Supplement to the QuickStart

KROHNE

 7.30948.32.00

GR

OPTIFLUX 4300 C
OPTIFLUX 5300 C
OPTIFLUX 4000 F
OPTIFLUX 5000 F
IFC 300 F

For use in hazardous areas (ATEX)

General advice on safety

- Do not install, operate or maintain this device 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 device.
- Use only mains supply with protective earthing connected.
- Do not use the device with covers removed under wet conditions.
- Follow the handling and lifting instructions to avoid damage.
- Install the device securely and stable.
- Install and connect cabling properly to prevent damage or harmful situations.
- If the product does not operate normally, refer to the service instructions or consult a qualified KROHNE service engineer. There are no operator-serviceable parts inside the product.

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.
or
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 device. 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 this device, 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 device 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 device rests solely with the user. Improper installation and operation of the device 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 a device needs to be returned to KROHNE, please note the information given at the back of the installation and operating instructions. KROHNE regrets that they cannot repair or check a device unless accompanied by the completed form (see back pages of the installation and operating instructions).

This instrument has been 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.
See **www.krohne.com.**

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 general regulations for low-voltage installations such as HD384, etc. the regulations laid down in the standard for electrical installations in gas hazardous areas such as EN 60079-14 or dust hazardous areas such as EN 50 281-1-2 must be complied with!
- Installation, commissioning, utilization and maintenance must be carried out only by personnel trained in explosion safety!

Table of contents

1. Introduction

1.1 Description of system

The OPTIFLUX flowmeter system consists of a flow sensor and a flow converter.

The separate flowmeter is identified as:

- OPTIFLUX 4000 F flow sensor with IFC 300 F signal converter; see KEMA 04 ATEX 2125 X with KEMA 04 ATEX 2166
- OPTIFLUX 5000 F flow sensor with IFC 300 F signal converter; see KEMA 04 ATEX 2126 X with KEMA 04 ATEX 2166

The compact flowmeter in compact configuration is identified as:

- OPTIFLUX 4300 C (= OPTIFLUX 4000 + IFC 300 C); see KEMA 04 ATEX 2077 X
- OPTIFLUX 5300 C (= OPTIFLUX 5000 + IFC 300 C); see KEMA 04 ATEX 2127 X

1.2 OPTIFLUX 4300

OPTIFLUX 4000-EEx is certified as category 2 GD equipment for gas hazardous areas zone 1 and 2, gas group IIC, temperature classes T6 (or T5) ... T3 and dust hazardous areas zone 21 and 22 surface temperature T85°C … 180°C.

The connection box contains terminals for the connection of the field current and electrode circuits:
Field current circuits, in type of protection "Increased safety" (EEx e), terminals 7,8 and 9: U < 40 V (switched DC voltage, alternately +40 and -40 V), I = 125 mA (injected square wave current)
Electrode terminals, in type of protection "Intrinsic safety" (EEx ia), terminals 1, 2, 3, and 4: Ui = 20 V , Ii = 175 mA, Ci ≈ 0 nF, Li ≈ 0 mH.
Connection box, electrode terminals 1, 2, 20, 3, 30, 4 and 40: EEx ia (Intrinsic Safety)
Connection box, field coil terminals 7, 8 and 9: EEx e (Increased safety)
The **cable gland** for the electrode circuits is - as intrinsic safe circuit - marked with a blue O-ring.
The **electrode circuits** are always EEx ia.

OPTIFLUX 4300 C-EEx is certified as a group II, category 2 GD equipment, if fitted with an IFC 300-EEx converter unit without EEx ia signal in/outputs or A group II, category 2 (1) GD equipment, if fitted with an IFC300-EEx converter unit with EEx ia signal in/outputs.
It is therefore suitable for installation in gas hazardous areas zone 1 or 2 and dust hazardous areas zone 21 or zone 22. Additionally, the EEx ia signal inputs/outputs of the IFC 300-EEx converter may run or originate from a Zone 0 Gas hazardous area.

EEx marking OPTIFLUX 4000

DN range	
10-20	II 2 GD EEx me ia IIC T6..T3 T85..150°C
25-150	II 2 GD EEx de ia IIC T6..T3 T85..180°C
200-300	II 2 GD EEx qe ia IIC T6..T3 T85..150°C
350-3000	II 2 GD EEx e ia IIC T6..T3 T85..160°C
Optional:	
25-150 ((EEx qe coils)	II 2 GD EEx qe ia IIC T5..T3 T85..180°C
200-300 (EEx e coils)	II 2 GD EEx e ia IIC T6..T3 T85..160°C

EEx-marking OPTIFLUX 4300 C

Nominal diameter	EEx e or EEx ia connection compartment	EEx d connection compartment
10-20	EEx dme [ia] IIC T6..T3	EEx dme [ia] IIC T6..T3
25-150	EEx de [ia] IIC T6..T3	EEx d [ia] IIC T6..T3
200-300	EEx dqe [ia] IIC T6..T3	EEx dqe [ia] IIC T6..T3
350-3000	EEx de [ia] IIC T6..T3	EEx de [ia] IIC T6..T3
Optional:		
25-150	EEx dqe [ia] IIC T5..T3	EEx dqe [ia] IIC T5..T3
200-300	EEx de [ia] IIC T6..T3	EEx de [ia] IIC T6..T3

1.3 OPTIFLUX 5300

OPTIFLUX 5000 and OPTIFLUX 5300 C are certified as category 2 GD equipment for gas hazardous areas classified as zone 1 and 2, gas group IIC, temperature classes T6 … T3 and dust hazardous areas zone 21 and 22, surface temperature T85°C .. 180°C.

The connection box of the flow sensor OPTIFLUX 5000 contains terminals for the connection of the field current and electrode circuits:
Field current circuits, in type of protection "Increased safety" (EEx e), terminals 7,8 and 9: U < 40 V (switched DC voltage, alternately +40 and -40 V), I = 125 mA (injected square wave current)
Electrode terminals, in type of protection "Intrinsic safety" (EEx ia), terminals 1, 2, 3, and 4: Ui = 20 V, Ii = 175 mA, Ci ≈ 0 nF, Li ≈ 0 mH.
Connection box, electrode terminals 1, 2, 3 and 4: EEx ia (Intrinsic Safety)
Connection box, field coil terminals 7, 8 and 9: EEx e (Increased safety)
The cable gland for the electrode circuits is - as intrinsic safe circuit - marked with a blue O-ring.

EEx marking OPTIFLUX 5000

Nominal diameter	
2,5-15	II 2 GD EEx me ia IIC T6..T3 T85..180°C
25-100	II 2 GD EEx de ia IIC T6..T3 T85..180°C

In the coil housing (flow sensor) following types of protection are used: DN 2,5-15: EEx me, DN 25-100: EEx d
The electrode circuits in the coil housing are always in type of protection EEx ia.

EEx-marking OPTIFLUX 5300 C

Nominal diameter	EEx e or EEx ia connection compartment	EEx d connection compartment
2,5-15	EEx dme [ia] IIC T6...T3	EEx dme [ia] IIC T6...T3
25-100	EEx de [ia] IIC T6...T3	EEx d [ia] IIC T6...T3

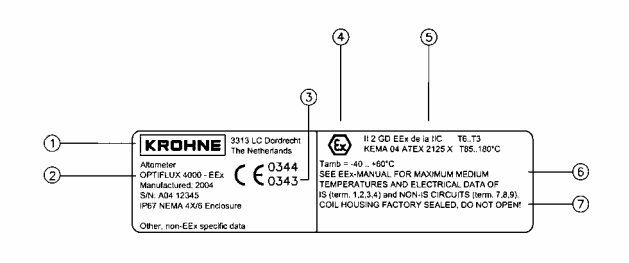
1.4 IFC 300

EEx marking for all versions is II 2 GD EEx de [ia] IIC T6 T85°C for converter with non EEx ia signal inputs/outputs or II 2 (1) GD EEx de [ia] IIC T6 T85°C for converter with EEx ia signal inputs/outputs.

In the IFC 300 F-EEx flow converter following types of protection are used;
Field current circuit: in type of protection “Increased safety” (EEx e), terminals 7, 8 and 9: U < 40 V (switched DC voltage, alternately +40 and -40 V), I = 125 mA (injected square wave current). The field current source is protected by 2 TR5 fuses, rated value 160 mA. The maximum prospective short circuit current is restricted to 35 A.
Electrode terminals: in type of protection “Intrinsic safety” (EEx ia), terminals 1, 2, 20, 3, 30, 4 and 40: U_o = 14 V, I_o = 70 mA, P_o = 300 mW (linear), C_o = 430 nF, L_o = 2 mH.
Converter housing, connection compartment: with power supply (terminals L, N / L+, L-) and I/O connections (terminals A, A+, A-, B, B-, C, C-, D and D-): EEx e (Increased safety). Optionally compact flowmeters, e.g. OPTIFLUX 4300 C and OPTIFLUX 5300 C have EEx d (Flameproof Enclosure). For certain versions of converter IFC 300-EEx the terminals A, A+, A-, B, B-, C, C-, D and D- are additionally EEx ia (Intrinsic safety). Consult the table with CG30 numbers for details.
Converter housing, electronics compartment: EEx d (Flameproof enclosure)
Connection box, electrode terminals 1, 2, 20, 3, 30, 4 and 40: EEx ia (Intrinsic safety)
Connection box, field current terminals 7, 8 and 9: EEX e (increased safety)

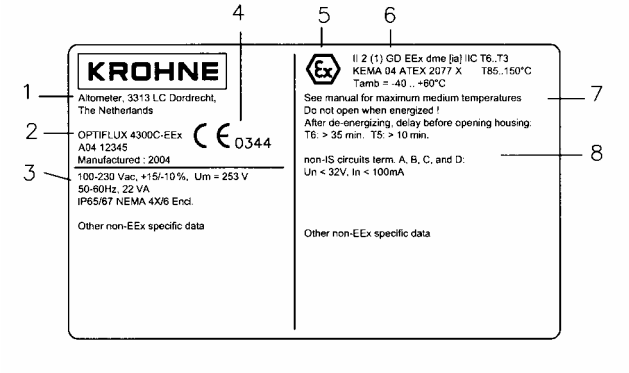
1.5 Data stickers

The data sticker on the connection box of separate flow sensors typically contains following information:



1. Name and address of the manufacturer
2. Type designation of the flowmeter
3. CE sign with number(s) of notified body/bodies for notification of Quality System and other EC directives (if required)
4. Specific sign for explosion protection
5. Symbols and code letters for explosion safety
5. Number of EC-type examination certificate
6. General EEx notes and warnings
7. Specific EEx notes and warnings

The data sticker on the IFC 300 converter typically contains following information:



1. Name and address of the manufacturer
2. Name of flowmeter, serial no, manufacturing date
3. Electrical data mains circuit
4. CE sign with identification number(s) of notified body/bodies
5. Specific sign for explosion protection
6. Symbols and code letters for explosion safety: group (II), categories (2 or 2(1)), Gas/Dust (GD), EEx followed by the code letters for each type of protection used, group (IIC) and temperature classes (normally T6...T3)
7. Explosion safety warnings
8. Electrical data of the signal inputs/outputs

2. Temperature limits

2.1 OPTIFLUX 4300

- In general the OPTIFLUX 4000-EEx flow sensors are suitable for an ambient temperature range of -40°C ... +60°C. The temperature range is often limited further by the liner type used (refer to Quick Start).
- The minimum process temperature is -40°C.
- The maximum process temperature Tp is dependent on the required temperature class T6/T5..T3, the diameter and the maximum ambient temperature Ta. For dust hazardous areas the maximum surface temperature is equal to the process temperature Tp with a minimum of 85°C.

OPTIFLUX 4000 DN 10 -20 (EEx me coils)

Temperature class	Max. process temperature Tp (in °C)		
	Ta ≤ 40°C	40°C < Ta ≤ 50°C	50°C< Ta ≤ 60°C
T6	75	70	70
T5	95	90	75
T4	130	115	75
T3	150	115	75

OPTIFLUX 4000 DN 25 -150 (EEx d coils)

Temperature class	Max. process temperature Tp (in °C)		
	Ta ≤ 40°C	40°C < Ta ≤ 50°C	50°C< Ta ≤ 60°C
T6	70	70	70
T5	85	85	85
T4	120	120	120
T3	180	180	180
use heat resistant cables for Tp above*	Not needed	155	105

OPTIFLUX 4000 DN 200 - 300 (EEx qe coils)

Temperature class	Max. process temperature Tp (in °C)		
	Ta ≤ 40°C	40°C < Ta ≤ 50°C	50°C< Ta ≤ 60°C
T6	75	70	70
T5	95	90	75
T4	130	115	75
T3	130	115	75

OPTIFLUX 4000 DN 350-3000 (EEx e coils)

Temperature class	Max. process temperature (in °C)		
	Ta ≤ 40°C	40°C < Ta ≤ 50°C	50°C< Ta ≤ 60°C
T6	60	60	60
T5	80	75	75
T4	115	115	115
T3[1]	160	150	140
use heat resistant cables for Tp above*	Not needed	145	110

[1] For some versions the process temperature for T3 is restricted to 130°C. This version is identified by extra text on the data sticker.

OPTIFLUX 4000 DN 25 -150 (EEx qe coils, optional)

Temperature class	Max. process temperature Tp (in °C)		
	Ta ≤ 40°C	40°C < Ta ≤ 50°C	50°C< Ta ≤ 60°C
T5	60	55	Not possible
T4	110	105	100
T3	180	180	180
use heat resistant cables for Tp above*	Not needed	155	105

OPTIFLUX 4000 DN 200 - 300 (EEx e coils, optional)

Temperature class	Max. process temperature Tp (in °C)		
	Ta ≤ 40°C	40°C < Ta ≤ 50°C	50°C< Ta ≤ 60°C
T6	60	60	60
T5	80	75	75
T4	115	115	115
T3	160	150	140
use heat resistant cables for Tp above*	Not needed	145	110

*The heat resistant cables must have a continuous operating temperature of at least 85°C.

- The OPTIFLUX 4300 C is suitable for ambient temperature range of -40°C … +60°C.
- The minimum process temperature for all DN sizes is -40°C. The process temperature limit (Tm) is determined by the temperature class T6..T3 of the gas hazardous area of concern, the maximum ambient temperature (Ta), and the nominal diameter.
- For dust hazardous areas, the maximum surface temperature is equal to the medium temperature with a minimum of 85°C.
- For ease of reference the flowmeter variants are simply denoted by main type of EEx-protection of the flow sensor, e.g. EEx m for DN 10-20 range instead of the official EEx me.

OPTIFLUX 4300 C DN 10-20 (EEx m)

Temperature class (for gasses)	Maximum medium temperature (in °C)		
	Ta ≤ 40°C	40 < Ta ≤ 50°C	50 < Ta ≤ 60°C
T6	70	60	-
T5	95	85	60
T4	130	130	60
T3	150	150	60

OPTIFLUX 4300 C DN 25-150 (EEx d)

Temperature class (for gasses)	Maximum medium temperature (in °C)		
	Ta ≤ 40°C	40 < Ta ≤ 50°C	50 < Ta ≤ 60°C
T6	80	80	80
T5	95	95	80
T4	130	130	80
T3	150	150	80

OPTIFLUX 4300 C DN 25-150 (EEx q)

Temperature class (for gasses)	Maximum medium temperature (in °C)		
	Ta ≤ 40°C	40 < Ta ≤ 50°C	50 < Ta ≤ 60°C
T5	50	Not possible	Not possible
T4	100	95	80
T3	150	150	80

OPTIFLUX 4300 C DN 200-300 (EEx q and EEx e) and DN 350-3000 (EEx e).

Temperature class (for gasses)	Maximum medium temperature (in °C)		
	Ta ≤ 40°C	40 < Ta ≤ 50°C	50 < Ta ≤ 60°C
T6	80	80	75
T5	95	95	80
T4	130	130	80
T3[1]	150 (130)	150 (130)	80

[1] For some versions the process temperature for T3 is restricted to 130°C. This version is identified by extra text on the data sticker.

2.2 OPTIFLUX 5300

- The OPTIFLUX 5000 and 5300 C are suitable for ambient temperature range -20°C … +60°C (DN 2,5-15) or -40°C … +60°C (DN 25-100).
- The process temperature is limited to -20°C for DN 2,5-15 and -40°C for DN 25-100.
- The maximum process temperature Tp is dependent on the required temperature class T6..T3 and the maximum ambient temperature Ta.

OPTIFLUX 5000

Temperature class for Gas	Maximum surface temperature for Dust °C	Max. process temperature Tp (in °C)		
		Ta ≤ 40°C	40°C < Ta ≤ 50°C	50°C< Ta ≤ 65°C
T6	85	65	65	60
T5	95	85	85	75
T4	130	125	125	115
T3	180	180	165	140
use heat resistant cable for Tp above*		165	130	100

*The heat resistant cables must withstand a continuous operating temperature of at least 85°C.

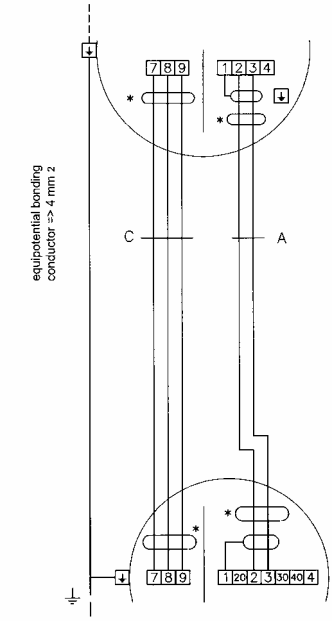
OPTIFLUX 5300 C

For dust hazardous areas, the maximum surface temperature is equal to the medium temperature with a minimum of 85 °C.

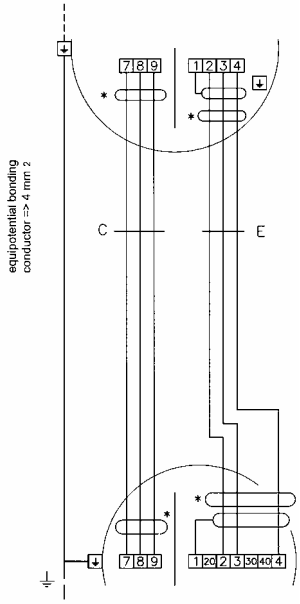
Temperature class	Maximum process (medium) temperature Tm (in °C)		
	Ta ≤ 40°C	Ta ≤ 50°C	Ta ≤ 60°C
T6	60	55	Not possible
T5	75	75	70
T4	115	115	75
T3	150	135	75

3. Connection diagrams

Connection diagrams with DS300 cable (double screen)

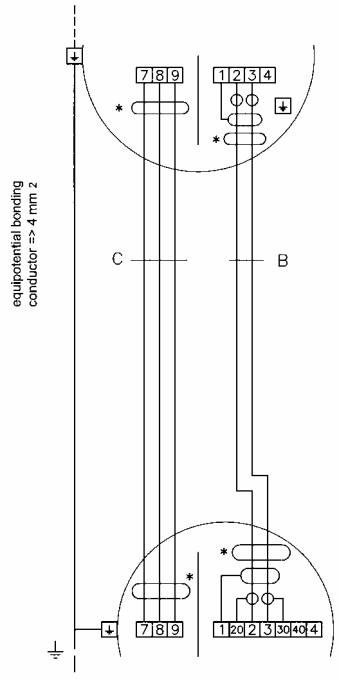


OPTIFLUX with 2 electrodes

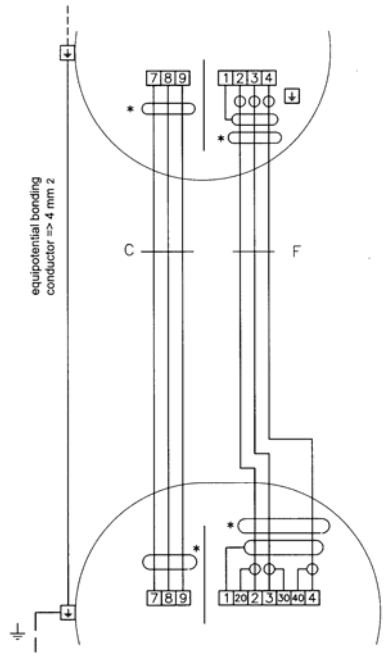


OPTIFLUX with 4 electrodes

Connection diagrams with BTS300 cable (triple screens)



OPTIFLUX with 2 electrodes



OPTIFLUX with 4 electrodes

- Screens marked with * are mounted under the associated saddle earth clamps.
- Cables type A and E: DS300 electrode cables for 2 or 4 electrodes respectively, to EN 60079-14 clause 12.2 (Intrinsic safety). Cable can be ordered from manufacturer.
- Cable type B and F: BTS300 electrode cables for 2 or 4 electrodes respectively, to EN 60079-14 clause 12.2 (Intrinsic safety). Cable can be ordered from manufacturer.
- Cable C: field current cable to EN 60079-14 clause 9.3 and 11.3 (Increased safety).

3.1 Equipotential bonding

- As the EEx ia electrode circuits of the flow sensors are effectively grounded through the conductive liquid in the measuring tube, an equipotential bonding system must exist over the whole area in which the electrode circuits, including their wiring, are installed, conform EN 60 079-14 clause 12.2.4.
- The flowmeters OPTIFLUX 4000-EEx and 5000-EEx, the electrode cable and the IFC 300 F signal converter must all be included in the equipotential bonding system of the hazardous area. If a single separate conductor is used for equipotential bonding, than this conductor must have a cross section of at least 4 mm2 copper.
- The separate equipotential bonding conductor between flowmeter and converter can be left out, if by other means (e.g. over bonding conductors over the metal piping system) a high level of assurance that potential equalization exists between flowmeter and converter is reached.

3.2 Cable and conduit entries

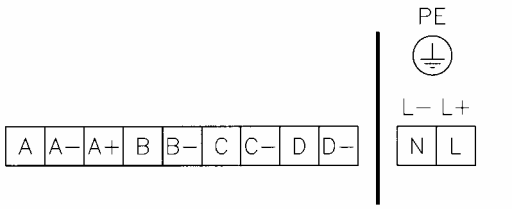
The flowmeters are normally delivered with two EEx e certified cable glands. If these are replaced by other cable glands or thread adapters, the replacements must also be EEx e (Increased safety) certified and suitable for the conditions of use and correctly installed. For gas (G) hazardous areas the replacements must have a minimum IP degree to EN 60 529 of IP54. For Dust (D) hazardous areas the minimum IP degree must be IP64.
Unused openings must be closed with suitable certified closing elements. With the use of conduit, a suitable certified sealing device, e.g. a stopping box with setting compound must be provided immediately at the entrance to the flameproof enclosure (converter housing).

4. Electrical connection

4.1 General

- The covers of the housing electronics compartment and the housing itself are provided with a "flameproof" thread. Compared to 'normal' thread, the f "flameproof" thread is a relatively tight fit due to explosion proof requirements. Therefore, screw the cover on or off with care; never use brute force!
- Keep threads free of dirt. Threads must be well-greased (e.g. with Teflon grease) to make as smooth as possible.
- To open the covers first remove the hexagonal "retention" lock using a No. 3 Allen key. After closing of the covers, the "retention lock" must be refitted.
- Allow the electronics to de-energize before opening the electronics compartment: T6: at least 35 min., T5: at least 10 min.

Connection compartment with terminal block



Terminal	Function, electrical data
L, N L+, L-	Connection for mains, always non-EEx i 100..230 VAC, +10%/-15%, 22 VA 12..24 V DC, +30%/-25%, 12 W Um = 253 V
A, A-,A+ B, B- C, C- D, D-	Connection for signal I/Os (PELV circuits), non-EEx I or EEx I, are dependent on specific version of the IFC300-EEx converter ordered. Consult the table with CG30 numbers below for details

The exact I/O-configuration for circuits A, B, C and D is order-specific and can be determined by the CG30 number shown on the converter - check sticker on the back of the IFC300 electronic unit.
The CG30 number contains 10 characters of which the last three (XYZ) determine the I/O configuration (I/O circuits):

CG30	*	*	*	X	Y	Z
pos 1.. 4	5	6	7	8	9	10
				determine I/O circuits		

- Schematic overviews of the CG30 numbers can be found in paragraph 4.2 (non-EEx i signal I/O connections) and 4.3 (EEx i signal I/O connections). The overviews do not show all details. The exact connection diagram for a specific IFC 300-EEx converter can be found on the sticker inside the cover of the connection compartment.
- For use in gas hazardous areas: The cable entry devices shall be in line with the type of protection chosen for the terminal compartment, that is increased safety (EEx e) or flameproof enclosure (EEx d). They should be suitable for the conditions of use and correctly installed.
- The flowmeter with an EEx e terminal compartment is supplied ex-factory with two EEx e certified cable glands and one EEx e stopping plug.
- The flowmeter with an EEx d terminal compartment is supplied ex-factory one EEx d stopping plug and two temporarily plugs. The two temporarily plugs – only for transport and storage – must be replaced by suitable EEx d certified glands, plugs or conduit accessories before the flowmeter is taken into service.
- Unused openings shall be closed by suitable certified plugs
- The wiring of the compact flowmeter has to conform to the requirements specified in the relevant national or regional standard for electrical installations in hazardous areas, e.g. EN 60079-14. From this standard section 9 (Wiring systems) is valid for all types of protection. Section 10 (additional requirements for type of protection “d” – Flameproof enclosures), section 11 (additional requirements for type of protection “e” – Increased safety) and section 12 (additional requirements for type of protection “I” – Intrinsic safety) are valid for EEx e, EEx d or EEx I connection compartments respectively.
- The compact flowmeter must always be included in the equipotential bonding system of the hazardous area. This can be achieved internally – by means of the PE conductor of the mains system connected to the internal PE clamp – or externally – by means of a separate equipotential bonding conductor connected to the external PE clamp under the converter housing. A separate bonding conductor must have a cross sectional area of at least 4 mm2.

4.2 Non-EEx I signal I/O connections

The following non-intrinsically safe signal inputs/outputs are available:

I/O PCB	input/output functions, Un < 32 V DC, In < 100 mA Um = 253 V
Basic I/O	Current Output active and passive, with HART Status Output / Control Input Status Output Pulse / Status Output
Modular I/O	Current Output, active or passive, with HART Pulse / Status Output, active or passive, highC or Namur
Modular carrier with 1 or 2 I/O modules	each module: 1 out of following 3 in/output functions: • Current Output, active or passive • Status / Pulse Output, active or passive, highC or Namur • Control Input, active or passive, highC or Namur
Profibus DP I/O	Profibus-DP, active
Fieldbus I/O	Profibus-PA or Foundation Fieldbus

- The options separated with slash "/" are software selectable (can be changed by user)
- The options separated by the word "or" are hardware versions (must be ordered as such)
- All outputs are passive unless otherwise indicated
- HighC means High Current input/output, Namur means input/output to Namur recommendations

Overview of possible combinations, defined by their CG30 number					
Characters XYZ	**Name I/O circuits**	**Terminals A, A-**	**Terminals B, B-**	**Terminals C, C-**	**Terminals D, D-**
100	Basic I/O	CO CO (a) over A+	SO/CI	SO	PO/SO
488 to 4LL 588 to 5LL 688 to 6LL 788 to 6LL 888 to 88L A88 to 6LL B88 to 6LL C88 to 6LL	Modular I/O or Modular Carrier with 1 or 2 I/O Modules	Many combinations possible			
D88	Fieldbus I/O Profibus PA	n.c.	n.c.	PA	PA
D8A to DLL	Fieldbus I/O Profibus PA with Module Carrier with 1 or 2 I/O Modules	many combinations possible		PA	PA
E88	Fieldbus I/O Foundation Fieldbus	n.c.	n.c.	FF	FF
E8A till ELL	Fieldbus I/O Foundation Fieldbus with Module Carrier with 1 or 2 I/O Modules	many combinations possible		FF	FF
F00	FL0Profibus DP I/O	n.c.	DP(a)	DP(a)	DP(a)
F80 till	FL0Profibus DP I/O with 0 or 1 I/O Module	many combinations possible	DP(a)	DP(a)	DP(a)

- shorts for in/output functions: CO= current output, PO=Pulse Output, SO= Status Output, CI= Control Input, PA=Profibus PA, FF=Foundation Fieldbus, DP=Profibus DP
- all in/outputs are passive unless otherwise noted as active (a)
- n.c. = not connected.

4.3 EEx i signal I/O connections

Following intrinsically safe signal I/Os are available:

I/O PCB	I/O functions	
Ex i I/O	Current Output + HART communication Pulse / Status Output Current Output, active + HART communication	EEx ia IIC Ui =30V, Ii = 100 mA, Pi = 1,0 W Ci = 10nF, Li = negligibly low EEx ia IIC Uo = 21 V, Io = 90 mA, Po = 0,5 W linear characteristic Co = 90 nF, Lo =2,0 mH Co = 110 nF, Lo =0,5 mH
Ex i Option	Current Output Pulse / Status Output / Control Input Current Output, active	EEx ia IIC Ui =30V, Ii = 100 mA, Pi = 1,0 W Ci = 10nF, Li = negligibly low EEx ia IIC Uo = 21 V, Io = 90 mA, Po = 0,5 W linear characteristic Co = 90 nF, Lo = 2,0 mH Co = 110 nF, Lo = 0,5 mH
Fieldbus I/O	Profibus-PA Foundation Fieldbus	EEx ia IIC Ui = 24 V, Ii = 380 mA, Pi = 5,32 W Ci , Li = negligibly low, suitable for connection to an intrinsically safe fieldbus in accordance with the FISCO-model

Overview possible CG30 numbers with EEx ia in/outputs

Characters XYZ	Name I/O circuits	Terminals A, A-	Terminals B, B-	Terminals C, C-	Terminals D, D-
200	Ex i I/O	n.c.	n.c.	CO (a)	PO/SO
300		n.c.	n.c.	CO	PO/SO
210	Ex i I/O with Ex i Option	CO (a)	PO/SO/CI	CO (a)	PO/SO
220		CO	PO/SO/CI	CO (a)	PO/SO
310		CO (a)	PO/SO/CI	CO	PO/SO
320		CO	PO/SO/CI	CO	PO/SO
D00	Fieldbus I/O Profibus PA	n.c.	n.c	PA	PA
D10	Fieldbus I/O Profibus PA with Ex i Option	CO (a)	PO/SO/CI	PA	PA
D20		CO	PO/SO/CI	PA	PA
E00	Fieldbus I/O Foundation Fieldbus	n.c.	n.c	FF	FF
E10	Fieldbus I/O Foundation Fieldbus with Ex i Option	CO (a)	PO/SO/CI	FF	FF

- Shorts for in/output functions: CO= current output, PO=Pulse Output, SO= Status Output, CI= Control Input, PA=Profibus PA, FF=Foundation Fieldbus, DP=Profibus DP
- All in/outputs are passive unless otherwise noted as active (a)
- n.c. = not connected

- The I/O circuits named Ex i I/O, Ex i Option are always in type of protection Intrinsic safety (EEx ia). The I/O circuits Fieldbus I/O Profibus PA and Fieldbus I/O Foundation Fieldbus can be in type of protection Intrinsic safety.
- A maximum of 4 intrinsically safe (EEx ia) in/outputs are possible. All intrinsically safe circuits are galvanically insulated with respect to earth and to each other. To avoid summation of voltages and currents, the wiring of these EEx ia circuits must be sufficiently separated, e.g. in line with the requirements of standard EN IEC 60079-14, section 12.2.
- The EEx ia signal in/outputs may only be connected to other EEx ia or ib certified device (e.g. intrinsically safe isolation amplifiers), even if such devices are installed in the non-hazardous area!
- Connection to a non-EEx i apparatus cancels the EEx ia properties of the flowmeter.
- Terminals L, N (or L+, L-) for mains connection are always non-intrinsically safe. To achieve the necessary spatial separation to EN 50 020 between the non-EEx i and EEx i circuits the mains terminals are provided with a semi-circular insulation cover with a "snap-in" lock. This cover has to be closed before powering up the converter.
- Note: For converters with an EEx e terminal compartment, it is allowed to open this compartment in an energized state for short periods and to access the intrinsically safe terminals for possible checks provided the semi-circular insulation cover over the non-intrinsically L, N (L+, L-) terminals is kept closed.

5. Service and maintenance

5.1 Maintenance

The OPTIFLUX flowmeters are maintenance free with respect to the flowmetering properties. Within the scope of periodic inspections required for electrical equipment installed in hazardous areas it is recommended to check the flameproof converter housing and covers for signs of damage or corrosion.
For flowmeters sizes DN 25-100 with an EEx d flow sensor housing, this housing should also be inspected.

5.2 Replacement of mains fuse

- After opening the window cover, pull the display-unit forward using the two metal levers left and right. Slip the display-unit sideward. Loosen the two crosshead screws with which the electronic unit is fixed. Now carefully slide the electronic unit forward. When the unit is almost completely removed from the housing, disconnect the long rectangular (14-pole) blue connector at the back-end of the unit. This connector is for the electrode- and coil circuits. Now the unit can be completely removed from the housing.
- The mains fuse is situated in a fuse holder at the back-end of the electronic unit. Replacement types must have a high breaking capacity to IEC 60 127. The rated nominal values must be ≤ 1.6 A for the 100..230 V AC version and ≤ 2.0 A for the 12..24 V DC version. Consult the Handbook for the correct nominal value.

5.3 Returning the device for service or repair

This device has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, it will rarely present any problems. Should you nevertheless need to return a device for inspection or repair, please pay strict attention to the following points:

- Due to statutory regulations on environmental protection and safeguarding the health and safety of our personnel, KROHNE may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.
- This means that KROHNE can only service this device if it is accompanied by the following certificate confirming that the device is safe to handle.

If the device has been operated with toxic, caustic, flammable or water polluting liquids, you are kindly requested:

- To check and ensure, if necessary by rinsing or neutralizing, that all cavities in the device are free from dangerous substances.
- To enclose a certificate with the device confirming that it is safe to handle and stating the product used.
- We cannot service your device unless accompanied by such a certificate.

The following specimen statement is available on the KROHNE website as a word file. Simply download and use the tabulator key to go from one fill-out field to the next. Please attach the form to the returned device.

Specimen statement

Company:
Department:
Address:
Name:
Tel. No.

The enclosed device:
Type:
KROHNE Order No.
Has been operated with the following liquid:

Because the liquid is:
☐ water-pollutant ☐ toxic ☐ caustic ☐ flammable (tick where applicable)

We have checked that the flowmeter and all cavities in the flowmeter are
☐ free from such substances ☐ flushed* out and ☐ neutralized.
* delete where not applicable

We hereby confirm that there is no risk to man or environment through any residual liquid in or on the flowmeter or in any of its cavities.
Date:
Signature: Company Stamp:

Appendix 1 EC 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)

OPTIFLUX 4300 C
OPTIFLUX 5300 C
OPTIFLUX 4000 F
OPTIFLUX 5000 F
IFC 300 F

Electromagnetic flowmeter (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
Pressure 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):

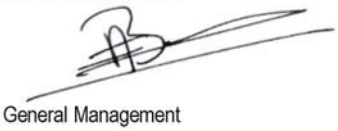
• EN 50 081-1	• EN 50 019 : 2000
• EN 50 082-2	• EN 50 020 : 2002
• EN 61 010-1	• EN 50 028 : 1987 [2]
• EN 50 014 : 1997 + A1, A2	• EN 50 281-1-1 : 1998 + A1
• EN 50 017 : 1998 [1]	• EN 50 284 : 1999 [3]
• EN 50 018 : 2000 + A1	

1) Only available for OPTIFLUX 4000 and 4300 C versions
2) Not available for IFC 300 F version
3) Not available for OPTIFLUX 4000 and 5000 versions.

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

Directive	Assessment	Certificate	Notified Body	Ident. No.
94/9/EC		KEMA 04 ATEX Q3202	KEMA	0344
97/23/EC	Module H	STW 302050726	Stoomwezen	0343

Dordrecht, April 2004



General Management

KROHNE
Altometer

Addition

to the Installation and Operating instructions

Optiflux 4300 C-EEx

rev. 0 (20-07-2004)

Important notices!

- Besides the general regulations for low-voltage installations like HD384 etc. the regulations laid down in the standard for electrical installations in gas hazardous areas like EN 600079-14 or dust hazardous areas like EN 50 281-1-2 must be respected !
- Installation, use and maintenance of this apparatus may only be performed by personal skilled in explosion safety !

1 Description of the flowmeter

The compact flowmeter Optiflux 4300 C-EEx is certified as:
- a group II, category 2 GD equipment, if fitted with an IFC 300-EEx converter unit **without** EEx ia signal in/outputs (see section 2.2)
or
- a group II, category 2 (1) GD equipment, if fitted with an IFC300-EEx converter unit **with** EEx ia signal in/outputs (see section 2.3)

The Optilfux 4300 C-EEx is therefore suitable for installation in Gas (G) hazardous areas classified as zone 1 or 2 and in Dust (D) hazardous areas classified as zone 21 or zone 22.
Additionally, the **EEx ia** signal in/outputs of the IFC 300-EEx converter may run or originate from a Zone 0 Gas hazardous area.

The flowmeter incorporates several types of protection against ignition , namely:

- Converter housing, connection compartment: with in/output terminals L, N (or L+, L-) and A+, A, A-, B, B-, C, C-, D, D- :

standard : EEx e (Increased safety)
special : EEx d (Flameproof enclosure)

For certain versions of converter IFC300-EEx the terminals A, A+, A-, B, B-, C, C- D, and D- are additionally in type of protection EEx ia (Intrinsic safety). Consult the table with CG30 numbers for details in section 4.

- Converter housing, electronics compartment:

always EEx d (Flameproof enclosure)

- Coil housing (primary head) :

depending on DN size :

DN 10-20 :	EEx m (Moulded) and EEx e (Increased safety)
DN 25-150	EEx d (Flameproof enclosure)
DN 200-300	EEx q (Powder filling) and EEx e (Increased safety)
DN 350-3000	EEx e (Increased safety)

for special versions, e.g. high pressure tubes, non-standard flanges, other types of protection for the primary head are required:

DN25-150	EEx q (Powder filling) and EEx e (Increased safety)
DN200-300	EEx e (Increased safety)

- internal electrode circuit :

always EEx ia (Intrinsic Safety)

The resulting marking (EEx code) on the data sticker is therefore:

DN size	EEx e or EEx ia connection compartment	EEx d connection compartment
10-20	EEx dme [ia] IIC T6..T3	EEx dme [ia] IIC T6..T3
25-150	EEx de [ia] IIC T6..T3	EEx d [ia] IIC T6..T3
200-300	EEx dqe [ia] IIC T6..T3	EEx dqe [ia] IIC T6..T3
350-3000	EEx de [ia] IIC T6..T3	EEx de [ia] IIC T6..T3

Special versions:

25-150	EEx dqe [ia] IIC T5..T3	EEx dqe [ia] IIC T5..T3
200-300	EEx de [ia] IIC T6..T3	EEx de [ia] IIC T6..T3

Data sticker

A representative example of the data sticker is shown in figure 1. Order specific deviations, e.g. in the code letters for used types of protection, are possible.

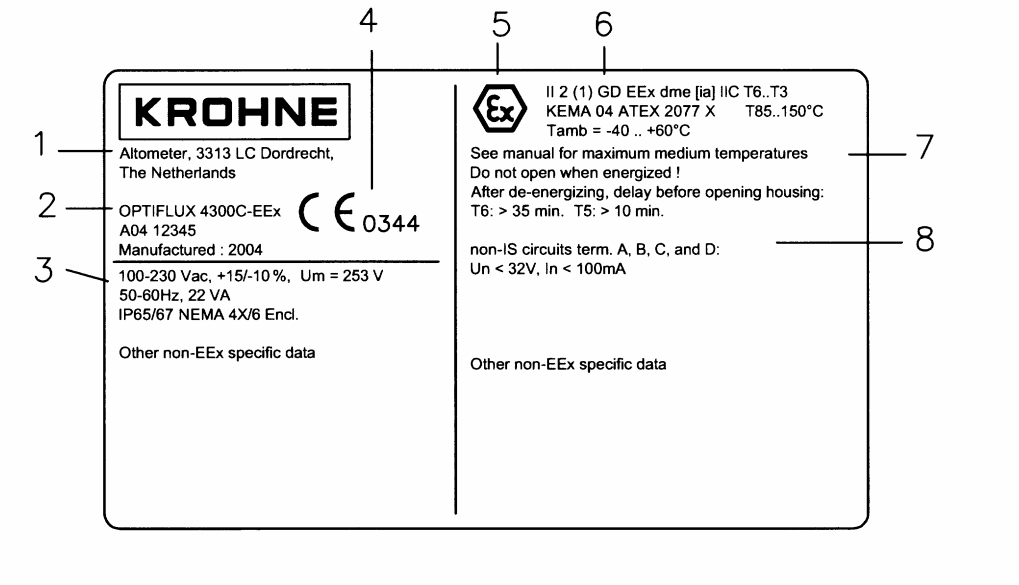


Figure 1 Example data sticker

1	Name and address of the manufacturer
2	Name of flowmeter, serial no, manufacturing date
3	Electrical data mains circuit
4	CE sign with identification number(s) of notified body / bodies
5	specific sign for explosion protection
6	Symbols and code letters for explosion safety: group (II), categories (2 or 2(1)), Gas/Dust (GD), EEx followed by the code letters for each used type of protection, gas group (IIC) and temperature classes (normally T6...T3)
7	Warnings relevant for the explosion safety
8	Electrical data of the signal in/outputs

Maximum ambient and process temperatures

The compact flowmeter is suitable for ambient temperature range -40 till +60 °C.

The flowmeter is certified for gas group IIC, temperature classes T6...T3.
The limit for the process (medium) temperature (T_m) is determined by the temperature class T6..T3 of the gas hazardous area of concern, the maximum ambient temperature (T_a) and the DN size, see following tables.
Note: for ease of reference the several flowmeter variants are simply denoted by the main EEx type of protection of the primary head, e.g. EEx m for DN10-20 range instead of the official EEx me.

Temperature class (for gasses)	Maximum medium temperature (in °C)		
	$T_a = 40°C$	$40 < T_a = 50°C$	$50 < T_a = 60$ °C
T6	70	60	---
T5	95	85	60
T4	130	130	60
T3	150	150	60

Table 1 Maximum medium temperatures for EEx m flowmeters DN10-20

Temperature class (for gasses)	Maximum medium temperature (in °C)		
	$T_a = 40°C$	$40 < T_a = 50°C$	$50 < T_a = 60$ °C
T6	80	80	80
T5	95	95	80
T4	130	130	80
T3	150	150	80

Table 2 Maximum medium temperatures for EEx d flowmeters DN25-150

Temperature class (for gasses)	Maximum medium temperature (in °C)		
	$T_a = 40°C$	$40 < T_a = 50°C$	$50 < T_a = 60$ °C
T5	50	not possible	not possible
T4	100	95	80
T3	150	150	80

Table 3 Maximum medium temperatures for EEx q flowmeters DN25-150

Temperature class (for gasses)	Maximum medium temperature (in °C)		
	$T_a = 40°C$	$40 < T_a = 50°C$	$50 < T_a = 60$ °C
T6	80	80	75
T5	95	95	80
T4	130	130	80
T3	150 (130)	150 (130)	80

Table 4 Maximum medium temperatures for EEx q flowmeters DN200-300 and EEx e flowmeters DN200-300 and 350-3000.

The minimum process (medium) temperature for all DN sizes is -40 °C.

For the special version Optiflux 4300 C- .../RT-EEx, only possible for EEx e flowmeters sizes DN200-300 or DN350-3000, the limit temperature for T3 is restricted to 130 °C (see values in brackets in line T3 of table 4).
This special version can be recognized by the suffix "RT" in the name of the flowmeter shown on the data sticker.

For dust hazardous areas, the maximum surface temperature is equal to the medium temperature with a minimum of 85 °C.

2 Electrical connection

2.1 General

Warnings:

- The covers of the housing electronic compartment and the housing itself are provided with "flameproof" thread. Compared with 'normal' thread the fitting of "flameproof" thread is relatively tight due to explosion proof requirements. Therefore screwing on or off of the cover must be done with care, never use brute force !
- Keep the threads free of dirt. The thread must be well-greased (with a suitable teflon grease for example) to make a smooth run possible.
- For opening of the covers first the "retention" lock must be disabled by means of a hexagonal socket screwdriver no. 3. After closing of the covers, the "retention lock" must be enabled again.
- Before opening of the electronic compartment a delay time after de-energizing has to be respected: T6 : at least 35 min., T5: at least 10 min.

The connection compartment with terminal block is schematically depicted in figure 2.

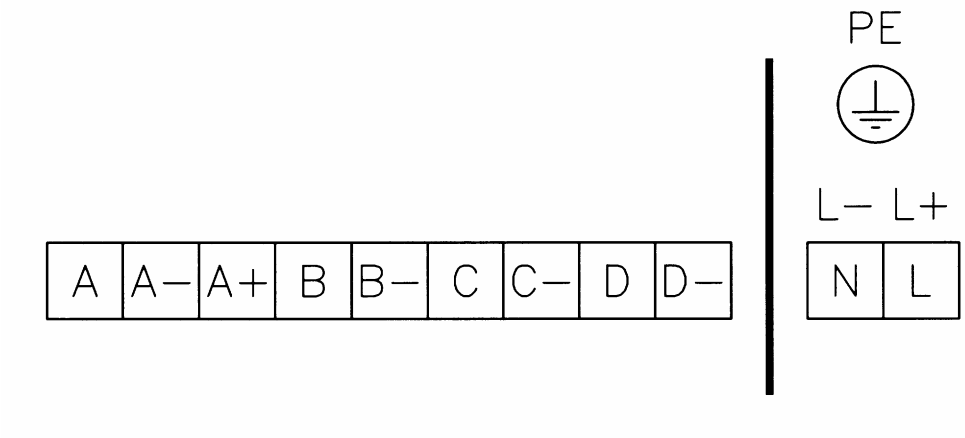


Figure 2 Connection compartment with terminal block

Function and electrical data of the terminals:

Terminal	Function, electrical data
L, N L+, L-	connection for mains, always non-EEx i 100..230 Vac, +10%/-15%, 22 VA 12..24 Vdc, +30%/-25%, 12 W U_m = 253 V
A, A-,A+ B, B- C, C- D, D-	Connection for signal in/outputs (PELV circuits), non-EEx i or EEx i, dependant on specific version of the IFC300-EEx converter ordered. Consult the table with CG30 numbers below for details

Table 5 Function and electrical data of the IFC300-EEx terminals

The exact IO-configuration for circuits A,B, C and D is order specific, that is determined by the CG30 number shown on the converter, check sticker on the backside of the IFC300 electronic unit.

The CG30 number contains 10 characters of which the last three (XYZ) determine the IO configuration (IO circuits) :

CG30	*	*	*	X	Y	Z
pos 1.. 4	5	6	7	8	9	10
				determine IO circuits		

Table 6 Explanation to CG30 numbers

Schematic overviews of the CG30 numbers can be found in paragraph 2.2 (non-EEx i IO in/outputs) and 2.3 (EEx i IO in/outputs).
The overviews do not show all details. The exact connection diagram for a specific IFC300-EEx converter can be found on the sticker glued on the inside of the cover of the connection compartment .

For use in gas hazardous areas:
The cable entry devices shall be in line with the type of protection chosen for the terminal compartment, that is increased safety (EEx e) or flameproof enclosure (EEx d). They should be suitable for the conditions of use and correctly installed.

The flowmeter with terminal compartment in type of protection EEx e is default delivered with two EEx e certified cable glands and one EEx e stopping plug.
The flowmeter with terminal compartment in type of protection EEx d is default delivered with one EEx d stopping plug and two temporarily plugs. The two temporarily plugs - only for transport and storage - must be replaced by suitable EEx d certified glands, plugs or conduit accessories before the flowmeter is taken into service.
Unused openings shall be closed by suitable certified closing elements.

The wiring of the compact flowmeter has to be conform the requirements specified in the relevant national or regional standard for electrical installations in hazardous areas, e.g. EN 60079-14. From this standard section 9 (Wiring systems) is valid for all types of protection. Section 10 (additional requirements for type of protection "d" - Flameproof enclosures), section 11 (additional requirements for type of protection "e" - Increased safety) and section 12 (additional requirements for type of protection "i" - Intrinsic safety) are valid for EEx e, EEx d or EEx i connection compartments respectively.

The compact flowmeter Optiflux 4300 C-EEx must always be included in the equipotential bonding system of the hazardous area. This can be achieved internally - by means of the PE conductor of the mains system connected to the internal PE clamp - or externally - by means of a separate equipotential bonding conductor connected to the external PE clamp under the converter housing. A separate bonding conductor must have a cross sectional area of at least 4 mm^2.

2.2 Non-EEx i connection of signal in/outputs

Following non-intrinsically safe signal in/outputs are available:

IO pcb	in/output functions, U_n < 32 Vdc, I_n < 100 mA U_m = 253 V
Basic IO	Current Output active and passive, with HART Status Output / Control Input Status Output Pulse / Status Output
Modular IO	Current Output, active or passive, with HART Pulse / Status Output, active or passive, highC or namur
Modular carrier with 1 or 2 IO modules	each module: 1 out of following 3 in/output functions: - Current Output, active or passive - Status / Pulse Output, active or passive, highC or Namur - Control Input, active or passive, highC or namur
Profibus DP IO	Profibus-DP, active
Fieldbus IO	Profibus-PA or Foundation Fieldbus
Notes - the options separated with slash "/" are software selectable (can be changed by user) - the options separated by the word "or" are hardware versions (must be ordered as such) - all outputs are passive unless otherwise indicated - highC is High Current in/output, namur is in/output to Namur recommendations	

Table 7 Possible non-EEx ia in/output circuits

Overview of possible combinations, defined by their CG30 number:

characters XYZ	Name I/O circuits	terminals A, A-	terminals B, B-	terminals C, C-	terminals D, D-
100	Basic IO	CO CO (a) over A+	SO/CI	SO	PO/SO
488 till 4LL 588 till 5LL 688 till 6LL 788 till 6LL 888 till 88L A88 till 6LL B88 till 6LL C88 till 6LL	Modular IO or Modular Carrier with 1 or 2 IO Modules	many combinations possible			
D88	Fieldbus IO Profibus PA	n.c.	n.c.	PA	PA
D8A till DLL	Fieldbus IO Profibus PA with Module Carrier with 1 or 2 IO Modules	many combinations possible		PA	PA
E88	Fieldbus IO Foundation Fieldbus	n.c.	n.c.	FF	FF
E8A till ELL	Fieldbus IO Foundation Fieldbus with Module Carrier with 1 or 2 IO Modules	many combinations possible		FF	FF
F00	Profibus DP IO	n.c.	DP (a)	DP (a)	DP (a)
F80 till FL0	Profibus DP IO with 0 or 1 IO Module	many combinations possible	DP (a)	DP (a)	DP (a)

Table 8 Overview of CG30 numbers with non-EEx ia in/outputs

Notes:
- shorts for in/output functions:
  CO= current output, PO=Pulse Output, SO= Status Output, CI= Control Input,
  PA=Profibus PA, FF=Foundation Fieldbus, DP=Profibus DP
- all in/outputs are passive unless otherwise noted as active (a)
- n.c. is not connected.

2.3 EEx i connection of signal in/outputs

Following intrinsically safe signal in/outputs are available:

IO pcb	in/output functions	
Ex i IO	Current Output + HART communication	EEx ia IIC U_i =30V, I_i = 100 mA, Pi = 1,0 W C_i = 10nF, L_i = negligibly low
	Pulse / Status Output	
	Current Output, active + HART communication	EEx ia IIC U_o = 21 V, I_o = 90 mA, P_o = 0,5 W linear characteristic C_o = 90 nF, L_o =2,0 mH C_o = 110 nF, L_o =0,5 mH
Ex i Option	Current Output	EEx ia IIC U_i =30V, I_i = 100 mA, Pi = 1,0 W C_i = 10nF, L_i = negligibly low
	Pulse / Status Output / Control Input	
	Current Output, active	EEx ia IIC U_o = 21 V, I_o = 90 mA, P_o = 0,5 W linear characteristic C_o = 90 nF, L_o = 2,0 mH C_o = 110 nF, L_o = 0,5 mH

Fieldbus IO	Profibus-PA Foundation Fieldbus	EEx ia IIC U_i = 24 V, I_i = 380 mA, Pi = 5,32 W C_i , L_i = negligibly low, suitable for connection to an intrinsically safe fieldbus in accordance to the FISCO-model

Overview possible CG30 numbers with EEx ia in/outputs:

characters XYZ	Name I/O circuits	terminals A, A-	terminals B, B-	terminals C, C-	terminals D, D-
200	Ex i IO	n.c.	n.c.	CO (a)	PO/SO
300		n.c.	n.c.	CO	PO/SO
210	Ex i IO with Ex i Option	CO (a)	PO/SO/CI	CO (a)	PO/SO
220		CO	PO/SO/CI	CO (a)	PO/SO
310		CO (a)	PO/SO/CI	CO	PO/SO
320		CO	PO/SO/CI	CO	PO/SO
D00	Fieldbus IO Profibus PA	n.c.	n.c	PA	PA
D10	Fieldbus IO Profibus PA with Ex i Option	CO (a)	PO/SO/CI	PA	PA
D20		CO	PO/SO/CI	PA	PA
E00	Fieldbus IO Foundation Fieldbus	n.c.	n.c	FF	FF
E10	Fieldbus IO Foundation Fieldbus with Ex i Option	CO (a)	PO/SO/CI	FF	FF
E20		CO	PO/SO/CI	FF	FF

Table 5 Overview of CG30 numbers with EEx ia in/outputs

Notes :
- shorts for in/output functions:
  CO= current output, PO=Pulse Output, SO= Status Output, CI= Control Input,
  PA=Profibus PA, FF=Foundation Fieldbus, DP=Profibus DP
- all in/outputs are passive unless otherwise noted as active (a)
- n.c. is not connected

The IO circuits named Ex i IO, Ex i Option are always in type of protection Intrinsic safety (EEx ia). The IO circuits Fieldbus IO Profibus PA and Fieldbus IO Foundation Fieldbus **can** be in type of protection Intrinsic safety.

A maximum of 4 intrinsically safe (EEx ia) in/outputs are possible. All intrinsically safe circuits are galvanically insulated with respect to earth and to each other. To avoid summation of voltages and currents, the wiring of the of these EEx ia circuits must be sufficiently separated, e.g. in line with the requirements of standard EN IEC 60079-14, section 12.2.

The EEx ia signal in/outputs may only be connected to other EEx ia or ib certified apparatus (e.g. intrinsically safe isolation amplifiers) , even if these apparatus are installed in the non-hazardous area !
Connection to an non-EEx i apparatus cancels the EEx ia properties of the flowmeter.

Terminals L, N (or L+, L-) for mains connection are **always non-intrinsically safe**. To achieve the necessary spatial separation to EN 50 020 between the non-EEx i and EEx i circuits the mains terminals are provided with an half-circular insulation cover with "snap-on" lock. This cover has to be closed before energizing the converter.

Note: for converters with an EEx e terminal compartment it is allowed to open this compartment in energized state for short periods and to access the intrinsically safe terminals for possible checks insofar the half-circular insulation cover over the non-intrinsically L, N (L+, L-) terminals is kept closed.

3 Replacement of mains fuse

Before opening the converter housing:
Note the warnings in the beginning of section 4 !

After opening of the window cover, move the display-unit forward by means of the two metal pullers left and right. Slip the display-unit side wards. Loosen the two cross headed screws with which the electronic unit is fixed. Now carefully slide the electronic unit forward. When them unit is almost completely moved out of the housing, the long rectangular (14-pole) blue connector at the back-end of the unit must be released. This connector is for the connection of the electrode- and coil circuits. Now the unit can be completely moved from the housing.

The mains fuse is placed in a fuse holder at the back-end of the electronic unit. Replacement types must have a high breaking capacity to IEC 60 127. The rated nominal values must be = 1,6 A for the 100..230 V_{ac} version and = 2,0 A for the 12..24 V_{dc} version. Consult the standard Installation and Operating Instructions for the correct nominal value.

4 Maintenance

The compact flowmeter Optiflux 4300 C-EEx is maintenance free with respect to the flowmetering properties. Within the scope of periodic inspections required for electrical equipment installed in hazardous areas it is recommended to check the flameproof converter housing and covers on signs of damage or corrosion.
For flowmeters sizes DN25-100 with EEx d primary head housing this housing should also be included in the inspection.

5 EC Declaration of Conformity

We

Krohne Altometer
Kerkeplaat 12
3313 LC Dordrecht
The Netherlands

declare under our sole responsibility that the product

Compact electromagnetic flowmeter Optiflux 4300 C-EEx

fulfils the requirements of following EC directives:

- ATEX directive 94/9/EC
- EMC directive 89/336/EC

The Optiflux 4300 C-EEx compact electromagnetic flowmeter is designed and manufactured conform following harmonized standards:

- EN 50 014 : 1997 + A1 + A2
- EN 50 017 : 1998
- EN 50 018 : 2000
- EN 50 019 : 2000
- EN 50 020 : 2002
- EN 50 028 : 1987
- EN 50 281-1-1 : 1998

- EN 61 326-1 : 1997, A1 + A2
- EN 61 010-1 : 2001

The Optiflux 4300 C-EEx flowmeter is examined and type approved under EC-type examination certificate KEMA 04 ATEX 2077 X. The Krohne Altometer Quality Assurance system is approved by KEMA Registered Quality b.v .

Dordrecht, August 12, 2004,

A. H. Boer
General manager

KROHNE
Altometer

Addition

to the Installation and Operating instructions

Optiflux 5300 C-EEx

rev. 0 (23-06-2004)

Important notices!

- Besides the general regulations for low-voltage installations like HD384 etc. the regulations laid down in the standard for electrical installations in gas hazardous areas like EN 600079-14 or dust hazardous areas like EN 50 281-1-2 must be respected !
- Installation, use and maintenance of this apparatus may only be performed by personal skilled in explosion safety !

1 Description of the flowmeter

The compact flowmeter Optiflux 5300 C-EEx is suitable for installation in gas and dust hazardous areas classified as zone 1 and 2 (for Gas) or zone 21 and 22 (for Dust). The flowmeter incorporates several types of protection against ignition , namely:

- Converter housing, connection compartment: with in/output terminals L, N (or L+, L-) and A+, A, A-, B, B-, C, C-, D, D- :

standard : EEx e (Increased safety)
special : EEx d (Flameproof Enclosure)

For certain versions of converter IFC300-EEx the terminals A, A+, A-, B, B-, C, C- D, and D- are additionally in type of protection EEx ia (Intrinsic Safety). Consult the table with CG30 numbers for details in section 4.

- Converter housing, electronics compartment:

always EEx d (Flameproof Enclosure)

- Coil housing (primary head) :

depending on DN size :
DN2,5-15 : EEx m (Moulded)
DN25-100 EEx d (Flameproof Enclosure)

- internal electrode circuit :

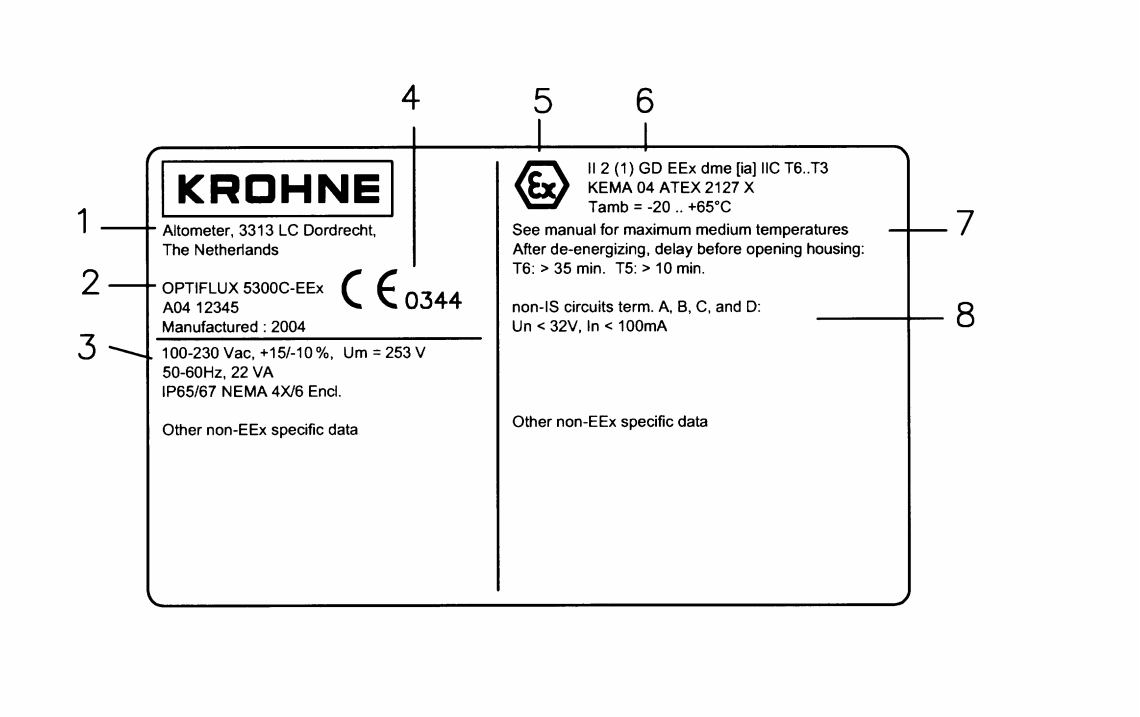
always EEx ia (Intrinsic Safety)

The resulting marking (EEx code) on the data sticker is therefore:

DN size	EEx e or EEx ia connection compartment	EEx d connection compartment
2,5-15	EEx dme [ia] IIC T6...T3	EEx dme [ia] IIC T6...T3
25-100	EEx de [ia] IIC T6...T3	EEx d [ia] IIC T6...T3

Data sticker

A representative example of the data sticker is shown in figure 1. Order specific deviations, e.g. in the code letters for used types of protection, are possible.



1	Name and address of the manufacturer
2	Name of flowmeter, serial no, manufacturing date
3	Electrical data mains circuit
4	CE sign with identification number(s) of notified body / bodies
5	specific sign for explosion protection
6	Symbols and code letters for explosion safety: group (II), categories (2(1)), Gas/Dust (GD), EEx followed by the code letters for each used type of protection, gas group (IIC) and temperature classes (T6...T3)
7	Warnings relevant for the explosion safety
8	Electrical data of the signal in/outputs

Figure 1 Example data sticker

Maximum ambient and process temperatures

The compact flowmeter is suitable for ambient temperature range -20 till +60 °C (DN2,5-15) or -40 till +60 (DN25-100). The process (medium) temperature is limited to -20 °C for DN2,5-15 and -40°C for DN25-100.
The flowmeter is certified for gas group IIC, temperature classes T6...T3. The temperature class for gas hazardous areas is determined by the maximum ambient (T_a) and process (medium) temperature (T_m) to following table:

Temperature class	Maximum process (medium) temperature T_m		
	T_a = 40 °C	T_a = 50 °C	T_a = 60 °C
T6	60 °C	55 °C	not possible
T5	75 °C	75 °C	70 °C
T4	115 °C	115 °C	75 °C
T3	150 °C	135 °C	75 °C

For dust hazardous areas, the maximum surface temperature is equal to the medium temperature with a minimum of 85 °C.

2 Electrical connection

2.1 General

Warnings:

- The covers of the housing electronic compartment and the housing itself are provided with "flameproof" thread. Compared with 'normal' thread the fitting of "flameproof" thread is relatively tight due to explosion proof requirements. Therefore screwing on or off of the cover must be done with care, never use brute force !
- Keep the threads free of dirt. The thread must be well-greased (with a suitable teflon grease for example) to make a smooth run possible.
- For opening of the covers first the "retention" lock must be disabled by means of a hexagonal socket screwdriver no. 3. After closing of the covers, the "retention lock" must be enabled again.
- Before opening of the electronic compartment a delay time after de-energizing has to be respected:
  T6 : at least 35 min., T5: at least 10 min.

The connection compartment with terminal block is schematically depicted in figure 2.

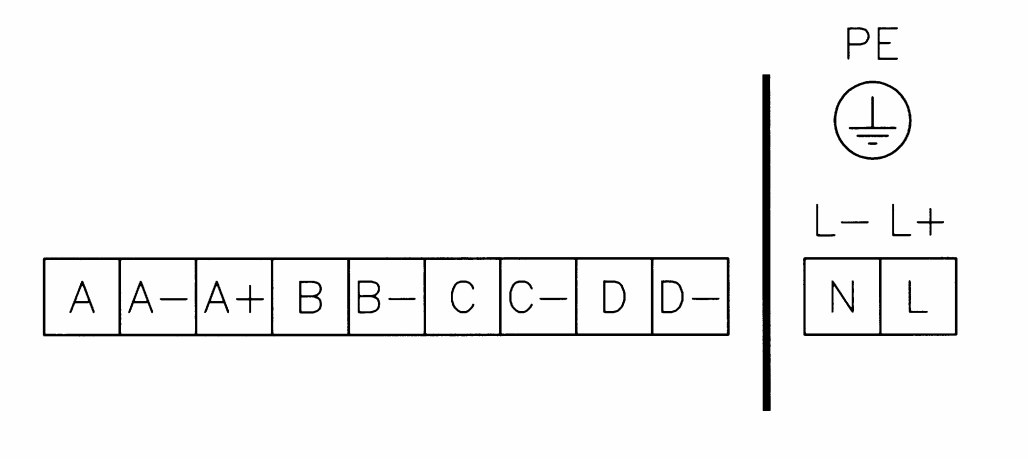


Figure 2 Connection compartment with terminal block

Function and electrical data of the terminals:

Terminal	Function, electrical data
L, N L+, L-	connection for mains, always non-EEx i 100..230 Vac, +10%/-15%, 22 VA 12..24 Vdc, +30%/-25%, 12 W U_m = 253 V
A, A-,A+ B, B- C, C- D, D-	Connection for signal in/outputs (PELV circuits), non-EEx i or EEx i, dependant on specific version of the IFC300-EEx converter ordered. Consult the table with CG30 numbers below for details

Table 1 Function and electrical data of the IFC300-EEx terminals

The exact IO-configuration for circuits A,B, C and D is order specific, that is determined by the CG30 number shown on the converter, check sticker on the backside of the IFC300 electronic unit. The CG30 number contains 10 characters of which the last three (XYZ) determine the IO configuration (IO circuits) :

CG30	*	*	*	X	Y	Z
pos 1.. 4	5	6	7	8	9	10
				determine IO circuits		

Table 2 Explanation to CG30 numbers

Schematic overviews of the CG30 numbers can be found in paragraph 2.2 (non-EEx i IO in/outputs) and 2.3 (EEx i IO in/outputs).
The overviews do not show all details. The exact connection diagram for a specific IFC300-EEx converter can be found on the sticker glued on the inside of the cover of the connection compartment .

For use in gas hazardous areas:
The cable entry devices shall be in line with the type of protection chosen for the terminal compartment, that is increased safety (EEx e) or flameproof enclosure (EEx d). They should be suitable for the conditions of use and correctly installed.

The flowmeter with terminal compartment in type of protection EEx e is default delivered with two EEx e certified cable glands and one EEx e stopping plug.
The flowmeter with terminal compartment in type of protection EEx d is default delivered with one EEx d stopping plug and two temporarily plugs. The two temporarily plugs - only for transport and storage - must be replaced by suitable EEx d certified glands, plugs or conduit accessories before the flowmeter is taken into service.
Unused openings shall be closed by suitable certified closing elements.

The wiring of the compact flowmeter has to be conform the requirements specified in the relevant national or regional standard for electrical installations in hazardous areas, e.g. EN 60079-14. From this standard section 9 (Wiring systems) is valid for all types of protection. Section 10 (additional requirements for type of protection "d" - Flameproof enclosures), section 11 (additional requirements for type of protection "e" - Increased safety) and section 12 (additional requirements for type of protection "i" - Intrinsic safety) are valid for EEx e, EEx d or EEx i connection compartments respectively.

The compact flowmeter Optiflux 5300 C-EEx must always be included in the equipotential bonding system of the hazardous area. This can be achieved internally - by means of the PE conductor of the mains system connected to the internal PE clamp - or externally - by means of a separate equipotential bonding conductor connected to the external PE clamp under the converter housing. A separate bonding conductor must have a cross sectional area of at least 4 mm^2.

2.2 Non-EEx i connection of signal in/outputs

Following non-intrinsically safe signal in/outputs are available:

IO pcb	in/output functions, U_n < 32 Vdc, I_n < 100 mA U_m = 253 V
Basic IO	Current Output active and passive, with HART Status Output / Control Input Status Output Pulse / Status Output
Modular IO	Current Output, active or passive, with HART Pulse / Status Output, active or passive, highC or namur
Modular carrier with 1 or 2 IO modules	each module: 1 out of following 3 in/output functions: - Current Output, active or passive - Status / Pulse Output, active or passive, highC or Namur - Control Input, active or passive, highC or namur
Profibus DP IO	Profibus-DP, active
Fieldbus IO	Profibus-PA or Foundation Fieldbus
Notes - the options separated with slash "/" are software selectable (can be changed by user) - the options separated by the word "or" are hardware versions (must be ordered as such) - all outputs are passive unless otherwise indicated - highC is High Current in/output, namur is in/output to Namur recommendations	

Table 3 Possible non-EEx ia in/output circuits

Overview of possible combinations, defined by their CG30 number:

characters XYZ	Name I/O circuits	terminals A, A-	terminals B, B-	terminals C, C-	terminals D, D-
100	Basic IO	CO CO (a) over A+	SO/CI	SO	PO/SO
488 till 4LL 588 till 5LL 688 till 6LL 788 till 6LL 888 till 88L A88 till 6LL B88 till 6LL C88 till 6LL	Modular IO or Modular Carrier with 1 or 2 IO Modules	many combinations possible			
D88	Fieldbus IO Profibus PA	n.c.	n.c.	PA	PA
D8A till DLL	Fieldbus IO Profibus PA with Module Carrier with 1 or 2 IO Modules	many combinations possible		PA	PA
E88	Fieldbus IO Foundation Fieldbus	n.c.	n.c.	FF	FF
E8A till ELL	Fieldbus IO Foundation Fieldbus with Module Carrier with 1 or 2 IO Modules	many combinations possible		FF	FF
F00	Profibus DP IO	n.c.	DP (a)	DP (a)	DP (a)
F80 till FL0	Profibus DP IO with 0 or 1 IO Module	many combinations possible	DP (a)	DP (a)	DP (a)

Table 4 Overview of CG30 numbers with non-EEx ia in/outputs

Notes:
- shorts for in/output functions:
  CO= current output, PO=Pulse Output, SO= Status Output, CI= Control Input,
  PA=Profibus PA, FF=Foundation Fieldbus, DP=Profibus DP
- all in/outputs are passive unless otherwise noted as active (a)
- n.c. is not connected.

2.3 EEx i connection of signal in/outputs

Following intrinsically safe signal in/outputs are available:

IO pcb	in/output functions	
Ex i IO	Current Output + HART communication Pulse / Status Output Current Output, active + HART communication	EEx ia IIC U_i =30V, I_i = 100 mA, Pi = 1,0 W C_i = 10nF, L_i = negligibly low EEx ia IIC U_o = 21 V, I_o = 90 mA, P_o = 0,5 W linear characteristic C_o = 90 nF, L_o =2,0 mH C_o = 110 nF, L_o =0,5 mH
Ex i Option	Current Output Pulse / Status Output / Control Input Current Output, active	EEx ia IIC U_i =30V, I_i = 100 mA, Pi = 1,0 W C_i = 10nF, L_i = negligibly low EEx ia IIC U_o = 21 V, I_o = 90 mA, P_o = 0,5 W linear characteristic C_o = 90 nF, L_o = 2,0 mH C_o = 110 nF, L_o = 0,5 mH
Fieldbus IO	Profibus-PA Foundation Fieldbus	EEx ia IIC U_i = 24 V, I_i = 380 mA, Pi = 5,32 W C_i , L_i = negligibly low, suitable for connection to an intrinsically safe fieldbus in accordance to the FISCO-model

Overview possible CG30 numbers with EEx ia in/outputs:

characters XYZ	Name I/O circuits	terminals A, A-	terminals B, B-	terminals C, C-	terminals D, D-
200	Ex i IO	n.c.	n.c.	CO (a)	PO/SO
300		n.c.	n.c.	CO	PO/SO
210	Ex i IO with Ex i Option	CO (a)	PO/SO/CI	CO (a)	PO/SO
220		CO	PO/SO/CI	CO (a)	PO/SO
310		CO (a)	PO/SO/CI	CO	PO/SO
320		CO	PO/SO/CI	CO	PO/SO
D00	Fieldbus IO Profibus PA	n.c.	n.c	PA	PA
D10	Fieldbus IO Profibus PA with Ex i Option	CO (a)	PO/SO/CI	PA	PA
D20		CO	PO/SO/CI	PA	PA
E00	Fieldbus IO Foundation Fieldbus	n.c.	n.c	FF	FF
E10	Fieldbus IO Foundation Fieldbus with Ex i Option	CO (a)	PO/SO/CI	FF	FF
E20		CO	PO/SO/CI	FF	FF

Table 5 Overview of CG30 numbers with EEx ia in/outputs

Notes :

- shorts for in/output functions:
  CO= current output, PO=Pulse Output, SO= Status Output, CI= Control Input,
  PA=Profibus PA, FF=Foundation Fieldbus, DP=Profibus DP
- all in/outputs are passive unless otherwise noted as active (a)
- n.c. is not connected

The IO circuits named Ex i IO, Ex i Option are always in type of protection Intrinsic safety (EEx ia). The IO circuits Fieldbus IO Profibus PA and Fieldbus IO Foundation Fieldbus **can** be in type of protection Intrinsic safety.

A maximum of 4 intrinsically safe (EEx ia) in/outputs are possible. All intrinsically safe circuits are galvanically insulated with respect to earth and to each other. To avoid summation of voltages and currents, the wiring of the of these EEx ia circuits must be sufficiently separated, e.g. in line with the requirements of standard EN IEC 60079-14, section 12.2.

The EEx ia signal in/outputs may only be connected to other EEx ia or ib certified apparatus (e.g. intrinsically safe isolation amplifiers) , even if these apparatus are installed in the non-hazardous area !
Connection to an non-EEx i apparatus cancels the EEx ia properties of the flowmeter.

Terminals L, N (or L+, L-) for mains connection are always non-intrinsically safe. To achieve the necessary spatial separation to EN 50 020 between the non-EEx i and EEx i circuits the mains terminals are provided with an insulation cover. This cover has to be closed before energizing the converter.

3 Replacement of mains fuse

Before opening the converter housing:
Note the warnings in the beginning of section 4 !

After opening of the window cover, move the display-unit forward by means of the two metal pullers left and right. Slip the display-unit side wards. Loosen the two cross headed screws with which the electronic unit is fixed. Now carefully slide the electronic unit forward. When them unit is almost completely moved out of the housing, the long rectangular (14-pole) blue connector at the back-end of the unit must be released. This connector is for the connection of the electrode- and coil circuits. Now the unit can be completely moved from the housing.

The mains fuse is placed in a fuse holder at the back-end of the electronic unit. Replacement types must have a high breaking capacity to IEC 60 127. The rated nominal values must be $=$ 1,6 A for the 100..230 V_{ac} version and $=$ 2,0 A for the 12..24 V_{dc} version. Consult the standard Installation and Operating Instructions for the correct nominal value.

4 Maintenance

The compact flowmeter Optiflux 5300 C-EEx is maintenance free with respect to the flowmetering properties. Within the scope of periodic inspections required for electrical equipment installed in hazardous areas it is recommended to check the flameproof converter housing and covers on signs of damage or corrosion.
For flowmeters sizes DN25-100 the primary head housing should also be included in this inspection.

5 EC Declaration of the manufacturer

EC-declaration of the manufacturer

We

Krohne Altometer
Kerkeplaat 12
3313 LC Dordrecht
The Netherlands

declare under our sole responsibility that the product

Compact electromagnetic flowmeter Optiflux 5300 C-EEx

fulfils the requirements of following EC directives:

- ATEX directive 94/9/EC
- EMC directive 89/336/EC

The Optiflux 5300 C-EEx compact electromagnetic flowmeter is designed and manufactured conform following harmonized standards:

- EN 50 014 : 1997
- EN 50 018 : 2000
- EN 50 019 : 2000
- EN 50 020 : 2002
- EN 50 028 : 1987
- EN 50 281-1-1 : 1998

- EN 50 081-1
- EN 50 081-2
- EN 61 010-1

The Optiflux 5300 C-EEx flowmeter is examined and type approved under EC-type examination certificate KEMA 04 ATEX 2127 X. The Krohne Altometer Quality Assurance system is approved by KEMA Registered Quality b.v .

Dordrecht, 25 June 2004,

A. Boer
Vice-president Flow