KROHNE

03/99

**Addition to the Installation and Operating Instructions**

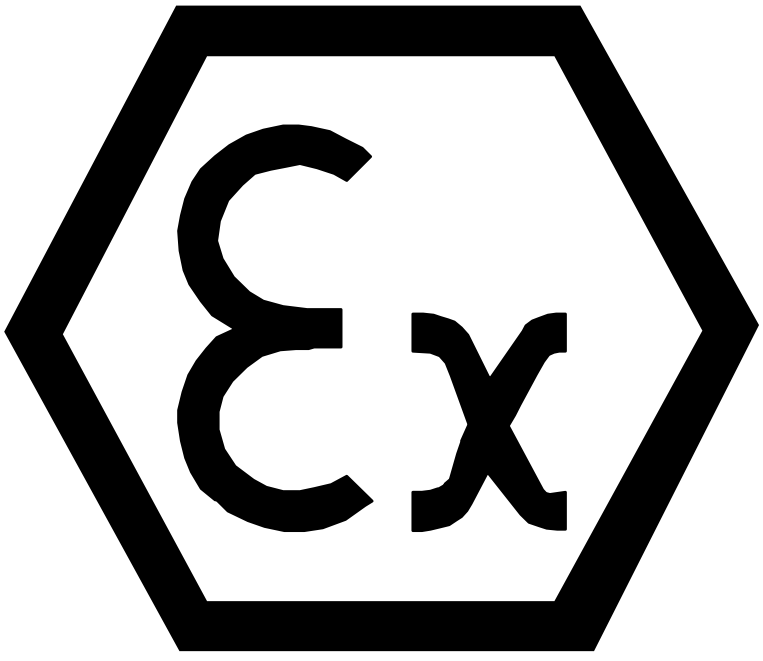
# Magnetic inductive flowmeters

# ALTOFLUX

## IFM 5080 K / i-EEx

**with**

## IFC 090 i -EEx signal converter



# 1 Contents

In this addition only the points which differ from the standard Installation and Operating Instructions are described. This addition is only valid for compact flowmeters with the IFC090 i-EEx signal converter with **intrinsically** safe signal in- and outputs.

## 2 Description of the system

The explosion protected compact-flowmeters differ from the standard flowmeters mainly in their "internal assembly". Several types of protection are used in the compact flowmeter IFM 5080 K / i-EEx, depending on the ordered type of the connection compartment of the signal converter housing. See following overview:

Electronic compartment signal converter housing
EEx d (Flameproof enclosure)

Connection compartment signal converter housing
- Housing and connection terminals for power supply:
  standard: EEx e (Increased safety)
  optional: EEx d (Flameproof enclosure)
- Connection terminals of signal in/outputs (Current, Pulse/status/control and Fieldbus)
  always EEx ia (Intrinsic safety. category ia)

Primary heads
EEx m (Encapsulation) and EEx e (Increased safety)

Internal electrode circuit
EEx ib (Intrinsic safety, category ib)

## 3 Installation in the pipeline

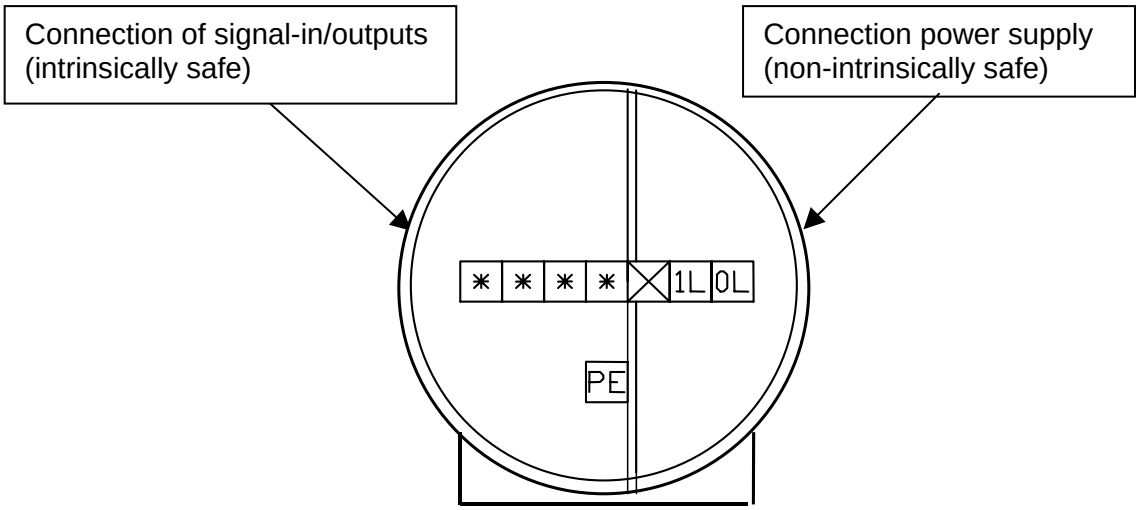
The installation of the compact flowmeter in the pipeline is equal to that of the standard compact flowmeters.

## 4 Electrical connection

For the electrical connection of the compact flowmeter the relevant national standard codes of practice for "Electrical installations of buildings" and "Electrical apparatus for use in potentially explosive atmospheres" have to be consulted.

In the connection compartment of the IFM 5080 K/ i-EEx the terminals for the **intrinsically safe** signal in/outputs and the **non**-intrinsically safe power supply circuits are placed. The location of the connection terminals is shown in the sketch on the next page.

The cable for the signal in/outputs leading into the IFM 5080 K / i-EEx is intrinsically safe. The connection of this cable must be carried out conform the requirements specified in the relevant national standard code of practice for the installation of electrically apparatus with type of protection "i".




With each in/output module a certain in/output function can be realised, see following overview:

| In/Output module | Function | Electrical data |
|---|---|---|
| P-SA | passive current output | Current: 4..20 mA<br>Working voltage: 8.. 30 V DC<br>Voltage drop: 8 V at 4 mA |
| FA-ST | passive pulse/status output or control input (selectable through software options) | Working voltage: 6..30 V DC<br>Working current: < 110 mA<br>Voltage drop in ON-state: < 2 V at 110 mA<br>Leakage current in OFF-state: < 900 µA at 30 V<br>Control input<br>Input voltage LOW level: < 3 V<br>Input voltage HIGH level: > 7 V<br>Frequency range: 0.. 12 KHz |
| DC-I | intrinsically safe voltage source, to be used in combination with modules P-SA and FA-ST | Voltage: 20 V DC<br>Maximum current: 30 mA<br>Internal resistance: 260 Ω |
| F-PA | passive Fieldbus interface | conform FISCO model |

The functionality of the terminals for signal in/outputs is depending on the version of the IFC090 i-EEx electronic-unit installed. Each version is equipped with a different pair of in/output modules. Following versions are possible:

| IFC090 i-EEx version | Order no. | MODIS module | | Terminal designation | | | |
|---|---|---|---|---|---|---|---|
| Ex-i1 | 2.11582.01 | P-SA | FA-ST | I⊥ | I | B1 | B1⊥ |
| Ex-i2 | 2.11582.03 | P-SA | F-PA | I⊥ | I | D | D⊥ |
| Ex-i3 | 2.11582.02 | P-SA | DC-I | I+ | | | I |
| Ex-i4 | 2.11582.04 | FA-ST | F-PA | B1 | B1⊥ | D | D⊥ |
| Ex-i5 | 2.11582.05 | FA-ST | DC-I | B1+ | | | B1 |
| Ex-i6 | 2.11582.06 | FA-ST | FA-ST | B2 | B2⊥ | B1 | B1⊥ |

The non-intrinsically safe terminals for the power supply 1L≈ and 0L≈ have to be wired conform the relevant standard code of practice for electrical apparatus for use in potentially explosive atmospheres, type of protection "e" (Increased safety) or type of protection "d" (flameproof enclosure), depending on the type of protection used for the connection compartment concerned.

To have access to the terminals for the power supply circuit, the circular plate must lifted slightly at one end and then rotated downwards, see notice on plate. After connection of the power supply cable, the circular plate must be returned in its original position.
The IFM 5080 K/ i-EEx compact flowmeters may only be connected to a power supply with a maximum prospective short circuit current of 1500 A.

The protective conductor or functional earth conductor of the power supply must be connected to the earth-clamp in the terminal compartment. For this purpose the protective conductor must be leaded through the rectangular opening in the metal partition plate to the earth terminal.
For the connection of the protective conductor also consult the standard Installation and Operating manual.
The explosion protective flowmeters are always to be connected to the equipotential bonding system through the external earth terminal placed at the underside of the converter housing.

## 5 Connection diagrams of the signal in/outputs

For the connection diagrams of the signal in/outputs see the next pages. It has to be noted that the intrinsically safe signal in/outputs may only be connected to following electrical apparatus (registering devices like amp-meters, pulse counters etc.):

- certified intrinsically safe apparatus
- certified associated apparatus
- passive apparatus as defined in your national standard code of practice for the installation of electrical apparatus for use in potentially explosive atmospheres.

Other apparatus may only be connected to the signal in/outputs through certified safety barriers, certified isolating interface units and the like. For ease of reading these barriers or units are not shown in the connection diagrams, it is assumed that they are integrated in the registering devices or as separate devices connected in series with them.
The registering devices may only be installed in the hazardous area insofar they are also explosion protected (constructed in a suitable type of protection as prescribed in your national standard code of practice).

When connected to other intrinsically or associated apparatus the maximum input/output parameters of all intrinsically safe circuits have to be taken into account.
The maximum parameters of the signal in/outputs of the IFC090 i-EEx converters are included in the Certificate of Conformity KEMA no. Ex-92.C.7162, 4 th. Amendment, page 1/3 and page 2/3. These maximum values are also shown in following table:

| MODIS-Module | intrinsically safe maximum parameters |
|---|---|
| P-SA, FA-ST | $U_i$ = 30 V, $I_i$ = 250 mA, $P_i$ =1,0 W<br>$C_i$ = 5 nF, $L_i \approx 0$ |
| F-PA | $U_i$ = 30 V, $I_i$ = 300 mA, $P_i$ = 4,2 W<br>$C_i$ = 5 nF, $L_i \approx 0$ |
| DC-I | $U_o$ = 23,5 V, $I_o$ = 98 mA, $P_o$ = 0,6 W<br>$C_o$ = 127 nF, $L_o$ = 4 mH |

The modules P-SA and DC-I (IFC090 i-EEx version Ex-i3) and FA-ST and DC-I (IFC090 i-EEx version Ex-i5) are internally connected in series.
If an intrinsically safe circuit of an associated electrical apparatus (i.e. a circuit that is active under the fault conditions specified in the standard EN 50 020) it's maximum output voltage $U_o$ may not exceed 6,5 V. See also the remark on page 2/3 of the 4 th Amendment.

## 6 Operation of the signal converter

The IFM 5080 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 versions Ex-i2 and Ex-i3:
(see also chapter 4.4 - page 4/5 - of the standard Installation and operating instructions of the IFC090 K/F)

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

| Fct. | Text | Description and settings |
|---|---|---|
| 1.00 | OPERATION | Operations menu |
| 1.01 | FULL SCALE | ... |
| | ~~→ VALUE P~~ | |
| ~~1.06~~ | ~~Output/Input B1~~ | |
| ~~1.07~~ | ~~Output/Input B2~~ | |
| ~~1.06~~ | ~~PULS B1~~ | |
| ~~1.06~~<br>~~1.07~~ | ~~STATUS B1~~<br>~~STATUS B2~~ | |
| ~~1.06~~<br>~~1.07~~ | ~~CONTROL B1~~<br>~~CONTROL B2~~ | |
| 3.00 | INSTALL. | Installation menu |
| 3.02 | FLOWMETER | ... |
| | ~~→ VALUE P~~ | |
| ~~3.07~~ | ~~HARDWARE~~ | |

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

# 7 Service

**Important!**
Following instructions must be followed when the converter housing has to be opened (e.g. in case of replacing the power supply fuse or programming of the converter through the internal IMOCOM-interface).

To open the housing the special wrench supplied with every flowmeter has to be used.
- Make sure there is no explosion hazard
- Gas-free certificate!
- Make sure all connection cables are safely isolated from any supply.
- Allow the prescribed waiting time to elapse before opening of the housing:
  20 mins. for temperature class T6
  11 mins. for temperature class T5

## 7.1 Replacement of the power supply fuse

1. Use the special wrench to remove the cover from the electronic compartment
2. Remove screws R and fold the display board aside.
   (see corresponding drawing in sect. 8.5 of the standard Installation and operating instructions).
3. Remove the 2-pole connector X1 (field power) and the 3-pole connector for the electrode circuit mounted on the safety-barrier printed circuit board.
4. Remove the screws Q of the electronic unit and the screw SE of the earthing strip at the backside of the electronic unit. For the removal of latter screw a screwdriver for recessed head screws, size no.2 with a blade length of at least 200 mm is needed.
5. Remove carefully the electronic unit.
6. Replace the power supply fuse mounted at the power-supply printed circuit board.
   Electrical data of the fuse: 1,25A slow, breaking capacity High, rated voltage 250V.
   (T1,25H250V to IEC127-2, Krohne Ident. no. 5.06232.00).
7. Reassemble in reverse order.

**Note**!
- The grounding strip of the safety barrier must always be reliable connected to the signal converter housing via screw **SE**.
- Screw the cover of the housing firmly in the housing to ensure that it can not be opened by hand!
- The screw threads and gaskets on the covers of the electronic and connection compartment must be well greased at all times (acid and resin free grease, e.g. silicone grease).

## 7.2 Replacement of the electronic unit

For part numbers of the electronic units, see sect. 8 of this addition.
The electronic units have been tested by Krohne conform the electrical safety codes involved.

**Before commencing work, note the instructions in the grey shaded box "Important" at the begin of section 7.**

1. Remove the cover of the connection compartment by using the special wrench.
2. Remove screws R (see drawing in section 8.8 of the standard installation and operating instructions) and fold the display board aside.
3. Remove the 2-pole connector X1 (field power) and the 3-pole connector for the electrode-circuits mounted on the safety-barrier board.
4. Remove screws Q and the screw SE for the earthing strip at the backside of the electronic unit. For latter screw a screwdriver for recessed-head screws (size 2, length of blade at least 200 mm) must be used. Carefully remove the electronic unit.
5. Relocate Dataprom IC18 on the amplifier PCB (see drawing in section 8.9 of the standard Installation and operating instructions) carefully from the old to the new electronic unit. Note the direction (position of pin 1) of IC18 while inserting it into the new socket.
6. Check the rating of the power supply fuse on the new electronic unit. If necessary, exchange.
7. Reassemble in reverse order (points 4 till 1). Note the instruction at the beginning of this paragraph.

# 8 Part numbers

See following table.
The IFC090 i-EEx electronic units are only available in 24 V AC/DC power supply.

| IFC090 i-EEx version | Part no. | Power supply fuse | Part no. of fuse |
|---|---|---|---|
| Ex-i1 | 2.11582.01 | T1,25 H 250V | 5.06232.00 |
| Ex-i2 | 2.11582.03 | | |
| Ex-i3 | 2.11582.02 | | |
| Ex-i4 | 2.11582.04 | | |
| Ex-i5 | 2.11582.05 | | |
| Ex-i6 | 2.11582.06 | | |

## 9 Technical data

See also the standard Installation and operating instructions.

Rated pressure: See typeplate

Ambient temperature: -20..40/50/60°C, see Certificate of Conformity (1. Amendment) or following table.

Medium temperature: See Certificate of Conformity (1. Amendment) or following table.

| Max. ambient temperature [°C] | Temperature class | Max. Medium temperature [°C] |
|---|---|---|
| 40 | T6 | 60 |
| | T5 | 75 |
| | T4 | 115 |
| | T3 | 155 |
| 50 | T6 | 50 |
| | T5 | 75 |
| | T4 | 115 |
| | T3 | 135 |
| 60 | T6 | not possible |
| | T5 | 75 |
| | T4 | 75 |
| | T3 | 75 |

**Note:**
The maximum medium temperatures listed in the table above are safety-technical limits! Due to function-technical reasons (e.g. kind of liner in the measuring tube) lower limits may prevail.

## 10 Maintenance

The IFM 5080 K / i- EEx compact flowmeters are maintenance free with regard to flowmetering properties. Within the scope of the periodic inspections required for electrical apparatus in hazardous areas, it is recommended to check the flameproof enclosures for external damage and signs of corrosion.
Opening of the housing of the primary head (coil housing) is not allowed, as this will nullify the used type of protection for the explosion safety. There are also no serviceable parts inside the primary head.