KROHNE

12/01

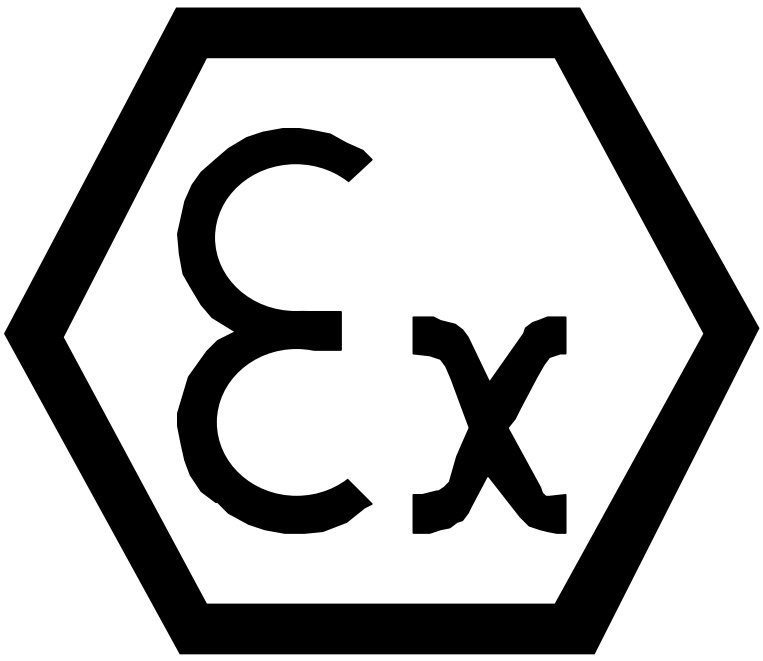
Electromagnetic flowmeter in 2-wire technology

Addition to the installation and operating instructions

ALTOFLUX 2W

IFM 4042 K-EEx

Compact flowmeter



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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.

CONTENTS

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.

Temperature class (for gases)	**Max. surface temperature** (for dusts)	**Maximum process liquid temperature**		
		$T_a \leq 40°C$	$T_a \leq 50°C$	$T_a \leq 60°C$
T6	T85°C	75°C	70°C	70°C
T5	T100°C	95°C	90°C	75°C
T4	T135°C	130°C	115°C	75°C
T3	T180°C	150°C	115°C	75°C

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

Temperature class (for gases)	**Max. surface temperature** (for dusts)	**Maximum process liquid temperature**		
		$T_a \leq 40°C$	$T_a \leq 50°C$	$T_a \leq 60°C$
T6	T85°C	70°C	70°C	70°C
T5	T100°C	85°C	85°C	85°C
T4	T135°C	120°C	120°C	115°C
T3	T180°C	180°C	180°C	115°C
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:

- DN10-20: II 2GD EEx dme [ib] IIC T6…T3.
- 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.

Meter size	Type of protection	
DN10 up to DN20	Field coils:	Increased safety "e" according to EN 50019 Encapsulation "m" according to EN 50028
	Electrodes:	Intrinsic safety "ib" according to EN 50020
DN25 up to DN150	Housing:	Flameproof enclosure "d" according to EN 50018
	Electrodes:	Intrinsic safety "ib" according to EN 50020
DN200 and larger	Field coils:	Increased safety "e" according to EN 50019
	Electrodes:	Intrinsic safety "ib" according to EN 50020

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, ⊥), 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 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.

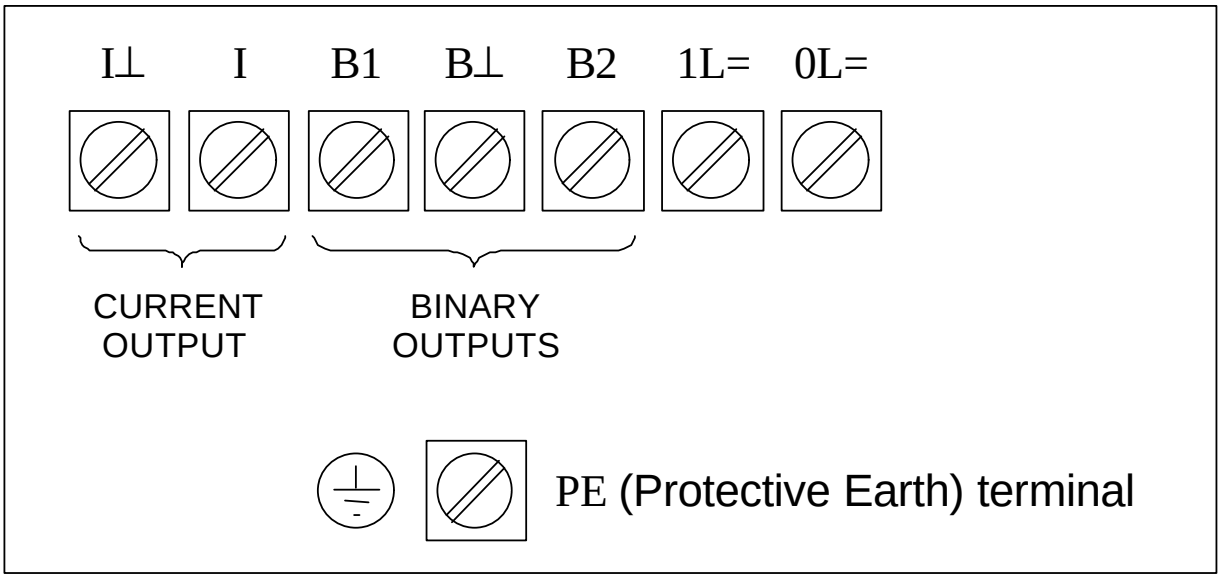


Figure 1: Terminal arrangement in terminal compartment.

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

- Current output (terminals 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.

<u>Version A:</u> Terminal compartment in "EEx de [ib]" with U_m = 60 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_m (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").**

<u>Version B:</u> Terminal compartment in "EEx de" with Um = 250 V.

This version is intended for applications were the mains power supply system provides a maximum safety-technical voltage of U_m = 250 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.

<u>IMPORTANT NOTES (applicable for both versions)</u>

- 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_m = 250 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, ⏚) 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.

Terminal designation	Function	Electrical data (per circuit)	
		Type of protection "EEx ib"	Type of protection "EEx e"
Circuit 1 I, ⏚	Current output, passive (2-wire connection) 4-20 mA, HART = possible	Maximum values: U_i = 30 V, I_i = 100 mA, P_i = 1.0 W C_i = 20 nF, L_i = 0 U_m = 60 V	U_n = 14…36 Vdc I_n = 4…20 mA U_m = 250 V
Circuit 2 1L=, 0L=	Additional power supply (4-wire connection) additional to circuit 1 (optional)		U_n = 14…36 Vdc I_n = 22 mA U_m = 250 V
Circuit 3 B1, B⊥ B2, B⊥	 Passive pulse/status output 1 Passive pulse/status output 2	Maximum values: U_i = 30 V, Ii = 100 mA, P_i = 1.0 W C_i = 0, L_i = 0 U_m = 60 V	Maximum values: U = 36 V I = 100 mA U_m = 250 V

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 U_m = 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, ⏚ are not polarity sensitive.

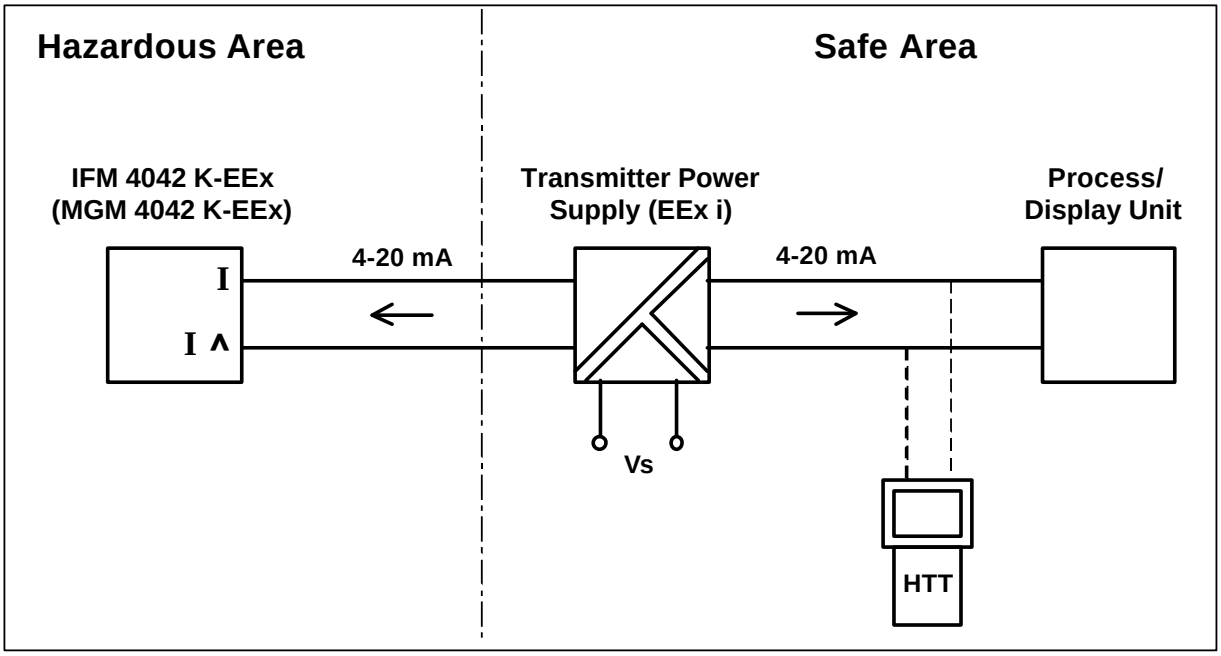


Figure 2: Connection of IFM 4042 K-EEx in 2-wire mode.

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 Uo ≤ 30 V, Io ≤ 100 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.

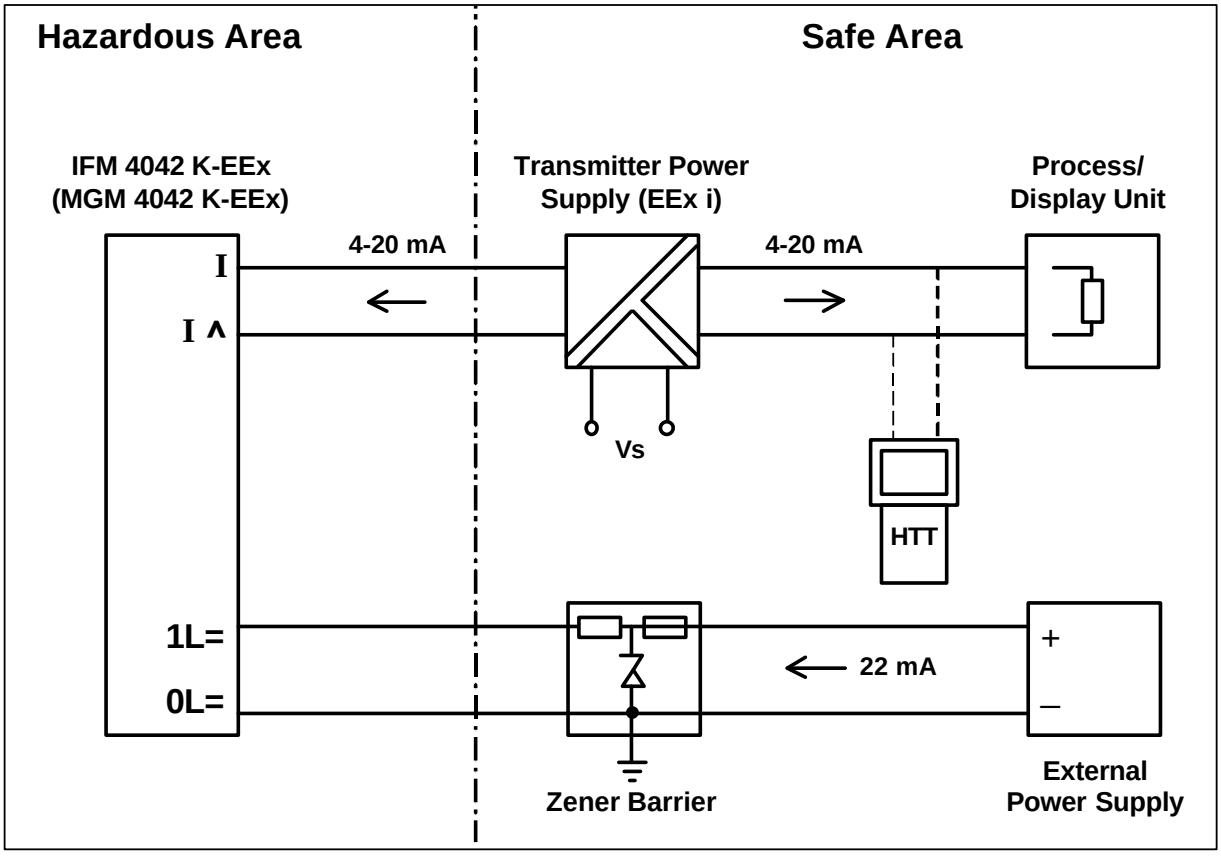


Figure 3: Connection of IFM 4042 K-EEx.

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 providfed 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 a ATEX approved "EEx i" zener barrier with a linear output load. The connection of the current output (terminals 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 "currrent 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 zenerbarrier 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
Io = 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.

Temperature class (for gases)	Max. surface temperature (for dusts)	Maximum process liquid temperature		
		$T_a \leq 40°C$	$T_a \leq 50°C$	$T_a \leq 60°C$
T6	T85°C	75°C	70°C	70°C
T5	T100°C	95°C	90°C	75°C
T4	T135°C	130°C	115°C	75°C
T3	T180°C	150°C	115°C	75°C

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

Temperature class (for gases)	Max. surface temperature (for dusts)	Maximum process liquid temperature		
		$T_a \leq 40°C$	$T_a \leq 50°C$	$T_a \leq 60°C$
T6	T85°C	70°C	70°C	70°C
T5	T100°C	85°C	85°C	85°C
T4	T135°C	120°C	120°C	115°C
T3	T180°C	180°C	180°C	115°C
Use heat-resistant cables above		-	-	50°C

Table 6: Temperature classification DN25…150.

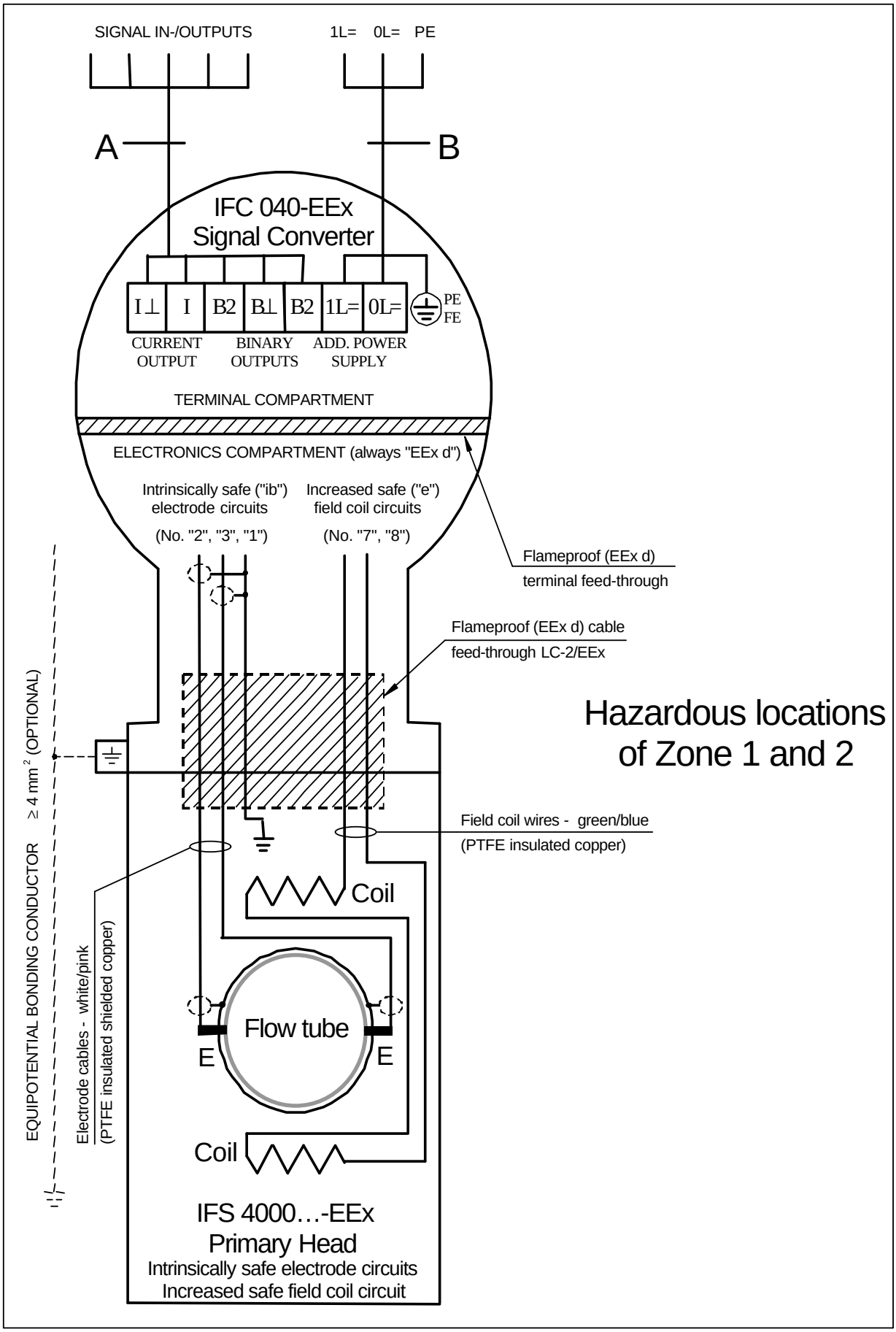
NOTES:

- 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



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

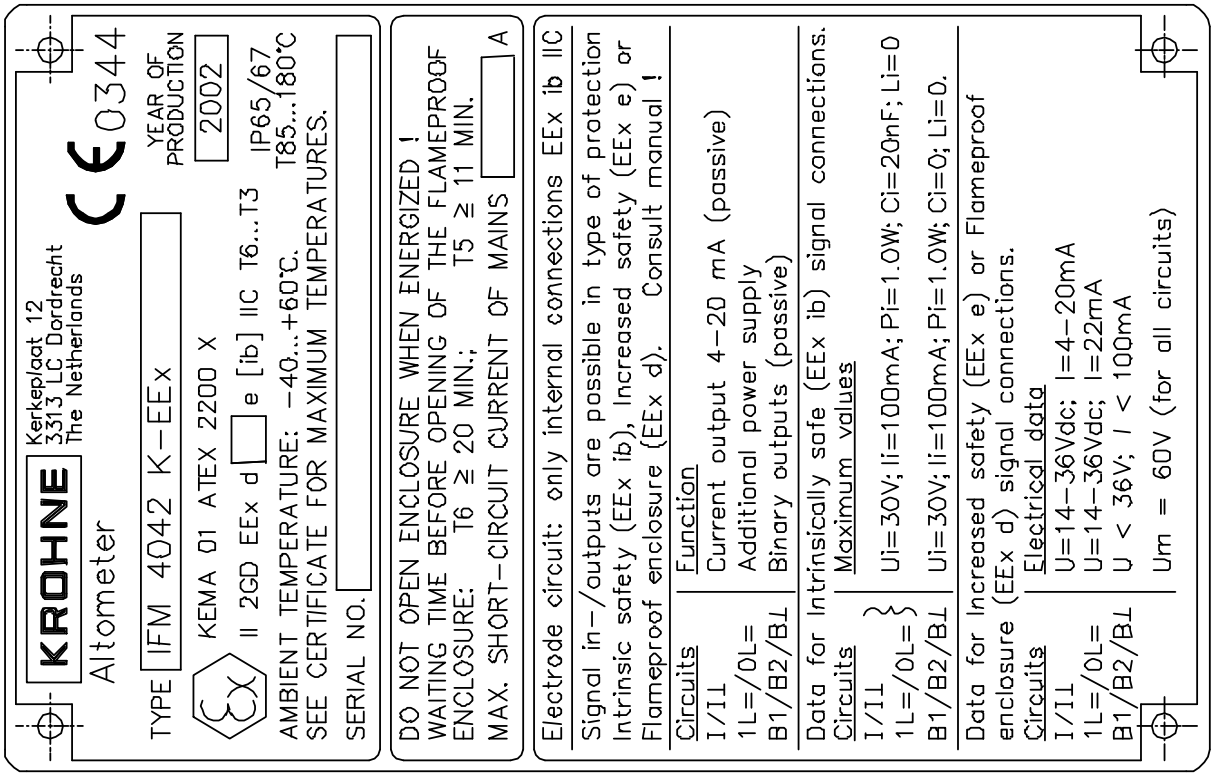


Figure 4: Data plate of IFM 4042 K-EEx, type "EEx de [ib]".

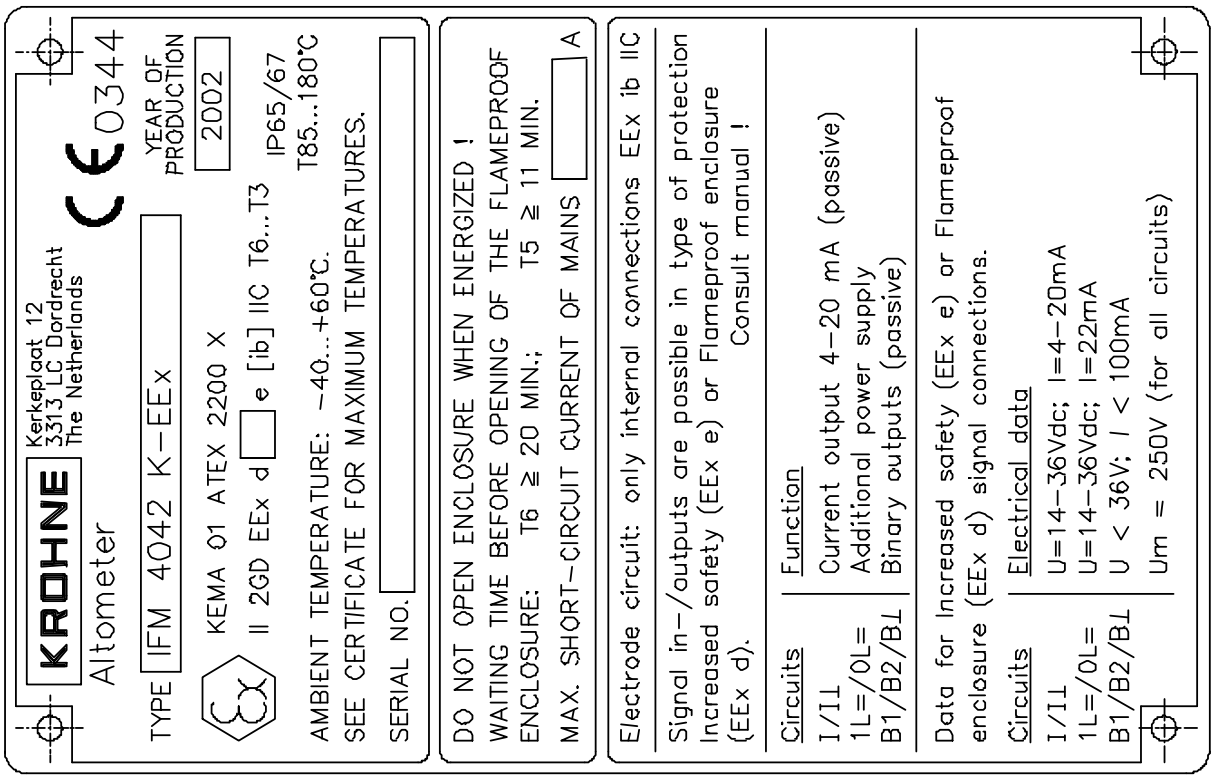


Figure 5: Data plate of IFM 4042 K-EEx, type "EEx de".

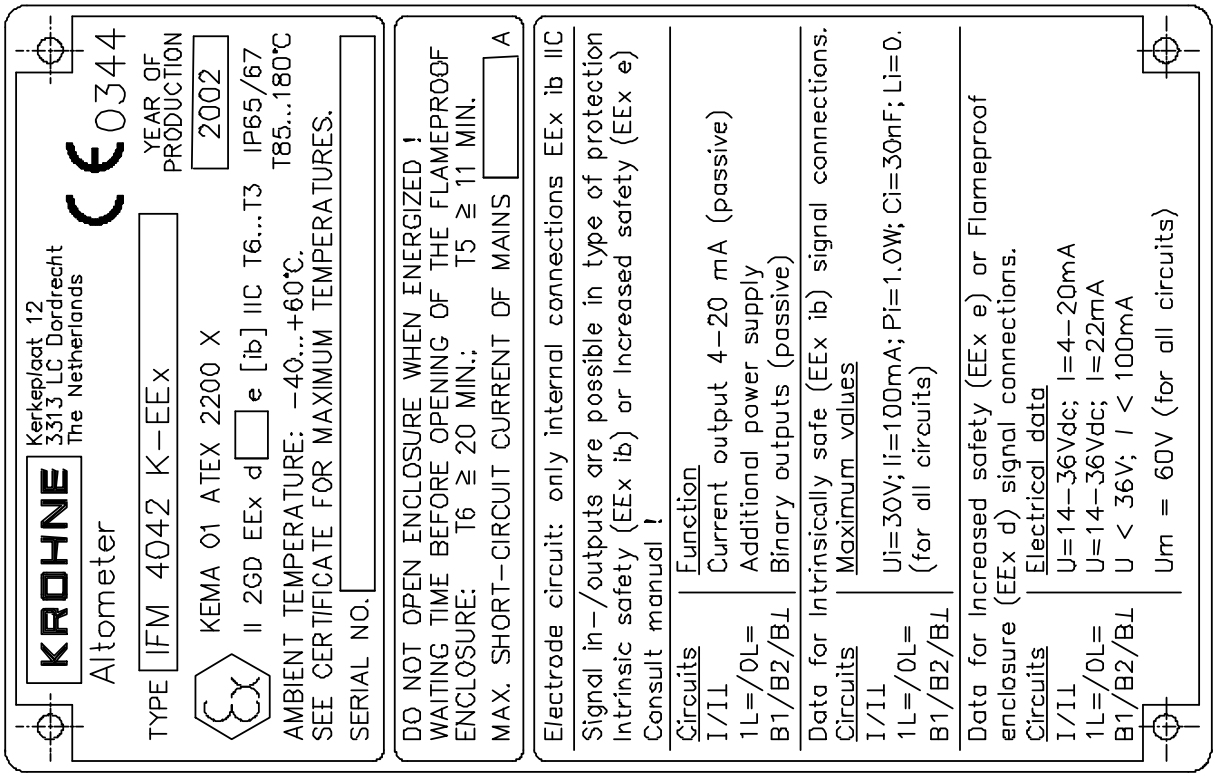


Figure 6: Data plate IFM 4042 K-EEx, type EEx e [ib].

KEMA

(1) **EC-TYPE EXAMINATION CERTIFICATE**

(2) Equipment or protective system intended for use in potentially explosive atmospheres – Directive 94/9/EC

(3) EC-Type Examination Certificate Number: **KEMA 01ATEX2200 X**

(4) Equipment or protective system: **Compact Magnetic Inductive Flowmeter, types IFM 4080 K/...-EEx, IFM 4042 K-EEx, MGM 4090 K/...-EEx and MGM 4042 K-EEx**

(5) Manufacturer: **Krohne Altometer**

(6) Address: **Kerkeplaat 12, 3313 LC Dordrecht, The Netherlands**

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

(8) KEMA Quality B.V., notified body number 0344 in accordance with Article 9 of the Council Directive 94/9/EC of 23 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 II to the Directive.

The examination and test results are recorded in confidential report no. 2011064.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50014 : 1997 **EN 50018 : 2000** **EN 50019 : 2000**
EN 50020 : 1994 **EN 50281-1-1 : 1998**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment or protection system is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment or protective system in accordance with the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

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

II 2 GD **EEx d [ia] IIC T6...T3 or EEx de [ib] IIC T6...T3 or EEx d [ia] [ib] IIC T6...T3 or EEx de [ia] [ib] IIC T6...T3 T 85...180 °C**

Arnhem, 28 March 2002
KEMA Quality B.V.

T. Pijpker
Certification Manager

* This Certificate may only be reproduced in its entirety and without any change.

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ACCREDITED BY THE DUTCH COUNCIL FOR ACCREDITATION

KEMA

(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate KEMA 01ATEX2200 X**

(15) **Description**

The Compact Magnetic Inductive Flowmeter, types IFM 4080 K/...-EEx, IFM 4042 K-EEx, MGM 4090 K/...-EEx and MGM 4042 K-EEx is used for measuring, counting and displaying the linear flow of an electrical conductive liquid.

The flowmeter consists of a signal converter housing in type of explosion protection flameproof enclosure "d" with a terminal compartment in type of explosion protection flameproof enclosure "d" or increased safety "e". The integral primary heads are in type of explosion protection flameproof enclosure "d" (sizes DN25 - DN150) or increased safety "e" (DN200 - DN3000) and are provided with measuring electrodes in type of explosion protection intrinsic safety EEx ia IIC.

Ambient temperature range -20 °C ... +60 °C (for flowmeter with electronics unit type IFC 090).
Ambient temperature range -40 °C ... +60 °C (for flowmeter with electronics unit types IFC 040 and IFC 090).

The maximum surface temperature T 85...180 °C is based on a maximum ambient temperature of 60 °C.

Electrical data

IFM4080 K/...-EEx / MGM 4090 K/...-EEx with IFC 090-EEx electronics

Power supply ..... 100/200 Vac, 115/230 Vac -15/+10 %, 10 VA
24 Vdc -25/+30 %, 24 Vac -15/+10 %, 8 W
U_m = 253 V

Signal I/O's ..... ≤ 36 Vdc

IFM4080 K/...-EEx / MGM 4090 K/...-EEx with IFC 090-EEx electronics

Power supply ..... 100...230 Vac -15/+10 %, 15 VA
24 Vdc -25/+30 %, 24 Vac -15/+10 %, 10 W
U_m = 253 V

Signal circuit
Modules P-SA and FA-ST ..... in type of explosion protection intrinsic safety EEx ia IIC, only for connection to a certified intrinsically safe circuit in type of explosion protection intrinsic safety
EEx ia IIC or EEx ia IIB or
EEx ib IIC or EEx ib IIB,
with the following maximum values:

U_i	=	30	V
I_i	=	250	mA
P_i	=	1,0	W

The effective internal capacitance C_i = 5 nF,
the effective internal inductance L_i is negligibly small.

(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate KEMA 01ATEX2200 X**

Electrical data (continued)

Signal circuit
Modules F-PA and F-FF ..... in type of explosion protection intrinsic safety EEx ia IIC, only for connection to a certified intrinsically safe circuit (for instance a Supply of the FISCO Model in accordance with document CLC/SC31-3(SEC)155 of Dec. 2000) in type of explosion protection intrinsic safety
EEx ia IIC or EEx ia IIB or
EEx ib IIC or EEx ib IIB,
with the following maximum values:

U_i	=	30	V
I_i	=	300	mA
P_i	=	4,2	W

The effective internal capacitance C_i = 5 nF,
the effective internal inductance L_i is negligibly small.

Signal/supply circuit
Module DC-I .....
(24 Vac/dc version only) in type of explosion protection intrinsic safety EEx ia IIC, with the following maximum values:

U_o	=	23,5	V
I_o	=	98	mA
P_o	=	0,6	W

Maximum allowed external capacitance C_o = 127 nF,
maximum allowed external inductance L_o = 4 mH.

Only for connection to certified intrinsically safe circuits in type of explosion protection EEx ia IIC or EEx ia IIB or EEx ib IIC or EEx ib IIB without supply (passive).

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

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

IFM 4042 K-EEx / MGM 4042 K-EEx with IFC 040-EEx electronics

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

a) Connection to a non-intrinsically safe circuit

Signal/supply circuit 1 ..... 14 - 36 Vdc, 4 - 20 mA

Signal/supply circuit 2 ..... 14 - 36 Vdc, 22 mA

Signal/supply circuit 3 ..... max. 36 Vdc, 100 mA

(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate KEMA 01ATEX2200 X**

Electrical data (continued)

b) Connection to an intrinsically safe circuit

Signal/supply circuits 1 and 2 ..... in type of explosion protection intrinsic safety EEx ib IIC with the following maximum values (each circuit):

U_i	=	30	V
I_i	=	100	mA
P_i	=	1,0	W

The effective internal capacitance C_i = 20 nF,
the effective internal inductance L_i is negligibly small.

Signal/supply circuit 3 ..... in type of explosion protection intrinsic safety EEx ib IIC with the following maximum values:

U_i	=	30	V
I_i	=	100	mA
P_i	=	1,0	W

The effective internal capacitance C_i is negligibly small,
the effective internal inductance L_i is negligibly small.

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

The aforementioned intrinsically safe circuits are safely galvanically separated from the non-intrinsically safe circuits up to a peak value U_m = 60 V.

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" for 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.

Unused openings shall be closed with suitable certified closing elements.

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

Routine tests

- Each welded primary head of size DN25 - DN150 must be submitted to the routine overpressure test according to EN 50018, Clause 16 at a test pressure of 14 bar during one minute.

(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate KEMA 01ATEX2200 X**

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 four times the reference pressure.

Each primary head of size DN200 - DN3000 shall withstand a test voltage according to EN 50019, Clause 6.1, of 500 V during one minute without breakdown between the field coils circuit and the enclosure and a test voltage of 1500 Vrms during one minute without breakdown between the field coils circuit and the intrinsically safe sensor circuit.

(16) **Report**

KEMA No. 2011054.

(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:

a) Meter size DN25 - DN150

Temperature class	Max. surface temperature	Max. process temperature		
		Ta ≤ 40 °C	Ta ≤ 50 °C	Ta ≤ 60 °C
T6	T 85 °C	70 °C	70 °C	70 °C
T5	T 100 °C	85 °C	85 °C	85 °C
T4	T 135 °C	120 °C	120 °C	115 °C
T3	T 180 °C	180 °C	180 °C	115 °C

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.

b) Meter size DN200 - DN3000

Temperature class	Max. surface temperature	Max. process temperature		
		Ta ≤ 40 °C	Ta ≤ 50 °C	Ta ≤ 60 °C
T6	T 85 °C	75 °C	70 °C	70 °C
T5	T 100 °C	95 °C	90 °C	75 °C
T4	T 135 °C	130 °C	115 °C	75 °C
T3	T 180 °C	150 °C	115 °C	75 °C

(18) **Essential Health and Safety Requirements**

Covered by the standards listed at (9).

KEMA

(13) SCHEDULE

(14) to EC-Type Examination Certificate KEMA 01ATEX2200 X

(19) **Test documentation**

1. Component Certificate: KEMA No. Ex-99.E.8128 U
   KEMA No. Ex-01.E.2036 U
   Certificate of Conformity: KEMA No. Ex-97.D.2886 X
   PTB No. Ex-90.C.2003 X
   PTB No. Ex-95.D.2209
   EC-Type Examination Certificate: KEMA 01ATEX2263 X
   PTB 98.ATEX.2012 U
   PTB 00.ATEX.2213 U

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