

# Safety Instructions

## Proline t-mass 500

KCs: Zone 0/1  
Zone 21





# Proline t-mass 500

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## About this document



The document number of these Safety Instructions (XA) must match the information on the nameplate.

## Associated documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:

- *Device Viewer* ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)): Enter serial number from nameplate.
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

To commission the device, please observe the Operating Instructions pertaining to the device:

Measuring device	Documentation code	
	HART	Modbus RS485
t-mass F 500	BA01996D	BA01998D
t-mass I 500	BA01997D	BA01999D

### Additional documentation

Contents	Document type	Documentation code
Explosion Protection	Brochure	CP00021Z/11

Please note the documentation associated with the device.

## Certificates and declarations

### KCs certificate of conformity

Certificate number:

- 21-KA4BO-0569X (KN: Ex ec nC [ia Ga] IIC T5...T4 Gc)
- 23-KA4BO-0742X (KN: [Ex ia] IIIC)
- 21-KA4BO-0570X (KN: Ex db ia IIC T4...T1 Ga/Gb)
- 21-KA4BO-0571X (KN: Ex ia tb IIIC T\*\*°C Db)
- 23-KA4BO-0743X (KN: Ex ec nC [ia Ga] IIC T5...T4 Gc)
- 23-KA4BO-0744X (KN: [Ex ia] IIIC)
- 23-KA4BO-0745X (KN: Ex db ia IIC T4...T1 Ga/Gb)
- 23-KA4BO-0746X (KN: Ex ia tb IIIC T\*\*°C Db)

Affixing the certificate number certifies conformity with Protection device Safety Certification Notification No. 2021-22.

**Manufacturer address**

Endress+Hauser Flowtec AG  
 Kägenstrasse 7  
 4153 Reinach BL  
 Switzerland

Endress+Hauser Flowtec (China) Co. Ltd.  
 Su-Hong-Zhong-Lu No. 465  
 Suzhou Industrial Park  
 215021 Suzhou  
 Province Jiangsu  
 China

**Extended order code**

The extended order code is indicated on the nameplate, which is affixed to the device in such a way that it is clearly visible. Additional information about the nameplate is provided in the associated Operating Instructions.

**Structure of the extended order code**

* * * * *	_	* * * * * ... * * * * *	+	A*B*C*D*E*F*G*...
<i>(Device type)</i>		<i>(Basic specifications)</i>		<i>(Optional specifications)</i>

\* = Placeholder  
 At this position, an option (number or letter) selected from the specification is displayed instead of the placeholders.

*Device type*

The device and the device design is defined in the "Device type" section (Product root).

*Basic specifications*

The features that are absolutely essential for the device (mandatory features) are specified in the basic specifications. The number of positions depends on the number of features available. The selected option of a feature can consist of several positions.

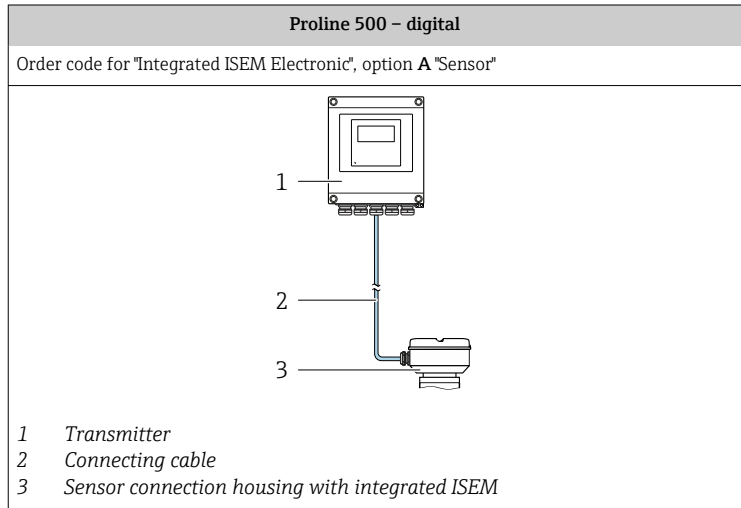
*Optional specifications*

The optional specifications describe additional features for the device (optional features). The number of positions depends on the number of features available. The features have a 2-digit structure to aid identification (e.g. JA). The first digit (ID) stands for the feature group and consists of a number or a letter (e.g. J = Test, Certificate). The second digit constitutes the value that stands for the feature within the group (e.g. A = 3.1 material (wetted parts), inspection certificate).

More detailed information about the device is provided in the following tables. These tables describe the individual positions and IDs in the extended order code which are relevant to hazardous locations.

**Device type**

Position	Order code for	Option selected	Description
1	Instrument family	6	Thermal mass flowmeter
2	Sensor	F, I	Sensor type
3	Transmitter	5	Transmitter type: 4-wire, remote version
4	Generation index	B	Platform generation
5, 6	Nominal diameter	<ul style="list-style-type: none"> <li>■ t-mass F: DN 15 to 100</li> <li>■ t-mass I: Insertion length 235 to 608 mm</li> </ul>	Nominal diameter of sensor



**Basic specifications**

Position 1, 2 Order code for "Approval" Option selected	Position 10 Order code for "Integrated ISEM electronics" Option selected	Type of protection	
		Transmitter	Sensor
KN	A	Ex ec nC [ia Ga] IIC T5...T4 Gc [Ex ia] IIIC	Ex db ia IIC T4...T1 Ga/Gb Ex tb IIIC T**°C Db

Position	Order code for	Option selected	Description
4, 5	Output, input 1	BA	4-20mA HART
		MA	Modbus RS485
6	Output, input 2	A	W/o
		B	4-20mA
		D	Configurable I/O initial setting off
		E	Pulse/frequency/switch output
		H	Relay
		I	4-20mA input
		J	Status input
7	Output, input 3	A	W/o
		B	4-20mA
		D	Configurable I/O initial setting off
		E	Pulse/frequency/switch output
		H	Relay
		I	4-20mA input
		J	Status input
8	Output; input 4	A	W/o
		B	4-20mA
		D	Configurable I/O initial setting off
		E	Pulse/frequency/switch output
		H	Relay
		I	4-20mA input
		J	Status input
9	Display; Operation	F	4-line, illuminated; touch control
		G	4-line, illuminated; touch control + WLAN
10	Integrated ISEM Electronic	A	Sensor
11	Transmitter Housing	A	Alu, coated
12	Sensor junction Housing	A	Alu, coated
		L	Cast, stainless
20, 21	Device Model	A2	2

## Optional specifications

ID	Order code for	Option selected	Description
Jx	Test, certificate	JP	Ambient temperature measuring device -50 °C
Px	Enclosed accessories	P8	Wireless antenna, wide area (external WLAN antenna) <sup>1)</sup>

1) The external WLAN antenna is available with the order code for "Accessory Enclosed", option P8.

### Safety instructions: General

- Staff must meet the following conditions for mounting, electrical installation, commissioning and maintenance of the device:
  - Be suitably qualified for their role and the tasks they perform
  - Be trained in explosion protection
  - Be familiar with national regulations or guidelines (e.g. KS C IEC 60079-14)
- Install the device according to the manufacturer's instructions and national regulations.
- Do not operate the device outside the specified electrical, thermal and mechanical parameters.
- Only use the device in media to which the wetted materials have sufficient durability.
- Refer to the temperature tables for the relationship between the permitted ambient temperature for the sensor and/or transmitter, depending on the range of application, and the temperature classes.
- Alterations to the device can affect the explosion protection and must be carried out by staff authorized to perform such work by Endress+Hauser.
- When using in hybrid mixtures (gas and dust occurring simultaneously), observe additional measures for explosion protection.
- For measuring device with digital signal transmission, order code for "Integrated ISEM electronics", Option A "Sensor" open the housing cover of the **sensor connection housing** in explosion protection Ex db only if one of the following conditions is met:
  - An explosive atmosphere is not present.
  - A waiting time of 10 minutes is observed after switching off the power supply.

The following warning notice is on the device:  
**WARNING – AFTER DE-ENERGIZING, DELAY 10 MINUTES BEFORE OPENING ENCLOSURE IN TYPE OF PROTECTION EX D**



- In devices with damaged Ex d threads:
  - Use in hazardous areas is not permitted.
  - Repair of Ex d threads is not permitted.
- Observe all the technical data of the device (see nameplate).
- Avoid electrostatic charge (e.g. caused by friction, cleaning, maintenance, strong currents in the medium):  
On the attached stainless steel nameplate and on painted metallic housings that are not integrated into the local potential equalization system.

## Safety instructions: Installation

- Continuous service temperature of the connecting cable:  
-40 to +80 °C (-50 to +60 °C for optional specification, ID Jx (Test, certificate) = JP); but at least according to the operating temperature range of the application plus allowance for process conditions ( $T_{a, \min}$  and  $T_{a, \max} + 20$  K).
- Only use certified cable glands suitable for the application. Observe selection criteria as per KS C IEC 60079-14.
- The following applies when connecting the transmitter with a connection compartment in Ex db:  
Only use separately certified cables and wire entries (Ex db IIC) which are suitable for operating temperatures up to 85 °C and for IP 66/67. If using conduit entries, the associated sealing mechanisms must be mounted directly on the housing.  
Plastic sealing plugs act as transport protection and have to be replaced by suitable, individually approved installation material. The mounted metal thread extensions and blind plugs are tested and certified as part of the housing for type of protection Ex db IIC. The thread extension or the blind plug labeled as follows for identification purposes:
  - Md: M20 x 1.5
  - d: NPT ½"
  - Gd: G ½"
- When the measuring device is connected, attention must be paid to the type of protection at the transmitter.
- In potentially explosive atmospheres:
  - Do not disconnect the electrical connection of the power supply circuit when energized.
  - Do not open the connection compartment cover when the device is energized.
- For measuring devices with order code "Approval", option the transmitter housing (plastic) is allowed to be installed at most in a Pollution Degree 2 environment.

- When connecting through a conduit entry approved for this purpose, mount the associated sealing unit directly at the enclosure.
- Seal unused entry glands with approved sealing plugs that correspond to the type of protection. The plastic transport sealing plug does not meet this requirement and must therefore be replaced during installation.
- Only use certified sealing plugs. The metal sealing plugs supplied meet this requirement.

### Optional external WLAN antenna

- Connect the antenna bushing H337 to the transmitter housing and tighten by hand.
- Use only external antennas supplied by Endress+Hauser.
- Connect antenna or antenna cable with plug-in connector type N (MIL-STD-348) to antenna bushing H337.

### Intrinsic safety

- Observe the guidelines for interconnecting intrinsically safe circuits (e.g. KS C IEC 60079-14 , proof of intrinsic safety).
- When the intrinsically safe Ex ia circuits of the device are connected to certified intrinsically safe circuits of Category Ex ib for Equipment Groups IIC or IIB, the type of protection changes to Ex ib IIC or Ex ib IIB.
- Proline 500 - digital (Order code for "Integrated ISEM electronics", option A)  
The connecting cables between the transmitter and sensor must meet the following requirements:
  - Group IIC:  $L/R \leq 0.0089 \text{ mH}/\Omega$  or  $L_{\text{cable}} \leq 26 \text{ }\mu\text{H}$  and  $C_{\text{cable}} \leq 760 \text{ nF}$
  - Group IIB:  $L/R \leq 0.0356 \text{ mH}/\Omega$  or  $L_{\text{cable}} \leq 104 \text{ }\mu\text{H}$  and  $C_{\text{cable}} \leq 4.2 \text{ }\mu\text{F}$

### Potential equalization

- Integrate the device into the potential equalization .
- If the ground connection has been established via the pipe as specified, it is also possible to integrate the sensor into the potential equalization system via the pipe.
- The antenna bushing H337 of the external antenna must be integrated into the potential equalization system. This is the case if the sensor is connected in accordance with the regulations via the coupling.

## Safety instructions: Zone 0

For sensors with EPL Ga/Gb the zone 0 is permitted in the measuring tube.

**Safety instructions:**  
**Zone 21**

- To ensure dust-tightness, securely seal all housing openings, cable entries and sealing plugs.
- Only open all housing briefly, ensuring that no dust or moisture enters the housing.
- Cable routing shall be arranged so that the cables are not exposed to friction effects and static buildup due to the passage of dust. Precautions shall be taken to prevent the build-up of static on surfaces of cables.

**Temperature tables**

**Ambient temperature**

*Minimum ambient temperature*

- $T_{a, \min} = -40 \text{ °C}$  depending on the device version selected (see nameplate)
- *Optional specification, ID Jx (Test, Certificate) = JP*  
 $T_{a, \min} = -50 \text{ °C}$  depending on the selected device variant (see nameplate)

*Maximum ambient temperature*

$T_{a, \max} = +60 \text{ °C}$  depending on the medium temperature and temperature class.

**Proline 500 – digital transmitter**

*Non-hazardous area*

Transmitter housing material	$T_{a, \max} \text{ [°C]}$			
	Non-hazardous area	T6 [85 °C]	T5 [100 °C]	T4 [135 °C]
Aluminum	60	–	45	60
Polycarbonate	60	–	–	–

**Medium temperature**

*Minimum medium temperature*

$T_{m, \min \text{ range}} = -50 \text{ °C}$

*Maximum medium temperature*

$T_{m, \max}$  for T4...T1 depending on the maximum ambient temperature  $T_{a, \max}$


**Proline 500 - digital**

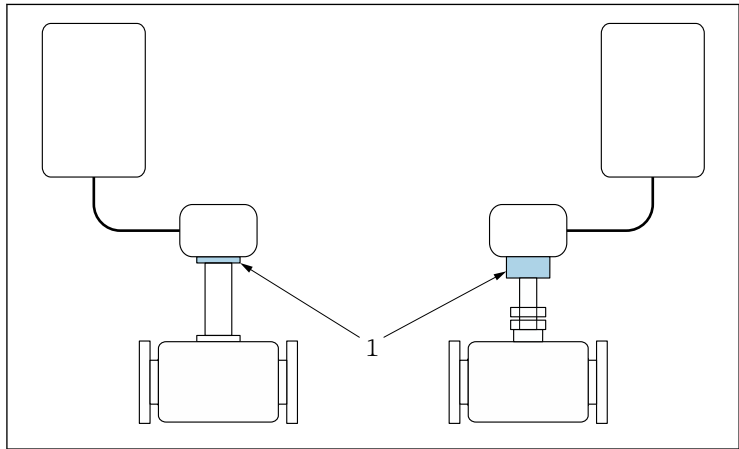
Order code for "Integrated ISEM electronics", option A

*Maximum medium temperature with or without thermal insulation according to Endress+Hauser specifications*


DN	T <sub>m, min range</sub> [°C]	T <sub>m, max range</sub> [°C]	T <sub>a, max</sub> [°C]	T <sub>m, max</sub> [°C]					
				T6 [85 °C]	T5 [100 °C]	T4 [135 °C]	T3 [200 °C]	T2 [300 °C]	T1 [450 °C]
Alle	-50	180	55	-	-	115	155	180	180
			60	-	-	115	130	130	130

*With thermal insulation without Endress+Hauser specifications*

The specified reference temperature T<sub>ref</sub> and the maximum medium temperature T<sub>m, max</sub> for each temperature class must not be exceeded  
 →  12.



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 1 Position of reference point for temperature measurement

1 Reference point (T<sub>ref</sub>)

Reference temperature T<sub>ref</sub>

T6 [80 °C]	T5 [100 °C]	T4 [135 °C]	T3 [200 °C]	T2 [300 °C]	T1 [450 °C]
-	-	76	78	82	82

## Explosion hazards arising from gas and dust

### Determining the temperature class and surface temperature with the temperature table

- In the case of gas: Determine the temperature class as a function of the maximum ambient temperature  $T_{a, \max}$  and the maximum medium temperature  $T_{m, \max}$ .
- In the case of dust: Determine the maximum surface temperature as a function of the maximum ambient temperature  $T_{a, \max}$  and the maximum medium temperature  $T_{m, \max}$ .

#### Example

- Measured maximum ambient temperature:  $T_{a, \max} = 58^\circ\text{C}$
- Measured maximum medium temperature:  $T_{m, \max} = 98^\circ\text{C}$

$T_a$ [°C]	T6 [85 °C]	T5 [100 °C]	T4 [135 °C]	T3 [200 °C]	T2 [300 °C]	T1 [450 °C]
50	-	-	115	150	180	180
55	-	-	115	155	160	160
60	-	-	100	100	100	100

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#### 2 Procedure for determining the temperature class and surface temperature

1. In the column for the maximum ambient temperature  $T_{a, \max}$  select the temperature that is immediately greater than or equal to the maximum ambient temperature  $T_{a, \max}$  that is present.
  - ↳  $T_{a, \max} = 60^\circ\text{C}$ .  
The row showing the maximum medium temperature is determined.
2. Select the maximum medium temperature  $T_{m, \max}$  of this row, which is immediately greater than or equal to the maximum medium temperature  $T_{m, \max}$  that is present.
  - ↳ The column with the temperature class for gas is determined:  
 $98^\circ\text{C} \leq 100^\circ\text{C} \rightarrow \text{T4}$ .
3. The maximum temperature of the temperature class determined corresponds to the maximum surface temperature for dust:  $T_4 = 135^\circ\text{C}$ .

## Connection values: Signal circuits

The following tables contain specifications which are dependent on the transmitter type and its input and output assignment. Compare the following specifications with those on the nameplate of the transmitter.

### Terminal assignment

*Transmitter: supply voltage, input/outputs*

#### HART

Supply voltage		Input/output 1		Input/output 2		Input/output 3		Input/output 4	
1 (+)	2 (-)	26 (+)	27 (-)	24 (+)	25 (-)	22 (+)	23 (-)	20 (+)	21 (-)
Device-specific terminal assignment: adhesive label in terminal cover.									

#### Modbus RS485

Supply voltage		Input/output 1		Input/output 2		Input/output 3		Input/output 4	
1 (+)	2 (-)	26 (B)	27 (A)	24 (+)	25 (-)	22 (+)	23 (-)	20 (+)	21 (-)
Device-specific terminal assignment: adhesive label in terminal cover.									

### Safety-related values

Order code "Output; input 1"	Output type	Safety-related values "Output; input 1"	
		26 (+)	27 (-)
Option BA	Current output 4 to 20 mA HART	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$	
Option MA	Modbus RS485	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$	

Order code "Output; input 2"; "Output; input 3" "Output; input 4"	Output type	Safety-related values					
		Output; input 2		Output; input 3		Output; input 4	
		24 (+)	25 (-)	22 (+)	23 (-)	20 (+)	21 (-)
Option B	Current output 4 to 20 mA	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$					
Option D	User-configurable input/output	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$					
Option E	Pulse/frequency/ switch output	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$					

Order code "Output; input 2"; "Output; input 3" "Output; input 4"	Output type	Safety-related values					
		Output; input 2		Output; input 3		Output; input 4	
		24 (+)	25 (-)	22 (+)	23 (-)	20 (+)	21 (-)
Option H	Relay output	$U_N = 30 V_{DC}$ $I_N = 100 mA_{DC}/500 mA_{AC}$ $U_M = 250 V_{AC}$					
Option I	Current input 4 to 20 mA	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$					
Option J	Status input	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$					



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