OPTIFLUX Supplementary Instructions

ATEX & IECEx supplement

OPTIFLUX 2300 C / 4300 C - OPTIFLUX 2000 F / 4000 F - IFC 300 F

KROHNE

1.1 Scope of the document

These instructions apply only to the explosion-protection version of the:

- OPTIFLUX 2300 C
- OPTIFLUX 4300 C
- OPTIFLUX 2000 F
- OPTIFLUX 4000 F
- IFC 300 F

INFORMATION!
For all other data, use the QuickStart and Handbook. If you do not have these documents, please download them from the manufacturer's website.

1.2 Safety instructions for the operator

WARNING!

- *Do not change the device. Unauthorised changes affect the explosion safety of the devices.*
- *The prescriptions and regulations, as well as the electrical data described in the EU type-examination certificate or the IECEx certificate of conformity must be obeyed.*
- *Beside the instructions for electrical installations in non-hazardous locations according to the applicable national standard (equivalent to HD 384 or IEC 60364, e.g. VDE 0100), especially the regulations in EN/IEC 60079-14 "Electrical installations in hazardous locations", equivalent national standard (e.g. DIN VDE 0165 Part 1).*
- *Installation, establishment, utilisation and maintenance are only allowed to be executed by personnel with education in explosion safety!*

These additional instructions are an extension to the handbook. All technical information as described in the handbook is applicable, when not specifically excluded, completed or replaced by the instructions in these additional instructions.

1.3 Approvals

The flowmeter consists of a flow sensorand a signal converter. The approval numbers are:

Compact versions:

OPTIFLUX 2300 C = OPTIFLUX 2000 + IFC 300
OPTIFLUX 4300 C = OPTIFLUX 4000 + IFC 300

FTZU 13 ATEX 0093 X and IECEx FTZU 13.0003X

The flowmeters are approved to following standards:

- EN IEC 60079-0 : 2018 / 2017
- EN IEC 60079-1 : 2014 / 2014
- EN IEC 60079-5 : 2015 / 2015
- EN IEC 60079-7-A1 : 2015 / 2017
- EN IEC 60079-11 : 2012 / 2011
- EN IEC 60079-18 : 2015 / 2014
- EN IEC 60079-31 : 2014 / 2013

Field versions:

IFC 300 F

FTZU 12 ATEX 0198 X and IECEx FTZU 12.0023X

Approved to following standards:

- EN IEC 60079-0 : 2018 / 2017
- EN IEC 60079-1 : 2014 / 2014
- EN IEC 60079-7 : 2015 / 2015
- EN IEC 60079-11 : 2012 / 2011
- EN IEC 60079-31 : 2014 / 2013

OPTIFLUX 2000 F and OPTIFLUX 4000 F

FTZU 13 ATEX 0175 X and IECEx FTZU 14.0001X

Approved to following standards:

- EN IEC 60079-0 : 2018 / 2017
- EN IEC 60079-1 : 2014 / 2014
- EN IEC 60079-5 : 2015 / 2015
- EN IEC 60079-7: 2015 / 2015
- EN IEC 60079-11 : 2012 / 2011
- EN IEC 60079-18 : 2015 / 2014
- EN IEC 60079-31 : 2014 / 2013

INFORMATION!
For more information of the certification and related EN IEC standards with date of compliances see the relevant certificates delivered with your flowmeter or available on the manufacturer website.

INFORMATION!
EN and IEC issue dates are separated by a backslash, EN issue date precedes the IEC issue date.

INFORMATION!
All ATEX EU-type examination certificates and IECEx certificates of conformity can be downloaded from the KROHNE website.

1.4 OPTIFLUX 2000 / 4000

1.4.1 Field versions

The OPTIFLUX 2000 F & 4000 F versions are suitable for installation in gas hazardous areas zone 1 or zone 2, group IIC, temperature class T6...T3 or T5...T3. The flowmeters are also suitable for installation in dust hazardous areas zone 21 or 22, group IIIC, surface temperature T180°C.

Field current circuit, in type of protection "Increased safety" (Ex 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 circuits, in type of protection "Intrinsic safety" (Ex ia), terminals 1, 2, 3 and 4:
Ui = 20 V, Ii = 175 mA, Ci = 0 nF, Li 0 = mH.

The before mentioned intrinsically safe circuits shall, from a safety point of view, be considered to be connected to ground. The cable gland for the electrode circuit is - as an intrinsically safe circuit - marked with a blue o-ring.

Ex Marking OPTIFLUX 2000 F / 4000 F

Nominal diameter	Ex marking	
DN2.5...15 ("mb")	II 2G	Ex eb ia mb IIC T6...T3 Gb
DN10...20 ("mb")	II 2G	Ex eb ia mb IIC T6...T3 Gb
DN25...150 ("db")	II 2G	Ex db eb ia IIC T6...T3 Gb
DN25...150 ("q")	II 2G	Ex eb ia q IIC T5...T3 Gb
DN200...300 ("q")	II 2G	Ex eb ia q IIC T6...T3 Gb
DN350...3000 ("e")	II 2G	Ex eb ia IIC T6...T3 Gb
Additionally:		
All diameters	II 2D	Ex tb IIIC T85°C...T180°C Db

INFORMATION!
Equipment group (II) and equipment category (2G or 2D) only included in marking for ATEX

1.4.2 Compact versions

The OPTIFLUX 2300 C / 4300 C compact versions are suitable for installation in gas hazardous areas zone 1 or zone 2, group IIC, temperature class T6...T3 or T5...T3. The flow meters in a stainless steel version are also suitable for installation in dust hazardous areas zone 21 or 22, group IIIC, surface temperature T85°C...T150°C.

Converter housing, connection compartment:
In equipment protection increased safety "eb" or (optional) flameproof enclosure "db".
The connection compartment contains the terminals for :
1. power supply - terminals L, N or L+, L-
2. I/O terminals A, A+, A-, B, B-, C, C-, D, D-

For certain versions of the signal converter the terminals A, A+, A-, B, B-, C, C-, D and D- are additionally in equipment protection intrinsic safety "ia". Consult the table with the CG numbers in section 3.7 for more details.

Converter housing, electronics compartment
Always in equipment protection flameproof enclosure "db".

Flow sensor
The equipment protection is DN size specific, see table below.

Ex Marking OPTIFLUX 2300 C / 4300 C (- Titanium)

Nominal diameter	Ex marking	
2.5...15 ("mb")	II 2(1)G	Ex db eb [ia Ga] mb IIC T6...T3 Gb
10...20 ("mb")	II 2(1)G	Ex db eb [ia Ga] mb IIC T6...T3 Gb
25...150 ("db")	II 2(1)G	Ex db eb [ia Ga] IIC T6...T3 Gb
25...150 ("q")	II 2(1)G	Ex db eb [ia Ga] q IIC T5...T3 Gb
200...300 ("q")	II 2(1)G	Ex db eb [ia Ga] q IIC T6...T3 Gb
350...3000 ("e")	II 2(1)G	Ex db eb [ia Ga] IIC T6...T3 Gb
Additionally		
All diameters	II 2 D	Ex tb IIIC T T85°C...T150°C Db

INFORMATION!
Equipment group (II) and equipment category [2(1)G or 2(1)D] only included in marking for ATEX.

1.4.3 Signal converter IFC 300 F

The IFC 300 F is suitable for installation in gas hazardous areas zone 1 or zone 2, group IIC, temperature class T6.
It is also suitable for installation in dust hazardous areas, zone 21 or zone 22, group IIIC, surface temperature T85°C.
If fitted with an IFC 300 F signal converter with Ex ia signal input/outputs (consult CG-numbers) these may originate or run from a zone 0 gas hazardous area.

	Ex marking	
IFC 300 F	II 2G	Ex db eb [ia] IIC T6 Gb
IFC 300 F with Ex ia signal inputs/outputs (consult CG number)	II 2(1)G	Ex db eb [ia Ga] IIC T6 Gb
Additional		
all the IFC 300 F versions	II 2D	Ex tb IIIC T85°C Db

Converter housing, connection compartment,

in equipment protection increased safety "eb".

The connection compartment contains the terminals for :

1. power supply terminals L, N or L+, L-
2. I/O terminals A, A+, A-, B, B-, C, C-, D and D-

For certain versions of the signal converter the terminals A, A+, A-, B, B-, C, C-, D and D- are additionally in equipment protection intrinsic safety "ia". Consult the table with the CG numbers in section 3.7 for more details.

Converter housing, electronics compartment,

in equipment protection flameproof enclosure "db".

The connection box for signal and field current cable with the terminals for:

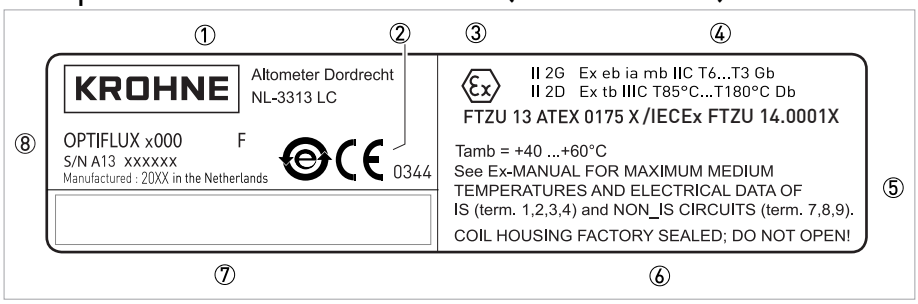
1. Field current circuit, terminals 7, 8 and 9, in equipment protection increased safety "e".
   Electrical data : U < 40 V injected square wave current.
   (switched DC-voltage, alternately +40 and -40 V = 125 mA)
   The field current circuit is protected by 2 TR5 fuses, rated value 160 mA. The maximum prospective short circuit current is restricted to 35 A.
2. Electrode circuits, terminals 1, 2, 20, 3, 30, 4 and 40 with parameters:

   Uo = 14 V, Io = 70 mA, Po = 300 mW (linear), Co = 430 nF, Lo = 2 mH.

1.5 Marking labels (examples)

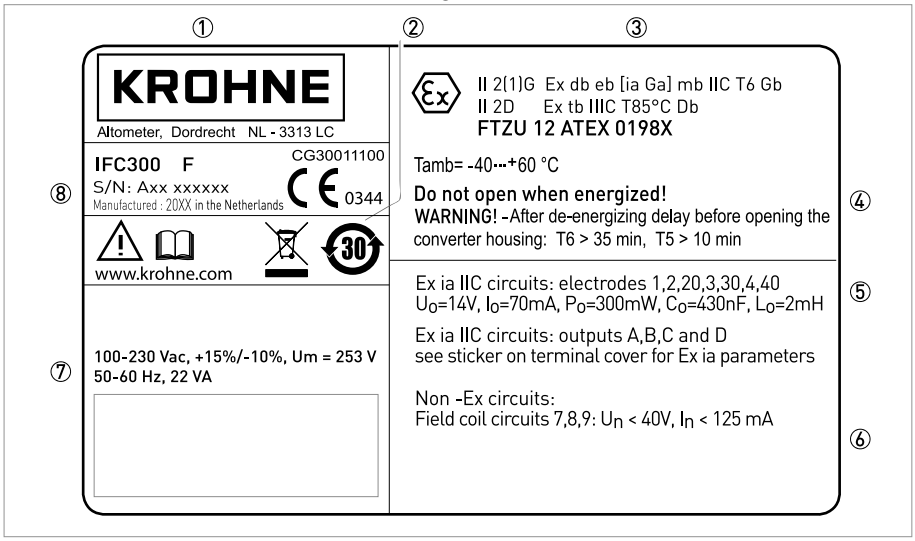
The ATEX/IECEx data stickers on the flowmeter and/or signal converter typically contains the following information:

Example of data sticker on the sensor (remote version)



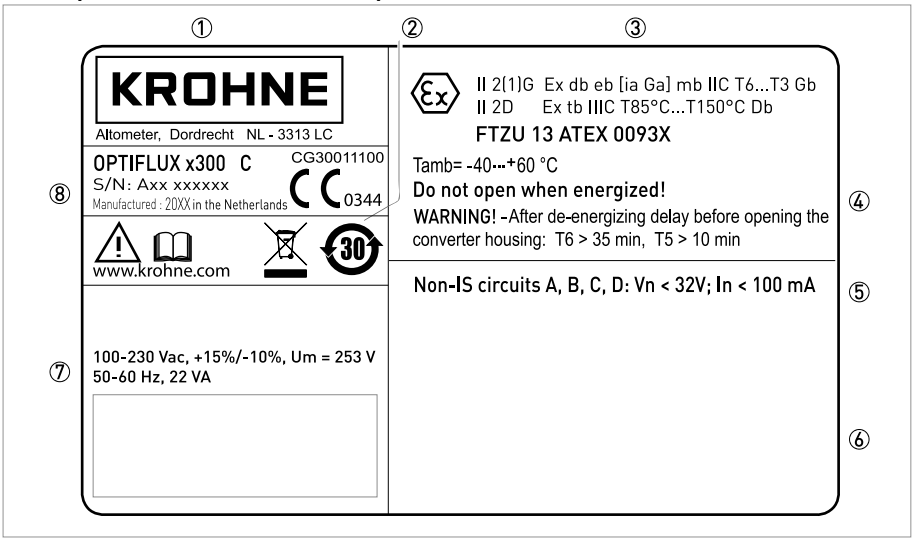
① Name and address of the manufacturer
② Disposal logo and CE mark with number of notified body
③ Ex marking for explosion safety
④ Symbols and marking for explosion safety and certificate number
⑤ Ambient temperature range, explosion safety notes and warnings
⑥ Other specific data and warnings
⑦ Non-Ex specific data and info
⑧ Type designation of flowmeter

Example of data sticker on the signal converter



① Name and address of the manufacturer
② Disposal logo and CE mark with number of notified body
③ Ex marking, symbols and marking for explosion safety and certificate number
④ Ambient temperature range, explosion safety notes and warnings
⑤ Ex specific remarks
⑥ Non-Ex specific data
⑦ Electrical data mains circuit
⑧ Type designation of flowmeter

Example of data sticker compact version



① Name and address of the manufacturer
② Disposal logo and CE mark with number of notified body
③ Ex marking, symbols and code letters for explosion safety and certificate number and certificate number
④ Ambient temperature range, explosion safety notes and warnings
⑤ Ex specific remarks
⑥ Non-Ex specific data
⑦ Electrical data mains circuit
⑧ Type designation of flow meter

The temperature limits apply under the following conditions:

- The instrument is installed and operated in accordance with the installation directions given in the installation and operating instructions.
- The instrument is not heated up by any additional heat radiation (direct solar radiation, heat from adjacent plant parts) so causing it to operate above the permissible ambient temperature range.
- Insulation is not hindering free ventilation of the signal converter housing.

2.1 OPTIFLUX 2000 / 4000

2.1.1 Field versions

- The OPTIFLUX 2000 F and OPTIFLUX 4000 F flow sensors are suitable for an ambient temperature of -40...+60°C.
- For dust hazardous areas, the maximum surface temperature is 180°C.
- The minimum process temperature for all DN sizes is -40°C.
- The maximum process temperature T_p is dependent on the required temperature class T6...T3 (or T5...T3), the diameter and the maximum ambient temperature T_a
- The process temperature range is often limited further by the liner type used (refer to the manual).
- The continuous operating temperature of heat resistant cables must be at least 85°C (see in following tables note ①)

DN2.5...15 ("mb")

Temperature class (Gas) / max. surface temperature (Dust)	Max. process temperature Tp [°C]		
	$T_a \leq 40°C$	$40 < T_a \leq 50°C$	$50 < T_a \leq 60°C$
T6/T85°C	70	70	70
T5/T100C	85	85	85
T4/T135°C	120	120	120
T3/T180°C	180	180	165
Use heat resistant cables for; T_p above	N.A.	N.A.	N.A.

DN10...20 ("mb")

Temperature class (Gas) / max. surface temperature (Dust)	Max. process temperature Tp [°C]		
	$T_a \leq 40°C$	$40 < T_a \leq 50°C$	$50 < T_a \leq 60°C$
T6/T85°C	75	70	70
T5/T100°C	95	90	75
T4/T135°C	130	115	75
T3/T150°C	150	130	75
Use heat resistant cables for; T_p above ①	N.A.	N.A.	N.A.

DN25...150 ("db")

Temperature class (Gas) / max. surface temperature (Dust)	Max. process temperature Tp [°C]		
	$T_a \leq 40°C$	$40 < T_a \leq 50°C$	$50 < T_a \leq 60°C$
T6/T85°C	70	70	70
T5/T100°C	85	85	85
T4/T135°C	120	120	120
T3/T180°C	180	180	180
Use heat resistant cables for; T_p above ①	N.A.	155	105

DN25...150 ("q")

Temperature class (Gas) / max. surface temperature (Dust)	Max. process temperature Tp [°C]		
	$T_a \leq 40°C$	$40 < T_a \leq 50°C$	$50 < T_a \leq 60°C$
T5/T100°C	60	55	---
T4/T135°C	110	105	100
T3/T180°C	180	180	180
Use heat resistant cables for; T_p above ①	N.A.	155	105

DN200...300 ("q")

Temperature class (Gas) / max. surface temperature (Dust)	Max. process temperature Tp [°C]		
	$T_a \leq 40°C$	$40 < T_a \leq 50°C$	$50 < T_a \leq 60°C$
T6/T85°C	75	70	70
T5/T100°C	95	90	75
T4/T135°C	130	115	75
T3/T180°C	160	130	75
Use heat resistant cables for; T_p above ①	N.A.	145	110

DN350...3000 ("eb")

Temperature class (Gas) / max. surface temperature (Dust)	Max. process temperature Tp [°C]		
	$T_a \leq 40°C$	$40 < T_a \leq 50°C$	$50 < T_a \leq 60°C$
T6/T85°C	80	75	70
T5/T100°C	95	95	95
T4/T135°C	130	130	130
T3/T180°C	160	160	160
Use heat resistant cables for; T_p above ①	N.A.	N.A.	145

2.1.2 Compact versions

- The OPTIFLUX 2300 C and OPTIFLUX 4300 C are suitable for an ambient temperature of -40°C ...+60°C
- For dust hazardous areas, the maximum surface temperature is equal to the maximum process temperature of 150°C.
- The minimum process temperature for all DN sizes is -40°C.
- The maximum process temperature T_p is determined by the temperature class T6...T3 or T5...T3 of the gas hazardous area of concern, the maximum ambient temperature (T_a), the nominal diameter of the flow sensor and the material of the signal converter housing; AL = aluminum, SS = stainless steel) see table below.
- The process temperature range is often limited further by the liner type used (refer to the manual).

DN2.5...15 ("mb")

Temperature class (Gas) / max. surface temperature (Dust)	Max. process temperature Tp [°C]					
	$T_a \leq 40°C$		$40 < T_a \leq 50°C$		$50 < T_a \leq 60°C$	
	AL	SS	AL	SS	AL	SS
T6/T85°C	70	70	70	60	70	60
T5/T100°C	85	95	85	85	85	60
T4/T135°C	120	120	120	120	100	60
T3/T180°C	150	150	150	140	100	60

DN10...20 ("mb")

Temperature class (Gas) / max. surface temperature (Dust)	Max. process temperature Tp [°C]					
	$T_a \leq 40°C$		$40 < T_a \leq 50°C$		$50 < T_a \leq 60°C$	
	AL	SS	AL	SS	AL	SS
T6/T85°C	70	70	60	60	--	--
T5/T100°C	95	95	85	85	60	60
T4/T135°C	130	130	130	130	60	60
T3/T180°C	150	150	150	140	60	60

DN25...150 ("db")

Temperature class (Gas) / max. surface temperature (Dust)	Max. process temperature Tp [°C]					
	$T_a \leq 40°C$		$40 < T_a \leq 50°C$		$50 < T_a \leq 60°C$	
	AL	SS	AL	SS	AL	SS
T6/T85°C	80	80	80	80	80	60
T5/T100°C	95	95	95	95	80	60
T4/T135°C	130	130	130	130	80	60
T3/T180°C	150	150	150	140	80	60

DN25...150 ("q")

Temperature class (Gas) / max. surface temperature (Dust)	Max. process temperature Tp [°C]					
	$T_a \leq 40°C$		$40 < T_a \leq 50°C$		$50 < T_a \leq 60°C$	
	AL	SS	AL	SS	AL	SS
T5/T100°C	50	50	--	--	--	--
T4/T135°C	100	100	95	95	80	60
T3/T180°C	150	150	150	140	80	60

DN200...300 (q") and DN350...3000 ("eb)"

Temperature class (Gas) / max. surface temperature (Dust)	Max. process temperature Tp [°C]					
	$T_a \leq 40°C$		$40 < T_a \leq 50°C$		$50 < T_a \leq 60°C$	
	AL	SS	AL	SS	AL	SS
T6/T85°C	80	80	80	80	75	60
T5/T100°C	95	95	95	95	80	60
T4/T135°C	130	130	130	130	80	60
T3/T180°C	150	150	150	140	80	60
(T3 *)	(130)	(130)	(130)	(130)	(80)	(60)

T3* option; only for DN350...3000 in equipment protection "eb" with thermal class F coils.

2.1.3 IFC 300 F

The IFC 300 F signal converter is suitable for an ambient temperature of:

-40°C...+65°C (aluminum housing)
or
-40°C...+60°C (stainless steel housing)

In the case of field versions, the electrical connection between the flow sensor and the signal converter is established via a signal cable and a field current cable.

The **field current cable** is no part of the supply and must be supplied by the user. It must be according EN IEC 60079-14 : and 15 (Increased Safety). The **signal cable** is part of the supply.

INFORMATION!
The clause numbers listed are based on EN IEC 60079-14:2014. For future editions of this standard, the clause numbers may be different.

3.1 Signal cable A

The signal cable A is a double screen shielding cable, according to EN IEC 60079-14 clause 16.2.2 (Intrinsic safety).

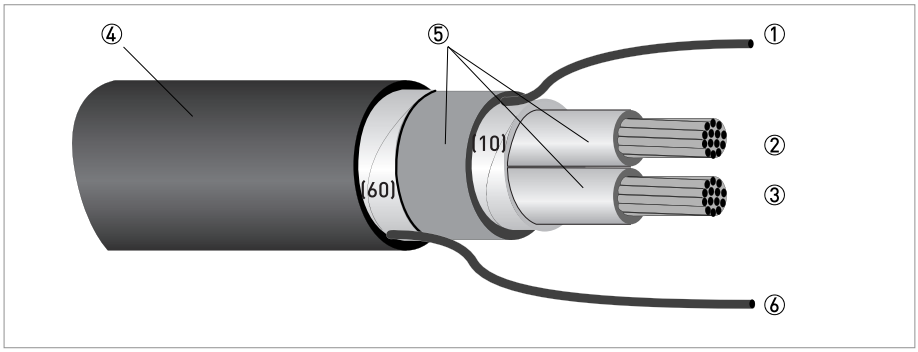


Figure 3-1: Construction of signal cable A

① Stranded drain wire (1) for the inner shield (10), 1.0 mm^2 Cu / AWG 17 (not insulated, bare)
② Insulated wire (2), 0.5 mm^2 Cu / AWG 20
③ Insulated wire (3), 0.5 mm^2 Cu / AWG 20
④ Outer sheath
⑤ Insulation layers
⑥ Stranded drain wire (6) for the outer shield (60)

3.2 Signal cable B

The signal cable B is a triple screen shielding cable, according to EN IEC 60079-14 clause 16.2.2 (Intrinsic safety)

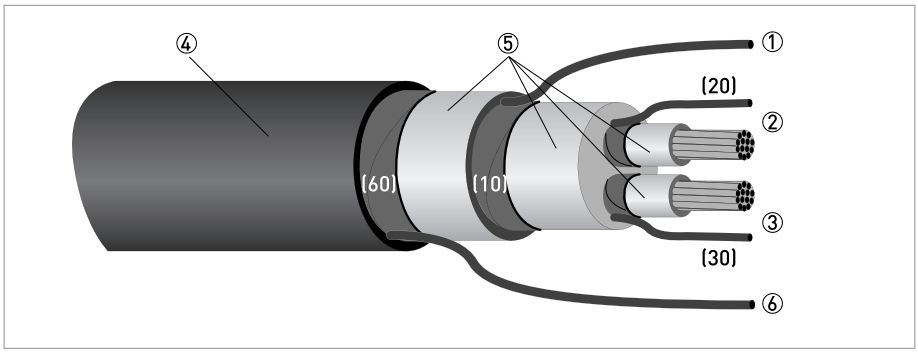


Figure 3-2: Construction of signal cable B

① Stranded drain wire for the inner shield (10), 1.0 mm^2 Cu / AWG 17 (not insulated, bare)
② Insulated wire (2), 0.5 mm^2 Cu / AWG 20 with stranded drain wire (20) of shield
③ Insulated wire (3), 0.5 mm^2 Cu / AWG 20 with stranded drain wire (30) of shield
④ Outer sheath
⑤ Insulation layers
⑥ Stranded drain wire (6) for the outer shield (60), 0.5 mm^2 Cu / AWG 20 (not insulated, bare)

3.3 Equipotential bonding

- As the Ex ia electrode circuits of the flow sensors are effectively earthed 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 IEC 60 079-14 clause 16.2.3.
- The flowmeters OPTIFLUX 2000 F, 4000 F, 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 mm^2 copper.
- The separate equipotential bonding conductor between flowmeter and signal 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.
  The outer screens of the electrode cable between the flowmeters OPTIFLUX 2000 F, 4000 F and the signal converterIFC 300 F, should also be included in the bonding system.

3.4 Signal cable connections

DANGER!
The device must be grounded in accordance with regulations in order to protect personnel against electric shocks.

CAUTION!
** Outer screen connected via strain reliefs.*

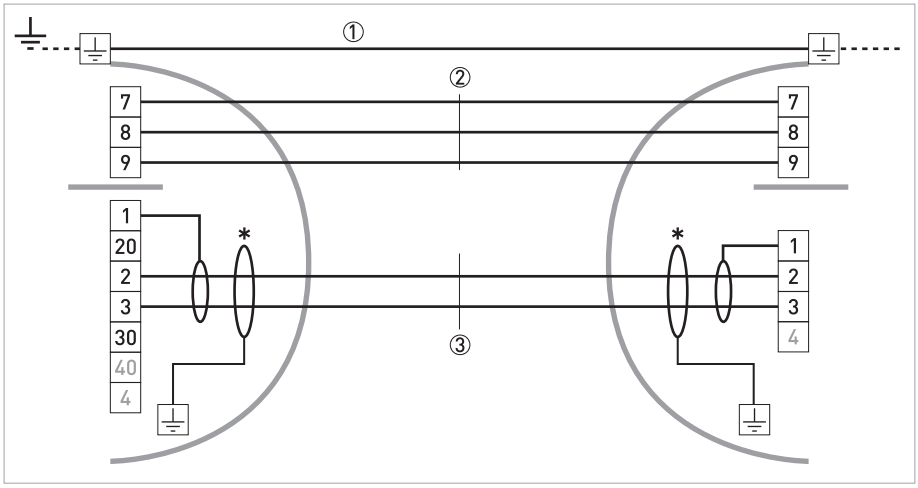


Figure 3-3: Connecting with signal cable A

① Equipotential bonding, conductor ≥ 4 mm²
② Field current cable acc. IEC 60079-14 clause 9.3 and 15 (Increased safety), do not connect the screen if available.
③ Signal cable A acc. IEC 60079-14 clause 16.2.2 (Intrinsic safety)

CAUTION!
** Outer screen connected via strain reliefs.*

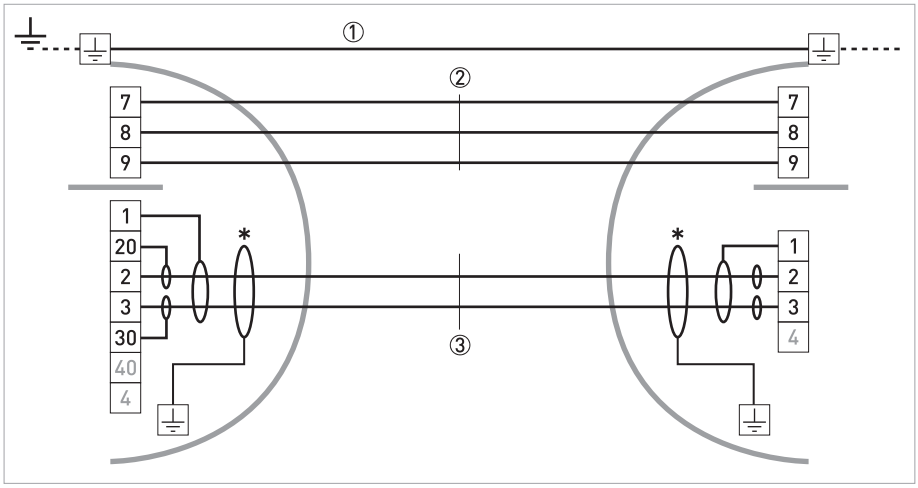


Figure 3-4: Connecting with signal cable B

① Equipotential bonding, conductor ≥ 4 mm²
② Field current cable acc. IEC 60079-14 clause 9.3 and 11.2 (Increased safety), do not connect the screen if available.
③ Signal cable B acc. IEC 60079-14 clause 16.2.2 (Intrinsic safety)

3.5 Installation instructions

When used in a potentially explosive atmosphere, requiring the use of apparatus of equipment category 2G or 2D, certified cable entry devices with a degree of ingress protection of at least IP64 according to EN 60 529 must be used, that are suitable for the application and correctly installed. Unused openings must be closed with suitable certified closing elements.
With the use of conduits, a suitable certified sealing device such as a stopping box with setting compound must be provided immediately at the entrance to the flameproof enclosure.

For IFC 300 F, OPTIFLUX 2000 F / 4000 F, and OPTIFLUX 2300 C / 4300 C

Electrostatic charge

Avoid the risk of ignition as a result of electrostatic charging. Do **not** use the device in areas:

- with processes that generate high charges
- with mechanical friction and cutting processes
- near electrostatic painting systems (spraying of electrons)
- with exposure of airborne powder or dust particles (pressurized systems)

The flowmeters are suitable for fixed installations only.

For IFC 300 F and OPTIFLUX 2300 C / 4300 C:

To avoid voltage and current addition, the intrinsically safe circuits must be separated and wired according to EN 60 079-14.

Additionally for OPTIFLUX 2000 F / 4000 F / 6000 F version :

The field coils in type of explosion protection "q" and "m" must be protected by a 160 mA fuse. The breaking capacity of the fuse must be in accordance with the prospective short circuit current of the supply. This concerns:

OPTIFLUX 2000 F / 4000 F	DN2.5...15 and DN10...20 ("mb")
	DN200...300 ("q")
	DN25...150 ("q")

The prospective short circuit current for the field coil circuit is limited to 35 A

INFORMATION !

The internal field fuses of an IFC 400IFC 300 electronic unit fulfill the above mentioned requirement
with respect to breaking capacity.

The cable glands shall be used according to the standard EN IEC 60 079-14:2014, clause 10.2, table 10. The cable glands shall be used only with Ex-protection type Ex eb IIc and Ex tb IIIC with a minimum ingress protection of IP64.

The IFC 400IFC 300 F signal converter is normally delivered with two Ex e certified M20 x 1.5 cable
glands and one Ex e certified M20 x 1.5 stopping plug in the connection compartment for power supply etc. and with two Ex e certified M20 x 1.5 cable glands in the connection box for the field current / electrode cables. The clamping range of the Ex e cable glands is Ø 6-12 mm.

The OPTIFLUX 2000 F / 4000 F flow sensors are normally delivered with two Ex e certified M20 x 1.5 cable glands, clamping range Ø 6-12 mm.

The OPTIFLUX 2300 C / 4300 C compact flow meters with connection compartment in equipment protection Ex e (increased safety) are delivered with two Ex e certified M20 x 1.5 cable glands, clamping range Ø 6-12 mm, and one Ex e certified M20 x 1.5 stopping plug.

The OPTIFLUX 2300 C / 4300 C compact flowmeters with connection compartment in equipment protection Ex d (flameproof enclosure) are delivered with one Ex d certified M20 x 1.,5 stopping plug and two temporary non-Ex d certified plastic plugs in the two remaining M20 x 1.5 Ex d conduit or cable gland openings.

INFORMATION!

The temporary plastic stopping plugs placed in the M20 x 1.5 Ex d conduit / cable gland openings must be removed and replaced by suitable Ex d connection before energizing the apparatus. This is also applicable for the plastic stopping plugs placed in all Ex e cable glands, which must be replaced by wiring or Ex e certified stopping plugs.
The purpose of the temporarily plastic plugs is only to keep the connection compartments free of dust and moisture during transport and storage.

3.6 Connection of the IFC 300 signal converter

The flow sensor and the signal converter in field version must be incorporated in the equipotential bonding system of the installation. This can be established internally by connection of the protective earth (PE) conductor of the mains supply system to the internal PE clamp, or externally, by connecting a separate equipotential bonding conductor to the external U-clamp terminal (size M5) at respectively the flange of the mounting support (in case of compact instruments) or at the wall-mounting device (for signal converters in field version). A separate bonding conductor must have a cross-sectional area of at least 4 mm^2.

The display cover seals the electronics compartment of the signal converter housing and provides type of protection "flameproof enclosure". The terminal compartment is default in type of protection "increased safety" and can optionally be performed as flameproof enclosure. The threaded joints formed by the covers and housing are a tight fit due to the requirements for type of protection "flameproof enclosure". Screw the covers on and off with care and never use excessive force.

Keep the screw-threads free of dirt and well-greased (e.g. with PTFE grease). The grease will help to prevent the threads from locking due to corrosion.
To unscrew the covers, first release the interlocking devices (one at each cover). Therefore unscrew the M4 head screw with internal hexagon socket set using a No. 3 Allen key until the interlocking device can be turned. After the covers are screwed back onto the housing, make sure that the interlocking devices are properly refitted.

WARNING!
Allow the electronics to de-energize before opening the electronics compartment of the signal converter housing. Wait at least 35 minutes for T6 and 10 minutes for T5 before opening.

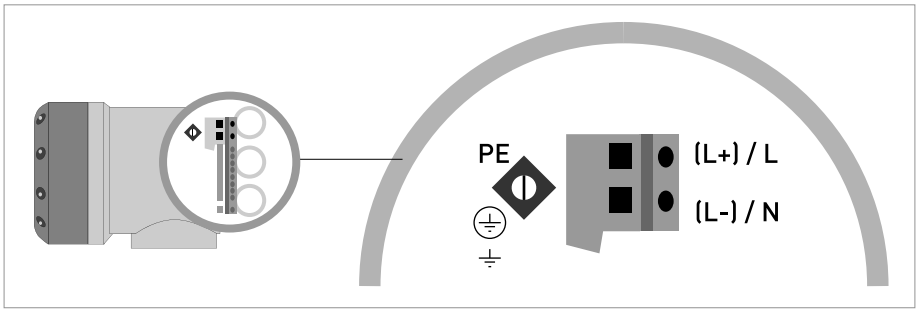


Figure 3-5: Electrical connections

Terminals	Function, electrical data
L, N L+, L-	Connections for mains supply, always non-Ex i 100...230 VAC, +10%/-15%, 22 VA 12...24 VDC, +30%/-10% (short-time: -25%), 12 W 24 VAC, +10%/-15%, 22 VA 24 VDC, +30%/-25%, 12 W U_m = 253 V
A, A-, A+ B, B- C, C- D, D-	Connections for signal I/Os (PELV circuits), non-"Ex i" or "Ex i", are dependent on the specific version of the signal converter ordered. Consult the tables with CG numbers for details.

Data for connection on all Ex e terminals:

IFC 300 F, OPTIFLUX 2300 C / 4300 C signal converter housing :
terminals L, N, A, A-, A+, B, B-, C, C-, D,D-
stripping length for wires: 8 mm, torque for screws: 0.6...0.8 Nm.

IFC 300 F connection box and OPTIFLUX 2000 F / 4000 F sensor :
terminals 7, 8 and 9
stripping length for wires: 9 mm, torque for screws: 0.4...0.5 Nm.

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

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

The wiring of instruments has to be in accordance with the requirements as specified in the relevant national or international standard for electrical installations in hazardous areas, e.g. EN 60079-14. Section 9 (wiring systems) of this standard applies to 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) apply to respectively "Ex d", "Ex e" and "Ex i" connection (terminal) compartments.

3.7 Input/output connections

- IFC 300 signal converters are available in versions with intrinsically safe (Ex i) or non-intrinsically safe (non-Ex i) inputs/outputs (I/O). Details of both versions (CG. no's and connection of terminals) are listed in the IFC 300 manual.
- The versions with non-Ex i I/O are listed in the IFC 300 manual (title: alterable input/output versions). The version basic I/O is also with non-Ex i I/O. The electrical data of the I/O circuits with non-Ex i I/O are:
  U_n< 32 VDC and I_n ≤100 mA.
- The versions with Ex i inputs/outputs are listed in the IFC 300 manual (title: Fixed, non-alterable input/output versions), except the IFC 300 version basic I/O, last digits of CG. no. 100. This version is always with non-Ex i I/O.
  The electrical data of the versions with Ex i I/O are listed below.

The following signal I/O connections are available as intrinsically safe:

I/O PCB	CG nr. (XYZ)	I/O functions	
Ex i I/O	300, 310, 320, 330, 340	Current output 4...20 mA with HART passive (C and C-)	Ex ia IIC U_i = 30 V, I_i = 100 mA, P_i = 1.0 W C_i = 10 nF, L_i = negligibly low
	200, 210, 220, 230, 240, 300, 310, 320, 330, 340, D30, D40, E30, E40	Pulse/status output (D and D-)	
	200, 210, 220, 230, 240	Current output 4...20 mA with HART active (C and C-)	Ex ia IIC U_o = 21 V, I_o = 90 mA, P_o = 0.5 W Linear characteristics C_o = 90 nF, L_o = 2.0 mH C_o = 110 nF, L_o = 0.5 mH
Ex i Option	220, 320, D20, E20	Current output 4...20 mA passive (A and A-)	Ex ia IIC U_i = 30 V, I_i = 100 mA, P_i = 1.0 W C_i = 10 nF, L_i = negligibly low
	210, 220, 310, 320, D10, D20, E10, E20	Pulse/status output Control input (B and B-)	
	210, 310, D10, E10	Current output 4...20 mA active (A and A-)	Ex ia IIC U_o = 21 V, I_o = 90 mA, P_o = 0.5 W Linear characteristics C_o = 90 nF, L_o = 2.0 mH C_o = 110 nF, L_o = 0.5 mH

I/O PCB	CG nr. (XYZ)	I/O functions	
Ex i Option 2	240, 340, D40, E40	Current input, passive (A and A-)	Ex ia IIC U_i = 30 V, I_i = 100 mA, P_i = 1,0 W C_i = 10 nF, L_i = negligibly low
	230, 240, 330, 340, D30, D40, E30, E40	Pulse/status output Control input (B and B-)	
	230, 330, D30, E30	Current input, active (A and A-)	Ex ia IIC U_o = 24,1 V I_o = 99 mA, P_o = 0,6 W Linear characteristics C_o = 75 nF L_o = 0,5 mH
Fieldbus I/O	D00, D10, D20, D30, D40	Profibus-PA (C and C-, D and D-)	Ex ia IIC U_i = 24 V I_i = 380 mA, P_i = 5.32 W C_i = 5 nF L_i = 10 µH Suitable for connection to an intrinsically safe fieldbus in accordance with the FISCO model.
	E00, E10, E20, E30, E40	Foundation Fieldbus (C and C-, D and D-)	

The I/O circuits titled "Ex i I/O" and "Ex i Option" are always provided with type of protection Intrinsic Safety (Ex ia). The I/O-circuits "Fieldbus I/O Profibus-PA" as well as "Fieldbus I/O Foundation Fieldbus" can be provided with type of protection Intrinsic Safety.

Up to a maximum of 4 intrinsically safe (Ex ia) in-/outputs are possible. All intrinsically safe circuits are galvanically insulated with respect to earth and each other. To avoid summation of voltages and current, the wiring of these "Ex ia"-circuits must be sufficiently separated, e.g. in accordance with the requirements of standard EN IEC 60079-14, clause 16.2.2.7 and 16.2.2.8. The "Ex ia" signal in-/outputs may only be connected to other "Ex ia" or "Ex ib" approved devices (e.g. intrinsically safe isolation amplifiers), even if such devices are installed in a non-hazardous location!

Connection to non-"Ex i" devices cancels the "Ex ia" properties of the flowmeter.

Terminals L and N (or L+ and L-) for connection of the mains supply are not available with type of protection "intrinsic safety". To achieve the necessary separation distances according to EN IEC 60079-11 between the non-"Ex i" and "Ex i" circuits, the mains terminals are provided with a semi-circular protection cover with a "snap-in" lock. This cover MUST be closed before establishing the power supply to the signal converter.

INFORMATION!
For signal converters with an "Ex e" terminal compartment, the compartment can be opened in an energized state for short periods of time, to access the intrinsically safe terminals for possible checks. However, the semi-circular insulation cover over the non-intrinsically safe mains supply terminals L and N (or L+ and L-) MUST be kept closed.

INFORMATION!
More detailed information about the connections can be found in the manual of the signal converter.

4.1 Maintenance and service

The OPTIFLUX flowmeters are maintenance free with respect to the flow metering properties. Within the scope of periodic inspections required for electrical equipment installed in hazardous areas it is recommended to check the flowmeter and signal converter housing for signs of the corrosion. This is especially important for the flameproof Ex d flowmeter or coil housing, sizes DN25...150 of the **OPTIFLUX 2000F/4000F and OPTIFLUX 2300C/4300C.**

Specific notes for the above mentioned types:

Ex d flowmeters, sizes DN25...150:

- In case of replacement of one (or more) of the four M6 hexagon socket head cap screws which connect the IFC 300 signal converter housing or the connection box with the OPTIFLUX 2000 / 4000 compact or remote flowmeter, equivalent types must be used, that are M6 x 16 hexagon socket head cap screws to ISO 4762, steel quality A2-70 or A4-70.

Ex q flowmeters, sizes DN25...150 and DN200...300:

- The coil housing is factory sealed. After the opening of the seal, the flowmeter must be returned to the manufacturer to re-fill the compact or remote flowmeter with the Ex q approved powder filling material.

Ex d signal converter housing of the IFC 300 F:

- In case of replacement of one (or more) of the four M6 hexagon socket head screws which connect the IFC 300 F signal converter housing with the connection box wall-mounting bracket, equivalent types must be used, that are M6 x 16 hexagon head screws to ISO 4017, steel quality A2-70 or A4-70.

If needed, contact the manufacturer for information on the dimensions of the flameproof joints.

4.2 Before and after opening

WARNING!
The following instructions must always be carefully followed, if the housing of the signal converter 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 electronics to de-energise before opening the electronics compartment of the signal converter housing.
  Wait at least 35 minutes for T6 and 10 minutes for T5 before opening.

When the instructions above are strictly followed, the display cover (includes glass window) of the electronics compartment may be removed. First unscrew the head screw with internal hexagon socket set (size M4) of the interlocking device by a No. 2.5 Allen key, until the cover can rotate freely.

After opening:

- Before the cover is screwed back onto the housing, the screw-thread must be clean and well-greased with an acid and resin-free grease, e.g. PTFE grease.
- Screw the cover as tight as possible into the housing by hand, until it cannot be opened by hand anymore. Fixate the screw of the interlocking device tight with the No. 2.5 Allen key.

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