Products Solutions

Safety Instructions

Proline t-mass 65

Division I



Safety instructions for electrical apparatus for explosion-hazardous areas according to FACTORY MUTUAL standards $^{\circledR}$ Page 3



Safety instructions for electrical apparatus for explosion-hazardous areas according to CANADIAN STANDARDS ASSOCIATION $^\circledR$ Page 3

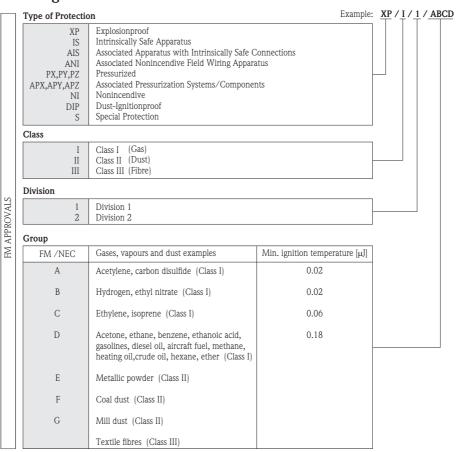


Examples for markings according to FM and CSA:



Temperature Class

sui	Maximum surface temperature				
T1	842 °F	450 °C			
T2	572 °F	300 °C			
T2A	536 °F	280 °C			
T2B	500 °F	260 °C			
T2C	446 °F	230 °C			
T2D	419 °F	215 °C			
Т3	392 °F	200 °C			
T3A	356 °F	180 °C			
ТЗВ	329 °F	165 °C			
T3C	320 °F	160 °C			
T4	275 °F	135 °C			
T4A	248 °F	120 °C			
T5	212 °F	100 °C			
Т6	185 °F	85 °C			





Temperature Class

Maximum						
Sui	surface temperature					
T1	450 °C	842 °F				
T2	300 °C	572 °F				
T2A	280 °C	536 °F				
T2B	260 °C	500 °F				
T2C	230 °C	446 °F				
T2D	215 °C	419 °F				
Т3	200 °C	392 °F				
T3A	180 °C	356 °F				
ТЗВ	165 °C	329 °F				
T3C	160 °C	320 °F				
T4	135 °C	275 °F				
T4A	120 °C	248 °F				
T5	100 °C	212 °F				
T6	85 °C	185 °F				

Class		Example: (Class I, Division 1, Group ABC
	I Class I (Gas) II Class II (Dust) II Class III (Fibre)		
Division			
	1 Division 1 2 Division 2		
Group			
CSA / CSC	Gases, vapours and dust examples	Min. ignition temperature [μJ]	
A	Acetylene, carbon disulfide (Class I)	0.02	
В	Hydrogen, ethyl nitrate (Class I)	0.02	
С	Ethylene, isoprene (Class I)	0.06	
D	Acetone, ethane, benzene (Class I)	0.18	
Е	Metallic powder (Class II)		
F	Coal dust (Class II)		
G	Mill dust (Class II)		
	Textile fibres (Class III)		
Type of Prote	ction		
Explosionpro Intrinsically S Associated Ap Associated No Pressurized	of afe Apparatus oparatus with Intrinsically Safe Connections onincendive Field Wiring Apparatus essurization Systems/Components oparatus		

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Safety Instructions

Proline t-mass 65

Division 1



Ex documentation

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

- BA00111D, Proline t-mass 65 HART
- BA00113D, Proline t-mass 65 PROFIBUS DP/PA
- BA00115D, Proline t-mass 65 Modbus RS485
- BA00135D, Proline t-mass 65 FOUNDATION Fieldbus

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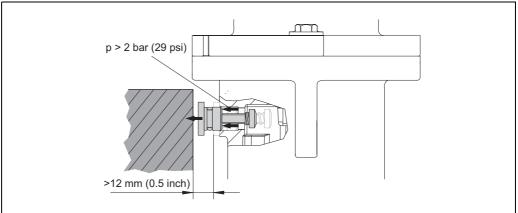
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Special conditions

- Install per National Electrical Code ANSI/NFPA 70.
- Control room equipment shall not use or generate more than 250 V rms.
- The device must be integrated into the potential equalization system.
- For terminals No. 20 to No. 27 of the transmitter, only devices with ratings U_m £ 250 V and I_m £ 500 mA are allowed to be connected (does not apply to intrinsically safe circuits).
- The specified temperature class in conjunction with the ambient temperature and the fluid temperature must be in compliance with the tables on Page 7.
- It is not permissible to connect into the service adapter whilst the atmosphere is considered to be explosive.
- Use of the devices is restricted to fluids against which the process-wetted materials are adequately resistant.
- Transmitter enclosure GO2 is factory sealed for use in Class I, Div. 1, Groups A, B, C, D.
- t-mass 65F, 65I are dual Seal Devices according to ANSI/ISA 12.27.01-2003.

Caution!

- Use supply wires suitable for 9 °F above ambient temperature, but at least for 176 °F.
- The devices are equiped with a pressure relief device. For the case of failure, make sure that the
 pressure relief device is not hindered mechanically from working and that the relief device is not
 directed as such to cause damage. See below diagram.



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General warnings

- Installation, connection to the electricity supply, commissioning and maintenance of the devices must be carried out by qualified specialists trained to work on Ex-rated devices.
- Compliance with national regulations relating to the installation of devices in potentially explosive atmospheres is mandatory, if such regulations exist.
- Open the device only when it is de-energized (and after a delay of at least 10 minutes following shutdown of the power supply).
- The housing of the Ex-rated transmitter can be turned in 90° steps. Whereas the non-Ex version has a bayonet adapter, however, the Ex version has a thread. Recesses for centering the worm screw are provided to prevent inadvertent movement of the transmitter housing.
- It is permissible to turn the transmitter housing through a maximum of 180° during operation (in either direction), without compromising explosion protection. After turning the housing the worm screw must be tightened again.
- The screw cap has to be removed before the local display can be turned, and this must be done with the device de-energized (and after a delay of at least 10 minutes following shutdown of the power supply) or while the area is known to be non-hazardous.

Approvals

General

The system meets 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 the Canadian Electrical Code.

No. / approval Type

J.I. 3024788

Notified body

FM Approvals

Identification

The identification of the system contains the following specifications:

- XP-IS-DIP / I, II, III / 1 / ABCDEFG / T4-T1
- XP-IS / I / 1 / IIC / T4-T1

Description of measuring system

The measuring system consists of transmitters and sensors.

Two versions are available:

- Compact version: transmitters and sensors form a mechanical unit.
- Remote version: transmitters and sensors are separated by open ground when installed and connected to each other via a connecting cable.

Nameplates

The nameplates, which are mounted in a clearly visible position on the transmitter and sensor, contain all of the relevant information about the measuring system.

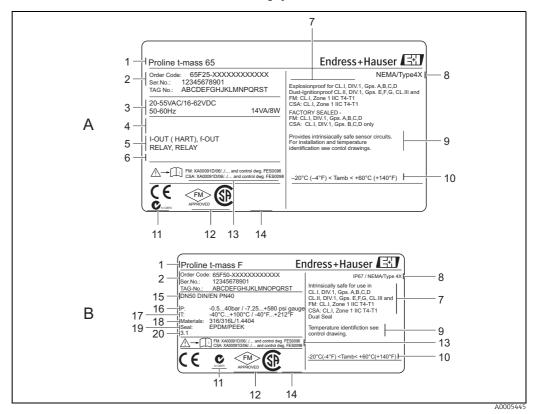
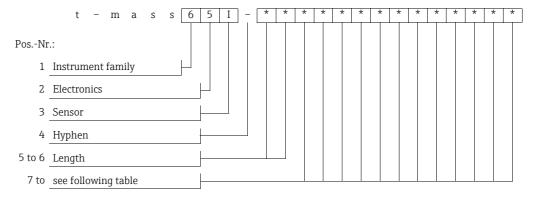


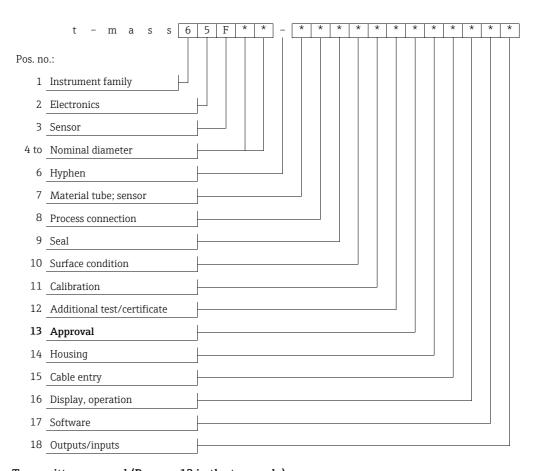
Fig. 1: Example for nameplates of a transmitter and of a sensor

- A Transmitter nameplate
- B Sensor nameplate
- 1 Transmitter or sensor type
- 2 Order code and serial number
- 3 Power supply, frequency and power consumption
- 4 Additional specifications (only if present)
- 5 Available inputs/outputs
- 6 Space for additional information on special products
- 7 Identification of the type of protection, explosion group, temperature class, Ingress protection
- 8 Type of housing protection
- 9 Space for notes, e.g. delays, etc. (only if necessary)
- 10 Ambient temperature range
- 11 C-Tick symbol
- 12 Label of notified body: FACTORY MUTUAL standard
- $13 \ \ Associated \ Ex \ documentation \ for \ explosion \ protected \ devices$
- 14 Space for other approval specifications and certificates, e.g. PROFIBUS, etc. (only if present)
- 15 Nominal diameter/nominal pressure
- 16 Fluid pressure range
- 17 Fluid temperature range
- 18 Material tube/sensor
- 19 Seal material
- 20 Additional information, e.g. 3.1 = 3.1 certificate for wetted materials

Type code

The type code describes the exact design and the equipment of the measuring system. It can be read on the nameplate of the transmitter and sensor and is structured as follows:





Transmitter approval (Pos. no. 13 in the type code)

	*	Approval
Ī	N	XP-IS-DIP / I, II, III / 1 / ABCDEFG / T4-T1
		XP-IS / I / 1 / IIC / T4-T1

Temperature table compact version

Max. fluid temperature $[^{\circ}F]$ for T4-T1 in relation to the ambient temperature T_a

	T _a	T4 (275 °F)	T3 (392 °F)	T2 (572 °F)	T1 (842 °F)
t-mass 65F**-*******	+140 °F	176	176	176	176

	T _a	T4 (275 °F)	T3 (392 °F)	T2 (572 °F)	T1 (842 °F)
t-mass 65I-*********	+140 °F	176	176	176	176

Seal and transmitter in relation to the fluid temperature T_{med}

t-mass 65F**-**2******* t-mass 65F**-**3******	−4 °F to +212 °F
t-mass 65F**-**4******	-40 °F to +212 °F

	t-mass 65I-***3******	−4 °F to +266 °F
t-mass 651		−31 °F to +266 °F
	t-mass 65I-***0****** t-mass 65I-***4******	-40 °F to +266 °F

The minimum permitted ambient temperature is -4 °F.

A version for a minimum permitted ambient temperature to $-40\,^{\circ}\text{F}$ is optionally available.

Temperature table remote version

Sensor

Max. fluid temperature [$^{\circ}$ F] for T4-T1 in relation to the maximum ambient temperature T_a

	T _a	T4 (275 °F)	T3 (392 °F)	T2 (572 °F)	T1 (842 °F)
t-mass 65F**-*******	+140 °F	176	176	176	176

	T _a	T4 (275 °F)	T3 (392 °F)	T2 (572 °F)	T1 (842 °F)
t-mass 65I-*********	+140 °F	176	176	176	176

Seal and transmitter in relation to the fluid temperature T_{med}

t-mass 65F**-**2******* t-mass 65F**-**3******	−4 °F to +212 °F
t-mass 65F**-**4******	−40 °F to +212 °F

	t-mass 65I-***3******	-4 °F to +266 °F			
t-mass 65I	t-mass 65I-***1******	−31 °F to +266 °F			
	t-mass 65I-***4****** t-mass 65I-***4******	-40 °F to +266 °F			

The minimum permitted ambient temperature is -4 °F.

A version for a minimum permitted ambient temperature to -40 °F is optionally available.

Transmitter

The transmitter of the remote version has the temperature class T6 up to an ambient temperature of $+140\,^{\circ}\text{F}$.

The maximum ambient temperature range is -4 to +140 °F.

A version for ambient temperatures to -40 °F is optionally available.

Design of measuring system

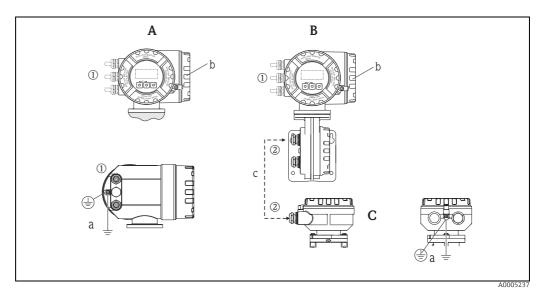


Fig. 2: Design of the measuring system, compact/remote version

- A Transmitter housing (compact version)
- B Transmitter housing on connection housing, remote version
- C Sensor, connection housing, remote version
- a Screw terminal for connecting to the potential equalization
- b Connection compartment cover
- c Remote version connecting cable
- 1 and 2 see following chapter "Cable entries"

Note

For connecting the remote version connecting cable ® Page 9

Cable entries

• ① Cable entries for transmitter terminal compartment (XP version) power supply/communication cable.

Choice of thread for cable entry: 1/2" NPT.

Make sure that the XP cable glands/entries are secured to prevent working loose.

 ② Cable entries for the transmitter terminal compartment (remote version) sensor cable connection:

Choice of thread for cable entry, ½" NPT.

Cable specification

You can find information about the cable specification in the associated Operating Instructions. Additionaly:

- \blacksquare Total inductance L_{cable} £ 0.09 mH
- \blacksquare Total capacitance $C_{\text{cable}} \ \mbox{\pounds} \ \mbox{0.1 } \mu F$
- Test voltage ³ 500V
- Maximum cable length £ 328ft. (100 m)

Potential equalization

- The transmitter (compact and remote version) must be safely integrated into the potential
 equalization via the screw terminal on the outside of the transmitter housing. Alternatively, the
 transmitter of the compact version can be integrated into the potential equalization via the pipeline
 as long as the pipeline provides a ground connection conforming to regulations.
- When using the remote version, the connection housing of the sensor must be grounded via the external screw terminal. Alternatively, the sensor can be integrated into the potential equalization via the pipeline as long as the pipeline provides a ground connection conforming to regulations.

Note!

Further information about potential equalization, screening and grounding can be found in the associated Operating Instructions.

Potential equalization for fieldbus versions, when both sides of the screen are grounded

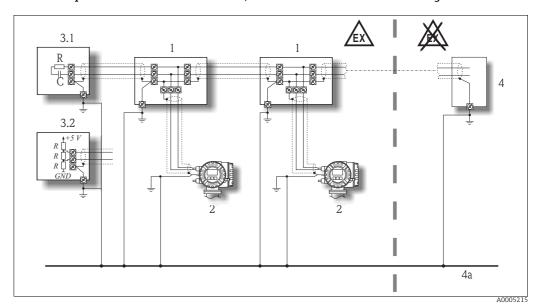


Fig. 3: Example for connecting potential equalization lines

- 1 Distributor/T-Box
- 2 Bus devices for potentially explosive atmospheres
- 3.1 Bus termination PROFIBUS PA or FOUNDATION Fieldbus
- 3.2 Bus termination PROFIBUS DP or MODBUS RS485
- 4 Bus power supply unit or automation system
- 4a Potential equalization line is fed out into the safe area

Note!

The length of the spurs is to be considered.

Connection of remote version connecting cable

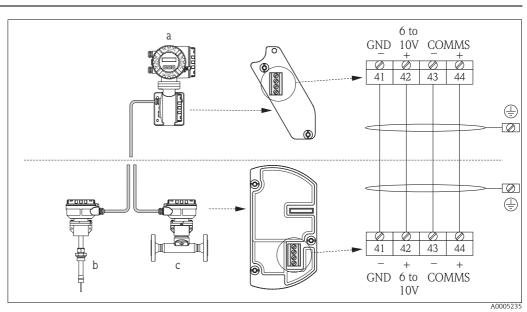


Fig. 4: Connection of remote version connecting cable

- a Field housing: Zone 1
- b Remote version insertion version
- c Remote version flange version

Wire colors (color code according to DIN 47100) ® terminal number: 41 = white, 42 = brown, 43 = green, 44 = yellow

Terminal assignment and connection data

The remote version connection between the sensor and the transmitter is carried out with explosion protection $EEx\ i.$

The maximum cable length is 328ft. (100 m).

Electrical connection

Connection compartment

Transmitter housing compact/remote version (terminal assignment, connection data Æ Page 10 ff.)

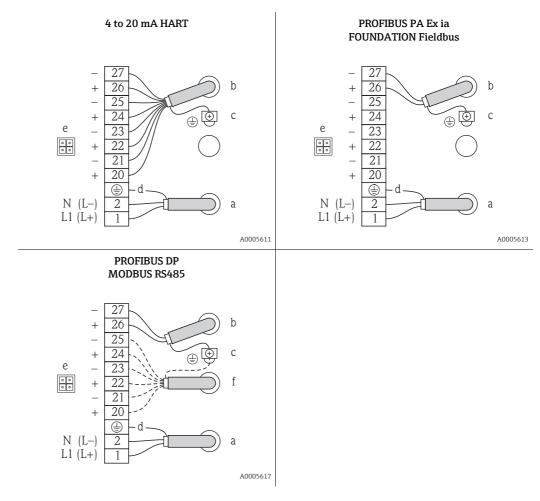


Fig. 5: Electrical connections

- a Power supply cable (terminal assignment, connection data $ilde{A}$ Page 10)
- b Signal cable/fieldbus cable (terminal assignment, connection data Æ Page 11 ff.)
- c Ground terminal for signal cable shield / fieldbus cable / RS485 line
- d Ground terminal for protective ground
- e Service adapter for connecting service interface FXA 193 (Fieldcheck, FieldCare)
- f Further connections:
 - PROFIBUS DP : Cable for external termination, optional (terminal assignment, connection data $\emph{\textit{XE}}$ Page 14)
 - PROFIBUS DP / MODBUS RS485 : Signal cable (terminal assignment, connection data Æ Page 14)

Terminal assignment and connection data, power supply

Terminal assignment and connection data

all transmitters	L1 (L+) 1	N (L-) 2	
Designation	Supply (as per n	Protective earth	
Functional values	AC: U = 85 to 0 AC: U = 20 to DC: U = 16	Caution! Observe the grounding scheme of the installation (plant)!	
Intrinsically safe circuit	r	10	
U _m	260		

Terminal assignment and connection data for signal circuits (intrinsically safe circuits)

Note!

The following tables contain values/specifications, which are dependent on the type code (type of measuring device). Please compare the following type code to the one shown on the nameplate of your measuring device. A graphic representation of the electrical connections can be found on Page 10.

Terminal assignment of transmitter 65F**-*...*F, 65I-*...*F

T	Terminal no. (inputs/outputs)											
Transmitter	20 (+)	21 (-)	22 (+)	23 (-)	24 (+)	25 (-)	26 (+)	27 (-)				
Assignment							PROI	FIBUS PA				
	-	_	•	_	-	-	PA+	PA -				
Electric circuit	_			-	-	-	intrins	sically safe				
Safety-related values	_		-		-		$\begin{aligned} &U_i \\ &I_i \\ &P_i \\ &L_i \\ &C_i \\ &\text{FISCO} \end{aligned}$	30 V DC 600 mA 8.5 W £ 10 mH £ 5 nF Field device				
Functional values		-		-	<u>-</u>	-	galvanically U_{Bus} I_{Bus} IEC 61158-2	9 to 32 V DC 11 mA				

Terminal assignment of transmitter 65F**-*...*G, 65I-*...*G

	Terminal no. (inputs/outputs)								
Transmitter	20 (+)	21 (-)	22 (+)	23 (-)	24 (+)	25 (-)	26 (+)	27 (-)	
Assignment							FOUNDA	TION Fieldbus	
		-		_		-	FF +	FF -	
Electric circuit				-	intrin	intrinsically safe			
Safety-related values		_		-	-		U _i I _i P _i L _i C _i FISCO	30 V DC 600 mA 8.5 W £ 10 mH £ 5 nF Field device	
Functional values	-	-		_		-	galvanically U_{Bus} I_{Bus} IEC 61158-2	9 to 32 V DC 12 mA	

Terminal assignment of transmitter 65F**-*...*R, 65I-*...*R

	Terminal no. (inputs/outputs)									
Transmitter	20 (+)	21 (-)	22 (+)	23 (-)	24 (+)	25 (-)	26 (+)	27 (-)		
Assignment			Current output, active		Current output HART, active					
Electric circuit	-	-	-	intri		sically safe	intrins	sically safe		

				Te	erminal no.	(inputs/output	s)	
Transmitter	20 (+)	21 (-)	22 (+)	23 (-)	24 (+)	25 (-)	26 (+)	27 (-)
Safety-related		-	-	-	U _o	21.8 V DC	U _o	21.8 V DC
values					Io	90 mA	I_o	90 mA
					P_o	490 mW	P_o	490 mW
					Lo	4.1 mH	Lo	4.1 mH
					Co	150 nF	Co	150 nF
					U_{i}	30 V DC 1)	Ui	30 V DC 1)
					I_i	10 mA ¹⁾	I_i	10 mA ¹⁾
					P_{i}	0.3 W ¹⁾	P_{i}	0.3 W ¹⁾
					L _i	0	Li	0
					Ci	6 nF	C_{i}	6 nF
Functional	-	_	-	-	galvanically	isolated,	galvanically i	isolated,
values					active: 0/4 to	o 20 mA	active: 0/4 to	20 mA
					$R_{L} < 400 W$		$R_{L} < 400 W$	
							R _L HART ³ 2 ⁵	50 W
1) The interconnecti	on must	t be asse	ssed acc	ording	to national in	stallation standar	d.	

Terminal assignment of transmitter 65F**-*...*S, 65I-*...*S

Terminal assignment of transmitter our 5, 001 5									
				Τe	erminal no.	(inputs/outpu	ts)		
Transmitter	20 (+)	21 (-)	22 (+)	23 (-)	24 (+)	25 (-)	26 (+)	27 (-)	
Assignment	-	_	-	-		quency output, assive		output HART, active	
Electric circuit		-	-	-	intrin	sically safe	intrin	sically safe	
Safety-related values		-	-	-	U _i I _i P _i L _i IIC C _i IIC	30 V DC 300 mA 600 mW 0 6 nF	$\begin{array}{c} U_{o} \\ I_{o} \\ P_{o} \\ L_{o} \\ C_{o} \\ U_{i} \\ I_{i} \\ P_{i} \\ L_{i} \\ C_{i} \end{array}$	21.8 V DC 90 mA 490 mW 4.1 mH 150 nF 30 V DC ¹⁾ 10 mA ¹⁾ 0.3 W ¹⁾ 0 6 nF	
Functional values		-	-	-	galvanically isolated, passive: 30 V DC / 250 mA Open Collector Full scale frequency 2 to 1000 Hz		galvanically isolated, active: $0/4$ to 20 mA $R_L < 400$ W R_L HART 3 250 W		
1) The interconnection must be assessed according to national installation standard.									

Terminal assignment of transmitter $65F^{**}-^*...^*T$, $65I^{-*}...^*T$

				Τe	erminal no.	(inputs/output	ts)		
Transmitter	20 (+)	21 (-)	22 (+)	23 (-)	24 (+)	25 (-)	26 (+)	27 (-)	
Assignment	-		-	Pulse/frequency output,			output HART, assive		
Electric circuit	-	-	-		intrin	intrinsically safe		intrinsically safe	
Safety-related values	-	-	-	$\begin{array}{cccc} - & U_i & 30 \text{ V DC} \\ I_i & 300 \text{ mA} \\ P_i & 600 \text{ mW} \\ L_i & 0 \\ C_i & 6 \text{ nF} \end{array}$		$ \begin{array}{lll} U_i & 30 \text{ V DC} \\ I_i & 100 \text{ mA} \\ P_i & 1.25 \text{ W} \\ L_i & \text{negligible} \\ C_i & 6 \text{ nF} \end{array} $			
Functional values	-	-	-	-	passive: 30 V DC / 250 mA Open Collector Full scale frequency		$\begin{array}{llllllllllllllllllllllllllllllllllll$		20 mA £ 9 V

Terminal assignment of transmitter $65F^{**}$ -*...*U, 65I-*...*U

		Terminal no. (inputs/outputs)							
Transmitter	20 (+)	21 (-)	22 (+)	23 (-)	24 (+)	25 (-)	26 (+)	27 (-)	
Assignment	-	-	-	-	Current	output passive	Current outp	out HART, passive	
Electric circuit	-	-	_		intrin	intrinsically safe		sically safe	
Safety-related values			$\begin{array}{c} U_i \\ I_i \\ P_i \\ L_i \\ C_i \end{array}$	30 V DC 100 mA 1.25 W negligible 6 nF	$ \begin{array}{llllllllllllllllllllllllllllllllllll$				
Functional values	-	-	-	$\begin{array}{llllllllllllllllllllllllllllllllllll$			20 mA £ 9 V		

Terminal assignment and connection data for signal circuits (non-intrinsically safe circuits)

Note!

The following tables contain values/specifications, which are dependent on the type code (type of measuring device). Please compare the following type code to the one shown on the nameplate of your measuring device. A graphic representation of the electrical connections can be found on Page 10.

Terminal assignment

T			Term	inal no. (i	inputs/out	puts)			
Transmitter	20 (+)	21 (-)	22 (+)	23 (-)	24 (+)	25 (-)	26 (+)	27 (-)	
Fixed communicat	ion boards (p	ermanent a	ssignment)						
65F**-**A 65I-**A	-	_	-	-		Pulse/frequency output		Current output HART	
65***-**B 65I-**B	Relay o	output 2	Relay o	utput 1		requency put		t output ART	
65***-**J					External to	ermination	PROFIB	US DP *	
65I-**J		_	-	-	+5 V	DGND	В	Α	
65***-**K 65I-**K	-	_	-	-		_		DATION dbus	
0J1 K							FF +	FF -	
65***-**Q 65I-**Q	-		-	-		Status input		S RS485* A	
Flexible communic	ation boards						В		
65F**-**C 65I-**C	Relay o	utput 2	Relay output 1 Pulse/frequency output			t output ART			
65F**-**D 65I-**D	Status	sinput	Relay	output	Pulse/frequency output		Current output HART		
65F**-**E 65I-**E	Status	sinput	Relay	output	Current	output 2	Current output 1 HART		
65F**-**L 65I-**L	Status	sinput	Relay o	utput 2	Relay o	output 1		t output ART	
65F**-**2 65I-**2	Relay	output	Current	output 2	2 Pulse/frequency output			output 1 ART	
65F**-**4 65I-**4	Curren	it input	Relay output			equency put		t output ART	
65F**-**5 65I-**5	Status	sinput	Current input		Pulse/frequency output			t output ART	
65F**-**6 65I-**6	Status	sinput	Curren	Current input		Current output 2		Current output HART	
65F**-**8 65I-**8	Status	s input	Pulse/frequency output		Current output 2		Current output HART		

Safety-related and functional values of signal circuits Æ Page 15

^{*} PROFIBUS DP, MODBUS RS485:

⁻ terminal 26 (+) ® B (RxD/TxD-P) - terminal 27 (-) ® A (RxD/TxD-N)

Safety-related and functional values of signal circuits

Signal circuits	Functional values	Safety-related values
Current output HART	galvanically isolated, active/passive can be selected: active: $0/4$ to 20 mA $R_L < 700$ W, R_L HART 3 250 W passive: 4 to 20 mA $V_s = 18$ to 30 V DC, R_i 3 150 W	$\begin{array}{ll} \text{intrinsically safe } = \text{no} \\ U_m & = 250 \text{ V} \\ I_m & = 500 \text{ mA} \end{array}$
Current output	galvanically isolated, active/passive can be selected: active: $0/4$ to 20 mA $R_L < 700$ W passive: 4 to 20 mA $V_s = 18$ to 30 V DC, R_i 3 150 W	
Pulse/frequency output	galvanically isolated, active/passive can be selected: active: 24 V DC / 25 mA (max. 250 mA during 20 ms) R _L > 100 W passive: 30 V DC / 250 mA Open Collector Full scale frequency 2 to 1000 Hz	
Relay output	(f _{max} = 1250 Hz) galvanically isolated, max. 30 V AC / 500 mA max. 42 V DC / 100 mA	
Current input	galvanically isolated, active/passive can be selected: active: 4 to 20 mA, R _i £ 150 W U _{out} = 24 V DC, short-circuit proof passive: 0/4 to 20 mA, R _i £ 150 W U _{max} = 30 V DC	
Status input	galvanically isolated, 3 to 30 V DC R _i = 5 kW	
PROFIBUS DP	galvanically isolated, RS485 as per Standard EIA/TIA-485	
PROFIBUS DP, external termination	galvanically isolated, RS485 as per Standard EIA/TIA-485 Terminal 24: +5 V terminal 25: DGND	
FOUNDATION Fieldbus	galvanically isolated, $U_{Bus} = 9 \text{ to } 32 \text{ V DC}$ $I_{Bus} = 12 \text{ mA}$ IEC 61158-2 (MBP)	
MODBUS RS485	galvanically isolated, RS485 as per Standard EIA/TIA-485	

Service adapter

The service adapter is only used for connecting service interfaces approved by Endress+Hauser.

\triangle Warning!

It is not permissible to connect into the service adapter whilst the atmosphere is considered to be explosive.

Device fuse

Use only fuses of the following types; the fuses are installed on the power supply board:

 Voltage 20 to 55 V AC / 16 to 62 V DC:
 Fuse 2.0 A slow-blow, disconnect capacity 1500 A (Schurter, 0001.2503 or Wickmann, Standard Type 181 2.0 A)

Voltage 85 to 260 V AC:
 Fuse 0.8 A slow-blow, disconnect capacity 1500 A
 (Schurter, 0001.2507 or Wickmann, Standard Type 181 0.8 A)

Technical Data

Dimensions

Please find the differences between the standard version transmitter and the EEx d version in the following diagram. These dimensions are valid both for the compact version and for the remote version. The dimensions of the sensor (B and L) correspond to the standard version. Refer to the following Technical information for these dimensions: t-mass 65F, 65I $^{\circ}$ TI00069D

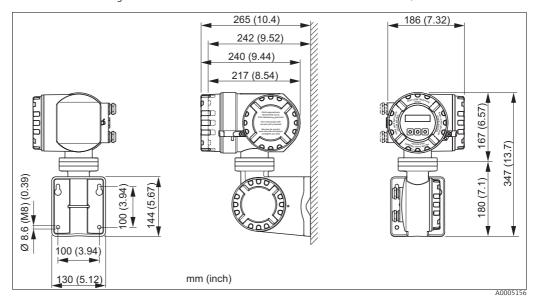


Fig. 6: Dimensions of Ex-remote version

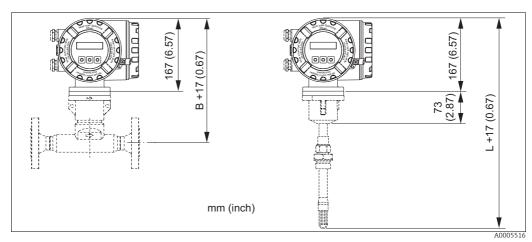


Fig. 7: Dimensions of Ex-compact version

Weight

The weight of the EEx d version weights approx. 4.4 lbs more than the standard version.

Control Drawings

Endress+Hauser Reinach hereby declares that the product is in conformity with the requirements of the FACTORY MUTUAL standard.

Note 🇠

The "Documentation/Important Information" folder provided with the measuring device contains a CD-ROM with all the Control Drawings.

Safety Instructions

Proline t-mass 65

Division 1



© Ex documentation

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

- BA00111D, Proline t-mass 65 HART
- BA00113D, Proline t-mass 65 PROFIBUS DP/PA
- BA00115D, Proline t-mass 65 Modbus RS485
- BA00135D, Proline t-mass 65 FOUNDATION Fieldbus

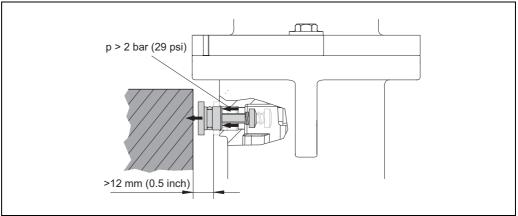
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Special conditions

- Install per Canadian Electrical Code.
- Control room equipment shall not use or generate more than 250 V rms.
- The device must be integrated into the potential equalization system.
- For terminals No. 20 to No. 27 of the transmitter, only devices with ratings $U_m \pounds 250 \text{ V}$ and $I_m \pounds 500 \text{ mA}$ are allowed to be connected (does not apply to intrinsically safe circuits).
- The specified temperature class in conjunction with the ambient temperature and the fluid temperature must be in compliance with the tables on Page 22.
- It is not permissible to connect into the service adapter whilst the atmosphere is considered to be explosive.
- Use of the devices is restricted to fluids against which the process-wetted materials are adequately resistant.
- Transmitter enclosure is factory sealed for use in Class 1Division 1 Groups B, C, D.
- t-mass 65F, 65I are dual seal devices according to ANSI/ISA 12.27.01-2003.
- The devices are equiped with a pressure relief device. For the case of failure, make sure that the
 pressure relief device is not hindered mechanically from working and that the relief device is not
 directed as such to cause damage. See below diagram.



A000565

Caution!

Use supply wires suitable for 5 °C above ambient temperature, but at least for 80 °C.

General warnings

- Installation, connection to the electricity supply, commissioning and maintenance of the devices must be carried out by qualified specialists trained to work on Ex-rated devices.
- Compliance with national regulations relating to the installation of devices in potentially explosive atmospheres is mandatory, if such regulations exist.
- Open the device only when it is de-energized (and after a delay of at least 10 minutes following shutdown of the power supply).
- The housing of the Ex-rated transmitter can be turned in 90° steps. Whereas the non-Ex version has a bayonet adapter, however, the Ex version has a thread. Recesses for centering the worm screw are provided to prevent inadvertent movement of the transmitter housing.
- It is permissible to turn the transmitter housing through a maximum of 180° during operation (in either direction), without compromising explosion protection. After turning the housing the worm screw must be tightened again.
- The screw cap has to be removed before the local display can be turned, and this must be done with the device de-energized (and after a delay of at least 10 minutes following shutdown of the power supply) or while the area is known to be non-hazardous.

Approvals

General

The system meets 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 the Canadian Electrical Code.

Certification number

160686 - 1715837

Inspection body

CSA INTERNATIONAL

Identification

The identification of the system contains the following specifications:

- Class I, Div.1, Groups ABCD
- Class I, Zone 1, Group IIC T4-T1
- Class II, Div.1, Groups EFG
- Class III

Description of measuring system

The measuring system consists of transmitters and sensors.

Two versions are available:

- Compact version: transmitters and sensors form a mechanical unit.
- Remote version: transmitters and sensors are separated by open ground when installed and connected to each other via a connecting cable.

Nameplates

The nameplates, which are mounted in a clearly visible position on the transmitter and sensor, contain all of the relevant information about the measuring system.

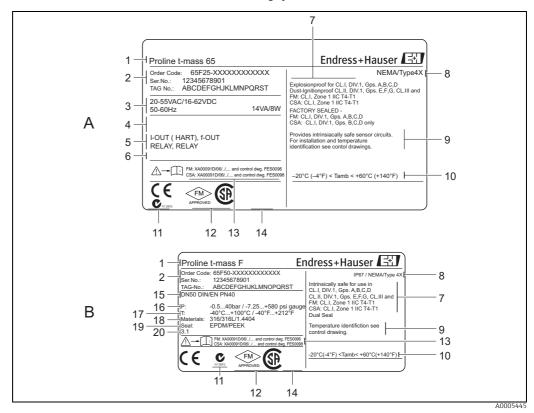
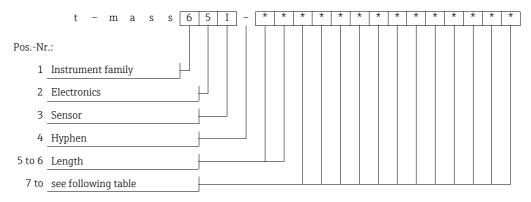


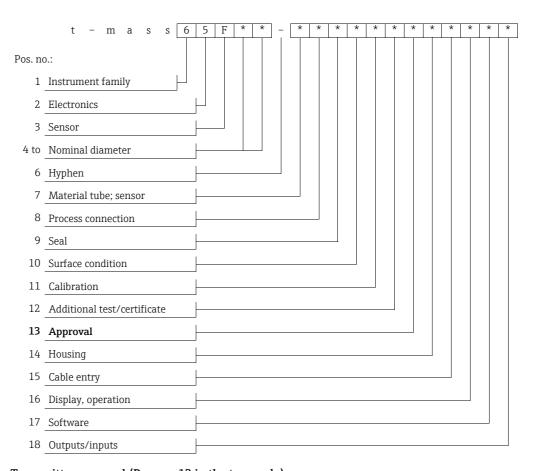
Fig. 1: Example for nameplates of a transmitter and of a sensor

- A Transmitter nameplate
- B Sensor nameplate
- 1 Transmitter or sensor type
- 2 Order code and serial number
- 3 Power supply, frequency and power consumption
- 4 Additional specifications (only if present)
- 5 Available inputs/outputs
- 6 Space for additional information on special products
- 7 Identification of the type of protection, explosion group, temperature class, Ingress protection
- 8 Type of housing protection
- 9 Space for notes, e.g. delays, etc. (only if necessary)
- 10 Ambient temperature range
- 11 C-Tick symbol
- 12 Label of notified body: CANADIAN STANDARDS ASSOCIATION
- 13 Associated Ex documentation
- 14 Space for other approval specifications and certificates, e.g. PROFIBUS, etc. (only if present)
- 15 Nominal diameter/nominal pressure
- 16 Fluid pressure range
- 17 Fluid temperature range
- 18 Material tube/sensor
- 19 Seal material
- 20 Additional information, e.g. 3.1 = 3.1 certificate for wetted materials

Type code

The type code describes the exact design and the equipment of the measuring system. It can be read on the nameplate of the transmitter and sensor and is structured as follows:





Transmitter approval (Pos. no. 13 in the type code)

*	Approval
N	Explosionproof and Dust-Ignitionproof for: Class I, Div.1, Groups ABCD Class I, Zone 1, Group IIC T4-T1 Class II, Div.1, Groups EFG
	Class III Class III

Temperature table compact version

Max. fluid temperature $[^\circ\!C]$ for T4-T1 in relation to the ambient temperature T_a

	T _a	T4 (135 ℃)	T3 (200 °C)	T2 (300 °C)	T1 (450 °C)
t-mass 65F**-*******	+55 ℃	80	80	100	100
t-mass our -	+60 ℃	80	80	80	80

	T _a	T4 (135 °C)	T3 (200 °C)	T2 (300 °C)	T1 (450 °C)
t-mass 65I-*********	+60 ℃	80	80	100	130

Seal and transmitter in relation to the fluid temperature T_{med}

t-mass 65F**-**2******* t-mass 65F**-**3******	−20 °C to +100 °C
t-mass 65F**-**4******	−40 °C to +100 °C

	t-mass 65I-***3******	−20 °C to +130 °C
t-mass 65I	t-mass 65I-***1******	−35 °C to +130 °C
	t-mass 65I-***0******* t-mass 65I-***4******	−40 °C to +130 °C

The minimum permitted ambient temperature is $-20\,^{\circ}$ C.

A version for a minimum permitted ambient temperature to $-40\,^{\circ}\text{C}$ is optionally available.

Temperature table remote version

Sensor

Max. fluid temperature [$^{\circ}$ C] for T4-T1 in relation to the maximum ambient temperature T_a

	T _a	T4 (135 °C)	T3 (200 °C)	T2 (300 °C)	T1 (450 °C)
t-mass 65F**-*******	+55 ℃	80	80	100	100
t mass opr	+60 °C	80	80	80	80

	Ta	T4 (135 °C)	T3 (200 °C)	T2 (300 °C)	T1 (450 °C)
t-mass 65I-*********	+60 °C	80	80	100	130

Seal and transmitter in relation to the fluid temperature T_{med}

t-mass 65F**-**2******* t-mass 65F**-**3******	−20 °C to +100 °C	
t-mass 65F**-**4******	−40 °C to +100 °C	

	t-mass 65I-***3******	−20 °C to +130 °C
t-mass 65I	t-mass 65I-***1******	−35 °C to +130 °C
	t-mass 65I-***0******* t-mass 65I-***4******	−40 °C to +130 °C

The minimum permitted ambient temperature is -20 °C.

A version for a minimum permitted ambient temperature to $-40\,^{\circ}\text{C}$ is optionally available.

Transmitter

The maximum ambient temperature range is -20 to +60 °C.

A version for ambient temperatures to $-40~^{\circ}\text{C}$ is optionally available.

Design of measuring system

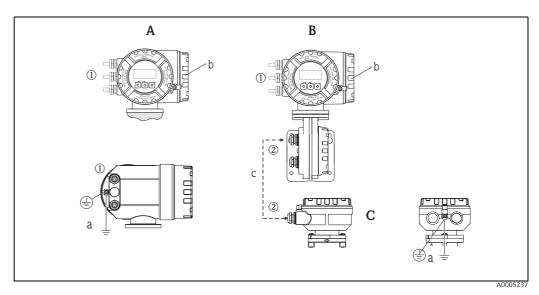


Fig. 2: Design of the measuring system, compact/remote version

- A Transmitter housing (compact version)
- B Transmitter housing on connection housing, remote version
- C Sensor, connection housing, remote version
- a Screw terminal for connecting to the potential equalization
- b Connection compartment cover
- c Remote version connecting cable
- ① and ② see following chapter "Cable entries"

Note

For connecting the remote version connecting cable ® Page 24

Cable entries

 ① Cable entries for transmitter terminal compartment (XP version) power supply/communication cable.

Choice of thread for cable entry: 1/2" NPT.

Make sure that the XP cable glands/entries are secured to prevent working loose and that the seals are installed immediately adjacent to the housing, if required (Class I, Div. 1, Group A).

 ② Cable entries for the transmitter terminal compartment (remote version) sensor cable connection:

Choice of thread for cable entry, ½" NPT.

Cable specification

You can find information about the cable specification in the associated Operating Instructions. Additionally:

- Total inductance L_{cable} £ 0.09 mH
- \blacksquare Total capacitance $C_{\text{cable}} \ \mbox{\texttt{t}} \ \, 0.1 \ \mbox{μF}$
- Test voltage ³ 500V
- Maximum cable length £ 100m

Potential equalization

- The transmitter (compact and remote version) must be safely integrated into the potential equalization via the screw terminal on the outside of the transmitter housing. Alternatively, the transmitter of the compact version can be integrated into the potential equalization via the pipeline as long as the pipeline provides a ground connection conforming to regulations.
- When using the remote version, the connection housing of the sensor must be grounded via the external screw terminal. Alternatively, the sensor can be integrated into the potential equalization via the pipeline as long as the pipeline provides a ground connection conforming to regulations.

Note 🏖

Further information about potential equalization, screening and grounding can be found in the associated Operating Instructions.

Potential equalization for fieldbus versions, when both sides of the screen are grounded

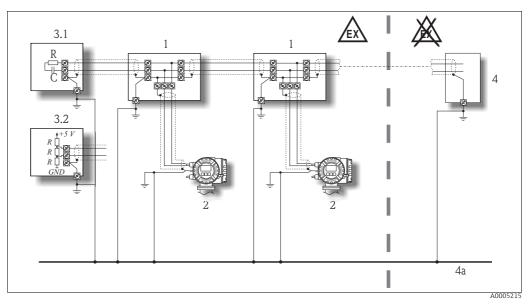


Fig. 3: Example for connecting potential equalization lines

- 1 Distributor/T-Box
- 2 Bus devices for potentially explosive atmospheres
- 3.1 Bus termination PROFIBUS PA or FOUNDATION Fieldbus
- 3.2 Bus termination PROFIBUS DP or MODBUS RS485
- 4 Bus power supply unit or automation system
- 4a Potential equalization line is fed out into the safe area

Note!

The length of the spurs is to be considered.

Connection of remote version connecting cable

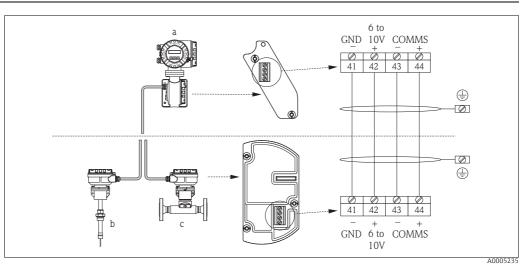


Fig. 4: Connection of remote version connecting cable

- a Field housing: Zone 1
- b Remote version insertion version
- c Remote version flange version

Wire colors (color code according to DIN 47100) ® terminal number: 41 = white, 42 = brown, 43 = green, 44 = yellow

Terminal assignment and connection data

The remote version connection between the sensor and the transmitter is carried out with explosion protection \mbox{EEx} i.

The maximum cable length is 100 m.

Electrical connection

Connection compartment

Transmitter housing compact/remote version (terminal assignment, connection data Æ Page 24 ff.)

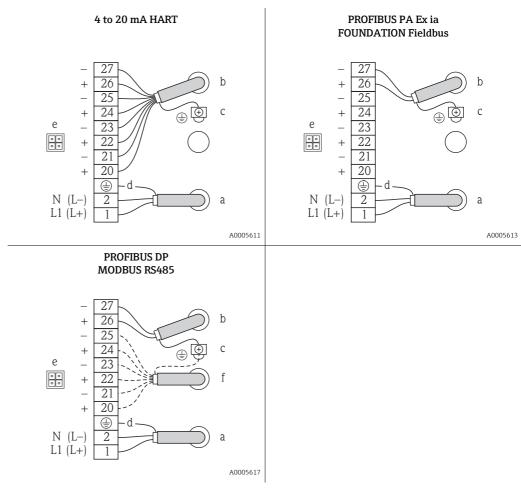


Fig. 5: Electrical connections

- a Power supply cable (terminal assignment, connection data Æ Page 24)
- b Signal cable/fieldbus cable (terminal assignment, connection data Æ Page 26 ff.)
- c Ground terminal for signal cable shield / fieldbus cable / RS485 line
- d Ground terminal for protective ground
- e Service adapter for connecting service interface FXA 193 (Fieldcheck, FieldCare)
- f Further connections:
 - PROFIBUS DP: Cable for external termination, optional (terminal assignment, connection data $ilde{E}$ Page 29)
 - PROFIBUS DP / MODBUS RS485: Signal cable (terminal assignment, connection data \not E Page 29)

Terminal assignment and connection data, power supply

Terminal assignment and connection data

all transmitters	L1 (L+) 1	N (L-) 2	
Designation	Supply (as per na	Protective earth	
Functional values	AC: U = 85 to 2 AC: U = 20 to DC: U = 16	Caution! Observe the grounding scheme of the installation (plant)!	
Intrinsically safe circuit	no		
U _m	260		

Terminal assignment and connection data for signal circuits (intrinsically safe circuits)

Note!

The following tables contain values/specifications, which are dependent on the type code (type of measuring device). Please compare the following type code to the one shown on the nameplate of your measuring device. A graphic representation of the electrical connections can be found on Page 25.

Terminal assignment of transmitter 65F**-*...*F, 65I-*...*F

Tuonamittan	Terminal no. (inputs/outputs)							
Transmitter 20 (+) 21 (-) 22 (+)		23 (-)	24 (+)	25 (-)	26 (+)	27 (-)		
Assignment							PROI	FIBUS PA
	-	_		_	-	-	PA+	PA -
Electric circuit	-		-		-	-	intrin	sically safe
Safety-related values	-		-		-		$\begin{aligned} &U_i \\ &I_i \\ &P_i \\ &L_i \\ &C_i \\ &\text{FISCO} \end{aligned}$	30 V DC 600 mA 8.5 W £ 10 μH £ 5 nF Field device
Functional values	-	-		_	-	-	galvanically U_{Bus}	isolated, 9 to 32 V DC
							I _{Bus} IEC 61158-2	11 mA 2 (MBP)

Terminal assignment of transmitter 65F**-*...*G, 65I-*...*G

	Terminal no. (inputs/outputs)								
Transmitter	20 (+)	21 (-)	22 (+)	23 (-)	24 (+)	25 (-)	26 (+)	27 (-)	
Assignment							FOUNDA	TION Fieldbus	
	-	_		_	-		FF +	FF -	
Electric circuit	-	-	-		-		intrinsically safe		
Safety-related values	-	-	-	-		-	$\begin{array}{c} U_i \\ I_i \\ P_i \\ L_i \\ C_i \\ FISCO \end{array}$	30 V DC 600 mA 8.5 W £ 10 μH £ 5 nF Field device	
Functional values			-		galvanically isolated,				
·araco							U_{Bus}	9 to 32 V DC	
							I_{Bus}	12 mA	
							IEC 61158-2	2 (MBP)	

Terminal assignment of transmitter 65F**-*...*R, 65I-*...*R

		Terminal no. (inputs/outputs)							
Transmitter	20 (+)	21 (-)	22 (+)	23 (-)	24 (+)	25 (-)	26 (+)	27 (-)	
Assignment	-	-	_		Current output, active		Current output HART, active		
Electric circuit	-	-	-		intrinsically safe		intrinsically safe		

	Terminal no. (inputs/outputs)							
Transmitter		21 (-)	22 (+)	23 (-)	24 (+)	25 (-)	26 (+)	27 (-)
Safety-related	_		-	-	U _o	21.8 V DC	U _o	21.8 V DC
values					I_o	90 mA	I _o	90 mA
					P_{o}	490 mW	P_o	490 mW
					Lo	4.1 mH	Lo	4.1 mH
					C_{o}	150 nF	C_{o}	150 nF
					U_{i}	30 V DC 1)	Ui	30 V DC 1)
					I_i	10 mA ¹⁾	I_i	10 mA ¹⁾
					P_{i}	0.3 W ¹⁾	P_{i}	0.3 W ¹⁾
					Li	0	L _i	0
					C_{i}	6 nF	C_{i}	6 nF
Functional	-		-	-	galvanically	isolated,	galvanically i	isolated,
values					active: 0/4 t	o 20 mA	active: 0/4 to	20 mA
					$R_{L} < 400 W$		$R_{L} < 400 W$	
							R _L HART ³ 25	50 W
1) The interconnection must be assessed according to national installation standard.								

The interconnection must be assessed according to national installation stands

Terminal assignment of transmitter 65F**-*...*S, 65I-*...*S

	Terminal no. (inputs/outputs)							
Transmitter	20 (+)	21 (-)	22 (+)	23 (-)	24 (+)	25 (-)	26 (+)	27 (-)
Assignment			Pulse/frequency output, passive			output HART, active		
Electric circuit		-	-	_	intrin	sically safe	intrin	sically safe
Safety-related values	-		-		U _i I _i P _i L _i IIC C _i IIC	30 V DC 300 mA 600 mW 0 6 nF	$\begin{array}{c} U_o \\ I_o \\ P_o \\ L_o \\ C_o \\ U_i \\ I_i \\ P_i \\ L_i \\ C_i \end{array}$	21.8 V DC 90 mA 490 mW 4.1 mH 150 nF 30 V DC ¹⁾ 10 mA ¹⁾ 0.3 W ¹⁾ 0 6 nF
Functional values	-	- -	-		galvanically isolated, passive: 30 V DC / 250 mA Open Collector Full scale frequency 2 to 1000 Hz to national installation standar		galvanically isolated, active: 0/4 to 20 mA R _L < 400 W R _L HART ³ 250 W	

Terminal assignment of transmitter 65F**-*...*T, 65I-*...*T

	Terminal no. (inputs/outputs)							
Transmitter	20 21 (+) (-)	22 23 (+) (-)	24 (+)	25 (-)	26 (+)	27 (-)		
Assignment			Pulse/frequency output, passive		Current output HART, passive			
Electric circuit			intrinsically safe		intrinsically safe			
Safety-related values	-	-	$\begin{array}{c} U_i \\ I_i \\ P_i \\ L_i \\ C_i \end{array}$	30 V DC 300 mA 600 mW 0 6 nF	$\begin{array}{c} U_i \\ I_i \\ P_i \\ L_i \\ C_i \end{array}$	30 V DC 100 mA 1.25 W negligible 6 nF		
Functional values	-	_	galvanically isolated, passive: 30 V DC / 250 mA Open Collector Full scale frequency 2 to 1000 Hz		galvanically in passive: 4 to voltage drop R _L < [(V _{p. supp} mA]	20 mA		

Terminal assignment of transmitter $65F^{**}-^*...^*U$, $65I^{-*}...^*U$

	Terminal no. (inputs/outputs)							
Transmitter	20 (+)	21 (-)	22 (+)	23 (-)	24 (+)	25 (-)	26 (+)	27 (-)
Assignment	-	-	_		Current output passive		Current outp	out HART, passive
Electric circuit	-			intrinsically safe		intrinsically safe		
Safety-related values	-	-	-	-	$\begin{array}{c} U_i \\ I_i \\ P_i \\ L_i \\ C_i \end{array}$	30 V DC 100 mA 1.25 W negligible 6 nF	$\begin{array}{c} U_i \\ I_i \\ P_i \\ L_i \\ C_i \end{array}$	30 V DC 100 mA 1.25 W negligible 6 nF
Functional values			galvanically isolated, passive: 4 to 20 mA voltage drop £ 9 V $R_L < [(V_{p.supply} - 9V) \div 25 \\ mA]$		galvanically isolated, passive: 4 to 20 mA voltage drop £ 9 V R _L < [(V _{p. supply} - 9 V) ÷ 25 mA]			

Terminal assignment and connection data for signal circuits (non-intrinsically safe circuits)

Note!

The following tables contain values/specifications, which are dependent on the type code (type of measuring device). Please compare the following type code to the one shown on the nameplate of your measuring device. A graphic representation of the electrical connections can be found on Page 25.

Terminal assignment

	Terminal no. (inputs/outputs)											
Transmitter	20 (+) 21 (-)	22 (+) 23 (-)	24 (+)	25 (-)	26 (+)	27 (-)						
Fixed communication boards (permanent assignment)												
65F**-**A 65I-**A	-	-		Pulse/frequency output		Current output HART						
65***-**B 65I-**B	Relay output 2	Relay output 1	Pulse/fr out	equency put	Current output HART							
65***-**J			External to	ermination	PROFIBUS DP *							
65I-**J	_	_	+5 V	DGND	В	Α						
65***-**K 65I-**K	_	_	-	-	FOUNDATION Fieldbus							
031 11					FF +	FF -						
65***-**Q	_	_	Status input		MODBUS	S RS485*						
65I-**Q					В	Α						
Flexible communica	ition boards											
65F**-**C 65I-**C	Relay output 2	Relay output 1	Pulse/frequency output		Current output HART							
65F**-**D 65I-**D	Status input	Relay output	Pulse/frequency output		Current output HART							
65F**-**E 65I-**E	Status input	Relay output	Current	Current output 2		output 1 ART						
65F**-**L 65I-**L	Status input	Relay output 2	Relay output 1		Current output HART							
65F**-**2 65I-**2	Relay output 1	Current output 2	Pulse/frequency output		Current output HART							
65F**-**4 65I-**4	Current input	Relay output	Pulse/frequency output		Current output HART							
65F**-**5 65I-**5	Status input	Current input	Pulse/frequency output		Current output HART							
65F**-**6 65I-**6	Status input	Current input	Current output 2		Current output HART							
65F**-**8 65I-**8	Status input	Pulse/frequency output	Current	Current output 2		Current output HART						

Safety-related and functional values of signal circuits $ilde{E}$ Page 30

^{*} PROFIBUS DP, MODBUS RS485:

⁻ terminal 26 (+) ® B (RxD/TxD-P) - terminal 27 (-) ® A (RxD/TxD-N)

Safety-related and functional values of signal circuits

Signal circuits	Functional values	Safety-related values
Current output HART	galvanically isolated, active/passive can be selected: active: 0/4 to 20 mA R _L < 700 W, R _L HART ³ 250 W passive: 4 to 20 mA V _s = 18 to 30 V DC, R _i ³ 150 W	$\begin{array}{ll} \text{intrinsically safe } = \text{no} \\ U_m & = 250 \text{ V} \\ I_m & = 500 \text{ mA} \end{array}$
Current output	galvanically isolated, active/passive can be selected: active: 0/4 to 20 mA R _L < 700 W passive: 4 to 20 mA V _s = 18 to 30 V DC, R _i ³ 150 W	
Pulse/frequency output	galvanically isolated, active/passive can be selected: active: 24 V DC / 25 mA (max. 250 mA during 20 ms) R _L > 100 W passive: 30 V DC / 250 mA Open Collector Full scale frequency 2 to 1000 Hz	
	(f _{max} = 1250 Hz)	
Relay output	galvanically isolated, max. 30 V AC / 500 mA max. 60 V DC / 100 mA	
Current input	galvanically isolated, active/passive can be selected: active: 4 to 20 mA, R _i £ 150 W U _{out} = 24 V DC, short-circuit proof passive: 0/4 to 20 mA, R _i £ 150 W U _{max} = 30 V DC	
Status input	galvanically isolated, 3 to 30 V DC R _i = 5 kW	
PROFIBUS DP	galvanically isolated, RS485 as per Standard EIA/TIA-485	
PROFIBUS DP, external termination	galvanically isolated, RS485 as per Standard EIA/TIA-485 Terminal 24: +5 V terminal 25: DGND	
FOUNDATION Fieldbus	galvanically isolated, $U_{Bus} = 9 \text{ to } 32 \text{ V DC}$ $I_{Bus} = 12 \text{ mA}$ IEC 61158-2 (MBP)	
MODBUS RS485	galvanically isolated, RS485 as per Standard EIA/TIA-485	

Service adapter

 $\label{thm:connecting} The service \ adapter \ is \ only \ used \ for \ connecting \ service \ interfaces \ approved \ by \ Endress+Hauser.$

It is not permissible to connect into the service adapter whilst the atmosphere is considered to be explosive.

Device fuse

Use only fuses of the following types; the fuses are installed on the power supply board:

 Voltage 20 to 55 V AC / 16 to 62 V DC:
 Fuse 2.0 A slow-blow, disconnect capacity 1500 A (Schurter, 0001.2503 or Wickmann, Standard Type 181 2.0 A)

Voltage 85 to 260 V AC:
 Fuse 0.8 A slow-blow, disconnect capacity 1500 A
 (Schurter, 0001.2507 or Wickmann, Standard Type 181 0.8 A)

Technical Data

Dimensions

Please find the differences between the standard version transmitter and the EEx d version in the following diagram. These dimensions are valid both for the compact version and for the remote version. The dimensions of the sensor (B and L) correspond to the standard version. Refer to the following Technical information for these dimensions: t-mass 65F, 65I $^{\circ}$ TI069D

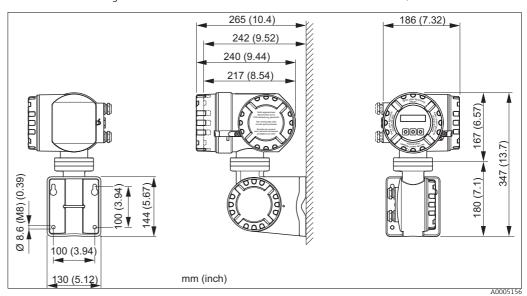


Fig. 6: Dimensions of Ex-remote version

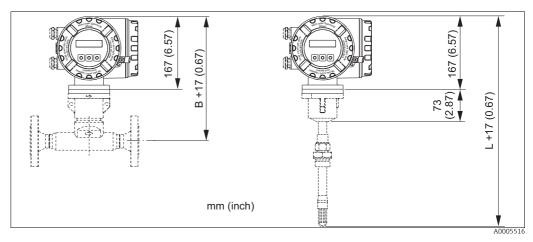


Fig. 7: Dimensions of Ex-compact version

Weight

The weight of the EEx d version weights approx.2 kg (4.4 lbs) more than the standard version.

Control Drawings

Endress+Hauser Reinach hereby declares that the product is in conformity with the requirements of the CANADIAN STANDARDS ASSOCIATION.

Note!

The "Documentation/Important Information" folder provided with the measuring device contains a CD-ROM with all the Control Drawings.

