the measured value

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

The current output signal represents the level (L). 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.

During the entire measuring process (lowering and hoisting of the sensing weight) the Silopilot 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 (e.g. external start button) or periodically (e.g. programmed function of the Silopilot).

Measuring device

The Silopilot M FMM50 is a compact transmitter. In contrast to the measuring device Silopilot FMM760 (Z) with control unit ZAD423, the entire microprocessor-controlled electronic system is integrated into the Silopilot. The measuring unit offers comprehensive input and output facilities. For details please refer to the ordering information.

To ensure compatibility with older installations using the control unit ZAD423, an appropriate pulse output is provided for connection to the control unit.

Device variants

Ex version
For application in areas subject to explosion hazards due to flammable dusts, Zones 20, 21 and 22 (measuring zone) or Zones 21 and 22 (device zone), category 1/2D

Mechanical and electrical options

- Ambient temperature:
  -20°C to +70°C or
  -40°C to +70°C by using the self-control housing heater
  (Ex version down to -35°C)
  Also recommended in case of moisture in vessels and for ambient temperatures below 0°C.

- Process pressure:
  0.8 to 1.1 bar absolute or
  0.8 to 3 bar absolute

- Process temperature:
  -20°C to +70°C (also Ex version) or
  -20°C to +150°C or
  -20°C to +230°C

- Standard for two power supply ranges:
  90 - 127 VAC, 50/60 Hz or
  180 - 253 VAC, 50/60 Hz

- Traction power:
  250 N for light bulk solids like powder, granulate or grain
  500 N for heavy bulk solids like gravel, sand or cement

- Tape wiper:
  - Length: 230 mm, 500 mm or 1000 mm
  - Material: Alu/steel or stainless steel

- Optional:
  - Four supplementary relay outputs
  - External start button and gauge-glass in the device cover
  - Enhanced climate resistance (at ambient temperature range -20°C to +70°C)
  - Housing coated (RAL 5012, cover RAL 7035), bubble level for mechanical arrangement

- Sensing weight:
  A diverse range of sensing weights is available according to the application. For details please refer to the relevant section heading.

Input

Measured value

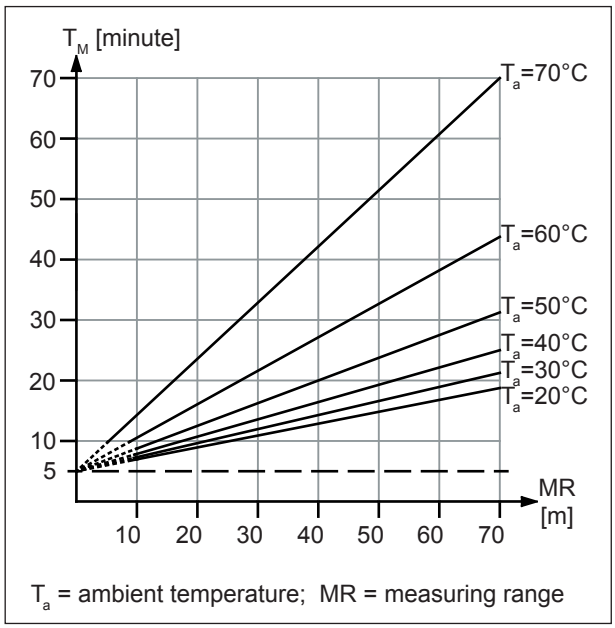
The measured value is the distance between the flange of the Silopilot minus a blocking distance and the surface of the product. The filling level is computed taking into account the fixed given calibration values, e.g. the empty calibration (height of the silo).
The filling level can be converted to other values as desired, e.g. volume or mass, by the application of linearization.

Measuring range

- max. 70 m

Measuring cycle

Please observe the minimum time (T_M) for one measuring cycle with the Silopilot M FMM50 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.



Disregarding this can lead to undue warming and result in failure. We recommend not to go below a time of 5 minutes for one measuring cycle.

Measuring tolerance

- ± 5 cm (irrespective of the selected measuring range)

Inputs

Two inputs (active/passive) are available for external operation of the Silopilot:
- Active input:
  - Connection of an external voltage
  - Input voltage range: 12 ... 24 VDC
- Passive input:
  - Connection of an external command device, e.g. switch/button, relay contact
  - Contact rating: max. 5 mW
- Input polarity:
  - Normally open or normally closed
- Start pulse length:
  - min. 200 ms
- Optional:
  - External start button

Output

Output signal

- 0/4 - 20 mA current output, active
- 2 relay outputs (optional 6 relay outputs)
  - Contact load capability: 250 VAC, 6 A
  - Contact material: silver-cadmium-oxide, gold-flashed
- Selectable relay functions:
  - Counter pulse: emits pulses equivalent to the length of the rolled-out tape
  - Reset pulse: pulse before new measurement, e.g. reset of an external counter
  - Tape reverse: indication of the lower tape direction reversal
  - Ascent of sensing weight: indication of ascent of the tape, e.g. fade-out the counter pulses
  - Upper park position of sensing weight: indication of upper park position, e.g. end of measurement
  - Measurement active: indication of an active measurement, e.g. lock of filling equipment
  - Alarm: output alarm states
  - Maintenance interval: notice to maintain the Silopilot
  - 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.)

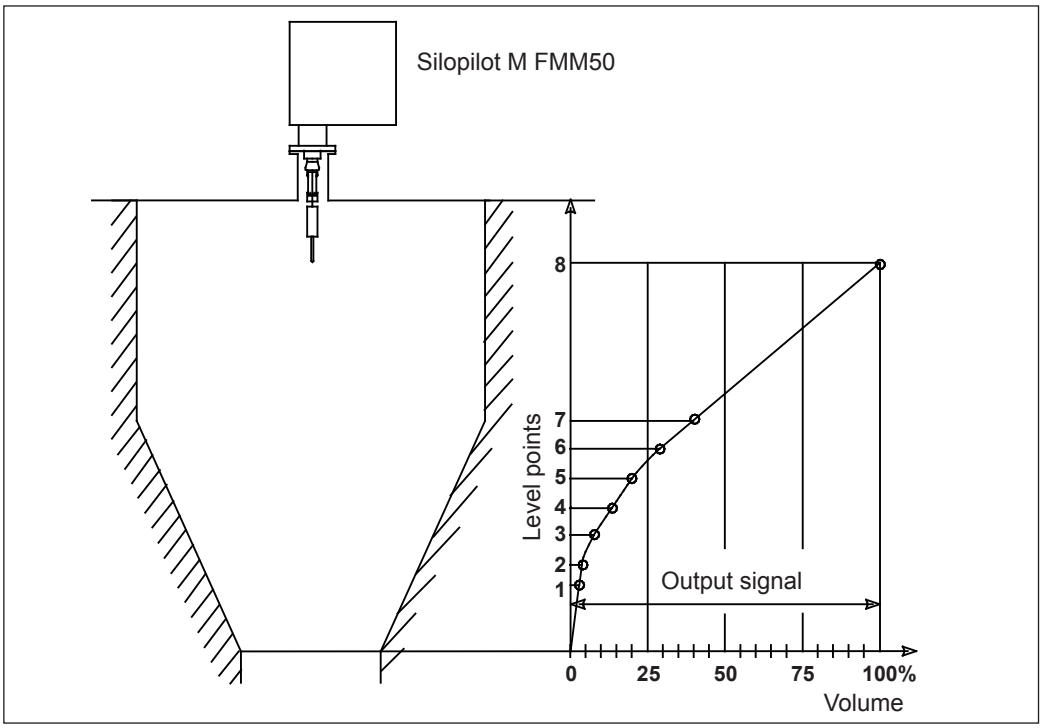
Malfunction signal

Malfunction signal can be called up via the following interfaces:

- Local indication:
  - Error symbol
  - Error code with text indication
- Current output, programmable status:
  - Minimum: minimum current value <=3.6 mA (4 - 20 mA) or 0 mA (0 - 20 mA)
  - Maximum: maximum current value + 10% (≈22 mA)
- Relay outputs (alarm function)

Linearization

The linearization function of the Silopilot 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.



Example of linearization using 8 reference values

Highest measurable point
The highest measurable point is given by the blocking distance (see figure "Determination of the measured value" on page 3) plus a minimum descent length of 20 cm. This maximum length must be considered on input of the maximum measuring range (Full calibration, see page 3).

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.

When using the normal weight in connection with the 230 mm tape wiper, the blocking distance amounts to 0.8 m and the highest measurable point is 1 m under the flange of the Silopilot.

Auxiliary energy

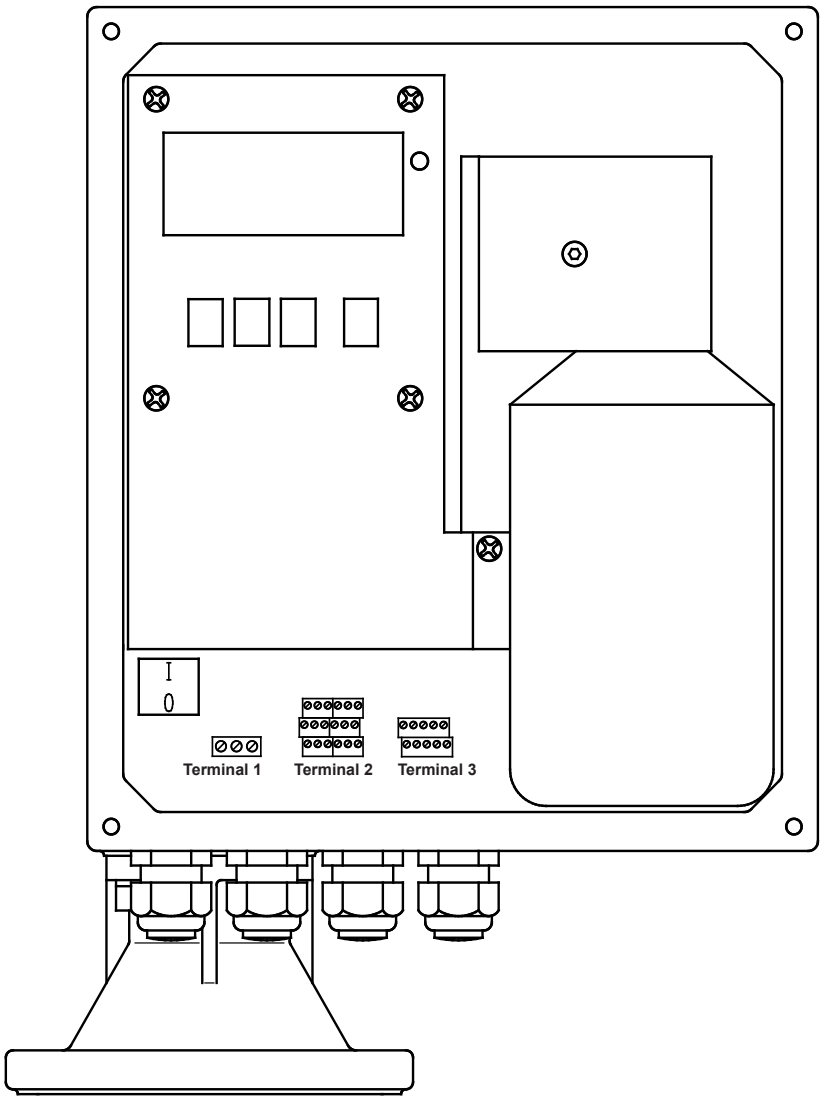
Supply voltage

- 90 – 127 VAC, 50/60 Hz or
  180 – 253 VAC, 50/60 Hz
- Power consumption:
  – without optional heater: max. 230 VA
  – with optional heater: max. 250 VA

Cable entry

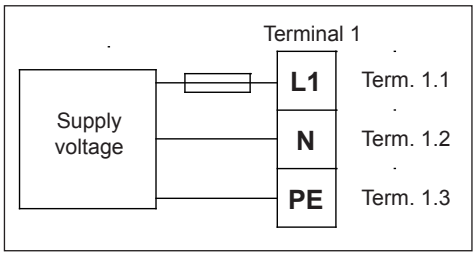
- M25 x 1.5
- Cable gland:
  – Material: plastic
  – Colour: grey (EX version: black)

Arrangement of the terminals



Electrical connection

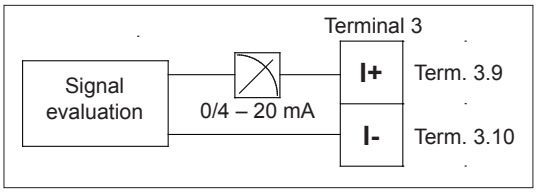
Supply voltage



Connecting the supply voltage

The supply voltage (mains voltage) is connected to the plug-in terminals on terminal block 1.
The maximum cable cross-section is 2.5 mm².
You should use a fuse to protect the power supply against short-circuit.

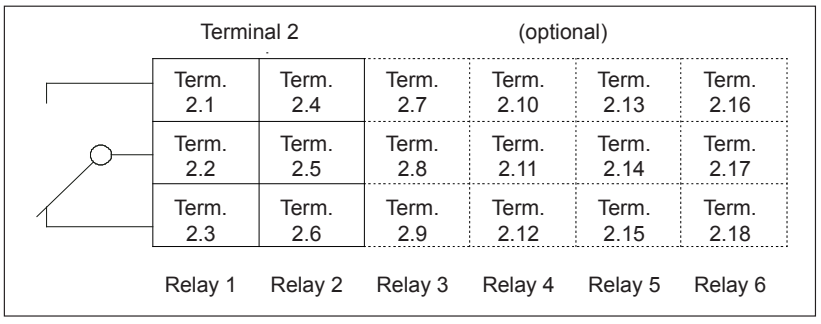
0/4 - 20 mA current output



Connecting the current output

The active 0/4 - 20 mA current output is connected to the plug-in terminals on terminal block 3.
The maximum cable cross-section is 1.5 mm².
Normal installation cables are sufficient for making the connections.

Relays

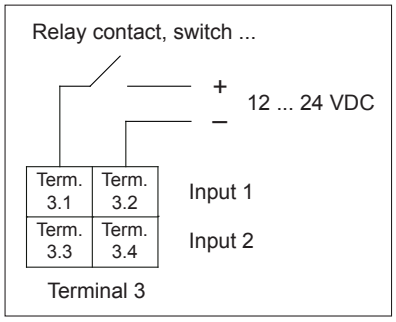


Connecting the relay outputs (rest position)

The connection cables are terminated on the plug-in terminal block 2, to relay 1 and relay 2, and optionally up to relay 6.
The maximum cable cross-section is 1.5 mm².
Normal installation cables are sufficient for making the connections.
The individual circuits must have a maximum of 6 A fuse protection.

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

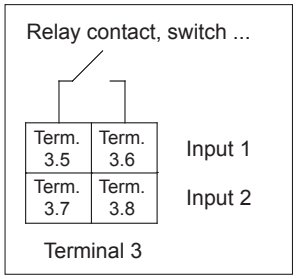
Input (active)



Connecting the active signal input

The active input signal is connected to the plug-in terminals on terminal block 3.
The maximum cable cross-section is 1.5 mm^2.
Normal installation cables are sufficient for making the connections.
Input voltage range: 12 ... 24 VDC

Input (passive)



Connecting the passive signal input

The passive input signal is connected to the plug-in terminals on terminal block 3.
The maximum cable cross-section is 1.5 mm^2.
Normal installation cables are sufficient for making the connections.
Contact rating: max. 5 mW

Notice about the inputs:
The signal inputs (active/passive) can only be used alternatively.
A double connection from input x active and passive can not be used.
The minimum start pulse length is 200 ms.

Operating conditions

Sensing weight

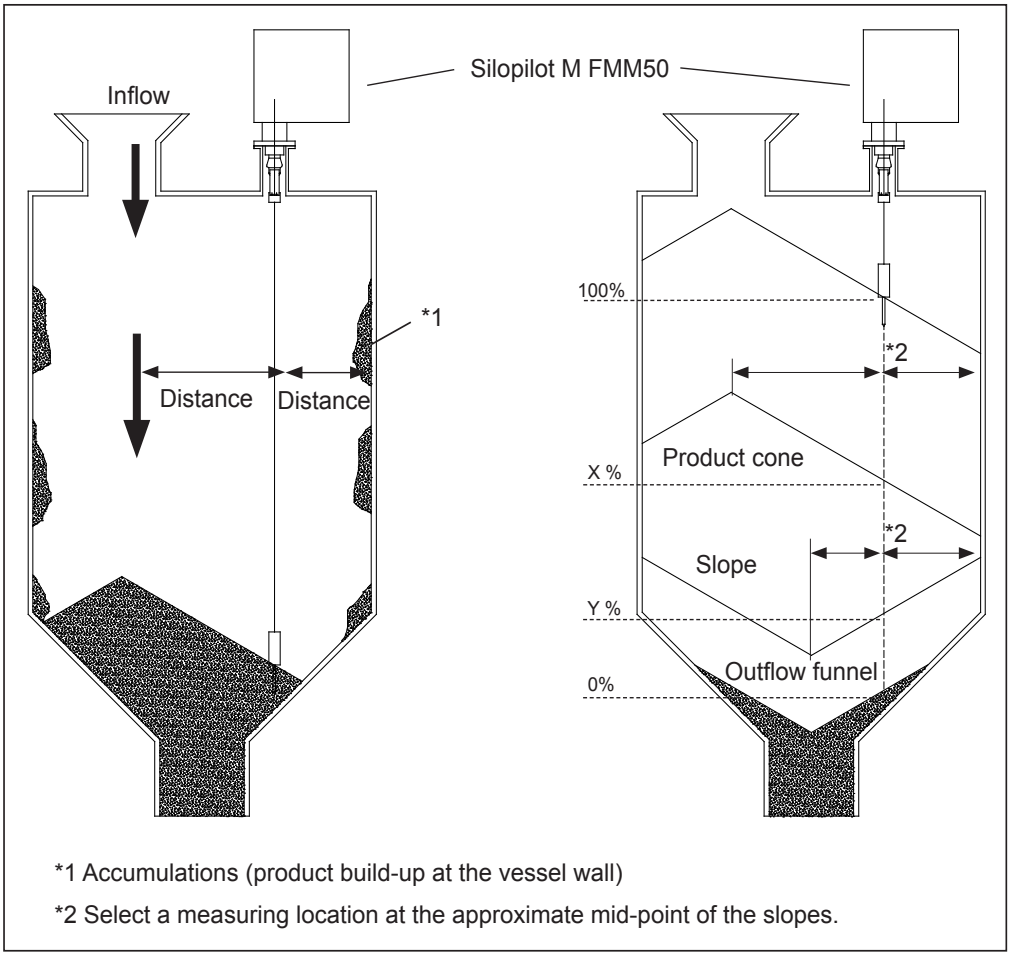
Sensing weights (see relevant section heading)

When selecting the sensing weight, the following points should be taken into consideration:
- The sensing weight must not sink into the product during measuring, nor should it be diverted by the product inflow cone.
- The sensing weight must be suitable for the chemical properties of the product and for the temperature inside the bunker/silo.

Special designs for individual applications can be offered on request.

Mounting location

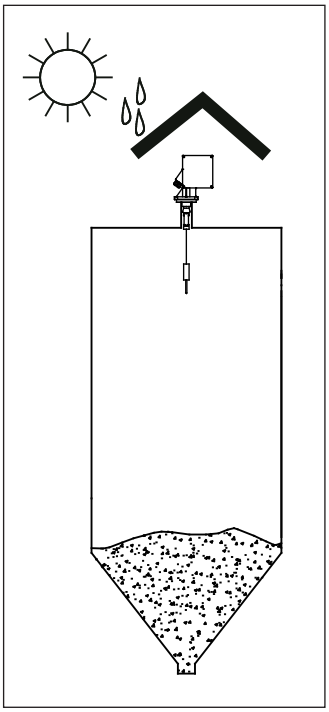
Planning the mounting location
Select a mounting location on the bunker or silo such that product falling inside during filling, or accumulations of product collapsing inward, cannot cover the sensing weight nor damage the measuring tape. Take due account of the shape and location of the product inflow cone and the outflow funnel within the vessel.
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.



Selection of the mounting location

Preparation for mounting

The Silopilot 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 Silopilot can also be mounted horizontally onto it (maximum angle of inclination 2°). 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.

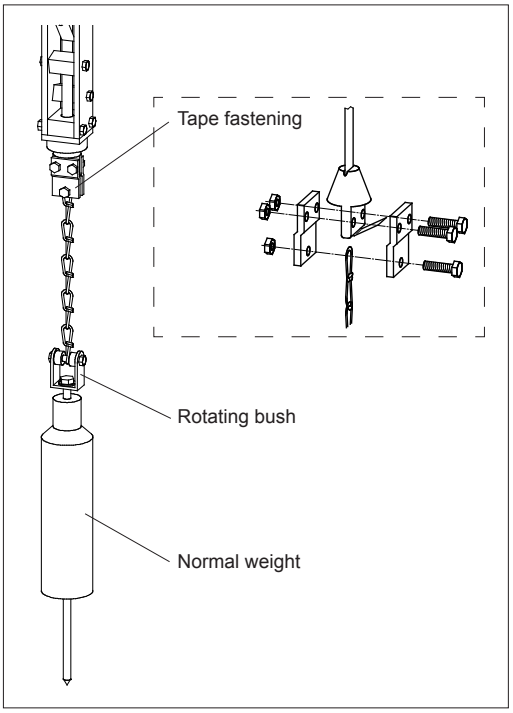


Weather protection

When installing outside, fit a protection hood or install a weather protection roof.

Mounting of the sensing weight

Normal weights, umbrella weights and bag weights (see overview of sensing weights under the relevant section heading) can be passed through the DN100 mounting flange into the bunker/silo.

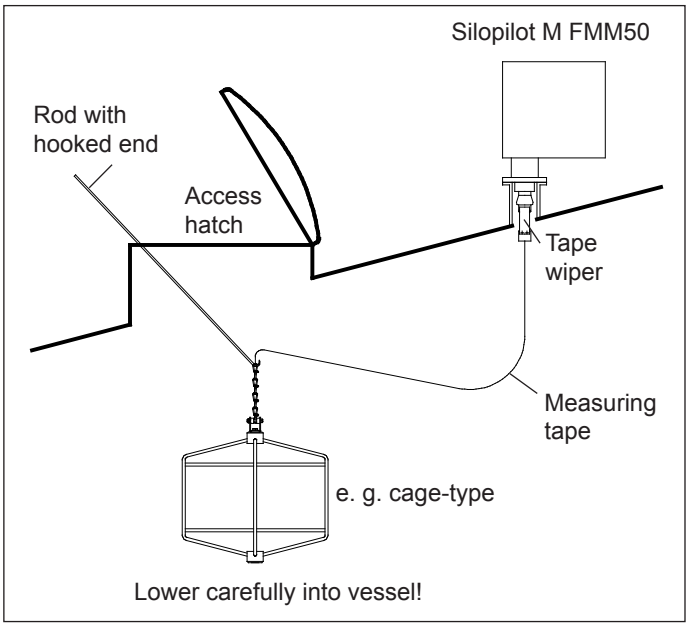


Mounting of the sensing weight

The measuring tape is pressed into the tape fastening by two screws. A third screw secures the chain. A rotating bush is mounted at the lowest extent of the chain, to accommodate any turning motion of the sensing weight.

The weight fixings (tape fastening, chain and rotating bush) are made from galvanized steel or stainless steel.

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 (see illustration).



Mounting of larger sensing weights

For details of these installations please refer to the operating instructions!

Mounting of the Silopilot

Fit a sealing gasket on the flange (particularly in case of pressurised bunker/silo). Carefully guide the sensing weight into the bunker/silo. When using larger sensing weights, please refer to the section heading "Mounting of the sensing weight".

Now place the Silopilot onto the flange and secure it using four M16 bolts of suitable length.
Please note the following:
- Mount the Silopilot horizontally (see under section heading "Preparation for mounting").
- Take the position of cable entries for electrical connections into consideration.

When installing in bunkers/silos with heavy dust loadings, a slight positive pressure can be generated at the Silopilot 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 (see dimensions of the standard version).

Ambient conditions

Ambient temperature at the Silopilot:
- -20 ... +70°C
- -40 ... +70°C by using the self-control housing heater (Ex version down to -35°C)

Process conditions

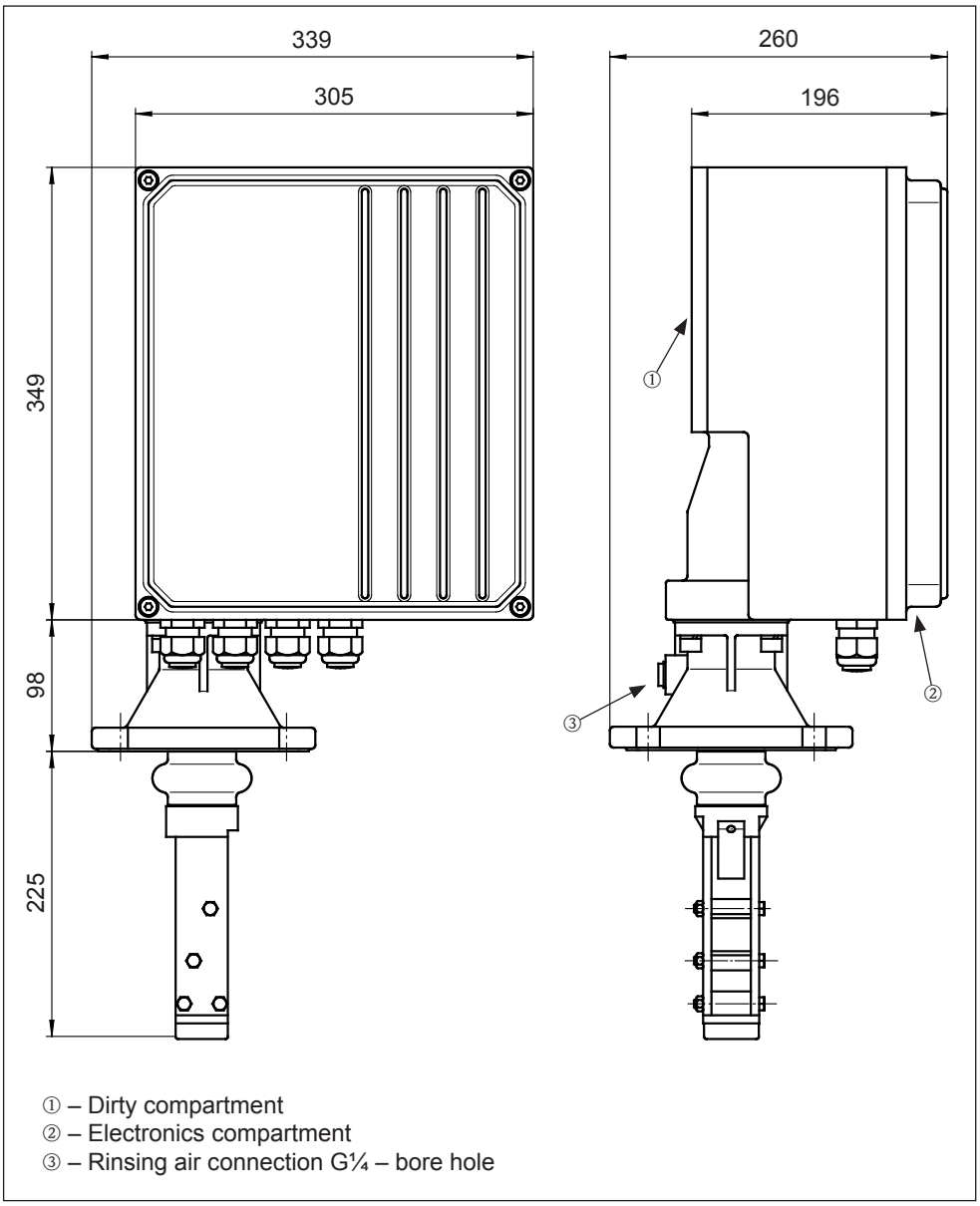
Process temperature:
- -20 ... +70°C (standard and Ex version)
- -20 ... +150°C
- -20 ... +230°C

Process pressure (in the vessel):
- 0.8 ... 1.1 bar absolute (standard and Ex version)
- 0.8 ... 3.0 bar absolute (high pressure version)

Note!
Use a nozzle of 400 - 500 mm height with process temperatures from +70°C up to 150°C (**Silopilot M FMM50-********2*****) for a temperature reduction. In this case a wiper length of 500 mm must be used.
Use a nozzle of 900 - 1000 mm height with process temperatures from +70°C up to 230°C (**Silopilot M FMM50-********3*****) for a temperature reduction. In this case a wiper length of 1000 mm must be used.

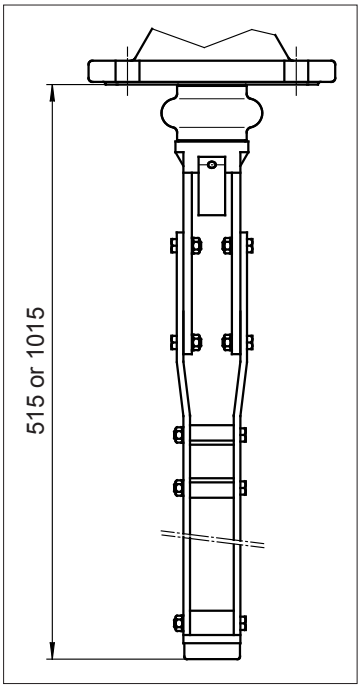
Dimensions

Housing dimensions (with standard wiper 230 mm)



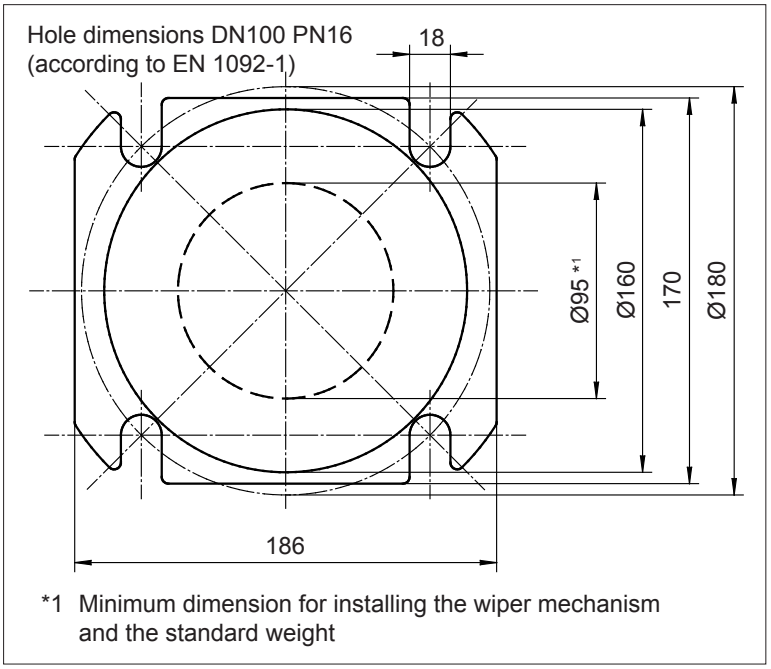
Housing dimensions

Dimensions of the extended tape wiper



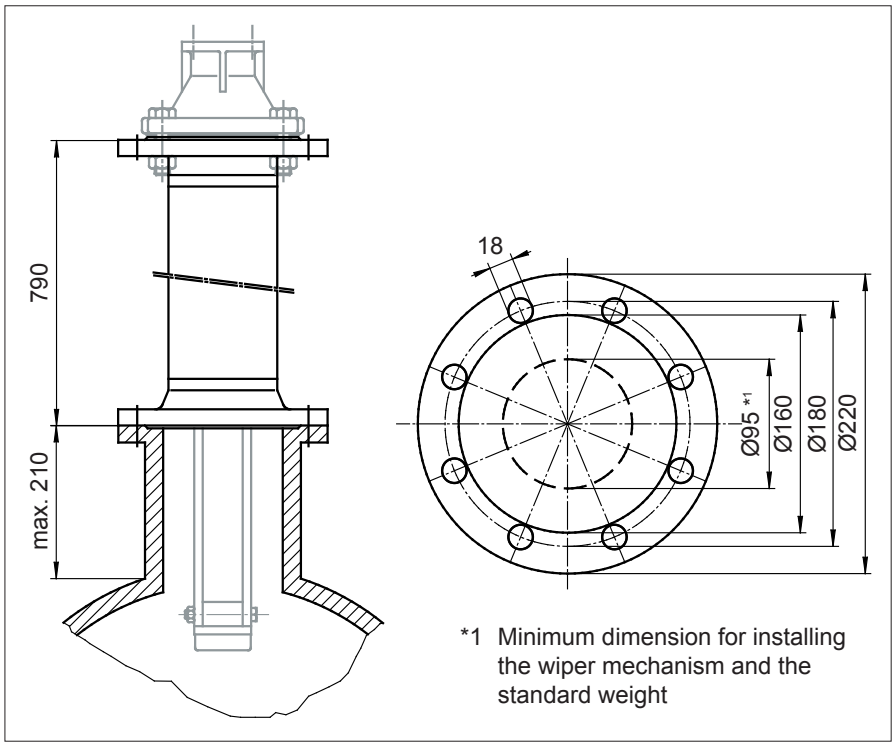
Dimensions of the wiper extension

Dimensions of the process connection (standard version)



Dimensions of the standard process connection

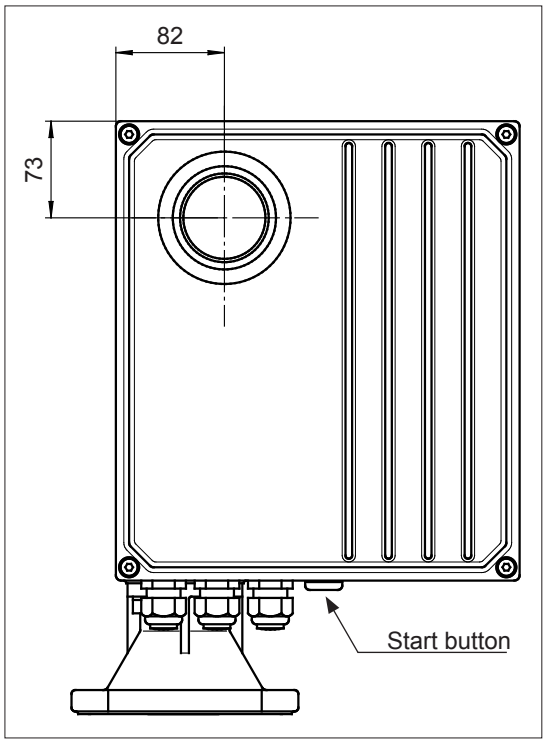
Dimensions of the process adapter extension (accessory)



Dimensions of the process adapter extension

Note!
Use a nozzle of 400 – 500 mm height with process temperatures from +70°C up to 150°C (**Silopilot M FMM50-********2*****) for a temperature reduction. In this case a wiper length of 500 mm must be used.
Use a nozzle of 900 – 1000 mm height with process temperatures from +70°C up to 230°C (**Silopilot M FMM50-********3*****) for a temperature reduction. In this case a wiper length of 1000 mm must be used.

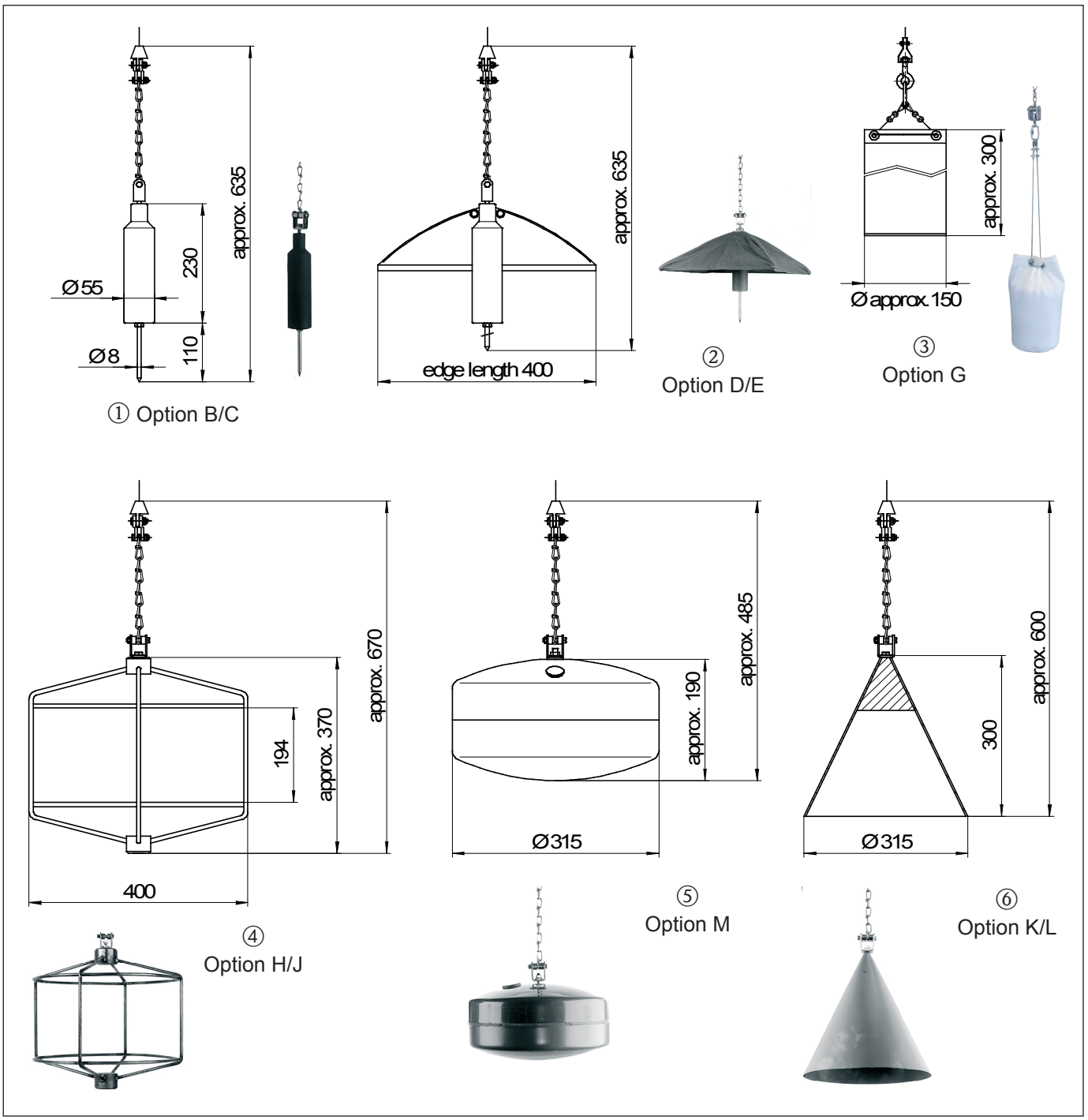
Dimensions of the optional window and external start button



Dimensions of the optional window

Dimensions of sensing weights (see relevant section headings)

Sensing weights



Normal weight (Option B/C)

- Application:
  For coarse bulk solids, e.g. coals, ores or stones and granulates.
- Materials:
  Steel or stainless steel
- Weight:
  3.5 kg
- The spike can be screwed off.
- 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.

Umbrella weight (Option D/E)

- Application:
  For very light and loose bulk solids, e g. 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:
  3.5 kg
- Maximum permissible temperature:
  +150°C
- When folded closed, the weight can be passed through the DN100 mounting flange into the bunker.

Bag weight (Option G)

- Application:
  In bunkers to which e.g. 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
- 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 (Option H/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.
- Materials:
  Steel or stainless steel
- 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 (e.g. cellar wheel feeder or screw conveyor), no damage can result.

Oval float (Option M)

- Application:
  For liquids, e.g. fuel oil, also for granulates.
- Material:
  Hard PVC
- Weight:
  The float must be filled with product to a total weight of 3.5 kg (empty weight 1.3 kg).
- Maximum permissible temperature:
  +70°C
- Use of the oval float in the "Dust ignition-proof" version is not permitted!

Bell weight (Option K/L)

- Application:
  For light and loose bulk solids; especially where higher temperatures and particular characteristics preclude the use of an umbrella weight.
- Materials:
  Steel or stainless steel
- Weight:
  4.3 kg

Selection recommendations

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.

Controls and instrumentation

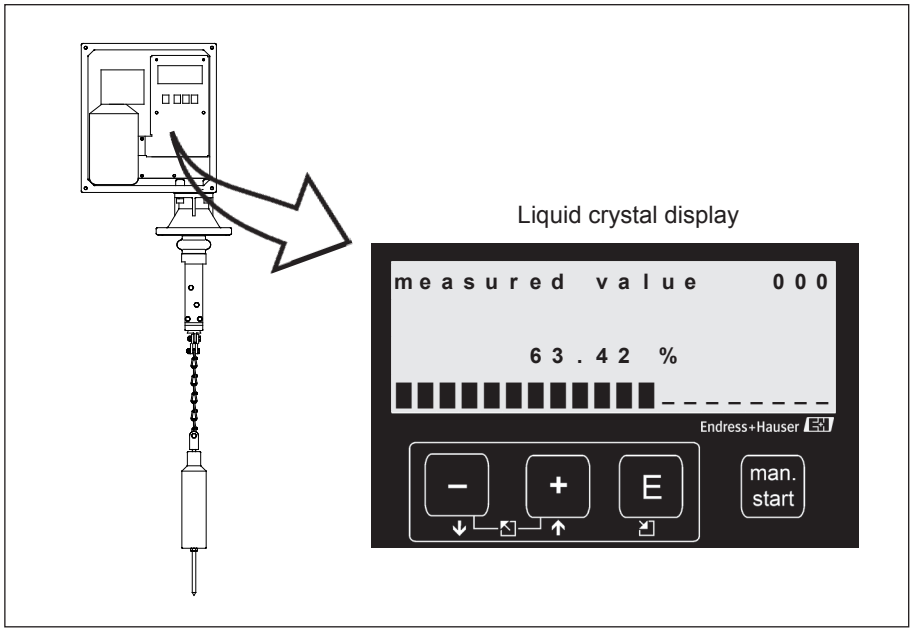
Control concept

Parameters for the Silopilot are set locally using a large 4-line text display, which can also display the existing measured values.

The menu guidance and integrated help texts ensure quick and safe commissioning.

Display

Liquid crystal display (LC-display)
- Four lines
- 20 characters per line
- Display contrast adjustable by using a key combination



Controls and instrumentation

Controls

The control elements are located within the housing (exception: external start button) and can be operated after opening the electronics cover.

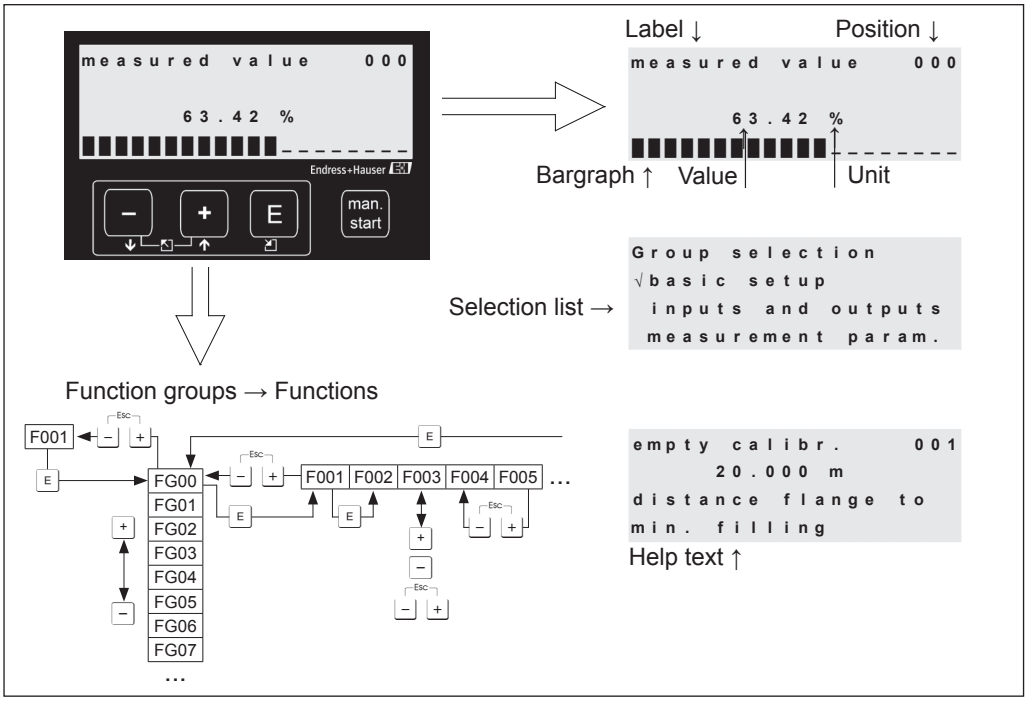
The Silopilot may only be operated with closed cover in areas subject to explosion hazards!

Function of the keys

Key(s)	Function
[+] or [↑]	- Navigation upward within the menu list - Editing of numerical values within a function
[–] or [↑]	- Navigation downward within the menu list - Editing of numerical values within a function
[Esc] [–] [+] or [←]	- Navigation to the left within a function group
[E]	- Navigation to the right within a function group - Enter
[+] and [E] or [–] and [E]	Contrast settings of the LCD - [+] and [E] increase the contrast - [–] and [E] decrease the contrast
[man. start]	- Start measuring (only in function 000)

Local control

The LC-display can be used for configuration direct to the Silopilot using 3 keys. A menu control is used to set all unit functions. The menu comprises function groups and functions. Application parameters can be displayed and set within the functions. The user is guided through the complex start-up procedure.



Local control

Safety instructions

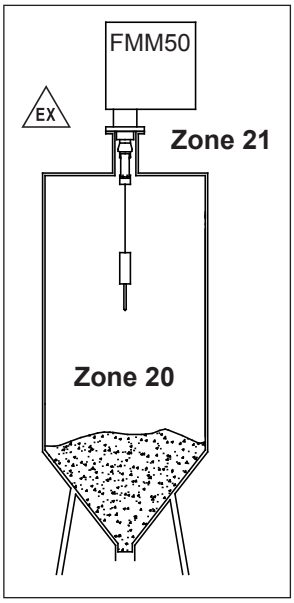
Features of the ATEX version

- Designation:
  ⟨Ex⟩ II 1/2D IP67 T99°C
- Certification number:
  BVS 05 ATEX E 049

Use in accordance with directives

- Operation of the Silopilot in areas subject to explosion hazards is only permissible with the housing closed.
- The Silopilot with "Ex" design may only be repaired by the manufacturer.
- The requirements of EN 50281-1-2, e.g. with respect to dust deposits and temperatures must be adhered to under all circumstances.
- Please take care that the ambient temperature will not be greater than +70°C, even if the process temperature range is between +70°C and +230°C. Use special equipment (e. g. process adapter extension) or select possible mounting position to keep this condition.

Assembly instructions



Assembly instructions (ATEX)

For details please refer to the XA425F-A/97/a3.

Ordering information

Ordering information for Silopilot M FMM50

10	**Approval:**							
	A	Non-hazardous area						
	B	ATEX II 1/2D IP67 T99°C						
	Y	Special version, to be specified						
20		**Housing:**						
		1	Aluminium					
		2	Aluminium, coated					
		9	Special version, to be specified					
30			**Motor traction power:**					
			A	max. 250 N, bulk density low				
			B	max. 500 N, bulk density high				
			Y	Special version, to be specified				
40				**Measuring range:**				
				1	25 m			
				2	35 m			
				3	50 m			
				4	70 m			
				9	Special version, to be specified			
50					**Max. nozzle height; tape wiper**			
					A	230 mm, alu/steel		
					B	230 mm, stainless steel		
					C	500 mm, alu/steel		
					D	500 mm, stainless steel		
					E	1000 mm, alu/steel		
					F	1000 mm, stainless steel		
					Y	Special version, to be specified		
60						**Power supply:**		
						1	180 - 253 VAC, 50/60 Hz	
						2	90 - 127 VAC, 50/60 Hz	
						9	Special version, to be specified	
70							**Output:**	
							A	0/4 - 20 mA + 2x relay, adjustable: counting / reverse / upwards / max. position / alarm / limit / measuring active
							B	0/4 - 20 mA + 6x relay, adjustable: counting / reverse / upwards / max. position / alarm / limit / measuring active
							Y	Special version, to be specified

Continuation ordering information for Silopilot M FMM50

80	**Ambient temperature:**	
	A	Range -20 ... +70°C
	B	Range -40 ... +70°C + heater (ATEX II 1/2D min. -35°C)
	C	Range -20 ... +70°C + enhanced climate resistance
	Y	Special version, to be specified

90	**Process temperature:**	
	1	Range -20 ... +70°C
	2	Range -20 ... +150°C
	3	Range -20 ... +230°C
	9	Special version, to be specified

100	**Process pressure:**	
	1	0.8 ... 1.1 bar absolute
	2	0.8 ... 3.0 bar absolute
	9	Special version, to be specified

110	**Sensing weight:**	
	A	without
	B	Steel
	C	Stainless steel
	D	Steel + umbrella
	E	Stainless steel + umbrella
	G	Medium bag
	H	Steel cage
	J	Stainless steel cage
	K	Steel bell
	L	Stainless steel bell
	M	Oval float (PVC)
	Y	Special version, to be specified

120	**Additional option:**	
	1	Basic version
	2	Window + external start button
	9	Special version, to be specified

FMM50-		Order code

Comments regarding the product structure

The following limitations apply to devices with an ATEX license:
- **Ambient temperature (80), option B**: min. -35°C
- **Process temperature (90)**: only (**1**)
- **Process pressure (100)**: only (**1**)
- **Sensing weights (110)**: (**M**) not permitted
- **Additional equipment (120)**: (**2**) not permitted

The following limitations apply to devices with a process temperature range of up to +150°C:
- **Sensing weights (110)**: (**M**) not permissible

The following limitations apply to devices with a process temperature range of up to +230°C:
- **Max. connection height; wiper (50)**: only (**F**)
- **Sensing weights (110)**: (**D**), (**E**), (**G**) and (**M**) not permissible

Note!
Use a nozzle of 400 – 500 mm height with process temperatures from +70°C up to 150°C (**Silopilot M FMM50-********2*****) for a temperature reduction. In this case a wiper length of 500 mm must be used. Use a nozzle of 900 – 1000 mm height with process temperatures from +70°C up to 230°C (**Silopilot M FMM50-********3*****) for a temperature reduction. In this case a wiper length of mm must be used. You can order a special process adapter extension for this version (see accessories).

Other limitations:
- **Ambient temperature (80), option C**: only in conjunction with coated housing

User-specific settings

All settings of the Silopilot M FMM50 can optionally be preset at the factory according to the customers requirements. When ordering, chose the relevant unit type (FMM50-**********9) and complete the form "**User-specific settings**" (ad042000en, preprint see next page), which has to accompany the order.

User-specific settings

Endress+Hauser

People for Process Automation

The order option for Silopilot M FMM50 with user-specific settings requires that all necessary parameters and options are mentioned. Whereever 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.	003 full calibration	020 measurem. type	021 time interval	022 time unit	023 normal or short
_____ m/ft/in	_____ m/ft/in	❑ **single cycle** ❑ periodical	_____ [022]	❑ **h** ❑ min.	❑ **normal** ❑ short
024 service interval	060 language	061 back to home	062 no. of decimals	080 tag no.	083 distance unit
_____	❑ **English** ❑ Deutsch ❑ Français ❑ ニホソゴ	_____ s (default: 100)	❑ X ❑ X.X ❑ **X.XX** ❑ X.XXX	_____ (max. 16 digits)	❑ **m** ❑ ft ❑ in

Settings inputs and current output

010 input 1	011 Polarity input 1	012 input 2	013 polarity input 2
❑ **not used** ❑ bolting ❑ start measurement	❑ NC contact ❑ **NO contact**	❑ **not used** ❑ bolting ❑ start measurement	❑ NC contact ❑ **NO contact**
030 current mode	031 0/4 mA value	032 20 mA value	033 current range
❑ **normal** ❑ magnify	_____ [056]	_____ [056]	❑ **4-20 mA** ❑ 0-20 mA

Settings relay outputs

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

Safety settings and linearization

040 output on alarm	041 output on alarm	042 safety distance	043 security distance	044 in security distance
❑ **MIN (0/3.6mA)** ❑ MAX (22mA) ❑ hold ❑ user-specific	_____ mA	_____ [083]	_____ [083]	❑ **warning** ❑ alarm
045 in safety distance	050 level/volume	051 linearization	056 customer unit	057 max. scale
❑ **warning** ❑ alarm	❑ **level CU** ❑ ullage CU ❑ level DU ❑ ullage DU	❑ **linear** ❑ manually *1 ***1 you need to enter manually a linearization curve**	❑ **%** ❑ ft³ ❑ kg ❑ m ❑ t ❑ ft ❑ m³ ❑ in	_____ [056]

Note:

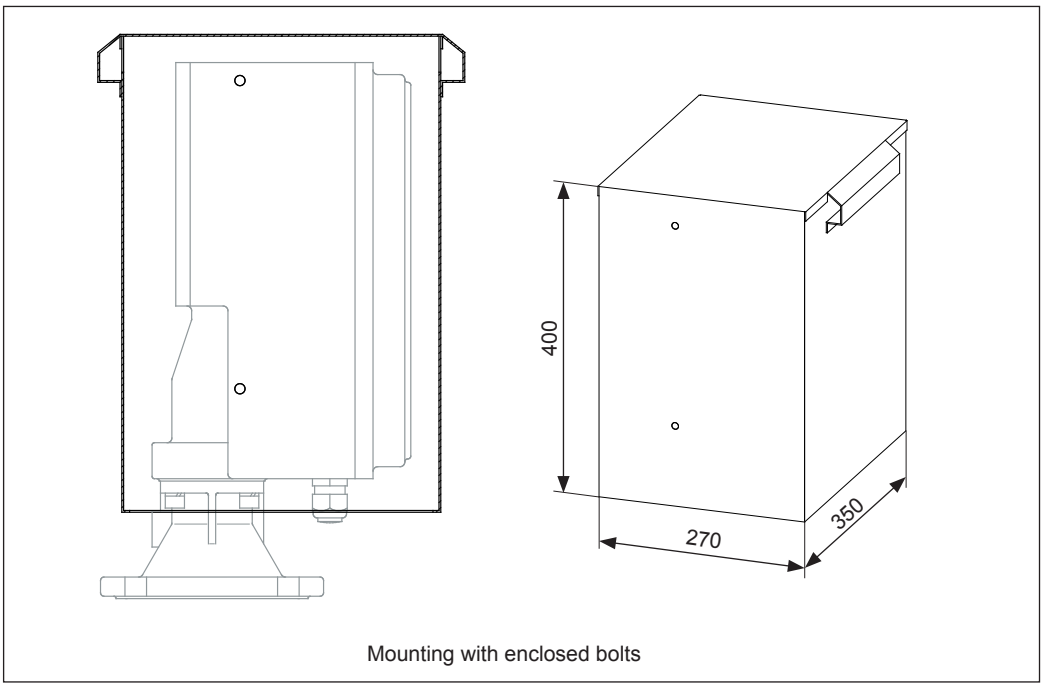
- The bold marked options are the default values.
- Settings like "_____ **[123]**" relate to the option you select in function 123.

ad042000en/01.07

Accessories

The following accessories can be delivered for the Silopilot:

- Protection hood FMM50
  - Order code: 52027964
  - Material: Stainless steel 1.4301
  - Weight: 7.5 kg
  - The delivery contains the mounting bolts.



Protective hood

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

- Process adapter extension (see chapter "Dimensions" for details)
  - Order code:
    a) 52028082 (Material: Steel) or
    b) 52028083 (Material: Stainless steel)
  - Weight: 16 kg

Technical data

Mechanical

- Weight:
  max. 23 kg (without sensing weight)

- Housing:
  Material: Aluminium
  Coating optional (RAL 5012, cover RAL 7035)

- Tape wiper:
  Material: Aluminium/steel or stainless steel

- Ambient temperature range:
  -20 ... +70°C standard version
  -40 ... +70°C with self-control housing heater
  (Ex version down to -35°C)

- Dimensions of standard version [mm]:
  447 x 339 x 260 [HxBxD]

- Measuring tape:
  - Material: Stainless steel
  - Length: max. 70 m

- Tape speed:
  - Minimum 0.21 m/s
  - Maximum 0.35 m/s

- Protection type:
  IP67 according to EN 60529

- Angle of inclination:
  max. 2°

Electrical

- Supply voltage:
  90 - 127 VAC, 50/60 Hz or
  180 - 253 VAC, 50/60 Hz

- Power consumption:
  without housing heater: max. 230 VA
  with housing heater: max. 250 VA

- Inputs:
  active: Input voltage range 12 ... 24 VDC
  passive: Contact loading max. 5 mW
  start pulse length: min. 200 ms

- Outputs:
  0/4 - 20 mA current output, active
  Relay output: 250 VAC, 6 A

- Terminals:
  Power supply: max. 2.5 mm^2
  Inputs/outputs: max. 1.5 mm^2

Certificates and approvals

CE symbol

The Silopilot measuring unit complies with the legislative requirements of EC guidelines.
By applying the CE symbol Endress+Hauser declares that the unit was successfully tested.

Ex approvals

See "Safety instructions"

External standards and guidelines

- **EN 60529**
  Types of protection housings (IP code)
- **EN 61010-1**
  Safety directives for electrical measuring, control, regulating and laboratory devices
- **EN 61326**
  Interference emissions (Equipment class B) and interference resistance (Attachment A – industrial systems)
- **EN 50281-1-1**
  Electrical equipment for use in areas containing flammable dust
- **RL 89/336/EWG**
  EMC guidelines
- **RL 94/9/EG**
  ATEX guidelines

Supplementary documentation

Operating instructions

Silopilot M FMM50
Operating instruction for Silopilot M FMM50, BA286F/97/en

Safety instructions

Silopilot M FMM50
Safety instruction for electrical apparatus for explosion-hazardous areas, XA425F-A/97/a3

Subject to modification

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