KROHNE

01/99

Addition to the Installation and Operating Instructions

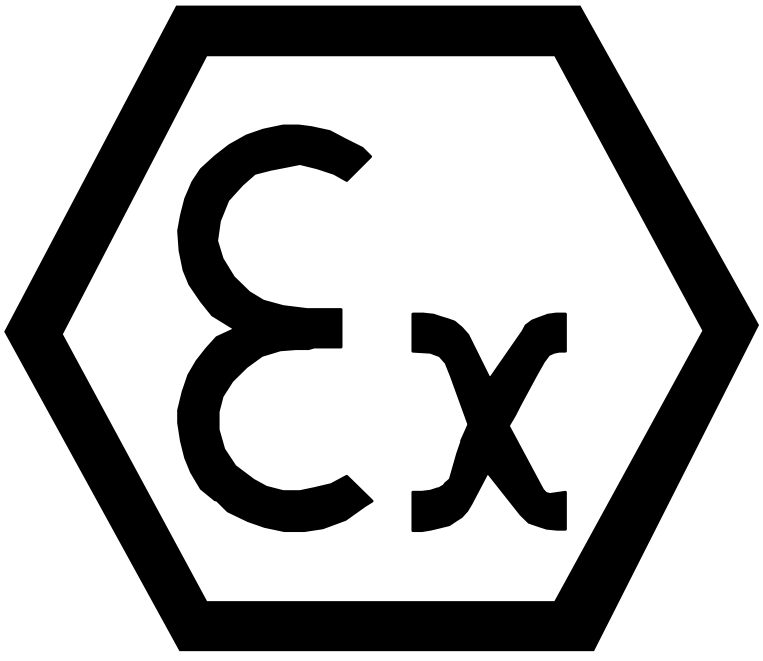
Magnetic inductive flowmeters

ALTOFLUX

IFM 6080 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 6080 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

DN2.5 - DN15: EEx m (Encapsulation) and EEx e (Increased safety)
DN25 - DN80: EEx d (Flameproof enclosure)

Internal electrode circuit

EEx ib (Intrinsic safety, category ib)

3 Installation in the pipeline

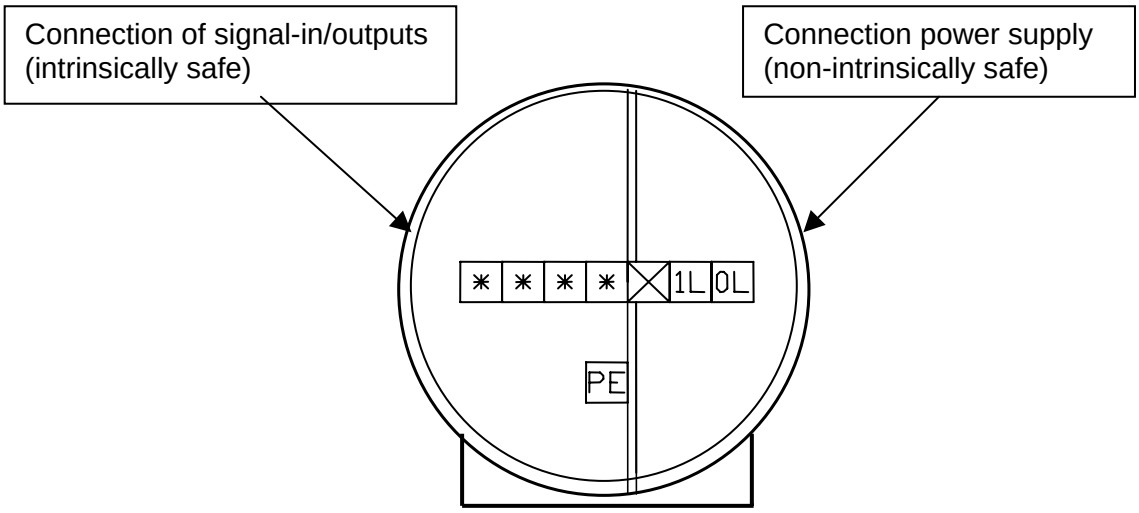
The installation of the compact flowmeter in the pipeline is equal to that of the standard compact flowmeters.

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 6080 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 6080 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 Working voltage: 8.. 30 V DC 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 Working current: < 110 mA Voltage drop in ON-state: < 2 V at 110 mA Leakage current in OFF-state: < 900 µA at 30 V Control input Input voltage LOW level: < 3 V Input voltage HIGH level: > 7 V 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 Maximum current: 30 mA 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 6080 K/ i-EEx compact flowmeters, sizes DN2.5 till DN15 inclusive, 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-96.D.1850 X, 1st 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 C_i = 5 nF, $L_i \approx 0$
F-PA	U_i = 30 V, I_i = 300 mA, P_i = 4,2 W C_i = 5 nF, $L_i \approx 0$
DC-I	U_o = 23,5 V, I_o = 98 mA, P_o = 0,6 W 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 1st Amendment.

6 Operation of the signal converter

The IFM 6080 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~~ ~~1.07~~	~~STATUS B1~~ ~~STATUS B2~~	
~~1.06~~ ~~1.07~~	~~CONTROL B1~~ ~~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).
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
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..50/60°C, see Certificate of Conformity or following table.
Medium temperature: See Certificate of Conformity or following table.

Max. ambient temperature [°C]	Temperature class	Max. Medium temperature [°C]
50	T6	70
	T5	85
	T4	120
	T3	180
60	T6	70
	T5	85
	T4	100
	T3	100

Note:
The maximum medium temperatures listed in the table above are safety-technical limits! Due to function-technical reasons lower limits may prevail.

10 Maintenance

The IFM 6080 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.

KEMA
REGISTERED QUALITY

(1) CERTIFICATE OF CONFORMITY

(2) KEMA No. **Ex-96.D.1850 X**

(3) **This certificate is issued for the electrical apparatus:**

Magnetic Flowmeter Type IFM 6080 K-EEx

(4) Manufacturer:

Krohne Altometer
Krausstraat 14 - 18
3364 AD Sliedrecht
The Netherlands

(5) This electrical apparatus and any acceptable variation thereto is specified in the Annex to this certificate and the documents therein referred to.

(6) KEMA, being an Approved Certification Body in accordance with Article 14 of the Council Directive of the European Communities of 18 December 1975 (76/117/EEC), confirms that the apparatus has been found to comply with the harmonised European standards:

Electrical apparatus for potentially explosive atmospheres

EN 50 014 : 1977 + A1 ... A5, General requirements
EN 50 018 : 1977 + A1 ... A3, Flameproof enclosure "d"
EN 50 019 : 1977 + A1 ... A5, Increased safety "e"
EN 50 020 : 1977 + A1 ... A5, Intrinsic safety "i"
EN 50 028 : 1987, Encapsulation "m"

and has successfully met the examination and test requirements which are recorded in a confidential test report.

(7) The apparatus marking shall include the code:

EEx d ib IIC T6 ... T3 or EEx de ib IIC T6 ... T3 or EEx dme ib IIC T6 ... T3

(8) The manufacturer of the electrical apparatus referred to in this certificate, has the responsibility to ensure that the apparatus conforms to the specification laid down in the Annex to this certificate and has satisfied routine verifications and tests specified therein.

(9) This apparatus may be marked with the Distinctive Community Mark specified in Annex II to the Commission Directive of 16 January 1984 (84/47/EEC).

Arnhem, 28 April 1997
by order of the Board of Directors of N.V. KEMA

C.M. Boschloo
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KEMA

ANNEX

to Certificate of Conformity KEMA No. Ex-96.D.1850 X

Description

The Magnetic Flowmeter Type IFM 6080 K-EEx is used to convert the flow of a conducting fluid into an electrical signal.

The range of flowmeter sizes is DN 1 ... DN 80.

The relation between temperature class, process temperature and ambient temperature is shown in following table:

Temperature class	Maximum process temperature (°C)	
	$T_a \leq 50$ °C	$T_a \leq 60$ °C
T6	70	70
T5	85	85
T4	120	100
T3	180	100

Ambient temperature range -20 °C ... +60 °C.

Electrical data

Supply power: ..... 24 V, 100 V, 110 V, 115 V, 120 V, 200 V 220 V, 230 V or 240 V; 48 ... 63 Hz or 24 Vdc

Current output: ..... 0 / 4 ... 20 mA (max. 22 mA)

Pulse output: ..... 0 ... 1000 Hz

Routine tests

Each welded flowmeter size DN 25 ... DN 80 shall be submitted to the routine test according to Clause 15.1 of EN 50 018 based on a reference pressure of 6,8 bar. Each potted cable feed-through shall be submitted to the routine test according to Clause 15.1 of EN 50 018 based on a reference pressure of 8,5 bar.

Routine tests according to Clause 15 of EN 50 018 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 flowmeter shall withstand a test voltage of 1500 Vrms during one minute without breakdown between the field coils circuit and the intrinsically safe sensor circuit. Each flowmeter size DN 1 ... DN 15 shall additionally withstand a test voltage of 1500 Vrms during one minute without breakdown between the field coils circuit and the enclosure.

Installation instructions

The cable entry device shall be of a certified type EEx d for the terminal compartment in type of protection flameproof enclosure "d" or shall be of a certified type EEx e for a terminal box in type of protection increased safety "e", and shall be suitable for the conditions of use and correctly installed. Unused apertures shall be closed with suitable blanking elements.

KEMA

ANNEX

to Certificate of Conformity KEMA No. Ex-96.D.1850 X

Test documentation

1. Certificate of Conformity KEMA No. Ex-92.C.7162
   Certificate of Conformity KEMA No. Ex-95.D.9699 X

		signed
2. Description (39 pages)		26.04.1996, 05.11.1996 16.12.1996, 14.01.1997 and 02.04.1997
3. Drawing No.	8.30470.01	26.04.1996
	8.30470.02	26.04.1996
	8.30470.03 A	20.12.1996
	8.30470.04 A	20.12.1996
	8.30470.05	26.04.1996
	8.30470.06	26.04.1996
	8.30470.07 A	13.01.1997
	8.30470.08 A	20.12.1996
	8.30470.09	26.04.1996
	8.30470.10 A	21.03.1997
	8.30470.12)	
	8.30470.13)	
	8.30470.14)	26.04.1996
	8.30470.15)	
	8.30470.16)	
	8.30470.17 A	20.12.1996
	8.30470.18	26.04.1996
	8.30478.04 A)	
	8.30478.05 A)	
	8.30478.06 A)	
	8.30181.13 A)	
	3.31028.01)	
	33117701)	20.12.1996
	33117702)	
	33117801)	
	33117802)	
	33120601 A)	
	33120602 A)	
	8.30520.01)	
	8.30520.02)	
	8.30520.03)	
	8.30520.04)	02.04.1997
	8.30520.05)	
	8.30520.06)	
	8.30520.07)	

4. Samples

Arnhem, 28 April 1997
by order of the Board of Directors of N.V. KEMA

C.M. Boschloo
Certification Manager

KEMA

AMENDMENT 1

to Certificate of Conformity KEMA No. Ex-96.D.1850 X

Manufacturer:

Krohne Altometer
Kerkeplaat 12
3313 LC Dordrecht
The Netherlands

Description

In future the Magnetic Flowmeter Type IFM 6080 K-EEx may also be constructed in accordance with the documentation listed below.

The changes concern:

- The mechanical construction.

- The insertion of the electronic assembly type IFC 090i/...-EEx.
  This assembly is provided with a combination of two of the below mentioned modules, which contain the associated intrinsically safe circuits.
  Module DC-I (supply circuit) is combined with module P-SA or module FA-ST only.
  When Module DC-I is not used the other Modules must be considered to be passive.

  For this version the model code becomes IFM 6080 K /.../ i-EEx and the apparatus marking shall include the code
  EEx d ib [ia] IIC T6...T3 or **EEx de ib [ia] IIC T6...T3** or **EEx dme ib [ia] IIC T6...T3**

- In future the manufacturer's address will be as mentioned above.

Electrical Data

External supply ..... 24 Vdc +30%/-25%, 10 W; or
(terminals 1L=, 0L=) 24 Vac +10%/-15%, 10 W

Signal circuit ..... in type of explosion protection EEx ia IIC, only for
Module P-SA and Module FA-ST connection to a certified intrinsically safe circuit
(terminals I, I⊥ respectively in type of explosion protection
B1, B1⊥, B2, B2⊥) 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 W

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

AMENDMENT 1

to Certificate of Conformity KEMA No. Ex-96.D.1850 X

Signal circuit .....
Module F-PA
(terminals D, D⊥)

in type of explosion protection EEx ia IIC, only for connection to a certified intrinsically safe circuit (for instance a Supply of the FISCO Model in accordance to PTB-Report W-53 of August 1994) in type of explosion protection
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 is negligibly small.

Signal-/Supply circuit .....
Module DC-I, combined with
Module P-SA or FA-ST
(Terminals I+, I, respectively
B1+, B1)

in type of explosion protection 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).

When (also) connected to an active certified intrinsically safe circuit in type of explosion protection EEx ia IIC or EEx ia IIB or EEx ib IIC or EEx ib IIB the maximum output voltage U_o of that circuit must be ≤ 6,5 V.
For the interconnecting circuit this value and the aforementioned values of U_o, I_o, P_o, C_o and L_o must be taken into account as well.

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 are safely galvanically separated from the non-intrinsically safe circuits up to a peak value of the nominal voltage of 375 V.

All other data remain unchanged.

KEMA

AMENDMENT 1

to Certificate of Conformity KEMA No. Ex-96.D.1850 X

Test documentation

1. Component Certificate PTB No. Ex-98.D.2004 U
   Certificate of Conformity KEMA No. Ex-92.C.7162

		signed
2. Description (10 pages)	)	
	)	26.02.1998
3. Drawing No. 8.30470.19	)	

4. Sample

Arnhem, 10 July 1998
by order of the Board of Directors of KEMA N.V.

C.M. Boschloo
Certification Manager

Code: EEx d ib IIC T6...T3 or EEx de ib IIC T6...T3 or EEx dme ib IIC T6...T3 or
EEx d ib [ia] IIC T6...T3 or EEx de ib [ia] IIC T6...T3 or EEx dme ib [ia] IIC T6...T3

[98.1711]