KROHNE

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GR

Addition to the installation and operating instructions

Universal 3-Beam ultrasonic flowmeter

UFM 3030 K/...EEx compact ultrasonic flowmeter
UFC 030 F/...EEx ultrasonic flow converter
UFS 3000 F/...EEx ultrasonic flow sensor

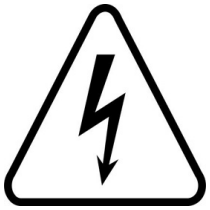
Electromagnetic flowmeters
Variable area flowmeters
Mass flowmeters
Ultrasonic flowmeters
Vortex flowmeters
Flow controllers
Level measuring instruments
Pressure and temperature
Heat metering
Communications technology
Switches, counters, displays and recorders
Engineering systems & solutions

General advice on safety

- Do not install, operate or maintain this flow meter without reading, understanding and following the factory-supplied instructions, otherwise injury or damage may result.
- Read these instructions carefully before starting installation and save them for future reference.
- Observe all warnings and instructions marked on the product.
- Use only mains supply with protective earthing connected.
- Do not use the product with removed covers under wet conditions.
- Consider handling and lifting instructions to avoid damage.
- Install the product securely and stable.
- Install and connect cabling proper to exclude damage or harmful situations.
- If the product does not operate normally, refer to the service instructions or refer to qualified KROHNE service engineers.
- There are no operator-serviceable parts inside the product.

The following symbols may appear in this manual or on the product

ATTENTION: Refer to operating and installation instructions!



DANGER: Risk of electric shock!

PROTECTIVE EARTH (PE) conductor terminal!

These terms may appear in this manual or on the instrument:

WARNING statement: Identify conditions or practice that could result in injury or loss of life.

CAUTION statement: Identify conditions or practice that could result in damage to the instrument or other property.

Disclaimer

- This document contains important information on the instrument. KROHNE attempts to be as accurate and up-to-date as possible but assumes no responsibility for errors or omissions. Nor does KROHNE make any commitment to update the information contained herein. This manual and all other documents are subject to change without prior notice.
- KROHNE will not be liable for any damage of any kind by using its instrument, including, but not limited to direct, indirect, incidental, punitive and consequential damages.
- This disclaimer does not apply in case KROHNE has acted on purpose or with gross negligence. In the event any applicable law does not allow such limitations on implied warranties or the exclusion of limitation of certain damages, you may, if such law applies to you, not be subject to some or all of the above disclaimer, exclusions or limitations.
- Any instrument purchased from KROHNE is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.
- KROHNE reserves the right to alter the content of its documents, including this disclaimer in any way, at any time, for any reason, without prior notification, and will not be liable in any way for possible consequences of such changes.

Product liability and warranty

- Responsibility for suitability and intended use of this ultrasonic flow meter rests solely with the user. Improper installation and operation of the flow meter (system) may lead to loss of warranty.
- In addition, the Terms and Conditions of Sale are applicable and are the basis for the purchase contract.
- If flow meters need to be returned to KROHNE, please note the information given on the last pages of the installation and operating instructions. KROHNE regrets that they cannot repair or check flow meter(s) unless accompanied by the completed form (see last pages of the installation and operating instructions).

Items included with order

- UFM 3030 ultrasonic flow meter, comprising of a flow sensor, UFS 3000 and a flow converter, UFC 030 either built together as a compact system or supplied as two separate pieces, in the size as indicated on the packaging box
- Signal cable (only in case of a separate system)
- Special tool for opening the converter housing

Documentation supplied

- Condensed installation and operating manual
- For Ex-units: installation and operating instructions for use in hazardous areas
- Instruction card: overview of the configuration menu and display markers
- Service Handbook
- Approval documents, unless reproduced in the installation and operating instructions
- Report of factory settings of the flow converter
- Certificate of system calibration data

This instrument is developed and manufactured by:

KROHNE Altometer
Kerkeplaat 12
3313 LC Dordrecht
The Netherlands

For information, maintenance or service please contact your nearest local KROHNE representative.

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

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 HD 384 or 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 Part 1) must be strictly followed.
- Installation, establishment, utilization and maintenance are only allowed to be executed by personnel with an education in explosion safety!

These additional instructions are an extension to the installation and operating instructions and only apply to the EEx versions of the UFM 3030 K, UFS 3000 F and UFC 030 F ultrasonic flowmeters. All technical information as described in the installation and operating instructions is applicable, when not specifically excluded, completed or replaced by the instructions in these additional instructions.

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1 System Components

1.1 General information

The UFM 3030 ultrasonic flowmeters in compact and separate design are in accordance with the European Directive 94/9 EC (ATEX 100a) and approved for hazardous classified locations of Zone 1 and 2 by the PTB conform to the European Standards of the EN 500xx series, approval number: PTB 03 ATEX 2021 X.

1.2 Compact flowmeter

The standard UFM 3030 K-EEx compact flowmeter is designed for ambient temperatures (i.e. Ta) in the range of -40°C up to +65°C. The MODIS version of type UFM 3030 K/i-EEx with intrinsically safe signal in-/outputs is suitable for ambient temperatures in the range from -20°C up to +65°C. The maximum allowed process liquid (medium) temperature is restricted by the combustible atmosphere that (possibly) surrounds the apparatus, determined by the temperature class of the atmosphere, see table below.

Temperature class	**Maximum process liquid temperature at**			
	Ta ≤ 40°C	**Ta ≤ 50°C**	**Ta ≤ 60°C**	**Ta ≤ 65°C**
T6	80°C	80°C	80°C	80°C
T5	95°C	95°C	95°C	95°C
T4	130°C	130°C	125°C	100°C
T3	180°C	165°C	125°C	100°C

The UFM 3030 K/…-EEx compact flowmeter consists of the UFC 030…-EEx flow converter that is screwed on top of the UFS 3000-EEx flow sensor by four hexagonal socket head cap screws of size M6. The standard (i.e. non-MODIS) compact flowmeter is marked with one of the codes below:

Default:
- **II 2G EEx de [ib] IIC T6…T3** for the terminal compartment of the flow converter housing in type of protection increased safety "e" according to EN 50019.

Optional (only if explicitly ordered!):
- **II 2G EEx d [ib] IIC T6…T3** for the terminal compartment of the flow converter housing designed as flameproof enclosure "d" according to EN 50018.

The MODIS version of the compact flowmeter, i.e. UFM 3030 K/i-EEx, is marked with one of the following codes:

Default MODIS:
- **II 2G EEx de [ia/ib] IIC T6…T3** for the terminal compartment of the flow converter housing in type of protection increased safety "e" according to EN 50019.

Optional MODIS (only if explicitly ordered!):
- **II 2G EEx d [ia/ib] IIC T6…T3** for the terminal compartment of the flow converter housing designed as flameproof enclosure "d" according to EN 50018.

For service purposes the electronics unit of the two beam ultrasonic converter UFC 500…-EEx unit can be replaced by the new UFC 030…-EEx electronics unit.

1.3 Flow sensor

1.3.1 Standard instruments

The UFS 3000…-EEx flow sensor is the default measuring unit of the UFM 3030 (3-beam) ultrasonic flowmeters. It contains the ultrasonic sensor (three pairs of opposite transducers) in type of protection intrinsic safety category "ib" according to EN 50020. All sensor circuits are wired by separate coaxial cables and connected through SMB connectors, which are marked by the respective numbers 1.1, 1.2, 2.1, 2.2, 3.1 and 3.2. The flow sensors are available in size DN25 (1") up to DN3000 (120") in diameter.

The UFS 3000…-EEx flow sensor is used in combination with the flow converter unit type UFC 030…-EEx, which is either directly mounted on top of the flow sensor (compact meter) or installed on a distance and connected via a cable (separate version). In the last case the flow sensor as well as the flow converter unit are both provided with a junction box, in which the SMB connectors are mounted.

The UFS 3000 F/…-EEx flow sensor in separate design is the measuring unit of the separate flowmeter system. There is a standard version, suitable for process liquid temperatures from -25°C up to 180°C and an extended temperature (XT) version UFS 3000 F/XT-EEx, which allows a maximum process temperature of 220°C. Both versions are designed for an ambient temperature in the range of -40°C up to +65°C.

The UFS 3000 F/…-EEx flow sensors in separate design are classified according to the temperature classification table below.

Temperature class	**Maximum process liquid temperature at Ta = 65°C**	
	Standard design	**XT-design**
T6	80°C	80°C
T5	95°C	95°C
T4	130°C	130°C
T3	180°C	195°C
T2	N.A.	220°C

The UFS 3000 F/…-EEx flow sensors are marked with the explosion safety codes:

- Standard UFS 3000 F-EEx: **II 2G EEx ib IIC T6…T3**
- XT-version UFS 3000 F/XT-EEx: **II 2G EEx ib IIC T6…T2**

The intrinsically safe "ib" ultrasonic sensor circuits inside the UFS 3000…-EEx flow sensor have the following maximum values (i.e. entity parameters):

- Maximum input voltage : Vmax = 13.1 V
- Maximum input current : Imax = 600 mA
- Maximum internal capacitance : Ci = 13.1 nF (maximum, 3 sensor circuits)
- Maximum internal inductance : Li = 134 µH (maximum, 3 sensor circuits)

The intrinsical safe sensor circuits of the UFM 3030 K/…-EEx compact flowmeter are only internal circuits and not accessible for the user.

1.3.2 Optional instruments

The following options are available to support customers that have one or more ultrasonic flowmeter systems (in compact and/or separate design) based on the UFM 500…-EEx series and need to replace the UFC 500…-EEx electronics unit.

Because the intrinsically safe “ib” sensor circuits of UFS 500…-EEx flow sensor have almost the same maximum values (i.e. entity parameters) as the UFS 3000…-EEx, it can also be driven by the UFC 030…-EEx electronics unit. Therefore only four of the six SMB connectors on the front-end printed circuit board of the UFC 030…-EEx electronics unit must be connected to the four SMB connectors of the UFS 500…-EEx flow sensor. For proper functioning must connector number 1.1, 1.2, 2.1 and 2.2 of the UFC 030…-EEx be connected to respective number 4, 3, 1 and 2 of the UFS 500…-EEx flow sensor.

An exception applies to the ALTOSONIC V-version UFS 500 F/5STR-EEx, which can only be driven by five UFC 500…-EEx electronics units.

The intrinsically safe "ib" ultrasonic sensor circuits inside the UFS 500…-EEx flow sensor have the same maximum values (i.e. entity parameters) as the UFS 3000…-EEx, except for the internal capacitance, which is a little smaller, namely: Ci = 7.7 nF (maximum, 2 sensor circuits)

The UFS 500-EEx as part of the UFM 500 K…-EEx compact flowmeter is approved under number PTB 01 ATEX 2015 X and the UFS 500 F/…-EEx flow sensor with a separate design has approval number PTB 01 ATEX 2012 X. See Appendix 1.

1.4 Flow converter

The UFC 030…-EEx flow converter consists of an approved cylindrical housing, made of a die-casted aluminium alloy (type AX/P/…-EEx with KEMA No. Ex-99.E.8128 U) or of stainless steel (type VX-EEx with PTB No. Ex-96.D.1068 U). It contains two separate compartments, divided from each other by wall with an integrated encapsulated flameproof terminal feed-through. The housing of the compact version is screwed on top of the flow sensor, the housing of the separate version is screwed on an aluminium or stainless steel wall-mounting bracket. A junction box made of die-casted aluminium alloy or stainless steel is screwed to the side of the bracket by four M6 recessed head screws with internal hexagonal socket set (only applicable for the flow converter in separate design).

The flow converter housing is on both ends closed by a threaded cylindrical cover with O-ring sealing. Coaxial cables of type RG179 or RG316 with SMB plugs at their ends connect the intrinsically safe sensor output circuits of the flow converter to the corresponding SMB male-to-male bulkheads in the junction box.

The equipotential bonding conductor is screwed under the external M5 U-clamp terminal, which is located on the mounting flange at the bottom of the neck of the flow converter housing. The flow converter housing has an ingress protection degree of at least IP67 in accordance with EN 60529.

1.4.1 Electronics compartment

The electronics compartment accommodates the UFC 030…-EEx electronics unit. The compartment is designed with type of protection flameproof enclosure "d" in accordance with EN 50018. It is closed by a flameproof display cover with glass window, which is glued and additionally mechanical supported by a screwed in back-up ring made of aluminum or stainless steel (depends on the material of the housing). The interconnecting part (i.e. neck) at the bottom of the housing contains a flameproof cable feed-through, through which the coaxial cables run. The feed-through provides a flameproof sealing at the bottom of the electronics compartment.

The UFC 030…-EEx electronics unit is inserted into the electronics compartment with the help of two sliding rubbers that position and fixate the unit at the front of the inside of the housing. Two M4 screws mount the unit and a third M4 screw fixates the brass earth strip at the back-end of the front-end printed circuit board, which contains the integrated voltage/current limiting circuit. The three screws are screwed to the integrated wall inside the electronics compartment. The on the front-end PCB integrated voltage/current limiting circuit provides the ultrasonic sensors inside the flow sensor with type of protection intrinsic safety category "ib" according to EN 50020.

The voltage/current limiting circuit has the following maximum output values:

- Maximum output voltage : V_O = 8.15 V
- Maximum output current : I_O = 220 mA
- Maximum allowed external capacitance : C_O = 1.3 µF
- Maximum allowed external inductance : L_O = 0.5 mH

1.4.2 MODIS electronics units

The MODIS electronics units have type designation UFC 030i-EEx and are provided with two MODIS modules. The modules provide intrinsically safe signal input/output circuits, which are accessible by the user for connection in the terminal compartment of the flow converter housing. Three types of modules can be used on the UFC 030i-EEx electronics unit, namely: P-SA (current output), FA-ST (pulse or status output) and F-PA (fieldbus type Profibus).

A combination of two of the above listed modules is installed on the power supply printed circuit board of the MODIS versions of the UFC 030…-EEx electronics.

1.4.3 Terminal compartment

The terminal compartment accommodates seven M4 clamp terminals for connection of the power supply and the signal in-/output circuits. The terminals are separated from each other by insulation plates (eight in total, from which one at each end of the row).

The terminal compartment (default in type of protection increased safety “e”) is standard equipped with two metal cable glands of size M20x1.5 or Pg13.5. The terminal compartment can optionally be provided as a flameproof enclosure “EEx d”, in which case the customer must use pre-certified “EEx d” cable glands or conduits.

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 (in accordance with ATEX 100a directive) sealing devices (i.e. stopping boxes) directly at the conduit entrances of the as flameproof enclosure “EEx d” performed terminal compartment.

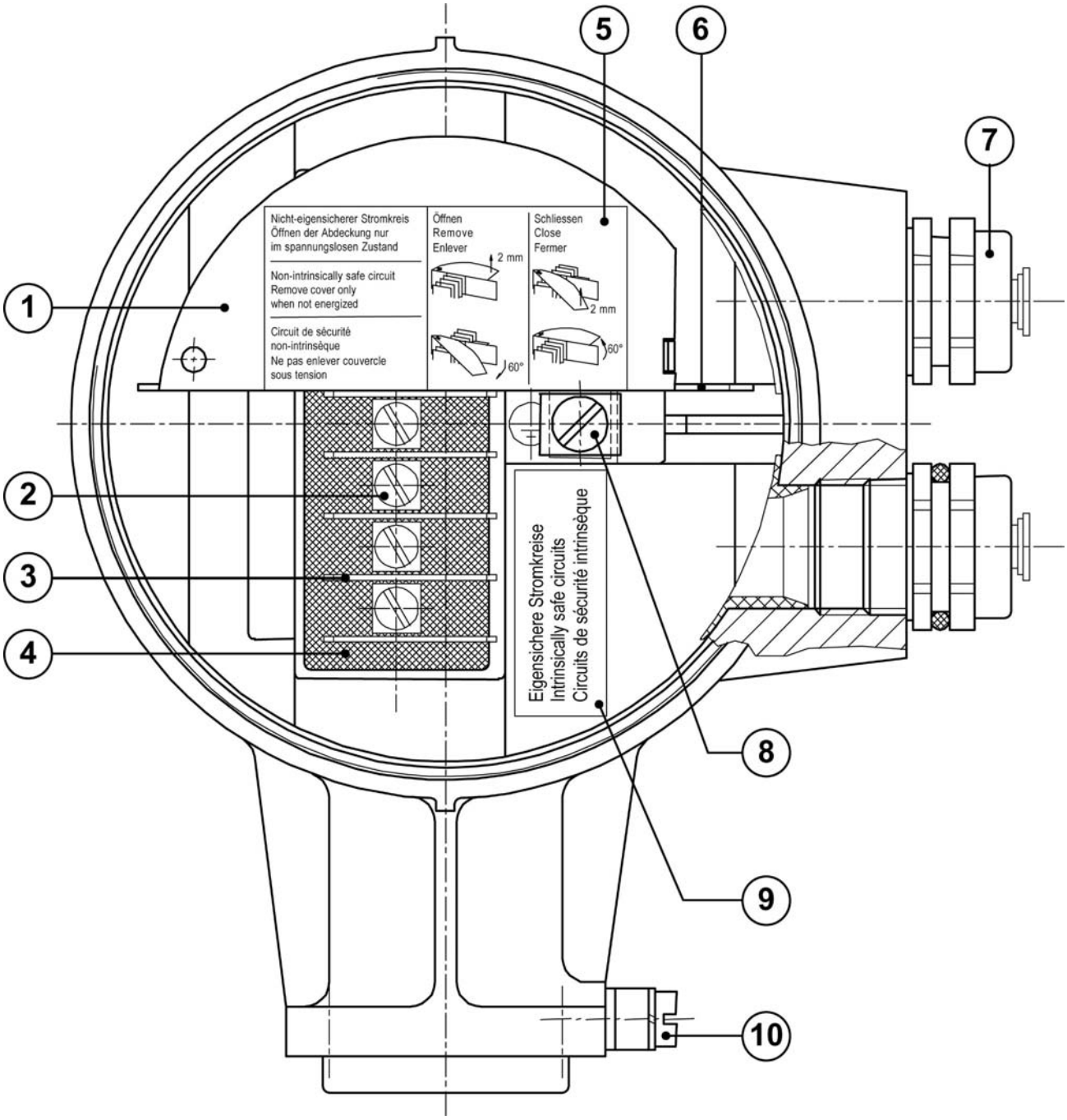
1.4.4 MODIS terminal design

The connections for the intrinsically safe MODIS input/output circuits consist of four M4 U-clamp terminals, separated from the two power supply terminals by an earthed metal plate, which is screwed to a non-used M4 U-clamp terminal. Eight dividing plates of insulating material in-between the seven terminals and at each end of the row separate the terminals from each other and from the earthed metal housing.

After the power supply cable is connected to the appropriate two terminals, these two terminals are covered by a semi-circular insulating plate to prevent any possible contact with the intrinsically safe MODIS conductors. See figure below.

“EEx d” approved cable glands are no part of the standard delivery package, but must be provided by the customer himself or ordered explicitly at KROHNE.

1) Semi-circular insulating cover plate
2) U-clamp terminal size M4 (7 in total)
3) Dividing plate of insulating material (8 in total)
4) Flameproof terminal feed-through
5) Sticker with handling instructions for insulating cover plate
6) Metal dividing plate intrinsically safe and non-intrinsically safe terminals
7) Cable gland (size M20x1.5 or Pg13.5) or cable adapter
   (e.g. M20x1.5 to ½ inch NPT)
8) PE/FE U-clamp terminal size M5
9) Indication sticker for intrinsically safe signal in-/output terminals (MODIS)
10) External U-clamp terminal size M5 for equipotential bonding cable.



Terminal compartment of MODIS versions

1.5 Electrical data

1.5.1 Power supply unit

The UFC 030…-EEx electronics unit is equipped with a switching-mode power supply, which is available in two supply voltage ranges, namely:

- 100…240 V AC power supply;
- 24 V AC/DC power supply.

The power supplies are available in the standard as well as the MODIS design. The main difference between these versions is that the MODIS versions are not provided with the analogue input A1 and its driver logic. The +33 V output of the secondary winding of the mains transformer that provides the necessary 24 V for the analogue input driver logic is therefore not available on the MODIS versions.

The power supply's mains transformer provides the galvanic separation between the primary circuit (i.e. mains supply) and the secondary circuits. The secondary windings of the mains transformer deliver the following output voltages:

- +/- 33 V to supply 24 V to the driver logic of the analogue input A1. This analogue input is only available on the standard (non-MODIS) versions.
- +/- 24 V for the +6 V and -6 V internal supply voltages of the electronic components of the UFC 030…-EEx electronics unit.

The table below lists the electrical input voltages of the power supply units, at the primary side of mains transformer.

Power supply	**Nominal voltage**	**Tolerances**	**Mains supply voltage**		
			Minimum	**Maximum**	**Limit**
24 V AC/DC	24 V AC	-10/+15%	21.6 V AC	27.6 V AC	39 Vpeak
	24 V DC	-25/+33%	18 V DC	32 V DC	
100…240 V AC	100…240 V AC	-15/+10%	85 V AC	264 V AC	375 Vpeak

The table below lists the electrical data of the power supply outputs. Note that the MODIS versions of the 24 V AC/DC and 100…240 V AC power supply units are not equipped with the analogue input driver. The secondary winding of the mains transformer that supplies the 24 V for the current output driver is therefore not used. It only has a pull-down resistor of 10 M Ohm towards earth potential.

Power supply output	**Parameter**	**Minimum**	**Nominal**	**Maximum**	**Limit (1)**
Electronics pos. supply	Voltage	+5.4 V	+6 V	+6.54 V (2)	40 V
	Current	225 mA	400 mA	571 mA	-
Electronics neg. supply	Voltage	-5.2 V	-6 V	-9 V	40 V
	Current	20 mA	50 mA	88 mA	-
Analogue input driver (3)	Voltage	21.6 V	24 V	26.4 V	40 V
	Current	1 mA	(4)	100 mA	-

(1) Due to the explosion safety measures for the MODIS modules.
(2) Depends on the load.
(3) Only for standard (non-MODIS) versions.
(4) Depends on what the user connects to the current output.

1.5.2 Intrinsically safe sensor circuits

The on the front-end printed circuit board integrated voltage/current limiting circuits are connected via SMB receptacles of type Radiall R114 665 (for coaxial cables). They are soldered into the PCB at the front side of the board (close to the local display unit). The connections are established during the installation of the IFC 030…-EEx electronics unit inside the flameproof electronics compartment of the flow converter housing by KROHNE Altometer personnel.

1.5.3 In-/output circuits

The analogue input circuit A1 is protected against overcurrent by a fuse of type TR5 No. 19372 in accordance with IEC 127-3 of manufacturer Wickmann. This fuse is rated
T 50 mA, 250 V AC and has a breaking capacity of 35 A.

1.5.4 MODIS design

The MODIS versions of the UFC 030i-EEx is available with a 100…240 V AC and 24 V AC/DC power supply unit. The power supply printed circuit board of the UFC 030i-EEx is therefore equipped with two MODIS modules, which are approved under no. PTB 97 ATEX 2265 U.

1.5.5 Power supply units

The power supply units of the MODIS versions are based on those of the standard units, with the main difference that the analogue input A1 and its circuitry is removed from the power supply printed circuit boards. The ±33 V secondary output of the mains transformer is no longer needed to generate the ±24 V for the analogue inputs driver logic.

1.5.6 MODIS modules

The modules are suitable for a maximum ambient temperature of 65°C with non-driven electronics and installed in the closed flameproof electronics compartment of the flow converter housing. The minimum ambient temperature is limited at -20°C.

Module	Terminal designation	Function/data
P-SA	I ⏚ I	Current output (0/4-20 mA), passive Vi = 30 V, Ii = 250 mA, Pi = 1.0 W Ci = 5 nF, Li ≈ 0
FA-ST	B1, B1 ⊥ or B2, B2 ⊥	Pulse (frequency) output or status in-/output, all passive The function can be set by software Vi = 30 V, Ii = 250 mA, Pi = 1.0 W Ci = 5 nF, Li ≈0
F-PA	D,D ⊥	Fieldbus module, type Profibus system, passive Vi = 30 V, Ii = 380 mA, Pi = 5.32 W Ci = 5 nF, Li ≈0

The UFC 030i-EEx can be equipped with a combination of two MODIS modules, see table below. The possible combinations of the installed MODIS modules and the terminal designation in the terminal compartment of the flow converter housing are listed in table below.

Combination of MODIS modules		Designation of intrinsically safe outputs			
P-SA	FA-ST	I ⊥	I	B1	B1 ⊥
P-SA	F-PA	I ⊥	I	D	D ⊥
FA-ST	FA-ST	B2	B2 ⊥	B1	B1 ⊥
FA-ST	F-PA	B1	B1 ⊥	D	D ⊥

2 Technical data

2.1 Mains supply

Connector X1, pins 6 and 7 on power supply PCB

24 V AC/DC	24 V AC +15%/-10%, 8 W, Vm = 264 V 24 V DC +33%/-25%, 8 W, Vm = 264 V
100…240 V AC	100…240 V AC -15%/+10%, 11 W, Vm = 264 V

2.2 Signal in-/outputs

Standard versions

Connector X1, pins 1, 2, 3, 4 and 5 on power supply PCB	24 V DC ±10%, 0-22 mA (100 mA max.), Vm = 264 V

MODIS versions

P-SA, FA-ST (passive current output respectively passive frequency / status output)	in type of protection Intrinsic Safety EEx ia IIC, only to be connected to intrinsically safe circuits with maximum values (i.e. entity parameters) of: Vi = 30 V, Ii = 250 mA, Pi = 1.0 W Ci = 5 nF, Li ≈ 0
F-PA (Fieldbus Profibus)	in type of protection Intrinsic Safety EEx ia IIC, only to be connected to intrinsically safe circuits with maximum values (i.e. entity parameters) of: Vi = 30 V, Ii = 380 mA, Pi = 5.32 W Ci = 5 nF, Li ≈ 0

2.3 Ultrasonic sensor circuits

6 separate SMB connectors X1, X2, X6, X7, X10 and X11 on front-end PCB	in type of protection Intrinsic Safety EEx ib IIC Maximum values (i.e. entity parameters): Vo = 8.15 V, Io = 220 mA Lo = 0.5 mH, Co = 1.3 µF

2.4 Environment temperatures

Ambient temperature Ta

- standard version -40°C - +65°C
- MODIS versions -20°C - +65°C

Component ambient temperature Tac (inside closed converter housing)

- during unfavorable operation ≤85°C
- under fault conditions ≤100°C

MODIS modules ambient temperature -20°C …+65°C (with non-driven electronics) (inside closed converter housing).

2.5 Power dissipation

At nominal supply voltage and full load at the outputs, the nominal power dissipation of the UFC 030…-EEx with the 100…240 V AC power supply is limited at a maximum of 11 W and with the 24 V AC/DC it is limited to 8 W.

3 Electrical connections

3.1 Safety instructions

These instruments are designed in accordance with IEC 61010-1 for Installation Category 2 and Pollution Degree 2. Hazardous voltages are present within this product during normal operation. They are designed for Protection Class I and should never be operated without protective earthing. The instruments shall also never be operated with the covers removed. Always follow the basic and local safety precautions when using these instruments to reduce the risk of injury from electrical shock, spread of fire or other dangerous situations.

3.2 Power supply connection

When the UFC 030…-EEx flow converter is connected to the mains supply voltage, the following environmental requirements must be maintained for safe operation:

a) Suitable for indoor and outdoor use, protection category IP67 according to IEC 60529.
b) Use up to an altitude of 2000 m above see level.
c) Suitable for an operation ambient temperature range - 40°C to +65°C.
d) Suitable for an storage temperature range -40°C to + 80°C.
e) Suitable for use in atmospheres with a relative humidity up op 80%.
f) Mains supply voltage fluctuations for 100 – 240 V AC: -15 to +10%; 24 V AC: -10 to +15%; DC: -25 to +33% of the specified voltage range.
g) Overvoltages up to category II on the main supply voltage (IEC 60364-4-443).
h) Connected to protective earth conductor (Protection Class I).
i) Rated pollution degree 2.

- This instrument is intended for permanent connection to the mains supply. It is required (e.g. for service) to mount an external switch or circuit breaker in the proximity of the instrument for disconnection from the mains. It must be easily reachable by the operator and marked as the disconnecting device for this product. The switch or circuit breaker must be suitable for the application and shall also be in accordance with the local (safety) requirements and of the building installation. (IEC 60947-1 /-3).
- The U-clamp terminal size M5, press-fitted in the terminal compartment (near the mains connection terminals), for the protective earth conductor must always be connected to the protective earth conductor of the mains supply. Conductors up to 4 mm^2 (11 AWG) can be connected to this terminal. The diameter of the conductors of the mains supply, including the protective earth conductor shall be in accordance with the general and local requirements.
- It is not allowed to use the protective earth terminal for any other connection than the protective earth conductor.
- IP67 is only warranted when suitable cabling is used with the cable glands and covers mounted as specified.

3.3 Equipotential bonding

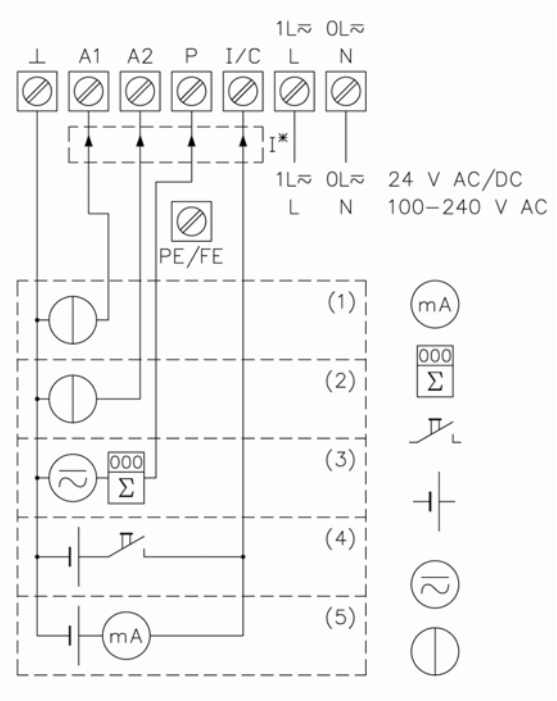
All ultrasonic flowmeters of the UFM 3030 series must always be incorporated within the equipotential bonding system of the hazardous area. For this purpose it is provided with an external PE-terminal. The external PE-terminal is located on the connecting flange at the bottom of the flow converter housing and on top of the support of the flow sensor, just below the junction box.

A separate bonding conductor must be at least 4 mm^2 (11 AWG) or 2,5 mm^2 (14 AWG) in case it is mechanical protected, see Clause 413 of HD 384.4.41 or IEC 364-4-41. Make sure that the core of the bonding wire is properly mounted under the U-clamp of the PE-terminal and that the screw is tightly fixed.

3.4 Standard versions

The field cables enter the terminal compartment of the UFC 030…-EEx flow converter unit (i.e. power supply, current and signal in-/outputs) and are non-intrinsically safe. To connect external devices to the in-/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. DIN VDE 0165, paragraph 5.6).

The PE conductor of the mains supply must always be connected to the M5 clamp terminal marked with the safety earth symbol, which is press-fitted into the dividing aluminum wall of the flameproof flow converter housing. The terminal arrangement for standard versions without NAMUR outputs (non-MODIS) is shown below.



Symbols and specifications

Milliampère meter Ri ≤ 680 Ohm

Electronic or electro-mechanical totalizer
U ≤ 32 V DC / 24 V AC; I ≤ 150 mA

Switch, N/O contact 32 V DC / 1.5 mA

External power supply, DC voltage
For passive current output: V_{ext} = 15 – 24 V DC; I ≥ 22 mA
For passive digital input: V_{ext} = 15 – 32 V DC; I ≥ 1.5 mA

External power supply, DC or AC voltage
V_{ext} ≤ 32 V DC / ≤ 24 V AC: I ≤ 150 mA

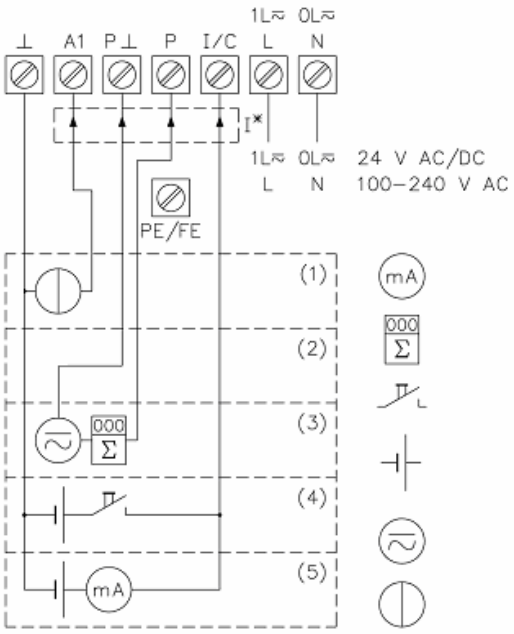
External current source, e.g. temperature transducer
I_{ext} ≤ 25 mA

Abbreviations and specifications

⊥	Common earth contact for in-/output circuits
A1, A2	Analogue input : 0 – 20 mA / I ≤ 25 mA
P	Pulse output : ≤ 32 V DC / ≤ 24 V AC: I ≤ 150 mA
I/C	Current output I : 0 – 22 mA / Rload ≤ 680 Ohm / 24 V DC or Digital input C : 0 – 5 V DC = 'low' / 15 – 32 V DC = 'high'
L, 1L≈	Life mains supply terminal : 100…240 V AC, 24 V AC or 24 V DC
N, 0L≈	Neutral mains supply terminal : 100…240 V AC, 24 V AC or 24 V DC
PE/FE	Protective Earth / Functional Earth terminal

3.5 Namur versions

See connection diagram below for standard version with NAMUR outputs (non-MODIS)
See paragraph 4.4 how to set-up the NAMUR NE 43 failure indication



Symbols and specifications

Milliampère meter Ri ≤ 680 Ohm

Electronic or electro-mechanical totalizer
U ≤ 32 V DC / 24 V AC; I ≤ 150 mA

Switch, N/O contact 32 V DC / 1.5 mA

External power supply, DC voltage
For passive current output: V_{ext} = 15 – 24 V DC; I ≥ 22 mA
For passive digital input: V_{ext} = 15 – 32 V DC; I ≥ 1.5 mA

External power supply, DC or AC voltage
V_{ext} ≤ 32 V DC / ≤ 24 V AC: I ≤ 150 mA

External current source, e.g. temperature transducer
I_{ext} ≤ 25 mA

Abbreviations and specifications

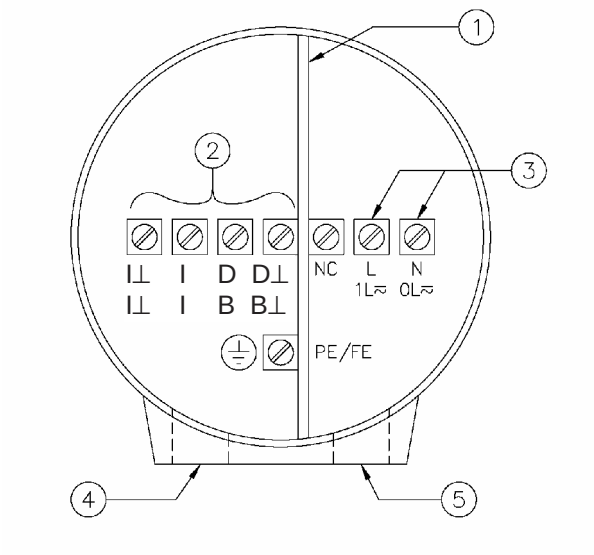
⊥	Earth contact for current output and analogue input
A1	Analogue input : 0 – 20 mA / I ≤ 25 mA
P⊥	Earth contact for pulse output
P	Pulse output : ≤ 32 V DC / ≤ 24 V AC: I ≤ 150 mA
I/C	Current output I : 0 – 22 mA / Rload ≤ 680 Ohm / 24 V DC or Digital input C : 0 – 5 V DC = 'low' / 15 – 32 V DC = 'high'
L, 1L≈	Life mains supply terminal : 100…240 V AC, 24 V AC or 24 V DC
N, 0L≈	Neutral mains supply terminal : 100…240 V AC, 24 V AC or 24 V DC
PE/FE	Protective Earth / Functional Earth terminal

All in-/output circuits must be connected in passive mode. Observe the polarity of the instrument: current (I) always flows towards A1, P and I/C (current sink) !

To connect external devices to the in-/output terminals, the wiring requirements for the specific type of protection of the terminal compartment (standard: increased safety "e", optional: flameproof enclosure "d") must be respected, see standard EN 60079-14 or the corresponding national standard.

3.6 MODIS versions

The field cables of the non-intrinsically safe power supply and the intrinsically safe "ia" signal in-/outputs enter the terminal compartment of the UFC 030i-EEx flow 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 "d") must be conform to the international or national standard involved (e.g. DIN VDE 0165, paragraph 5.6).The figure below shows the terminal arrangement inside the terminal compartment for the MODIS versions (i.e. UFC 030i-EEx).



1) Metal dividing plate for separation of IS and non-IS terminals
2) Connecting terminals for intrinsically safe signal inputs/outputs
3) Connecting terminals for non-intrinsically safe power supply
   L / N : 100…240 V AC
   1L≈ / 0L≈ : 24 V AC/DC
   PE : Protective Earth
   FE : Functional Earth
4) Cable entrance for intrinsically safe sensor cable
5) Cable entrance for non-intrinsically safe power supply cable

   NC: Not connected

Terminal arrangement of MODIS versions in terminal compartment.

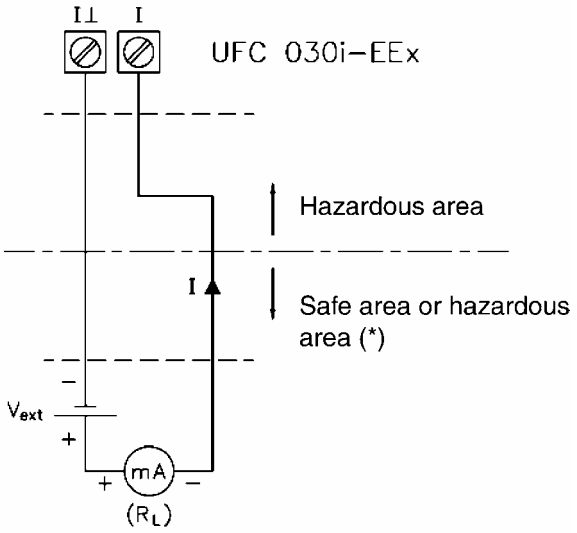
The PE conductor of the mains supply must be connected to the M5 clamp terminal marked with the safety earth symbol, which is press-fitted into the dividing aluminum wall of the flameproof flow converter housing. The following table below lists the electrical data of the non-intrinsically safe power supply.

Power Supply	**Electrical data**
24 V AC/DC terminals 1L≈, 0L≈, FE	24 V AC +15%/-10%, 48 - 63 Hz, 8 W of 24 V DC +33%/-25%, 8 W
100…240 V AC terminals L, N, PE	100…240 V AC +10%/-15%, 48 - 63 Hz, 11 W

The non-intrinsically safe terminals for connection of the power supply (L, 1L≈ and N, 0L≈) must be connected in accordance with 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 flow converter housing.

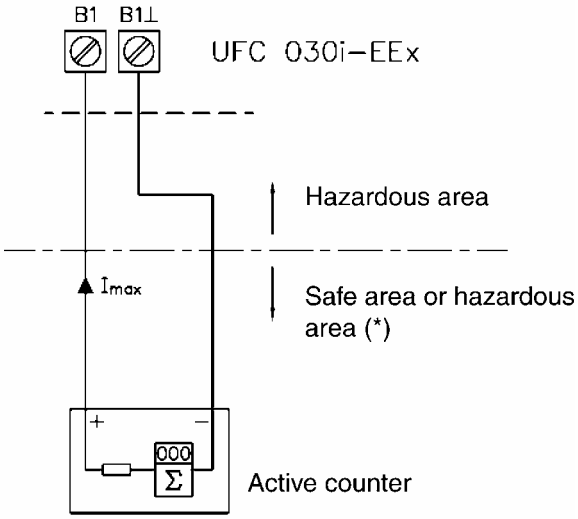
Current output I passive
Vext = 8.1... 30 V

$R_L \leqq (V_{ext} - 8) / 0.022$
$I = 4 \ldots 20$ mA



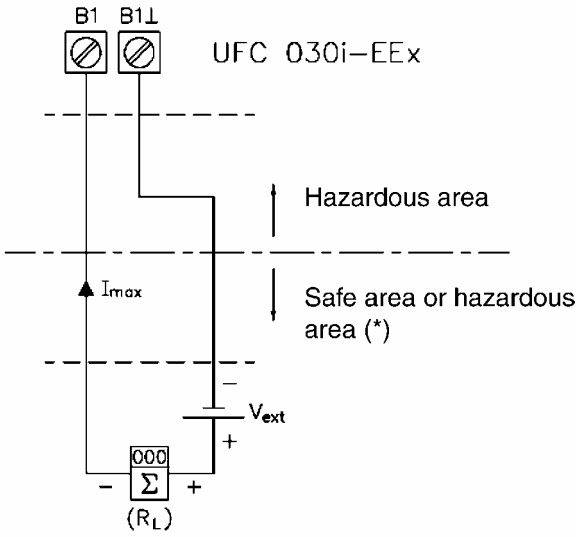
Pulse output P passive
Vext = 6... 30 V

$I_{max} \leqq 110$ mA



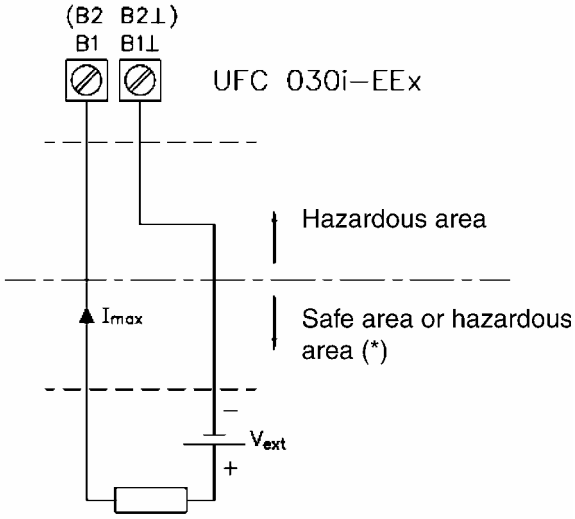
Pulse output P passive

$V_{ext} = 6 \ldots 30$ V
$I_{max} \leqq 110$ mA



Status output S passive
Connection to B1/B1 (earthing sign) and B2/B2 (earthing sign)

$V_{ext} = 6 \ldots 30$ V
$I_{max} \leqq 110$ mA

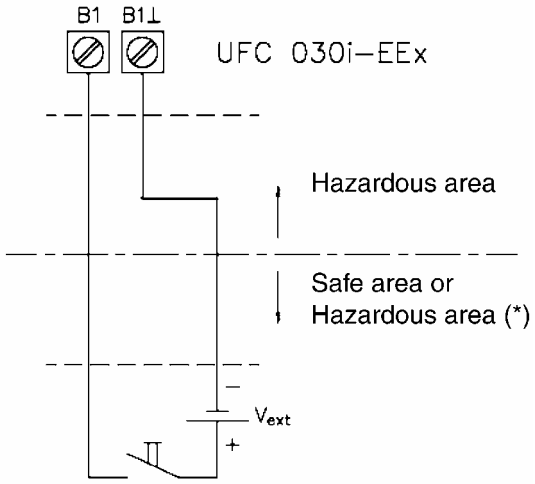


Passive counter with external power supply

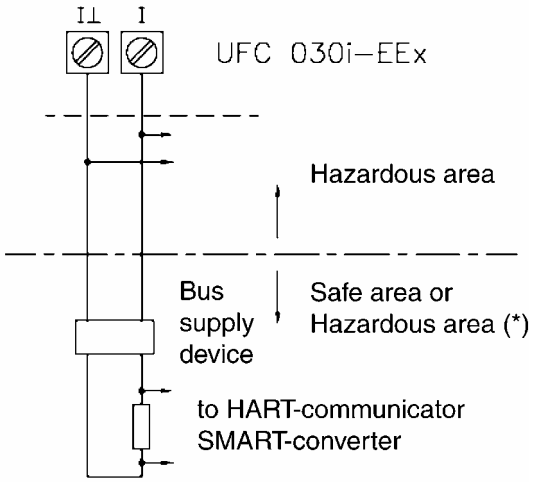
(*) Only if measuring devices are explosion protected!

Control input C passive
Connection to B1/B1 (earthing sign)

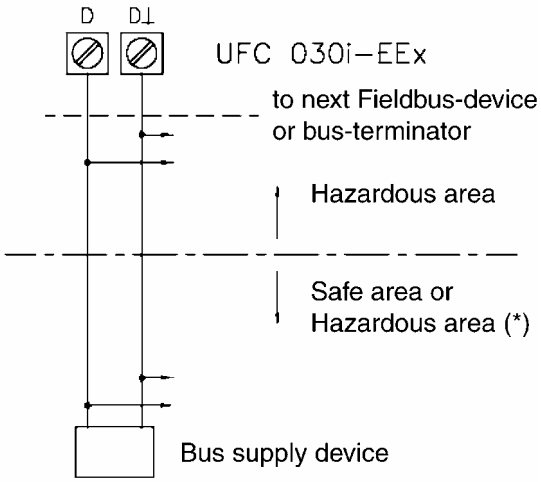
V_{ext} = 7 ... 30 V DC



HART passive



Fieldbus: Profibus



MODIS signal in- and output connections

(*) Only if measuring devices are explosion protected!

4 Operation of the flow converter

4.1 Operation of the flow converter

The UFC 030…-EEx electronics unit of the UFM 3030 K/…-EEx compact flowmeter and the UFC 030 F/…-EEx flow converter in remote design is equipped with a display unit that contains magnetic sensors (Hall-sensors). The sensors enable setting of the UFC 030…-EEx electronics to be set or reset with the help of the with the apparatus delivered bar magnet without opening the flameproof electronics compartment in the hazardous area. Consult the standard Installation and Operating Instructions (i.e. Part B) for the program functions of the software of the UFC 030…-EEx electronics unit.

4.2 Connecting cables

The below described cables are shown in the connection diagram of these additional Installation and Operating Instructions.

Cable A Signal cable for current output and binary in-/outputs (pulse and status output). This cable type must be in accordance with clause 9 of the EN 60079-14 "Electrical installations in hazardous locations" or an equivalent national standard (e.g. DIN VDE 0165 Part 1).

Cable B Mains power supply cable. This cable type must also be in accordance with clause 9 of the EN 60079-14 "Electrical installations in hazardous locations" or an equivalent national standard (e.g. DIN VDE 0165).
Rated voltage: ≥ 500 V
Examples: H07..-., H05..-. to HD 21.S2 or HD22.S2

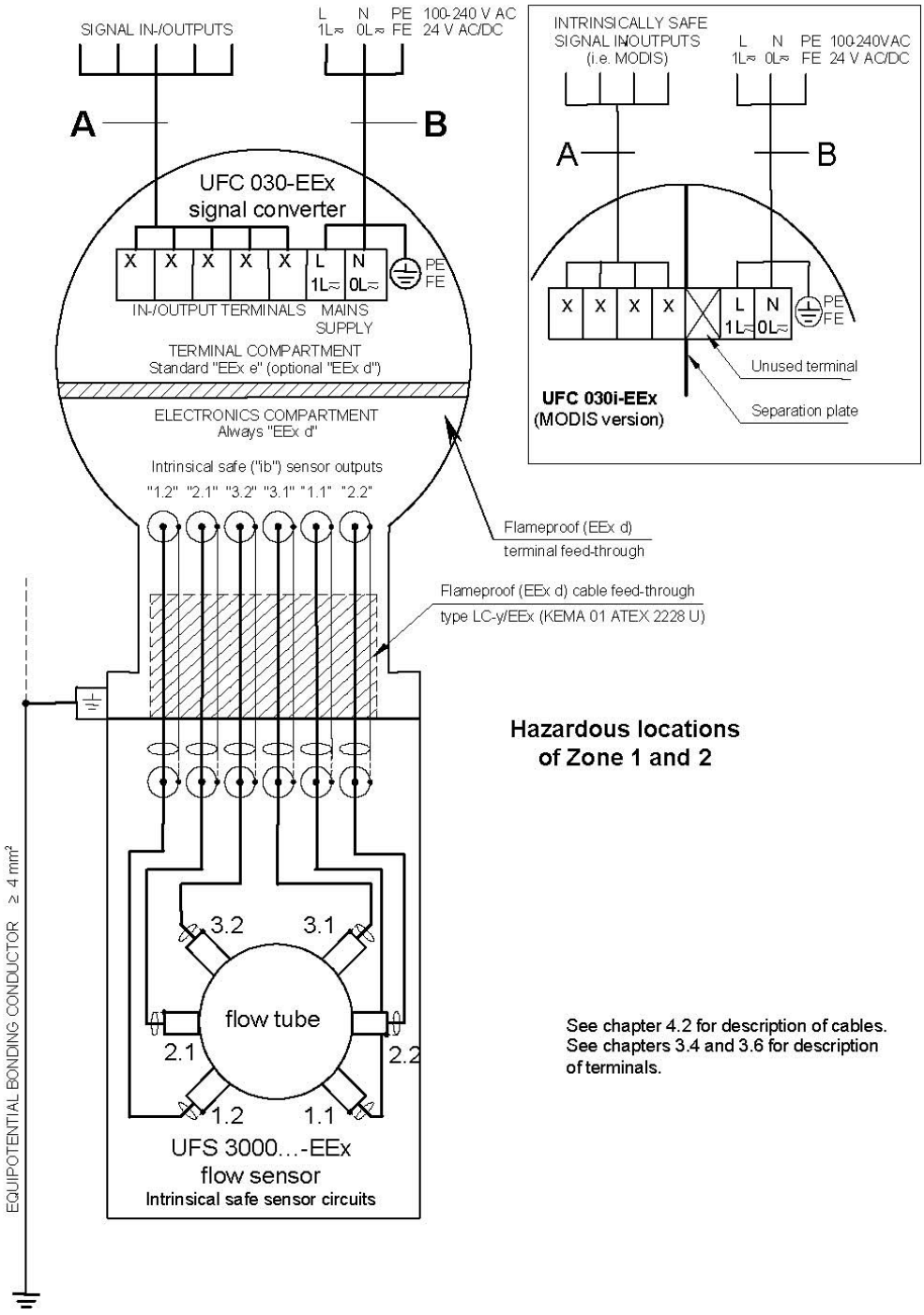
Cable C MR06 coaxial cable (only for remote default version), to be supplied by KROHNE Altometer.
Technical data:
Test voltage: ≥ 500 V
Diameter of strand (core and screen): ≥ 0.1 mm
Distributed capacitance (core/screen): 67 pF/m
Distributed inductance (core/screen): 0.4 µH/m

Cable D MR04 coaxial cable (only for remote optional version), also supplied by KROHNE Altometer. This cable has the same technical data as cable C above, except that it contains four coaxial cables in stead of six for the MR06 cable.

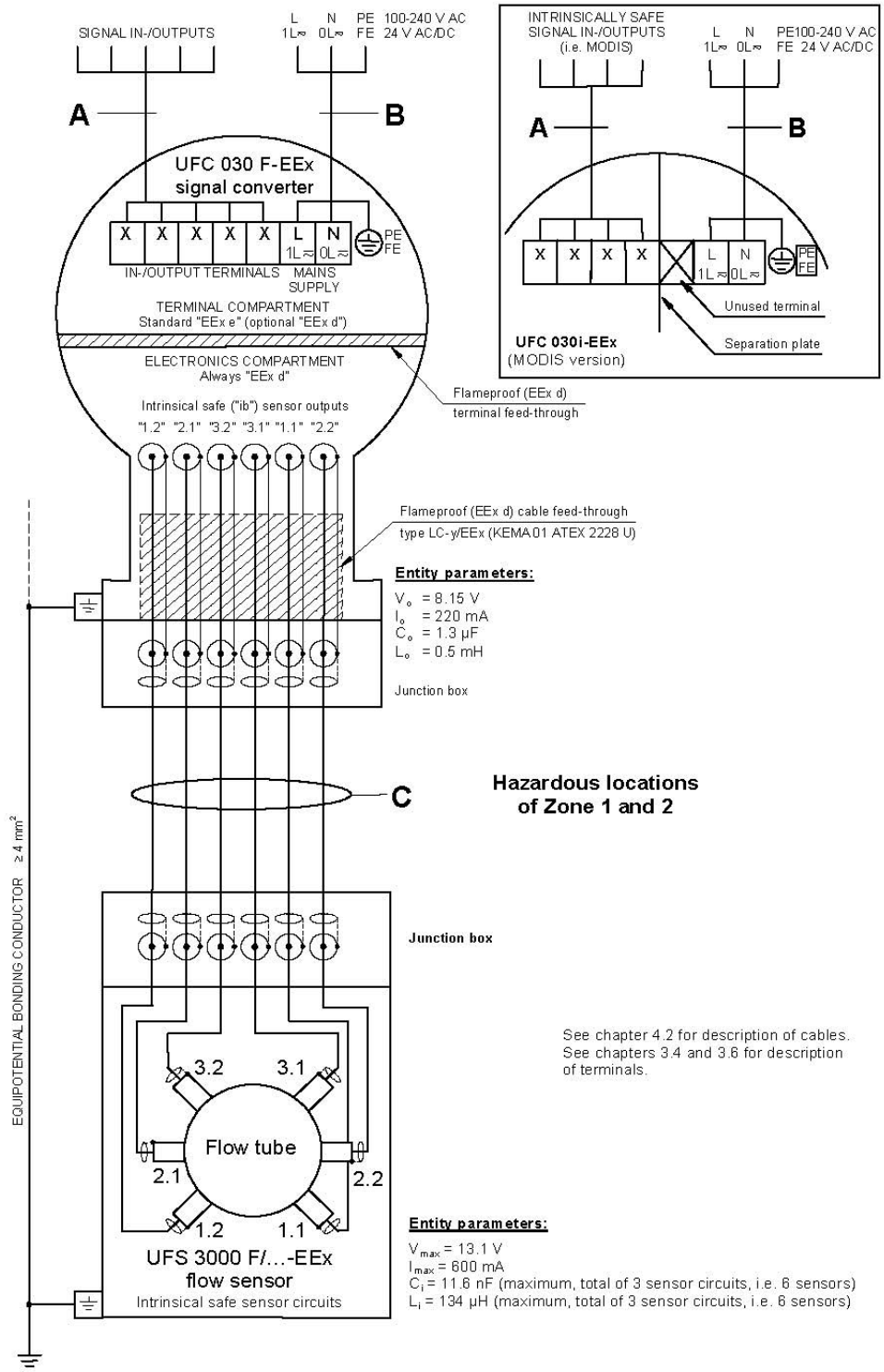
Equipotential bonding conductor Minimum cross-sectional area;
- unprotected: 4 mm^2 (11 AWG)
- protected by metal conduit: 2.5 mm^2 (14 AWG).

4.3 Connection diagrams

The following diagrams show the connection diagrams of respectively the compact ultrasonic flowmeter system and remote ultrasonic flowmeter system (default). The picture in the frame shows the connecting terminals of the UFC 030i-EEx (non-MODIS version) electronics unit.



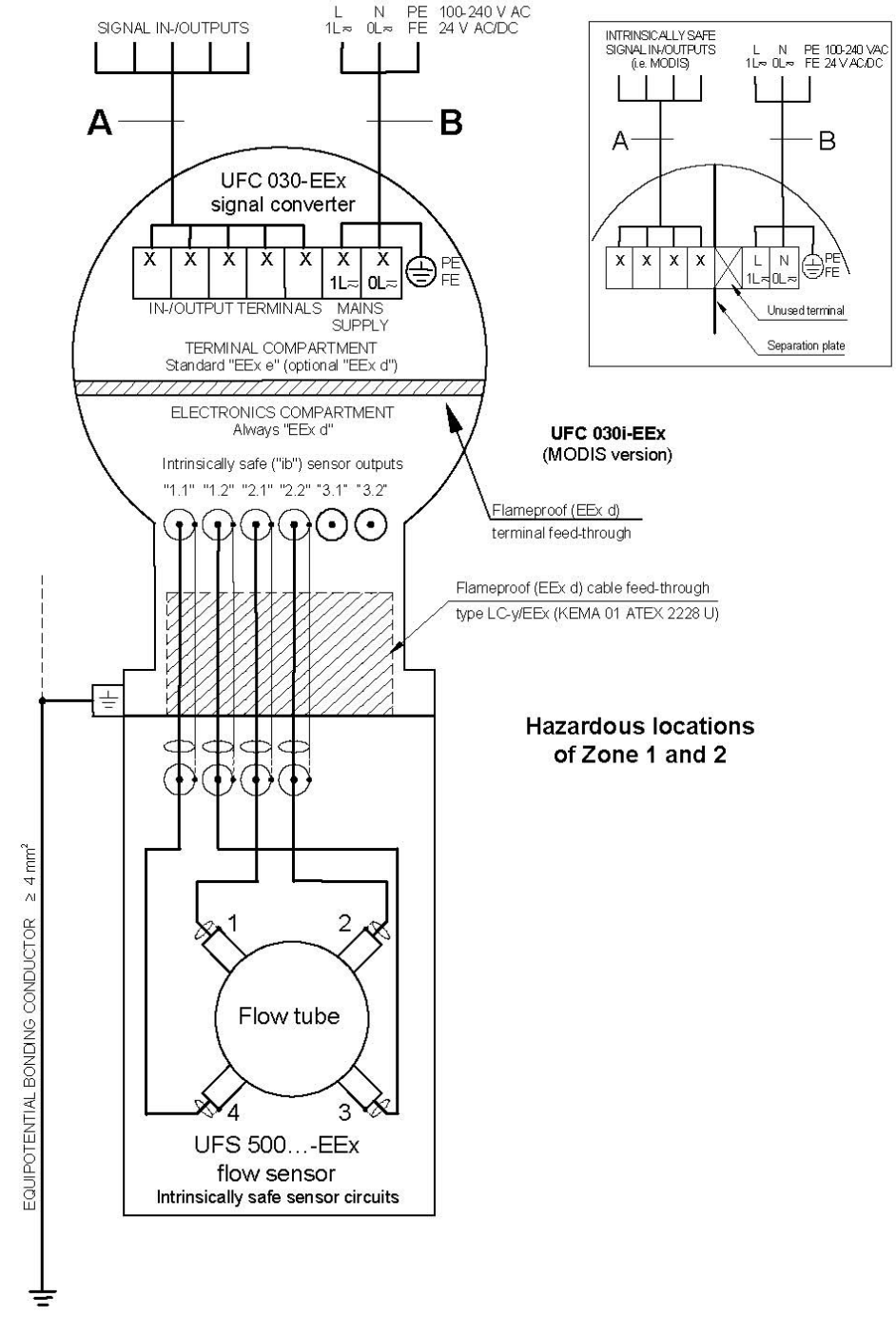
UFM 3030 K/…-EEx compact flowmeter



UFS 3000 F/...EEx (sensor) + UFC 030 F/...EEx (converter) with connection cable between sensor and converter

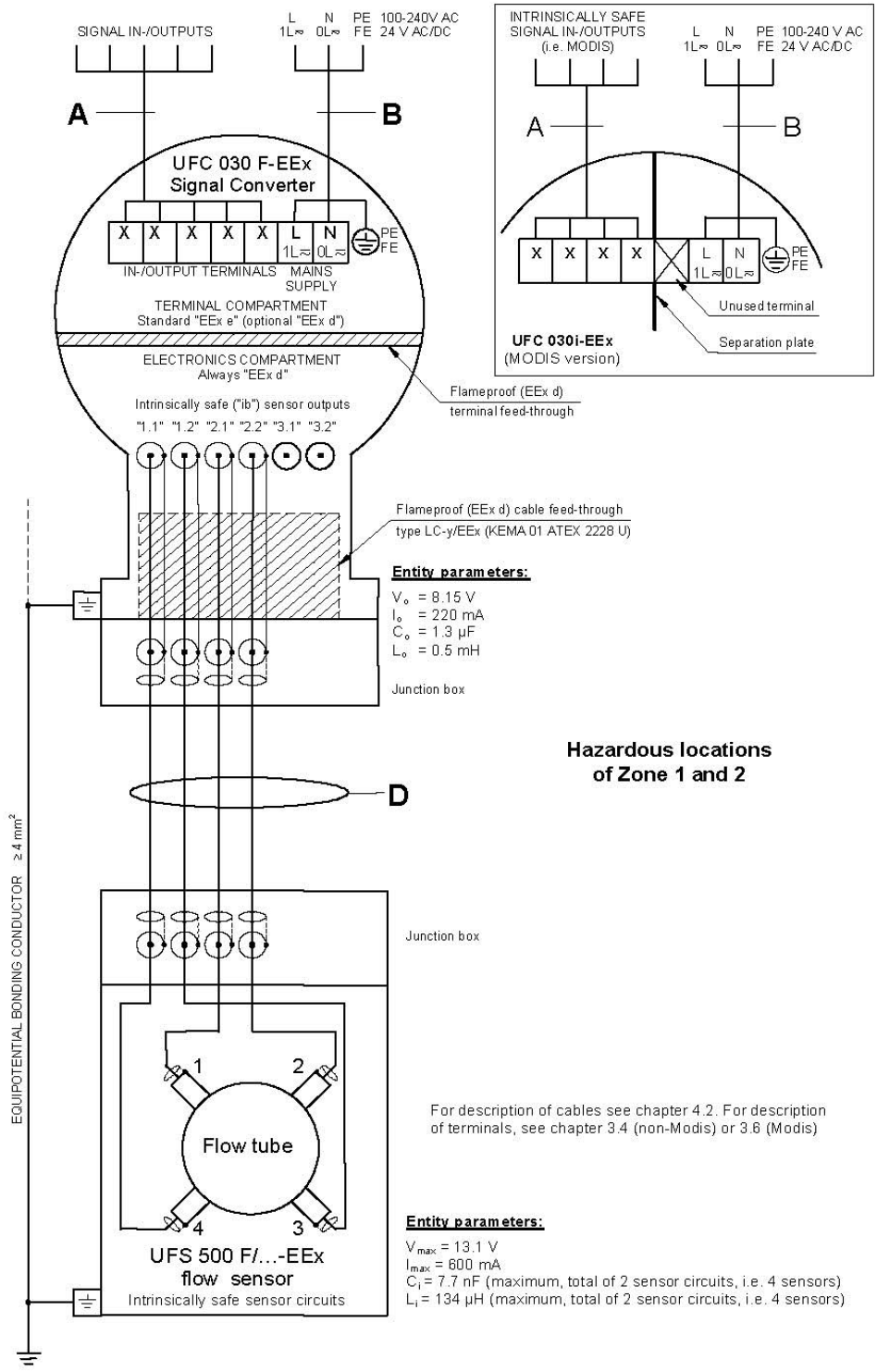
UFS 3000 F/…EEx (sensor) + UFC 030 F/…EEX (converter) with connection cable between sensor and converter.

The following figures show the connection diagram of the optional versions, i.e with UFS 500…-EEx flow sensor. Note in this case two of the intrinsically safe sensor outputs of the UFC 030…-EEx electronics unit (no. 3.1 and 3.2) are not connected.



UFM 530 K/…-EEx compact flowmeter (option).

UFM 530 K/…EEx compact flowmeter (option) for High Pressure



UFS 500 F/…EEx (sensor) + UFC 030 F/…EEx (converter). Optional for High Temperature/High Pressure with connection cable between sensor and converter.

UFS 500 F/…EEx (sensor) + UFC 030 F/…EEx (converter), optional for High Temperature / High Pressure with connection cable between sensor and converter.

4.4 Namur NE 43 settings

The UFM 3030…EEx and UFC 030…EEx can be set-up such that the Current Output functions are according to Namur NE 43. This means the current will go either to 3.6 or to 21.5 mA (failure value can be user defined, normal operating limits are between 3.8 and 20.5 mA) in case the instrument indicates a failure.

When the failure is no longer indicated, the instrument will automatically return to the measured current output again. For a full description of the failure please refer to the “Short form Operating and installation instructions.”

Standard each Namur device is programmed to give a 3.6 mA output in case of failure.
To program the UFM for Namur settings, the steps as described below should be followed:

3.04.02	Direction	Forward
3.04.03	Range	Other
3.04.04	0 pct	04 MA
3.04.05	100 pct	20 MA
3.04.07	ERR INDIC	IERR=3.6 MA or IERR=21.5 MA

5 Service and maintenance

5.1 Introduction

Contact your nearest local KROHNE representative for ordering information of the UFC 030…-EEx electronics units and/or fuses.

The UFM 3030 ultrasonic flowmeters are maintenance free with regard to the flow metering properties. Within the scope of the periodical inspections, which are required for electrical apparatus that is installed and used in a hazardous classified location, it is recommended to check the flameproof converter housing on signs of corrosion and damages.

5.2 Replacement of electronics unit or power fuse(s)

The following instructions must always be carefully followed, if the flow converter housing in which the UFC 030…-EEx is installed has to be opened respectively closed again!

Before opening:

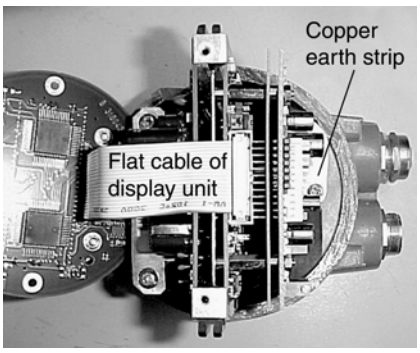
- Make absolutely sure that there is no explosion hazard!
- Gas-free certificate!
- Make sure that all connecting cables are safely isolated from all external sources!
- Allow the prescribed waiting time to elapse before opening the housing: 20 minutes for temperature class T6 and 11 minutes for temperature class T5

When the instructions above are strictly followed, the cover (includes a 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 grounding strip at the back of the electronics unit must be securely screwed to the housing (back-end of electronics compartment) by screw C (see figure below). The electronics unit is screwed into the electronics compartment by two screws B. Before screws B and C 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.

Display unit (left)



Electronics unit after removal of display unit (right).

5.3 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. Important customer specific data (like the value of the internal totaliser) should be noted before replacing the UFC 030…-EEx electronics unit !

Before commencing work, note the “Before opening” instructions, then continue as follows:

1) Remove the cover of the electronics compartment.
2) Unscrew the two screws A of the display unit and turn display unit carefully aside or remove the unit completely by taking out the flat cable connector.
3) Unscrew the two mounting screws B of the electronics unit as well as screw C, 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 C (e.g. screwdriver type Philips No. 2).
4) Carefully pull the electronics unit slightly out of the converter housing, until the SMB connectors of the coaxial cables can easily be unplugged. Then remove the complete electronics unit from the housing.
5) Carefully insert the new electronics unit until the numbered SMB connectors can be connected to the corresponding numbered SMB receptacles on the electronics unit. Then mount the unit completely into the housing and fix the screws. First C, then B and finally screw the display unit on the electronics via screws A, after the flat cable connector is connected.
6) Screw the cover of the electronics compartment back into the housing.

Note the “After opening" instructions during reassembling.

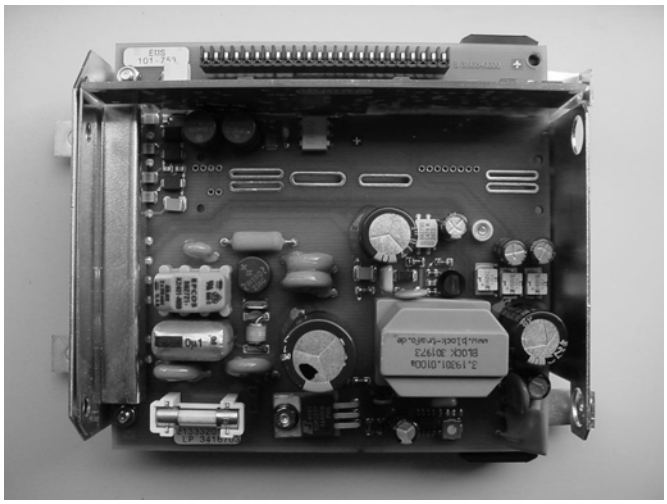
Carefully keep the coaxial cables to the side of the housing, while inserting the electronics unit into respectively removing it from the converter housing. This is to prevent damaging of the coaxial cables!

5.4 Replacement of mains fuse and analogue input fuses

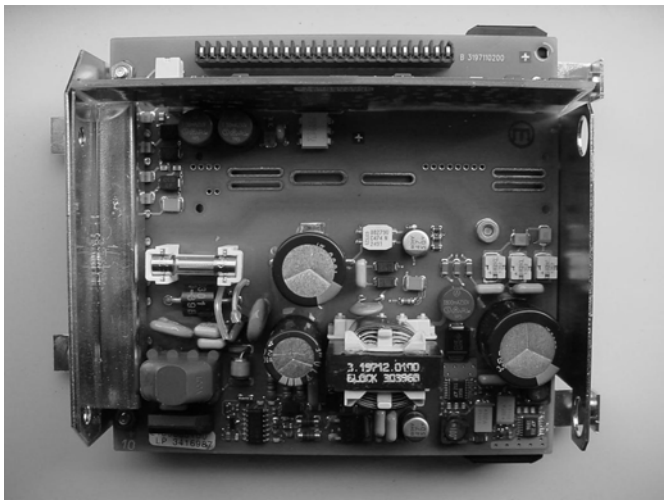
Before commencing work, note the “Before opening” instructions, then continue as follows:

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 mains fuse in accordance with IEC 127-2 size Ø5 x 20 mm is mounted, is now accessible to replace the defect power fuse by a new fuse with the same rating. The 100…240 V AC power supply (see figure 7 on the next page) is provided with a fuse rated at T 0.8 A / 250 V, the 24 V AC/DC power supply has a fuse of T 1.25 A / 250 V (see figure 8). The analogue input circuit A1 is protected by a sub-miniature fuse of type TR 5 that are rated T 50 mA / 250 V according to IEC 127-3 publication. The MODIS versions have the same power fuses and locations as the standard (non-MODIS) versions, but they do not have analogue input fuses.
4) Reassemble the unit in reverse order (points 2 and 1).

Note the “After opening" instructions during reassembling.



Power supply PCB - 100…240 V AC standard (non-MODIS).



Power supply PCB - 24 V AC/DC standard (non-MODIS).

Appendix 1 Declaration of conformity

EC Declaration of Conformity

KROHNE
The Level and Flow Company

KROHNE Altometer
Kerkeplaat 12
3313 LC DORDRECHT
The Netherlands

We declare under our sole responsibility that the product(s)

UFM 3030 K-EEx
UFM 3030 K/i-EEx
UFM 530 K-EEx
UFM 530 K/i-EEx
UFC 030 F-EEx
UFC 030 F/i-EEx
UFS 3000 F-EEx
UFS 3000 F/XT-EEx

Ultrasonic flowmeters (type in accordance with quotation, order acknowledgement, tagging; details in Handbook) are in conformity with the protection requirements of Council Directives (as far as applicable):

EMC Directive 89/336/EC
Presure Equipment Directive 97/23/EC
ATEX Directive 94/9/EC

The stipulated safety and public health safety requirements are fulfilled in accordance with the harmonized standards or mentioned technical specifications (as far as applicable):

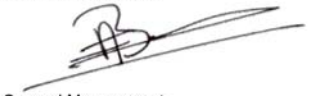
• EN 50 081-1 • EN 50 082-2 • EN 61 010-1	• EN 50 014 : 1997 • EN 50 018 : 2000 • EN 50 019 : 2000 • EN 50 020 : 1994 • EN 50 281-1-1 : 1998

The equipment type plates and order acknowledgement show the detailed tagging due to these directives. These are described in the Handbook.

The KROHNE Altometer quality system is assessed by KEMA Registered Quality B.V.

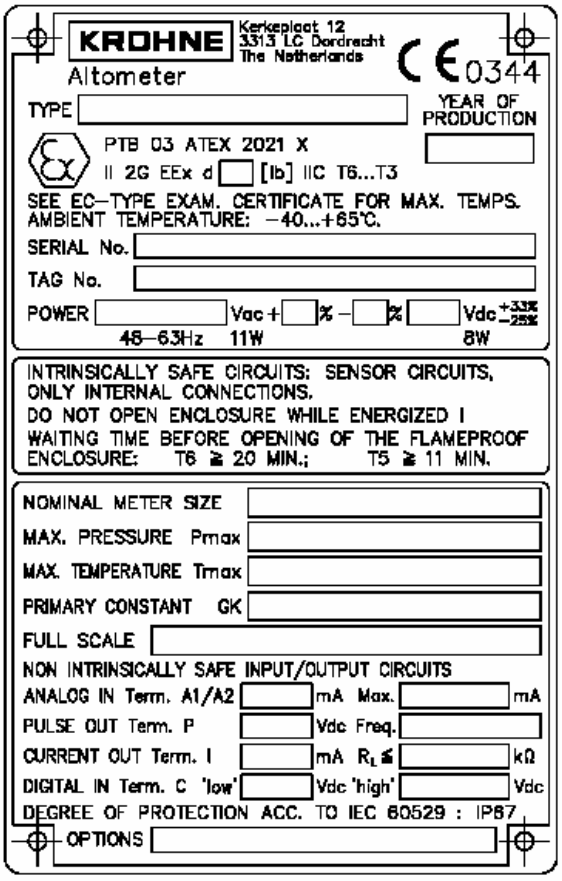
Directive	Assessment	Certificate	Notified Body	Ident. No.
94/9/EC		PTB 03 ATEX 2021 X	KEMA	0344
97/23/EC	Module H	STW 302050726	Stoomwezen	0343

Dordrecht, May 2005

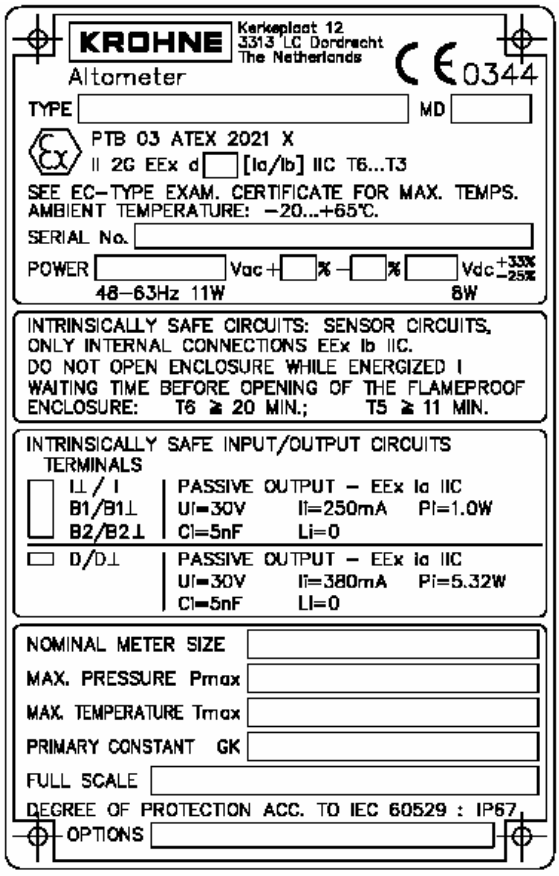


General Management

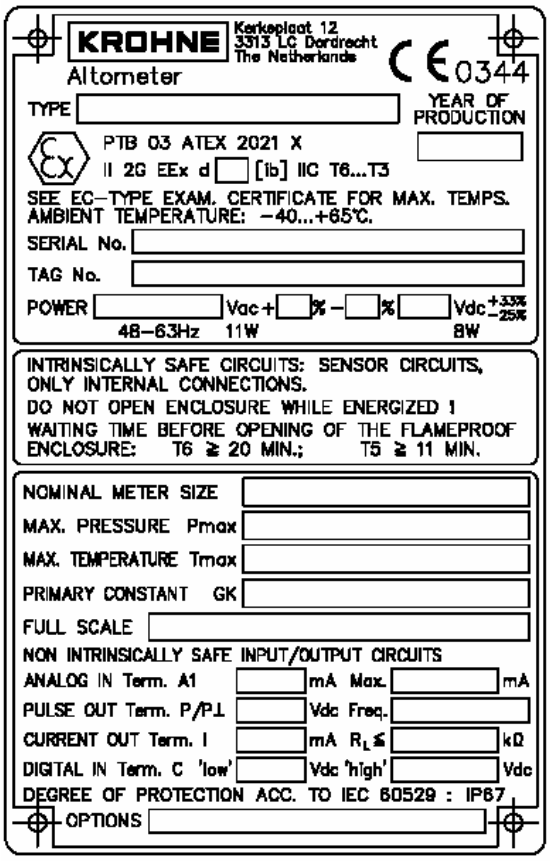
Appendix 2 Data plates



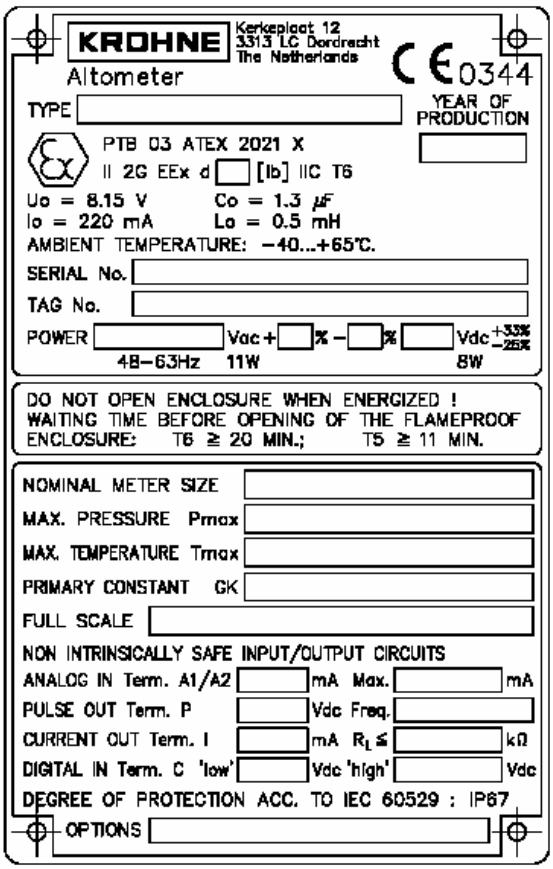
UFM 3030 K-EEx + UFM 530 K-EEx



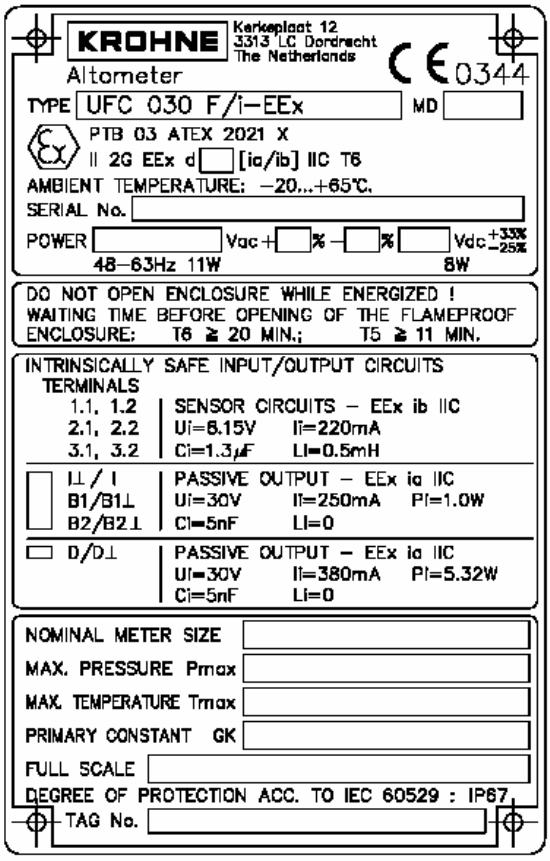
UFM 3030 K/i-EEx (MODIS)



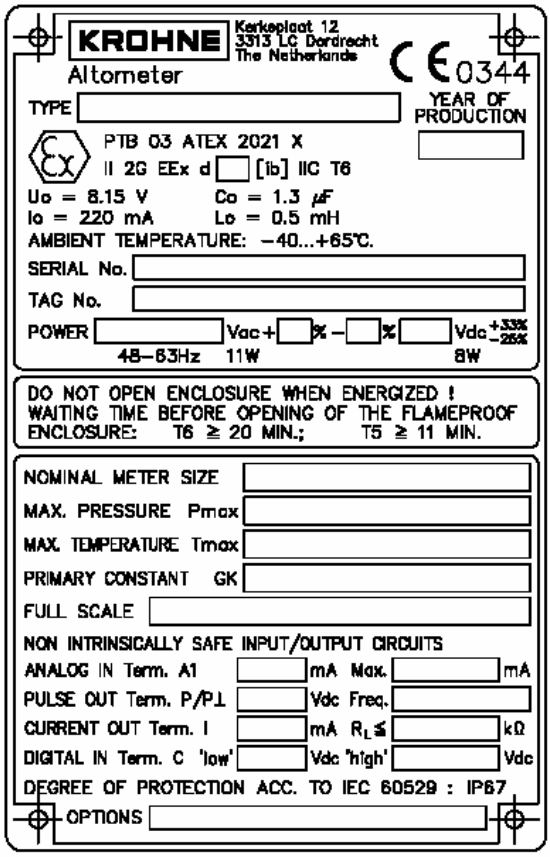
UFM 3030 K-EEx + UFM 530 K-EEx (NAMUR)



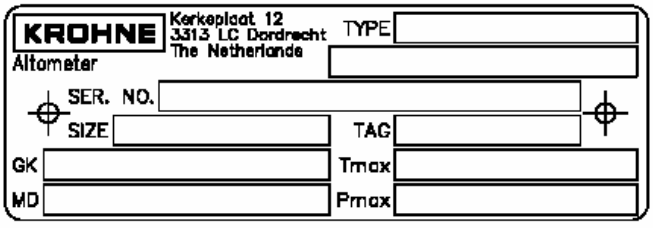
UFC 030 F-EEx



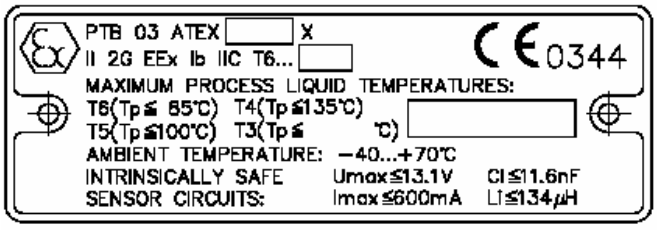
UFC 030 F/i-EEx (MODIS)



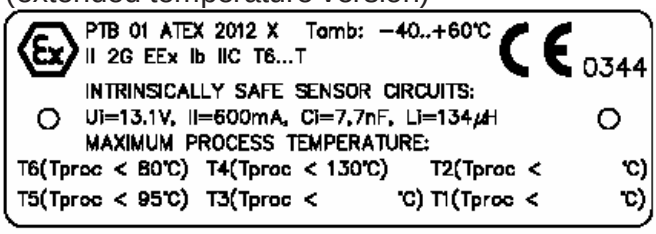
UFC 030 F-EEx (NAMUR)



UFS 3000 F–EEx + UFS 3000 F/XT-EEx (extended temperature version)

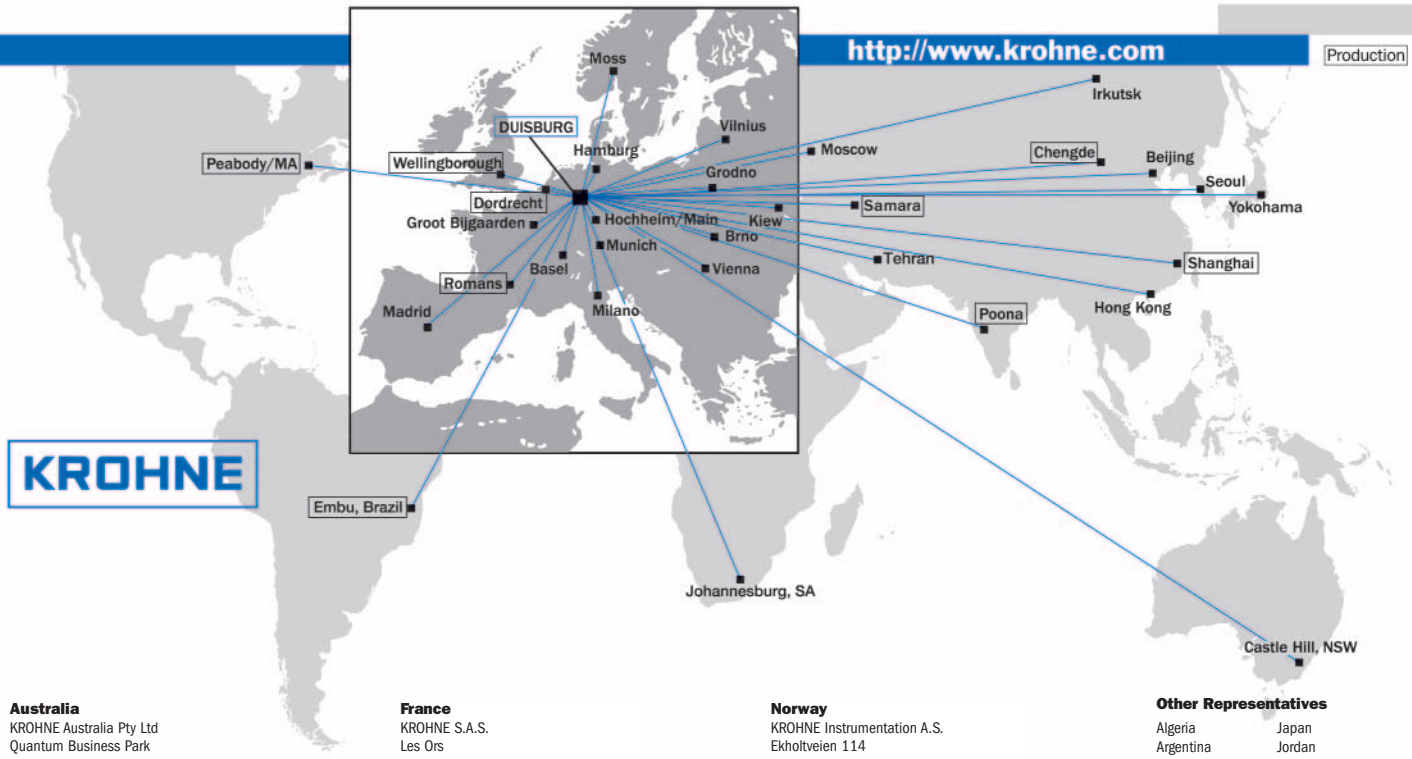


UFS 3000 F-EEx (standard version) + UFS 3000 F/XT-EEx (extended temperature version)



UFS 500 F-EEx + UFS 500 F/HT -EEx

Notes



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