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Safety Instructions

CNGmass DCI

JPN: Zone 1 (Ex d version)

Safety instructions for electrical apparatus for explosion-hazardous areas

Endress+Hauser
People for Process Automation

Safety Instructions

CNGmass DCI

JPN: Zone 1 (Ex d version)

Ex documentation

This document is an integral part of the following Operating Instructions:
- BA00138D, CNGmass DCI
- BA00140D, CNGmass DCI Modbus RS485

Contents

Endress+Hauser
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Associated documentation

All documentation is available:
- On the CD-ROM supplied.
- Internet: www.endress.com/deviceviewer.
- Smart phone/Tablet: *Endress+Hauser Operations App*
- In the Download Area of the Endress+Hauser web site: www.endress.com → Download

Additional documentation:

Document type	Contents	Documentation code
Brochure	Explosion Protection	CP00021Z/11

Please note the documentation associated with the device.

General warnings

- Compliance with national regulations relating to the installation, connection to the electricity supply, commissioning and maintenance of devices in potentially explosive atmospheres is mandatory, if such regulations or guidelines exist (e.g. JNIOSH-TR-NO.44; www.jniosh.go.jp/publication/tr.html).
- 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 all of the technical data of the device (see nameplate) is mandatory.
- Open the device only when it is de-energized (and after a delay of at least 10 minutes following shutdown of the power supply) or in an area free of explosive atmospheres.
- It is not permissible to connect the service adapter whilst the atmosphere is considered to be explosive.
- Opening the transmitter housing is only permitted for a brief time. During this time, ensure that no dust enters the housing.
- To guarantee resistance to dust, the transmitter housing, the connection housing of the remote version and the cable entries must be tightly sealed.
- Use of the devices is restricted to mediums against which the process-wetted materials are adequately resistant.
- The suitability of the device in the event of simultaneous occurrence of gas-air and dust-air mixtures requires an additional assessment.
- The device must be integrated into the potential equalization system.

Installation instructions

- For terminals No. 22 to No. 27 of the transmitter, only devices with ratings $U_m \leq 260$ V and $I_m \leq 500$ mA are allowed to be connected (does not apply to intrinsically safe circuits).
- The measuring device must only be used in the permitted temperature class.
  The values of the individual temperature classes can be found in the temperature tables: → 7.
- The following applies when connecting the transmitter with a connection compartment in Ex d:
  Only use separately certified cable and wire entries (Ex d IIC) which are suitable for operating temperatures up to 80 °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 dummy plugs are tested and certified as part of the housing for type of protection Ex d IIC. The thread extension or the dummy plug labeled as follows for identification purposes:
  – Md: M20 × 1.5
  – NPTd: NPT ½"
  – Gd: G ½"
- Suitable cables and suitable certified cable glands, cable entries and drain plugs must be used for measuring devices operated at temperatures below −20 °C. More information can be found in section “Cable entries” → 8
- The cable entries and openings not used must be sealed tight with suitable components.
- Turning the local display:
  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).
- If Category “ia” intrinsically safe circuits of the measuring device are connected to certified intrinsically safe Category “ib” circuits with explosion group IIC or IIB ratings, the type of protection changes to Ex ib IIC or Ex ib IIB, as applicable. Intrinsically safe “ib” circuits are suitable for areas which require Zone 1 equipment.
- If the active intrinsically safe communication circuits (“Output; Input” option F, G, R, S, T, U; terminals 26/27 resp. 24/25) are fed into areas that require Zone 20 or Zone 21 apparatus, the connected apparatus must be tested and certified accordingly.

- In Zone 0, potentially explosive vapor/air mixtures may only occur under atmospheric conditions. If no potentially explosive mixtures are present, or if additional protective measures have been taken, the devices may be operated under other atmospheric conditions in accordance with the manufacturer's specifications.

Turning the transmitter housing

1. Unscrew the grub screw.
2. Rotate the transmitter housing cautiously clockwise until the end stop (end of the thread).
3. Rotate the transmitter housing counter-clockwise (max. 360°) in the wanted position.
4. Tighten the grub screw again.

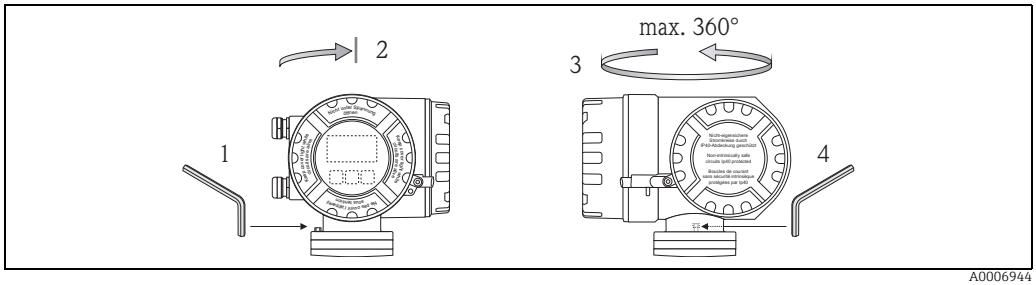


Fig. 1: Turning the transmitter housing

Manufacturer's certificates

JPN Type Examination Certificate

Certificate number: CML 19JPN1475X

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

- JNIOSH-TR-1: 2015
- JNIOSH-TR-2: 2015
- JNIOSH-TR-6: 2015

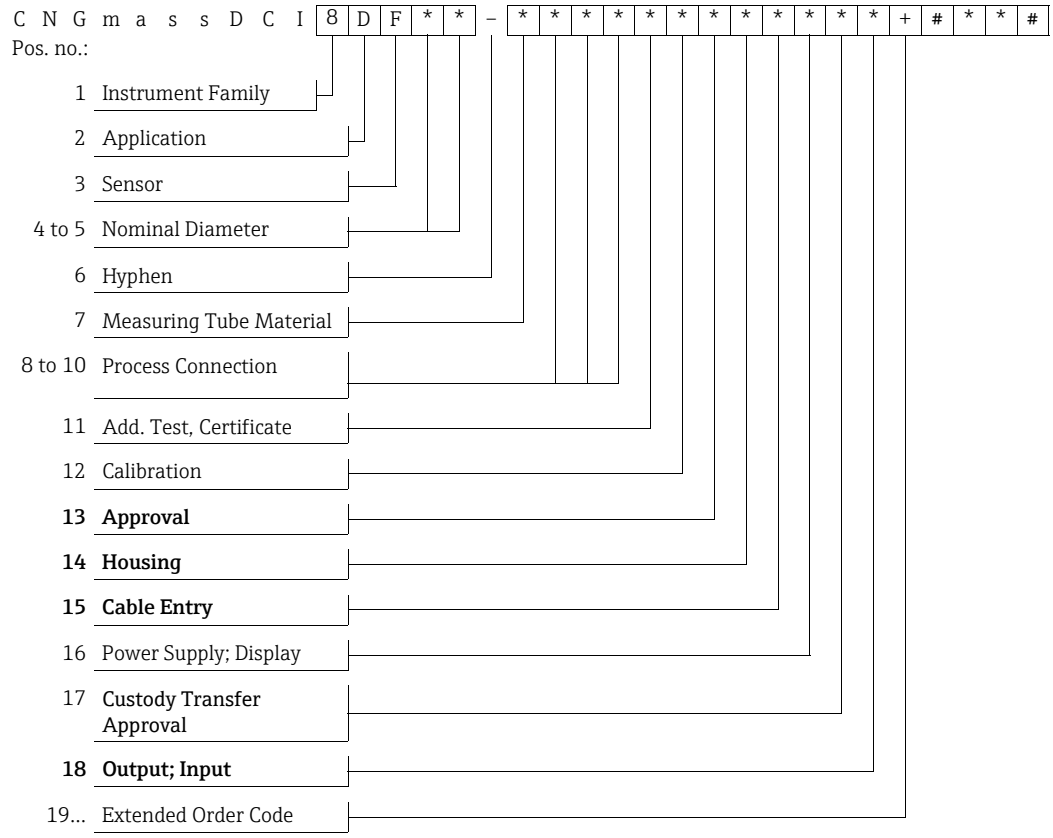
Description of measuring system

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.

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:



Approval (Pos. no. 13 in type code)

*	Type of explosion protection			
	Transmitter			Sensor
	Remote	Intrinsically safe inputs and outputs Ex ia	Non-intrinsically safe inputs and outputs	
V	Ex d [ia Ga] IIC T5...T1 Gb	Ex d ia [ia Ga] IIC T5...T1 Gb	Ex d ia IIC T5...T1 Gb	Ex ia IIC T5...T1 Gb

Housing (Pos. no. 14 in the type code)

*	Type	Min. ambient temperature $T_{a\ min}$
A	Compact	−20 °C
1, 4		−40 °C
E, F	Remote	−20 °C
7, 8		−40 °C

Cable Entry (Pos. no. 15 in type code)

*	Thread (cable entry)
A	M20 × 1.5
B	NPT ½"
C	G ½"
6	JPN M20 × 1.5 (Ex d IIC T3)

In case of sensor only, pos. no. 15 is "x"
See further information on cable entries → 8.

Output; Input (Pos. no. 18 in the type code)

*	Explosion protection
D, M, N, Q, 1, 2, 7	non-intrisically safe inputs and outputs
S, T	Ex ia

In case of sensor only, pos. no. 18 is "x"

✎ Note!
For a detailed explanation of these values, regarding the available inputs and outputs, as well as a description of the associated terminal assignments and connection data: → 11 onwards.

✎ Note!
- In case of transmitter only, pos. no. 4 and 5 is "x".
- In case of sensor only, pos. no. 15, 16, 17 and 18 is "x".

Temperature table

Max. medium temperature [°C] for T6...T1 in relation to the maximum ambient temperature T_a

	DN [mm]	T_a [°C]	T6 (85 °C)	T5 (100 °C)	T4 (135 °C)	T3 (200 °C)	T2 (300 °C)	T1 (450 °C)
CNGmass DCI 8DF**-...	08, 15	+60	–	80	130	13	150	150
	25			95		150		

The minimum **medium temperature** is −50 °C.

The minimum **ambient temperature** T_a is −20 °C. A version for ambient temperatures T_a up to −40 °C is optionally available.

Gas and dust explosion protection

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 ambient temperature T_a and the 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 of the maximum surface temperature for explosion hazards arising from dust

Device: CNGmass DCI, compact version, DN 25
Maximum ambient temperature: T_a = 60 °C
Maximum medium temperature: T_m = 98 °C

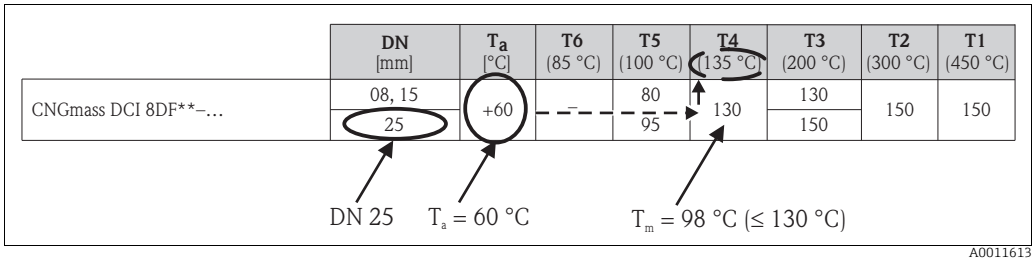


Fig. 2: Procedure for calculating the max. surface temperature

1. Select the device (CNGmass DCI), nominal diameter (DN 25) and ambient temperature T_a (60 °C) in the associated temperature table (compact version).
   The row showing the maximum medium temperature is determined.
2. Select the maximum medium temperature T_m (98 °C), which is smaller than or equal to the maximum medium temperature of a cell.
   The column with the temperature class for gas is determined (98 °C ≤ 130 °C → T4).
3. The maximum temperature of the temperature class determined corresponds to the maximum surface temperature: T4 = 135 °C = maximum surface temperature for dust.

Design of measuring system

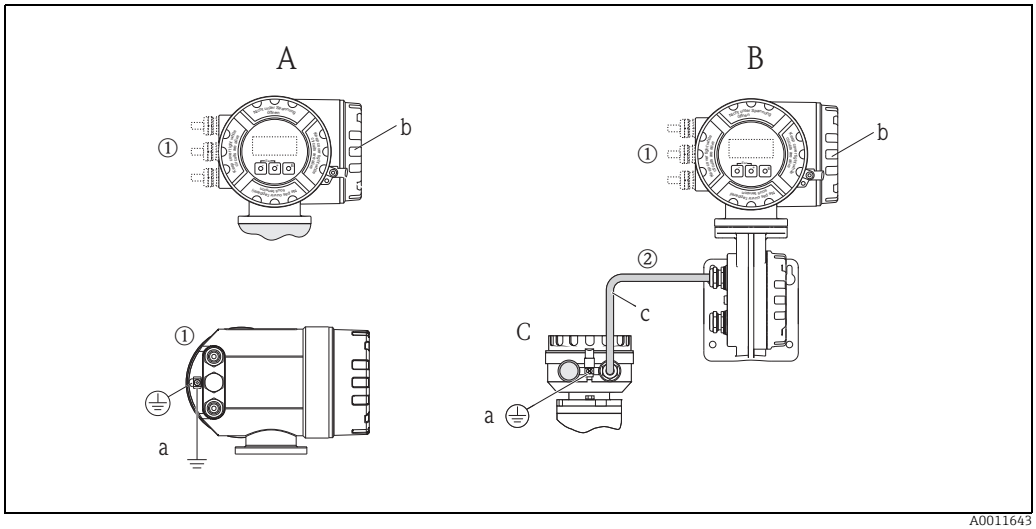


Fig. 3: Design of the measuring system, compact/remote version

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 Connecting cable remote version
① and ② see following section "Cable entries"

✎ Note!
Connection of remote version connecting cable → 🖹 10

Cable entries

For the connection compartment (Ex d version), power supply cable and cable of the communication circuit (①)

- Choice of thread for cable entries M20 × 1.5, ½" NPT or G ½".
- Make sure that the Ex d cable glands/entries are secured to prevent working loose and that the seals are installed immediately adjacent to the housing.
- Following Ex d cable glands can be installed on the device (for details, contact our service center):
  - IECEx approved cable glands suitable for Ex d, e.g. HSK-M-Ex-d, HSK-MZ-Ex-d, HSK-M-PVDF-Ex-d, HSK-INOX-Ex-d, HSK-INOX-PVDF-Ex-d, EXTC-16MG
  - JPN Ex approved cable glands suitable for Ex d IIC, e.g. KXBF-20, KXBF-20·16, KXBF-20·N16, SFGB10-M, SFLB10-M, SFLT10-M, SFGU10-M, SFLU10-M
- The yellow cap attached to the cable glands is for transportation and must be removed when a delivered equipment is installed.
- If the third cable gland is not used, remove it and seal the thread hole with Ex d blind plug (M20 × 1.5)
- Information on our service center:
  Service Desk
  5-70-3 Nisshin-cho, Fuchu-shi, Tokyo-to
  Tel: 042-314-1919, Fax: 042-314-1941

For remote version connecting cable (②):

- Choice of cable gland M20 × 1.5 or thread for cable entries ½" NPT or G ½"

⚠ Warning!
When using cable glands M20 × 1.5:
- Only approved cable glands may be used (→ 🖹 4, "Installation instructions").
- The cable glands must be very leak-tight.

Cable specification

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

Potential equalization

- The transmitter (compact and remote version) is to be securely connected to the potential equalization system using the screw terminal on the outside of the transmitter housing. Alternatively, the transmitter of the compact version as of serial number 4Axxxxxx000 can be connected to the potential equalization system via the pipeline if a ground connection via the pipeline according to regulations can be assured.
- 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, shielding and grounding can be found in the associated Operating Instructions.

Potential equalization with shield grounded at both sides for fieldbus version

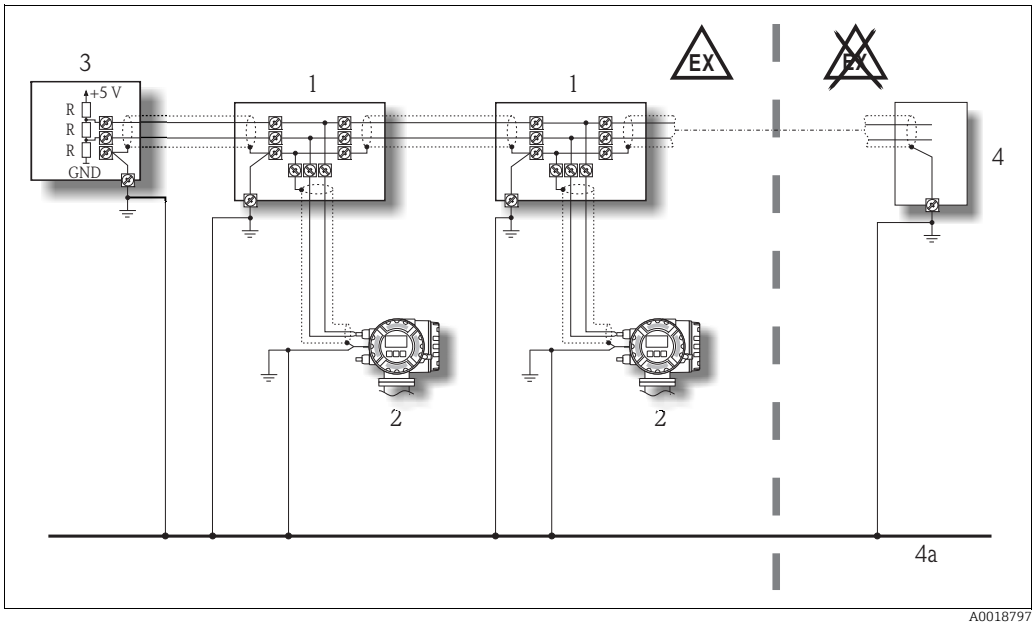


Fig. 4: Example for connecting potential equalization lines

1 Distributor/T-Box
2 Bus devices for potentially explosive atmospheres
3 Bus terminator Modbus RS485
4 Bus supply unit or automation system
4a Potential equalization line is fed out into the safe area

✎ Note!
The length of the spur must be observed.

Connection of remote version connecting cable

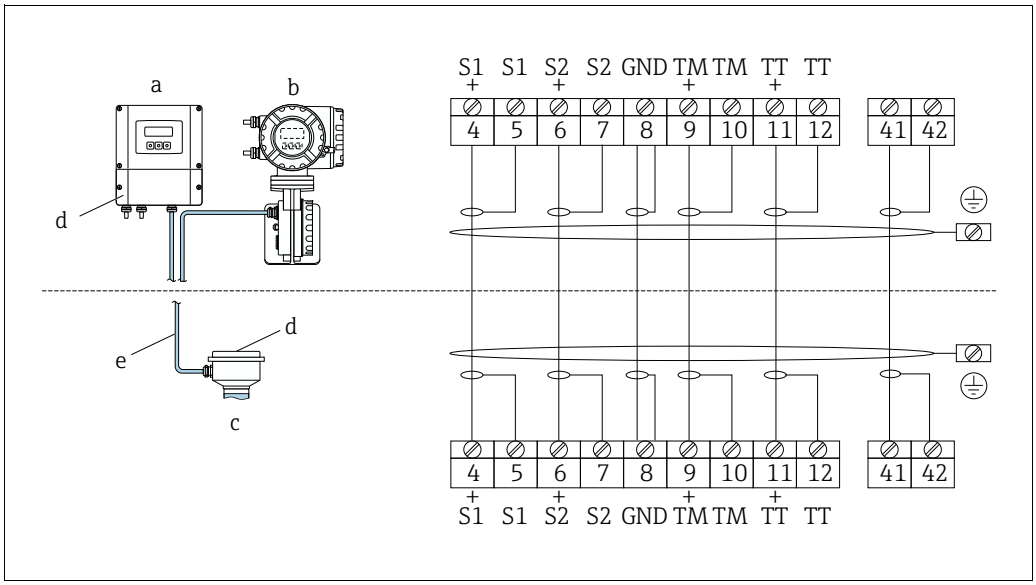


Fig. 5: Connection of remote version connecting cable

a Transmitter wall-mount housing: non-hazardous area
b Transmitter wall-mount housing: Zone 1
c Sensor connecting housing
d Cover of connection compartment or connection housing
e Connecting cable

Wire colors:
Terminal No.: 4/5 = gray; 6/7 = green; 8 = yellow; 9/10 = pink; 11/12 = white; 41/42 = brown

Terminal assignment and connection data

The connection of the remote version, between the sensor and the transmitter, has Ex i explosion protection.

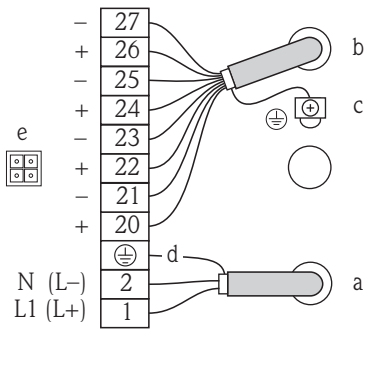
Caution!
Only preterminated connecting cables supplied by Endress+Hauser may be used.

Electrical connection

Connection compartment

Transmitter housing compact/ remote version (terminal assignment, connection data → 11 ff.)

4 to 20 mA HART



Modbus RS485*

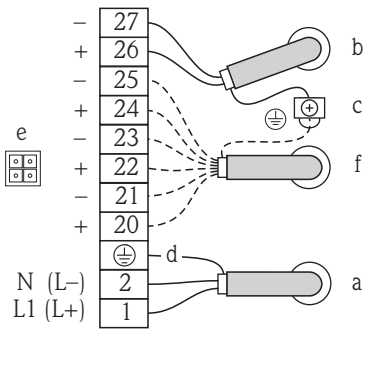


Fig. 6: Electrical connections

**) Flexible communication board*
a Power supply cable (terminal assignment and connection data → 11)
b Ground terminal for protective ground
c Signal cable/ fieldbus cable (terminal assignment and connection data → 11)
d Ground terminal for signal cable shield / fieldbus cable / RS485 line
e Service adapter for connecting service interface FXA 193 (Fieldcheck, FieldCare)
f Signal cable

Terminal assignment and connection data, power supply

All transmitters	1 L (+)	2 N (–)	⏚
Designation	Supply voltage		Protective earth
Functional values	AC: U = 85 to 260 V AC: U = 20 to 55 V DC: U = 16 to 62 V Power consumption: 15 VA / 15 W		Caution! Observe the grounding plans of the system!
Intrinsically safe circuit	no		
U_m	260 V AC		

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. For a graphic representation of the electrical connections: → 🖹 10.

Terminal assignment of CNGmass DCI 8DF-**********S+#**#**

Transmitter	Terminal no. (Output; Input)							
	20 (+)	21 (–)	22 (+)	23 (–)	24 (+)	25 (–)	26 (+)	27 (–)
Assignment	–		–		Pulse/frequency output, passive		Current output HART, active	
Electric circuit	–		–		Ex ia		Ex ia	
Safety-related values	–		–		U_i 30 V DC I_i 500 mA P_i 600 mW L_i negligible C_i 6 nF		U_o 21.8 V DC I_o 90 mA P_o 491 mW L_o IIC/IIB 4.1 mH/15 mH C_o IIC/IIB 160 nF/1160 nF [1] L_o IIC/IIB 2 mH/10 mH [1] C_o IIC/IIB 80 nF/300 nF U_i 30 V DC [2] I_i 10 mA [2] P_i 0.3 W [2] L_i negligible C_i 6 nF	
Functional values	–		–		galvanically isolated, passive: 30 V DC / 250 mA Open Collector Full scale frequency 2 to 5000 Hz		galvanically isolated, active: 0/4 to 20 mA R_L < 400 Ω R_L HART ≥ 250 Ω	

[1] Permitted values in the event of simultaneous occurrence of concentrated inductances and capacitances.
[2] The interconnection must be assessed according to the valid construction provisions.

Terminal assignment of CNGmass DCI 8DF-**********T+#**#**

Transmitter	Terminal no. (Output; Input)							
	20 (+)	21 (–)	22 (+)	23 (–)	24 (+)	25 (–)	26 (+)	27 (–)
Assignment	–		–		Pulse/frequency output, passive		Current output HART, passive	
Electric circuit	–		–		Ex ia		Ex ia	
Safety-related values	–		–		U_i 30 V DC I_i 500 mA P_i 600 mW L_i negligible C_i 6 nF		U_i 30 V DC I_i 100 mA P_i 1.25 W L_i negligible C_i 6 nF	
Functional values	–		–		galvanically isolated, passive: 30 V DC / 250 mA Open Collector Full scale frequency 2 to 5000 Hz		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. For a graphic representation of the electrical connections: → 10.

Terminal assignment

Order characteristic "Output; Input"	Terminal no. (Output; Input)							
	20 (+)	21 (–)	22 (+)	23 (–)	24 (+)	25 (–)	26 (+)	27 (–)
Non-convertible communication boards (fixed assignment)								
Q	–		–		Status input		Modbus RS485 [1]	
Convertible communication boards								
D	Status input		Relay output		Frequency output		Current output, HART	
M	Status input		Frequency output 2		Frequency output 1		Current output, HART	
N	Current output		Frequency output		Status input		Modbus RS485 [1]	
1	Relay output		Frequency output 2		Frequency output 1		Current output, HART	
2	Relay output		Current output 2		Frequency output		Current output 1, HART	
7	Relay output 2		Relay output 1		Status input		Modbus RS485 [1]	

Safety-related and functional values of signal circuits → 12
[1] Modbus RS485:
– Terminal 26 (+) → B (RxD/TxD-P)
– Terminal 27 (–) → A (RxD/TxD-N)

Safety-related and functional values of signal circuit

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 Ω, R_L HART ≥ 250 Ω ▪ passive: 4 to 20 mA V_s = 18 to 30 V DC, R_i ≥ 150 Ω	Intrinsically safe: no U_m = 260 V I_m = 500 mA
Current output	galvanically isolated, active/passive can be selected: ▪ active: 0/4 to 20 mA R_L < 700 Ω ▪ passive: 4 to 20 mA V_s = 18 to 30 V DC, R_i ≥ 150 Ω	
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 Ω ▪ passive: 30 V DC / 250 mA Open Collector Full scale frequency 2 to 10 000 Hz (f_{max} = 12 500 Hz)	
Relay output	galvanically isolated, max. 30 V AC / 500 mA max. 60 V DC / 100 mA	
Status input Option "Output; Input" D, M	galvanically isolated, 3 to 30 V DC R_i = 5 kΩ	
Status input Option "Output; Input" N, Q, 7	galvanically isolated, independent of polarity, 3 to 30 V DC R_i = 3 kΩ	
Modbus RS485	galvanically isolated, RS485	

Service adapter

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

⚠ Warning!
It is not permissible to connect the service adapter whilst the atmosphere is considered to be explosive.

Device fuse

⚠ Warning!
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 refer to the respective Technical Information → TI00098D.

Weight

The weight of the Ex d version is approximately 2 kg greater than that of the standard version.

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