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Technical Information
Level Switch MPC2

Tank Gauging



Application

MPC2 is a displacement-type level switch. It is mounted on a tank, indicates liquid level alarms with a lamp, and outputs a contact signal for controlling pumps and valves. It provides from 1 to up to 4 control output contacts while activating micro switches with a magnet. Each contact is designed to operate independently.

Features and benefits

- Level alarm that does not require a power supply
- Ability to handle a wide range of level control
- Flat spring-type micro switch holders ensure proper operation, unaffected by vibration
- Multi-point control (4 points maximum) with a single level controller
- High-temperature, high-pressure resistance
- Simple mechanical construction, stable operation
- Control level easily modified by changing displacer position

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People for Process Automation

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About this document

Symbols

Safety symbols

DANGER
This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

WARNING
This symbol alerts you to a potentially dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

CAUTION
This symbol alerts you to a potentially dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE
This symbol alerts you to a potentially harmful situation. Failure to avoid this situation can result in damage to the product or something in its vicinity.

Electrical symbols

Symbol	Meaning
⎓	Direct current
~	Alternating current
⎓ ~	Direct and alternating current
⏚	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
⏚	**Protective earth (PE)** Ground terminals that must be connected to ground prior to establishing any other connections. The ground terminals are located on the interior and exterior of the device: ▪ Interior ground terminal: protective earth is connected to the mains supply. ▪ Exterior ground terminal: device is connected to the plant grounding system.

Tool symbols

Phillips head screwdriver

Flat blade screwdriver

Torx screwdriver

Allen key

Open-ended wrench

Symbols for certain types of information and graphics

Permitted
Procedures, processes or actions that are permitted

Preferred
Procedures, processes or actions that are preferred

Forbidden
Procedures, processes or actions that are forbidden

Tip
Indicates additional information

Reference to documentation


Reference to graphic

▶
Notice or individual step to be observed

1., 2., 3.
Series of steps


Result of a step


Visual inspection


Operation via operating tool


Write-protected parameter

1, 2, 3, ...
Item numbers

A, B, C, ...
Views


Safety instructions
Observe the safety instructions contained in the associated Operating Instructions


Temperature resistance of the connection cables
Specifies the minimum value of the temperature resistance of the connection cables

Documentation

The following documentation types are available in the Downloads area of the Endress+Hauser website (www.endress.com/downloads):


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

Technical Information (TI)

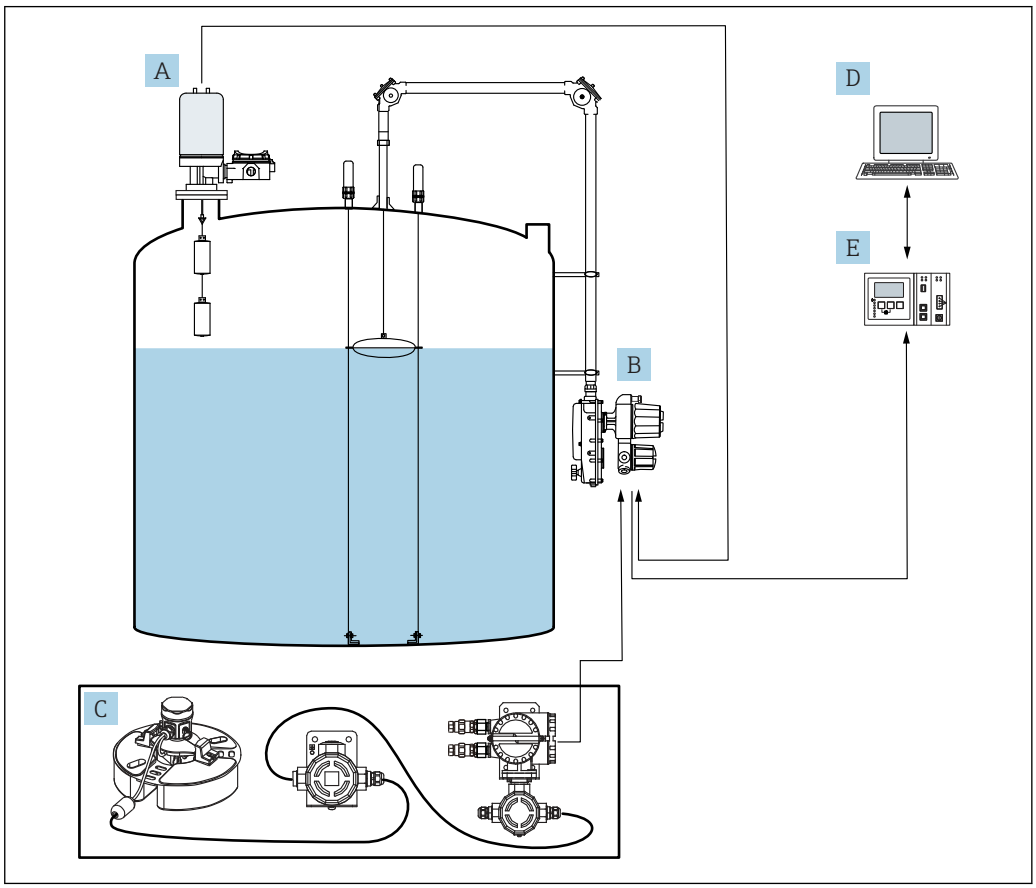
Planning aid
This document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

Operating Instructions (BA)

Operating Instructions contain all the information required for all stages in the device life cycle (from product identification, incoming acceptance, storage, mounting, connection, operation, and setting to troubleshooting, maintenance, and disposal).

Function and system design

System design



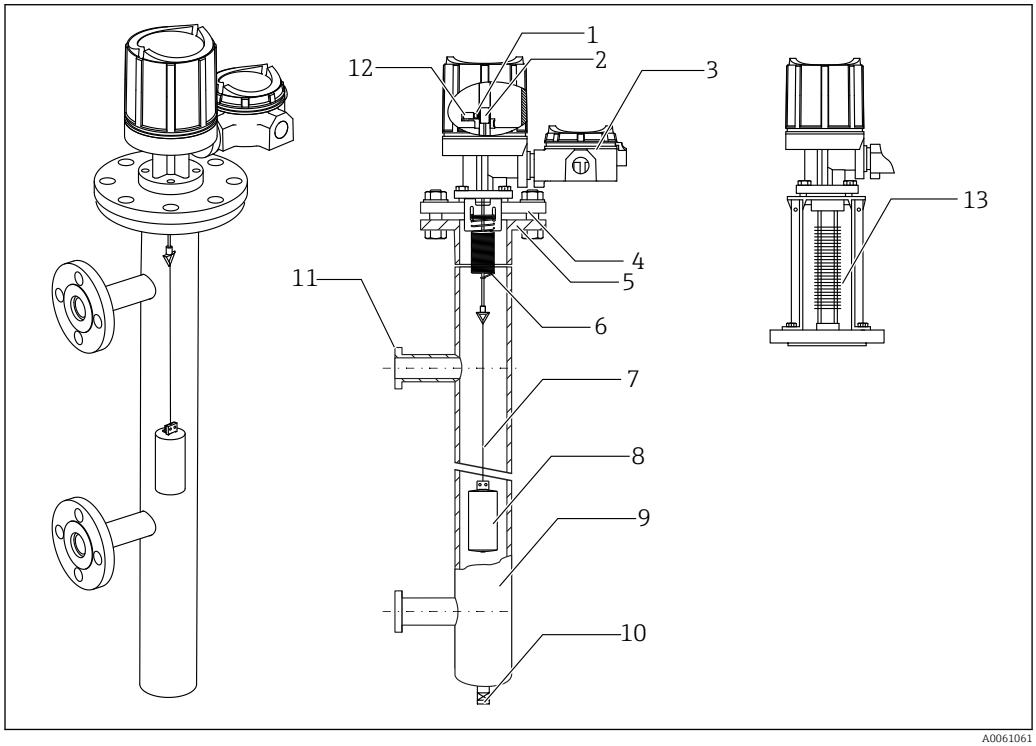
1 *Typical device system design*

A Level switch MPC2
B Digital transmitter TMD1 (HART temperature input specification)
C Oil leak detector NAR300 system (NAR300, sensor I/F Ex box, NRR261)
D PC
E Tankvision (Host communication system)

Product design

MPC2 is configured in combination with mainly the following products.

The following figure shows a 1-point switch type with an external guide pipe (side-side mounting) and a single fin (optional). For different types, refer to → 24



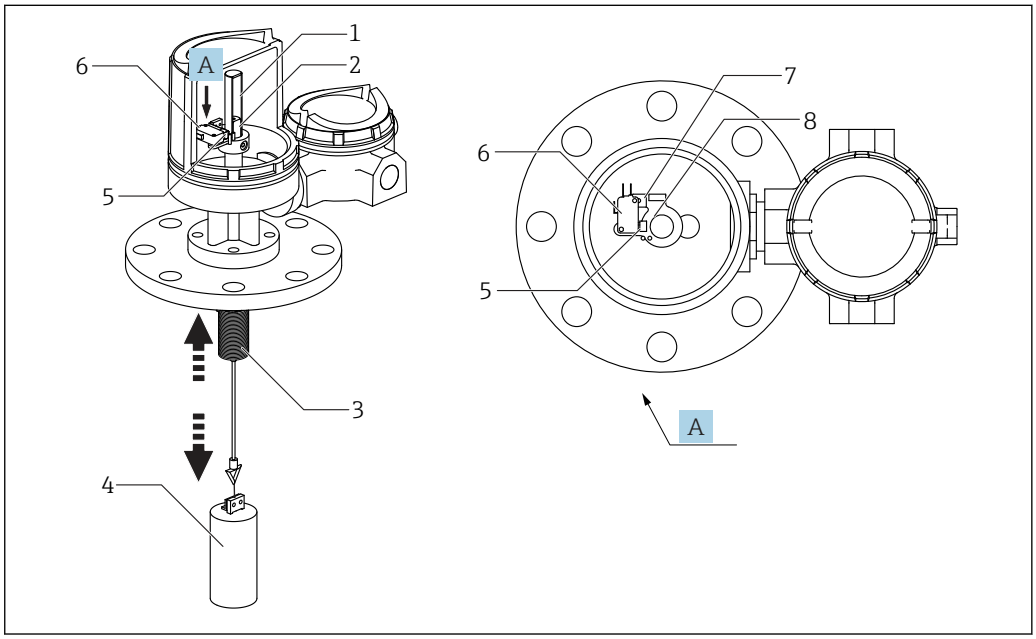
2 *MPC2 configuration example*

1 *Magnet*
2 *Iron core*
3 *Terminal box (supplied with TIIS specification)*
4 *Flange 1*
5 *Flange 2 (refer to Note)*
6 *Spring*
7 *Wire*
8 *Displacer*
9 *External guide pipe*
10 *Drain cap*
11 *Nozzle flange*
12 *Switch*
13 *Radiation fins (select between single/double, optional)*

Flange 2 for the external guide pipe type is supplied upon delivery. Flange 2 must be supplied by the customer if the internal guide pipe type or no guide pipe has been selected.

Detection system

When the liquid level changes, the draft will change and the buoyancy will increase or decrease based on the displacer's position. This change in weight, corresponding to the change in buoyancy, causes the spring to extend and retract, moving up and down the iron core on the intermediate shaft fixed to the spring. The switch consists of a micro switch, a flat spring, and a magnet mounted on the bracket, and it is mounted on the protection pipe. When the iron core moves up and down inside the protection pipe and the set position is reached, the magnet is drawn in and the micro switch is activated. Normally, the micro switch is in the closed ON state, which is the normal condition of the application. When the iron core on the intermediate shaft moves, the contact of the micro switch is drawn towards it and the switch opens, which activates the alarm by putting the micro switch in the OFF state. Although the magnet is small, it has a strong magnetic field as it is a rare-earth cobalt magnet. For a 2-point alarm, there are 2 sets of magnets and micro switches for 1 iron core, and the alarm is activated using the same operating principle. Radiation fins are mounted on high-temperature types (0 to 250 °C (32 to 482 F)), which insulate the main body from the tank's internal temperature.

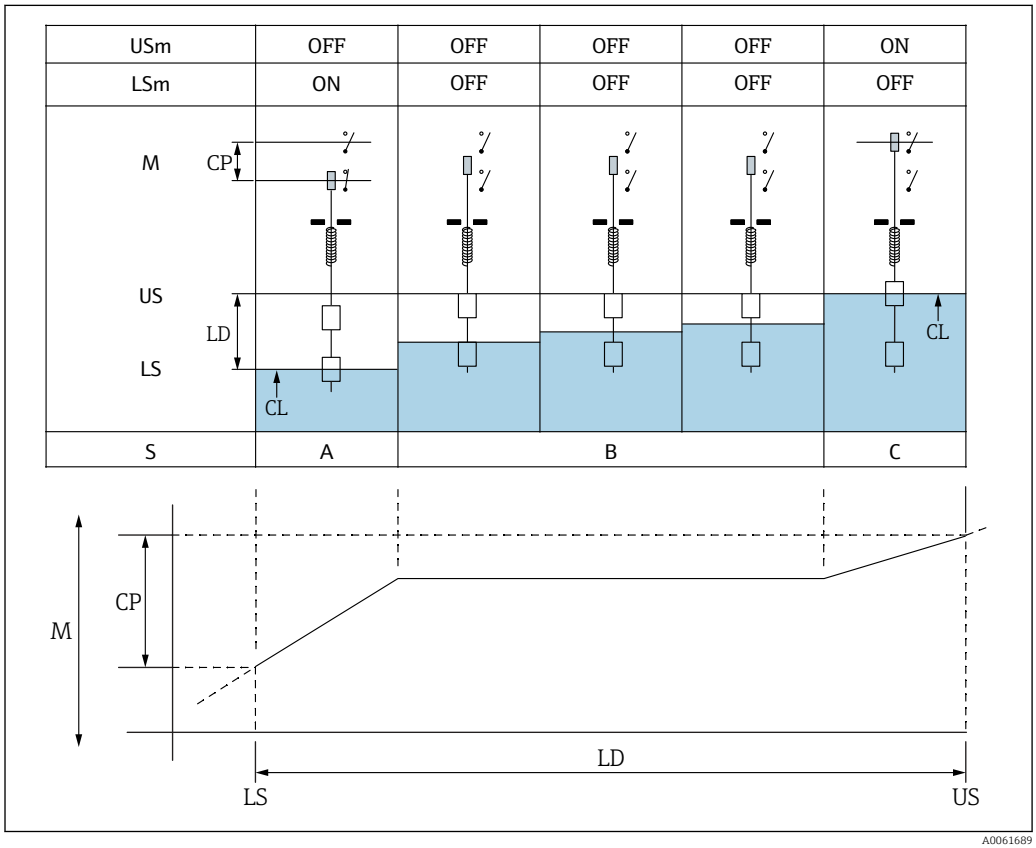


3 *Detection system (e.g., for 1-point explosion-proof type switch)*

A Details of part A (top view)
1 Protection pipe
2 Iron core
3 Spring
4 Displacer
5 Magnet
6 Micro switch
7 Flat spring
8 Bracket

Operating principle

The micro switch is normally pressed down by a flat spring. When the iron core approaches and the magnetic force exceeds the spring force, the micro switch flips. For this reason, when the upper and lower limit switches are turned ON, it means that the micro switch is not pressed down.



A0061689

USm Upper limit switch movement
LSm Lower limit switch movement
M Iron core movement
US Upper limit set position
LS Lower limit set position
S State
CP Deviation of iron core position (difference in the iron core position inside the sensor)
LD Water level deviation (difference from the set liquid level)

Input/output

Accuracy

No radiation fins	-	1 to 2 points	Within ± 3 mm (0.12 in)
	-	3 to 4 points	Within ± 5 mm (0.20 in) (at 25 °C (77 °F))
With radiation fins	Single fins	1 to 2 points	± 7 mm (0.26 in)
		3 to 4 points	± 10 mm (0.40 in)
	Double fins	1 to 2 points	± 7 mm (0.26 in)
		3 to 4 points	± 10 mm (0.40 in)

Maximum operating pressure

2.94MPa (30kgf/cm^2)

The maximum operating pressure will vary slightly depending on the flange specifications.

Ambient temperature

Non-explosion-proof type	–20 to 60 °C (68 to 140 F)
Explosion-proof type	–10 to 40 °C (14 to 104 F) (There must be no freezing or condensation)

Liquid temperature

No radiation fins	0 to 100 °C (32 to 212 F)
With radiation fins	0 to 250 °C (32 to 482 F)

For more information on high-temperature applications, refer to → 18

Density of measurement liquid

Density range	0.65 to 1.2 g/cm^3

Wetted materials / gas wetted materials

Reference ordering information	060 "Process connection, top-mounted flange" 080 "Internal guide pipe, external guide pipe"

Alarm contacts

1 to 4 points

Contact rating

TIIS Ex d rating	Maximum 250 V_{AC}1050 V_{AC} / Maximum 250 V_{DC}120 V_{DC}
Allowable contact rating	1 to 2 points: 250 V_{AC}, 4.2 A, 1050 V_{AC}, 125 V_{DC}, 0.4 A, 50 W
Allowable contact rating	3 to 4 points: 250 V_{AC}, 2.8 A, 700 V_{AC}, 125 V_{DC}, 0.4 A, 50 W

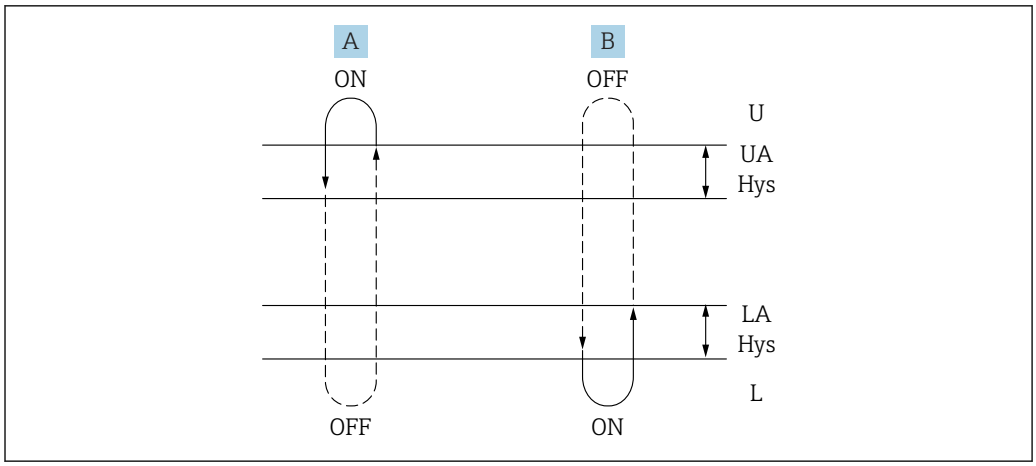
Hysteresis

Standard (without radiation fins) (at density = 1 g/cm^3)

1- to 2-point type	7 to 25 mm (0.28 to 0.98 in)
3- to 4-point type	7 to 45 mm (0.28 to 1.77 in)

High temperature (with radiation fins) (at density = 1 g/cm^3)

1- to 2-point type	7 to 40 mm (0.28 to 1.57 in)
3- to 4-point type	7 to 40 mm (0.28 to 1.57 in)



4 *Hysteresis*

A Upper limit switch
B Lower limit switch
U Above the upper level limit
L Below the lower level limit
UA Upper alarm point hysteresis Hys
LA Lower alarm point hysteresis Hys

Paint color Silver (internal guide pipe is not painted)

Process connections

None/internal guide pipe type

10K 80A RF, SUS304, JIS flange B2220
10K 80A RF, SUS316, JIS flange B2220
20K 80A RF, SUS304, JIS flange B2220
20K 80A RF, SUS316, JIS flange B2220
3" 150Ibs RF, SUS304, ANSI flange B16.5
3" 150Ibs RF, SUS316, ANSI flange B16.5
3" 300Ibs RF, SUS304, ANSI flange B16.5
3" 300Ibs RF, SUS316, ANSI flange B16.5
80A 150lbs RF, SUS304, JPI flange 7S-15
80A 150lbs RF, SUS316, JPI flange 7S-15
80A 300lbs RF, SUS304, JPI flange 7S-15
80A 300lbs RF, SUS316, JPI flange 7S-15

External guide pipe type

10K 65A RF, SUS304, JIS flange B2220
10K 65A RF, SUS316, JIS flange B2220
20K 65A RF, SUS304, JIS flange B2220
20K 65A RF, SUS316, JIS flange B2220
2-1/2" 150Ibs RF, SUS304, ANSI flange B16.5
2-1/2" 150Ibs RF, SUS316, ANSI flange B16.5
2-1/2" 300Ibs RF, SUS304, ANSI flange B16.5
2-1/2" 300Ibs RF, SUS316, ANSI flange B16.5
65A 150lbs RF, SUS304, JPI flange 7S-15
65A 150lbs RF, SUS316, JPI flange 7S-15
65A 300lbs RF, SUS304, JPI flange 7S-15
65A 300lbs RF, SUS316, JPI flange 7S-15

Overflow detection

10K 100A RF, SUS304, JIS flange B2220
10K 100A RF, SUS316, JIS flange B2220
4" 150Ibs RF, SUS304, ANSI flange B16.5
4" 150Ibs RF, SUS316, ANSI flange B16.5
100A 150lbs RF, SUS304, JPI flange 7S-15
100A 150lbs RF, SUS316, JPI flange 7S-15

Cable entry

Explosion-proof type

Conduit connection	PF(G)3/4, PF(G)1, PF(G)1-1/4, NPT3/4
Cable gland	TF16-11, TF22-13, TF22-15, TF28-18

Waterproof type

Conduit connection	PF(G)3/4, NPT3/4, PF(G) 1/2
Cable gland	20a.b.c

⚠ WARNING

Using cable glands

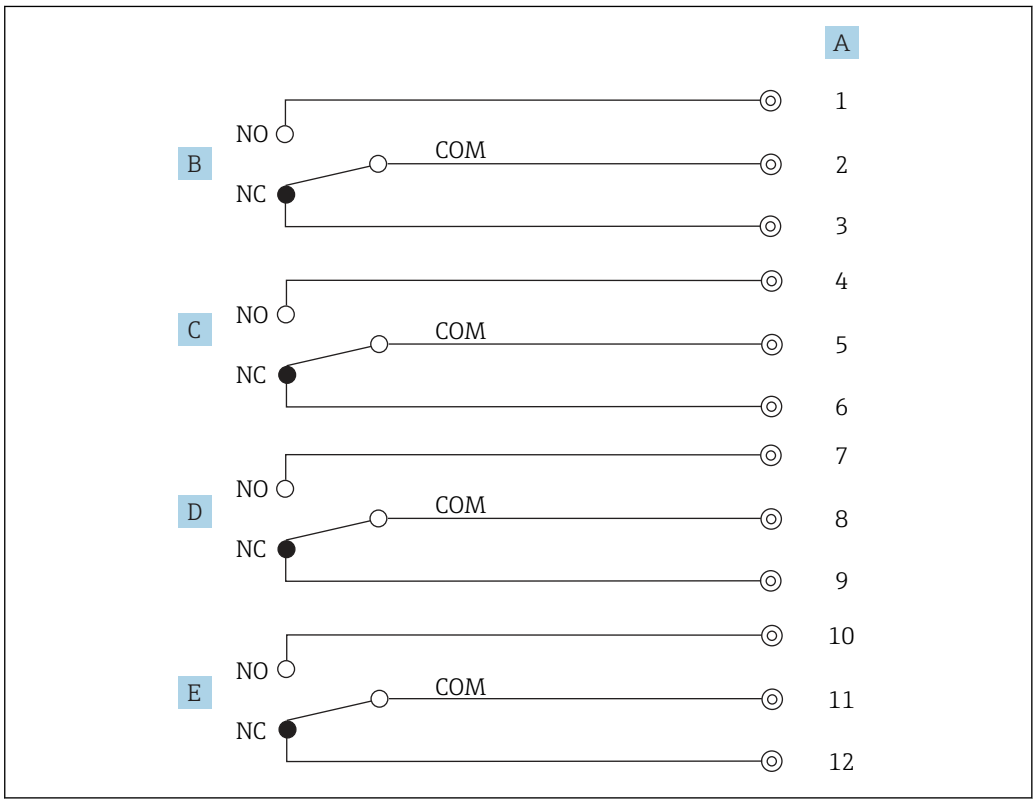
Do not use non-genuine cable glands.

- Only use genuine cable glands authorized by Endress+Hauser. Use of non-genuine cable glands may compromise the waterproof/explosion-proof performance, which may lead to malfunctioning and accidents, and safety cannot be guaranteed. Select an option with cable glands using the order code.

Electrical connection

Wiring diagram

The figure shows each switch contact condition when the level is normal.



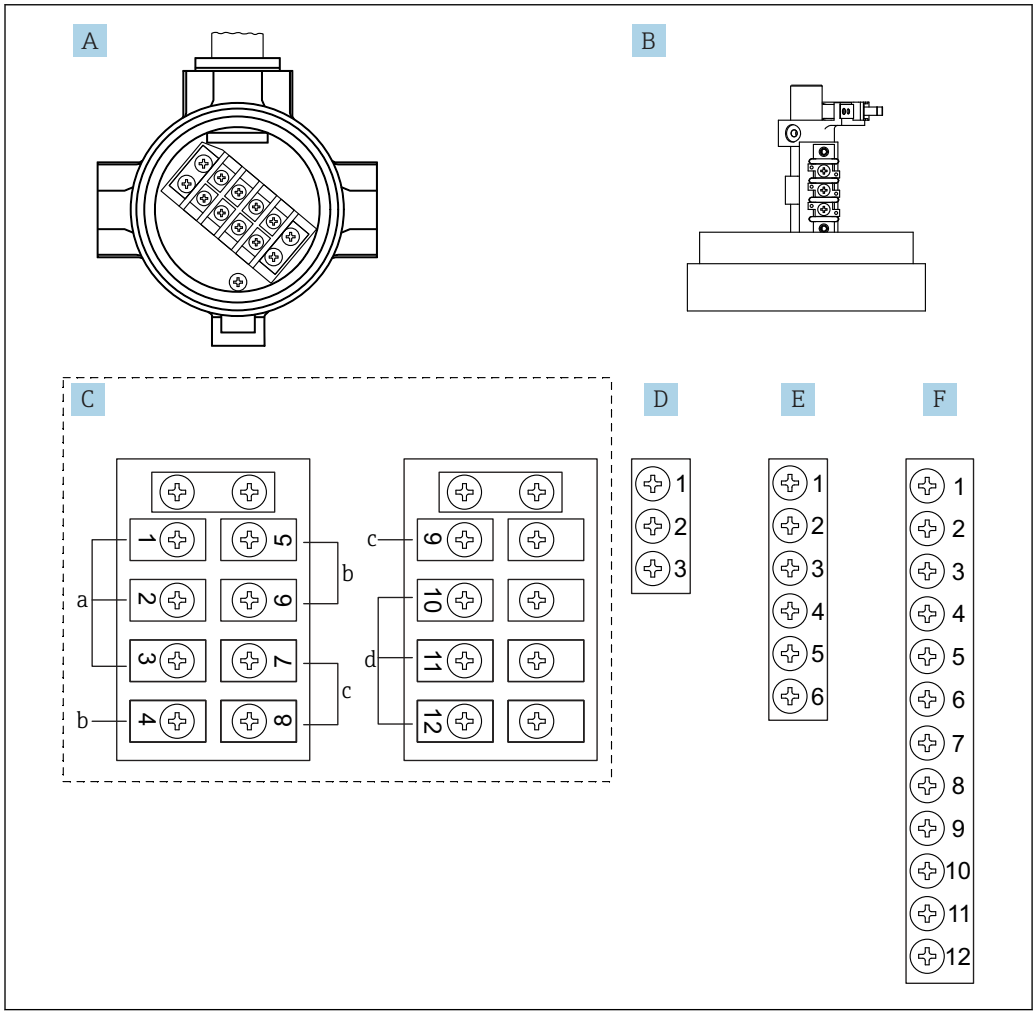
5 *Wiring diagram*

A Terminal number
B 1 point
C 2 points
D 3 points
E 4 points

Terminal connection

Each MPC2 switch has 3 wires (NO, NC, COM) for terminal connection. This means that each switch requires 3 terminal connectors (e.g., C-a is used for a 1-point switch explosion-proof type; D is used for a 1-point switch waterproof type). The wires are numbered in sequence along the terminal boxes as shown in the figure below. This is a standard factory sequence, but it can be changed to any position. Contact your nearest Endress+Hauser sales office or distributor for more details.

Overview A below, which includes the casting of a terminal block, is for a 1- to 2-point switch (explosion-proof type), and Overview B is a sample diagram of a 1-point switch (waterproof type).



6 *Arrangement of terminal box*

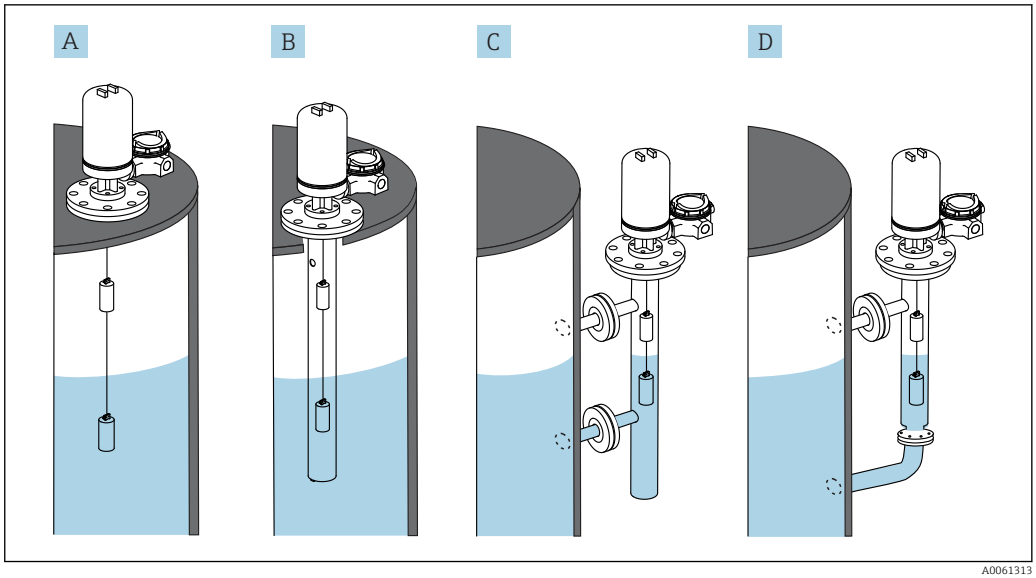
A Terminal box for explosion-proof type
B Terminal box for waterproof type
C Terminal box for explosion-proof type
D Terminal box for waterproof type (for 1-point switch)
E Terminal box for waterproof type (for 2-point switch)
F Terminal box for waterproof type (for 3- and 4-point switch)
a Explosion-proof terminal box (for 1-point switch)
a, b Explosion-proof terminal box (for 2-point switch)
a to c Explosion-proof terminal box (for 3-point switch)
a to d Explosion-proof terminal box (for 4-point switch)

Installation

Installation types

There are four common ways to mount MPC2 as described below. The following figure shows a typical mounting example.

- Without guide pipe
- Internal guide pipe type: Tank top mounting
- External guide pipe type: Side-side mounting
- External guide pipe type: Side-bottom mounting

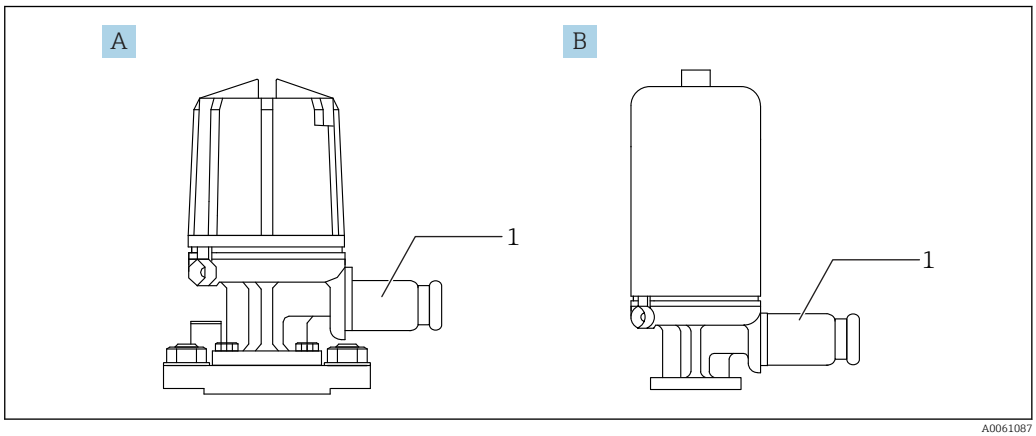


7 *Installation types*

A Without guide pipe
B Internal guide pipe type: Tank top mounting
C External guide pipe type: Side-side mounting
D External guide pipe type: Side-bottom mounting

Waterproof type option

A cable connector can optionally be attached to the waterproof type.



8 *Waterproof type option*

A MCP2 for 1-point switch type
B MCP2 for 2- to 4-point switch type
1 Cable connector (optional)

Overflow alarm

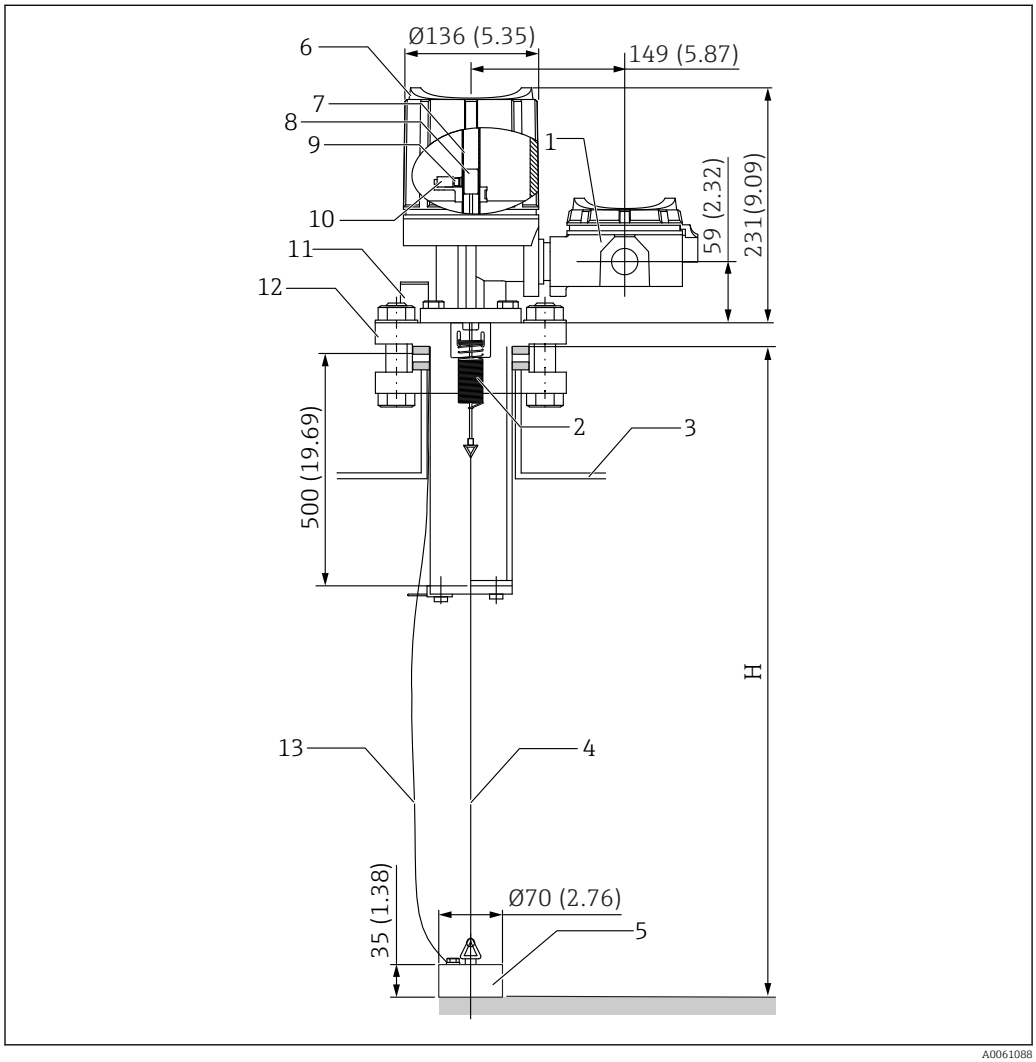
Either of the two following specifications can be used for an overflow alarm:

- Weight type for FRT
- Displacer type for CRT

When a displacer or a weight reaches a specified position (upper limit), an alarm signal is output to prevent an overflow in advance. The operation and function are the same as those of the 1-point switch type, but with an operation check function. Unscrew the plug of the test wire seal unit at the top of the flange and pull the ring connected to the test wire. This raises the displacer or weight, creating a simulated alarm mode, which allows the device's operation to be checked.

Floating roof tank (FRT)

Order info.: 030 (switch count) code: 5 (1 x FRT overflow detection)

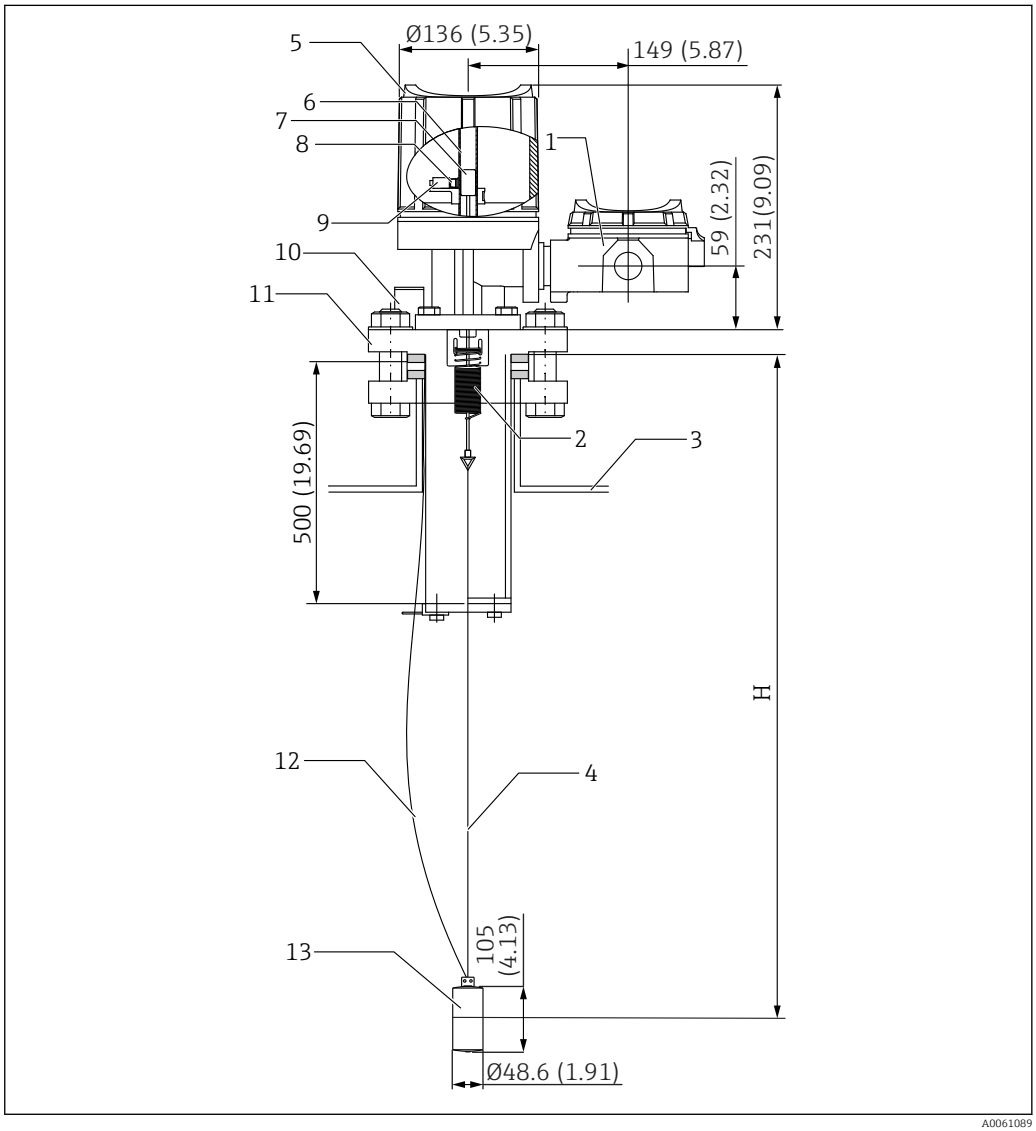


9 Overflow detection (weight type)

1	Terminal box	6	Cover	11	Test wire seal unit
2	Spring	7	Protection pipe	12	Top-mounted flange
3	100A/4" nozzle	8	Iron core	13	Test wire
4	Weight wire	9	Magnet	H	Alarm position
5	Weight	10	Micro switch		

Cone roof tank (CRT)

Order info.: 030 (switch count) code: 6 (1 x CRT overflow detection)



10 Overflow detection (displacer type)

1	Terminal box	6	Protection pipe	11	Top-mounted flange
2	Spring	7	Iron core	12	Test wire
3	100A/4" nozzle	8	Magnet	13	Displacer
4	Displacer wire	9	Micro switch	H	Alarm position
5	Cover	10	Test wire seal unit		

Instructions for use at high temperatures

Although it is recommended to lower the temperature around the spring as much as possible when using MPC2, it can still be used at high temperatures by making adjustments based on the temperature around the spring. The following specialized springs are used for MPC2 depending on the number of switch points.

Switch points	1	2	3	4
Spring coefficient	4 g/mm	5 g/mm	7 g/mm	8 g/mm
Temperature characteristic	−0.05% / ℃			

The spring coefficients at 25 ℃ (77 ℉) are as follows.

4 g	4 - 4 x (0.05/100) x 25 = 3.95
5 g	5 - 5 x (0.05/100) x 25 = 4.94
7 g	7 - 7 x (0.05/100) x 25 = 6.91
8 g	8 - 8 x (0.05/100) x 25 = 7.10

Since the constant for spring load rate decreases as temperature rises, switch position adjustment is required. The temperature characteristics are the same for all springs at −0.05% / ℃. Since this characteristic is linear, setting the correction value to a normal temperature in advance is possible when operating temperature is limited (specified).

Upon adjustment completion, accuracy in high temperature conditions is within ±7 mm (0.28 in) for 2 points and ± 10 mm (0.39 in) for 3 to 4 points.

Description of symbols used in equation

S (cross-section of displacer)	18.55 cm^2
W (weight)	g (intermediate axis + nx displacer)
ρ1 (water density at (25 ℃ (77 ℉))	0.997
ρ2 (liquid density)	g/cm^3
K1 (spring constant at (25 ℃ (77 ℉))	g/mm
K2 (spring constant at operating temperature)	g/mm

Correction formula for switch points: N (N = 1 to 4)

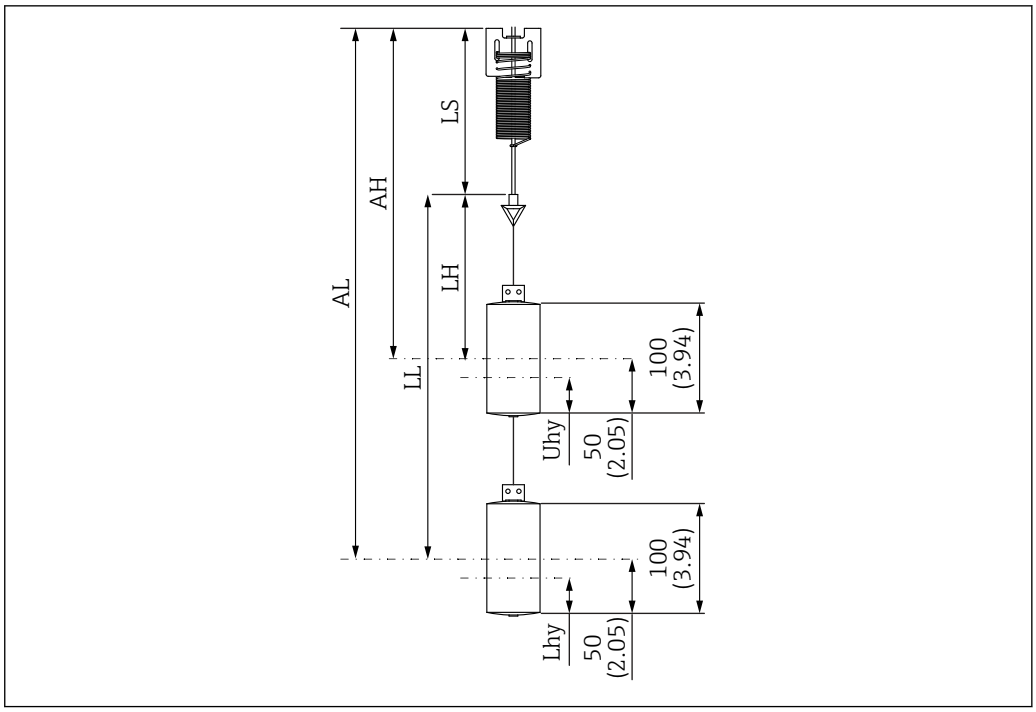
The following is the correction formula for N (N = 1 to 4) switch points.

(W-ρ2 x S x (10 (N-1) + 5)) / K2 = (W-ρ1 x S x (10 (N-1) +0.1hy)) / K1 [1]

Change in characteristics for 2-point switch and example of correction at normal temperature

When setting the draft line to the center of the displacer at operating temperature, the dimension hy (mm/in) (corrected) at 25 ℃ (77 ℉) will be the calculated value of the following formula.

Lower level	(W -ρ2 x W -ρ2 x S x 5) / K2 = (W -ρ1 x S x 0.1hy) / K1 [2]
Upper level	(W -ρ2 x S x (10 + 5)) / K2 = (W -ρ1 x S x (10 + 0.1hy)) / K1 [3]



11 *Correction example*

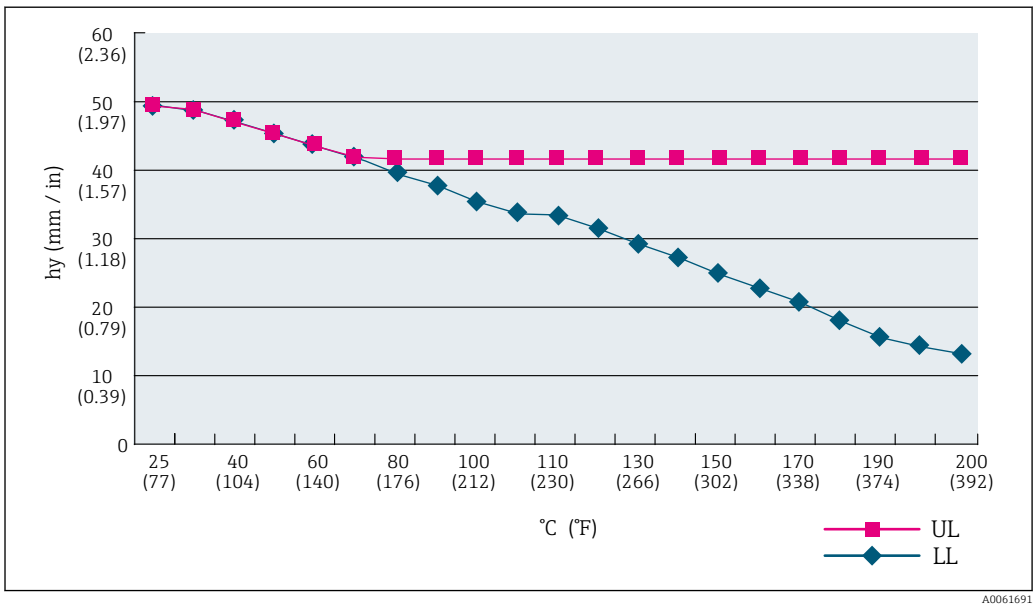
AL Customer-specified lower alarm position
AH Customer-specified upper alarm position
LL Manufacturing adjustment length
LH Manufacturing adjustment length
LS Each alarm length
Uhy Upper hysteresis
Lhy Lower hysteresis

The following table shows hysteresis values derived from the formula above for various temperatures. The dimension of Uhy is calculated by taking hysteresis (hy) (7 mm (0.28 in) to 40 mm (1.57 in)) into consideration. The maximum hysteresis 40 mm (1.57 in) is adjusted at 5 % for a margin of 42 mm (1.65 in). For the lower level, the dimension of hysteresis in actual liquid is set to 50 mm (1.97 in). The values can be corrected up to approximately 200 °C (392 °F).

Table 1 Correction value (for 2-point switch)

Temperature (°C / °F)	Density (x10-^{3} g/ mm^3)	Spring coefficient (g/mm)	Lower level hy (mm)	Lower limit with actual liquid hy (mm)	Upper level (hy mm)	Upper limit with actual liquid hy (mm)
25 / 77	0.997	4.94	50.0	50.0	50.0	50.0
30 / 86	0.996	4.93	49.2	50.0	49.3	50.0
40 / 104	0.992	4.90	47.4	50.0	47.6	50.0
50 / 122	0.988	4.88	45.6	50.0	45.9	50.0
60 / 140	0.983	4.85	43.7	50.0	44.0	50.0
70 / 158	0.978	4.83	41.8	50.0	42.2	50.0
80 / 176	0.972	4.80	39.9	50.0	42.0	51.9
90 / 194	0.965	4.78	37.9	50.0	42.0	54.1
100 / 212	0.958	4.75	35.8	50.0	42.0	56.4
110 / 230	0.951	4.73	33.7	50.0	42.0	58.7
120 / 248	0.943	4.71	31.6	50.0	42.0	61.2
130 / 266	0.935	4.68	29.4	50.0	42.0	63.8

Temperature (°C / °F)	Density (x10-3 g/ mm3)	Spring coefficient (g/mm)	Lower level hy (mm)	Lower limit with actual liquid hy (mm)	Upper level (hy mm)	Upper limit with actual liquid hy (mm)
140 / 284	0.926	4.66	27.2	50.0	42.0	66.5
150 / 302	0.917	4.63	24.9	50.0	42.0	69.4
160 / 320	0.907	4.61	22.6	50.0	42.0	72.4
170 / 338	0.897	4.58	20.2	50.0	42.0	75.6
180 / 356	0.887	4.56	17.8	50.0	42.0	78.8
190 / 374	0.876	4.53	15.3	50.0	42.0	82.3
195 / 383	0.870	4.52	14.0	50.0	42.0	84.2
200 / 392	0.865	4.51	12.8	50.0	42.0	85.9



12 *Dimensions of hysteresis based on temperature*

hy Hysteresis
UL Upper level
LL Lower level

Change in characteristics for 1-point switch and example of correction at normal temperature

W (weight) = 375 g, if using a spring with 4 g/mm

(W-ρ2 x S x (10(N-1)+5)) / K2 = (W-ρ1 x S x (10(N-1)+0.1hy)) / K1 (N = 1)

The following table shows hysteresis values derived from the formula above for various temperatures. The dimension of hysteresis at the upper level is calculated by taking (7 mm (0.28 in) to 40 mm (1.57 in)) into consideration. The maximum hysteresis 40 mm (1.57 in) is adjusted at 5 % for a margin of 42 mm (1.65 in). For the lower level, the dimension of hysteresis in actual liquid is set to 50 mm (1.97 in). The values can be corrected up to approximately 250 °C (482 °F).

Table 2 Correction value (for 1-point switch)

Temperature (°C / °F)	Density (x10-3 g/mm3)	Spring coefficient (g/mm)	First point hy (mm)
25 / 77	0.997	3.95	50.0
30 / 86	0.996	3.94	49.2
40 / 104	0.992	3.92	48.6
50 / 122	0.988	3.90	47.6

Temperature (°C / °F)	Density (x10^{-3} g/mm^3)	Spring coefficient (g/mm)	First point hy (mm)
60 / 140	0.983	3.88	46.5
70 / 158	0.978	3.86	45.5
80 / 176	0.972	3.84	44.3
90 / 194	0.965	3.82	43.1
100 / 212	0.958	3.80	41.9
110 / 230	0.951	3.78	40.7
120 / 248	0.943	3.76	39.4
130 / 266	0.935	3.74	38.1
140 / 284	0.926	3.72	36.8
150 / 302	0.917	3.70	35.4
160 / 320	0.910	3.68	34.1
170 / 338	0.901	3.66	32.7
180 / 356	0.893	3.64	31.3
190 / 374	0.885	3.62	29.9
200 / 392	0.877	3.60	28.5
210 / 410	0.868	3.58	27.1
220 / 428	0.860	3.56	25.7
230 / 446	0.852	3.54	24.2
240 / 464	0.844	3.52	22.7
250 / 482	0.835	3.50	21.2

Change in characteristics for 3-point switch and example of correction at normal temperature

W (weight) = 670 g + 295 g, weight of 1 displacer: 295 g, using a spring with 7 g/mm

(W-ρ2 x S x (10 (N-1) + 5)) / K2 = (W-ρ1 x S x (10 (N-1) + 0.1hy)) / K1

The following table shows hysteresis values derived from the formula above for various temperatures. The dimension of hysteresis at the upper level is calculated by taking (7 mm (0.28 in) to 40 mm (1.57 in)) into consideration. The maximum hysteresis 40 mm (1.57 in) is adjusted at 5 % for a margin of 42 mm (1.65 in). For the lower level, the dimension of hysteresis in actual liquid is set to 50 mm (1.97 in). The values can be corrected up to approximately 150 °C (302 °F).

Table 3 Correction values (at the first point of a 3-point switch)

Temperature (°C / °F)	Density (x10^{-3} g/mm^3)	Spring coefficient (g/mm)	First point hy (mm)
25 / 77	0.997	6.91	50.0
30 / 86	0.996	6.90	49.0
40 / 104	0.992	6.86	46.4
50 / 122	0.988	6.83	43.8
60 / 140	0.983	6.79	41.2
70 / 158	0.978	6.76	38.5
80 / 176	0.972	6.72	35.8
90 / 194	0.965	6.69	32.9
100 / 212	0.958	6.65	30.1
110 / 230	0.951	6.62	27.2
120 / 248	0.943	6.58	24.2

Temperature (°C / °F)	Density (x10-3 g/mm3)	Spring coefficient (g/mm)	First point hy (mm)
130 / 266	0.935	6.55	21.2
140 / 284	0.926	6.51	18.1
150 / 302	0.917	6.48	14.9

Table 4 Correction values (at the second point of a 3-point switch)

Temperature (°C / °F)	Density (x10-3 g/mm3)	Spring coefficient (g/mm)	Lower limit with actual liquid hy (mm)	Second point hy (mm)	Upper limit with actual liquid hy (mm)
25 / 77	0.997	6.91	50.0	50.0	50.0
30 / 86	0.996	6.90	50.0	49.1	50.0
40 / 104	0.992	6.86	50.0	46.6	50.0
50 / 122	0.988	6.83	50.0	44.2	50.0
60 / 140	0.983	6.79	50.0	42.0	50.5
70 / 158	0.978	6.76	50.0	42.0	53.1
80 / 176	0.972	6.72	50.0	42.0	56.1
90 / 194	0.965	6.69	50.0	42.0	59.1
100 / 212	0.958	6.65	50.0	42.0	62.1
110 / 230	0.951	6.62	50.0	42.0	65.2
120 / 248	0.943	6.58	50.0	42.0	68.5
130 / 266	0.935	6.55	50.0	42.0	71.8
140 / 284	0.926	6.51	50.0	42.0	75.4
150 / 302	0.917	6.48	50.0	42.0	78.9

Table 5 Correction values (at the third point of a 3-point switch)

Temperature (°C / °F)	Density (x10-3 g/mm3)	Spring coefficient (g/mm)	Lower limit with actual liquid hy (mm)	Second point hy (mm)	Upper limit with actual liquid hy (mm)
25 / 77	0.997	6.91	50.0	50.0	50.0
30 / 86	0.996	6.90	50.0	49.1	50.0
40 / 104	0.992	6.86	50.0	46.6	50.0
50 / 122	0.988	6.83	50.0	44.2	50.0
60 / 140	0.983	6.79	50.0	42.0	50.1
70 / 158	0.978	6.76	50.0	42.0	52.8
80 / 176	0.972	6.72	50.0	42.0	55.7
90 / 194	0.965	6.69	50.0	42.0	59.0
100 / 212	0.958	6.65	50.0	42.0	62.3
110 / 230	0.951	6.62	50.0	42.0	65.6
120 / 248	0.943	6.58	50.0	42.0	69.2
130 / 266	0.935	6.55	50.0	42.0	72.8
140 / 284	0.926	6.51	50.0	42.0	76.8
150 / 302	0.917	6.48	50.0	42.0	80.8

Change in characteristics for 4-point switch and example of correction at normal temperature

W (weight) = 670 g + 590 g, weight of 2 displacers: 295 g, using a spring with 8 g/mm

(W-ρ2 x S x (10 (N-1) + 5)) / K2 = (W-ρ1 x S x (10 (N-1) + 0.1hy)) / K1 [1]

The following table shows hysteresis values derived from the formula above for various temperatures. The dimension of hysteresis at the upper level is calculated by taking (7 mm (0.28 in) to 40 mm (1.57 in)) into consideration. The maximum hysteresis 40 mm (1.57 in) is adjusted at 5 % for a margin of 42 mm (1.65 in).

For the lower level, the dimension of hysteresis in actual liquid is set to 50 mm (1.97 in). The values can be corrected up to approximately 130 °C (266 °F).

Table 6 Correction values (at the first point of a 4-point switch)

Temperature (°C / °F)	Density (x10^{-3} g/mm^3)	Spring coefficient (g/mm)	First point hy (mm)
25 / 77	0.997	7.90	50.0
30 / 86	0.996	7.88	48.8
40 / 104	0.992	7.84	46.2
50 / 122	0.988	7.80	43.7
60 / 140	0.983	7.76	41.0
70 / 158	0.978	7.72	41.0
80 / 176	0.972	7.68	35.6
90 / 194	0.965	7.64	32.7
100 / 212	0.958	7.60	29.9
110 / 230	0.951	7.56	29.9
120 / 248	0.943	7.52	24.0
130 / 266	0.935	7.48	21.0
140 / 284	0.926	7.44	17.9
150 / 302	0.917	7.40	14.8

Table 7 Correction values (at the second point of a 4-point switch)

Temperature (°C / °F)	Density (x10^{-3} g/mm^3)	Spring coefficient (g/mm)	Lower limit with actual liquid hy (mm)	Second point hy (mm)	Upper limit with actual liquid hy (mm)
25 / 77	0.997	7.90	50.0	50.0	50.0
30 / 86	0.996	7.88	50.0	49.1	50.0
40 / 104	0.992	7.84	50.0	46.6	50.0
50 / 122	0.988	7.80	50.0	44.2	50.0
60 / 140	0.983	7.76	50.0	42.0	50.6
70 / 158	0.978	7.72	50.0	42.0	53.3
80 / 176	0.972	7.68	50.0	42.0	56.1
90 / 194	0.965	7.64	50.0	42.0	59.2
100 / 212	0.958	7.60	50.0	42.0	62.2
110 / 230	0.951	7.56	50.0	42.0	65.3
120 / 248	0.943	7.52	50.0	42.0	68.6
130 / 266	0.935	7.48	50.0	42.0	72.0
140 / 284	0.926	7.44	50.0	42.0	75.5
150 / 302	0.917	7.40	50.0	42.0	79.1

Table 8 Correction values (at the third point of a 4-point switch)

Temperature (°C / °F)	Density (x10-3 g/mm3)	Spring coefficient (g/mm)	Lower limit with actual liquid hy (mm)	Second point hy (mm)	Upper limit with actual liquid hy (mm)
25 / 77	0.997	7.90	50.0	50.0	50.0
30 / 86	0.996	7.88	50.0	49.1	50.0
40 / 104	0.992	7.84	50.0	46.6	50.0
50 / 122	0.988	7.80	50.0	44.2	50.0
60 / 140	0.983	7.76	50.0	42.0	50.2
70 / 158	0.978	7.72	50.0	42.0	52.9
80 / 176	0.972	7.72	50.0	42.0	55.8
90 / 194	0.965	7.64	50.0	42.0	59.1
100 / 212	0.958	7.60	50.0	42.0	59.1
110 / 230	0.951	7.56	50.0	42.0	65.7
120 / 248	0.943	7.52	50.0	42.0	69.3
130 / 266	0.935	7.48	50.0	42.0	72.9
140 / 284	0.926	7.44	50.0	42.0	76.9
150 / 302	0.917	7.40	50.0	42.0	80.9

Table 9 Correction values (at the fourth point of a 4-point switch)

Temperature (°C / °F)	Density (x10-3 g/mm3)	Spring coefficient (g/mm)	Lower limit with actual liquid hy (mm)	Second point hy (mm)	Upper limit with actual liquid hy (mm)
25 / 77	0.997	7.90	50.0	50.0	50.0
30 / 86	0.996	7.88	50.0	49.1	50.0
40 / 104	0.992	7.84	50.0	46.6	50.0
50 / 122	0.988	7.80	50.0	44.2	50.0
60 / 140	0.983	7.76	50.0	42.0	50.2
70 / 158	0.978	7.72	50.0	42.0	52.5
80 / 176	0.972	7.68	50.0	42.0	55.6
90 / 194	0.965	7.64	50.0	42.0	59.0
100 / 212	0.958	7.60	50.0	42.0	62.5
110 / 230	0.951	7.56	50.0	42.0	66.0
120 / 248	0.943	7.52	50.0	42.0	69.9
130 / 266	0.935	7.48	50.0	42.0	73.9
140 / 284	0.926	7.44	50.0	42.0	73.9
150 / 302	0.917	7.40	50.0	42.0	82.7

Mechanical construction

Design, dimensions

Standard dimensions of parts are used for the installation conditions. Contact your nearest Endress +Hauser sales office or distributor for more details.

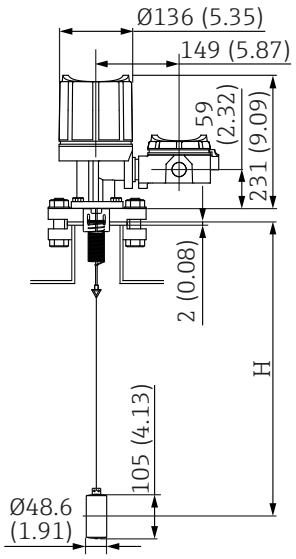
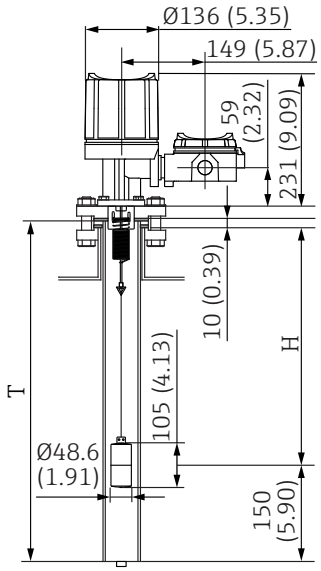
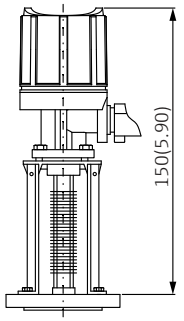
For parts names, refer to → 🖹 6

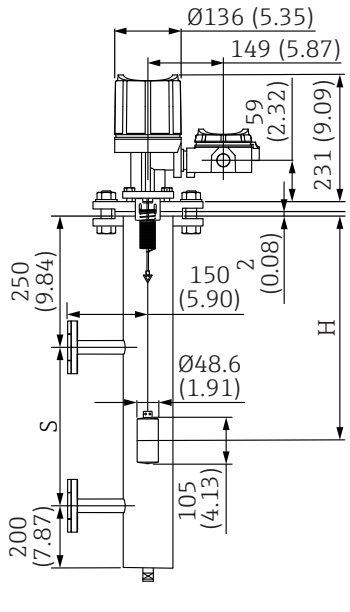
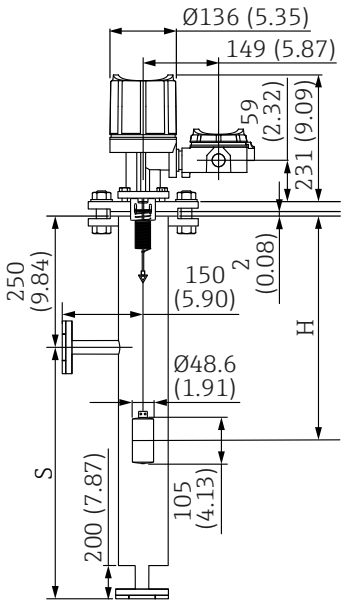
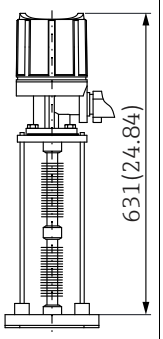
1-point switch position

Description of symbols

The specific position, spacing, and length will vary based on the customer's specifications.

- H: Alarm position
- S: Nozzle spacing
- T: Pipe length

Without guide pipe	Internal guide pipe type: Tank top mounting	Radiation fins
MPC - 20 xxE	MPC-21 xxE	Single fins
		

External guide pipe type: Side-side mounting	External guide pipe type: Side-bottom mounting	Radiation fins
MPC - 22 xxE	MPC-23 xxE	Double fins
		

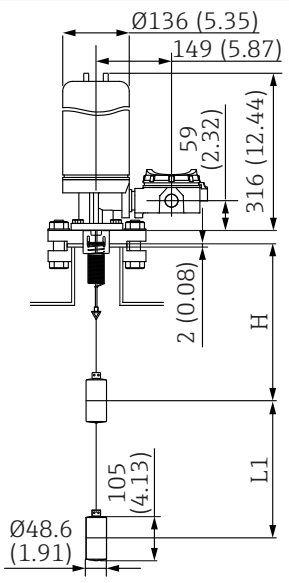
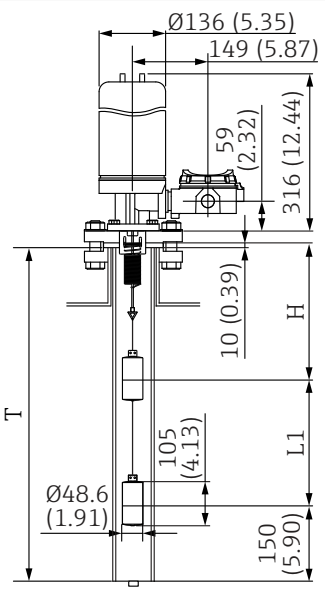
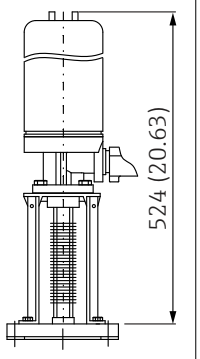
The size of a nozzle flange for an external guide pipe type is 25A/1".

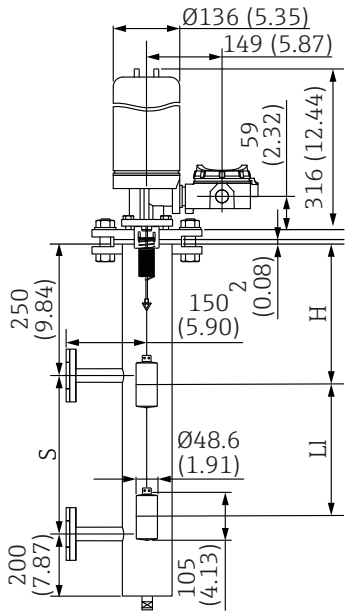
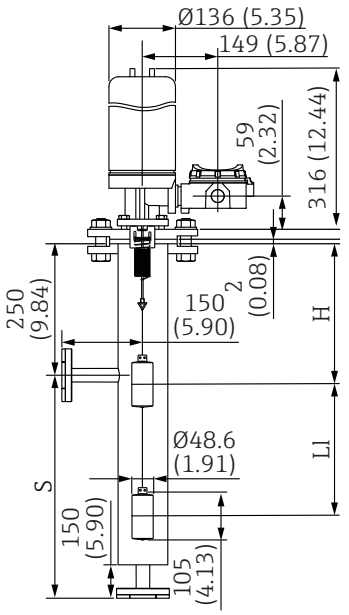
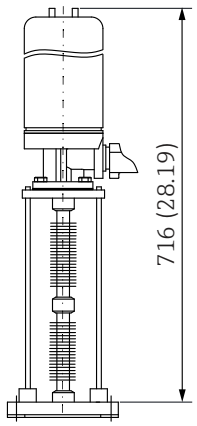
2-point switch position

Description of symbols

The specific position, spacing, and length will vary based on the customer's specifications.

- H: Alarm position
- L1: Alarm spacing
- S: Nozzle spacing
- T: Pipe length

Without guide pipe	Internal guide pipe type: Tank top mounting	Radiation fins
MPC - 20 xxE	MPC-21 xxE	Single fins
		

External guide pipe type: Side-side mounting	External guide pipe type: Side-bottom mounting	Radiation fins
MPC - 22 xxE	MPC-23 xxE	Double fins
		

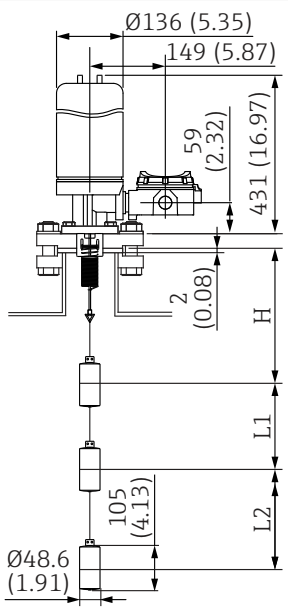
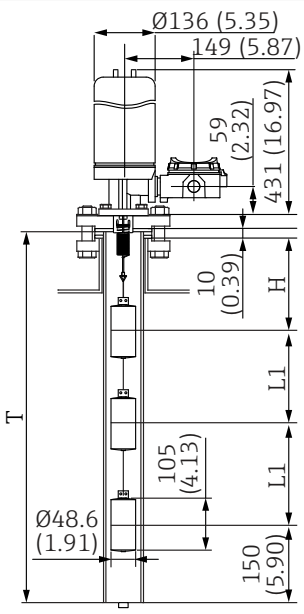
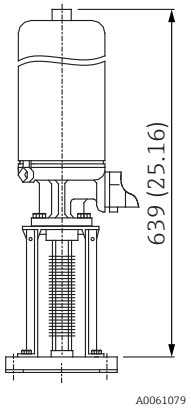
The size of a nozzle flange for an external guide pipe type is 25A/1".

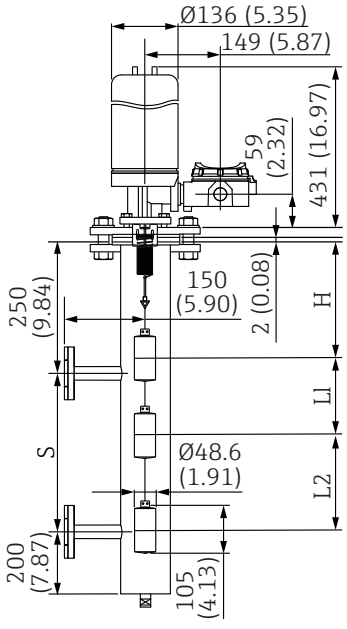
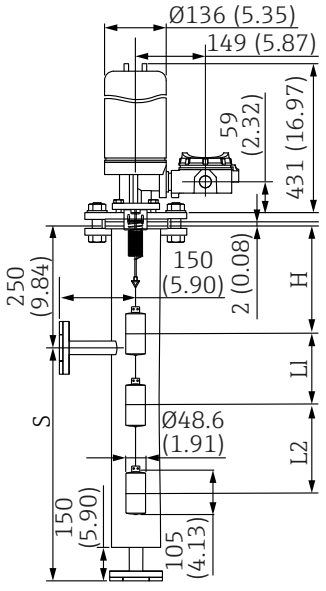
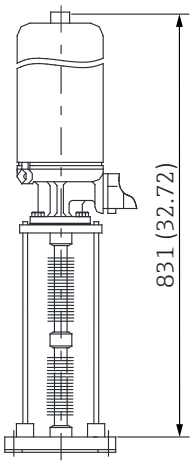
3-point switch position

Description of symbols

The specific position, spacing, and length will vary based on the customer's specifications.

- H: Alarm position
- L1: Alarm spacing
- S: Nozzle spacing
- T: Pipe length

Without guide pipe	Internal guide pipe type: Tank top mounting	Radiation fins
MPC - 20 xxE	MPC-21 xxE	Single fins
		

External guide pipe type: Side-side mounting	External guide pipe type: Side-bottom mounting	Radiation fins
MPC - 22 xxE	MPC-23 xxE	Double fins
		

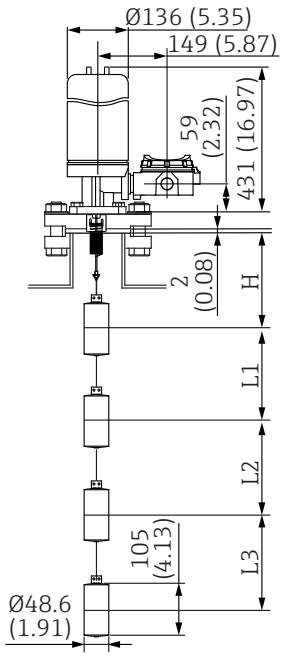
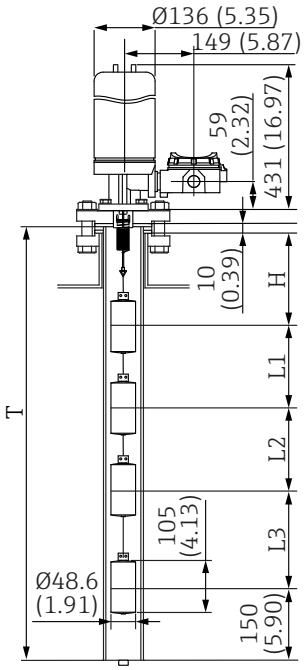
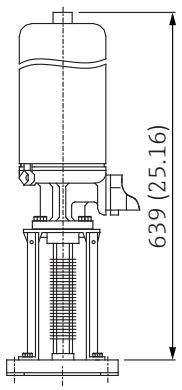
The size of a nozzle flange for an external guide pipe type is 25A/1".

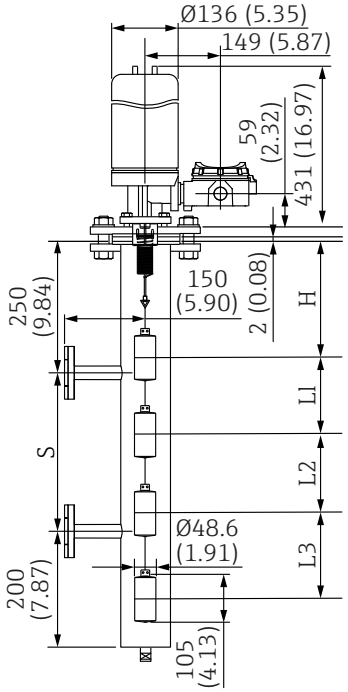
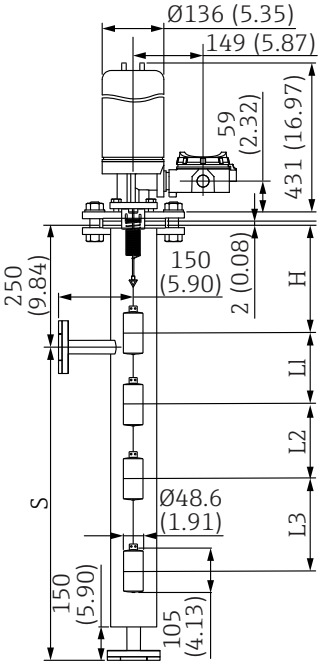
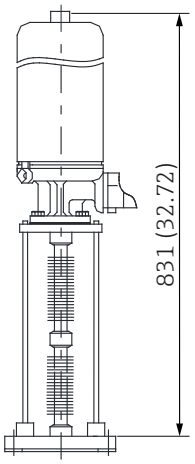
4-point switch position

Description of symbols

The specific position, spacing, and length will vary based on the customer's specifications.

- H: Alarm position
- L1: Alarm spacing
- S: Nozzle spacing
- T: Pipe length

Without guide pipe	Internal guide pipe type: Tank top mounting	Radiation fins
MPC - 20 xxE	MPC-21 xxE	Single fins
		

External guide pipe type: Side-side mounting	External guide pipe type: Side-bottom mounting	Radiation fins
MPC - 22 xxE	MPC-23 xxE	Double fins
		

The size of a nozzle flange for an external guide pipe type is 25A/1".

Certificates and approvals

Ex-approval	Ex d TIIS d2G4
Protection class	IP65

Ordering information

Detailed ordering information is available from the following sources:

- Product configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select country -> Click "Products" -> Use the filters and search field to select a product -> Display the product page -> Click the "Device specifications selection" button on the right side of the product image to display the product configurator.
- For your nearest Endress+Hauser sales office or distributor: 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 information specific to the measuring point, such as the 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
- Ability to order directly in the Endress+Hauser Online Shop



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