Electromagnetic flowmeter in 2-wire technology

ALTOFLUX 2W
IFM 4042 K-EEx

Compact flowmeter
WARNING!
No changes may be made to the devices. Unauthorized changes might affect the explosion safety of the devices.

These additional instructions are an extension to the Installation and Operating Instructions and only applies for the EEx version of the IFM 4042 K electromagnetic compact flowmeter. All technical information described in the Installation and Operating Instructions are applicable, when not specifically excluded or replaced by the instructions in these additional instructions.

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Be sure to follow these instructions!

IMPORTANT!

- The prescriptions and regulations as well as the electrical data described in the EC-type examination certificate must be obeyed.
- Beside the instructions for electrical installations in non-hazardous locations according to the applicable national standard (equivalent of IEC 364, e.g. VDE 0100), especially the regulations in EN 60079-14 "Electrical installations in hazardous locations" or equivalent national standard (e.g. DIN VDE 0165) must be followed.
- Installation, establishment, utilization and maintenance are only allowed to be executed by personnel with an education in explosion safety!
1. SYSTEM COMPONENTS

1.1 General information

The Altoflux 2W IFM 4042 K-EEx electromagnetic compact flowmeter in 2-wire technology is in accordance with European Directive 94/9 EG (ATEX 100a) and approved for hazardous classified locations of Zone 1 and 2 by the KEMA conform to the European Standards of the EN 500xx series. The IFM 4042 K-EEx has the following approval number.

KEMA 01 ATEX 2200 X

The IFM 4042 K-EEx compact flowmeter is designed for ambient temperatures in the range of -40°C up to +60°C.

The allowed process liquid temperature is a.o. limited by the combustible atmosphere that (possibly) surrounds the apparatus, which again is determined by the temperature class of the atmosphere (first column of the tables). See table 1 and 2 below for details.

For dusts the second column of the two below listed tables is applicable.

<table>
<thead>
<tr>
<th>Temperature class (for gases)</th>
<th>Max. surface temperature (for dusts)</th>
<th>Maximum process liquid temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$T_a \leq 40°C$</td>
</tr>
<tr>
<td>T6</td>
<td>T85°C</td>
<td>75°C</td>
</tr>
<tr>
<td>T5</td>
<td>T100°C</td>
<td>95°C</td>
</tr>
<tr>
<td>T4</td>
<td>T135°C</td>
<td>130°C</td>
</tr>
<tr>
<td>T3</td>
<td>T180°C</td>
<td>150°C</td>
</tr>
</tbody>
</table>

Table 1: Temperature classification DN10…20 and DN200 and larger.

<table>
<thead>
<tr>
<th>Temperature class (for gases)</th>
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<td>T5</td>
<td>T100°C</td>
<td>85°C</td>
</tr>
<tr>
<td>T4</td>
<td>T135°C</td>
<td>120°C</td>
</tr>
<tr>
<td>T3</td>
<td>T180°C</td>
<td>180°C</td>
</tr>
</tbody>
</table>

Use heat-resistant cables above - - 50°C

Table 2: Temperature classification DN25…150 with PFA liner.

The IFM 4042 K-EEx flowmeter consists of the IFC 040-EEx signal converter unit, which is screwed on top of the primary head (i.e. the measuring unit). The compact flowmeter is marked with one of the codes below, depending on the meter size:

- DN25-150: II 2GD EEx de [ib] IIC T6…T3 ("EEx e" or "EEx d" terminal compartment).
- DN200 and up: II 2GD EEx de [ib] IIC T6…T3.

For details see the EC-type examination certificate in Section 10 of these instructions.

1.2 Primary head

The primary head is the measuring unit of the IFM 4042 K-EEx compact flowmeter and contains two field coils (see table 3 on the next page for the type of protection) and two electrodes in type of protection intrinsic safety category “ib” according to EN 50020.
<table>
<thead>
<tr>
<th>Meter size</th>
<th>Type of protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN10 up to DN20</td>
<td>Field coils: Increased safety &quot;e&quot; according to EN 50019</td>
</tr>
<tr>
<td></td>
<td>Encapsulation &quot;m&quot; according to EN 50028</td>
</tr>
<tr>
<td></td>
<td>Electrodes: Intrinsic safety &quot;ib&quot; according to EN 50020</td>
</tr>
<tr>
<td>DN25 up to DN150</td>
<td>Housing: Flameproof enclosure &quot;d&quot; according to EN 50018</td>
</tr>
<tr>
<td></td>
<td>Electrodes: Intrinsic safety &quot;ib&quot; according to EN 50020</td>
</tr>
<tr>
<td>DN200 and larger</td>
<td>Field coils: Increased safety &quot;e&quot; according to EN 50019</td>
</tr>
<tr>
<td></td>
<td>Electrodes: Intrinsic safety &quot;ib&quot; according to EN 50020</td>
</tr>
</tbody>
</table>

Table 3: Types of protection of primary head.

NOTE:
The intrinsically safe electrode circuits of the IFM 4042 K-EEx compact flowmeter are only internal circuits and not accessible for the customer.

1.3 IFC 040-EEx signal converter

The IFC 040-EEx signal converter consists of a cylindrical housing of die-casted aluminum, which has two separate compartments, divided from each other by an integrated wall with casted flameproof terminal feed-through. The neck at the bottom of the housing contains a flameproof cable feed-through. The signal converter housing is on both ends closed by a cylindrical threaded cover with O-ring sealing. The housing has an ingress protection degree of at least IP65 conform to EN 60529.

1.3.1 Electronics compartment

The electronics compartment accommodates the pre-certified IFC 040-EEx electronics unit with approval number PTB 00 ATEX 2213 U. The compartment is designed with type of protection flameproof enclosure "d" according to EN 50018. It is closed by a flameproof display cover with glass window.

1.3.2 Terminal compartment

The terminal compartment has seven terminals for connection of the current output (I, I⊥), the additional power supply or "Power Booster" (1L=, 0L=) and binary pulse/status outputs (B1, B⊥, B2). Chapter 2 shows the terminal arrangement of the IFC 040-EEx. There are two versions possible with a different explosion protection according to the European Standards, which is dependent on the safety-technical maximum voltage $U_m$ of the mains power supply system to which the flowmeter is connected.

**Version A: Terminal compartment in type of protection "EEx de [ib]" with $U_m = 60$ V.**

The connections of the output circuits can be ordered by the customer in one of the following types of explosion protection:

- EEx [ib] (intrinsic safety, category "ib") or
- EEx e (increased safety) or
- EEx d (flameproof enclosure).

**Version B: Terminal compartment in type of protection "EEx de" with $U_m = 250$ V.**

The customer can order the connections of the output circuits in one of the following types of explosion protection:

- EEx e (increased safety) or
- EEx d (flameproof enclosure).

The two versions (A and B) of the terminal compartment as well as their requirements are described in more detail in section 2.1 of these additional instructions.
1.3.3 Cable or conduit entries
Dependent on the explosion protection type that the terminal compartment is configured with, (see description on the previous page), can the terminal compartment be equipped with cable entries or conduit adapters. The used cable entries (glands and/or blind plugs) must have a ATEX approval in accordance with the type of protection of the terminal compartment.

Type of protection Intrinsic Safety category "ib" is only applicable for mains power supply systems with a maximum voltage of \( U_m = 60 \, \text{V} \). In this case "EEx ib" approved cable entries must be used, which are marked by a blue color.

The cable entry holes can be provided with a screw-thread size of Pg13.5, Pg16 or M20x1.5. For flameproof conduit systems, the terminal compartment must have type of protection flameproof enclosure "d" according to EN 50018. The conduits must be sealed by "EEx d" approved (within the ATEX 100a directive) sealing devices (i.e. stopping box) directly at the conduit entrances of the as flameproof enclosure performed terminal compartment.

ATEX approved "EEx d" cable glands, screw-threaded adapters as well as blind plugs are no integral part of the delivery package and must be purchased by the customer himself or can be ordered through their (local) Krohne representative as special parts!

2. ELECTRICAL CONNECTION
To connect external devices to the signal output terminals, the wiring requirements for the type of protection of the compartment must also be conform to the international or national standard involved (e.g. EN 60079-14). The terminal arrangement is shown by figure 1 below.

![Figure 1: Terminal arrangement in terminal compartment.](image-url)

The following outputs are available for connection to external circuits (see figure above):

- **Current output** (terminals I, I⊥)
  This circuit constitutes a passive 4-20 mA current loop and includes the HART protocol of the communication device (the polarity is free to choice).

- **Additional power supply** (terminals 1L=, 0L=)
  These terminals are connected to provide the 2x2 wire mode (choice of polarity is free).

- **Binary outputs** (terminals B1, B⊥, B2)
  Terminals B1 and B⊥ can be configured as pulse or status output through software. Terminals B2 and B⊥ can be configured as pulse or status output to NAMUR.
Galvanical separation of circuits:
  
- The internal electrode circuit with type of protection "EEx ib" is galvanically connected to the aluminum signal converter housing (i.e. PE potential).
- The current output, the additional power supply and the internal field current circuit are galvanically connected to each other.

2.1 Detailed description of the output circuits

The terminal compartment of the IFM 4042 K-EEx is, with respect to the explosion protection, available in two versions. The version can be identified by the information that is listed on the data plate, which is mounted on the signal converter housing.

**Version A: Terminal compartment in "EEx de [ib]" with \( U_m = 60 \text{ V} \).**

The customer can decide in which type of explosion protection the output circuits - current output, additional power supply and binary outputs (i.e. pulse and/or status outputs) - can be driven; in type of protection “EEx ib”, “EEx e” or “EEx d”.

The safety-technical maximum voltage \( U_h \) (maximum effective AC or DC voltage) of the mains power supply system for the terminal compartment in type of protection EEx de [ib] is restricted to 60 V. With this maximum voltage it is guaranteed that the protective components on which the intrinsic safety of these circuits depends are not overloaded. This condition is met if the mains power supply system satisfies the PELV requirements in accordance with IEC 364 / IEC 536.

**RESTRICTION !**

- It is not allowed to mix two different types of protection (e.g. current output in type of protection "EEx ib" and pulse/status outputs in "EEx e" or "EEx d").

**Version B: Terminal compartment in "EEx de" with \( U_m = 250 \text{ V} \).**

This version is intended for applications were the mains power supply system provides a maximum safety-technical voltage of \( U_h = 250 \text{ V} \). The terminals can either be provided with type of protection increased safety "EEx e" according to EN 50019 or flameproof enclosure "EEx d" conform to EN 50018. Type of protection intrinsical safety "EEx ib" is **not allowed** for this version.

**IMPORTANT NOTES (applicable for both versions)**

- The intrinsically safe "EEx ib" internal electrode circuit is supplied by the IFC 040-EEx signal converter electronics unit inside the electronics compartment. This circuit is separated from all other circuits up to a maximum voltage of \( U_h = 250 \text{ V} \) according to En 50020. The internal electrode circuit with type of protection intrinsic safety "ib" is galvanically connected with the PE (housing potential).
- The IFM 4042 K-EEx compact flowmeter must be incorporated within the equipotential bonding system of the installation in the hazardous area in accordance with the standard EN 60079-14. Therefore the internal or external M5 clamp terminal (i.e. PE) must be used. Disconnection of the equipotential bonding system is only allowed when the flowmeter is not energized.
• The current output (terminals I, I⊥) and the additional power supply (terminals 1L=, 0L=) must be galvanically separated connected and driven from each other. To avoid voltage or current summation, at least one of the two circuits must be isolated from earth potential. It is not allowed to drive both circuits at the same time with grounded zener barriers. Both current circuits, including all connection cables, must be galvanically separated at all times according to the valid regulations.

• Also in case of non-intrinsically safe connections, it is absolutely necessary to maintain a galvanic separation between the current output circuits and the additional power supply connections. Without a galvanic separation, the IFC 040-EEx signal converter electronics will be damaged, because these two circuits are internally connected to each other.

• A safe connection of the IFC 040-EEx signal converter electronics with the equipotential bonding system is achieved through the zinc-plated mounting frame, which must be securely screwed to the aluminum signal converter housing (PE potential) by means of two long-shafted screws. To access the two long-shafted screws it is necessary to unscrew the display unit and fold it aside. The screws must be tightly secured with a torque of 1.3 Nm (a 2 Pt. Phillips screwdriver is recommended).

2.2 Safety-technical data

The safety-technical data are listed in the table below.

Important: The functional-technical must also be regarded, therefore see the standard installation and operating instructions.

<table>
<thead>
<tr>
<th>Terminal designation</th>
<th>Function</th>
<th>Electrical data (per circuit)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Circuit 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I, I⊥</td>
<td>Current output, passive (2-wire connection) 4-20 mA, HART = possible</td>
<td>Maximum values: Uᵢ = 30 V, Iᵢ = 100 mA, Pᵢ = 1.0 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uᵢ = 14…36 Vdc</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Iᵢ = 4…20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Um = 250 V</td>
</tr>
<tr>
<td><strong>Circuit 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1L=, 0L=</td>
<td>Additional power supply (4-wire connection) additional to circuit 1 (optional)</td>
<td>Maximum values: Uᵢ = 20 nF, Lᵢ = 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uᵢ = 36 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Iᵢ = 100 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Um = 250 V</td>
</tr>
<tr>
<td><strong>Circuit 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B₁, B⊥</td>
<td>Passive pulse/status output 1</td>
<td>Maximum values: Uᵢ = 30 V, Iᵢ = 100 mA, Pᵢ = 1.0 W</td>
</tr>
<tr>
<td>B₂, B⊥</td>
<td>Passive pulse/status output 2</td>
<td>Cᵢ = 0, Lᵢ = 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uᵢ = 36 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Iᵢ = 100 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Um = 250 V</td>
</tr>
</tbody>
</table>

Table 4: Safety-technical data of output circuits.

2.3 Connection examples

In this section two examples for connection of the IFM 4042 K-EEx compact flowmeter are described for operation in the 2-wire mode (figure 2) as well as in the 2x2-wire mode (figure 3).

See figure 2 on the next page. It shows an IFM 4042 K-EEx with the terminal compartment in version A (EEx de [ib] with Uᵢ = 60 V). The flowmeter is connected through a so-called transmitter power supply ("EEx i" approved) in 2-wire mode. If data communication with the flowmeter through the HART protocol is required, the transmitter power supply unit must be HART compatible. Terminals I, I⊥ are not polarity sensitive.
The entity parameters of the “EEx i” approved transmitter power supply, including the cable capacitances and inductances, must fit the entity parameters of the IFM 4042 K-EEx compact flowmeter, namely \( U_0 \leq 30 \text{ V} \), \( I_0 \leq 100 \text{ mA} \). Suitable HART compatible transmitter power supplies that can be used in combination of the Altoflux 2W IFM 4042 K-EEx are:

- Phoenix PI/Ex-ME-RPSS-I/I;
- CEAG 6/420.

Figure 2: Connection of IFM 4042 K-EEx in 2-wire mode.

Figure 3: Connection of IFM 4042 K-EEx.
Figure 3 on the previous page shows an example of the connection of the IFM 4042 K-EEx in 2x2-wire mode. As in the previous example (figure 2), the terminal compartment of the IFM 4042 K-EEx is performed as version A, which means that it is provided with type of protection "EEx de [ib]".

The additional power supply (terminals 1L=, 0L=) of the IFM 4042 K-EEx is supplied by an external power supply unit through an ATEX approved "EEx i" zener barrier with a linear output load. The connection of the current output (terminals I, I⊥) and the additional power supply (terminals 1L=, 0L=) is insensitive for polarity reversal.

**IMPORTANT !**

Only one of the two connected circuits of the IFM 4042 K-EEx, namely the "current output" or the "additional power supply" may be earthed to maintain the required galvanic separation between the two circuits!

The voltage of the external power supply unit must be carefully chosen to keep it within the allowed limits. The upper limit is determined by the maximum working voltage of the zener barrier, which in general lies a few volts below the maximum open voltage value Uo of the used zener barrier. The lower limit is determined by the sum of the minimum working voltage of the additional power supply of the IFM 4042 K-EEx flowmeter of 14 V and the voltage drop over the zener barrier that is caused by the end-to-end resistance of the barrier. This voltage drop can be significant. The above described determination of the external power supply voltage is explained by the following example.

**Example with typical parameters:**

Zener barrier data:  
Uo = 28 V  
I0 = 93 mA  
Maximum working voltage = 25.5 V  
End-to-end resistance = 340 Ω.

The voltage drop across the end-to-end resistance of the zener barrier is:  
22 mA x 340 Ω = 7.5 V

This means that the external power supply must supply an output voltage to the zener barrier that lies in the range somewhere between 21.5…25.5 V. The voltage over the terminals of the additional power supply of the IFM 4042 K-EEx is in that case between the required 14.0…18.0 V.

3. **OPERATION OF THE SIGNAL CONVERTER**

The IFM 4042 K-EEx contains the IFC 040-EEx signal converter electronics unit, which is equipped with a display unit that contains magnetic Hall sensors. These Hall sensors enable the settings of the IFC 040-EEx electronics unit to be set respectively reset with the help of the with the apparatus delivered bar magnet without opening the flameproof signal converter housing in the hazardous area.

Consult the standard Installation and Operating Instructions for the program functions of the software of the IFC 040-EEx electronics unit.
4. REPLACEMENT OF ELECTRONICS UNIT

**IMPORTANT !**
The following instructions must be followed carefully, when the IFC 040-EEx signal converter housing has to be opened respectively closed again!

**Before opening:**
- Make absolutely sure that there is no explosion hazard!
- If necessary provide a "Gas-free certificate"!
- Make sure that all connecting cables are safely isolated from the power supply!
- Allow the prescribed waiting time to elapse before opening the housing:
  - 20 minutes for temperature class T6
  - 11 minutes for temperature class T5

When the instructions above are strictly followed, the display cover (with the glass window) can be removed. First unscrew the recessed head screw of the interlocking device by a hollow-head screw wrench size 3, until the cover can rotate freely. Unscrew the cover with the special plastic wrench (black) that is supplied with the apparatus.

Then continue as follows:
1. Remove the display cover of the electronics compartment.
2. Unscrew the two screws of the display unit and turn it carefully aside.
3. Carefully disconnect the 12 pin connector (for field coil and electrode circuits connection) from the electronics unit.
4. Unscrew the two mounting screws of the electronics unit, which fixes the zinc-plated frame to the back of the signal converter housing. A screwdriver with a long shaft like the screwdriver type 2 Pt. Phillips is most suitable.
5. Carefully remove the electronics unit of the converter housing (see the Remark below).
6. Reassemble in reverse order with the replacement of the IFC 040-EEx electronics unit.

**After opening:**
- The zinc-plated frame of the IFC 040-EEx electronics unit must be securely screwed to the housing (back-end of electronics compartment) by the two non-removable fastening screws. Screw them with a tightening torque of 1.3 Nm. These two screw-connections also establish the safety-technical connection of the electronics unit to the signal converter housing and equipotential bonding system. Before the two screws can be accessed, the display unit must be removed via their two screws.
- Before the cover is screwed back into the housing, the screw-thread must be clean and well-greased with an acid and resin-free grease, e.g. silicone grease.
- Screw the display cover as tight as possible into the housing by hand, so that the gasket of the cover must be clamped to provide the required Ingress Protection (IP) degree.
- Screw the recessed head screw of the interlocking device tight.

Refer to the standard Installation and Operating Instructions for detailed information about resetting and reprogramming the new electronics unit after replacement.

**REMARK !**
Carefully keep the connecting cables of the field coil and electrode circuits to the side of the housing, while removing respectively inserting the electronics unit into the signal converter housing. This is to prevent damaging of the connecting cables!
5. EQUIPOTENTIAL BONDING SYSTEM

The IFM 4042 K-EEx electromagnetic compact flowmeter must be incorporated into the equipotential bonding system. Therefore the bonding conductor with a maximum cross-sectional area of 4 mm$^2$ (AWG 10) must be connected to the external U-clamp terminal M5 that is press-fitted in the connecting flange at the bottom of the neck of the flameproof signal converter housing.

The U-clamp terminal is made of nickel-plated brass to prevent it for corrosion. When the IFM 4042 K-EEx is incorporated in the equipotential bonding system, make sure that the core of the bonding wire is properly mounted under the U-clamp and that the screw is tightly fixed.

6. TECHNICAL DATA

See also the standard installation and operating instructions of the Altoflux 2W magnetic-inductive compact flowmeter type IFM 4042 K-EEx.

Ambient temperature: -40°C…+60°C.

Process liquid temperature: See EC-type Examination Certificate of the IFM 4042 K-EEx with No. KEMA 01 ATEX 2200 X or the two tables below.

<table>
<thead>
<tr>
<th>Temperature class (for gases)</th>
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</tr>
<tr>
<td></td>
<td></td>
<td>$T_a \leq 50°C$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_a \leq 60°C$</td>
</tr>
<tr>
<td>T5</td>
<td>T100°C</td>
<td>75°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75°C</td>
</tr>
<tr>
<td>T4</td>
<td>T135°C</td>
<td>95°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>90°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75°C</td>
</tr>
<tr>
<td>T3</td>
<td>T180°C</td>
<td>130°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>115°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75°C</td>
</tr>
</tbody>
</table>

Table 5: Temperature classification DN10…20 and DN200 and larger.

<table>
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<th>Maximum process liquid temperature</th>
</tr>
</thead>
<tbody>
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<td>$T_a \leq 40°C$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_a \leq 50°C$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_a \leq 60°C$</td>
</tr>
<tr>
<td>T5</td>
<td>T100°C</td>
<td>70°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70°C</td>
</tr>
<tr>
<td>T4</td>
<td>T135°C</td>
<td>85°C</td>
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<td>85°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>85°C</td>
</tr>
<tr>
<td>T3</td>
<td>T180°C</td>
<td>120°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120°C</td>
</tr>
<tr>
<td>Use heat-resistant cables above</td>
<td></td>
<td>115°C</td>
</tr>
</tbody>
</table>

Table 6: Temperature classification DN25…150.

NOTES:
- $T_a$ represents the maximum ambient temperature.
- The maximum process liquid temperatures listed in the above tables apply for measuring tubes that have a PFA liner and are absolute safety-technical limits. Due to function-technical reasons (e.g. different lining material) lower process liquid temperatures can be in effect.

7. MAINTENANCE

The IFM 4042 K-EEx electromagnetic compact flowmeters are maintenance free with regard to the flowmetering properties. Within the scope of the periodical inspections, which are required for electrical apparatus that are installed and used in hazardous classified locations, it is recommended to check the flameproof enclosure(s).
8. CONNECTION DIAGRAM

Hazardous locations of Zone 1 and 2

IFS 4000...-EEx
Primary Head
Intrinsically safe electrode circuits
Increased safe field coil circuit

Coil
Flow tube
E
E
Coil

EQUIPOTENTIAL BONDING CONDUCTOR ≥ 4 mm² (OPTIONAL)
Electrode cables - white/pink
(PTFE insulated shielded copper)

FIELD COIL WIRE - green/blue
(PTFE insulated copper)

Flameproof (EEx d) cable
feed-through LC-2/EEx

Flameproof (EEx d) terminal feed-through

IFS 4000...-EEx
Signal Converter

CURRENT OUTPUT
BINARY OUTPUTS
ADD. POWER SUPPLY
TERMINAL COMPARTMENT

ELECTRONICS COMPARTMENT (always “EEx d”)

Intrinsically safe ("ib")
electrode circuits
(No. “2”, “3”, “1”)

Increased safe ("e")
field coil circuits
(No. “7”, “8”)

PE

TERMINAL COMPARTMENT

1L= 0L= PE

A
B

SIGNAL IN-/OUTPUTS
1L= 0L= PE

Flow tube

Hazardous locations of Zone 1 and 2
9. ORDERING INFORMATION

In case of questions about spare or replacing parts contact your local Krohne representative. The part number of the IFC 040-EEx electronics unit is 2.12896.01.00.

10. DATA PLATES

<table>
<thead>
<tr>
<th>Figure 4: Data plate of IFM 4042 K-EEx, type &quot;EEx de [ib]&quot;.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Figure 5: Data plate of IFM 4042 K-EEx, type &quot;EEx de&quot;.</th>
</tr>
</thead>
</table>
Figure 6: Data plate IFM 4042 K-EEx, type EEx e [ib].

DO NOT OPEN ENCLOSURE WHEN ENERGIZED!
WAITING TIME BEFORE OPENING OF THE FLAMEPROOF ENCLOSURE: T6 ≥ 20 MIN.; T5 ≥ 11 MIN.
MAX. SHORT-CIRCUIT CURRENT OF MAINS _______ A

Electrode circuit: only internal connections EEEx ib IIC
Signal in-/outputs are possible in type of protection Intrinsically safe (EEEx ib) or increased safety (EEEx e)
Consult manual!

<table>
<thead>
<tr>
<th>Circuits</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1L</td>
<td>Current output 4–20 mA (passive)</td>
</tr>
<tr>
<td>1L=/0L</td>
<td>Additional power supply</td>
</tr>
<tr>
<td>B1/B2/B3</td>
<td>Binary outputs (passive)</td>
</tr>
</tbody>
</table>

Data for Intrinsically safe (EEEx ib) signal connections. Maximum values

<table>
<thead>
<tr>
<th>Circuits</th>
<th>U=14–36Vdc; I=4–20mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1L</td>
<td></td>
</tr>
<tr>
<td>1L=/0L</td>
<td></td>
</tr>
<tr>
<td>B1/B2/B3</td>
<td></td>
</tr>
</tbody>
</table>

Data for increased safety (EEEx e) or Flameproof enclosure (EEEx e) signal connections. Electrical data

<table>
<thead>
<tr>
<th>Circuits</th>
<th>U &lt; 36V; I &lt; 100mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1L</td>
<td></td>
</tr>
<tr>
<td>1L=/0L</td>
<td></td>
</tr>
<tr>
<td>B1/B2/B3</td>
<td>Um = 60V (for all circuits)</td>
</tr>
</tbody>
</table>

AMBIENT TEMPERATURE: -40...+60°C
SEE CERTIFICATE FOR MAXIMUM TEMPERATURES.
SERIAL NO.
EC-TYPE EXAMINATION CERTIFICATE

(1) EC-TYPE EXAMINATION CERTIFICATE

(2) Explanation or protective system marketed by use in potentially explosive atmospheres - Directive 94/9/EC.

(3) EC-Type Examination Certificate Number: KEMA 191ATE3220.0

(4) Explanation or protective system: Compact Magnetic Inductive Flowmeter, types IFM 4080 49...EX, IFM 4082 H-EX, M450 49...EX and M450 49...H-EX

(5) Manufacturer: Vendee Automation

(6) Address: Workplaat 12, 5313 LA Breda, The Netherlands

(7) This equipment or protective system and any acceptable variants thereof is specified in this schedule to the certificate and the documents therein referred to.

(8) KEMA Qualif. B.V. notified body number 034 in accordance with Article 9 of the Council Directives 94/9/EC of 20 March 1994, certifies that the equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex I to the Directive.

The examination and test results are recorded in confidential report no. 391185A.

(9) Compliance with the Essential Health and Safety Requirements has been assessed by conformity with:

EN 50654: 1997
EN 20911: 2009
EN 50220: 1994
EN 50515: 2003
EN 50281-1-1: 1998

(10) If the mark "A" is shown after the certificate number, it indicates that the equipment or protective system is subject to special conditions for use as specified in the schedule to the certificate.

(11) This EC-Type Examination Certificate covers only to the design, manufacture and tests of the equipment or protective system in accordance with the Directive 94/9/EC. Further requirements of the Legislation apply to the manufacturing process and supply of the equipment or protective system. These are recorded by the certificate.

(12) The marking of the equipment or protective system shall include the following:

Ex [10]
Ex d ii 1 or 2 G X: IC IC TH...T3
Ex e i 1 or 2 G X: IC IC TH...T3

(13) SCHEDULE

To EC-Type Examination Certificate KEMA 191ATE3220.0

(14) Description

The Compact Magnetic Inductive Flowmeter, types IFM 4080 49...EX, IFM 4082 H-EX, M450 49...EX and M450 49...H-EX is used for measuring, counting and displaying the linear flow rate of an electrical conductive fluid.

The flowmeter consists of a signal converter having a type of explosion protection flameproof enclosure "e" with a terminal compartment in type of explosion protection flameproof enclosure "d" or increased safety "i". The integral primary head is of type of explosion protection flameproof enclosure "d" (cases DN25 - DN150) or increased safety "i" (DN300 - DN1000) and are provided with measuring electrodes in type of explosion protection flameproof enclosure "e" in IC.

Ambient temperature range: -20°C...+40°C (for flowmeter with electronics unit type IFM 4090).
Ambient temperature range: -40°C...+60°C (for flowmeter with electronics unit types IFM 4090 and IFM 5000).

The maximum surface temperature of the unit body is based on a maximum ambient temperature of 60°C.

(15) Electrical data

Table:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>110/209 V, 150/332 Vac -15/+10 %, 10 VA</td>
</tr>
<tr>
<td></td>
<td>24 Vac, 300 mA, 24 Vac, 15/+13 %, 8 W</td>
</tr>
<tr>
<td></td>
<td>Ue = 253 V</td>
</tr>
<tr>
<td>Signal PCBs</td>
<td>&lt;0.36 W</td>
</tr>
</tbody>
</table>

IFM 4080 49...EX / M450 49...EX with IFM 3900-420 Electronics

Table:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>110/209 V, 150/332 Vac -15/+10 %, 15 VA</td>
</tr>
<tr>
<td></td>
<td>24 Vac, 305 mA, 24 Vac, 15/+13 %, 10 W</td>
</tr>
<tr>
<td></td>
<td>Ue = 253 V</td>
</tr>
<tr>
<td>Signal circuit Modules FA-5A and FA-5T</td>
<td></td>
</tr>
</tbody>
</table>

The effective internal resistance Ri is negligibly small.

(16) Page 2/6
SCHEDULE

for EC-Type Examination Certificate KEMA 01ATEX2200 X

Electrical data (continued)

Signal circuit

- Module F-P-F and F-T

- in type of explosion protection intrinsic safety EEx i IIC

- for instance: Supply of the RISCO Modul in accordance with document C09/056/10-01/00 (Dec. 2000) in type of explosion protection intrinsic safety EEx i IIC

- EEx i IIC or EEx i IIB or EEx i IIA

- with the following maximum values:

- \( U_1 = 35 \text{ V} \)
- \( I_1 = 200 \text{ mA} \)
- \( P_1 = 4.3 \text{ W} \)

- The effective internal capacitance \( C_i = 5 \text{ nF} \)

- the effective internal inductance \( L_i \) is negligibly small.

- Signal supply circuit

- Module G1

- (24 Vac/dc version only)

- in type of explosion protection intrinsic safety EEx i IIC

- with the following maximum values:

- \( U_1 = 33.5 \text{ V} \)
- \( I_1 = 8.4 \text{ mA} \)
- \( P_1 = 0.6 \text{ W} \)

- Maximum allowed external capacitance \( C = 12 \text{ nF} \)

- maximum allowed external inductance \( L = 4 \text{ mH} \)

- Only for connection to intrinsically safe circuits of type explosion protection intrinsic safety EEx i IIC or EEx i IIB or EEx i IIA or BEx i IIC or Ex i IIB or without supply (passive).

The applicable type of explosion protection of the aforementioned intrinsically safe circuits EEx i IIC is determined by the type of protection of the intrinsically safe circuit which is connected to it, respectively EEx i IIC is IIC.

The aforesaid type of explosion protection of the aforementioned intrinsically safe circuits EEx i IIC is determined by the type of protection of the intrinsically safe circuit which is connected to it, respectively EEx i IIB or EEx i IIA.

The aforesaid intrinsically safe circuits shall, from the safety point of view, be considered to be connected to ground.

Safety instructions

- The signal supply circuits may all be connected either intrinsically safe or non-intrinsically safe.

- A combination of intrinsically non-intrinsically safe connections forever is not allowed.

- a) Connection to a non-intrinsically safe circuit.

- Signal supply circuit 1

- 14 - 36 Vac; 4 - 20 mA

- Signal supply circuit 2

- 14 - 36 Vac; 22 mA

- Signal supply circuit 3

- max. 36 Vdc; 100 mA

- Installation instructions

- For use in potentially explosive atmospheres of flammable gases, fluids or vapours.

- The cable entry device shall be in type of protection flameproof enclosure "d" for the terminal compartment in type of protection flameproof enclosure "d" or increased safety "e" or the terminal compartment in type of protection increased safety "e", suitable for the conditions of use and correctly installed.

- For use in the presence of combustible dust.

- The cable entry device shall be in type of equipment Category II 2 D, suitable for the conditions of use and correctly installed.

- Unsealed openings shall be closed with suitable certified sealing elements.

- With the use of override, a suitable certified sealing device such as a closing box with sealing compound shall be provided immediately at the entrance to the flameproof enclosure.

- Routine tests

- Each tested primary head of size DN201 - DN50 must be submitted to the routine overpressure test according to EN 50018, Clause 15 at a test pressure of 14 bar during one minute.
(13) SCHEDULE

to EC-Type Examination Certificate KEMA 21ATEX230 I

Routine tests (continued)

- Routine tests according to EN 50018, Clause 16, are not required for the electronics enclosure since the type test has been made at a static pressure of 2.5 times the reference pressure.

Each primary head of size DIN28 ENI0000 shall withstand a test voltage according to EN 60698, Clause 6.1, of 1000 V during 1 minute without breakdown between the field coil and the end coil and a test voltage of 1500 Vms during one minute without breakdown between the field coil circuit and the intentionally safe earth circuit.

(15) Report

KEMA Inc. 0110341.

(17) Special conditions for safe use

The relation between temperature class, maximum surface temperature, maximum process temperature and ambient temperature is shown in the following tables.

i) Motor sizes DN15 - DN115

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Max. surface temperature</th>
<th>Max. process temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>70°C</td>
<td>T ≤ 40°C</td>
</tr>
<tr>
<td>T5</td>
<td>70°C</td>
<td>T ≤ 50°C</td>
</tr>
<tr>
<td>T4</td>
<td>70°C</td>
<td>T ≤ 60°C</td>
</tr>
<tr>
<td>T3</td>
<td>80°C</td>
<td>T ≤ 50°C</td>
</tr>
<tr>
<td>T2</td>
<td>90°C</td>
<td>T ≤ 60°C</td>
</tr>
</tbody>
</table>

For T5 ≥ 50°C and a process temperature ≤ 15°C, heat resistant cables with a continuous operating temperature of at least 100°C must be used.

i) Motor sizes DN200 - DN1000

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Max. surface temperature</th>
<th>Max. process temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>70°C</td>
<td>T ≤ 40°C</td>
</tr>
<tr>
<td>T5</td>
<td>70°C</td>
<td>T ≤ 50°C</td>
</tr>
<tr>
<td>T4</td>
<td>70°C</td>
<td>T ≤ 60°C</td>
</tr>
<tr>
<td>T3</td>
<td>80°C</td>
<td>T ≤ 50°C</td>
</tr>
<tr>
<td>T2</td>
<td>90°C</td>
<td>T ≤ 60°C</td>
</tr>
</tbody>
</table>

(19) Essential Health and Safety Requirements

Covered by the standards listed at (9).