

# Safety Instructions

## t-mass 300

EAC: Zone 1  
Zone 21



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# t-mass 300

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**Associated documentation**

- All documentation is available:
- On the CD-ROM supplied (not included in the delivery for all device versions).
  - Available for all device versions via:
    - Internet: [www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)
    - Smart phone/tablet: *Endress+Hauser Operations App*
  - In the Download Area of the Endress+Hauser web site: [www.endress.com](http://www.endress.com) → Download.

This document is an integral part of the following Operating Instructions:

Measuring device	Documentation code	
	HART	Modbus RS485
t-mass F 300	BA01992D	BA01994D
t-mass I 300	BA01993D	BA01995D

*Additional documentation*

Contents	Document type	Documentation code
Remote display and operating module DKX001	Special documentation	SD01763D
	Safety Instructions 1Ex ia IIC T6 Gb, Ex tb IIIC T115 °C Db	XA01664D
Explosion Protection	Brochure	CP00021Z/11

Please note the documentation associated with the device.

**Manufacturer's certificates**

Flowmeters meet the fundamental health and safety requirements for the design and construction of devices and protective systems intended for use in potentially explosive atmospheres in accordance with TR CU 012/2011.

**Certification body**

ООО "НАННО ЦСВЭ"

**Certificate number**

EAЭC RU C-CH.AA87.B.00899/22

Affixing the certificate number certifies conformity with the standards (depending on the device version).

- GOCT 31610.0-2014 (IEC 60079-0:2011)
- GOCT IEC 60079-1-2013
- GOCT 31610.7-2017 (IEC 60079-7:2015)
- GOCT IEC 60079-31-2013

**Manufacturer  
address**

Endress+Hauser Flowtec AG  
Division Reinach  
Kägenstrasse 7  
4153 Reinach BL  
Switzerland

**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*...
(Device type)		(Basic specifications)		(Optional specifications)
* = 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	3	Transmitter type: 4-wire, compact version
4	Generation index	B	Platform generation
5, 6	Nominal diameter	<div><div>■</div>t-mass F: DN 15 to 100</div> <div><div>■</div>t-mass I: Insertion length 235 to 608 mm</div>	Nominal diameter of sensor

Basic specifications

Position 1, 2 Order code for "Approval" Option selected	Position 4, 5 Order code for "Output, input 1" Option selected	Type of protection
GB, BB <sup>1)</sup>	BA, MA	Ga/Gb Ex db eb ia IIC T4...T1 X Ex tb IIIC T** Db X or 1 Ex db eb ia IIC T4...T1 Gb X Ex tb IIIC T** Db X
	CA, CC	Ga/Gb Ex db eb ia [ia Ga] IIC T4...T1 X Ex tb [ia Da] IIIC T** Db X or 1 Ex db eb ia [ia Ga] IIC T4...T1 Gb X Ex tb [ia Da] IIIC T** Db X
GD, BD <sup>2)</sup>	BA, MA	Ga/Gb Ex db ia IIC T4...T1 X Ex tb IIIC T** Db X or 1 Ex db ia IIC T4...T1 Gb X Ex tb IIIC T** Db X
	CA, CC	Ga/Gb Ex db ia [ia Ga] IIC T4...T1 X Ex tb [ia Da] IIIC T** Db X or 1 Ex db ia [ia Ga] IIC T4...T1 Gb X Ex tb [ia Da] IIIC T** Db X

1)

Connection compartment of the transmitter Ex e

2)

Connection compartment of the transmitter Ex d

Position	Order code for	Option selected	Description
4, 5	Output, input 1	BA	4-20mA HART
		CA	4-20mA HART Ex-i passive
		CC	4-20mA HART Ex-i active
		MA	Modbus RS485
6	Output, input 2	A	W/o
		B	4-20mA
		C	4-20mA Ex-i passive
		D	Configurable I/O initial setting off
		E	Pulse/frequency/switch output
		G	Pulse/frequency/switch output Ex-i passive
		H	Relay
		I	4-20mA input
		J	Status input
7	Output, input 3	A	W/o
		B	4-20mA
		C	4-20mA Ex-i passive
		D	Configurable I/O initial setting off
		E	Pulse/frequency/switch output
		G	Pulse/frequency/switch output Ex-i passive
		H	Relay
		I	4-20mA input
		J	Status input
8	Display; Operation	A	W/o; via communication
		F	4-line, illuminated; touch control
		G	4-line, illuminated; touch control + WLAN
		M	W/o; prepared for remote display DKX001 <sup>1)</sup>
		O	Separate, with remote display DKX001 <sup>1)</sup> , 4-line, illuminated; 10 m / 30 ft cable; touch control
9	Housing	A	Alu, coated
17, 18	Device Model	A2	2

1) DKX001 is approved according to EA3C RU C-CH.AA87.B.00849/21.

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. GOCT IEC 60079-14-2013)
- 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.
- Modifications 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.
- Open the housing cover of the transmitter 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
- Devices with damaged Ex d threads may no longer be used in hazardous location. It is not permitted to repair or mend Ex d threads.
- Observe all the technical data of the device (see nameplate).



## Safety instructions: Installation

- Continuous service temperature of the connecting cable:  
–40 to +80 °C (–50 to +60 °C for optional specifications, ID Jx (Test, Certificate) = JP); in accordance with the range of service temperature taking into account additional influences of the process conditions ( $T_{a,min}$  and  $T_{a,max} + 20$  K).
- Only use certified cable entries suitable for the application. Observe selection criteria as per I/OCT IEC 60079-14-2013.
- 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"
- The following applies when connecting the transmitter with a connection compartment in Ex eb:  
Only use separately certified cable and wire entries and sealing plugs (Ex eb IIC) which are suitable for operating temperatures up to 85 °C and for IP 66/67. The cables must be routed such that they are securely seated, and sufficient strain relief must be ensured. The mounted metal thread extensions and blind plugs supplied are tested and certified as part of the housing for type of protection Ex eb IIC. Plastic sealing plugs act as transport protection and have to be replaced by suitable, individually approved installation material. Supplied cable glands are separately certified and marked as components and meet device specification requirements.
- When the measuring device is connected, attention must be paid to explosion protection at the transmitter.
- Turning the transmitter housing
  - Loosen both hexagon socket screws until the transmitter housing can be turned.
  - Turn transmitter housing to desired position (mechanically limited); if necessary turn 270° in other direction.
  - Tighten both hexagon socket screws with a maximum of 7 Nm.
- 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 energized.

- 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.
- Transmitters with Ex db eb approval must not be connected via the service interface (CDI-RJ45)! Order code "Approval; Transmitter + Sensor", options (Ex de):

### Optional external WLAN antenna

- The external WLAN antenna can be used only in conjunction with an Ex eb connection compartment.  
Use with an Ex db connection compartment is not permitted.
- 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. IEC 60079-14:2013, 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.
- The device can be connected to the remote display DKX001 which has Ex ia explosion protection: refer to the Special documentation and Ex documentation.



- When using the remote display and operating module DKX001 the internal display and operating module must be removed.
- When using the separate approved, remote display and operating module DKX001, only use the following variants:  
Basic specification of the remote display and operating module DKX001, order code "Approval", option GE


## Potential equalization

- Integrate the device into the local 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

Install the transmitter electronics in Zone 1. 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.
- Only use certified cable entries. The metal cable entries, extensions and sealing plugs supplied meet this requirement.
- The metal extensions and blind plugs supplied are tested and certified as part of the enclosure for explosion protection Ex tb IIIC. Plastic sealing plugs in extensions act as transport protection and have to be replaced by suitable, individually approved installation material. Supplied cable glands are separately certified and marked as components and meet device specification requirements.
- If the transmitter is connected to the remote display and operating module DKX001, the circuit has Ex ia IIIC explosion protection. Connection values , DKX001 →  15

## Temperature tables

### Ambient temperature

#### *Minimum ambient temperature*

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

#### *Maximum ambient temperature*

$T_a = +60\text{ °C}$  depending on the medium temperature and temperature class.

Medium temperature

Minimum medium temperature

$T_m = -50\text{ }^{\circ}\text{C}$

Maximum medium temperature

$T_m$  for T4...T1 depending on the maximum ambient temperature  $T_a$

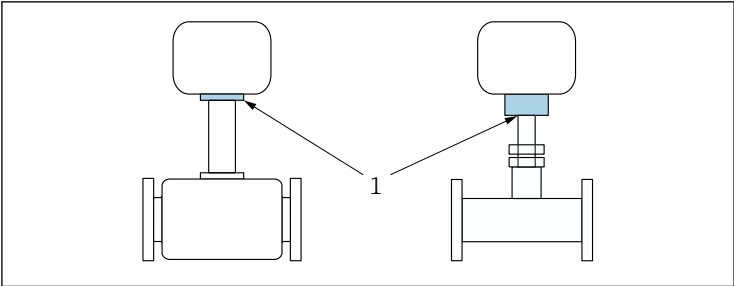
Maximum medium temperature with or without thermal insulation according to Endress+Hauser specifications

DN	$T_{a, \text{max}}$ [ $^{\circ}\text{C}$ ]	$T_{m, \text{min}}$ [ $^{\circ}\text{C}$ ]	$T_{m, \text{max}}$ [ $^{\circ}\text{C}$ ]	$T_m$ [ $^{\circ}\text{C}$ ]					
				T6 [85 $^{\circ}\text{C}$ ]	T5 [100 $^{\circ}\text{C}$ ]	T4 [135 $^{\circ}\text{C}$ ]	T3 [200 $^{\circ}\text{C}$ ]	T2 [300 $^{\circ}\text{C}$ ]	T1 [450 $^{\circ}\text{C}$ ]
All	50	-50	180	–	–	115	150	180	180
	55			–	–	115	155	160 (180) <sup>1)</sup>	160 (180) <sup>1)</sup>
	60			–	–	100 (115) <sup>1)</sup>	100 (130) <sup>1)</sup>	100 (130) <sup>1)</sup>	100 (130) <sup>1)</sup>

1) Values in brackets for applications in which the transmitter is not located above the sensor.

With thermal insulation without Endress+Hauser specifications

The specified reference temperature  $T_{\text{ref}}$  and the maximum medium temperature  $T_{m, \text{max}}$  for each temperature class must not be exceeded  
→ 12.



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1 Position of reference point for temperature measurement

1 Reference point ( $T_{\text{ref}}$ )

Reference temperature  $T_{ref}$ 

T6 [85 °C]	T5 [100 °C]	T4 [135 °C]	T3 [200 °C]	T2 [300 °C]	T1 [450 °C]
–	–	73	76	77	77

Explosion hazards  
arising from gas  
and dustDetermining 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  $T_a$  and the maximum medium temperature  $T_m$ .
- In the case of dust: Determine the maximum surface temperature as a function of the maximum ambient temperature  $T_a$  and the maximum medium temperature  $T_m$ .

## Example

- Measured maximum ambient temperature:  $T_{ma} = 58\text{ °C}$
- Measured maximum medium temperature:  $T_{mm} = 98\text{ °C}$

3.

$T_a$ [°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

1. 2.

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2 Procedure for determining the temperature class and surface temperature

1. In the column for the maximum ambient temperature  $T_a$  select the temperature that is immediately greater than or equal to the maximum ambient temperature  $T_{ma}$  that is present.
  - ↳  $T_a = 60\text{ °C}$ .  
The row showing the maximum medium temperature is determined.
2. Select the maximum medium temperature  $T_m$  of this row, which is immediately greater than or equal to the maximum medium temperature  $T_{mm}$  that is present.
  - ↳ The column with the temperature class for gas is determined:  
 $98\text{ °C} \leq 100\text{ °C} \rightarrow T_4$ .

3. The maximum temperature of the temperature class determined corresponds to the maximum surface temperature for dust:  $T_4 = 135\text{ }^{\circ}\text{C}$ .

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

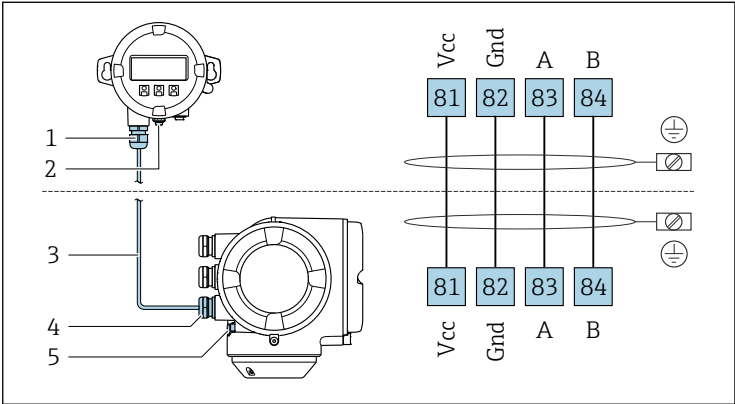
HART

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

Modbus RS485

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

Remote display and operating module DKX001



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- 1 Remote display and operating module DKX001
- 2 Protective earth (PE)
- 3 Connecting cable
- 4 Measuring device
- 5 Protective earth (PE)

## Safety-related values

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

Order code "Output; input 2"; "Output; input 3"	Output type	Safety-related values			
		Output; input 2		Output; input 3	
		24 (+)	25 (-)	22 (+)	23 (-)
Option <b>B</b>	Current output 4 to 20 mA	$U_N = 30 \text{ V}_{DC}$ $U_M = 250 \text{ V}_{AC}$			
Option <b>D</b>	User-configurable input/output	$U_N = 30 \text{ V}_{DC}$ $U_M = 250 \text{ V}_{AC}$			
Option <b>E</b>	Pulse/frequency/ switch output	$U_N = 30 \text{ V}_{DC}$ $U_M = 250 \text{ V}_{AC}$			
Option <b>H</b>	Relay output	$U_N = 30 \text{ V}_{DC}$ $I_N = 100 \text{ mA}_{DC}/500 \text{ mA}_{AC}$ $U_M = 250 \text{ V}_{AC}$			
Option <b>I</b>	Current input 4 to 20 mA	$U_N = 30 \text{ V}_{DC}$ $U_M = 250 \text{ V}_{AC}$			
Option <b>J</b>	Status input	$U_N = 30 \text{ V}_{DC}$ $U_M = 250 \text{ V}_{AC}$			



Intrinsically safe values

Order code for "Output; input 1"	Output type	Intrinsically safe values "Output; input 1"	
		26 (+)	27 (-)
Option CA	Current output 4-20mA HART Ex-i passive	U <sub>i</sub> = 30 V I <sub>i</sub> = 100 mA P <sub>i</sub> = 1.25 W L <sub>i</sub> = 0 µH C <sub>i</sub> = 6 nF	
Option CC	Current output 4-20mA HART Ex-i active	<b>Ex ia</b> U <sub>0</sub> = 21.8 V I <sub>0</sub> = 90 mA P <sub>0</sub> = 491 mW L <sub>0</sub> = 4.1 mH(IIC)/ 15 mH(IIB) C <sub>0</sub> = 160 nF(IIC)/ 1 160 nF(IIB)  U <sub>i</sub> = 30 V I <sub>i</sub> = 10 mA P <sub>i</sub> = 0.3 W L <sub>i</sub> = 4.1 µH C <sub>i</sub> = 6 nF	

Order code for "Output; input 2"; "Output; input 3"	Output type	Intrinsically safe values			
		Output; input 2		Output; input 3	
		24 (+)	25 (-)	22 (+)	23 (-)
Option C	Current output 4 to 20 mA Ex i passive	U <sub>i</sub> = 30 V I <sub>i</sub> = 100 mA P <sub>i</sub> = 1.25 W L <sub>i</sub> = 0 C <sub>i</sub> = 0			
Option G	Pulse/frequency/ switch output Ex i passive	U <sub>i</sub> = 30 V I <sub>i</sub> = 100 mA P <sub>i</sub> = 1.25 W L <sub>i</sub> = 0 C <sub>i</sub> = 0			

Remote display DKX001

Basic specification, position 1, 2 Approval	Terminal assignment	Basic specification, position 8 Display; Operation Option O
Option <sup>1)</sup> GB, GD, BB, BD	81, 82, 83, 84	A connecting cable with the value $L/R \leq 24 \mu H/\Omega$ and $C_{cable} \leq 1\,000\, nF$ must be used for the version for connecting to the remote display DKX001 or ODKX001. The cable supplied meets this requirement.

1) With separate order of DKX001: GE, GF, GG, BE, BF, BG

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

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