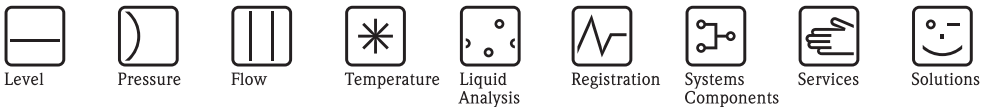



Safety Instructions

# CNGmass DCI

## NEPSI Zone 1, Zone 21

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

## Contents



XA00138D/06/EN/14.12
71146635

Endress+Hauser
People for Process Automation

## General warnings

- For installation, use and maintenance of the flow meter, the instruction manual and the following standards shall be observed:
  - GB50257-1996 "Code for construction and acceptance of electric device for explosive atmospheres and fire hazard electrical equipment installation engineering"
  - GB3836.13-1997 "Electrical apparatus for explosive gas atmospheres – Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres"
  - GB3836.15-2000 "Electrical apparatus for explosive gas atmospheres – Part 15: Electrical installations in hazardous area (other than mines)"
  - GB3836.16-2006 "Electrical apparatus for explosive gas atmospheres – Part 16: Inspection and maintenance of electrical installation (other than mines)"
  - GB15577-2007: "Safety regulations for dust explosion prevention and protection" (Only if installed in dust hazardous areas.)
  - GB12476.2-2006 "Electrical apparatus for use in the presence combustible dust – Part 1-2: Electrical apparatus protected by enclosures and surface temperature limitation – Section. Installation and maintenance" (Only if installed in dust hazardous areas.)
- Any maintenance shall be done after power off or the area known to be non-hazardous.
- The flow meter shall not be modified in order to ensure the explosion protection performance of the equipment. Any change may impair safety.
- 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 non-hazardous (classified) locations.
- It is not permissible to connect the service adapter whilst the atmosphere is considered to be explosive.
- Opening the transmitter housing and the connection housing of the remote version is only permitted for a brief time. During this time, ensure that no dust or water enters the housing.
- To guarantee resistance to dust and water, 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.

## Special conditions

The device must be integrated into the potential equalization system. Potential must be equalized along the intrinsically safe sensor circuits.
Further information is provided in the "Potential equalization" section: → 8.

## Installation instructions

- For terminals No. 20 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: → 6.
- The following applies when using the terminal compartment in type of protection "flameproof/Ex d":
  Only cable entries and cable glands, which are approved by NEPSI in accordance with GB3836.1-2010 and GB3836.2-2010 and which are suitable for an operating temperature of up to 80 °C, they shall be used.
- The following applies when using the terminal compartment in type of protection "increased safety/Ex e":
  Only cable entries, cable glands and blanking plugs, which are approved by NEPSI in accordance with GB3836.1-2010 and GB3836.3-2010 and which are suitable for an operating temperature of up to 80 °C and for an ingress protection of IP 67, they shall be used. The cables must be installed in such a way, that they are fixed in place in order to ensure adequate strain relief.
- Suitable cables and suitable, certified cable glands, cable entries and blanking plugs must be used for measuring devices operated at temperatures below –20 °C.
- The cable entries and openings not used must be sealed tight with suitable components.
- If the active intrinsically safe communication circuits (input/output option F, G, R, S, T, U; terminals 26/27 resp. 24/25) are fed into areas that require 1D or 2D 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 according to EN 1127-1, the devices may be operated under other atmospheric conditions in accordance with the manufacturer's specifications.

## Installation instructions (continued)

Caution!
The explosion group for the measuring device can be IIC. However, it is reduced to IIB if the permitted, external capacitance/inductance for the intrinsically safe communication circuits is increased → 10.

- 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).

**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.

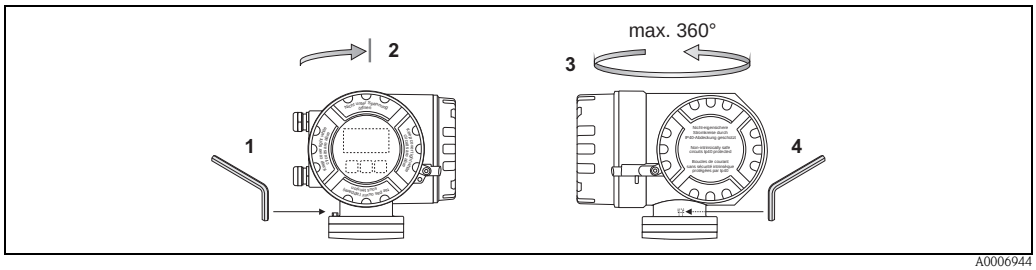



*Fig. 1: Turning the transmitter housing*

## COC certificates of conformity

**COC certificates of conformity**

By affixing the certification number the product conforms with the following standards:

- GB3836.1~4 - 2010
- IEC60079-31: 2008
- IECEx61241-0: 2008
- GB12476.4–2000

Certification numbers:

- GYJ11.1569X

**Inspection body**

NEPSI, National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation

## 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 installed separately 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.

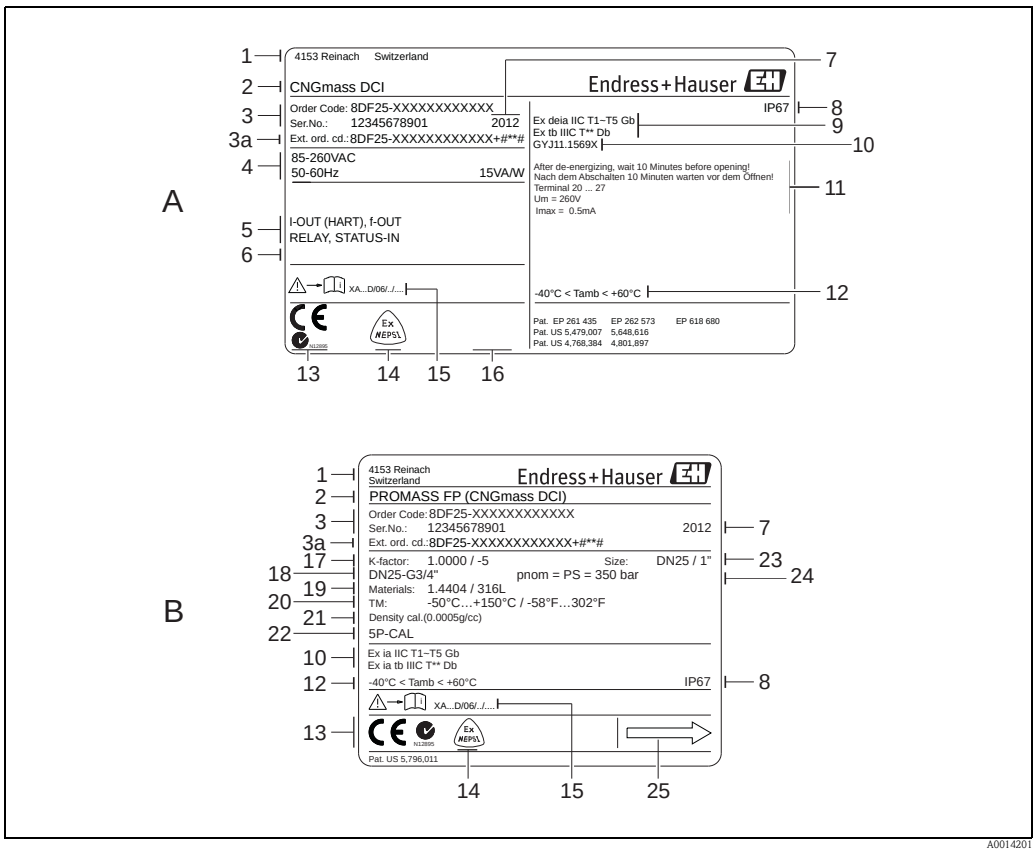


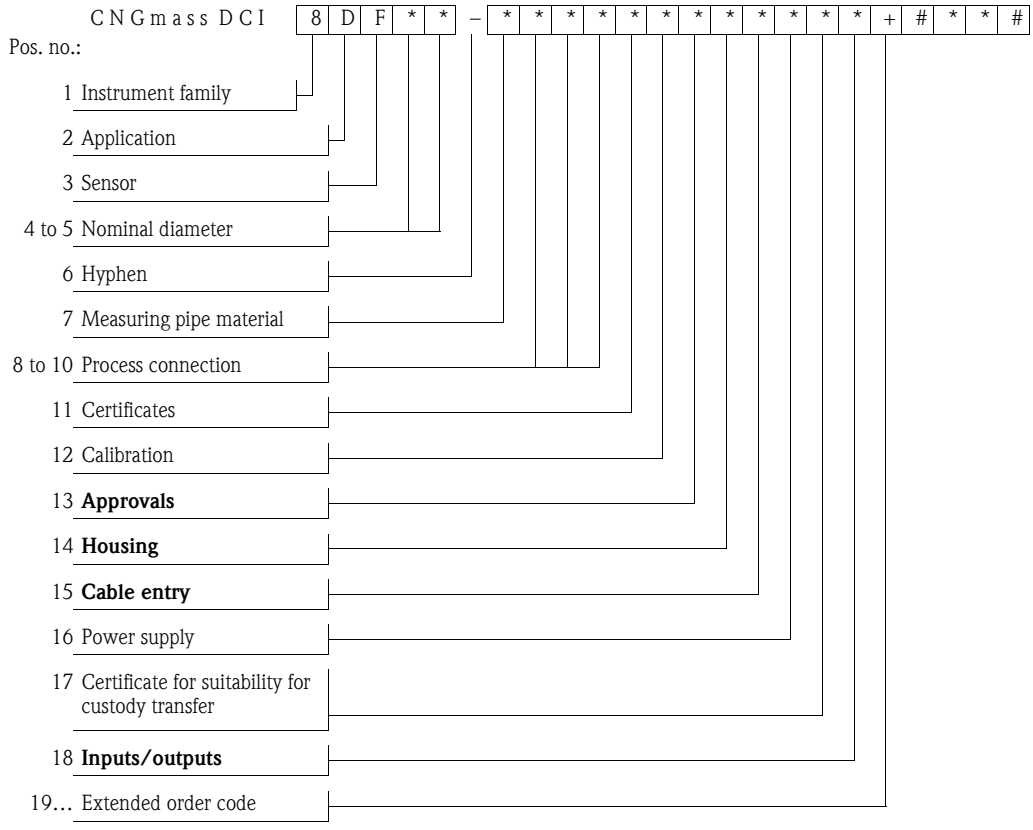

*Fig. 2: Example for nameplates of a transmitter and of a sensor*

*A Transmitter nameplate*
*B Sensor nameplate*

*1 Production site*
*2 Transmitter or sensor type*
*3 Order code and serial number*
*3a Extended order code*
*4 Power supply, frequency and power consumption*
*5 Available inputs/outputs*
*6 Space for additional information on special products*
*7 Year of manufacture*
*8 Type of enclosure protection*
*9 Type of protection*
*10 Number of the NEPSI certificate of conformity*
*11 Space for notes, e.g. delays, etc. (only if necessary)*
*12 Ambient temperature range*
*13 C-Tick symbol*
*14 NEPSI Symbol*
*15 Associated Ex documentation*
*16 Space for other approval specifications and certificates, e.g. PROFIBUS, etc. (only if present)*
*17 Calibration factor/zero point*
*18 Nominal diameter/nominal pressure*
*19 Materials in contact with the medium*
*20 Fluid temperature range*
*21 Density accuracy*
*22 Additional information, e.g. 5P-CAL = 5-point calibration, 3.1B = 3.1 B certificate for wetted material*
*23 Device nominal diameter*
*24 Nominal pressure*
*25 Direction of flow*

## 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:




### Approvals (Pos. no. 13 in the type code)

| * | Type of explosion protection | | | |
|---|---|---|---|---|
| | Transmitter | | | Sensor |
| | Remote | Compact<br>Ex ia | Compact<br>non-instrinsically safe | |
| K | Ex d[ia Ga] IIC T5 Gb<br>Ex tb[ia Da] IIIC T** Db | Ex dia[ia Ga] IIC T1~T5 Gb<br>Ex tb[ia Da] IIIC T** Db | Ex dia IIC T1~T5 Gb<br>Ex tb IIIC T** Db | Ex ia IIC T1~T5 Gb<br>Ex ia tb IIIC T** Db |
| S | Ex de[ia Ga] IIC T5 Gb<br>Ex tb[ia Da] IIIC T** Db | Ex deia[ia Ga] IIC T1~T5 Gb<br>Ex tb[ia Da] IIIC T** Db | Ex deia IIC T1~T5 Gb<br>Ex tb IIIC T** Db | Ex ia IIC T1~T5 Gb<br>Ex ia tb IIIC T** Db |

### 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 the type code)

| * | Thread (cable entry) |
|---|---|
| A | M20 × 1.5 |
| B | NPT ½" |
| C | G ½" |

### Inputs/outputs (Pos. no. 18 in the type code)

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

✎ Note!
A detailed explanation of these values, regarding the available outputs and inputs, as well as a description of the associated terminal assignments and connection data: → 🖹 10 onwards.

## Temperature table

Max. medium temperature [°C] for T1-T6 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 | 130 | 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

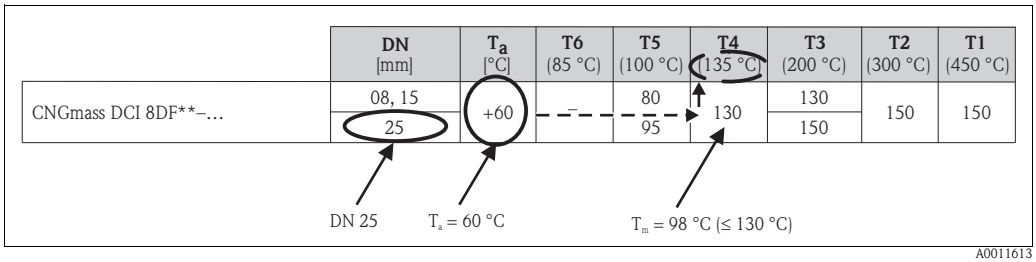



*Fig. 3: Procedure for calculating the max. surface temperature*

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 ≤ 125 °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

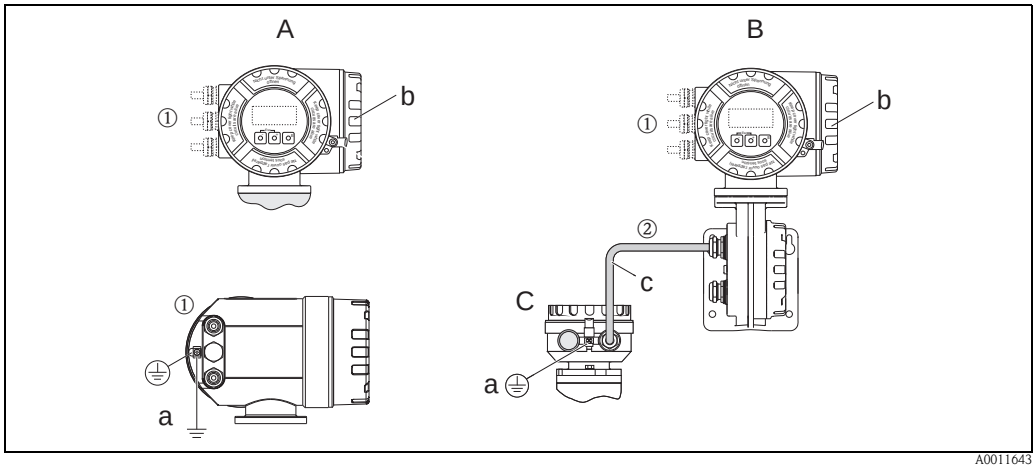



*Fig. 4: Design of the measuring system, compact/ remote version*

*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 → 🗎 9

## Cable entries

- ① for connection compartment (Ex d version): power supply cable and cable of the communication circuit → 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.
- ① for connection compartment (Ex e version): power supply cable and cable of the communication circuit → Choice of cable gland M20 × 1.5 or thread for cable entries ½" NPT or G ½".
  The cables must be installed such that they are fixed in place. Adequate strain relief must be ensured.
- ② for remote version connecting cable:
  → 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 (→ 🗎 2, "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**

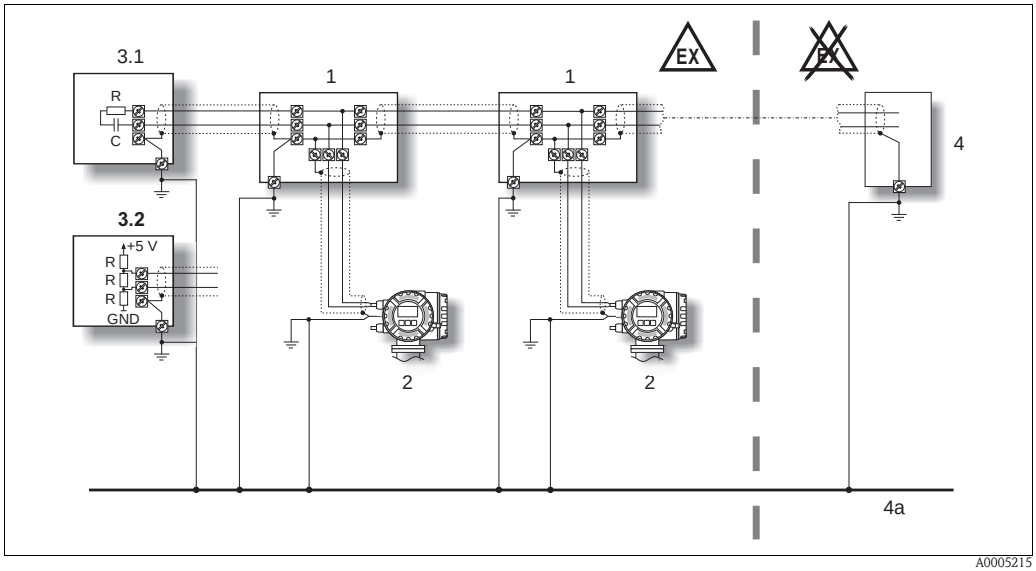



*Fig. 5: Example for connecting potential equalization lines*
*1 Distributor/ T-Box*
*2 Bus devices for potentially explosive atmospheres*
*3.2 Bus terminator Modbus RS485*
*4 Bus supply unit or automation system*
*4a Potential equalization line is fed out into the safe area*

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

## Connection of remote version connecting cable

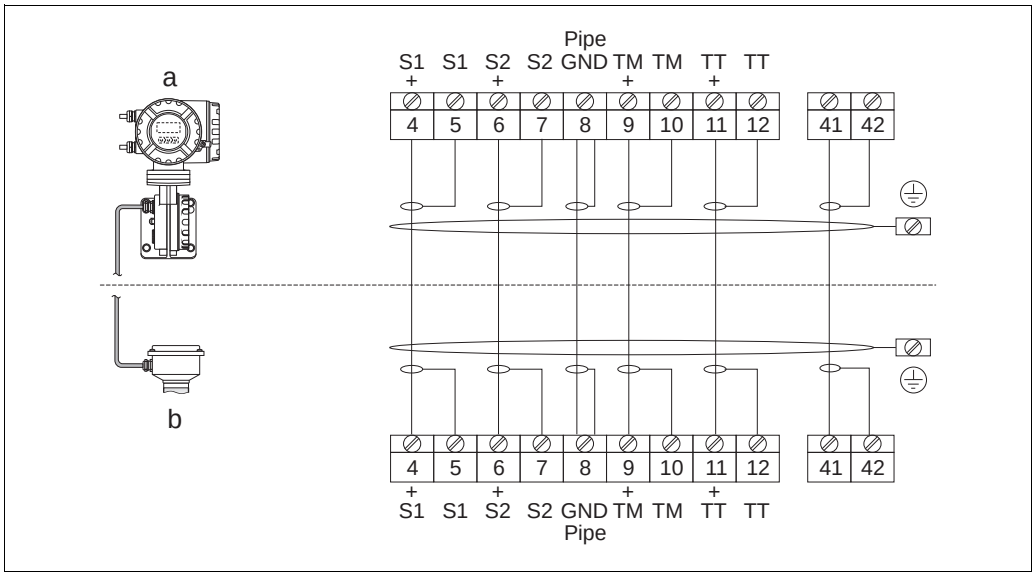



*Fig. 6: Connection of remote version connecting cable*

*A Wall-mount housing: NEPSI Zone 1*

*B Remote version, flanged version*

*Wire colors (colour code according to DIN 47100):*
*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. The maximum cable length between transmitter and sensor must not exceed 120 m.

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 → 10 ff.)

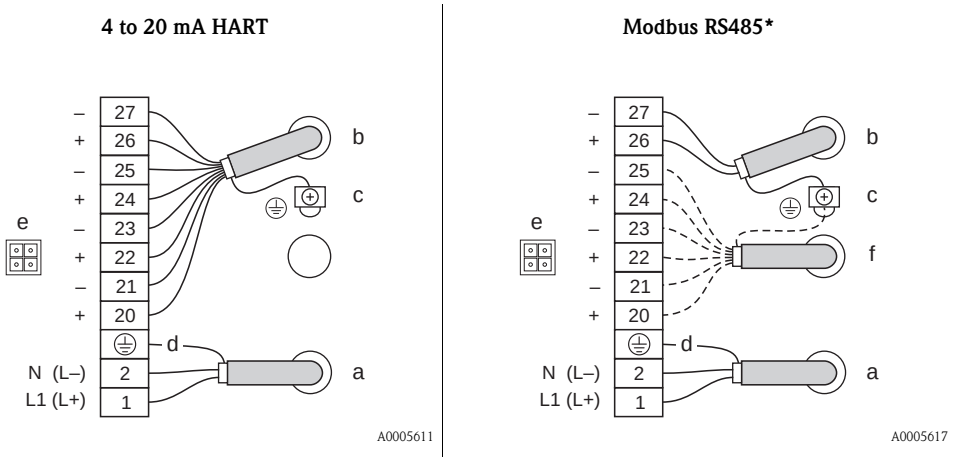



*Fig. 7: Electrical connections*

**) Flexible communication board*
*a Power supply cable (terminal assignment and connection data → 10)*
*b Ground terminal for protective ground*
*c Signal cable/ fieldbus cable (terminal assignment and connection data → 10)*
*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<br>AC: U = 20 to 55 V<br>DC: U = 16 to 62 V<br><br>Power consumption: 15 VA / 15 W | | Caution!<br>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: → 📄 9.

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

| Transmitter | Terminal no. (inputs/outputs) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 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<br>$I_i$ 500 mA<br>$P_i$ 600 mW<br>$L_i$ negligible<br>$C_i$ 6 nF | | $U_o$ 21.8 V DC<br>$I_o$ 90 mA<br>$P_o$ 491 mW<br>$L_o$ IIC/IIB 4.1 mH/15 mH<br>$C_o$ IIC/IIB 160 nF/1160 nF<br>[1] $L_o$ IIC/IIB 2 mH/10 mH<br>[1] $C_o$ IIC/IIB 80 nF/300 nF<br>$U_i$ 30 V DC [2]<br>$I_i$ 10 mA [2]<br>$P_i$ 0.3 W [2]<br>$L_i$ negligible<br>$C_i$ 6 nF | |
| Functional values | – | | – | | galvanically isolated,<br>passive: 30 V DC / 250 mA<br>Open Collector<br>Full scale frequency 2 to 5000 Hz | | galvanically isolated,<br>active: 0/4 to 20 mA<br>$R_L$ < 400 Ω<br>$R_L$ 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. (inputs/outputs) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 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<br>$I_i$ 500 mA<br>$P_i$ 600 mW<br>$L_i$ negligible<br>$C_i$ 6 nF | | $U_i$ 30 V DC<br>$I_i$ 100 mA<br>$P_i$ 1.25 W<br>$L_i$ negligible<br>$C_i$ 6 nF | |
| Functional values | – | | – | | galvanically isolated,<br>passive: 30 V DC / 250 mA<br>Open Collector<br>Full scale frequency 2 to 5000 Hz | | galvanically isolated,<br>passive: 4 to 20 mA<br>voltage drop ≤ 9 V<br>$R_L < [(V_{p.\ supply} - 9\ V) : 25\ mA]$ | |

## 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: → 🖹 9.

### Terminal assignment

| Order characteristic "Inputs/outputs" | Terminal no. (inputs/outputs) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 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,<br>active/ passive can be selected:<br>■ active: 0/4 to 20 mA<br>$R_L$ < 700 Ω, $R_L$ HART ≥ 250 Ω<br>■ passive: 4 to 20 mA<br>$V_s$ = 18 to 30 V DC, $R_i$ ≥ 150 Ω | intrinsically = no<br>safe = 260 V<br>$U_m$ = 500 mA<br>$I_m$ |
| Current output | galvanically isolated,<br>active/ passive can be selected:<br>■ active: 0/4 to 20 mA<br>$R_L$ < 700 Ω<br>■ passive: 4 to 20 mA<br>$V_s$ = 18 to 30 V DC, $R_i$ ≥ 150 Ω | |
| Pulse/frequency output | galvanically isolated,<br>active/ passive can be selected:<br>■ active: 24 V DC / 25 mA<br>(max. 250 mA during 20 ms)<br>$R_L$ > 100 Ω<br>■ passive: 30 V DC / 250 mA<br>Open Collector<br><br>Full scale frequency 2 to 10 000 Hz<br>($f_{max}$ = 12 500 Hz) | |
| Relay output | galvanically isolated,<br>max. 30 V AC / 500 mA<br>max. 60 V DC / 100 mA | |
| Status input<br>Option "Inputs/outputs" D, M | galvanically isolated,<br>3 to 30 V DC<br>$R_i$ = 5 kΩ | |
| Status input<br>Option "Inputs/outputs" N, Q, 7 | galvanically isolated,<br>independent of polarity,<br>3 to 30 V DC<br>$R_i$ = 3 kΩ | |
| Modbus RS485 | galvanically isolated,<br>RS485 as per Standard EIA/TIA-485 | |

## 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 approx. 2 kg greater than that of the standard version.

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XA00138D/06/EN/14.12
71146635
FM+SGML 9.0