Magnetic-inductive flowmeters

ALTOFLUX
IFM 4080 K-EEEx
IFM 4080 K/i-EEEx
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 4080 K or IFM 4080 K / i - EEx magnetic-inductive 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 IFM 4080 K/…-EEx magnetic-inductive compact flowmeter is in accordance with the European Directive 94/9 EC (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 4080 K/…-EEx has the following approval number.

| KEMA 01 ATEX 2200 X |

The compact flowmeter is available in two types, namely:

- IFM 4080 K-EEx regular explosion protected version;
- IFM 4080 K/i-EEx, MODIS version. This type has intrinsically safe signal output circuits, which are provided by two on the IFC 090i-EEx electronics unit installed MODIS modules.

The regular IFM 4080 K-EEx compact flowmeter is designed for ambient temperatures in the range of -20°C (special -40°C) up to +60°C, the MODIS version type IFM 4080 K/i-EEx is rated for ambient temperatures from -20°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>T6</td>
<td>T85°C</td>
<td>T_a ≤ 40°C T_a ≤ 50°C T_a ≤ 60°C</td>
</tr>
<tr>
<td>T5</td>
<td>T100°C</td>
<td>75°C 70°C 70°C</td>
</tr>
<tr>
<td>T4</td>
<td>T135°C</td>
<td>95°C 90°C 75°C</td>
</tr>
<tr>
<td>T3</td>
<td>T180°C</td>
<td>130°C 115°C 75°C</td>
</tr>
</tbody>
</table>

Table 1: Temperature classification DN200 and larger.

<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>T6</td>
<td>T85°C</td>
<td>T_a ≤ 40°C T_a ≤ 50°C T_a ≤ 60°C</td>
</tr>
<tr>
<td>T5</td>
<td>T100°C</td>
<td>70°C 70°C 70°C</td>
</tr>
<tr>
<td>T4</td>
<td>T135°C</td>
<td>120°C 115°C 75°C</td>
</tr>
<tr>
<td>T3</td>
<td>T180°C</td>
<td>180°C 115°C 75°C</td>
</tr>
</tbody>
</table>

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

The IFM 4080 K/…-EEx flowmeter consists of the IFC 090/…-EEx signal converter unit, which is screwed on top of the primary head (i.e. measuring unit). The compact flowmeter is marked with one of the codes below, depending on the meter size:

- DN25-150: II 2GD EEEx d [ib] IIC T6...T3 (EEEx d terminal compartment) or II 2GD EEEx de [ib] IIC T6...T3 (EEEx e terminal compartment).
- DN200 and up: II 2GD EEEx de [ib] IIC T6...T3 (both EEEx d and EEEx e terminal compartment).
In case of the MODIS version IFM 4080 K/i-EEEx, the electronics unit of type IFC 090i-EEEx is provided with protective modules, which provide intrinsically safe output signals of category "ia". The flowmeter is then marked with one of the following codes:

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

For details see the EC-type examination certificate in Section 11 of these instructions.

### 1.2 Primary head

The primary head is the measuring unit of the IFM 4080 K/…-EEEx compact flowmeter and contains two field coils (see table 3 for 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>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 4080K/…-EEEx compact flowmeter are only internal circuits and not accessible for the customer.

### 1.3 IFC 090/…-EEEx signal converter

The IFC 090/…-EEEx 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 IP67 conform to EN 60529.

#### 1.3.1 Electronics compartment

The electronics compartment accommodates the pre-certified IFC 090…-EEEx electronics unit with approval number PTB 98 ATEX 2012 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 power supply and signal output circuits. Chapter 2 and 7 show the terminal arrangement for the regular and MODIS version of the IFC 090/…-EEEx signal converter. The terminal arrangement of the MODIS version (i.e. IFC 090i-EEEx) is shown in figure 4 on page 6. Two of the terminals are used for connection of the non-intrinsically safe power supply and four terminals (marked with "**") for the intrinsically safe, category "ia" signal outputs of the MODIS modules. The non-intrinsically and intrinsically safe terminals are separated from each other by a metal dividing plate, which is screwed to the remaining (not connected) M4 terminal. The two non-intrinsically safe power supply terminals are covered by an insulating plate.
The terminal compartment (with standard type of protection increased safety "e") is standard equipped with two ATEX approved "EEx e" cable glands. The terminal compartment can also be provided as a flameproof enclosure "d", in which case ATEX approved "EEx d" cable glands of size Pg13.5, Pg16 or M20x1.5 are either factory installed or must be installed by the customer. 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.

1.4 Electronics unit

The IFM 4080 K/…-EEx magnetic-inductive compact flowmeter can be equipped with the regular IFC 090-EEx or with the IFC 090i-EEx electronics unit with intrinsically safe signal outputs (i.e. MODIS version). The next subsections give a detailed description of these units.

1.4.1 Regular IFC090-EEx electronics unit

The IFC 090-EEx is used in the regular IFM 4080 K-EEx and can be equipped with one of the following power supplies (depends on the area of application).

<table>
<thead>
<tr>
<th>Power supply</th>
<th>Terminal</th>
<th>Function</th>
<th>Electrical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC-versions</td>
<td>L</td>
<td>Live</td>
<td>U_n = 100/115/200/230 V_ac -15/+10%</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Neutral</td>
<td>P_n = approx. 10 VA, U_m = 253 V</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>Protective Earth</td>
<td></td>
</tr>
<tr>
<td>AC/DC-version</td>
<td>1L</td>
<td>Live</td>
<td>U_n = 24 V ac/dc</td>
</tr>
<tr>
<td></td>
<td>0L</td>
<td>Neutral</td>
<td>AC: -15/+10%, P_n=10 VA</td>
</tr>
<tr>
<td></td>
<td>FE</td>
<td>Functional Earth</td>
<td>DC: -25/+30%, P_n=8 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>U_m = 253 V</td>
</tr>
</tbody>
</table>

Table 4: Electrical data of power supply.

The IFC 090-EEx electronics unit is equipped with the following in-/output circuits. Terminals B1, B⊥ and B2 can be configured as status or pulse outputs or as control inputs via the software. See the table below for the electrical data of these in-/output circuits.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Description</th>
<th>Nominal voltage</th>
<th>Maximum current</th>
</tr>
</thead>
<tbody>
<tr>
<td>I+, I</td>
<td>Current output</td>
<td>15 V</td>
<td>22 mA</td>
</tr>
<tr>
<td>B1, B⊥, B2</td>
<td>Pulse, status, control in-/outputs</td>
<td>32 V</td>
<td>150 mA</td>
</tr>
</tbody>
</table>

Table 5: Electrical data of in-/output circuits.

1.4.2 IFC 090i-EEx unit with MODIS modules

The IFC 090i-EEx electronics unit is equipped with a pair of MODIS-modules (see page 8). It is equipped with one of the following power supplies.

<table>
<thead>
<tr>
<th>Power supply</th>
<th>Terminals</th>
<th>Function</th>
<th>Electrical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC-version</td>
<td>L</td>
<td>Live</td>
<td>U_n = 100…230 Vac -15%/+10%</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Neutral</td>
<td>P_n = 15 VA, U_m = 253 V</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>Protective Earth</td>
<td></td>
</tr>
<tr>
<td>AC/DC-version</td>
<td>1L</td>
<td>Live</td>
<td>U_n = 24 Vac/dc</td>
</tr>
<tr>
<td></td>
<td>0L</td>
<td>Neutral</td>
<td>AC: -15%/+10% or 20.4…26.4 Vac</td>
</tr>
<tr>
<td></td>
<td>FE</td>
<td>Functional Earth</td>
<td>DC: -25%/+30% or 18…32 Vdc</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>P_n = 10 W, U_m = 253 V</td>
</tr>
</tbody>
</table>

Table 6: Electrical data of IFC 090i-EEx electronics unit.

NOTE: The mains fuses for both electronics units are listed in Section 8 of this manual.
2 ELECTRICAL CONNECTION

2.1 Equipotential bonding system

The IFM 4080 K-EEx and IFM 4080 K / i-EEx flowmeters must always be incorporated into the equipotential bonding system of the hazardous area. This connection can be achieved through the PE/FE conductor connected to the PE terminal in the terminal compartment (see figure 1) or through a separate PE conductor, cross sectional area at least 4 mm², connected to the external PE clamp, placed below the converter housing.

2.2 Regular IFC 090-EEx electronics unit

The field cables that enter the terminal compartment of the IFC 090-EEx signal converter unit (i.e. power supply, current and binary outputs) are non-intrinsically safe. To connect external devices to the signal output terminals, the wiring requirements for the type of protection of the compartment (standard: increased safety "e", optional: flameproof "d") must 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.

---

**Figure 2** Passive pulse/status output

**Figure 3** Active current output
Note:
The binary outputs (terminals B1, B⊥ and B2) can only be configured as passive outputs, the current output (terminals I+ and I) can only be configured as active output.

### 2.3 MODIS version IFC 090i-EEx electronics unit

The field cables of the **non-intrinsically safe** power supply and the **intrinsically safe, category "ia"** signal outputs enter the terminal compartment of the IFC 090i-EEx signal converter unit via two separate entrances. To connect external devices to the intrinsically safe signal output terminals, the wiring requirements for their type of protection as well as of the compartment (standard: increased safety "e", optional: flameproof enclosure "d") must be conform to the international or national standard involved (e.g. EN 60079-14). Figure 4 below shows the terminal arrangement inside the terminal compartment.

![Figure 4: Terminal arrangement in terminal compartment.](image)

The non-intrinsically safe terminals for connection of the power supply (1Lǂ and 0Lǂ) must be connected according to the relevant standard code of practice for electrical apparatus intended for use in potentially hazardous locations, type of protection Increased Safety "e" or type of protection Flameproof Enclosure "d", depending on the type of protection of the terminal compartment of the signal converter housing.

To gain access to the connection terminals of the power supply, the half-circular cover plate of insulating material must be slightly lifted at one end and then rotated downwards, see the instruction on the cover plate. After connection of the power supply cable, the half-circular cover plate must be restored into its original position, so that the minimum clearances and creepage distances towards the **intrinsically safe** signal in-/output terminals are maintained.
See for details figure 5.

Figure 5: Terminal compartment MODIS version IFC 090i-EEEx.
The PE (or FE) conductor must be connected to the press-fitted M5 clamp terminal marked inside the terminal compartment. This conductor must be guided through the rectangular opening in the metal dividing plate that separates the non-intrinsically safe power supply terminals from the intrinsically safe signal in-/output terminals.

2.3.1 Connection diagrams MODIS

Section 7 shows the block diagram of the IFM 4080 K/ i...-EEx magnetic-inductive compact flowmeter. The power supply (terminals 1L= 0L=) is connected via cable B. The PE terminal must be connected to the protective earth conductor of the mains supply.

The IFC 090i-EEx electronics unit is provided with intrinsically safe signal in-/output circuits due to the installed pair of MODIS modules in accordance with the table below.

<table>
<thead>
<tr>
<th>Module</th>
<th>Terminal designation</th>
<th>Function / Intrinsically safe maximum data</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-SA</td>
<td>I⊥, I</td>
<td>Current output (0/4-20 mA), passive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(U_i = 30) (V), (I_i = 250) (mA), (P_i = 1.0) (W)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(C_i = 5) (nF), (L_i = 0)</td>
</tr>
<tr>
<td>FA-ST</td>
<td>B1, B1⊥ or B2, B2⊥</td>
<td>Pulse (frequency) output or status in-/output, all passive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(U_i = 30) (V), (I_i = 250) (mA), (P_i = 1.0) (W)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(C_i = 5) (nF), (L_i = 0)</td>
</tr>
<tr>
<td>F-PA</td>
<td>D, D⊥</td>
<td>Fieldbus module, type Profibus system, passive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(U_i = 30) (V), (I_i = 300) (mA), (P_i = 4.2) (W)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(C_i = 5) (nF), (L_i = 0)</td>
</tr>
<tr>
<td>F-FF</td>
<td>D, D⊥</td>
<td>Fieldbus module, type Fieldbus Foundation, passive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(U_i = 30) (V), (I_i = 300) (mA), (P_i = 4.2) (W)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(C_i = 5) (nF), (L_i = 0)</td>
</tr>
<tr>
<td>DC-I</td>
<td>I+, B1+</td>
<td>Intrinsically safe voltage source for the passive module P-SA or FA-ST, so that active operation is possible.</td>
</tr>
<tr>
<td>(see note)</td>
<td></td>
<td>(U_o = 23.5) (V), (I_o = 98) (mA), (P_o = 0.6) (W)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(C_o = 132) (nF)(^\dagger), (L_o = 4) (mH)</td>
</tr>
</tbody>
</table>

**Table 7**: Overview of MODIS modules.

NOTES:

- Besides the shown intrinsically safe maximum values for voltages and current -which are based on certain fault conditions as prescribed by the standard EN 50 020 - the nominal values for current and voltage must also be respected otherwise a proper functioning of the modules is not guaranteed! See table 8 for the nominal values.

- The active module DC-I is needed in the 24 Vac/dc power supply version to form an active current or pulse output in combination with one of the passive modules P-SA or FA-ST. Due to limited space it is **not** available for 100...230 Vac supply versions.

Table 9 shows the possible combinations of the installed MODIS modules for the 24 Vac/dc power supply version of the IFC 090i-EEx and table 10 for the 100-230 Vac version.

\[\dagger\] When modules P-SA (or FA-ST) and DC-I are connected in series, the internal capacitance \(C_i\) of 5 \(nF\) must be subtracted from the \(C_o\) of 132 \(nF\). So the data plate will list a \(C_o\) of 127 \(nF\).
<table>
<thead>
<tr>
<th>MODIS module</th>
<th>Nominal values for voltage and current</th>
</tr>
</thead>
</table>
| P-SA (passive current output) | Current: 4 .. 20 mA  
Working voltage: 8 .. 30V  
Voltage drop: 8V at 4mA |
| FA-ST (frequency/pulse/status output or control input) | Working voltage: 6 .. 30V  
Working current: < 110 mA  
Voltage drop: in ON-state: < 2V at 110 mA  
Leakage current in OFF-state: < 900 µA at 30V  
Control input:  
Input voltage LOW level: < 3V  
Input voltage HIGH level: > 7V  
Frequency range: 0 .. 12 KHz |
| DC-I (active voltage source) | Voltage: 20V  
Current: 30 mA  
Internal resistance: 260 |

**Table 8:** Nominal voltage and current values for the MODIS modules

<table>
<thead>
<tr>
<th>IFC 090i-EEx version</th>
<th>Part No.</th>
<th>MODIS modules</th>
<th>Terminal designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex-i1</td>
<td>2.11582.01.00</td>
<td>P-SA</td>
<td>FA-ST</td>
</tr>
<tr>
<td>Ex-i2</td>
<td>2.11582.03.00</td>
<td>P-SA</td>
<td>F-PA</td>
</tr>
</tbody>
</table>
| Ex-i3 | 2.11582.02.00 | P-SA | DC-I | I+  
| Ex-i4 | 2.11582.05.00 | FA-ST | F-PA | B1 B1⊥ D D ⊥ |
| Ex-i5 | 2.11582.06.00 | FA-ST | DC-I | B1+  
| Ex-i6 | 2.11582.07.00 | FA-ST | FA-ST | B2 B2⊥ B1 B1⊥ |
| Ex-i7 | 2.11582.08.00 | P-SA | F-FF | I ⊥ I D D ⊥ |
| Ex-i8 | 2.11582.09.00 | FA-ST | F-FF | B1 B1⊥ D D ⊥ |

**Table 9:** IFC 090i-EEx 24 Vac/dc versions.

<table>
<thead>
<tr>
<th>IFC 090i-EEx version</th>
<th>Part No.</th>
<th>MODIS modules</th>
<th>Terminal designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex-i1</td>
<td>2.12253.01.00</td>
<td>P-SA</td>
<td>FA-ST</td>
</tr>
<tr>
<td>Ex-i2</td>
<td>2.12253.02.00</td>
<td>P-SA</td>
<td>F-PA</td>
</tr>
<tr>
<td>Ex-i4</td>
<td>2.12253.03.00</td>
<td>FA-ST</td>
<td>F-PA</td>
</tr>
<tr>
<td>Ex-i6</td>
<td>2.12253.04.00</td>
<td>FA-ST</td>
<td>FA-ST</td>
</tr>
<tr>
<td>Ex-i7</td>
<td>2.12253.05.00</td>
<td>P-SA</td>
<td>F-FF</td>
</tr>
<tr>
<td>Ex-i8</td>
<td>2.12253.06.00</td>
<td>FA-ST</td>
<td>F-FF</td>
</tr>
</tbody>
</table>

**Table 10:** IFC 090i-EEx 100-230 Vac versions.

Due to mechanical and electrical limitations, only the in table 9 and 10 listed pairs of MODIS modules are possible. The two modules each use two terminals of the bottom four terminals of the flameproof terminal feed-through in the dividing wall between the electronics and terminal compartment of the signal converter housing, except for the combination with module DC-I (only applicable for 24 Vac/dc versions), where only two of the four terminals are used. Interconnection of the two modules, P-SA and DC-I resp. FA-ST and DC-I is made internally.
The flameproof terminal feed-through has seven terminals in total, the top two terminals are used for connection of the power supply, the third one is only used for mounting of a metal dividing plate with insulating cover plate. The remaining four are used for the intrinsically safe signal in-/output circuits of the installed MODIS modules.

The metal dividing plate and the insulating cover plate warrant the required separation distances (i.e. clearances, creepage distances and distances through insulation) between the non-intrinsically safe power supply terminals and the intrinsically safe signal in-/output circuits. The insulating cover plate is provided with a sticker that contains important instructions how to remove and re-install the cover plate and the conditions under which it should be established (circuits not live!).

**IMPORTANT !**

Carefully follow the instructions on the sticker that is glued on top of the insulating cover plate, that covers the non-intrinsically safe power supply terminals!

For the connection diagrams of the intrinsically safe signal in-/outputs of the installed MODIS modules in the IFC 090i-EEx electronics unit (see figure 6, 7 and 8 on the following pages). It has to be noted that the intrinsically safe signal in-/outputs may only be connected to the following listed apparatus’ (registering devices like amp-meters, pulse counters, etc.):

- EEx-approved intrinsically safe apparatus;
- EEx-approved associated apparatus;
- Passive apparatus as defined in your national standard for installation of electrical apparatus in hazardous locations (equivalent of EN 60079-14, e.g. DIN VDE 0165).

Other types of apparatus may only be connected to the intrinsically safe signal in-/outputs through EEx-approved safety barriers, isolating interface units and the like. These barriers or units are not depicted in the connection diagrams of figure 6, 7 and 8 for reasons of readability. It is assumed that they are an integrated part of the registering devices or as separate devices connected in series with them. The registering devices may only be installed in the hazardous location if they also have a type of protection for explosion safety according to the European Standards of the EN 500xx series, or if they are constructed as prescribed in your standard national code of practice.

When the intrinsically safe signal in-/outputs are connected to other intrinsically safe or associated apparatus, the maximum safety values (i.e. entity parameters) of all intrinsically safe circuits have to be considered.

**IMPORTANT !**

The 100…230 Vac power supply versions of the IFC 090i-EEx signal converter electronics unit with MODIS modules can only be equipped with passive outputs. The connection diagrams in the following figures 6 through 8 with the numbers 1, 3, 6, 8 and 10 are therefore not applicable for the 100…230 Vac power supply versions.
Figure 6: Connection diagrams 1 through 4 of the intrinsically safe signal in-/outputs.
Figure 7: Connection diagrams 5 through 8 of the intrinsically safe signal in-/outputs.
Control input C passive
Connection to B1/B1⊥ and/or B2/B2⊥
Versions: Ex-i1, Ex-i4, Ex-i6 and Ex-i8
U ext = 7...30 V DC

HART active
Version: Ex-i3

Hazardous area
Safe area or Hazardous area (*)
U ext +
to HART-Communicator or SMART-Converter

HART passive
Versions: Ex-i1, Ex-i2 and Ex-i7

Fieldbus
Versions: Ex-i2, Ex-i4, Ex-i7 and Ex-i8

Bus supply device
to HART-Communicator or SMART-Converter

(*) Important note:
Only when the devices are also explosion protected!

Figure 8: Connection diagrams 9 through 12 of the intrinsically safe signal in-/outputs.
## 3 OPERATION OF THE SIGNAL CONVERTER

The IFM 4080 K / i-EEx compact flowmeters are always equipped with magnet sensors. In that way is possible to change the settings of the converter with aid of the magnet-bar without the necessity to open the flameproof converter housing in the hazardous area.

For the program functions and settings of the converter the standard Installation and operating instructions have to be consulted. It must be noted that - depending on the IFC090 i-EEx version installed - not all output/input functions are available.

Following menus do not apply for the IFC090 i-EEx versions Ex-i2 and Ex-i3:
(see also section 4.4. "Table of settable Functions" in the of the standard "Installation and operating instructions" of the IFC090 K/F signal converter)

- 1.01 VALUE P
- 1.06 Output/input B1
- 1.06 PULS B1
- 1.06 STATUS B1
- 1.06 CONTROL B1
- 1.07 Output/input B2
- 1.07 STATUS B2
- 1.07 CONTROL B2
- 3.02 VALUE P
- 3.07 HARDWARE

<table>
<thead>
<tr>
<th>Fct.</th>
<th>Text</th>
<th>Description and settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>OPERATION</td>
<td>Operations menu</td>
</tr>
<tr>
<td>1.01</td>
<td>FULL SCALE</td>
<td>...</td>
</tr>
<tr>
<td>1.06</td>
<td>Output/input B1</td>
<td></td>
</tr>
<tr>
<td>1.06</td>
<td>PULS B1</td>
<td></td>
</tr>
<tr>
<td>1.06</td>
<td>STATUS B1</td>
<td></td>
</tr>
<tr>
<td>1.07</td>
<td>OUTPUT B1</td>
<td></td>
</tr>
<tr>
<td>1.07</td>
<td>STATUS B2</td>
<td></td>
</tr>
<tr>
<td>1.06</td>
<td>CONTROL B1</td>
<td></td>
</tr>
<tr>
<td>1.07</td>
<td>CONTROL B2</td>
<td></td>
</tr>
<tr>
<td>3.00</td>
<td>INSTALL.</td>
<td>Installation menu</td>
</tr>
<tr>
<td>3.02</td>
<td>FLOWMETER</td>
<td>...</td>
</tr>
<tr>
<td>3.02</td>
<td>VALUE P</td>
<td></td>
</tr>
<tr>
<td>3.07</td>
<td>HARDWARE</td>
<td></td>
</tr>
</tbody>
</table>

As a consequence, the chapters included in the standard Installations and operating instructions, giving detailed descriptions of these menus, must be skipped.

## 4 SERVICE

See section 8 or contact your (local) Krohne sales representative for the ordering information of spare parts or replacements of IFC 090….EEx electronics units and/or power fuses.
4.1 Replacement of electronics unit or power fuse(s)

**IMPORTANT!**
The following instructions **must be followed carefully**, if the IFC 090/…-EEx signal converter housing has to be opened respectively closed again!

**Before opening:**
- Make absolutely sure that there is no explosion hazard!
- 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 cover (with glass window) of the electronics compartment may 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.

**After opening:**
- The copper earth strip at the back of the electronics unit **must** be securely screwed to the housing (back-end of electronics compartment) by screw SE (see figure 9 below). The electronics unit is screwed into the electronics compartment by two screws D. Before screws SE and D can be accessed, the display unit must be removed via screws A.
- 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 cover as tight as possible into the housing by hand, until it cannot be opened by hand anymore. Screw the recessed head screw of the interlocking device tight.

---

**Figure 9:** IFC 090-EEx electronics unit after removal of display unit.
4.1.1 Replacement of electronics unit

Refer to the standard Installation and Operating Instructions for detailed information about resetting and reprogramming the new electronics unit after replacement. The customer specific data (like the value of the internal totalizer) are stored in DATAPROM IC-18, which must be transferred from the "old" to the "new" electronics unit. See Section 8.7 of the standard Installation and Operating Instructions for detailed information.

Before commencing work, note the instructions in Section 3.1 ("Before opening"). Then continue as follows:

1. Remove the display cover of the electronics compartment.
2. Unscrew the two screws A of the display unit (see figure 10) and turn it carefully aside.
3. Disconnect the 2-pole field circuit connector (item B in figure 9) and the 3-pole electrode circuit connector (item C). Also see figure 11 on the next page.
4. Unscrew the two mounting screws D of the electronics unit and screw SE, which fixes the copper earth strip to the back of the housing. A screwdriver with a long shaft (≥ 200 mm) is most suitable for unscrewing screw SE (e.g. screwdriver type Philips No. 2).
5. Carefully remove the electronics unit of the converter housing (see the remark below).
6. Check if the voltage setting (only applicable for AC power supplies) and power fuse rating are correct on the new electronics unit. If necessary, change the voltage setting or replace the power fuse (see section 3.1.3 resp. 3.1.2 of this manual).
7. Carefully insert the electronics unit (keep cables aside, see remark below). Then mount the unit completely into the housing and fix the screws. First the two screws D, then screw SE and reconnect the 2-pole field circuit connector B and the 3-pole electrode circuit connector C to the right counter-plugs on the electronics unit (see also figure 9).
8. Finally screw the display unit back on the frame of the electronics via the two screws A.
9. Screw the cover of the electronics compartment back into the housing.

Note the instructions of section 3.1 ("After opening") during reassembling.

IMPORTANT !

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!
4.1.2 Replacement of power fuse(s)

The power fuse(s) of the different IFC 090...-EEx electronics units (regular or MODIS) have a different rating and are located on slightly different locations on the power supply printed circuit board. Only the power fuse on the 100...230 Vac power supply version of the regular IFC 090-EEx electronics unit can be reached without removing the complete unit out of the housing (only the display unit has to be unscrewed).

Regular IFC 090-EEx with 24 Vac/dc power supply

Before commencing work, note the instructions in Section 3.1 ("Before opening"). Then continue as follows:

1. Remove the cover of the electronics compartment.
2. Unscrew the two screws marked with A of the display unit and turn it carefully aside.
3. Disconnect the 2-pole field circuit connector (item B) as well as the 3-pole electrode circuit connector (item C). See figure 11 above.
4. Unscrew the two mounting screws D of the electronics unit and screw SE, which fixes the copper earth strip to the integrated aluminum dividing wall at the back of the electronics compartment. Use a screwdriver with a long shaft (≥ 200 mm) like type Philips No. 2 for screw SE. Then take out the electronics unit, but be careful with the connecting cables, so that they do not get damaged.
5. The defective power fuse(s) F1 and/or F2 (see figure 12 on the next page) can be replaced now. The 24 Vac/dc power supply uses two sub-miniature fuses type TR 5 that are rated T1.25A in accordance with IEC 127-3 publication (part No. 5.09080.00.00).
6. Reassemble in reverse order (points 3 through 1).

Note the instructions of section 3.1 ("After opening") during reassembling.
Regular IFC 090-EEx with 100...230 Vac power supply

Before commencing work, note the instructions in Section 3.1 ("Before opening"). Then continue as follows:

1. Remove the cover of the electronics compartment.
2. Unscrew the two screws A of the display unit and turn the display unit carefully aside.
3. The fuse-holder, in which the power fuse in accordance with IEC 127-2 size Ø5 x 20 mm is mounted, is now accessible to replace the defect power fuse F1 by a new fuse with the same rating. The rating depends on the voltage setting of the power supply unit. The power supply of 100/115 Vac requires a fuse of T200mA (part No. 5.05678.00.00) and the 200/230 Vac requires a fuse of T125mA (part No. 5.06627.00.00).

The fuse rating is also shown by the yellow sticker that is glued on the mains transformer, which can only be seen after the regular IFC 090-EEx electronics unit is completely removed from the flameproof signal converter housing. See figure 13 on the next page.

**NOTE:**
In case of any doubt about the fuse rating or the voltage setting of the unit, remove the complete unit from the housing as described in section 3.1.1 on page 16 and check the in figure 13 (on the next page) depicted items. Change when needed!

4. Reassemble the unit in reverse order (points 2 and 1).

**Note the instructions of section 3.1 ("After opening") during reassembling.**
Figure 13: Power supply version 115/230 Vac.

MODIS version IFC 090i-EEx

Before commencing work, note the instructions in Section 3.1 ("Before opening"). Then continue as follows:

1. Remove the cover of the electronics compartment.
2. Unscrew the two screws A of the display unit and turn it carefully aside.
3. Disconnect the 2-pole field circuit connector (item B) and the 3-pole electrode circuit connector (item C). See figure 11 on page 15 for details.
4. Unscrew the two screws D and screw SE by a screwdriver with a long shaft (200 mm). Take out the electronics unit, but do not damage the connecting cables. See the note marked with IMPORTANT (gray-shaded box) below.
5. The defective power fuse (see figure 14 on the next page) can be replaced now. Use a fuse rated at T1.25H250V (part No. 5.06232.00.00) for the 24 Vac/dc power supply and a fuse of T1.6H250V (part No. 5.07823.00.00) for the 100…230 Vac power supply. Notice that the locations are slightly different (the 24 Vac/dc supply version is shown).
6. Reassemble in reverse order (points 4 through 1).

Note the instructions of section 3.1 ("After opening") during reassembling.

IMPORTANT!

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!
4.1.3 Changing power supply voltage

This only applies to the regular IFC 090-EEx electronics unit with 100-230 Vac power supply. Before commencing work, note the instructions in Section 3.1 ("Before opening"). Then continue as follows:

1. Remove the cover of the electronics compartment.
2. Unscrew the two screws A of the display unit and turn the display unit carefully aside.
3. Unscrew the two mounting screws D of the electronics unit and screw SE, which fixes the copper earth strip at the back of the housing. A screwdriver with a long shaft (200 mm) can best be used to unscrew SE (e.g. screwdriver type Philips No. 2).
4. Disconnect the 2-pole and 3-pole connectors and carefully remove the electronics unit.
5. The voltage setting of the power supply can be changed by turning the dummy dual-in-line block (i.e. voltage selector, see figure 13 on the previous page) over 180° in its socket. The position of the notch on the dummy dual-in-line block indicates the voltage setting. Also see the sticker that is glued on the mains transformer.
6. Reassemble in reverse order (points 4 through 1).
7. Screw the cover of the electronics compartment back into the housing.

Note the instructions of section 3.1 ("After opening") during reassembling.

IMPORTANT!

Carefully keep the connecting cables of the field coil and electrode circuits to the side of the housing, while inserting the electronics unit into respectively removing it from the signal converter housing. This is to prevent damaging of the connecting cables!
5 CONNECTING CABLES

**NOTE:**
The below described cables are shown in the connection diagram on the following page.

**Cable A:**
Signal cable for current output and binary outputs (pulse and status output). The cable parameters must be in accordance with the regulations in the EN 60079-14 "Electrical installations in hazardous locations" or an equivalent national standard (e.g. DIN VDE 0165). For the MODIS version with IFC 090i-EEx electronics unit (right detail in connection diagram) the signal cable for the intrinsically safe signal in-/outputs must also conform the requirements as specified in the relevant standard national code of practice for the installation of electrical apparatus with type of protection Intrinsic Safety "i".

**Cable B:**
Power supply cable. The cable parameters must be in accordance with the regulations of the EN 60079-14 "Electrical installations in hazardous locations" or an equivalent national standard (e.g. DIN VDE 0165).

- Rated voltage: \( \geq 500 \text{ V} \)
- Examples: H07..-.-, H05..-.-

**Equipotential bonding conductor**
Cross-sectional area: \( 4 \text{ mm}^2 \) (equivalent to AWG 10)

6 MAINTENANCE

The IFM 4080 K/…-EEEx magnetic-inductive 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).
7 CONNECTION DIAGRAM

Hazardous locations of Zone 1 and 2

IFC 090-EEx Signal Converter

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

Electrode cables - white/pink
(PTFE insulated shielded copper)

Field coil wires - green/blue
(PTFE insulated copper)

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

OPTION: MODIS

Flameproof (EEx d) cable terminal feed-through

Separation plate

Unused terminal
8 ORDERING INFORMATION

In case of questions about spare or replacing parts contact your local Krohne representative. The part numbers of the several parts are listed in the sections below.

8.1 Regular IFC 090-EEx electronics unit

The below listed table shows the available regular (non-MODIS) IFC 090-EEx versions with the possible power supply units and the accompanying power fuses(s).

<table>
<thead>
<tr>
<th>IFC 090-EEx electronics unit</th>
<th>Power fuse(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>Part No.</td>
</tr>
<tr>
<td>230/240 Vac</td>
<td>2.10664.10.00</td>
</tr>
<tr>
<td>115/120 Vac</td>
<td>2.10664.10.00</td>
</tr>
<tr>
<td>200 Vac</td>
<td>2.10664.13.00</td>
</tr>
<tr>
<td>100 Vac</td>
<td>2.10664.13.00</td>
</tr>
<tr>
<td>24 Vac/dc</td>
<td>2.10665.10.00</td>
</tr>
</tbody>
</table>

Table 10: IFC 090-EEx electronics units and power fuses.

8.2 MODIS version IFC 090i-EEx electronics unit

Table 11 below summarizes the available IFC 090i-EEx electronics units (MODIS version) and the matching part number. The accompanying power fuses are listed in table 12.

<table>
<thead>
<tr>
<th>Version</th>
<th>MODIS modules</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex-i1</td>
<td>P-SA</td>
<td>2.11582.01.00</td>
</tr>
<tr>
<td>Ex-i2</td>
<td>F-SA</td>
<td>2.11582.03.00</td>
</tr>
<tr>
<td>Ex-i3</td>
<td>DC-I</td>
<td>2.11582.02.00</td>
</tr>
<tr>
<td>Ex-i4</td>
<td>FA-ST</td>
<td>2.11582.05.00</td>
</tr>
<tr>
<td>Ex-i5</td>
<td>F-PA</td>
<td>2.11582.06.00</td>
</tr>
<tr>
<td>Ex-i6</td>
<td>FA-ST</td>
<td>2.11582.07.00</td>
</tr>
<tr>
<td>Ex-i7</td>
<td>P-SA</td>
<td>2.11582.08.00</td>
</tr>
<tr>
<td>Ex-i8</td>
<td>F-FF</td>
<td>2.11582.09.00</td>
</tr>
</tbody>
</table>

Table 11: IFC 090i-EEx electronics units.

The above listed IFC 090i-EEx electronics units are either provided with a 24 Vac/dc power supply or a 100…230 Vac power supply. The table below lists the accompanying power fuse.

<table>
<thead>
<tr>
<th>Power supply version</th>
<th>Type</th>
<th>Rating</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 Vac/dc</td>
<td>G-fuse Ø5x20 1500A @ 250V</td>
<td>1.25 A T (T1.25H250V)</td>
<td>5.06232.00.00</td>
</tr>
<tr>
<td>100…230 Vac</td>
<td>G-fuse Ø5x20 1500A @ 250V</td>
<td>1.6 A T (T1.6H250V)</td>
<td>5.07823.00.00</td>
</tr>
</tbody>
</table>

Table 12: Power fuses of IFC 090i-EEx electronics units.

NOTES:

The in table 10 and 12 above listed G-fuses of size Ø5 x 20 mm and with 1500 A breaking capacity at 250 V are in accordance with IEC publication 127-2.

Fuse type TR5 is of size sub-miniature and has a breaking capacity of 35 A at 250 V. It is in accordance with IEC 127-3. The regular IFC 090-EEx electronics unit with 24 Vac/dc power supply contains two of these fuses in the primary circuits, labeled as F1 and F2.
9 DATA PLATES

Figure 15: Data plate of IFM 4080 K-EEx.

Figure 16: Data plate of IFM 4080 K/i-EEx.
10 DECLARATION OF CONFORMITY

KROHNE
Altimeter

EC - Declaration of Conformity

We
Krohne Altimeter
Kerkeplaat 12
3313 LC Dordrecht
The Netherlands

declare under our sole responsibility that the products
compact magnetic inductive flowmeter types
IFM 4080 K - EEx and
IFM 4080 K / i-EEx
IFM 4042 K - EEx

fulfill the requirements of following EC directives:
- ATEX Directive 94/9/EC
- EMC Directive 89/336/EC

The IFM 4080 K-EEx, IFM 4080 K / i-EEx and IFM 4042 K-EEx flowmeters are
designed and manufactured conform following harmonized standards:
- EN 50 014 : 1997
- EN 50 018 : 2000
- EN 50 019 : 2000
- EN 50 020 : 1994
- EN 50 281-1-1 : 1998
- EN 50 081-1
- EN 50 082-2
- EN 61 010-1

The IFM 4080 K-EEx, IFM 4080 K / i-EEx and IFM 4042 K-EEx flowmeters are
examined and type-approved under EC-type examination certificate KEMA 01 ATEX
2200 X. Our quality system is assessed by KEMA registered Quality b.v.

Dordrecht, 26-03-2002

L. IJMker
(General manager)
SCHEDULE

To EC-Type Examination Certificate KEMA 11ATE32200.1

Description

The flowmeter consists of a signal converter having in type of explosion protection flameproof enclosure "I" with a terminal compartment in type of explosion protection flameproof enclosure "I" with a terminal compartment in type of explosion protection flameproof enclosure "I" with a terminal compartment in type of explosion protection flameproof enclosure "I" with a terminal compartment in type of explosion protection flameproof enclosure "I" with a terminal compartment in type of explosion protection flameproof enclosure "I" with a terminal compartment in type of explosion protection flameproof enclosure "I" with a terminal compartment in type of explosion protection flameproof enclosure "I" with a terminal compartment in type of explosion protection flameproof enclosure "I" with a terminal compartment in type of explosion protection flameproof enclosure "I" with a terminal compartment.

Ambient temperature range -20 °C ... +60 °C (for flowmeter with electronic unit type IFC-090).
Ambient temperature range -40 °C ... +60 °C (for flowmeter with electronic unit types IFC-099 and IFC-099).

The maximum surface temperature T6B ≤ 150 °C is based on a maximum ambient temperature of 60 °C.

Electrical data
IFM4080 K-EEC / MIG 4080 K-EEC / IFM4090 K-EEC
Power supply 150230 Vac, 150230 Vac 
230 Vac - 380 Vac, 230 Vac - 380 Vac
Us = 230 V
Signal Ia ≤ ± 3,6 A
Power supply 150230 Vac, 150230 Vac 
230 Vac - 380 Vac, 230 Vac - 380 Vac
Us = 230 V
Signal Ia ≤ ± 3,6 A
12 V DC or 12 V DC or 12 V DC or 12 V DC or 12 V DC
12 V DC or 12 V DC
The effective internal capacitance C = 5 nF.
The effective internal inductance L is negligibly small.
### SCHEDULE

**to EC-Type Examination Certificate KEMA 01ATEK2200 X**

**Electrical data (continued)**

<table>
<thead>
<tr>
<th>Signal circuit</th>
<th>Value(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Signal circuit</strong></td>
<td></td>
<td>in type of explosion protection intrinsic safety EEx i IC, only for connection to a certified intrinsically safe circuit (for instance a supply of the BIRCO model in accordance with document OÜ/85/17.01-220/19 Dec. 2004) in type of explosion protection intrinsic safety EEx i IC or EEx e II T4 of EEx i IC, in type of explosion protection intrinsic safety EEx e II T4, with the following maximum values:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U0</td>
<td>30 V</td>
<td></td>
</tr>
<tr>
<td>I0</td>
<td>300 mA</td>
<td></td>
</tr>
<tr>
<td>P0</td>
<td>1.3 W</td>
<td></td>
</tr>
<tr>
<td>The effective internal capacitance C0 = 5 nF, the effective internal inductance L0 is negligibly small.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal supply circuit</td>
<td></td>
<td>in type of explosion protection intrinsic safety EEx i IC, with the following maximum values:</td>
</tr>
<tr>
<td><strong>Signal supply circuit</strong> (24 Vdc version only)</td>
<td>Value(s)</td>
<td>Description</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U0</td>
<td>22.5 V</td>
<td></td>
</tr>
<tr>
<td>I0</td>
<td>100 mA</td>
<td></td>
</tr>
<tr>
<td>P0</td>
<td>1.0 W</td>
<td></td>
</tr>
<tr>
<td>Maximum allowed external capacitance C0 = 127 nF, maximum allowed external inductance L0 = 4 mH.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only for connection to certified intrinsically safe circuits of type of explosion protection intrinsic safety EEx i IC or EEx e II T4 without supply (passive).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The applicable type of explosion protection of the aforementioned intrinsically safe circuits EEx i IC is determined by the type of protection of the intrinsically safe circuit which is connected to. If reversely EEx i IC or EEx e II T4 is connected to, the applicable type of explosion protection of the intrinsically safe circuits is EEx e II T4.

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

**FM 1992-1210**

The signal supply circuits may all be connected either intrinsically safe or non-intrinsically safe. A combination of intrinsically non-intrinsically safe connections however is not allowed.

### 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 "a" or for the terminal compartment in type of protection increased safety "a", suitable for the conditions of use and correctly installed.

- For use in the presence of combustible dust:
The cable entry devices shall be in type of equipment Category II 2 D, suitable for the conditions of use and correctly installed.

- Unused openings shall be closed with suitable certified closing elements.

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

### Routine tests

- Each wasted primary heat of size DNH - DN 100 must be submitted to the routine overpressure test according to EN 50318, Clause 16 at a test pressure of 14 bar during one minute.
(13) SCHEDULE
(16) to EC-Type Examination Certificate KEMA 01ATEX220 X

Routine tests (continued)
- Routine tests according to EN 50288, Clause 14 are not required for the electronics enclosure as the type test has been made at a static pressure of four times the reference pressure.

Each primary head of size DN250 - DN500 shall withstand a test voltage according to EN 18510, Clause 8.1, of 1500 V RMS during one minute without breakdown between the field coils circuit and the enclosure and a test voltage of 1500 V RMS during one minute without breakdown between the field coils circuit and the intrinsically safe auxiliary circuit.

(18) Report
KEMA No. 0011004.

(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 table:

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Max. surface temperature</th>
<th>Max. process temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>T4</td>
<td>≤ 135 °C</td>
<td>≤ 120 °C</td>
</tr>
<tr>
<td>T3</td>
<td>≤ 160 °C</td>
<td>≤ 180 °C</td>
</tr>
</tbody>
</table>

For Ta ≤ 50 °C and a process temperature ≤ 115 °C, heat resistant cables with a continuous operating temperature of at least 120 °C must be used.

1) Motor size DN200 - DN500

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Max. process temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>T4</td>
<td>≤ 135 °C</td>
</tr>
<tr>
<td>T3</td>
<td>≤ 180 °C</td>
</tr>
</tbody>
</table>

(18) Essential Health and Safety Requirements
Covered by the standards listed at (9).