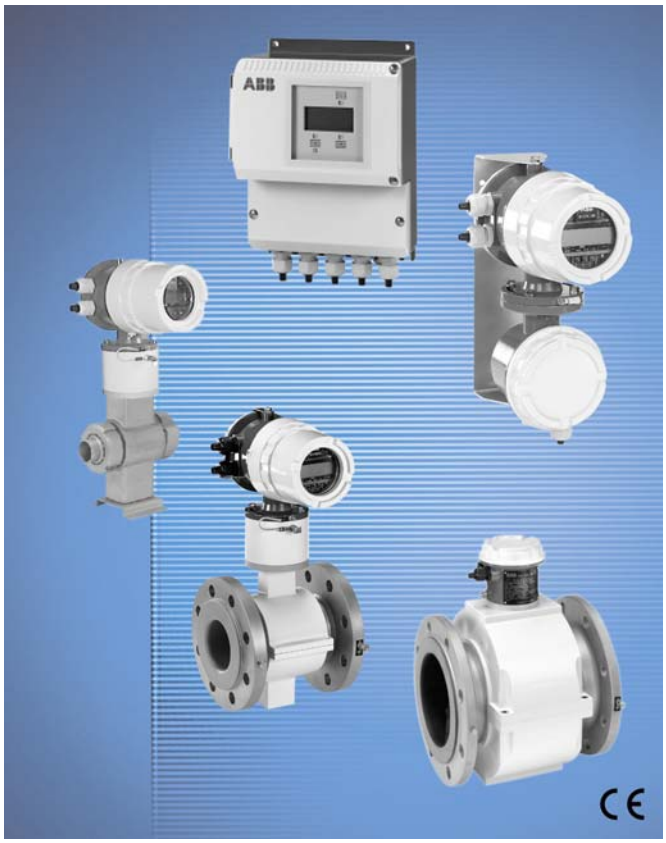
Operating Instruction
D184B115U02

Electromagnetic Flowmeter FXE4000 (COPA-XE/MAG-XE)

with Pulsed DC Magnetic Field
for Installation in an Ex-Area

Valid for Software Level B.13 and up
Valid for HART-Software Level X.35 and up
Models FXE4000-DE46F
FXE4000-DE47F
FXE4000-DE48F
FXE4000-DE27



HART COMMUNICATION PROTOCOL
PROFIBUS PROCESS FIELD BUS
Fieldbus Foundation

ABB

Product Designation
FXE4000

Operating Instruction

Part No. D184B115U02

Issue date: 02.2009
Revision: 03

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1 Safety Information

1.1 Basic Safety Requirements

1.1.1 Instrument Safety Standards

- This instrument satisfies the safety requirements defined in the Pressure Vessel Directive and is designed using the latest state of the art technology. It was tested at the factory based on the safety requirements and was shipped in proper working order. In order to maintain this condition over the expected life of the instrument the requirements described in this Operation Manual must be observed and followed.
- The instruments satisfy the EMC-Requirements in EN 61326 /NAMUR NE 21.
- All instrument parameters are securely stored in an NVRAM when the power is turned off. The instrument is immediately operational once the power is turned on again.

1.1.2 Regulated Usage

This instrument is designed to

measure during the transport of electrically conductive liquids, slurries and sludges the:

- the actual volume flowrate
- the mass flowrate (at constant pressure / temperature) when the mass units parameter is selected

Included in the Regulate Usage requirements are:

- installation compatible with the specified technical limits
- observing and following the instructions in the Operation Manual
- observing and following the information in the accompanying documents (Specification Sheet, Diagrams, Dimension Drawings)

The following uses of the instrument are prohibited:

- installation as an elastic compensation piece in a pipeline, e.g. to compensate for pipeline misalignment, pipeline vibrations, pipeline expansions, etc.
- use as a step ladder, e.g. for assembly purposes
- use as a support for external loads, e.g. as a bracket for pipeline etc.
- addition of materials or parts by painting over the Factory Plate, welding or soldering
- removal of material, e.g. drilling into housing
- repairs, modifications and additions and the use of replacement parts is only permitted using the procedures described in this Operation Manual. Additional tasks must be approved by ABB. **Excepted are repairs made in facilities authorized by us. We** accept no liability for unauthorized tasks.

The operation, service and maintenance requirements in this Operation Manual must be observed. The manufacturer assumes no responsibility for damages resulting from improper or prohibited use.

1.1.3 Technical Limits

The instrument is designed exclusively for use within the specifications listed on the Type Plate and in the Operation Manual. The following limits must be observed:

- the allowable pressure (PS) and the allowable fluid temperature (TS) may not exceed the pressure/temperature values (p/T-Ratings) listed in the Operation Manual.
- the maximum operating temperature per the instrument Specifications may not be exceeded.
- the allowable ambient temperature per the instrument Specifications may not be exceeded.
- housing Protection Class IP67 or IP68 per EN60529
- graphite may not be used on the gaskets because, under certain circumstances, it may cause an electrically conductive layer to form on the inside of the flowmeter.

- the flowmeter primary may not be operated in the vicinity of strong electromagnetic fields, e.g., motors, pumps, transformers, etc. A minimum spacing of approx. 100 cm should be maintained. For installation on or to steel parts (e.g. steel brackets) a minimum spacing of approx. 100 cm should be maintained. (Values were established using IEC801-2 or IEC TC 77B (SEC 101) as a guide).

1.1.4 Allowable Fluids (Liquids)

- Only such fluids (liquids) may be metered for which assurance is available, either from technical information or operational experience of the user, that the chemical and physical properties of the fluid wetted parts in the flowmeter, signal and or grounding electrodes, liner materials, connection fittings and grounding plates if used, will not be adversely affected during the **expected life** of the flowmeter.
- Fluids (liquids) with unknown or abrasive properties may only be metered if the user performs periodic inspections to assure that the safety parameters of the flowmeter have not been compromised.
- The specifications on the Factory Plate are to be observed.

1.1.5 Safety Signs and Symbols, Type and Factory Plates, CE-Mark

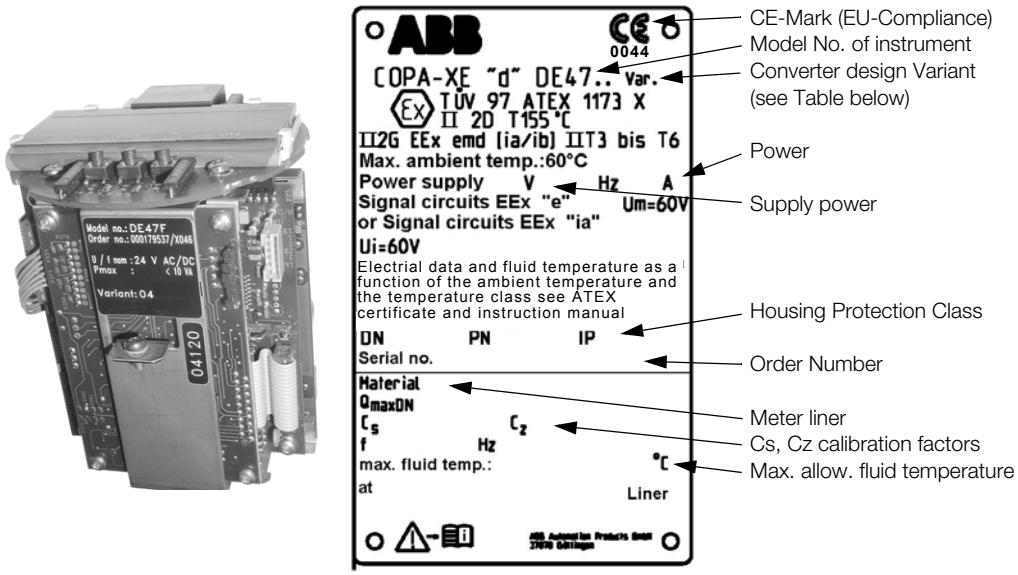
All safety signs, symbols and the Type and Factory plates are to maintained in a readable condition and replaced if damaged or lost. Observe the following general information:

	**Danger!**	DANGER indicates an **imminently hazardous** situation which, if not avoided, **will result** in death or serious injury. (High level of risk.)
	**Warning!**	WARNING indicates a **potentially hazardous** situation which, if not avoided, **could result** in death or serious injury. (Medium level of risk.)
	**Caution!**	CAUTION indicates a **potentially hazardous** situation which, if not avoided, **could result** in minor or moderate injury. (Low level of risk.)
	**Notice!**	NOTICE indicates a **potentially harmful** situation which, if not avoided, **may result** in damage of the product itself or of adjacent objects. (Damage to property)
	**Important!**	Indicates useful hints or other special information which, if not observed,could lead to a decline in operating convenience or affect the functionally (Does not indicate a dangerous or harmful situation!)
	**CE-Mark**	The CE-Mark symbolizes the compliance of the instrument with the following guidelines and the fulfillment of the their basic safety requirements: • CE-Mark on the Type Plate (on the converter) – Compliance with the EMC-Guideline 89/336/EWG – Compliance with the Low Voltage Guideline 73/23/EWG • CE-Mark on Factory Plate (on the flowmeter primary) – Compliance with the **P**ressure **E**quipment **D**irective (PED/DGRL) 97/23/EG Pressure instruments do not have a CE-Mark on the Factory Plate if: – the max. allowable pressure (PS) is less than 0.5 bar. – due to minimum pressure risks (meter sizes ≤ DN 25 [1"]) a certification procedure is not required. – instruments are installed as water meters in Water / Waste Water facilities. Applies to meter sizes >DN 600 [24”].
	**Ex-Protection**	This symbol indicates instruments with Ex-Protection. For installations in Ex-Areas observe the applicable requirements in the Chapter „Ex-Protection“.

1.1.6 Type Plate/Factory Plate

1.1.6.1 Specifications on the Type Plate / Identification of the Converter Design

The Type Plate is located on the converter housing. The Type Plate shown below is for the Model FXE4000 (COPA-XE).



The converter design is identified on the plate on the metal frame of the converter (see picture), or on the Type Plate on the converter housing.

Variant 01	Current output active + pulse output active + contact input + contact output
Variant 02	Current output active + pulse output active + contact input + contact output + HART Protocol
Variant 03	Current output active + pulse output passive + contact input + contact output
Variant 04	Current output active + pulse output passive + contact input + contact output + HART Protocol
Variant 05	Current output active + pulse output passive + contact input + contact output + RS485
Variant 06	Pulse output passive + contact output + PROFIBUS DP
Variant 14	PROFIBUS PA 3.0
Variant 15	FOUNDATION Fieldbus
Variant 16	PROFIBUS PA with plug M12
Variant 17	Current output passive + pulse output passive + contact input + contact output + HART Protocol

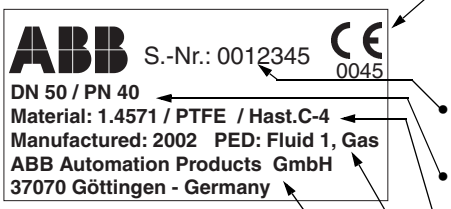
see also Chapter 4.1

Fig. 1: Information for Identifying the Converter Design

1.1.6.2 Specifications on the Factory Plate

The Factory Plate is mounted on the housing of the flowmeter primary. If the pressure vessel (instrument) is within the applicability range of PED/DGRL (see also Art. 3 Sect. 3 PED/DGRL 97/23/EU) a different Factory Plate is used than if it is outside of this range:

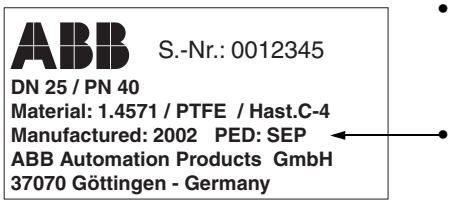
a) Pressure Vessel (Instrument) within the Applicability Range of PED/DGRL



The Factory Plate includes the following specifications:

- CE-Mark (with the Number of the issuing Agency) to certify the compliance of the pressure vessel (instrument) with the requirements in the Pressure Equipment Directive 97/23/EU.
- Manufacturer's Serial number for identification of the pressure equipment (instrument).
- Meter size and pressure rating of the pressure equipment (instrument).
- Flange material, liner material and electrode material (fluid wetted parts).
- Manufacture year and specification of the applicable fluid group per PED/DGRL (**Pressure Equipment Directive** = PED) Fluid Group 1 = hazardous liquids, gases
- Manufacturer of the pressure equipment

b) Pressure Vessel (Instrument) outside the Applicability Range of PED/DGRL



The Factory Plate contains most of the specifications included on the plate described above a) with the following differences:

- There is no CE-Mark because the pressure vessel, in accord with Art. 3 Sect. 3 in the PED/DGRL, is outside the applicability range of Pressure Equipment Directive 97/23/EU.
- In PED, the exception reason is specified in Art. 3 Sect. 3 in the PED/DGRL. The pressure vessel (instrument) is categorized as SEP (= Sound Engineering Practice).

1.1.7 Personnel Qualifications

- Electrical installation, start-up and maintenance of the instrument should only be carried out by trained technicians who have been authorized to perform these tasks by the system operator. The technicians must have read and understood the Operation Manual and follow its instructions.

1.1.8 User Responsibilities

- Prior to use for metering corrosive or abrasive fluids the user must consider the resistance of the fluid wetted parts. ABB will gladly provide assistance in their selection, however cannot not accept any liability for their selection.
- Observe the National Codes in your country relative to the installation, functional tests, repair and maintenance of electrical equipment.

1.1.9 Possible Dangers During Transport

Note during transport of the instrument to the installation site:

- that the center of gravity may be off-center.
- the protection plates or caps mounted on the process connections for PTFE/PFA lined flowmeters should only be removed just prior to installation.
- care must be exercised to assure that the liner on the flanges is not cut or damaged in order to prevent possible leaks.

1.1.10 Possible Dangers During Installation

Before installing assure that:

- the flow direction agrees with the direction arrow - if present.
- all flange bolts are tightened to the maximum specified torque value.
- the instrument is installed in a stress free manner (twist, bending) and that flanged and Wafer Design flowmeters are installed with parallel, concentric mating flanges and that only gaskets which are suitable for the operating conditions are used.

1.1.11 Possible Dangers During Electrical Installation

The electrical installation is to be completed by trained personnel in accordance with the Interconnection Diagrams.

- It is essential that the information in the Operation Manual relating to the electrical connections be followed, otherwise the electrical protection type may be compromised.
- Ground the flowmeter system.

Caution!

When the housing cover is removed the Ex-, EMC- and personnel contact protections are voided.

- Within the instrument there are circuits which are dangerous to touch. Therefore, before opening the housing cover the power should be turned off and not opened for at least 2 minutes.
- Installation and maintenance tasks should only be carried out by trained personnel.
- In the Ex-Areas special requirements apply for connecting the supply power, signals, outputs and ground. Follow these special requirements for Ex-Protection.

1.1.12 Possible Dangers During Operation

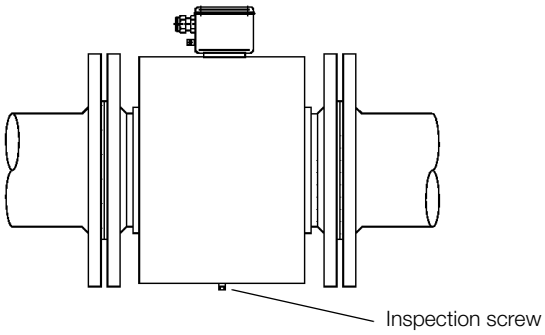
- When metering hot fluids, touching the flowmeter primary surface could result in burns
- Aggressive or corrosive fluids can cause damage to the liner or electrodes. Fluids under pressure could leak.
- Fatigue of the flange or process connection gaskets (e.g. aseptic pipe fittings, Tri-clamp) may result in fluid leakage when the system is pressurized.
- The internal flat gaskets in Model DE27 can become brittle due to CIP/SIP processes.

1.1.13 Possible Dangers During Inspection and Maintenance

- Prior to removing the instrument from the pipeline, assure that the instrument and the pipeline or reservoir are depressurized.
- Before opening the instrument, ascertain whether hazardous material had been present in the flowmeter. Hazardous residues may still be present in the flowmeter and exit when it is opened.
- It is recommended that the flange bolts and nuts be secured when pipeline vibrations are present.
- Within the framework user responsibilities a periodic inspection should conducted to check:
  - the pressure retaining walls/liners of the pressure vessel (instrument)
  - its mechanical operation
  - its seals
  - for wear (corrosion)

Danger!

- The inspection plug (for draining condensate) in flowmeters ≥ DN 350 [14”] could be under pressure - liquid squirting out may cause serious injury.
- After an instrument failure, dangerous fluids may exit when the housing cover is removed. Be sure to depressurize the pipeline prior to opening.



1.1.14 Returns

- If it is necessary to return the instrument for repair or recalibration to the ABB factory in Göttingen, Germany, use the original packaging material or a suitably protective packing material. Please indicate the reason for the return.

Important! In Accordance with EU Hazardous Materials Guidelines

The owner of special wastes is responsible for its decontamination and must satisfy the following regulations when shipping it:

- All flowmeter primaries and/or flowmeter converters which are returned to ABB Automation Products for repair are to be free of any hazardous materials (acids, bases, solvents, etc.). The flowmeter primaries must be flushed so that the hazardous materials, which may be present in the cavities in the flowmeter primaries between the meter pipe and the housing, are decontaminated. For flowmeter primaries ≥ DN 350[14”] the inspection plug (for draining condensate) at the bottom of the housing is to be opened in order to drain any hazardous materials and to decontaminate the coil and electrode areas. Written confirmation that these measures have been carried out should accompany the flowmeter.
- If the user cannot completely remove the hazardous materials, then appropriate documents should accompany the shipment acknowledging this condition. Any costs incurred by ABB to remove and decontaminate the hazardous materials during the repair will be billed to the owner of the instrument.

2 Principle of Operation, Instrument Designs, Accuracies

2.1 Principle of Operation

The electromagnetic flowmeters (EMF) from ABB are the ideal flowmeters for metering the flow of liquids, slurries and sludges that have a specific minimum electrical conductivity. These flowmeters measure accurately, create no additional pressure drop, contain no moving or protruding parts, are wear free and corrosion resistant. Installations are possible in all existing piping systems.

The ABB EMF has proven itself over many years and is the preferred flowmeter in the Chemical, Pharmaceutical and Cosmetic industries, Municipal Water and Waste Water treatment facilities and in the Food and Paper industries.

2.2 Measurement Principle

Faraday's Laws of Induction form the basis for flowrate measurements with an electromagnetic flowmeter. A voltage is generated in a conductor when it moves through a magnetic field.

This principle is applied to a conductive fluid which flows in the meter pipe through which a magnetic field is generated perpendicular to the flow direction (Fig. 2).

$$U_E \sim B \cdot D \cdot V$$

The voltage induced in the fluid is measured by two electrodes located diametrically opposite to each other. This signal voltage $\mathbf{U_E}$ is proportional to the magnetic Induction **B**, the electrode spacing **D** and the average flow velocity **v**. Noting that the magnetic induction **B** and the electrode spacing **D** are constant values indicates that a proportionality exists between the signal voltage $\mathbf{U_E}$ and the average flow velocity **v**. From the equation for calculating the volume flowrate*) it follows: $\mathbf{U_E} \sim \mathbf{q_v}$. The signal voltage $\mathbf{U_E}$ it linearly proportional to the volume flowrate.

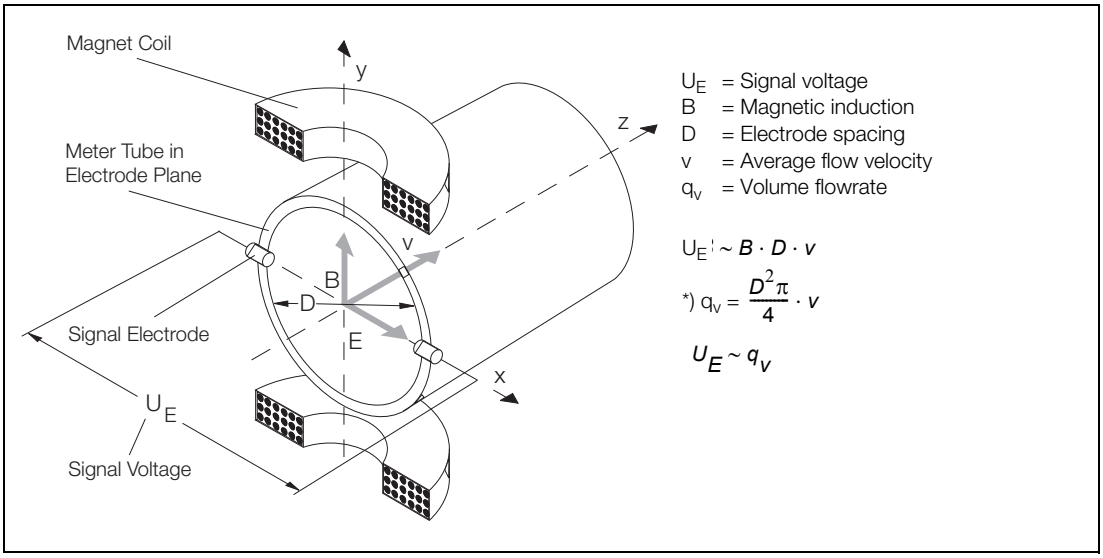


Fig. 2: Electromagnetic Flowmeter Schematic

2.3 Construction/Instrument Design

An electromagnetic flowmeter system consists of a flowmeter primary and a converter. The flowmeter primary is installed in the specified pipeline while the converter can be mounted locally or at a central location. In the Compact Design (COPA-XE) the flowmeter primary and converter constitute a single entity.

Compact Design FXE4000 (COPA-XE)

The µP-converter and the flowmeter primary constitute a single mechanical entity.

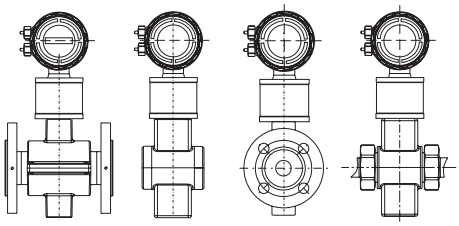
Flowmeter primary with Aluminum housing:
Model FXE4000-DE47F
Flowmeter primary with stainless steel housing:
Model FXE4000-DE27_

Remote Design FXE4000 (MAG-XE)

The µP-converter is physical separated from the flowmeter primary and is mounted outside of the Ex-area. Up to a 50 m cable length is possible for a minimum conductivity of 5 µS/cm. The electrical connection between the converter and the flowmeter primary is made in a connection box using a single cable.

Flowmeter primary with Aluminum housing:
Model FXE4000-DE46F

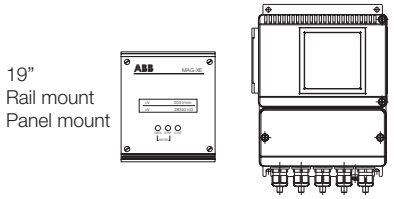
FXE4000 (COPA-XE)

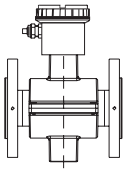


-DE47F Flanged

-DE27W -DE27F -DE27 Various process connections Stainless steel

FXE4000 (MAG-XE)





-DE46F
Flanged

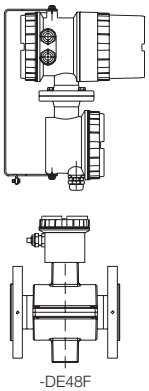
Separated Design FXE4000 (COPA-XE)

The µP-converter is mounted separate from the flowmeter primary (within the Ex-Zone).

Up to a 10 m cable length is possible for a minimum conductivity of 5 µS/cm. The electrical connection between the converter and the flowmeter primary is made in a connection box using a single cable.

Flowmeter primary with Aluminum housing:
Model FXE4000-DE48F

FXE4000 (COPA-XE)



-DE48F
Flanged

2.4 Accuracies

Reference Conditions per EN 29104

Fluid Temperature

20 °C ± 2 K

Supply Power

Nominal voltage per Type Plate U_N ± 1 % and
Frequency ± 1 %

Installation Requirements, Straight Pipe Sections

Upstream > 10 x D
Downstream > 5 x D
D = Flowmeter primary size

Warm Up Phase

30 min

Effect on Current Output

Same as pulse output plus ± 0.1 % of rate of rate

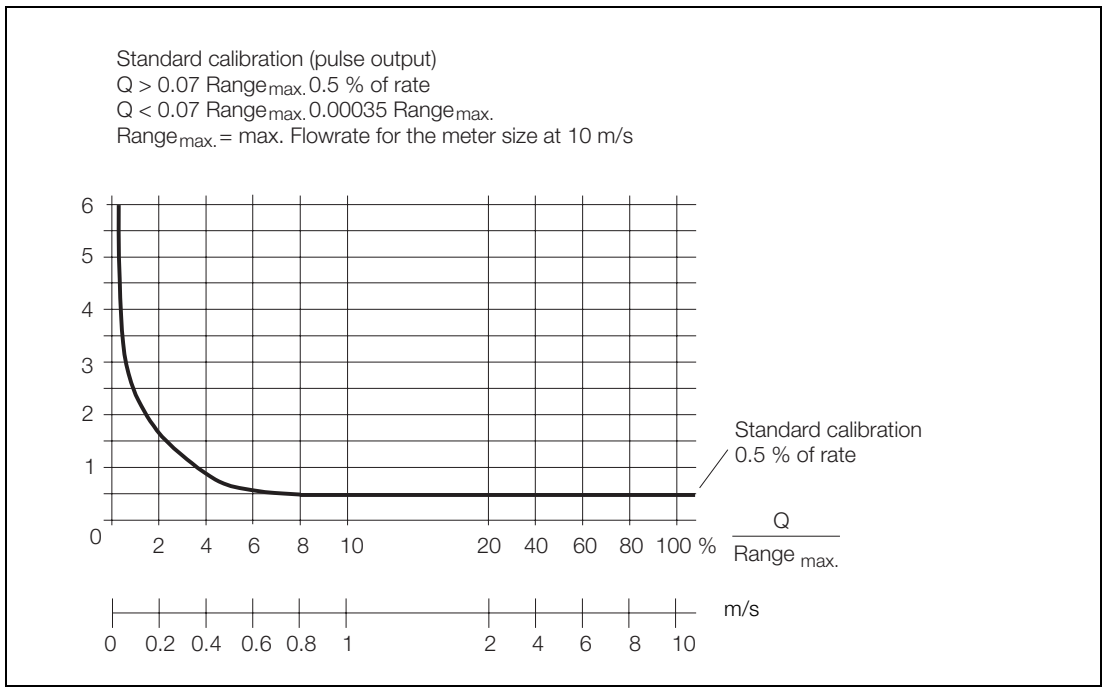


Fig. 3: Measurement System Accuracy FXE4000 (COPA-XE / MAG-XE)

2.5 General Converter Specifications

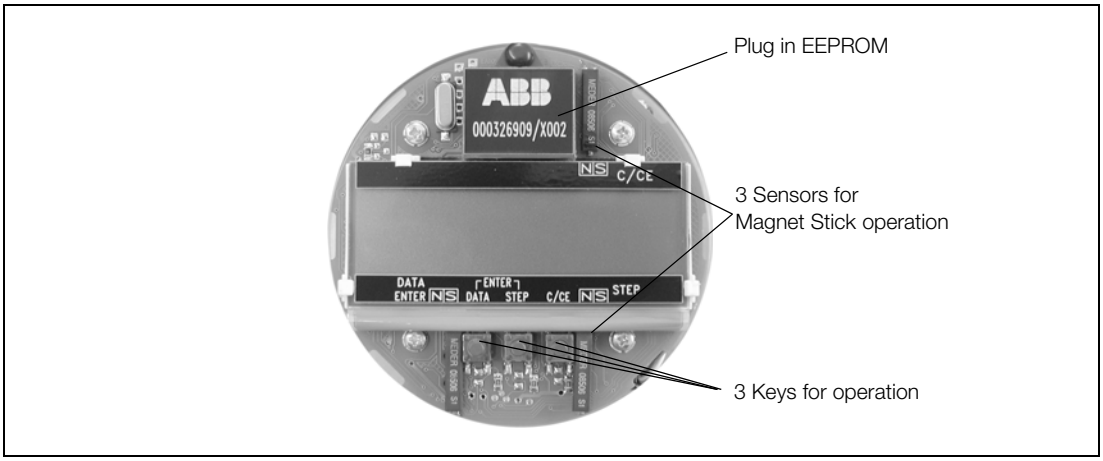


Fig. 4: Converter Keypad and Display

Flow Range

Continuously selectable between 0.5 and 10 m/s

Max. Measurement Value Deviations of the Meter System

≤ 0.5 % of rate

Reproducibility

≤ 0.15 % of rate

Minimum Conductivity

5 µS/cm (20 µS/cm for deionized water)

Response Time

For step jump 0-99 % (corresp. 5 τ) ≥ 1 s
at 6 1/4 / 7 1/2 Hz excitation

Supply Voltage

High voltage	AC 110-230 V (-15/+10 %)
Low voltage	AC -26.4 V
Low voltage	DC 16.8-31.2 V
Ripple:	< 5 %

Magnet Field Supply

6 1/4 Hz, 7 1/2 Hz 12½ Hz, 15 Hz, 25 Hz, 30 Hz (50/60 Hz supply power)

Power

≤ 10 VA (flowmeter primary including converter) for AC supply power
≤ 6 W for (flowmeter primary including converter) DC supply power

Ambient Temperature

-20 to +60 °C

Electrical Connections

Screw terminals and screwless, spring loaded terminals
Cable connector M20x1.5

Protection Class per EN 60529

IP67, IP68 (only for MAG-XE)

Forward/Reverse Metering

The flow direction is indicated by direction arrows in the display and over an optocoupler for an ext. signal. The signal is activated for the forward flow direction.

Display

With a lighted display, data is entered directly using the 3 keys on the converter or using the Magnet Stick without opening the housing.

2x16-character LCD-Dot-Matrix display. The flow is internally integrated separately for each flow direction in 16 different engineering units.The flowrate can be displayed in percent or in 45 different direct reading engineering units. The converter housing can be rotated 90° and the display can be plugged into 3 orientations so that the optimal readability is assured. In multiplex operation the flowrate indication in %, engineering units or as a bar graph, totalizer values, forward or reverse flow direction, TAG No. or current output value can additionally be displayed in the 1st or 2nd line of the display.

Design Variants for the Converter Housing

For Models FXE4000-DE27, FXE4000-DE47 (COPA XE)

Compact design with a painted, light metal converter housing - paint coat 60 mm thick, center section RAL 7012 dark gray, front and rear sections (cover) RAL 9002 light gray.

Design Variants for Instruments with a Separate Converter

For Models FXE4000-DE46 with separate converter Model FXE4000-E4

Cast light metal field mount housing - , paint coat 60 mm thick,
center section RAL 7012 dark gray, front and rear sections (cover) RAL 9002 light gray
19” Insert
Panel mount housing
Housing for rail mounting

For Model FXE4000-DE48

Cast light metal field mount housing - , paint coat 60 mm thick,
center section RAL 7012 dark gray, cover RAL 9002 light gray

Signal Cable (only MAG-XE)

The maximum cable length between the flowmeter primary FXE4000-DE46 and the converter is 50 m. A 10 m long cable is supplied with each meter. If a cable longer than 10 m is required, order using Part No. D173D018U02 or D173D025U01.

The instruments fulfill the general safety requirements in EN61010-1 and the EMC-Requirements per EN61326 as well as the NAMUR-Recommendation NE21.

Caution!

When the housing cover is opened the Ex-, EMC- and the personnel contact protections are voided.

Data Safeguards

All data is stored in an EEPROM on the converter when the supply power is turned off or an outage occurs. When an electronic converter module is exchanged, all parameter settings are automatically uploaded after the power is turned on.

3 Assembly and Installation

3.1 Inspection

Before installing the electromagnetic flowmeter system, check for mechanical damage due to possible mishandling during shipment. All claims for damage are to be made promptly to the shipper before installing the flowmeter.

3.2 Transport General

Note during transport of the instrument to the installation location:

- that the center of gravity may be off-center.
- the protection plates or caps mounted on the process connections for PTFE/PFA lined flowmeters should only be removed immediately prior to installation.
- care must be exercised to assure that the liner on the flanges is not cut or damaged in order to prevent possible leaks.
- flanged flowmeters may not be lifted by the converter housing or the connection box.
- when transporting flanged flowmeters ≤ DN 300 [12"], use a sling around the exposed meter pipe at both ends (Fig. 5). Chains should be avoided, they could damage the instrument.

Danger!

The center of gravity of the complete instrument may be higher than the lifting straps. Possible injury may result if the instrument slips or rotates! Care should be exercised to assure that the instrument cannot rotate or slip during transport.

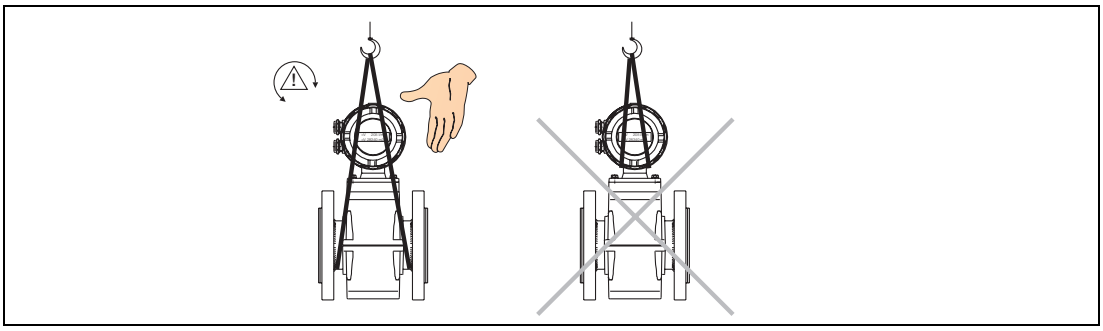


Fig. 5: Transport of Flanged Flowmeters ≤ DN 300 [12"]

3.2.1 Transport of Flanged Flowmeters ≥ DN 350 [14"]

Flanged flowmeters may not be lifted by the connection box or the sheet metal enclosure. Use only the eye bolts on the flowmeter for lifting the instrument into the pipeline.

Caution!

Do not use a fork lift under the sheet metal enclosure to lift the flowmeter. The enclosure could deform possibly damaging the magnet coils inside.

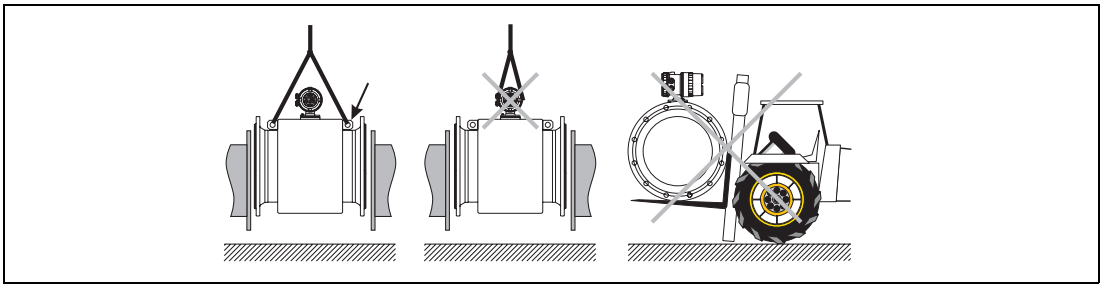


Fig. 6: Transport of Flanged Instruments ≥ DN 350 [14"]

3.2.2 Foundations and Supports ≥ DN 350 [14”]

These instruments must be mounted on a sufficiently strong foundation with appropriate supports.

Caution!

The instrument may not be laid on the sheet metal enclosure unless supports are used to prevent damage to the magnet coils in the flowmeter.

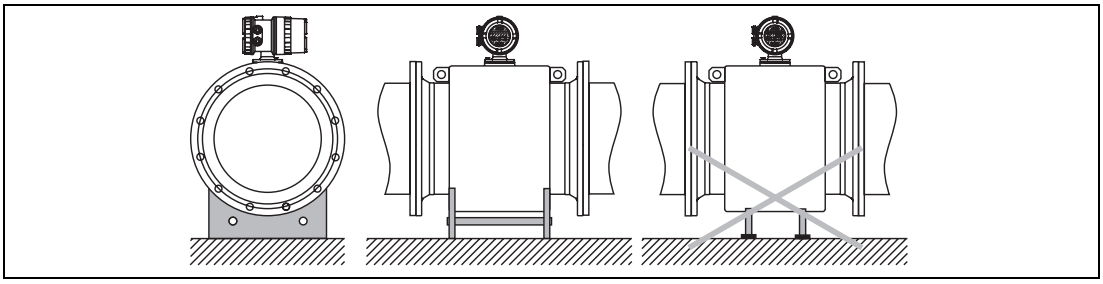


Fig. 7: Supports for Meter Sizes ≥ DN 350 [14”]

3.2.3 Installation Conditions

Before installing assure that:

- the flow direction agrees with the direction arrow - if present.
- all flange bolts are tightened to the maximum specified torque value.
- the instrument is installed in a stress free manner (twist, bending) and that flanged and Wafer Design flowmeters are installed with parallel, concentric mating flanges and that suitable gaskets are used.
- the gaskets do not protrude into the flow stream to prevent possible eddy formation which might affect the accuracy of the instrument.
- the pipeline can not exert any unallowed forces or moments on the instrument.
- the instrument display is positioned for best readability.
- the seal plugs in the cable connectors should only be removed just before the electrical connections are made.
- for the separate converter design (MAG-XE) the instrument should be installed in an essentially vibration free location.
- the converter should not be exposed to direct sunlight (use a sun shield if necessary).

3.2.4 Recommended Installation Conditions

- The meter pipe must always be completely full.
- The electrode axis should be horizontal if possible or max. 45° (Fig. 8)
- A slight slope in the pipeline aids in degassing see Fig. 9
- Install vertically for abrasive fluids, flow upwards through flowmeter, max. 3 m/s see Fig. 10
- Valves and shut off devices should be installed downstream from the flowmeter
- Free in- or outflow, provide an invert, to assure that the meter pipe is always full (Fig. 11)
- For a free outflow applications do not install flowmeter at the highest point in the pipeline (meter pipe may empty, air bubbles), Fig. 12.

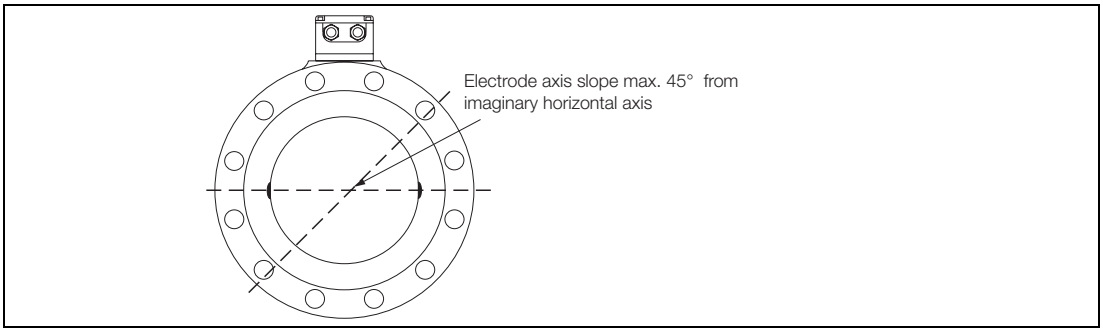


Fig. 8:

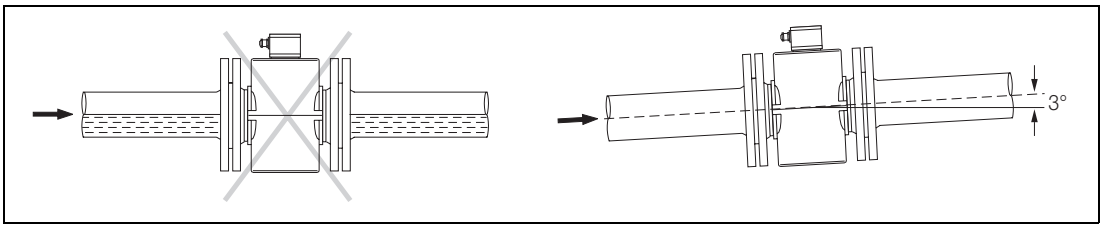


Fig. 9: Installation in a Horizontal Pipeline

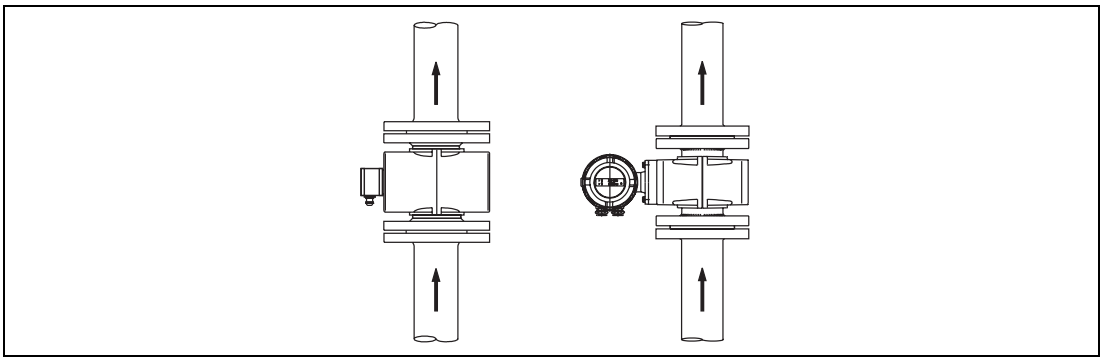


Fig. 10: Installation in a Vertical Pipeline

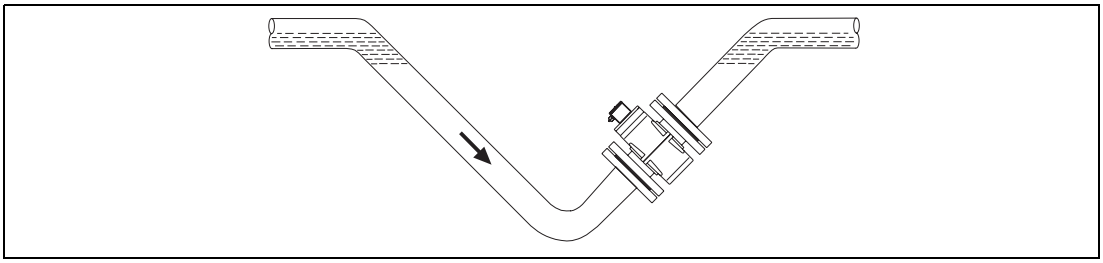


Fig. 11:

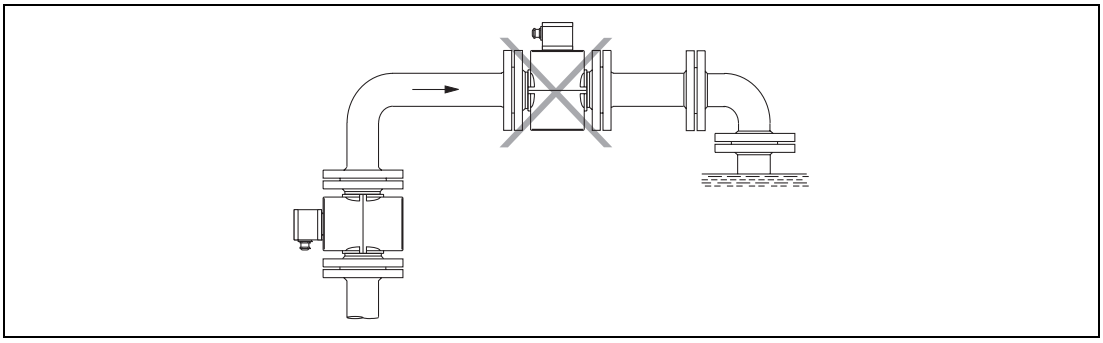


Fig. 12:

3.2.5 In- and Outlet Straight Sections

The measurement principle is independent of flow profile as long as standing eddies do not extend into the measurement region (e.g. after double elbows, tangential inflows or half open valves upstream of the flowmeter primary). In such situations measures to condition the flow are required. Experience indicates that in most cases a straight upstream section with a length of 3 x D and a downstream section of 2 x D are sufficient (D = flowmeter primary size) Fig. 13. In calibration stands the reference requirements in EN 29104 require straight lengths of 10 x D upstream and 5 x D downstream.

For certified instruments, special in- and outlet section requirements apply (see Chapter 3.2.10 Agency Approved EMF).

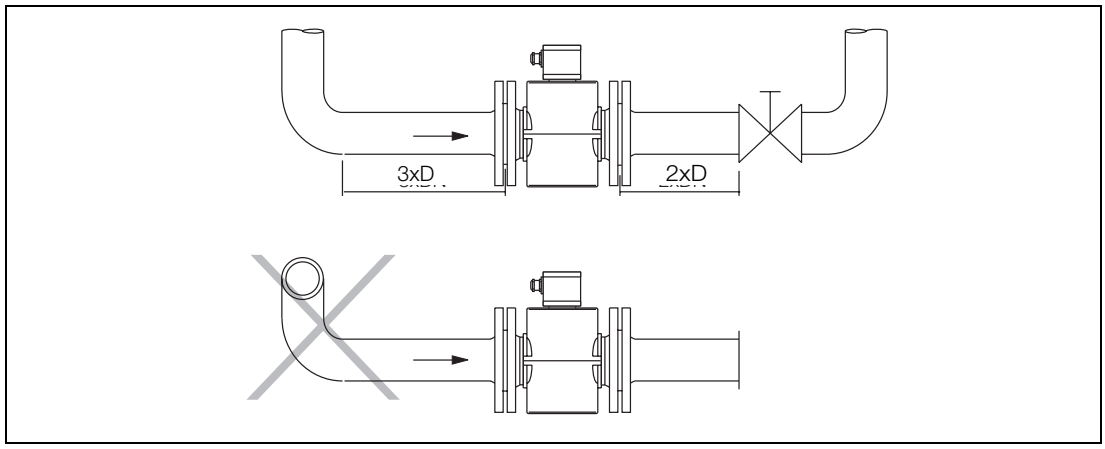


Fig. 13:

Wafer valves are to be installed in such a manner that the wafer, when open, does not extend into the flowmeter. Valves or other shut off devices should be installed downstream.

For highly contaminated fluids a bypass line Fig. 14 is recommended so that the during mechanical cleaning system operation need not be interrupted.

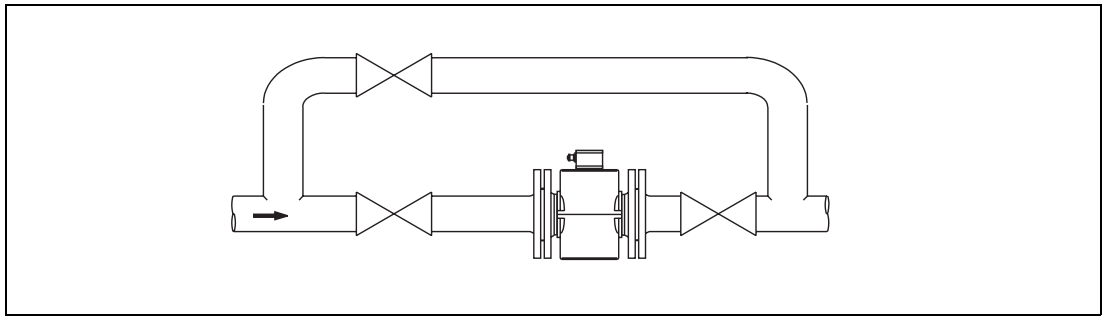


Fig. 14:

For flowmeter primaries which are to be installed in the vicinity of pumps or other vibration generating equipment, the utilization of mechanical vibration compensators is advantageous (Fig. 15).

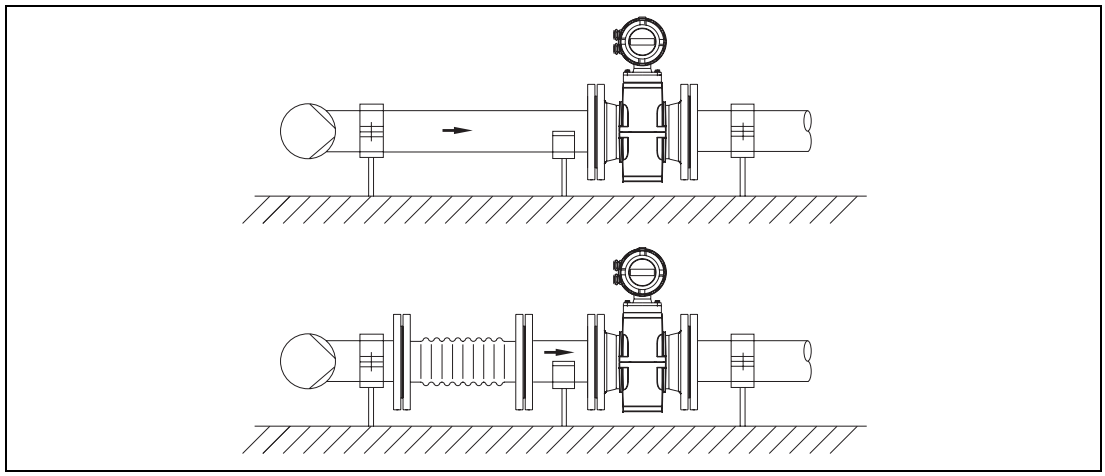


Fig. 15:

3.2.6 Installation of the Flowmeter Primary

3.2.6.1 General Installation Information

The electromagnetic flowmeter can be installed at any arbitrary location in the pipeline as long as the installation requirements (see 3.2.4) are satisfied.

When selecting the installation site consideration should be given to assure that moisture cannot enter into the electrical connection or converter areas. Make certain to carefully seat the gaskets and secure the covers after installation and start-up have been completed. Tighten the cable connectors.

Remove the seal plugs in the cable connectors just before installing the electric cables.

The flowmeter primaries in the size range DN 3 to DN 8 have a DN 10 DIN-Flange. The reduction to DN 3, 4, 6 or 8 is made internally in the flowmeter. As an option, DN 15 [1/2"] flanges are available for flowmeter primaries in the sizes DN 3 to DN 10 [1/10" to 3/8"].

Important!

Graphite should not be used for the flange or process connection gaskets, because in some instances, an electrically conductive coating may form on the inside of the metering spool. Vacuum shocks in the pipeline should be avoided to prevent damage to the liners (PTFE).

Gasket Surfaces on the Mating Flanges

In every installation parallel mating flange surfaces should be provided and gaskets made from materials suitable for the fluid and temperature should be installed. Only then can leaks be avoided. The flange gaskets for the flowmeter primary must be installed concentrically to achieve optimum measurement results.

Protection Plates

Protection plates are installed to prevent damage to the liner of flowmeter primary during transport. Remove the protection plates only when ready to install the meter in the pipe line. Be careful not to cut or otherwise damage the liner in order to prevent leaks.

Torque Specifications for Flanges

The mounting bolts are to be tightened equally in the usual manner without excessive one-sided tightening. We recommend that the bolts be greased prior to tightening and that they be tightened in a crisscross pattern as shown in Fig. 16. Tighten the bolts during the first pass to approx. 50%, during the second pass to approx. 80% and only during the third pass to 100% of the max. torque value. The max. torque values should not be exceeded, see the following tables.

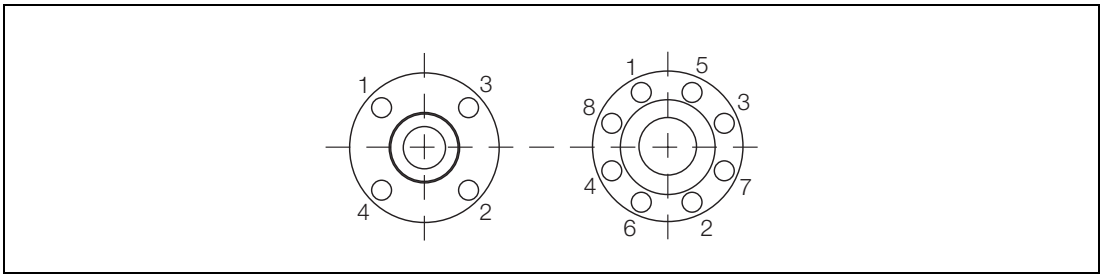


Fig. 16:

3.2.6.2 Installing the Instrument in Thermally Insulated Pipelines

Danger!

It is essential to observe the temperature specifications in the Ex-Approval TÜV97 ATEX1173X incl. supplements.

When required, the pipeline and the flowmeter are to insulated as shown in Fig. 17. The insulation may not extend beyond the insulation disk.

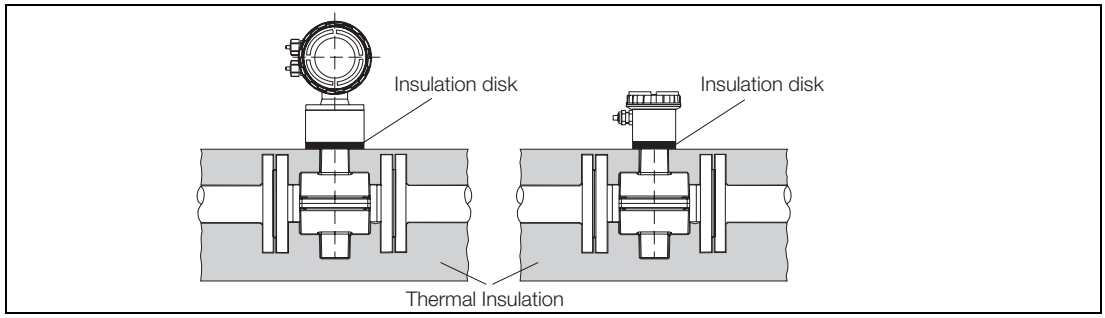


Fig. 17: Thermally Insulated Pipelines

3.2.7 Torques

3.2.7.1 Torque Specifications for Flanged Instruments

Liner	Meter Size DN	Meter Size Inch	Process Connection	Bolts	Torque max. Nm	PN bar
PFA/PTFE/Hard rubber	3-10	1/10-3/8	Flange	4 x M12	8	40
	15	1/2		4 x M12	10	40
	20	3/4		4 x M12	16	40
	25	1		4 x M12	21	40
	32	1-1/4		4 x M16	34	40
	40	1-1/2		4 x M16	43	40
	50	2		4 x M16	56	40
	65	2-1/2		8 x M16	39	40
	80	3		8 x M16	49	40
	100	4		8 x M16	47	16
PTFE/Hard rubber	125	5	Flange	8 x M16	62	16
	150	6		8 x M20	83	16
	200	8		12 x M20	81	16
	250	10		12 x M24	120	16
	300	12		12 x M24	160	16
	350	14		16 x M24	195	16
	400	16		16 x M27	250	16
PTFE/Hard rubber	500	20	Flange	20 x M24	200	10
	600	24		20 x M27	260	10
	700	28		24 x M27	300	10
	800	32		24 x M30	390	10
	900	36		28 x M30	385	10
	1000	40		28 x M33	480	10

Table 1

3.2.7.2 Torque Specifications for Wafer Design and with Variable Process Connections

Liner	Meter Size DN	Meter Size Inch	Bolts	Wafer flange torque max. Nm	PN bar	variable process connections DE27 model
PFA	3 - 8	1/10 - 5/16	4 x M12	2.3	40	6.5
PFA	10	3/8	4 x M12	7.0	40	6.5
	15	1/2	4 x M12	7.0	40	9
	20	3/4	4 x M12	11.0	40	20
	25	1	4 x M12	15.0	40	32
	32	1-1/4	4 x M16	26.0	40	56
	40	1-1/2	4 x M16	33.0	40	80
	50	2	4 x M16	46.0	40	30
	65	2-1/2	8 x M16	30.0	40	42
	80	3	8 x M16	40.0	40	100
	100	4	8 x M20	67.0	40	125

Table 2

3.2.8 Installations in Larger Pipeline Sizes

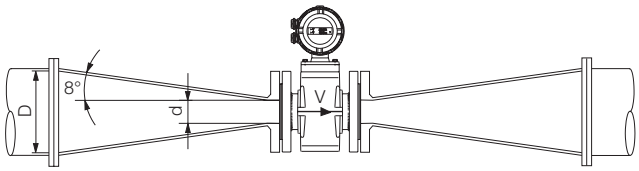
The flowmeter primary can readily be installed in larger pipeline sizes using reducers. The pressure drop resulting from the size reduction can be determined from the Pressure Drop Nomograph Fig. 18. The procedure for determining the pressure drop is as follows:

1. Calculate the diameter ratio d/D.

2. Determine the flow velocity as a function of the meter size and the flowrate:
   The flowrate can also be determined from the Flowrate Nomograph Fig. 19.

3. In Fig. 18 read the pressure drop on the Y-Axis at the intersection of the flow velocity and the “Diameter Ratio d/D“ value on -X- axis.

d = Inside diameter of the EMF
D = Inside diameter of the pipeline
v = Flow velocity in (m/s)
Δp= Pressure drop in mbar



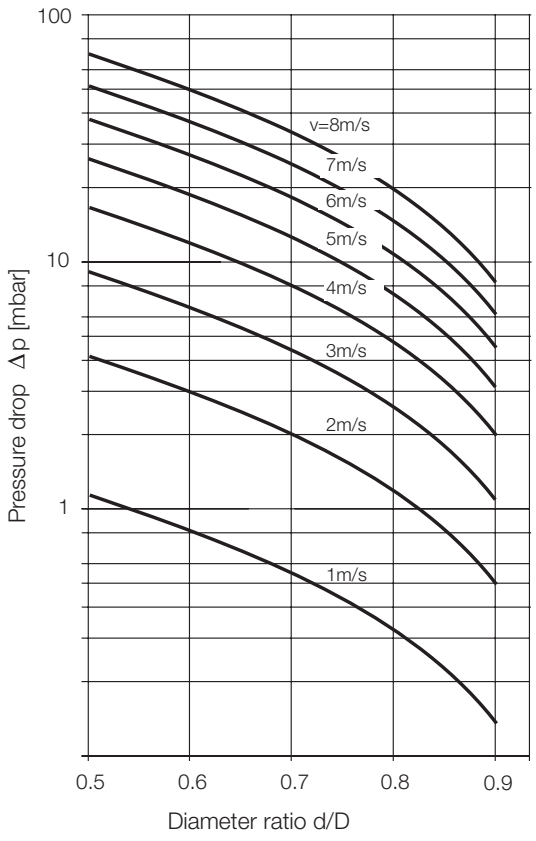


Fig. 18: Nomograph: Pressure Drop Determinations for EMF with Flanged Reducers α/2 = 8°

3.2.9 Meter Sizes, Pressure Ratings and Flow Ranges

Meter Size DN	Meter Size Inch	Std. Pressure Rating PN	Min. Flow Range Flow Velocity 0 to 0.5 m/s	Max. Flow Range Flow Velocity 0 to 10 m/s
3	1/10	40	0 to 0.2 l/min	0 to 4 l/min
4	5/32	40	0 to 0.4 l/min	0 to 8 l/min
6	1/4	40	0 to 1 l/min	0 to 20 l/min
8	5/16	40	0 to 1.5 l/min	0 to 30 l/min
10	3/8	40	0 to 2.25 l/min	0 to 45 l/min
15	1/2	40	0 to 5.0 l/min	0 to 100 l/min
20	3/4	40	0 to 7.5 l/min	0 to 150 l/min
25	1	40	0 to 10 l/min	0 to 200 l/min
32	1-1/4	40	0 to 20 l/min	0 to 400 l/min
40	1-1/2	40	0 to 30 l/min	0 to 600 l/min
50	2	40	0 to 3 m^3/h	0 to 60 m^3/h
65	2-1/2	40	0 to 6 m^3/h	0 to 120 m^3/h
80	3	40	0 to 9 m^3/h	0 to 180 m^3/h
100	4	16	0 to 12 m^3/h	0 to 240 m^3/h
125	5	16	0 to 21 m^3/h	0 to 420 m^3/h
150	6	16	0 to 30 m^3/h	0 to 600 m^3/h
200	8	10/16	0 to 54 m^3/h	0 to 1080 m^3/h
250	10	10/16	0 to 90 m^3/h	0 to 1800 m^3/h
300	12	10/16	0 to 120 m^3/h	0 to 2400 m^3/h
350	14	10/16	0 to 165 m^3/h	0 to 3300 m^3/h
400	16	10/16	0 to 225 m^3/h	0 to 4500 m^3/h
450	18	10/16	0 to 300 m^3/h	0 to 6000 m^3/h
500	20	10	0 to 330 m^3/h	0 to 6600 m^3/h
600	24	10	0 to 480 m^3/h	0 to 9600 m^3/h
700	28	10	0 to 660 m^3/h	0 to 13200 m^3/h
800	32	10	0 to 900 m^3/h	0 to 18000 m^3/h
900	36	10	0 to 1200 m^3/h	0 to 24000 m^3/h
1000	40	10	0 to 1350 m^3/h	0 to 27000 m^3/h

Flowrate Nomograph

The volume flowrate is a function of the flow velocity and the size of the flowmeter. The Flowrate Nomograph shows the flow ranges for each of the different flowmeter sizes as well as the flowmeter sizes suitable for a specific flow range.

Example:

Flowrate = 7 m^3/h (maximum flowrate = flow range end value). Suitable are flowmeter sizes DN 20 to DN 65 [3/4" to 2-1/2"] for flow velocities between 0.5 and 10 m/s.

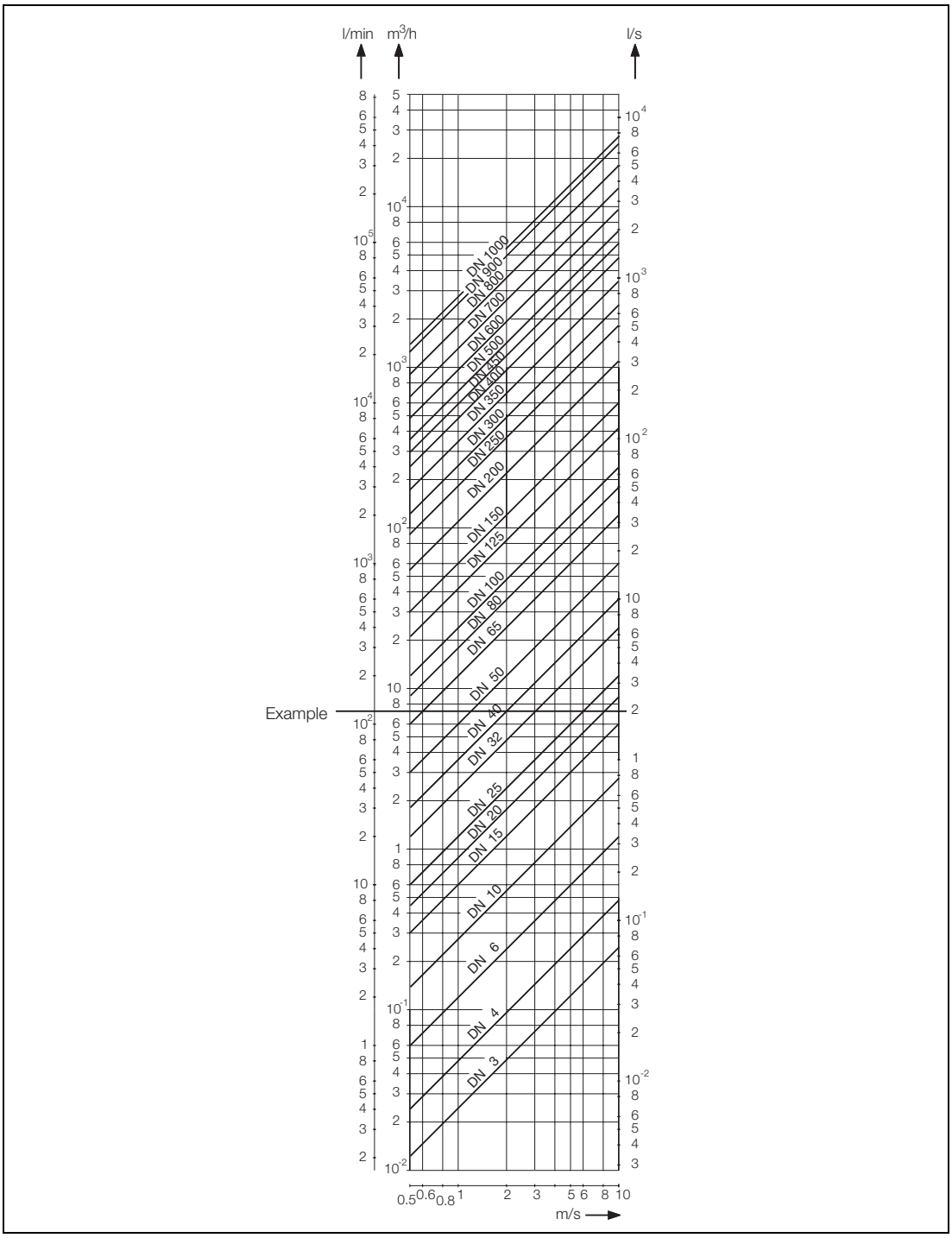


Fig. 19: Flowrate Nomograph DN 3 to DN 1000 [1/2" to 40"]

3.2.10 Agency Approved EMF

Approvals

The design of the measurement instrument “Electromagnetic Volume Flowrate Totalizer with Electrical Counter” has been approved by the National Institute for Science and Technology (Physikalisch-Technischen Bundesanstalt) in Braunschweig, Germany. The following approvals have been granted for the Volume Flowrate Totalizer which consists of a flowmeter primary and a converter:

6.221
87.12 Electromagnetic Volume Flowrate Totalizer with a Class “B” Electrical Counter for Cold Water and Waste Water

5.721
87.05 Electromagnetic Volume Flowrate Totalizer with an Electrical Counter for Liquids Other than Water

Appendix (EO6) or Appendix 5 (EO5) of the Certification Regulations of 1988 apply to the Electromagnetic Volume Flowrate Totalizer with Electrical Counter.

Certification

The Electromagnetic Volume Flowrate Totalizers are certified on the test stands in Göttingen Germany, which have been approved for certification calibrations. After the calibration has been completed, the parameters which impact the Certification Regulations can only be changed in the presence of a Certification Agent.

Approved Flowmeter Sizes for “Cold Water and Waste Water”

Meter Size DN	Meter Size Inch	Smallest allow. Flow Range End Value (approx. 2 m/s)	Largest allow. Flow Range End Value (approx. 10 m/s)
25	1	0 to 2.4 m^3/h	0 to 12 m^3/h
32	1-1/4	0 to 5 m^3/h	0 to 25 m^3/h
40	1-1/2	0 to 9 m^3/h	0 to 45 m^3/h
50	2	0 to 14 m^3/h	0 to 70 m^3/h
65	2-1/2	0 to 24 m^3/h	0 to 120 m^3/h
80	3	0 to 36 m^3/h	0 to 180 m^3/h
100	4	0 to 56 m^3/h	0 to 280 m^3/h
125	5	0 to 84 m^3/h	0 to 420 m^3/h
150	6	0 to 128 m^3/h	0 to 640 m^3/h
200	8	0 to 220 m^3/h	0 to 1100 m^3/h
250	10	0 to 360 m^3/h	0 to 1800 m^3/h
300	12	0 to 500 m^3/h	0 to 2500 m^3/h
350	14	0 to 700 m^3/h	0 to 3500 m^3/h
400	16	0 to 900 m^3/h	0 to 4500 m^3/h
500	20	0 to 1420 m^3/h	0 to 7100 m^3/h
600	24	0 to 2000 m^3/h	0 to 10000 m^3/h
700	28	0 to 2800 m^3/h	0 to 14000 m^3/h
800	32	0 to 3600 m^3/h	0 to 18000 m^3/h
900	36	0 to 4600 m^3/h	0 to 23000 m^3/h
1000	40	0 to 5600 m^3/h	0 to 28000 m^3/h

Approved Flowmeter Sizes for “Liquids Other than Water”

DN	Inch	Meter Size and the Largest allow. Flowrate Q_{max} Liter/min
25	1	selectable 60 to 200 in steps of 10
32	1-1/4	selectable 100 to 400 in steps of 10
40	1-1/2	selectable 150 to 750 in steps of 50
50	2	selectable 250 to 1000 in steps of 50
65	2-1/2	selectable 400 to 2000 in steps of 100
80	3	selectable 700 to 3000 in steps of 100
100	4	selectable 900 to 4500 in steps of 100
150	6	selectable 2000 to 10000 in steps of 500

DN	Inch	Smallest Metered Flowrate and Fluid	
		Smallest Flowrate l/min	Fluid
25	1	8	beer, milk, syrup
32	1-1/4	5	beer, milk, syrup
40	1-1/2	20	beer, milk
50	2	200	beer, wort
65	2-1/2	500	milk, wort, beer
80	3	500	milk, wort, beer
100	4	2000	brine, wort
150	6	2000	brine

Min. flow range approx. 2.5 m/s.
Max. flow range approx. 10 m/s.

The flow ranges are to be specified in accordance with the values listed in the tables. Subsequent flow range changes require a new calibration on an agency certified test stand.

Installation Requirements for Volume Flow Integrators

The following installation requirements are to be observed:
For “Cold Water and Waste Water” a straight pipeline section with a length of at least 5 times the flowmeter size must be installed upstream of the flowmeter and a section 2 times the flowmeter size downstream. For “Liquids other than Water” (milk, beer, wort, brine) the values shown in parentheses in Fig. 20 apply.

For flow metering in both directions (forward and reverse) the straight pipeline sections installed on both sides of the flowmeter must be at least 5 times the flowmeter size for “Cold Water and Waste Water” approvals and at least 10 times the flowmeter size for “Liquids other than Water” approvals. The pipeline system must always be completely filled with fluid. The signal cable length may not exceed 50 m.

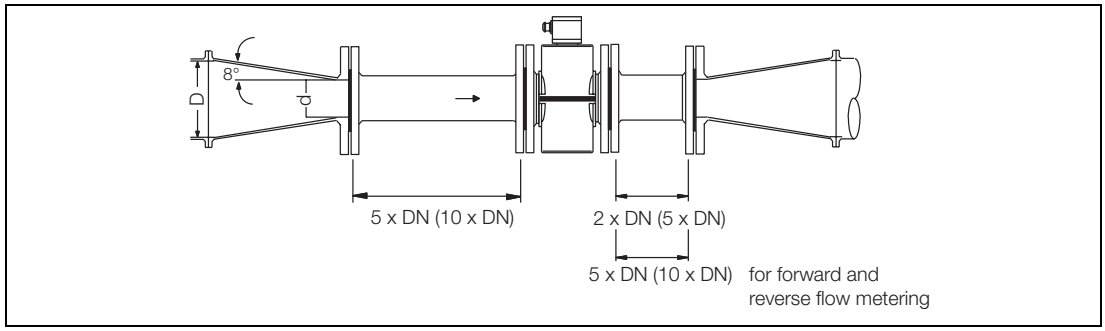


Fig. 20: Pipeline Installation, Reducers as Required

4 Grounds, Electrical Connections

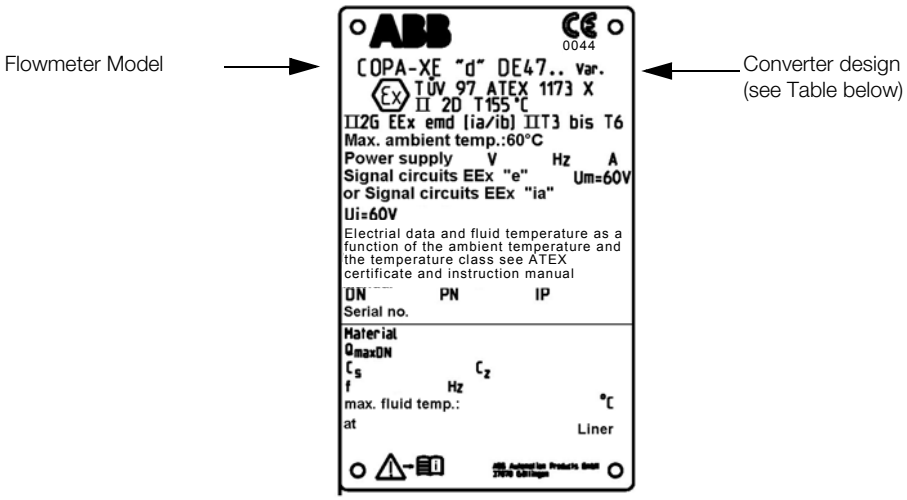
In this chapter information is presented for grounding the flowmeter primary together with the designs and routing of the signal cable followed by the electrical Interconnection Diagrams.

4.1 This is where the data for an instrument may be found

This Operation Manual is structured based on the specific converter designs. For each converter design the corresponding data is contained in one chapter (e.g. electrical Interconnection Diagrams, Ex-Specifications, Safety information, interconnections for peripherals etc.)

Models	Chapter
DE27, DE27F, DE47F, DE48F with converter design Var. 3/4	4.5
DE27, DE27F, DE47F, DE48F with converter design Var. 14/15	4.6
DE27, DE27F, DE47F, DE48F with converter design Var. 17	4.7
DE46F with converter Model E4 in design Var. 1/2/3/4	4.8
DE46F with converter Model E4 in design Var. 14/15/16	4.9

The converter design Variant may be found on the Type Plate on the instrument.



These signal in- and outputs options are incorporated in the individual converter designs

Converter Design Variants	
Var. 01	Current output active + pulse output active + contact input + contact output
Var. 02	Current output active + pulse output active + contact input + contact output + HART Protocol
Var. 03	Current output active + pulse output passive + contact input + contact output
Var. 04	Current output active + pulse output passive + contact input + contact output + HART Protocol
Var. 14	PROFIBUS PA 3.0
Var. 15	FOUNDATION Fieldbus
Var. 16	PROFIBUS PA with Plug M12
Var. 17	Current output passive + pulse output passive + contact input + contact output + HART Protocol

4.2 Grounding the Flowmeter System

The grounding procedure describe is to be followed. In accordance with EN60079-14 part 1, DIN VDE0165 the ground screw on the flowmeter primary (on the flange and on the converter housing) is to be connected with earth using at least a 2.5 mm^2 Cu-wire. In order to maintain the EMC-Compatibility/Low Voltage Guideline not only the meter tube in the flowmeter primary must be grounded but also the connection box or COPA-housing. The green/yellow cable included with the shipment should be used for this connection. The Potential Equalization lead is to be connected to the corresponding PA-Terminal. See figures below and also the Interconnection Diagrams Chapters 4.5. to 4.9.

Danger!

The housing is to be connected to the Potential Equalization PA. The operator must assure when the Protection Earth PE is connected that, even during a fault condition, no potential difference can exist between the Protection Earth PE and the Potential Equalization PA.

For plastic or insulated lined pipelines the fluid is grounded by grounding electrodes or by installing grounding plates. When there are stray potentials present in the pipeline a grounding plate is recommended at both ends of the flowmeter primary.

Three grounding configurations are described below. In cases a) and b) the fluid is in direct electrical contact with pipeline. In case c) it is isolated from the pipeline.

a) Metal pipe with fixed flanges

1. Drill blind holes into the flanges on the pipeline (18 mm deep)
2. Thread hole, (M6, 12 mm deep).
3. Using a screw (M6), spring washer and flat washer attach the ground strap and connect to the ground connection on the flowmeter primary.
4. Use a 2.5 mm^2 CU-wire for the earth connection between the flowmeter primary and the Potential Equalization PA.

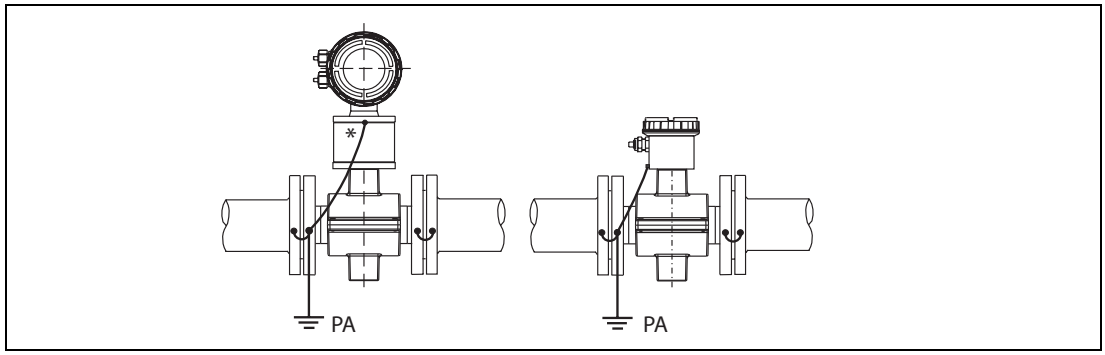


Fig. 21: Flowmeter Primary DN 3 - DN 1000 [1/10” - 40”] Flanged (Models FXE4000-DE46F, FXE4000-DE47F, FXE4000-DE48F, FXE4000-DE27F)

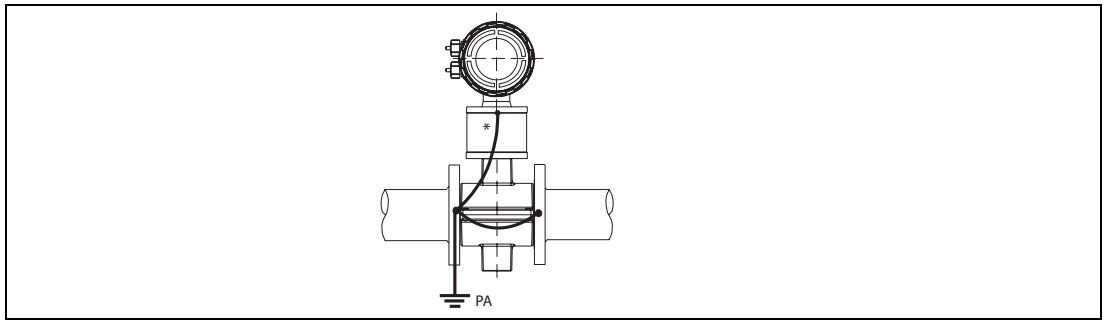


Fig. 22: Flowmeter Primary DN 3 - DN 100 [1/10" - 4"] Wafer Design (Model FXE4000-DE27)

* Use the supplied cable to establish this connection.

b) Metal pipe with loose flanges

1. In order to assure a good earth connection to the fluid and the flowmeter primary when loose flanges are used, 6 mm threaded stubs should be welded to the pipeline on each side.
2. Using a nut, spring washer and flat washer attach ground straps to the weld stubs and connect to the ground connections on the flowmeter primary.
3. Use a 2.5 mm^2 CU-wire for the earth connection between the flowmeter primary and the Potential Equalization PA.

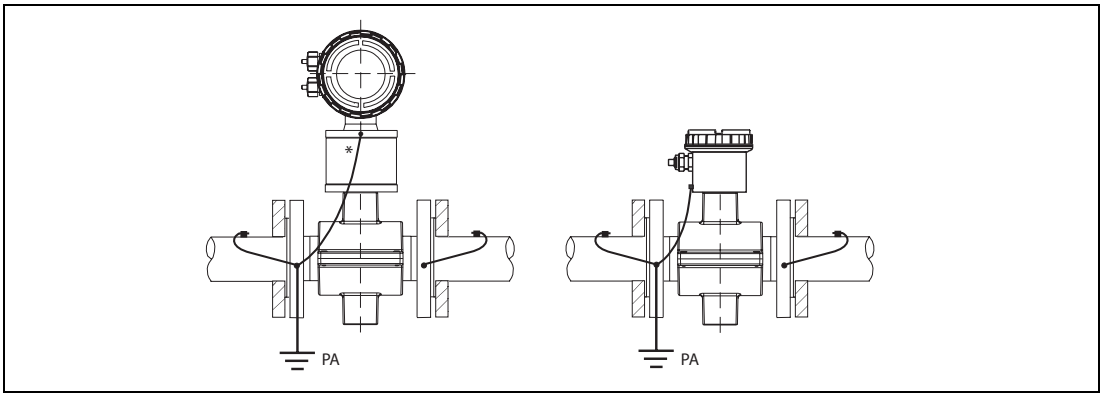


Fig. 23: Flowmeter Primary DN 3 - DN 1000 [1/10" - 40"] Flanged (Models FXE4000-DE46F, FXE4000-DE47F, FXE4000-DE48F, FXE4000-DE27F)

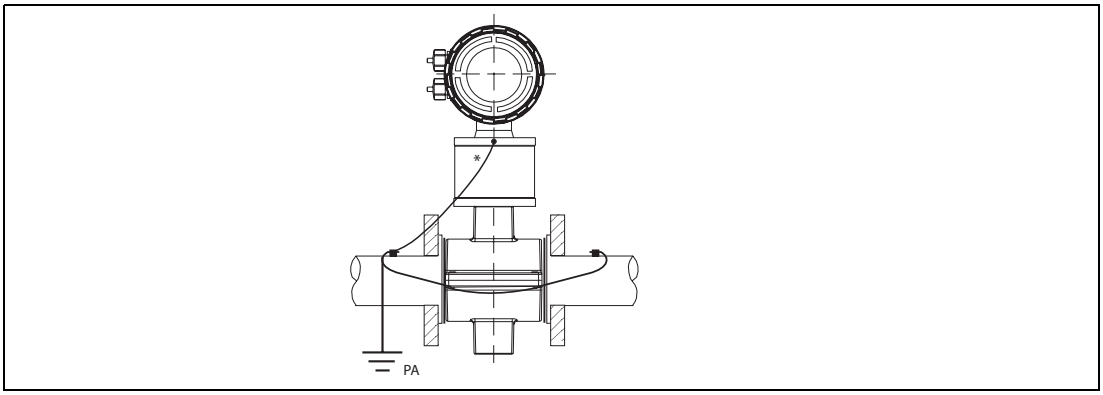


Fig. 24: Flowmeter Primary DN 3 - DN 100 [1/10" - 4"] Wafer Design (Model FXE4000-DE27)

* Use the supplied cable to establish this connection.

c) Plastic, concrete or insulated lined pipes

1. Install EMF in pipeline with grounding plates.
2. Connect the ground strap between ground tab on the grounding plate and the ground connection on the flowmeter primary.
3. Use a 2.5 mm^2 CU-wire for the earth connection between the flowmeter primary and the Potential Equalization PA.

For plastic pipes or pipes with insulation liners the earth connections to the fluid are made by the grounding plate as shown in Fig. 25 or by grounding electrodes integrated in the flowmeter primary (option). If grounding electrodes are used, then the grounding plates shown in Fig. 25 are not required.

If there are stray potentials in the pipeline and grounding plates are used, it is recommended that a grounding plate be installed at each end of the instrument.

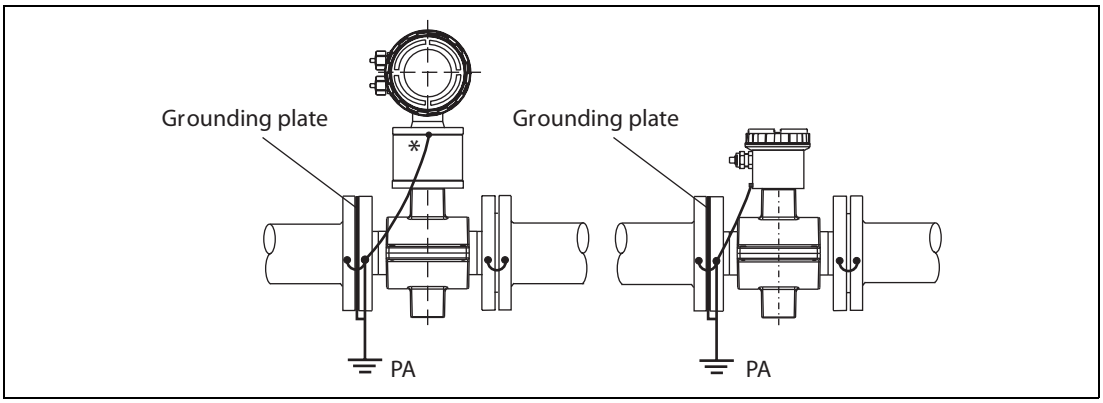


Fig. 25: Flowmeter Primary DN 3 - DN 1000 [1/10" - 40"] Flanged (Models FXE4000-DE46F, FXE4000-DE47F, FXE4000-DE48F, FXE4000-DE27F)

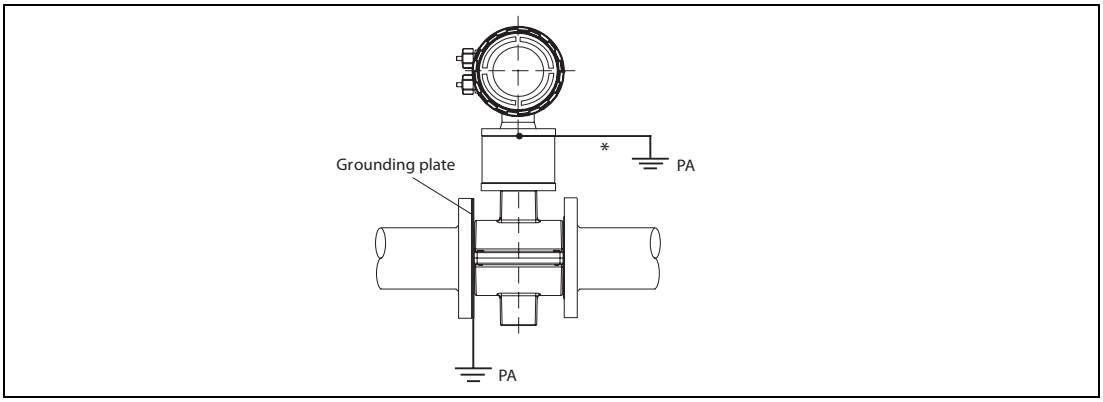


Fig. 26: Flowmeter Primary DN 3 - DN 100 [1/10" - 4"] Wafer Design (Model FXE4000-DE27)

Grounding Model FXE4000-DE27_

The ground connections are made as shown in Fig. 27. The fluid is grounded by the adapters and an additional ground connection is not required.

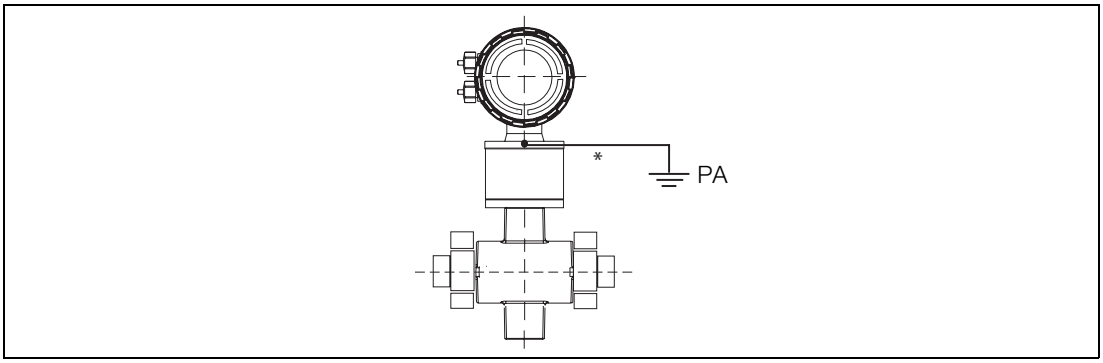


Fig. 27: Flowmeter Primary DN 3 - DN 100 [1/10" - 4"]

* Use the supplied cable to establish this connection.

Ground instruments with hard and soft rubber liners

A conductive element in integrated in the liner of these meters beginning at meter size DN 125 [5”]. This element grounds the fluid.

Grounding of instruments with protection plates

Fig. 28: Protection Plates/Ground Plate

Protection plates are used to protect the edges of the liner in the meter pipe, e.g. when metering abrasive fluids. They simultaneously provide the same grounding function as a grounding plate in plastic or insulated lined pipes.

Grounding with conductive PTFE-grounding plate

As an option in the meter size range DN 10 -100 [3/8” - 4”], grounding plates made of conductive PTFE are available. They are installed as shown in Fig. 29.

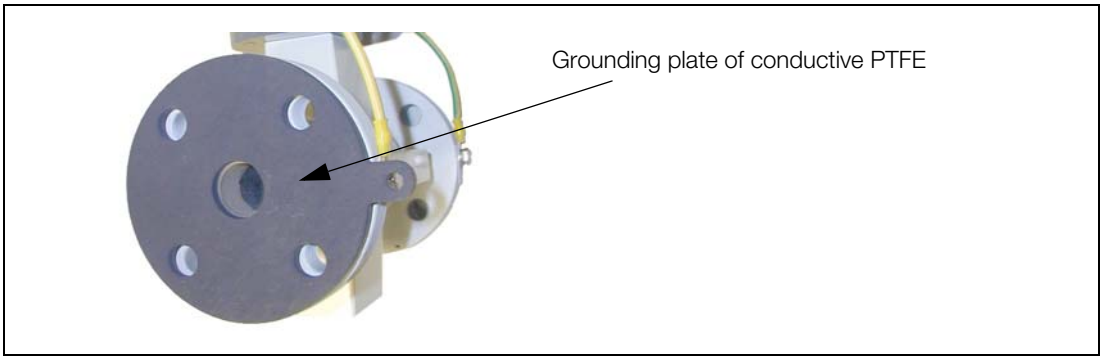


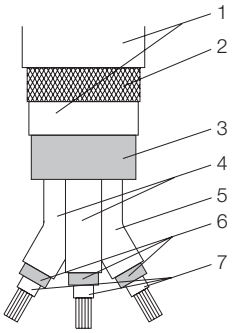
Fig. 29: PTFE Protection Plates/Ground Plate

4.3 Signal and Excitation Cable Connections for Models FXE4000-DE46F/-DE48F)

The electromagnetic flowmeter primary is connected to the converter with a signal/excitation cable. The coils in the flowmeter primary are supplied with an excitation voltage from the converter over terminals M1/M2. The signal/excitation cable is connected at the flowmeter primary to terminals 1, 2, M1, M2, 3, SE. The connection designations are described in Fig. 54. The ground connection on the outside of the connection box of the flowmeter primary is to be connected to the Potential Equalization PA. (See also Chapter 4.1)

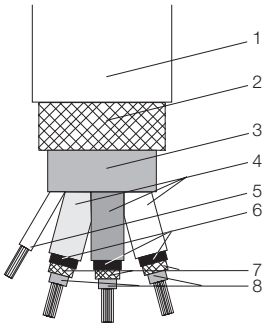
4.3.1 Signal and Excitation Cable Construction

The amplitude of the voltages in the signal and excitation cable are only a few millivolts and therefore the cable should be routed in the shortest way possible. The maximum allowable signal cable length is 50 m for Model DE46 and 10 m for Model DE48.



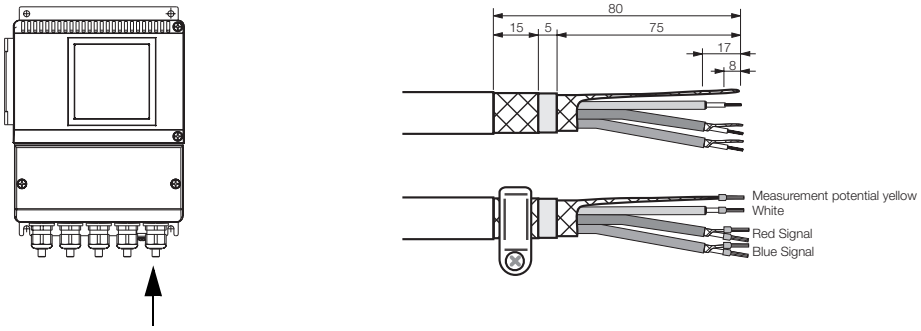
1 PVC jacket, white
2 Woven steel wire
3 Woven Cu wires
4 Flow signal red and blue
5 Excitation jacket, white
6 Each 1x shielded, woven Cu wires
7 Polyethylene, natural

Fig. 30: Signal Cable Construction ABB No. D173D018U02



1 PVC jacket, white
2 Woven steel wire
3 Filter layer black, conductive
4 Electrode signal
Electrode 1 red, Electrode 2 blue,
Reference voltage white
5 Measurement potential, yellow
6 Solid shield layer black, conductive
7 Shield, woven Cu wires
8 Polyolefin copolymer

Fig. 31: Signal Cable Construction ABB No. D173D025U01



Shielded signal cable D173D018U02 or D173D025U01
Prepare the signal cable as shown to the right. The shields may not touch each other (signal short circuit). Use cable end sleeves.

Fig. 32:

4.3.2 Routing the Signal and Excitation Cables

The cable should not be routed in the vicinity of large electrical machinery and switch gear equipment, which produce stray fields, switching spikes and potentials. All leads are to be shielded and connected to earth potential. The signal cable may not be routed through branch connections or terminal strips. In the signal and excitation cable a shielded excitation cable is run in parallel with the signal leads, so that only one cable is required between the flowmeter primary and the converter. To shield against possible magnetic coupling there is an outer shield which is connected to the SE terminal.

Caution!

If due to plant conditions, it is not possible to avoid routing the cable in close proximity to machinery and switch gear equipment, it is preferable to route the signal/excitation cable in a metal conduit which is connected to Potential Equalization PA.

Important!

When installing the signal/excitation cable a water trap should be installed. (Fig. 33). For vertical installations the cable connectors should be oriented downward.
When installing and tightening the housing cover care must be exercised. Check to make certain the gaskets are seated correctly. Only then will the Protection Class be assured.

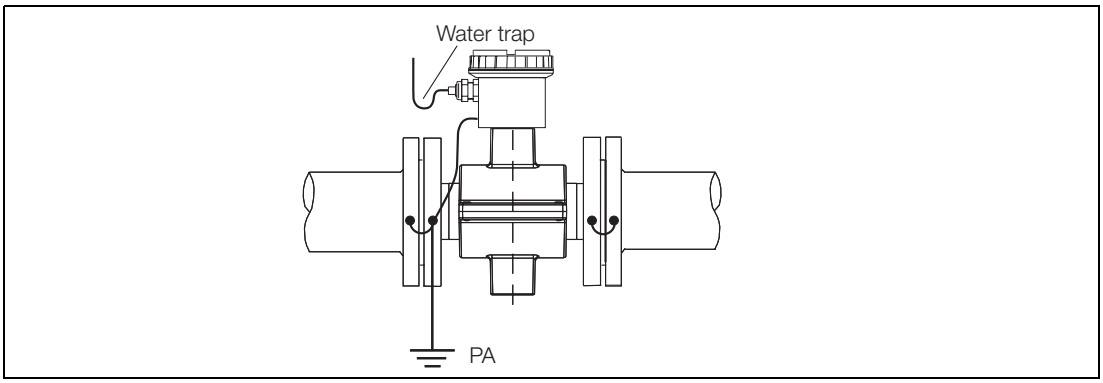


Fig. 33: Installation of a Water Trap for the Cable

4.3.3 Assembly and Installation for Protection Class IP 68

There are 2 different designs available.

4.3.3.1 Design with a Hose Connector

For flowmeter primaries in Protection Class IP68 the max. submergence depth is 5 m. In place of the cable connectors, a hose enclosed connector is used. The signal/excitation cable must be run in a 1/2“ hose from the connection box to a point above the highest flood level (Fig. 34). At that point the cable will be sealed using the water tight cable connector included with the shipment. Then, the hose is sealed to the hose connector with a screw clamp. Finally the connection box must be carefully closed.

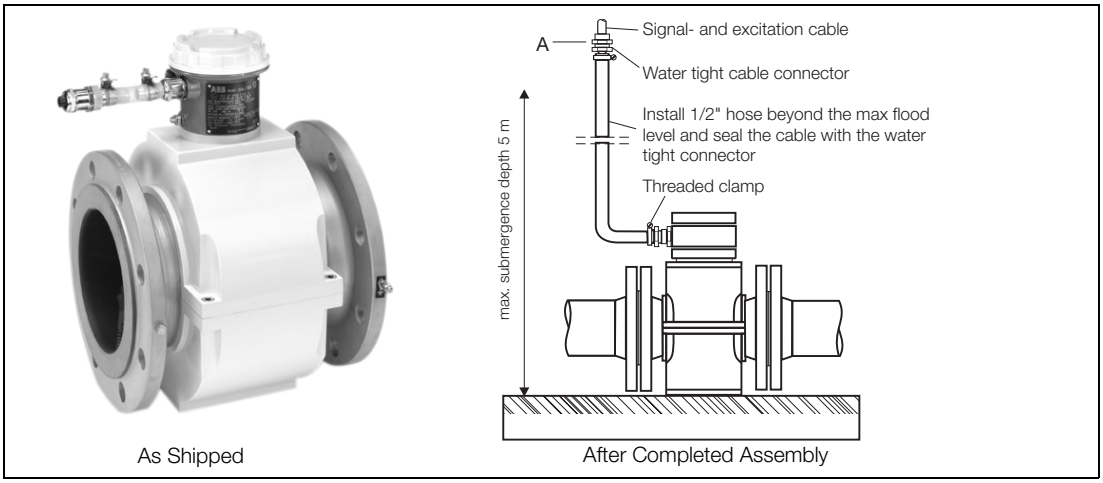


Fig. 34: Installation IP68 (Hose Connection)

4.3.3.2 Design without a Hose Connector

Signal cable D173D025U01 is to be used to connect the flowmeter primary to the converter. After the connections are completed the cable connectors are to be tightened and the connect box carefully closed.

The jacket of the signal cable may not be damaged. Only then will Protection Class IP68 for the flowmeter primary be assured.

4.4 Safety Information for Connecting the Converter

Danger!

There are circuits in the flowmeter primary and converter that are dangerous to touch. Therefore before opening the housing, turn off the supply power then wait at least 2 minutes before opening the housing. Assure that no explosion hazards exist. Work on the instrument with the housing opened should only be performed by trained personnel.

- Converter and flowmeter primary are to be connected to the Potential Equalization according to the applicable National Standards.
- The line connection must be sized for the current of the flowmeter system. The leads must correspond to IEC227 and IEC245.
- In installations inside buildings, the supply power line to the flowmeter system is to be routed through a switch or circuit breaker located in the vicinity of the flowmeter and appropriately marked.
- The electrical connections between the flowmeter primary and the converter may only be made with the cables supplied by ABB. The connections are to made according to Chapter 4.
- For safe operation of the instrument, the installation must follow the instructions in the Operation Manual.

Danger!
Information for connecting peripheral instruments

With the exception of the supply power, the voltages in the remaining circuits do not represent a personnel contact hazard. Only instruments whose circuit voltages are not hazardous to contact and do not exceed U_T = 60 V may be connected.

4.4.1 Specifications

EU-Type Examination Certificate TÜV 97 ATEX 1173X

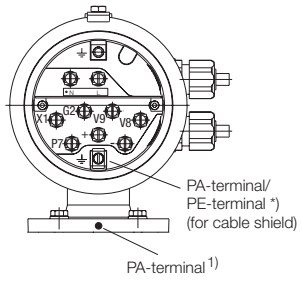
Marking: 

For details see EU-Type Examination Certificate in Chapter 14 in this Operation Manual.

4.5 Specifications for Converter Design Var. 03/04

4.5.1 Electrical Connection Area

4.5.1.1 For Models FXE4000-DE47F or FXE4000-DE27, FXE4000-DE27F (COPA-XE)

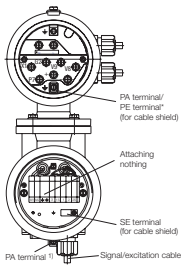


1) The housing is to be connected to Potential Equalization PA.

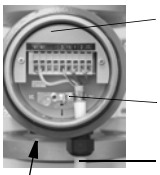
Fig. 35: Connection Area FXE4000-DE47F or FXE4000-DE27, DE27F (COPA-XE)

4.5.1.2 For Models FXE4000-DE48F

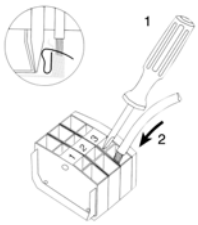
The converter may be installed within the Ex-Zone.



Converter



Flowmeter Primary Connection Box



Using the connection terminals

Information for 4.5.1.1 and 4.5.1.2

1) The housing is to be connected to Potential Equalization PA.
*) The operator must assure when the Protection Earth PE is connected that, even during a fault condition, no potential difference can exist between the Protection Earth PE and the Potential Equalization PA.

Terminal Designation	Connections	Terminal	Air Gap	Creepage Path
L; N/1+,2-	Supply power	Supply power to all other circuits and to housing	5.0 mm	8.0 mm
+ -	20 mA output and HART	Air gaps and creepage paths in connection area of intrinsically safe circuits (output signals)	3.0 mm	3.0 mm
V8 V9	Pulse output			
X1 G2	Contact input (G2 common)			
P7 G2	Contact output (G2 common)			
1 + 2	Leads for flow signal (red and blue)	Air gaps and creepage paths in connection area of the signal and excitation cable.		
1S + 2S	Cable shields for flow signal	a) Outer shield SE Terminal to all other circuits and to housing.	3.2 mm	5.0 mm
M1 + M2	Connections for magnetic field excitation (white)			
3	Inner cable shield (Copper) or internal lead (yellow) measurement potential	b) All other circuits to each other.	2.1 mm	3.4 mm
SE	Outer cable shield (steel)			

Air gaps and creepage paths are to be maintained.
Place insulating tubing over the cable shields.

Danger!

The supply power must be in accord with the specifications on the Type Plate at terminals L (Phase) and N (Neutral) or 1+ and 2- of the converter and connected through a line fuse and a line switch.

Fig. 36: Connection Area FXE4000-DE48 (COPA-XE)

4.5.2 Interconnection Diagram for Models DE27, DE27F, DE47F, DE48F

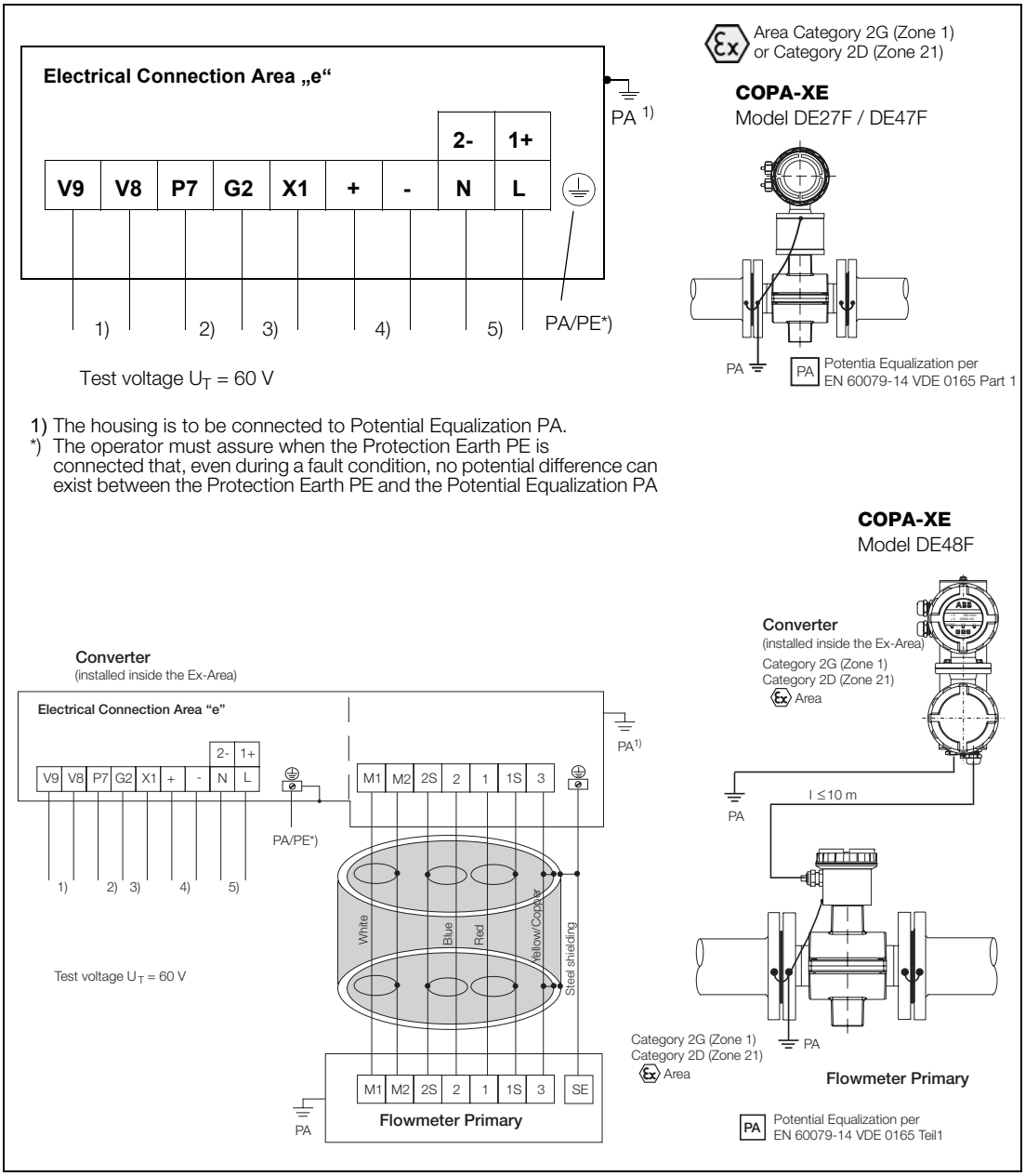


Fig. 37: Interconnection Diagram for Models DE27, DE27F, DE47F, DE48F, Converter Design Var. 03/04

1) **Scaled pulse output**, passive, optocoupler
Terminals: V8, V9,
Pulse factor selectable, pulse width from 0.1 ms to 2000 ms selectable, fmax = 5 kHz
a) Connections to an **intrinsically safe** circuit with following maximum values:
U_i = 15 V, I_i = 30 mA, P_i = 115 mW, effective internal capacitance: 2.4 nF,
effective internal inductance: 0.17 mH
Ignition Type: EEx ib IIC / IIB
Preferred configuration is a NAMUR-connection to a switch amplifier per DIN EN 60947-5-6 or
b) Connections to a **non-intrinsically safe** circuit
$0\ V \le U_{CEL} \le 2\ V$, $16\ V \le U_{CEH} \le 30\ V$
$0\ mA \le I_{CEH} \le 0.2\ mA$, $2\ mA \le I_{CEL} \le 220\ mA$
Factory confutation b). (standard connections)
For configuration b) the jumpers are to be set as shown in Fig. 39 .

2) **Contact output**, passive, optocoupler
Terminals: G2, P7
The following functions can be assigned in the software:
System monitor, empty pipe (≥ DN 10 [3/8"]; ≥ 20 µS/cm), forward/reverse direction signal, min. Alarm, max. Alarm
a) Connections to an **intrinsically safe** circuit with following maximum values:
U_i = 30 V, I_i = 250 mA, P_i = 1.1 W, effective internal capacitance: 4.8 nF,
effective internal inductance: 0.17 mH
Ignition Type: EEx ib IIC / IIB
Preferred configuration is a NAMUR-connection to a switch amplifier per DIN EN 60947-5-6 or
b) Connections to a **non-intrinsically safe** circuit
„closed" $0\ V \le U_{CEL} \le 2\ V$, $2\ mA \le I_{CEL} \le 220\ mA$
„opened" $16\ V \le U_{CEH} \le 30\ V$, $0\ mA \le I_{CEH} \le 0.2\ mA$
Factory confutation b).
For configuration b) the jumpers are to be set as shown in Fig. 39.

3) **Contact input**, passive, optocoupler
Terminals: G2, X1
The following functions can be assigned in the software:
External zero return, external totalizer reset, external totalizer stop
a) Connections to an **intrinsically safe** circuit with following maximum values:
U_i = 30 V, I_i = 250 mA, P_i = 1.1 W, effective internal capacitance: 4.8 nF,
effective internal inductance: 0.17 mH
Ignition Type: EEx ib IIC / IIB or
b) Connections to a **non-intrinsically safe** circuit
„On": $16\ V \le U_{CE} \le 30\ V$, „Off": $0\ V \le U_{CE} \le 2\ V$, $I \le 10\ mA$

4) **Current output active** selectable
Terminals: +/– The terminal – is connected internally to PA

0/4 to 20 mA	load ≤ 300 Ohm
0/2 to 10 mA	load ≤ 800 Ohm
0 to 5 mA	load ≤ 1800 Ohm
0–10–20 mA	load ≤ 300 Ohm
4–12–20 mA	load ≤ 300 Ohm

a) Connections to an **intrinsically safe** circuit (Ignition Type: EEx ib IIC / IIB)
Values for Uo, Io, Po, Lo see Chapter 4.5.4
b) Connections to a **non-intrinsically safe** circuit

Option: HART-Protocol, Specifications see Page 106.
5) **Supply power**, see Type Plate

Caution!
For measurement reasons PA should be identical to the pipeline potential if possible.

Fig. 38: Legends for Fig. 37

4.5.3 Internal Switching Between Standard Configuration (as shipped) and NAMUR-Configuration

The Ignition Type of the outputs remains unchanged.
The instruments connected to these circuits must satisfy the specific Ex-Requirements.

When the jumpers are set for the „NAMUR Configuration“ position, the resistors used to monitor for cable breaks or short circuits are integrated into the output circuits. The design as a NAMUR contact for connection to a switch amplifier is per DIN EN 60947-5-6. This applies to the pulse output and the contact output. The instrument is shipped in the standard configuration.

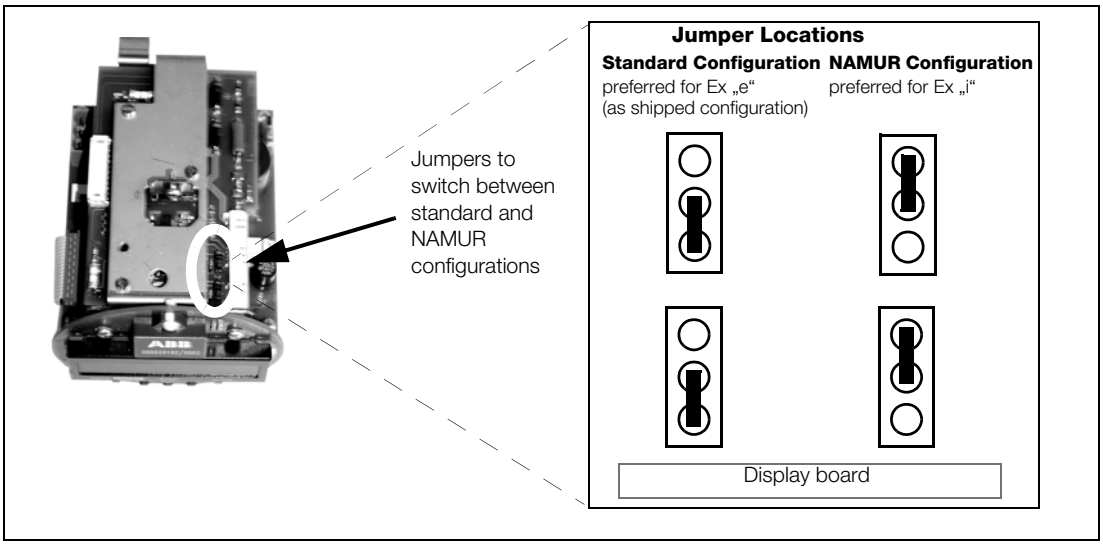
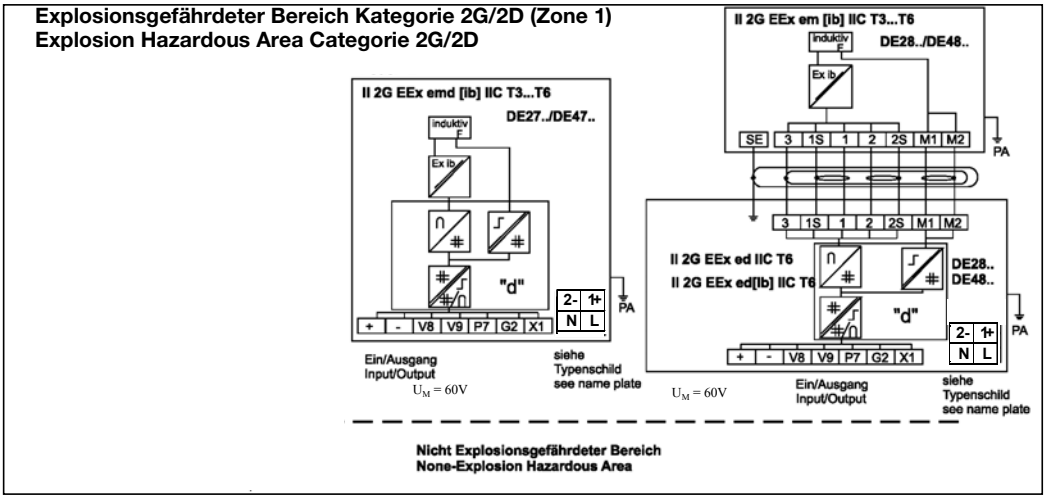


Fig. 39:

4.5.4 Safety Specifications for In- and Outputs for Converter Designs Var. 03 and Var. 04 for Models DE27, DE27F, DE47F, DE48F

Output Circuit	in Ignition Type Intrinsic Safety EEx ib IIC / IIB						Non-intrinsically safe, U_T = 60 V, I_T = 35 A
Current output active terminals +/– the terminal – is connected to PA	U_o = 20 V						Operating values: U = 30 V I = 30 mA
	I_o [mA]	P_o [mW]	EEx ib IIC		EEx ib IIB		
			C_o [nF]	L_o [mH]	C_o [nF]	L_o [mH]	
	100	500	218	3.8	1400	14.8	
	Curve: linear Effective internal capacitance C_i = 1.2 nF Effective internal inductance L_i = 0.082 mH For connection to passive, intrinsically safe circuits or intrinsically safe circuits with a maximum value: Ui = 60V The terminal – is connected to PA						
Pulse output terminals V8/V9 (V9 → Plus)	U_i = 15 V I_i = 30 mA P_i = 115 mW		C_i = 2.4 nF L_i = 0.17 mH				Operating values: U = 30 V I = 220 mA
Contact output terminals P7/G2 (P7 → Plus)	U_i = 30 V I_i = 250 mA P_i = 1.1 W		C_i = 4.8 nF L_i = 0.17 mH				Operating values: U = 30 V I = 10 mA
Contact input terminals X1/G2 (X1 → Plus)	U_i = 30 V I_i = 250 mA P_i = 1.1 W		C_i = 4.8 nF L_i = 0.17 mH				Operating values: U = 30 V I = 10 mA

TÜV 97 ATEX 1173 X



Safety Specifications

- Ambient temperature range -20 °C to +60 °C, minimum fluid temperatures -25 °C

The output circuits are designed so that they can be connected to **intrinsically safe** as well as **non-intrinsically safe** circuits. A combination of **intrinsically safe** and **non-intrinsically safe** is not permissible.
For **intrinsically safe** circuits, potential equalization is to be maintained along the entire length of the circuit. The max. voltage for the non-intrinsically safe circuits is U_T = 60 V.
The connection values to the flowmeter primary are U_{Nom} = 60 V, U_{Test} ≥ 1500 V, Signal cable Part No.: D173D018U02.
After turning the power to the flowmeter off wait at least t > 2 min. before opening the converter housing. At start-up the requirements in EN 50281-1-2 for applications with combustible dust must be observed. The operator must assure when the Protection Earth PE is connected that, even during a fault condition, no potential difference can exist between the Protection Earth PE and the Potential Equalization PA.

Special requirements:

The contact and pulse outputs can be configured internally (terminals V8, V9 / P7, G2) as NAMUR-contacts for connection to a NAMUR-amplifier.
The instrument is not shipped in the NAMUR configuration. As shipped, the installed cable connectors are black. If the signal outputs are connected to intrinsically safe circuits, then the light blue caps included with the shipment should be used for the those cable entries.

Caution!

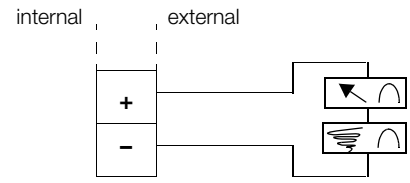
Observe the max. allow. ambient temperature, Temperature Classes, fluid temperature, the information for operation with thermally insulated pipelines and in areas with combustible dust. See also Chapter 7

Fig. 40: Safety Specifications, Converter Design Variants Var. 03 and Var. 04

4.5.5 Interconnection Examples for Peripherals for Converter Designs Var. 03/04 for Models DE27, DE27F, DE47F, DE48F

With the exception of the supply power, the voltages in the remaining circuits do not represent a personnel contact hazard. Only instruments whose circuit voltages are not hazardous and do not exceed U_T = 60 V may be connected.

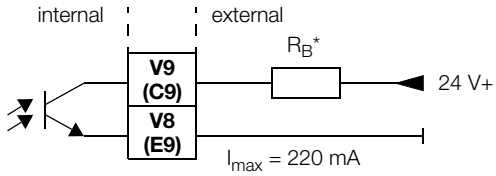
Current Output active



0/4-20 mA	load ≤ 300 Ohm
0/2-10 mA	load ≤ 800 Ohm
0-5 mA	load ≤ 1800 Ohm
0-10, 10-20 mA	load ≤ 300 Ohm
4-12, 12-20 mA	load ≤ 300 Ohm

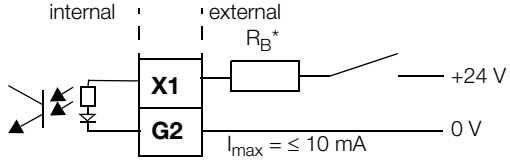
Important!
The circuits, based on the selected Ex-Protection Class („i“ or „e“), are to be configured as **intrinsically safe** or **non-intrinsically safe** as are the peripheral instruments which are to be connected to them.

Pulse output (optocoupler)



$* R_B \geq \frac{U_{CE}}{I_{CE}}$

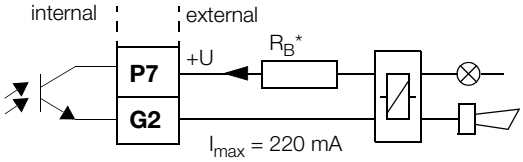
Contact Input for external zero return
Function selectable in software



$* R_B \geq \frac{U}{I}$

Contact setting:
Output is turned off when the contact is closed or
the internal totalizer is reset to zero when contact is closed

Contact output e.g. for system monitor, Max.-Min.-Alarm, empty pipe or forward/reverse direction signal
Function selectable in software



$* R_B \geq \frac{U_{CE}}{I_{CE}}$

Pulse output passive optocoupler, separate forward and reverse pulses on contact output

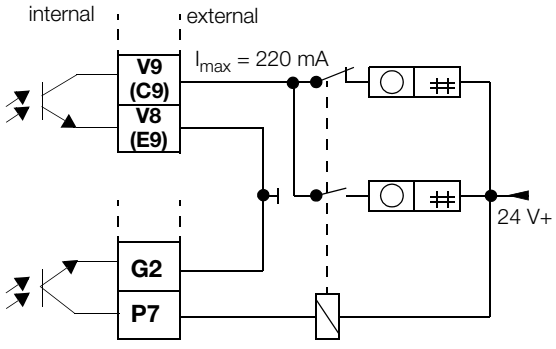


Fig. 41: Interconnection Examples for Peripherals with Analog Communication (incl. HART-Protocol)

4.6 Specifications for Converter Design Var. 14/15/16 (PROFIBUS PA, FOUNDATION Fieldbus)

4.6.1 Electrical Connection Area

4.6.1.1 For Models FXE4000-DE47F, or FXE4000-DE27 (COPA-XE)

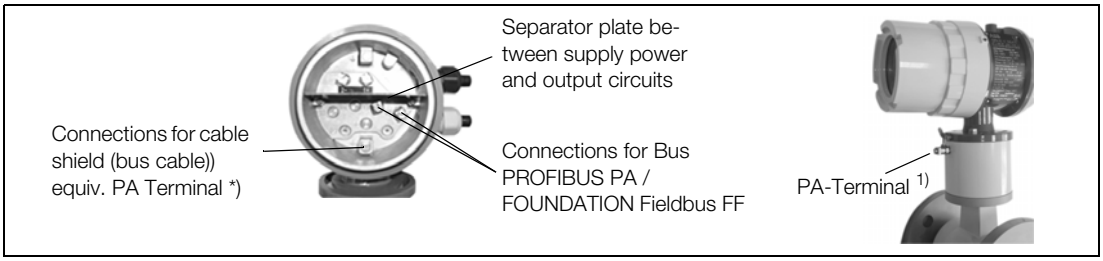
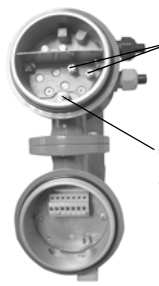
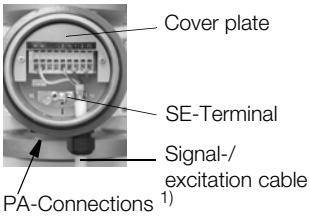


Fig. 42: Flowmeter Primary FXE4000-DE47F, DE27 (COPA-XE)

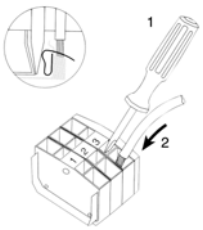
4.6.1.2 For Model FXE4000-DE48F



Converter



Flowmeter Primary Converter Box



Using the connection terminals

Information for 4.6.1.1 and 4.6.1.2

1) The housing is to be connected to Potential Equalization PA.
*) The operator must assure when the Protection Earth PE is connected that, even during a fault condition, no potential difference can exist between the Protection Earth PE and the Potential Equalization PA.

Terminal Designation	Connections	Terminal	Air Gap	Creepage Path
L; N/1+,2-	Supply power	Supply power to all other circuits and to housing	5.0 mm	8.0 mm
V8 V9	PROFIBUS PA or FOUNDATION Fieldbus FF	Air gaps and creepage paths in connection area of intrinsically safe circuits (output signals)	3.0 mm	3.0 mm
1, 2	Leads for flow signal (red and blue)	Air gaps and creepage paths in connection area for signal- and excitation cable.		
1S + 2S	Cable shield for flow signal	a) Outer shield SE terminal to all other circuits and to housing.	3.2 mm	5.0 mm
M1 + M2	Connections for magnetic field excitation (white)			
3	Inner cable shield (copper) or internal lead (yellow), measurement potential	b) all other circuits to each other.	2.1 mm	3.4 mm
SE	Outer cable shield (steel)			

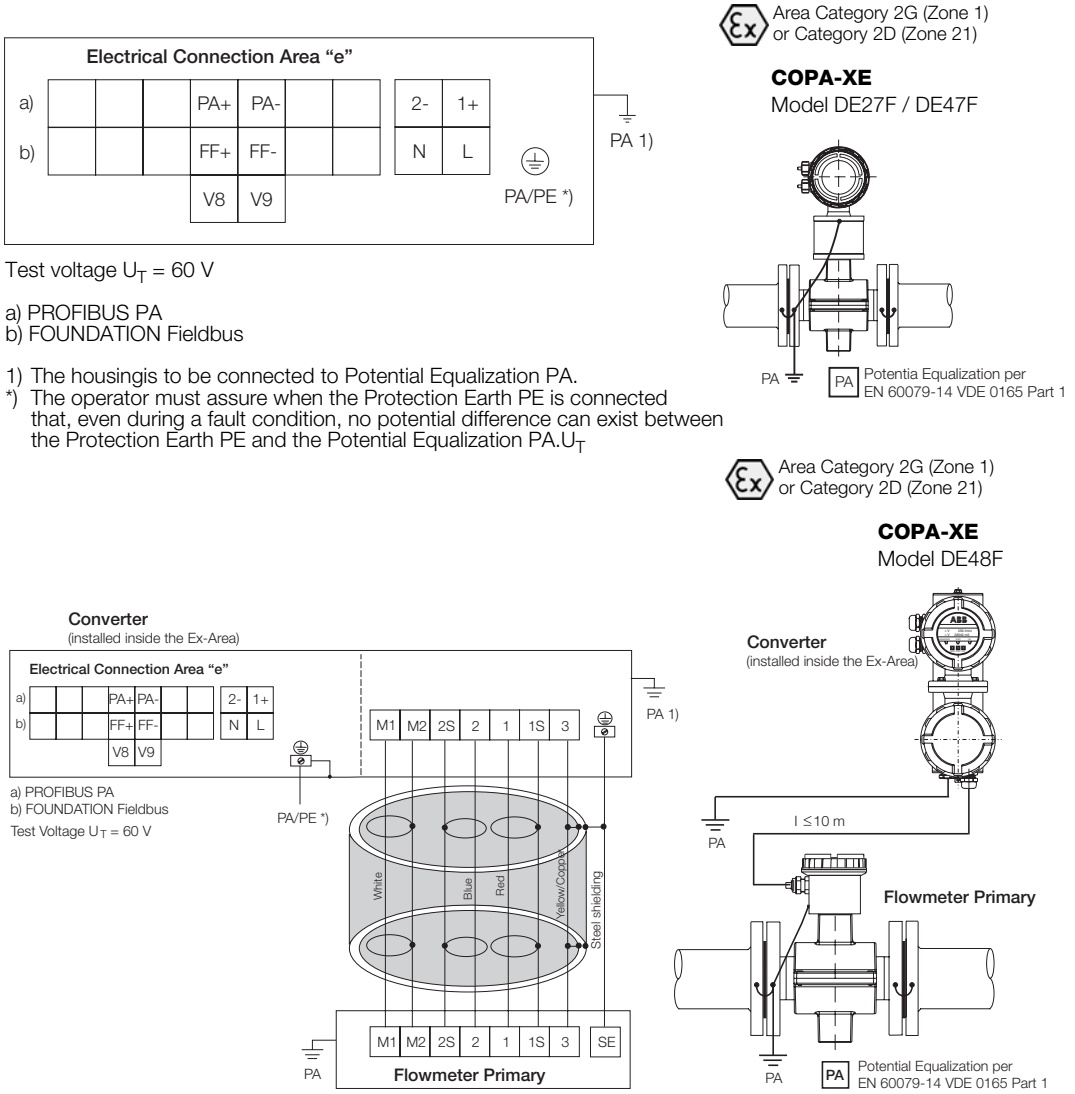
Air gaps and creepage paths are to be maintained.
Place insulating tubing over the cable shields.

Danger!

The supply power must be in accord with the specifications on the Type Plate at terminals L (Phase) and N (Neutral) or 1+ and 2- of the converter and connected through a line fuse and a line switch. The connection of the fieldbus cable shield to Potential Equalization PA is made on the supply side according to FISCO-Model. Air gaps and creepage paths are to be maintained.

Fig. 43: Connection Area FXE4000-DE48F (COPA-XE)

4.6.2 Interconnection Diagram for Models DE27, DE27F, DE47F, DE48F



1) The housingis to be connected to Potential Equalization PA.
*) The operator must assure when the Protection Earth PE is connected that, even during a fault condition, no potential difference can exist between the Protection Earth PE and the Potential Equalization PA

Design a)

Terminals PA+, PA- (V8, V9)
Connections for PROFIBUS PA per IEC 61158-2 (Profile 3.0),
U = 9-24 V, I = 13 mA (normal operation); 17 mA (during fault / FDE)

Design b)

Terminals FF+, FF- (V8, V9)
Connections for FOUNDATION Fieldbus (H1) per IEC 61158-2
U = 9-24 V, I = 13 mA (normal operation); 17 mA (during fault / FDE)
Supply power
See Type Plate

Important!
For measurement reasons PA should be identical to the pipeline potential if possible.
The connection of the fieldbus cable shield to Potential Equalization PA is made on the supply side according to FISCO-Model.

Fig. 44: Interconnection Diagram for Models DE27, DE27F, DE47F, DE48F; Converter Designs Var. 14/15/16

4.6.3 Safety Specifications for the In- and Outputs for Converter Design Var. 14/15/16

Output Circuit	in Ignition Type Intrinsic Safety EEx ia IIC	Non-Intrinsically Safe U_T = 60 V
Fieldbus Terminals V8/V9	U_T = 60 V The effective internal capacitance and inductance are negligibly small	Operating values: U = 9 ... 32 V I = 10 mA

Information for FISCO-Model

The Ex-Design of the COPA-XE/MAG-XE is designed according to the FISCO-Model (FISCO = Fieldbus Intrinsically Safe Concept) of PTB. Please observe the requirements according to EN60079-27.

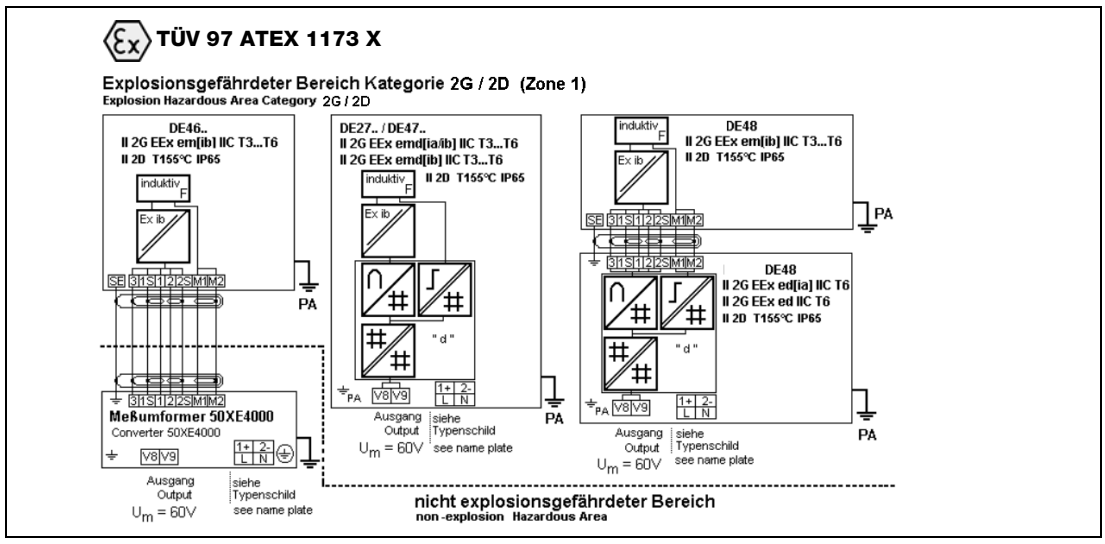


Fig. 45: Design Variants Var. 14/15/16Flowmeter Primary FXE4000-DE46F (MAG-XE)

Safety Specifications:

- Ambient temperatures -20 °C to +60 °C, minimum fluid temperature -25 °C

The output circuits are designed so that they can be connected to intrinsically safe as well as non-intrinsically safe circuits. A combination of intrinsically safe and non-intrinsically safe is not permissible.

The output circuits are designed so that they can be connected to **intrinsically safe** as well as **non-intrinsically safe** circuits. As long as the test voltage **U_T = 60 V** for connections to non-intrinsically safe external circuits is not exceeded, the Intrinsic Safety is maintained.

When using shielded connections cables the shield must be connected outside the explosion hazardous area and connected to Potential Equalization.

Flowmeter Primary connection values U_{Nom} = 60 V, $U_{Test} \geq$ 1500 V, signal cable Part No.: D173D018U02.

After turning off the power to the flowmeter, wait at least 2 minutes before opening the converter housing.

For start-up EN50281-1-2 is to be considered for areas with combustible dust.

The operator must assure when the Protection Earth PE is connected that, even during a fault condition, no potential difference can exist between the Protection Earth PE and the Potential Equalization PA.

Caution!

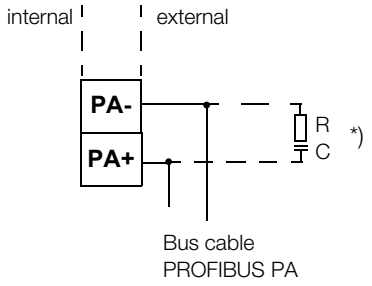
Observe the max. allow. ambient temperature, Temperature Classes, fluid temperature, the information for operation with thermally insulated pipelines and in areas with combustible dust. See also Chapter 7.

4.6.4 Interconnection Examples for Peripherals for Converter Designs Var. 14/15/16

(An example for PROFIBUS PA)

PROFIBUS PA

The resistor R and the capacitor C form the bus termination.
They are to be installed if the instrument is connected at the end of the bus cable.
R = 100 Ω; C = 1 µF



*) The bus termination (R-C component) must correspond to the FISCO-Model or the Ex-Requirements

4.7 Specifications for Converter Design Var. 17 (passive current output, pulse output passive, contact input, contact output, HART)

4.7.1 Electrical Connection Area

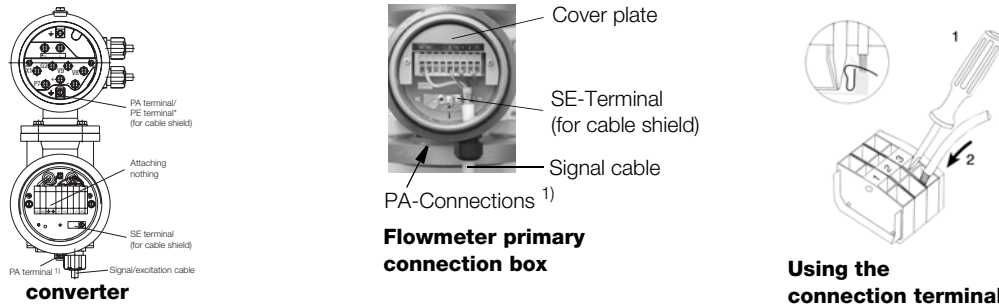
4.7.1.1 For Models FXE4000-DE47F or FXE4000-DE27 (COPA-XE)

1) The housing is to be connected to Potential Equalization PA.

Fig. 46: Connection Area FXE4000-DE47F or FXE4000-DE27, DE27F (COPA-XE)

4.7.1.2 For Models FXE4000-DE48F

The converter may be installed in the Ex-Zone.



Information for 4.7.1.1 and 4.7.1.2

1) The housing is to be connected to Potential Equalization PA.
*) The operator must assure when the Protection Earth PE is connected that, even during a fault condition, no potential difference can exist between the Protection Earth PE and the Potential Equalization PA.

Terminals Designation	Connections	Terminal	Air Gap	Creepage Path
L; N/1+,2-	Supply power	Supply power to all other circuits and to housing	5.0 mm	8.0 mm
+ -	20 mA output passive and HART	Air gaps and creepage paths in connection area of intrinsically safe circuits (output signals)	3.0 mm	3.0 mm
V8 V9	Pulse output			
X1 G2	Contact input (G2 common)			
P7 G2	Contact output (G2 common)			
1 + 2	Leads for flow signal (red and blue)	Air gaps and creepage paths in connection area of the signal and excitation cable. a) Outer shield SE Terminal to all other circuits and to housing.	3.2 mm	5.0 mm
1S + 2S	Cable shield for flow signal			
M1 + M2	Connections for magnetic field excitation (white)			
3	Inner cable shield (Copper) or internal lead in cable (yellow) measurement potential	b) all other circuits to each other.	2.1 mm	3.4 mm
SE	Outer cable shield (steel)			

Air gaps and creepage paths are to be maintained.
Place insulating tubing over the cable shields.

Danger!

The supply power must be in accord with the specifications on the Type Plate at terminals L (Phase) and N (Neutral) or 1+ and 2- of the converter and connected through a line fuse and a line switch.

Fig. 47: Connection Area FXE4000-DE48 (COPA-XE)

4.7.2 Interconnection Diagram for Models DE27, DE27F, DE47F, DE48F

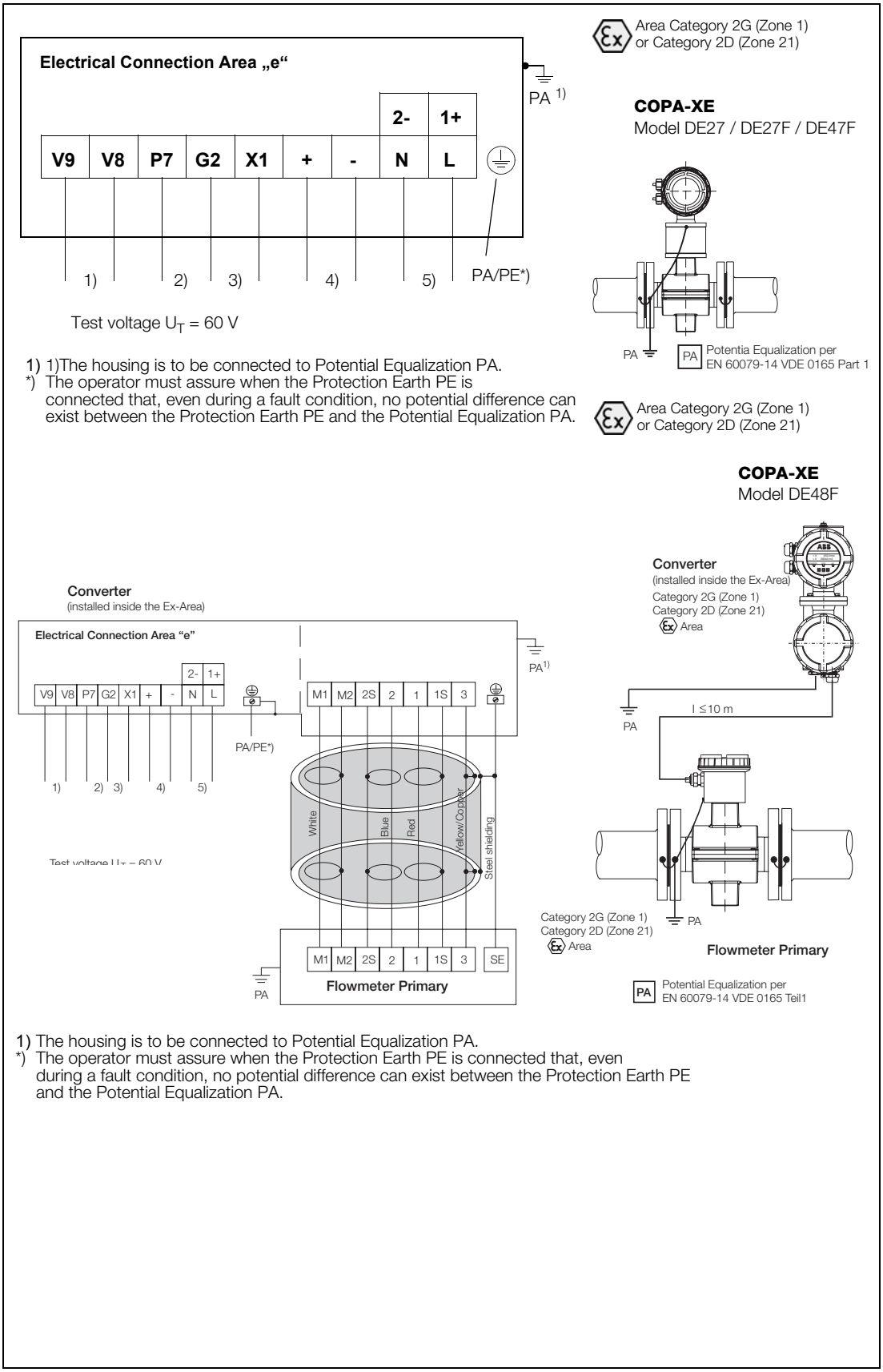


Fig. 48: Interconnection Diagram for Models DE27, DE27F, DE47F, DE48F; Converter Design Var. 17

1) **Scaled pulse output**, passive, optocoupler
Terminals: V8, V9,
Pulse factor selectable, pulse width from 0.1 ms to 2000 ms selectable, fmax = 5 kHz
a) Connections to an **intrinsically safe** circuit with following maximum values:
U_i = 30 V, I_i = 250 mA, P_i = 1.1 W, effective internal capacitance: 12 nF, effective internal inductance: negligibly small
Ignition Type: EEx ia IIC / IIB
Preferred configuration is a NAMUR-connection to a switch amplifier per DIN EN 60947-5-6 or
b) Connections to a **non-intrinsically safe** circuit
0 V ≤ U_{CEL} ≤ 2 V, 16 V ≤ U_{CEH} ≤ 30 V
0 mA ≤ I_{CEH} ≤ 0.2 mA, 2 mA ≤ I_{CEL} ≤ 220 mA
Factory configuration b). (standard connections)
For configuration b) the jumpers are to be set as shown in Fig. 50.

2) **Contact output**, passive, optocoupler
Terminals: G2, P7
The following functions can be assigned in the software:
System monitor, empty pipe (≥ DN 10 [3/8"]; ≥ 20 µS/cm), forward/reverse direction signal, min. Alarm, max. Alarm
a) Connections to an **intrinsically safe** circuit with following maximum values:
U_i = 30 V, I_i = 250 mA, P_i = 1.1 W, effective internal capacitance: 24 nF, effective internal inductance: negligibly small
Ignition Type: EEx ia IIC / IIB
Preferred configuration is a NAMUR-connection to a switch amplifier per DIN EN 60947-5-6 or
b) Connections to a **non-intrinsically safe** circuit
„closed" 0 V ≤ U_{CEL} ≤ 2 V, 2 mA ≤ I_{CEL} ≤ 220 mA
„opened" 16 V ≤ U_{CEH} ≤ 30 V,0 mA ≤ I_{CEH} ≤ 0.2 mA
Factory configuration b).
For configuration b) the jumpers are to be set as shown in Fig. 50.

3) **Contact input**, passive, optocoupler
Terminals: G2, X1
The following functions can be assigned in the software:
External Zero Return, external totalizer reset, external totalizer stop
a) Connections to an **intrinsically safe** circuit with following maximum values:
U_i = 30 V, I_i = 250 mA, P_i = 1.1 W, effective internal capacitance: 24 nF, effective internal inductance: negligibly small
Ignition Type: EEx ia IIC / IIB or
b) Connections to a **non-intrinsically safe** circuit
„On": 16 V ≤ U_{CE} ≤ 30 V,„Off": 0 V ≤ U_{CE} ≤ 2 V, I ≤ 10 mA

4) **Current output passive** selectable
Terminals: +/– The terminals (+ and –) are potential free (not connected internally to PA)
Allowable load: 250 Ohm to 560 Ohm
Output signal: 4–20 mA with superimposed HART-Protocol
Operating specifications for the passive current output
Operating voltage: 9–30 V (see also Diagram in Chapter 4.7.5)
Output current: 4–26 mA (max)
Ex-specification for the passive current output
a) Connections to an **intrinsically safe** circuit (Ignition Type: EEx ia IIC / IIB)
U_i = 60 V; C_i = 24 nF; effective internal inductance: negligibly small
b) Connections to a **non-intrinsically safe** circuit
Test voltage: U_m = 60 V
Operating values: U = 30 V; I = 26 mA

5) **Supply power**, see Type Plate

Caution!
For measurement reasons PA should be identical to the pipeline potential if possible.

Fig. 49: Legends for Fig. 48

4.7.3 Internal switching between Standard Configuration (as shipped) and NAMUR-Configuration

The Ignition Type of the outputs remains unchanged.
The instruments connected to these circuits must satisfy the specific Ex-Requirements.

When the jumpers are set for the „NAMUR Configuration“ position, the resistors used to monitor for cable breaks or short circuits are integrated into the output circuits. The design as a NAMUR contact for connection to a switch amplifier is per DIN EN 60947-5-6. This applies to the pulse output and the contact output. The instrument is shipped in the standard configuration.

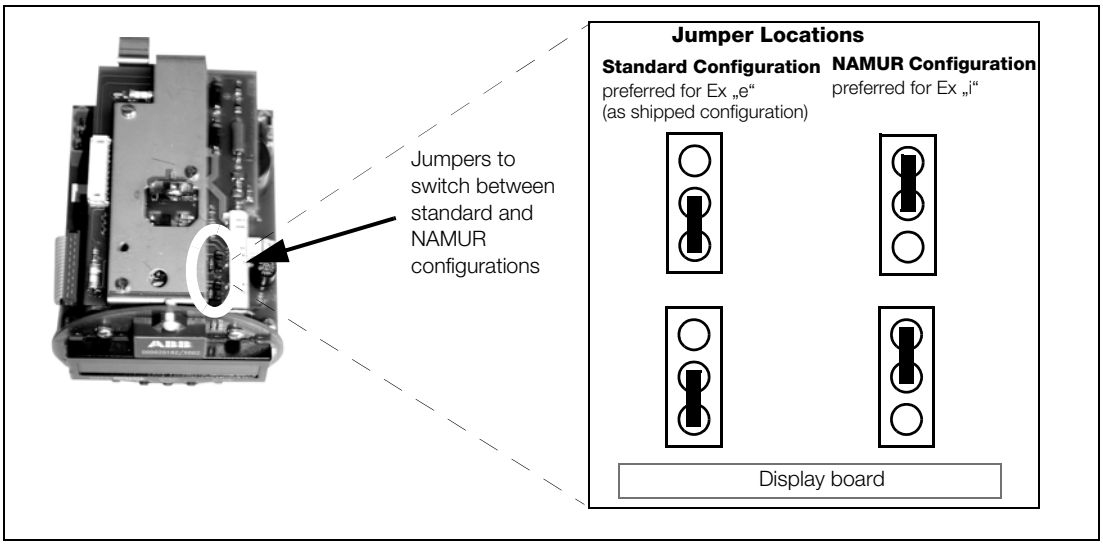


Fig. 50:

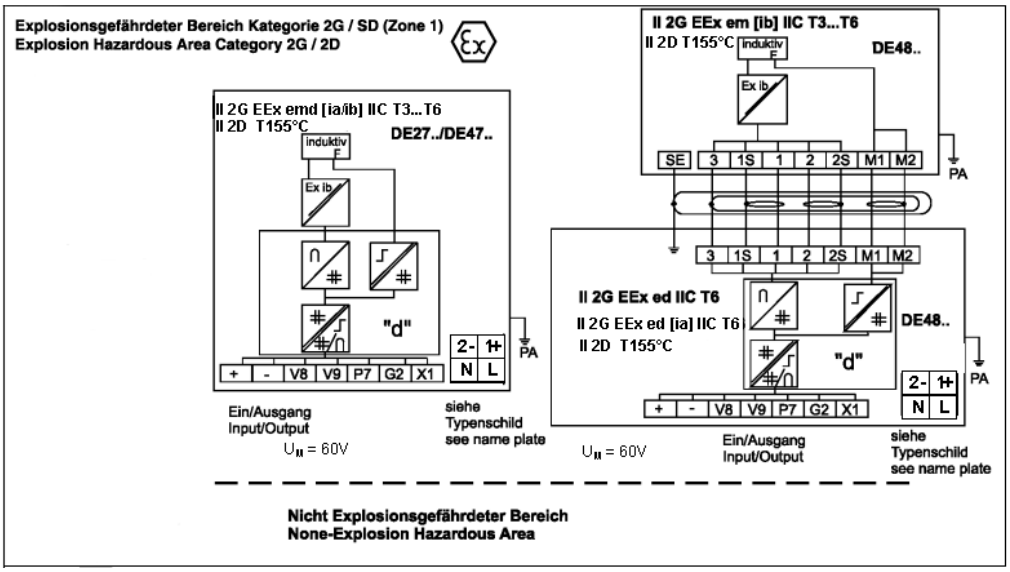
4.7.4 Safety Specifications for In- and Outputs for Converter Design Var. 17

Circuit	in Ignition Type Intrinsic Safety EEx ia IIC / IIB for connection to a certified intrinsically safe circuit	Non-Intrinsically Safe U_T = 60 V Operating Values:
Current output (passive) Terminals +/-	U_i = 60 V C_i = 24 nF L_i : 0.065 mH	U = 30 V I = 30 mA
Pulse output Terminals V8/V9 (V9 → Plus)	U_i = 30 V I_i = 250 mA P_i = 1.1 mW C_i = 12 nF L_i : negligibly small	U = 30 V I = 220 mA
Contact output Terminals P7/G2 (P7 → Plus)	U_i = 30 V I_i = 250 mA P_i = 1.1 mW C_i = 24 nF L_i : negligibly small	U = 30 V I = 10 mA
Contact input Terminals X1/G2 (X1 → Plus)	U_i = 30 V I_i = 250 mA P_i = 1.1 mW C_i = 24 nF L_i : negligibly small	U = 30 V I = 10 mA

Information on the current output (passive):

Because of the DE47's internal configuration, the power/current load is not relevant for the interconnection inspection.
An internal fuse limits the power load so that neither an inadmissible temperature increase nor an overload of the safety-relevant components in the pressure-resistant housing will occur.

TÜV 97 ATEX 1173X



Safety Specifications

- Ambient temperature range -20 °C to +60 °C, minimum fluid temperatures -25 °C

The output circuits are designed so that they can be connected to **intrinsically safe** as well as **non-intrinsically safe** circuits. A combination of **intrinsically safe** and **non-intrinsically safe** is not permissible.
For **intrinsically safe** circuits, potential equalization is to be maintained along the entire length of the circuit. The max. voltage for the non-intrinsically safe circuits is U_T = 60 V.
The connection values to the flowmeter primary are U_{Nom} = 60 V, $U_{Test} \geq$ 1500 V, Signal cable Part No.: D173D018U02.
After turning the power to the flowmeter off wait at least t > 2 min. before opening the converter housing. At start-up the requirements in EN 50281-1-2 for applications with combustible dust must be observed. The operator must assure when the Protection Earth PE is connected that, even during a fault condition, no potential difference can exist between the Protection Earth PE and the Potential Equalization PA.

Special Requirements:
The contact and pulse outputs can be configured internally (terminals V8, V9 / P7, G2) as NAMUR-contacts for connection to a NAMUR-amplifier.
The instrument is not shipped in the NAMUR configuration. As shipped, the installed cable connectors are black. If the signal outputs are connected to intrinsically safe circuits, then the light blue caps included with the shipment should be used for the those cable entries.

Caution!

Observe the max. allow. ambient temperature, Temperature Classes, fluid temperature, the information for operation with thermally insulated pipelines and in areas with combustible dust. See also Chapter 7.

Fig. 51: Safety Specifications, Instruments with Converter with Passive Current Output (Var. 17)

4.7.5 Interconnection Examples for Peripherals for Converter Design Var. 17

With the exception of the supply power, the voltages in the remaining circuits do not represent a personnel contact hazard. Only instruments whose circuit voltages are not hazardous and do not exceed U_T = 60 V may be connected.

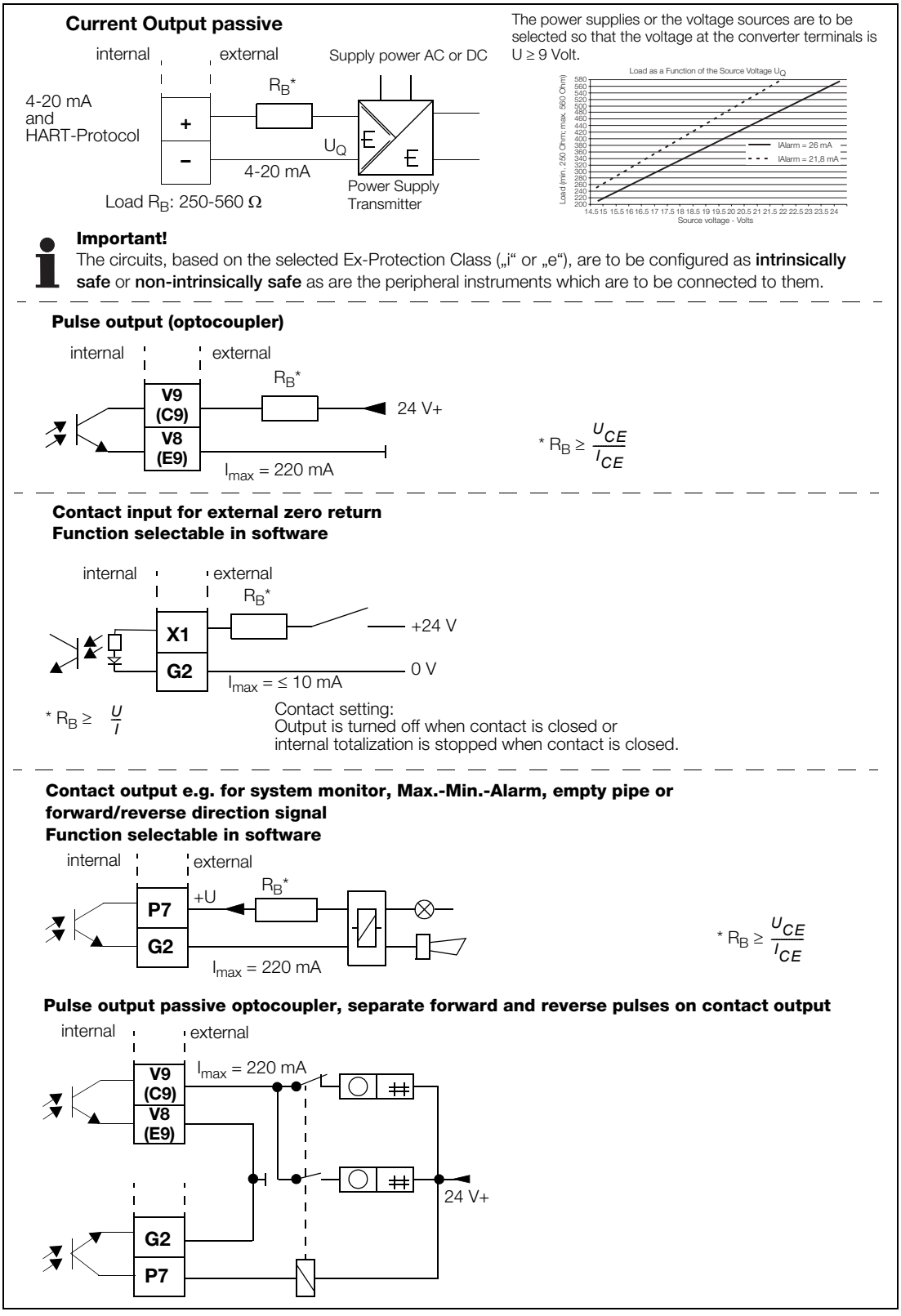


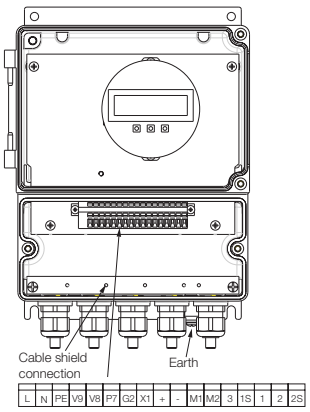
Fig. 52: Interconnection Examples for Peripheral Instruments with Analog Communication (incl. HART-Protocol)

4.8 Specifications for External Converter Model E4 in Converter Designs Var. 01/02/03/04 for Connection to Flowmeter Primary Model DE46F

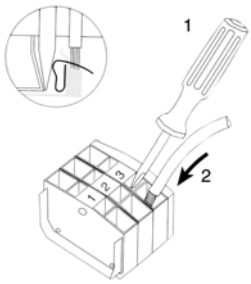
4.8.1 Electrical Connection Area

4.8.1.1 For Converter Model E4

The converter is to be installed outside the Ex-Area.



Terminal Designation	Connections
L; N/1+; 2–	Supply voltage
+ –	20 mA output and HART
V8 V9	Pulse output
X1 G2	Contact input (G2 common)
P7 G2	Contact output (G2 common)
1 + 2	Leads for flow signal (red and blue)
1S + 2S	Cable shield for flow signal
M1 + M2	Connections for magnetic field excitation (white)
3	Inner cable shield (copper) or internal lead (yellow), measurement potential
⏚	Outer cable shield (steel

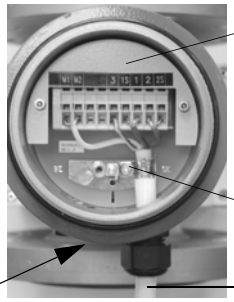


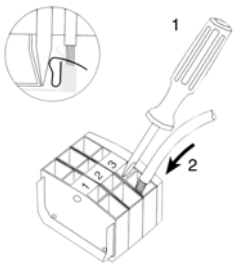
Using the connection terminals

Fig. 53: Connection Box Field Mount Housing

4.8.1.2 Flowmeter Primary Model FXE4000-DE46F

The leads of the signal/excitation cable are to be routed in the shortest way possible to the connection terminals. Loops are to be avoided.





Using the connection terminals

Terminals Designation	Connections	Terminal	Air Gap	Creepage Path
1 + 2	Leads for flow signal (red and blue)	Air gaps and creepage paths in connection area of the signal and excitation cable		
1S + 2S	Cable shield for flow signal			
M1 + M2	Connections for magnetic field excitation	a) Outer shield SE Terminal to all other circuits and to housing	3.2 mm	5.0 mm
3	Inner cable shield (Copper) or internal lead in cable (yellow) measurement potential	b) all other circuits to each other	2.1 mm	3.4 mm
SE	Outer cable shield (steel)			

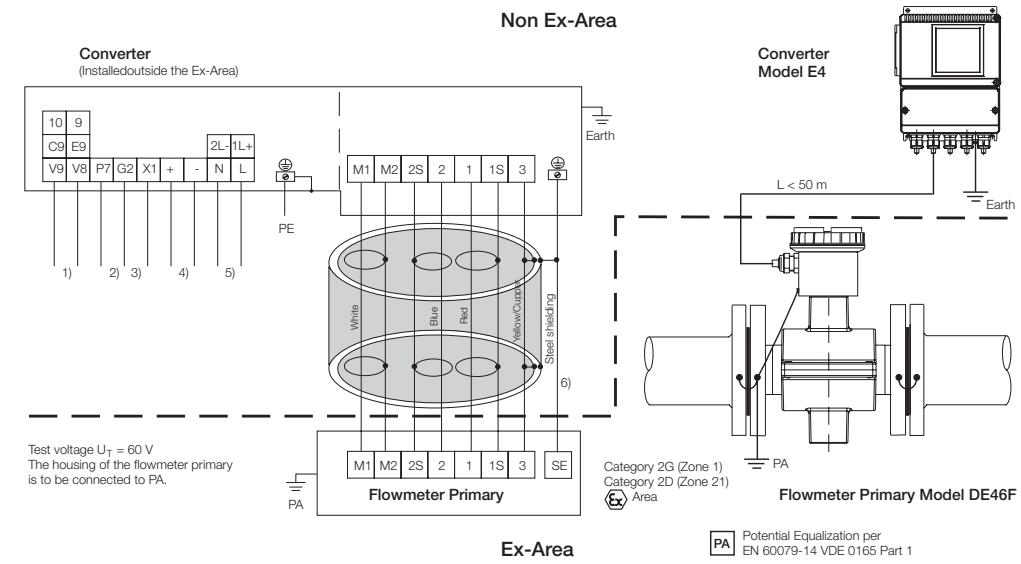
Air gaps and creepage paths are to be maintained.
Place insulating tubing over the cable shields.

Fig. 54: Flowmeter Primary FXE4000-DE46F (MAG-XE)

Danger!

The supply power must be in accord with the specifications on the Type Plate at terminals L (Phase) and N (Neutral) or 1+ and 2- of the converter and connected through a line fuse and a line switch.

4.8.2 Interconnection Diagram for Flowmeter Primary Model DE46F with External Converter Model E4 in Converter Designs Var. 01/02/03/04



1) a) **Scaled pulse output, passive**, Pulse width selectable from 0.1 ms to 2000 ms,
Terminals: V8, V9, Function E9, C9,
Optocoupler specifications: f_{max} 5 kHz
0 V ≤ U_{CEL} ≤ 2 V, 16 V ≤ U_{CEH} ≤ 30 V
0 mA ≤ I_{CEH} ≤ 0.2 mA, 2 mA ≤ I_{CEL} ≤ 220 mA

b) **Scaled pulse output, active** pulse width selectable from 0.1 to 2000 ms,
Terminals V8, V9, Function 9, 10
f_{max} ≤ 4 Hz
20 mA < I ≤ 150 mA; , pulse width ≤ 50 ms, pulse T_{16V} ≤ 25 ms, on/off ratio 1:4 (T_{on} : T_{off}),
f_{max} 5 kHz
2 mA ≤ I ≤ 20 mA; 16 V ≤ U ≤ 30 V

The selection of active or passive pulse output is made using jumpers in the converter

2) **Contact output**, function can be assigned in the software as system monitor, empty pipe (≥ DN 10 [3/8"]; ≥ 20 µS/cm), Max.-Min.-Alarm or F/R direction signal*, Terminals G2, P7
Optocoupler specifications:
0 V ≤ U_{CEL} ≤ 2 V, 16 V ≤ U_{CEH} ≤ 30 V;
0 mA ≤ I_{CEH} ≤ 0.2 mA, 2 mA ≤ I_{CEL} ≤ 220 mA

3) **Contact input**, function can be assigned in the software as external zero return, external totalizer stop or external totalizer reset
Terminals: G2, X1
optocoupler, 16 V ≤ U ≤ 30 V, Ri = 2 kΩ

4) **Current output active**
Terminals: +/-
load ≤ 600 Ω at 0/4 to 20 mA,
load ≤ 1200 Ω at 0/2 bis10 mA,
load ≤ 2400 Ω at 0 to 5 mA
Option: **HART-Protocol** (see Chapter 10.3, Page 107)

5) **Supply power**, see Type Plate

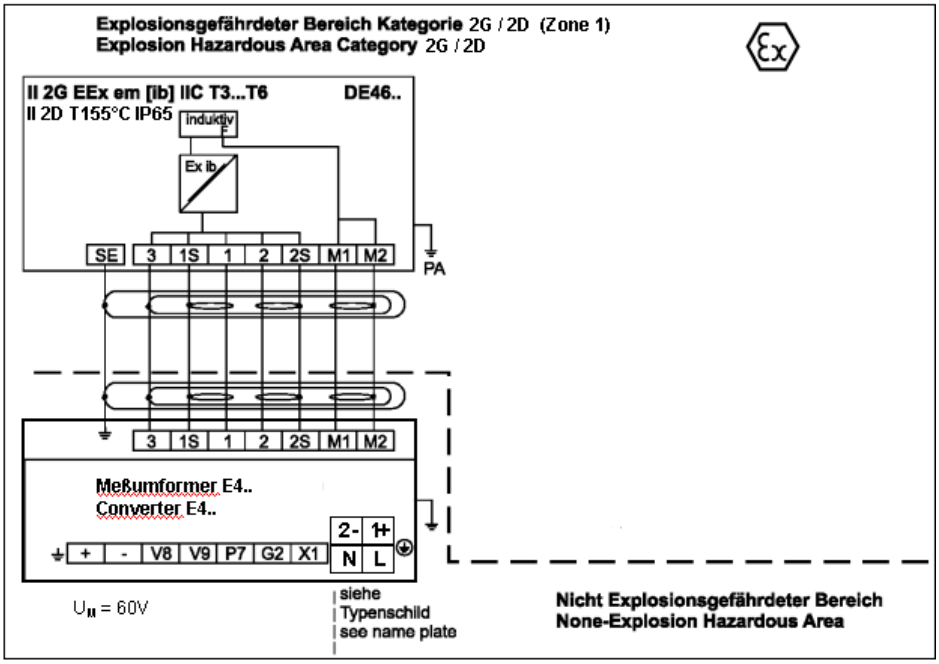
6) Shielded signal and excitation cable, Ordering No. D173D018U02 or (D173D025U01, Option)
10 m cable included with shipment.

Information!

For measurement reasons PA should be identical to the pipeline potential if possible.

Fig. 55: Interconnection Diagram for Model DE46F with External Converter Model E4

4.8.3 Safety Specifications for the In- and Outputs for Flowmeter Primary Model DE46F with External Converter Model E4 Designs Var. 01/02/03/04



Safety Specifications

- Ambient temperatures -20 °C to +60 °C, minimum fluid temperature -25 °C

The max. voltage for the **non-intrinsically safe** circuits is U_T = 60 V.
Flowmeter primary values U_{Nom} = 60 V, $U_{Test} \geq$ 1500 V, signal cable Part No.: D173D018U02.
After turning the power to the flowmeter off wait at least t > 2 min. before opening the converter housing. At start-up the requirements in EN 50281-1-2 for applications with combustible dust must be observed. The operator must assure when the Protection Earth PE is connected that, even during a fault condition, no potential difference can exist between the Protection Earth PE and the Potential Equalization PA.

Notice:

Observe the max. allow. ambient temperature, Temperature Classes, fluid temperature, the information for operation with thermally insulated pipelines and in areas with combustible dust. See also Chapter 7.

Fig. 56: Safety Specifications for the In- and Outputs for Flowmeter Primary Model DE46F with External Converter Model E4 Designs Var. 01/02/03/04

4.8.4 Interconnection Examples for Peripherals to External Converter Model E4 Designs Var. 01/02/03/04

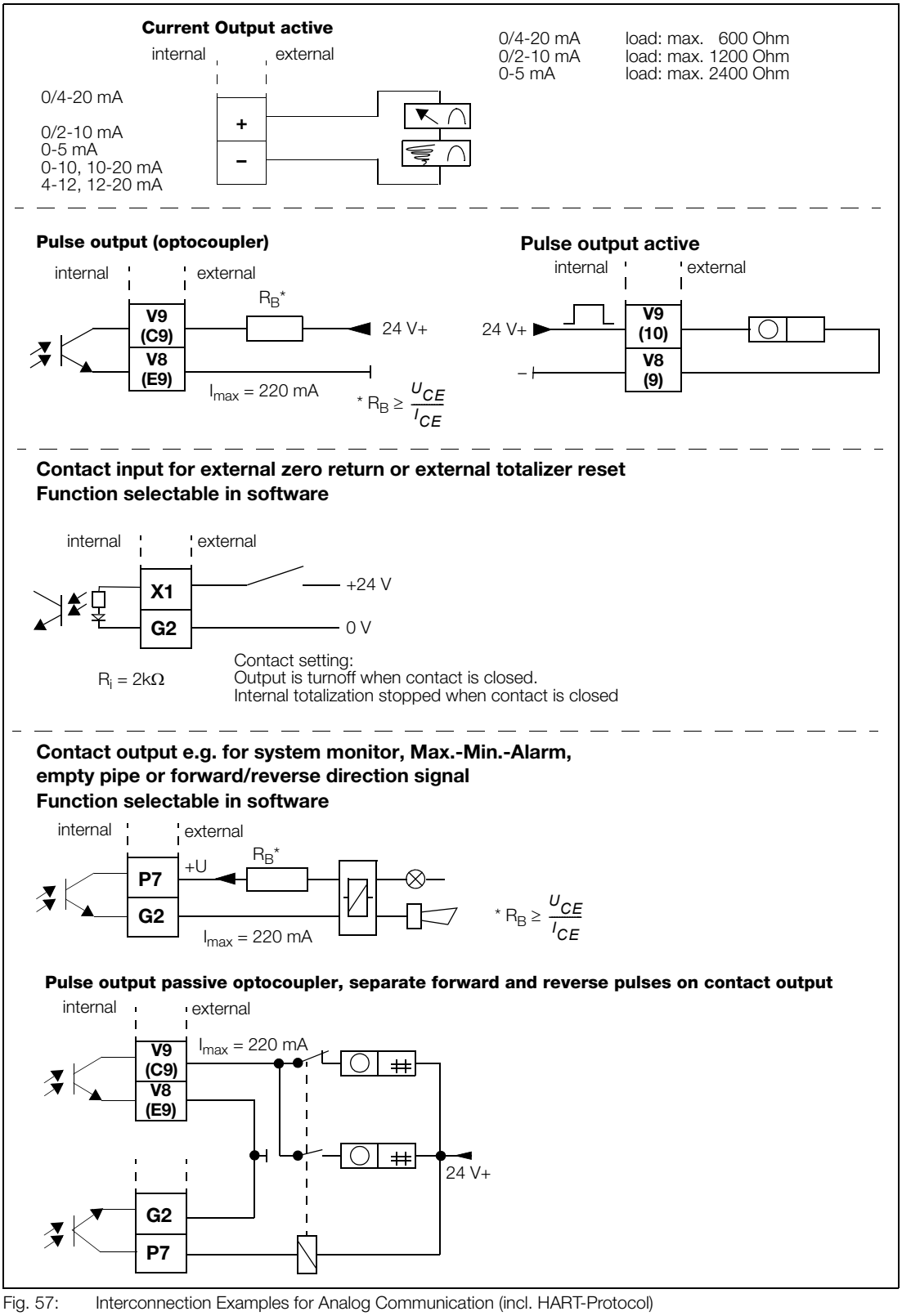


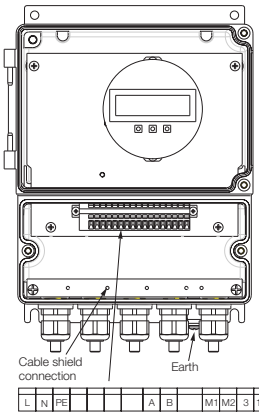
Fig. 57: Interconnection Examples for Analog Communication (incl. HART-Protocol)

4.9 Specifications for External Converter Model E4 in Designs Var. 14/15/16 for Connection to Flowmeter Primary Model DE46F

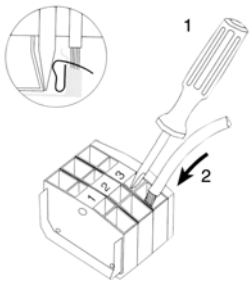
4.9.1 Electrical Connection Area

4.9.1.1 For Converter Model E4

The converter is to be installed outside the Ex-Area.



Terminal Designation	Connections
L; N/1+; 2–	Supply voltage
A, B	Fieldbus terminals
1 + 2	Leads for flow signal (red and blue)
1S + 2S	Cable shield for flow signal
M1 + M2	Connections for magnetic field excitation (white)
3	Inner cable shield (copper) or internal lead (yellow), measure-ment potential
⏚	Outer cable shield (steel

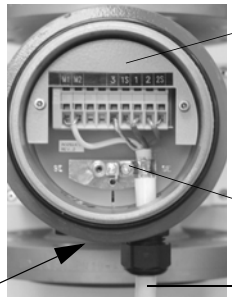


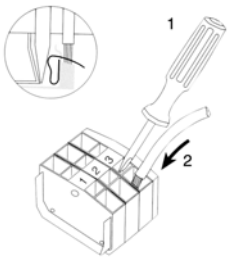
Using the connection terminals

Fig. 58: Electrical Connection Area Converter Model E4

4.9.1.2 Flowmeter Primary Model FXE4000-DE46F

The leads of the signal/excitation cable are to be routed in the shortest way possible to the connection terminals. Loops are to be avoided.





Using the connection terminals

Terminals Designation	Connections	Terminal	Air Gap	Creepage Path
1 + 2	Leads for flow signal (red and blue)	Air gaps and creepage paths in connection area of signal and excitation cable		
1S + 2S	Cable shield for flow signal			
M1 + M2	Connections for magnetic field excitation	a) Outer shield SE terminal to all other circuits and to housing	3.2 mm	5.0 mm
3	Inner cable shield (Copper) or internal lead in cable (yellow) measurement potential	b) all other circuits to each other	2.1 mm	3.4 mm
SE	Outer cable shield (steel)			

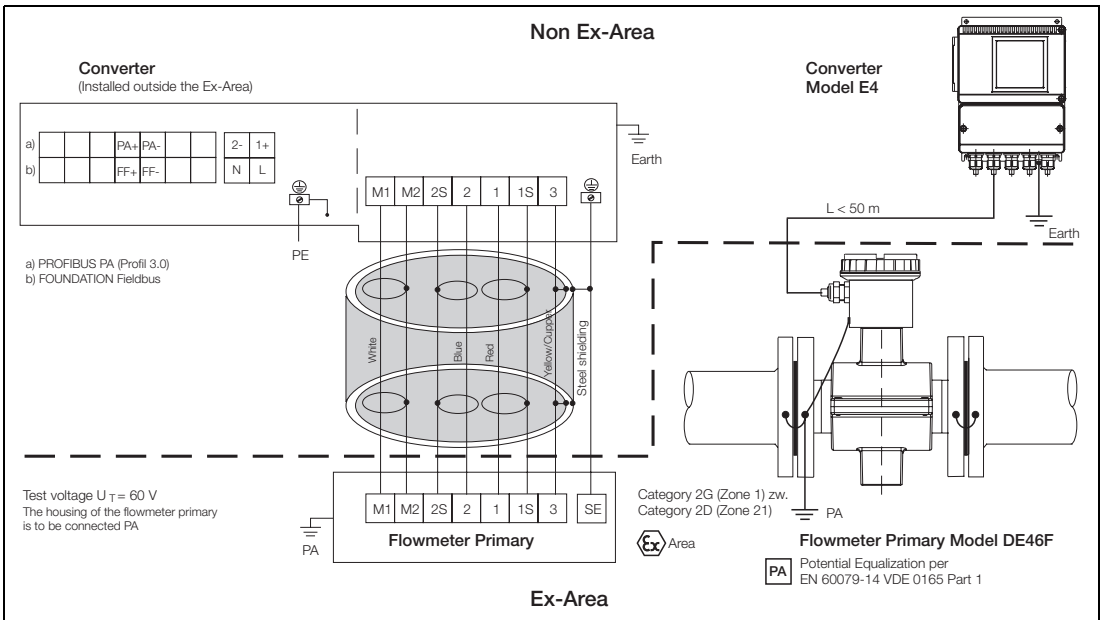
Air gaps and creepage paths are to be maintained.
Place insulating tubing over the cable shields.

Fig. 59: Flowmeter Primary FXE4000-DE46F (MAG-XE)

Danger!

The supply power must be in accord with the specifications on the Type Plate at terminals L (Phase) and N (Neutral) or 1+ and 2- of the converter and connected through a line fuse and a line switch.

4.9.2 Interconnection Diagram for Flowmeter Primary Model DE46F to External Converter Model E4 Designs Var. 14/15/16



Design a)

Terminals PA+, PA-
Connections for PROFIBUS PA per IEC 61158-2 (Profile 3.0),
U = 9-24 V, I = 13 mA (normal operation); 17 mA
(during fault / FDE)

Design b)

Terminals FF+, FF-
Connections for FOUNDATION Fieldbus (H1) per
IEC 61158-2
U = 9-24 V, I = 13 mA (normal operation);
17 mA (during fault / FDE)

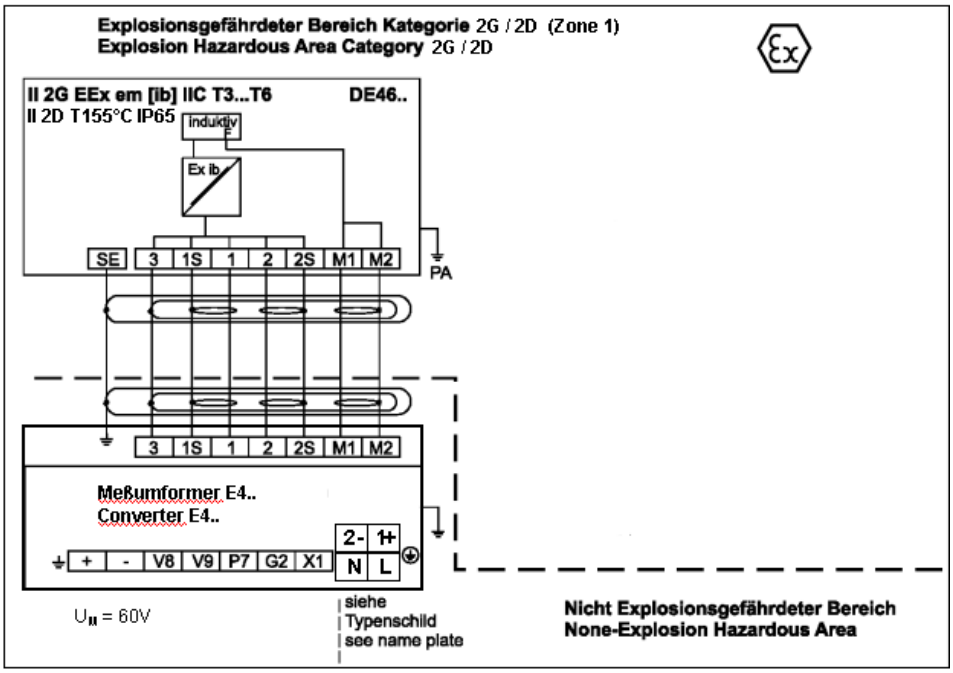
Supply power
See Type Plate

Shielded signal and excitation cable
Ordering No. D173D018U02 or
(D173D025U01, Option).
10 m cable included with shipment.

Notice!
For measurement reasons PA should be identical to the pipeline potential if possible.

Fig. 60: Interconnection Diagram for Flowmeter Primary Model DE46F to External Converter Model E4 Designs Var. 14/15/16

4.9.3 Safety Specifications for In- and Outputs for External Converter Model E4 Designs Var. 14/15/16



Safety Specifications

- Ambient temperatures -20 °C to +60 °C, minimum fluid temperature -25 °C

The max. voltage for the **non-intrinsically safe** circuits is U_T = 60 V.
Flowmeter primary values U_{Nom} = 60 V, $U_{Test} \geq$ 1500 V, signal cable Part No.: D173D018U02.
After turning the power to the flowmeter off wait at least t > 2 min. before opening the converter housing. At start-up the requirements in EN 50281-1-2 for applications with combustible dust must be observed. The operator must assure when the Protection Earth PE is connected that, even during a fault condition, no potential difference can exist between the Protection Earth PE and the Potential Equalization PA.

Notice!

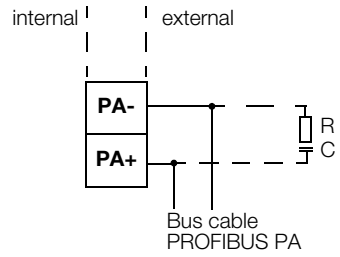
Observe the max. allow. ambient temperature, Temperature Classes, fluid temperature, the information for operation with thermally insulated pipelines and in areas with combustible dust. See also Chapter 7.

Fig. 61: Safety Specifications for In- and Outputs for External Converter Model E4 Designs Var. 14/15/16

4.9.4 Interconnection Examples for Peripherals to External Converter Model E4 Designs Var. 14/15/16

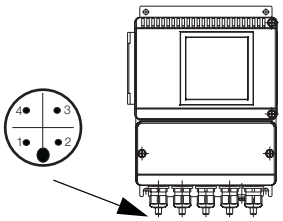
PROFIBUS PA

The resistor R and the capacitor C form the bus termination.
They are to be installed if the instrument is connected at the end of the bus cable.
R = 100 Ω; C = 1 µF



Connections using M12 plug (only for Design PROFIBUS PA)

Pin designations
(view from the front to the pin insert and pins
PIN 1 = PA+
PIN 2 = nc
PIN 3 = PA-
PIN 4 = Shield



The converter in a field mount hsg. can have a M12-plug installed (applies only for PROFIBUS PA).

As an option the bus termination can be made over a M12-plug instead of in the cable connector.
The instrument is then shipped completely wired. Compatible receptacles (Type EPG300) as well additional accessories may be found in the Parts Listing 10/63.6.44 DE.

Fig. 62: Interconnection Examples for Peripherals to External Converter Model E4 Designs Var. 14/15/16

5 Start-Up

5.1 Preliminary Checks of the Flowmeter System

5.1.1 Checking Flowmeter Primary FXE4000

The start-up and the operation must be in accord with ATEX 137 or BetrSichV (EN60079-14). The assembly and start-up as well as maintenance and service in the Ex-Area may only be performed by appropriately trained personnel. The start-up procedures described below are initiated after the installation and the electrical wiring of the flowmeter have been completed. The supply power is turned off.

Danger!
Information for opening the housing

The following information must be observed when the housing is to be opened.

- Assure that an explosion hazard does not exist.
- All connection leads must be potential free.
- When the housing is oped the EMC-, the personnel contact- and Ex-protections are voided.
- Before opening the housing wait at least 2 minutes after the supply power is turned off.

The surface temperature of the flowmeter primary may exceed 70 °C as a function of the fluid temperature!

Installations for intrinsic Safety "i" or Increase Safety "e"

The output circuits are designed so that they can be connected to either intrinsically safe or non-intrinsically safe circuits. A combination of intrinsically safe and non-intrinsically safe circuits is not permitted. For intrinsically safe circuits, Potential Equalization is to be established along the entire circuit. The test voltage for the non-intrinsically safe circuits is U_T = 60 V.

When connecting intrinsically safe circuits consider:

As shipped, the installed cable connectors are black. If the signal outputs are connected to intrinsically safe circuits, then the light blue caps included with the shipment should be used for the those cable entries.

By setting the jumpers the contact output and the pulse output (Terminal V8, V9 / P7, G2), if present, can internally be configured as a NAMUR-Contact for connection to a NAMUR-Amplifier.

The instrument is shipped in the standard configuration, not in the NAMUR configuration. To switch, the jumpers can be reset as shown in Fig. 63. (See also Chapter "Electrical Interconnection Diagrams").

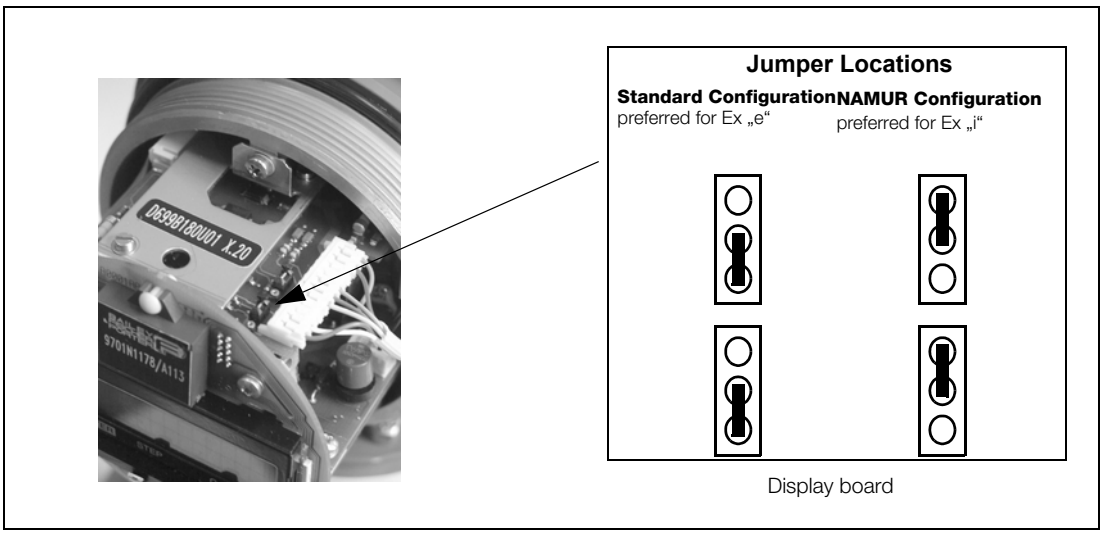


Fig. 63: Jumper Locations

5.2 Starting-Up the FXE4000 (COPA-XE)

First check if:

- the supply power is turned off.
- the supply power values correspond to the specifications on the Type Plate.
- the installation requirements have been considered.
- the installation site is essentially vibration free.
- the wiring was correctly installed per the Interconnection Diagrams.
- the ground connections were made as described.
- the temperature limits (Ex-Specifications) listed in the Operation Manual were maintained.
- the signal cable length for Model DE48 does not exceed10 m.
- the EEPROM is installed on the display board of the converter (see Fig. 64). The tag on the EEPROM lists an Order No. and a serial number whose end numbers are to be compared to those listed on the Type Plate on the converter for this EEPROM. **Both must be identical!**

Turn on supply power!

- After the power is turned on the flowmeter primary data in the external EEPROM are compared to those stored internally. If they are not identical, the data in the converter is automatically exchanged (uploaded).The converter displays the message "Primary data are loaded". The measurement system is ready for operation.
- The display indicates the instantaneous flowrate.
- It is only necessary to select or enter a few parameters to set up the instrument. The flow range is automatically set to 10 m/s. Enter the desired flow range in the Submenu „Qmax“. Hydraulically ideal flow range end values are approx. 2-3 m/s. In the „Submenu Current output“ the required output current range for the application can be selected. For the pulse output, the pulses per unit, the pulse width as well as the settings in the Submenu Totalizer are to be entered (see Chapter 8).
- The system zero should be checked (see Chapter 5.4).
- Finally, to complete the start-up, the Menu „Store data in external EEPROM“ should be called to save the settings which were made during the start-up. When a converter is exchanged the EEPROM is removed from the old converter and installed in the new converter.

5.3 Starting-Up the FXE4000 (MAG-XE)

First check if:

- the supply power is turned off.
- the supply power values correspond to the specifications on the Type Plate.
- the installation requirements were considered.
- the installation site for the converter is essentially vibration free.
- the wiring was correctly installed per the Interconnection Diagrams.
- the ground connections were made as described.
- the temperature limits (Ex-Specifications) listed in the Operation Manual were maintained.
- the signal cable length for Model DE46 does not exceed 50 m.
- the ambient temperature range for the converter (-20 °C and +60 °C) are maintained.
- all housing covers are closed and the safety closures engaged.
- the coordination between flowmeter primary and converter are correct. The flowmeter primary whose serial number end numbers (X1, X2, etc. on the Name Plate) is associated with the converter whose serial number end numbers (Y1, Y2, etc. on the Type Plate) are the same, i.e. Y1 and X1 constitute a one system.
- the EEPROM is installed on the display board of the converter (see Fig. 64). The tag on the EEPROM lists an Order No. and a serial number whose end numbers are to be compared to those listed on the Type Plate on the converter for this EEPROM. **Both must be identical!**

Turn on supply power!

- After the power is turned on the flowmeter primary data in the external EEPROM are compared to those stored internally. If they are not identical, the data in the converter is automatically exchanged (uploaded).The converter displays the message "Primary data are loaded". The measurement system is ready for operation.
- The display indicates the instantaneous flowrate.
- It is only necessary to select or enter a few parameters to set up the instrument. The flow range is automatically set to 10 m/s. Enter the desired flow range in the Submenu „Qmax“. Hydraulically ideal flow range end values are approx. 2-3 m/s. In the „Submenu Current output“ the required output current rage for the application can be selected. For the pulse output the pulses per unit, the pulse width as well as the settings in the Submenu Totalizer are to be entered (see Chapter 9.6).
- The system zero should be checked (see Chapter 9.6).
- Finally, to complete the start-up, the Menu „Store data in external EEPROM“ should be called to save the settings which were made during the start-up. When a converter is exchanged the EEPROM is removed from the old converter and installed in the new converter.

5.4 System Zero Check

The system zero of the system is set in the converter. The fluid in the flowmeter primary must be at absolute zero. The meter pipe of the flowmeter primary must be completely filled. Then the parameter “System zero” can be used to initiate an automatic adjustment or to enter a zero value manually: Select parameter with ENTER, and use the arrow keys to select either „automatic“ or „manual“. If „automatic“ is selected activate the adjustment routine with the ENTER-key. During the automatic adjustment the converter counts down from 255 to 0 in the 2nd line in the display, after which the system zero adjustment is completed. The adjustment takes approx. 20 seconds, see also Chapter 8.

Start-up of PROFIBUS PA instruments

A detailed description of the data link communication may be found in the separate Operation Manual

For PROFIBUS PA: Part No. D184B093U11

A Data Link Description is included with the shipment of a PROFIBUS instrument as well as the GSD-File.

5.5 Detector “Empty pipe”

At start-up the Detector “Empty pipe” is to be adjusted for the local operating conditions. For the adjustment procedure see Chapter 8.

Notice!

After the installation and start-up have been completed, all housing covers are closed and the safety closures engaged so that they can only be opened with special tools.

5.6 Converter Exchange

The parameter settings are stored in an EEPROM located on the display board. When a converter module is replaced, exchanging this EEPROM allows all parameter settings to be uploaded into the new converter. The converter specific data is automatically updated.

5.7 Socket for the Memory Module (external EEPROM)

The socket for the ext. EEPROM is located at the front of the display board or on the EEPROM-connection board for the versions without a display (see Fig. 64).

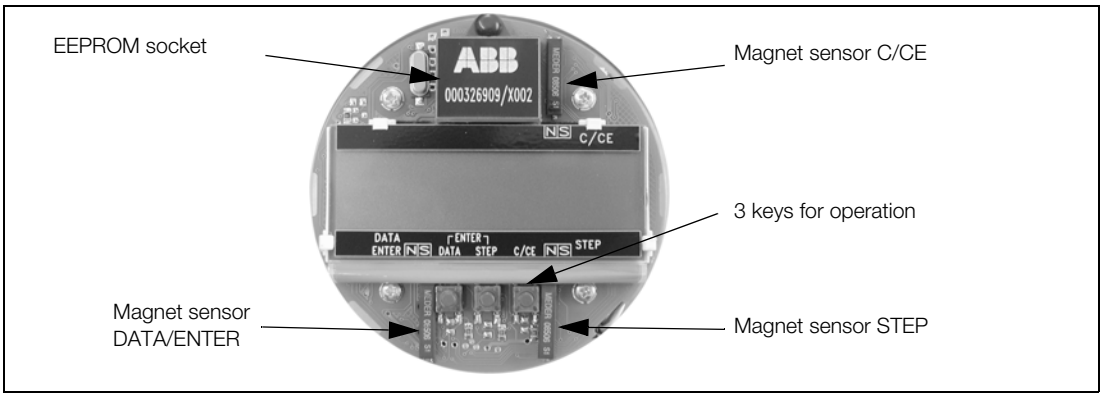


Fig. 64: Converter Keypad and Display

Notice!
Information for opening the housing

The following steps must be followed when the housing of the converter is to be opened:

- All connections leads must be potential free.
- When the housing is open the EMC-, the personnel contact- and the Ex-Protections are voided.
- Wait at least 2 minutes after the supply power is turned off before opening the housing.
- Before the housing is opened the security closures are to be loosened.

5.8 Display Rotation

Unscrew the cover. The display board is mounted using 4 Phillips head screws.

After the screws have been removed the display can be removed. The rotated display is to be carefully plugged into its new location and the 4 screws reinstalled. Replace the housing cover and carefully tighten and re-engage the security closures. Check that the gaskets are properly seated. Only then will the Protection Class be maintained.

Important!

If the flow direction indicators in the display do not coincide with the actual flow direction the parameter "Direction Indication" should be changed from "normal" to "inverse".

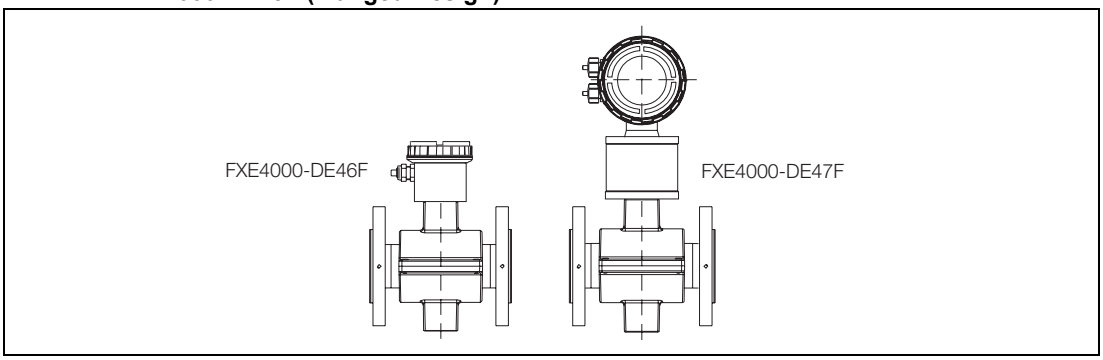
6 Specifications

6.1 Flanged Design Mod. FXE4000-DE46F / FXE4000-DE47F / FXE4000-DE48F

Notice!

Limitations of the allowable fluid temperature (TS) and the allowable pressure (PS) are a result of the liner and flange materials used (see Name and Type Plates on the housings). In addition, the temperature specifications in the Ex-Approval are to be observe.

6.1.1 Material Load Curves for Mod. FXE4000-DE46F / FXE4000-DE47F / FXE4000-DE48F (Flanged Design)



Max. Temperature ≤ 90 °C for hard/soft rubber liners
Max. Temperature ≤ 130 °C for PTFE/PFA liners

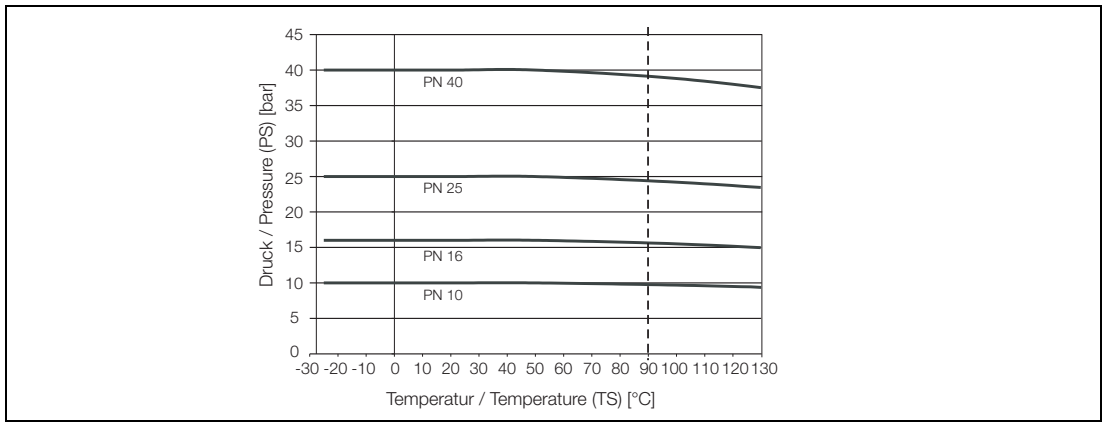


Fig. 65: DIN-Flanges SS 1.4571 [316Ti], to DN 600 [24"}

Max. Temperature ≤ 90 °C for hard/soft rubber liners
Max. Temperature ≤ 130 °C for PTFE/PFA liners

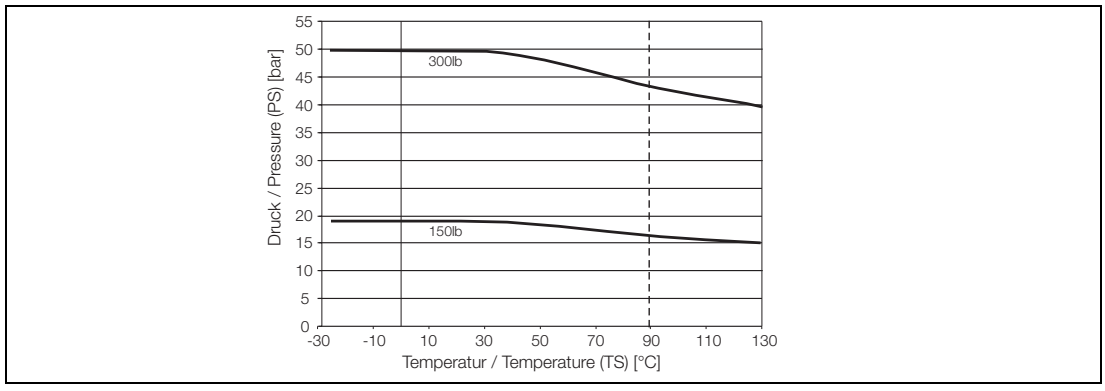


Fig. 66: ANSI-Flanges SS 1.4571 [316Ti], to 12" [DN 300] (CL 150/300); to 40" [DN 1000] (CL150)

Max. Temperature ≤ 90 °C for hard/soft rubber liners
Max. Temperature ≤ 130 °C for PTFE/PFA liners

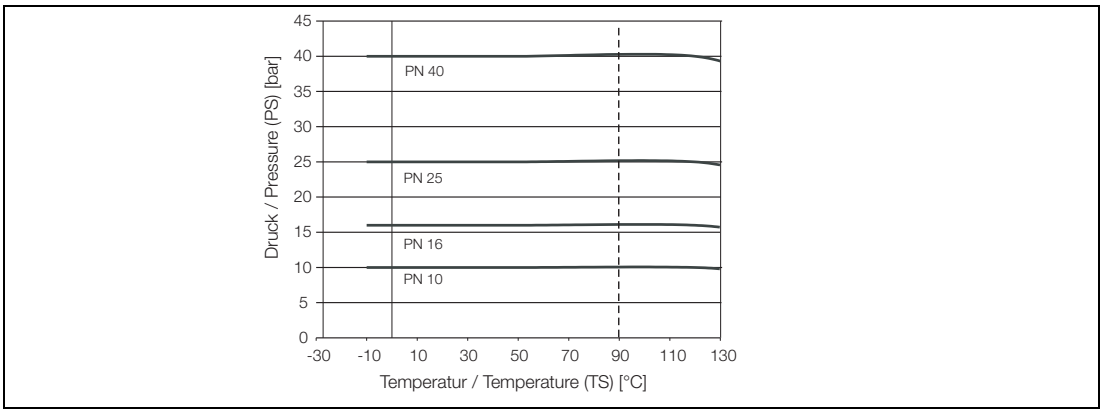


Fig. 67: DIN-Flanges Steel, to DN 600 [24”]

Max. Temperature ≤ 90 °C for hard/soft rubber liners
Max. Temperature ≤ 130 °C for PTFE/PFA liners

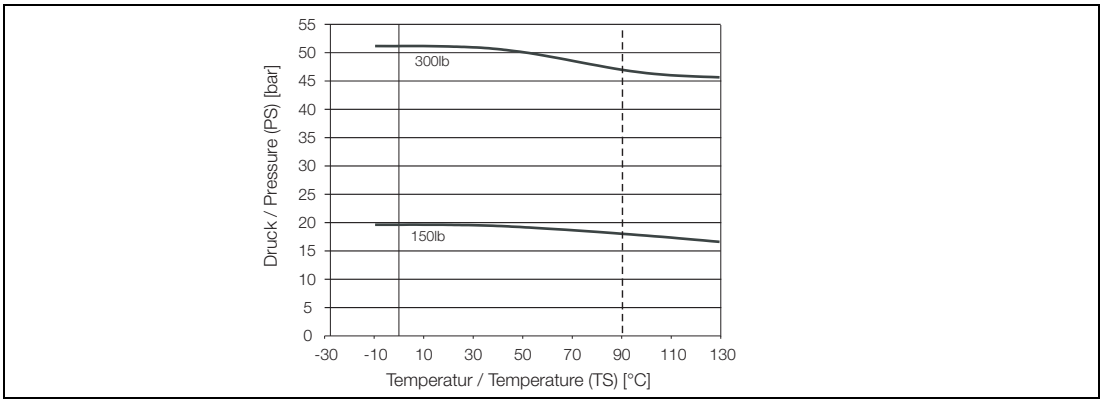


Fig. 68: ANSI-Flanges Steel to 12” [DN 300] (CL150/300); to 40” [DN 1000] (CL150)

JIS 10K-B2210 Flanges SS 1.4571 [316Ti] or Steel

Meter size DN	Meter size Inch	Material	PN	TS [°C]	PS [bar]
32–100	1-1/4 - 4	SS 1.4571 [316Ti]	10	-25 to +130	10
32–100	1-1/4 - 4	Steel	10	-10 to +130	10

Liner: PTFE, Hard/soft rubber (limited to 90 °C)

Max. Temperature ≤ 90 °C for hard/soft rubber liners

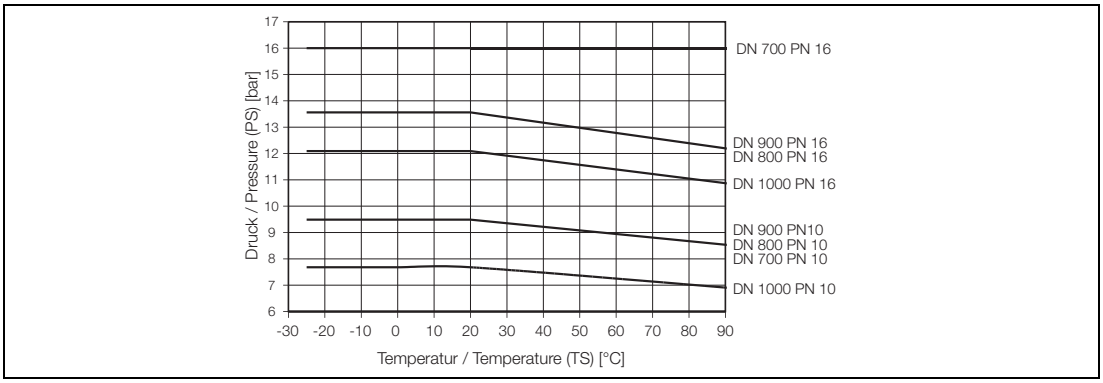


Fig. 69: DIN-Flanges SS 1.4571 [316Ti] DN 700 – DN 1000 [28” - 40”]

Max. Temperature ≤ 90 °C for hard/soft rubber liners

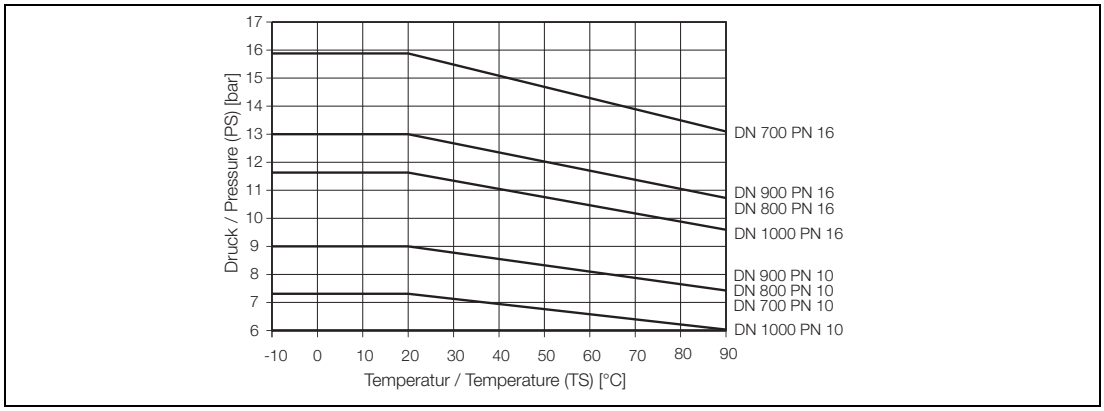


Fig. 70: DIN-Flanges Steel DN 700 – DN 1000 [28" - 40"]

6.1.2 General Specifications for Models FXE4000-DE46 / FXE4000-DE47 / FXE4000-DE48

Min. allow. pressure as a function of the fluid temperature

Liner	Meter size DN	Meter size Inch	$P_{Operate}$ mbar abs.	at	$T_{Operate}$ *) °C
Hard rubber	15 to 250	1/2 to 10	0		< 90
	300 to 1000	12 to 40	0		< 90
Soft rubber	50 to 250	2 to 10	0		< 90
	300 to 1000	12 to 40	0		< 90
PTFE	10 to 600	3/8 to 24	270 500		< 20 < 130 1)
PFA	3 to 100	1/10 to 4	0		< 130 1)

*) at 40 °C ambient temperature and Temperature Class T3

1) In meter sizes DN 25 and DN 32 [1" and 1-1/4"] for Model DE47F: $T_{Operate}$ ≤ 125 °C (Ex-Specifications) applies

Max. Allow. Cleaning Temperature

CIP-Cleaning	Liner Flowmeter Primary	T_{max} °C	t_{max} Minutes	$T_{Amb.}$ °C
Steam cleaning	PTFE, PFA	150	60	25
Liquid cleaning	PTFE, PFA	140	60	25

If the ambient temperature is > 25ºC, the difference must be deducted from the max. cleaning temp.,
T_{max} - Δ °C; Δ °C = ($T_{Amb.}$ - 25 °C)

For steam or liquid cleaning the temperature specifications in the Ex-Approval must also be observed!
See the Temperature Table in Chapter 7.1

Max. Allow. Fluid Temperature as a Function of the Ambient Temperature for Instruments with Steel Flanges

Observe the max. allow. temperatures specified in the Ex-Approval, see Chapter 7.1

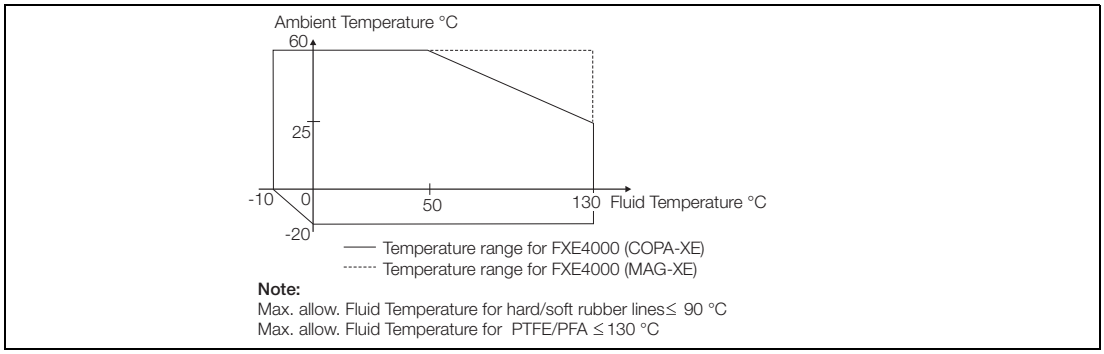


Fig. 71: Max. allow. Fluid Temperature as a Function of the Ambient temperature for Instruments with Steel Flanges, Observe Temperature Specifications in the Ex-Approval!

Max. Allow. Fluid Temperature as a Function of the Ambient Temperature for Instruments with Stainless Steel Flanges

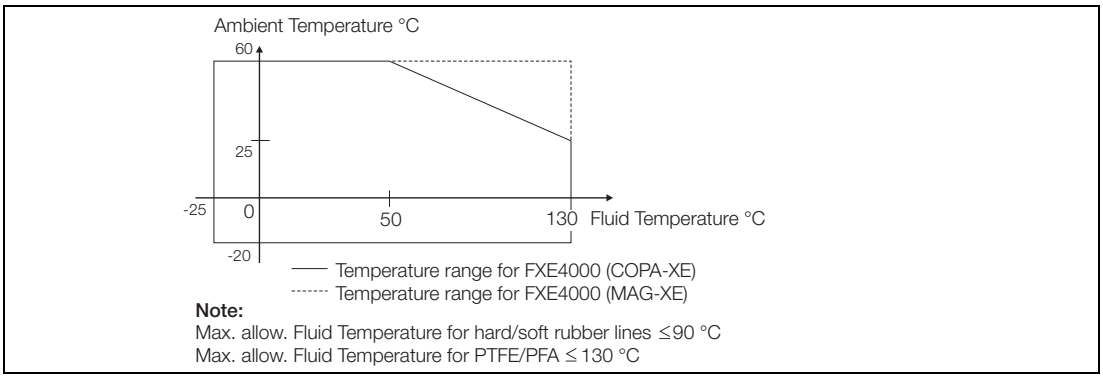


Fig. 72: Max. allow. Fluid Temperature as a Function of the Ambient temperature for Instruments with Stainless Steel Flanges, Observe Temperature Specifications in the Ex-Approval!

Ambient Requirements

Ambient Temperature

-20 °C to 60 °C

Materials Flowmeter Primary

Part	Standard	Others
Liner	PTFE, PFA, Hard Rubber, Soft Rubber	–
Signal and grounding electrodes for – hard rubber, soft rubber	SS 1.4571 [316Ti]	Hast. B-2 (2.4617), Hast. C-4, Titanium, Tantalum, Platinum-Iridium
– PTFE PFA	Hast. C-4 (2.4610)	SS 1.4571 [316Ti] Hast. B-2 (2.4617) Titanium, Tantalum Platinum-Iridium
Grounding plate for flanges	SS 1.4571 [316Ti]	upon request
Protection plate	SS 1.4571 [316Ti]	upon request

Process Connection Material

Part	Standard	Others
Flanges DN 3 - DN 15 1/10” -1/2” DN 20 - DN 300 3/4” - 12”	1.4571 (Standard) Steel (zinc plated)	 SS 1.4571 [316Ti]
DN 350 - DN 1000 14” - 40”	Steel (painted)	SS 1.4571 [316Ti]

Part	Standard	Others
Housing DN 3 - DN 300 1/10” -12”	Two piece housing Cast Alum., painted, Paint coat, 60 µm thick RAL 9002	–
DN 350 - 1000 14” -40”	Steel-welded construction, painted Paint coat, 60 µm thick RAL 9002	
Connection box	Alum. alloy, painted, 60 µm thick Frame: dark gray, RAL 7012 Cover: light gray, RAL 9002	–
Meter pipe	SS 1.4301 [304]	–
Pg-Connector	Polyamide	–

Protection Class per EN 60529

IP67
IP68 (only for FXE4000-DE46F flowmeter primary)

Pipeline Vibrations Using EN 60068-2-6 as a Guide

For Compact Design (COPA):

In the range of 10-58 Hz max. 0.15 mm amplitude
In the range of 58-150 Hz max. 2 g acceleration

For Instruments with a Separate Converter:

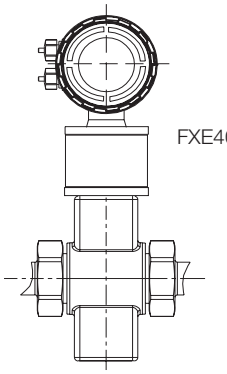
In the range of 10-58 Hz max. 0.15 mm amplitude

Designs

The lay lengths of the flanged instruments correspond to those defined in VDI/VDE 2641, ISO 13359 or per DVGW (Working Paper W420, Design WP, ISO 4064 short).

6.2 Specifications Stainless Steel Flowmeter, Model DE27, DN 3 to 100 1/10” to 4”

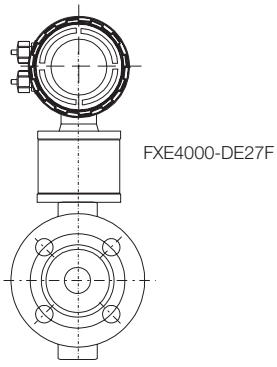
6.2.1 Material Loads for Variable Connections Model FXE4000-DE27



Process Connections Liner PFA	Meter size DN	 Inch	$PS_{max.}$ [bar]	$TS_{max.}$[°C] *)	$TS_{min.}$[°C]
Wafer Design	3– 50	1/10 - 2	40 (300 lb)	130*)	– 25
	65–100	2-1/2 - 4	16 (150 lb)	130*)	– 25
Weld stubs per ISO 2037	25–100	1 - 4	10	130*)	– 25
Weld stubs per DIN 2463	10–100	3/8 - 4	10	130*)	– 25
Weld stubs per DIN 11850	10 –100	3/8 - 4	10	130*)	– 25
Pipe fittings per DN 11851	3–100	1/10 - 4	10	130	– 25
Tri-Clamp per DIN 32676	3–100	1/10 - 4	10	121	– 25
External threads ISO 228	3– 25	1/10 - 1	10	130*)	– 25

*) Observe temperature specifications in the Ex-Approval

6.2.2 Material Load Curves for Flanged Connections for Model FXE4000-DE27F



Liner: PFA

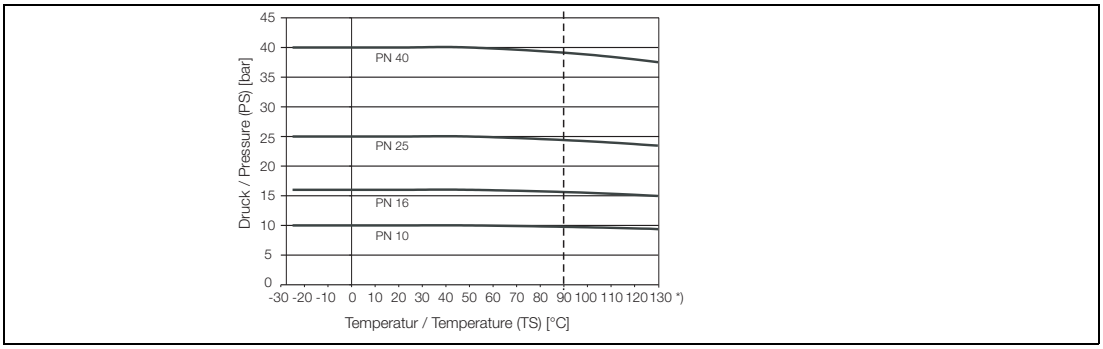


Fig. 73: DIN-Flanges SS 1.4571 [316Ti] to DN 100 [4”]

Liner: PFA

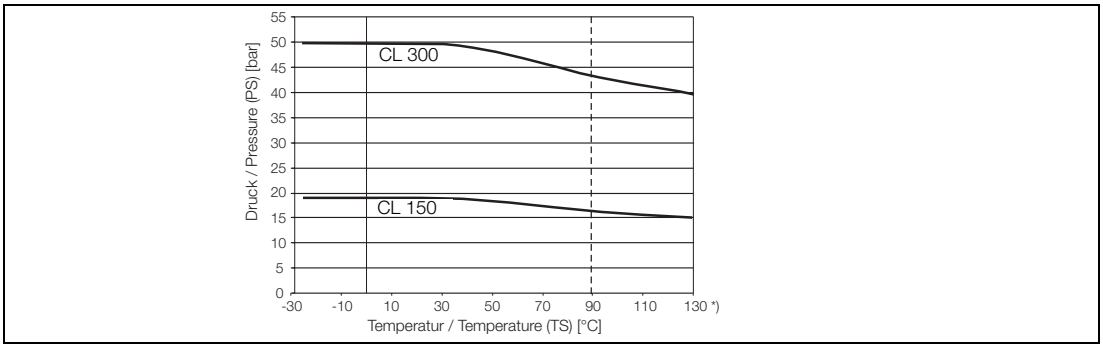


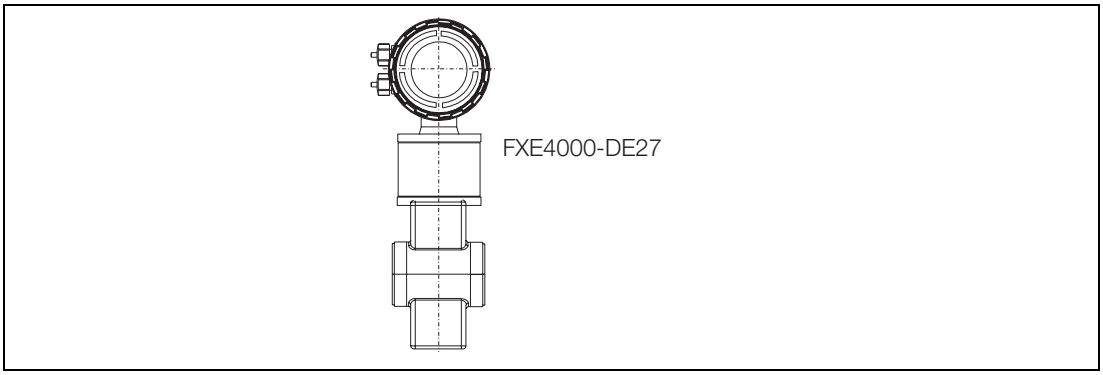
Fig. 74: ASME-Flanges SS 1.4571 [316Ti] to 4” [DN 100]

JIS 10K-B2210 Flanges SS 1.4571 [316Ti] or Steel

Meter size DN	Meter size Inch	Material	PN	TS [°C]	PS [bar]
25–100	1 - 4	SS 1.4571 [316Ti]	10	-25 to +130*)	10
25–100	1 - 4	Steel	10	-10 to +130*)	10

*) Observe temperature specifications in the Ex-Approval

6.2.3 Material Load Curves for Wafer Design for Model FXE4000-DE27



Liner: PFA

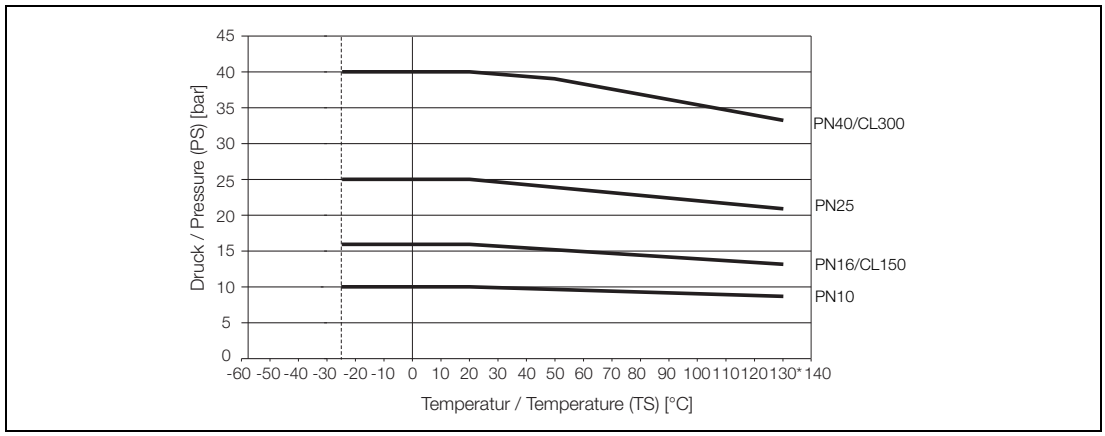


Fig. 75:

JIS 10K-B2210 Wafer Design

Meter size DN	Meter size Inch	Material	PN	TS [°C]	PS [bar]
32–100	1-1/4-4	SS 1.4404 [316] SS 1.4435 SS 1.4301 [304]	10	–25 to +130*)	10

*) Observe temperature specifications in the Ex-Approval

Minimum allow. Absolute Pressure

Liner	Meter size DN	Meter size Inch	$P_{Operate}$ mbar abs	at	$T_{Operate}$ °C *)
PFA	3 – 100	1/10 - 4	0	≤	130 [1)]

*) at 40 °C ambient temperature and Temperature Class T3

1) In meter sizes DN 25 and DN 32 [1" and 1-1/4"] for Model DE47F: $T_{Operate} \leq 125$ °C (Ex-Specifications) applies

Maximum allow. Cleaning Temperature

CIP-Cleaning	Liner	T_{max} °C	T_{max} Minutes	T_{Amb} °C
Steam cleaning	PFA	150	60	25
	PFA	140	60	25

For steam or liquid cleaning the temperature specifications in the Ex-Approval must also be observed!
See the Temperature Table in Chapter 6.5.
If the ambient temperature is > 25ºC, the difference must be deducted from the max. cleaning temp.,
T_{max} - Δ °C; Δ °C = ($T_{Amb.}$ - 25 °C).

Maximum allow. Temperature Shock

Liner	Temp. Shock max. Temp.-Diff. °C	Temp.-Gradient °C/min
PFA	any	any

Temperature Diagram

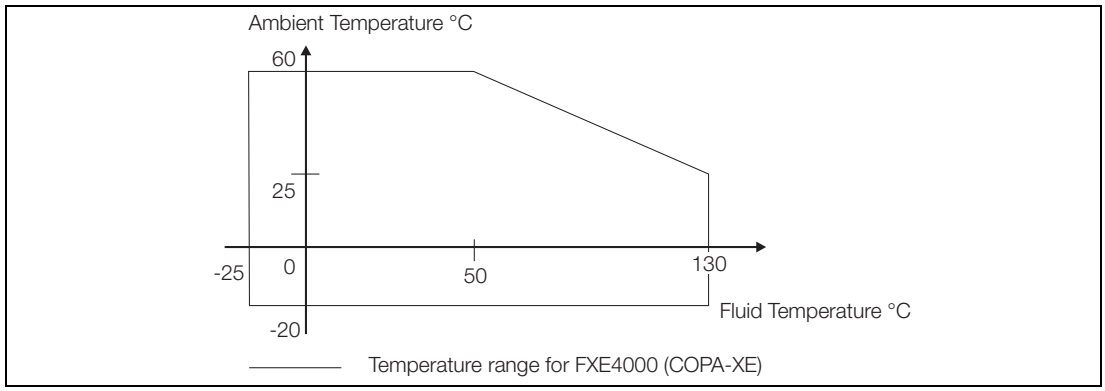


Fig. 76: Max. allow. Ambient Temperature as a Function of the Fluid Temperature for Instruments with Stainless Steel Connections and Wafer Designs (Observe Ex-Specifications!)

Ambient Requirements

Ambient temperature

-20 °C to +60 °C

Fluid temperature

-25 °C to +130 °C, CIP-cleaning capable, see Temperature Diagram and max. allow. cleaning temperature. Observe Ex-Specifications in Chapter 7.1.

Storage temperature

-20 °C to +70 °C

Materials Flowmeter Primary

Liner Material	Electrode Material		Electrode Design	
	Standard	Others	Standard	Others
PFA	Hast.-C4 (1.4539 for pipe fittings and Tri-Clamp	Hast.-B2 SS 1.4539 SS 1.4571 [316Ti] Tantalum, Titanium, Platinum-Iridium	Flat head	Pointed head (≥ DN 10 [3/8"])

Process Connection Material

	Standard
Flanges per DIN	SS 1.4571 [316Ti]
Wafer Design	None
Weld stubs	SS 1.4404 [316]
Pipe fittings per DIN 11851	SS 1.4404 [316]
Tri-Clamp per DIN 32676	SS 1.4404 [316]
External threads	SS 1.4404 [316]

Connection Box	Standard	Option
COPA-XE	Cast Alum., painted, Paint coat Frame: dark gray, RAL 7012 Cover: light gray, RAL 9002	
Meter pipe	SS 1.4301[304]	–
PG-Connector	Polyamide	–
Flowmeter Primary Hsg.	Deep drawn housing SS 1.4301[304]	

Gasket Material

Process Connections	Gasket Material
Wafer Design	None
Weld stubs, pipe fittings, Tri-Clamp, external threads	EPDM (Ethylene-Propylene) std. with FDA-Approval, Silicone with FDA-Approval (Option)
Housing flat gasket	Silicone

Protection Class per EN 60529

IP 67 Standard

Pipeline Vibrations Using EN 60068-2-6 as a Guide

For Compact Instruments (COPA):

In the range of 10-58 Hz max. 0.15 mm amplitude
In the range of 58-150 Hz max. 2 g acceleration

7 Ex-Specifications Information

7.1 Max. Ambient Temperatures, Temperature Classes, max. Fluid Temperatures per Ex-Approval TÜV97 ATEX1173X incl. supplements

7.1.1 Models FXE4000-DE27; FXE4000-DE47 (COPA-XE)

Max. Ambient Temperature °C	Temperature Class	Liner	Maximum allow. Fluid Temperature (Operating Specifications)		
			DN 3–20 [1/10" - 3/4"]	DN 25–32 [1" - 1-1/4"]	DN 40–100 [1-1/2" - 4"]
40°C	T3	PTFE/PFA	130	125	130
		Hard/soft rubber	90	90	90
	T4	PTFE/PFA	110	110	115
		Hard/soft rubber	90	90	90
	T5	PTFE/PFA	75	75	80
		Hard/soft rubber	75	75	80
	T6	PTFE/PFA	60	60	70
		Hard/soft rubber	60	60	70
50°C	T3	PTFE/PFA	130	125	125
		Hard/soft rubber	90	90	90
	T4	PTFE/PFA	110	110	115
		Hard/soft rubber	90	90	90
	T5	PTFE/PFA	75	75	80
		Hard/soft rubber	75	75	80
	T6	PTFE/PFA	60	60	70
		Hard/soft rubber	60	60	70
60°C	T3	PTFE/PFA	–	–	–
		Hard/soft rubber	–	–	–
	T4	PTFE/PFA	85	85	–
		Hard/soft rubber	85	85	–
	T5	PTFE/PFA	75	75	80
		Hard/soft rubber	75	75	80
	T6	PTFE/PFA	60	60	70
		Hard/soft rubber	60	60	70

Danger!
The higher Temperature Classes always include the lower ones. The lowest allow. fluid temperature is –25 °C. The max. allow. fluid temperatures specified in the tables are based on installations in non-insulated pipelines. The max. allow. temperature at the cable connectors is 70 °C.

7.1.2 Models FXE4000-DE46 (MAG-XE), FXE4000-DE48 (COPA-XE Separate Design)

Max. Ambient Temperature °C	Temperature Class	Liner	Maximum allow. Fluid Temperature (Operating Specifications)	
			DN 3–40 [1/10"-1½"]	DN 50–100 [2"-4"]
40°C	T3	PTFE/PFA	130	130
		Hard/soft rubber	90	90
	T4	PTFE/PFA	110	115
		Hard/soft rubber	90	90
	T5	PTFE/PFA	75	85
		Hard/soft rubber	75	85
	T6	PTFE/PFA	60	70
		Hard/soft rubber	60	70
50°C	T3	PTFE/PFA	—	130
		Hard/soft rubber	—	90
	T4	PTFE/PFA	110	115
		Hard/soft rubber	90	90
	T5	PTFE/PFA	75	85
		Hard/soft rubber	75	85
	T6	PTFE/PFA	60	70
		Hard/soft rubber	60	70
60°C	T3	PTFE/PFA	—	120
		Hard/soft rubber	—	90
	T4	PTFE/PFA	90	115
		Hard/soft rubber	90	90
	T5	PTFE/PFA	75	85
		Hard/soft rubber	75	85
	T6	PTFE/PFA	60	70
		Hard/soft rubber	60	70

Danger!
The higher Temperature Classes always include the lower ones. The lowest allow. fluid temperature is –25 °C. The max. allow. fluid temperatures specified in the tables are based on installations in non-insulated pipelines. The max. allow. temperature at the cable connectors is 70 °C. The converter for Model FXE4000-DE48 (COPA-XE Separate Design) can be operated to a max. ambient temperature of 60 °C . The Temperature Class is T6.

7.2 Information for Operation with Thermally Insulated Pipelines

When the flowmeter primary is to be insulated, the insulation may not extend above the lower edge of the insulation disk. The converter housing may not be insulated.

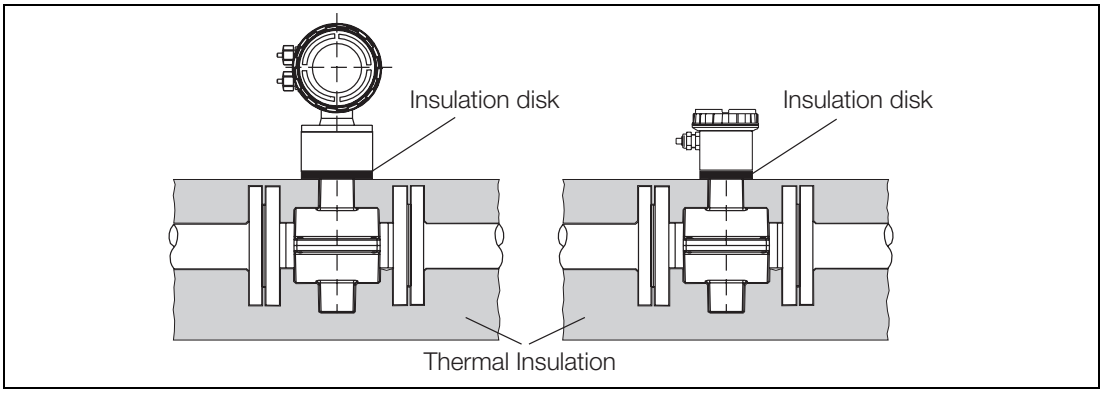


Fig. 77:

Danger!

It is essential that the temperature specification in the Ex-Approval be observed.

7.3 Additional Information for Operating Instruments in Areas with Combustible Dust

Notice!

The instrument has been approved for use in explosion hazardous areas (Gas and Dust; Zone 1, Zone 21). The dust explosion protection is assured, among other things, by the housing.

7.3.1 Ex-Marking

Die Ex-Marking is listed on the Type Plate, see Fig. 1.

7.3.2 Information for Opening and Closing the Housing

Notice!

When the housing is open the EMC-, the personnel contact- and the Ex-Protections are voided.
Before opening the housing, the supply power must be turned off. Wait at least 2 minutes after the supply power is turned off before opening the housing. The cover security closure must be engaged after the housing is closed.

Example

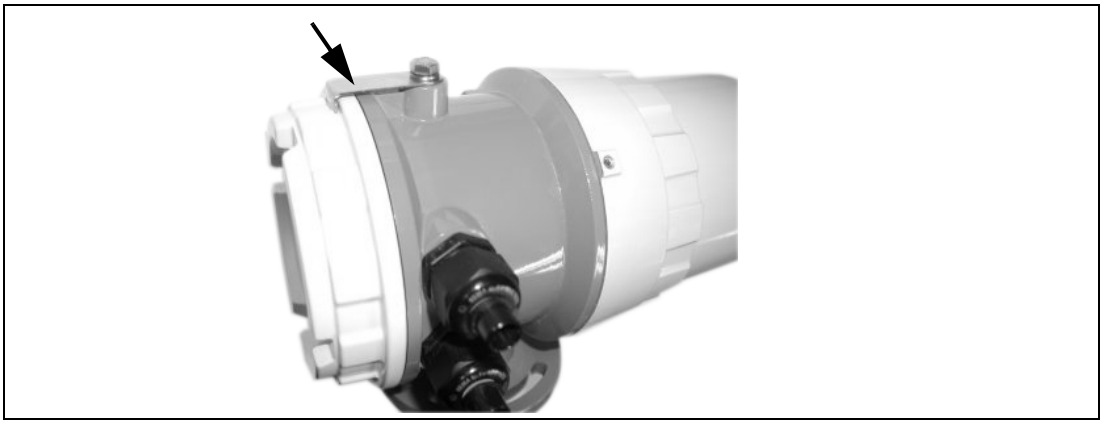


Fig. 78: Cover Security Closure for Compact Design Model DE47F and Model DE27

7.3.3 Protection Class of the Housing

The Protection Class of the instrument is listed on the Type Plate.

Standard: IP67
Option: IP68 (only for Model DE46)

Because the dust explosion protection, among other things, is assured by the housing, no changes (e.g. removing or omitting parts) may be made to the housing.

7.3.4 Max. allow. Surface Temperature/Dust Layer Thickness

Notice!

The surface temperature is T155 °C and applies for a dust layer thickness up to 5 mm. From these values, the minimum allowable ignition and glimmer temperatures of the dust atmosphere can be determined from EN50281-1-2.

For thicker dust layers the max. allow. surface temperature is to be reduced (see EN50281-1-2).

The dust may be electrically conductive or non-conductive.

7.3.5 Additional Standards which the User Must Consider.

For safe operation, the requirements in the EU Guideline ATEX 118a (Minimum Regulations for the Protection of Employees) are to be observed.

7.4 Special requirements according to EC-Type-Examination Test Certificate

The overvoltage class III may not be exceeded by connected circuits with power supply/circuits without power supply.

8 Programming the Converter

8.1 General Information about the Available Display Formats

After the power is turned on the Model Number of the converter is displayed in the first line and the Software Version and its Revision Level in the second line. Subsequently the actual process information for the instrument location appears in the display.

The actual flow direction (→F for forward or ←R for reverse) and the instantaneous flowrate value (percent or direct reading engineering units) are displayed in the first line. The totalizer value (7 digits) and its units are displayed in the second line.

The totalizer value always represents the actual measured value in the selected units independent of the pulse factor setting . This display format will be referred to as the „Process Information“.

The totalizer value for the other flow direction can be displayed by pressing the STEP or DATA key.

→F	98.14 l/h
→**F**	12.30000 **m3**

1st line Forward direction instantaneous flowrate value
2nd line Forward totalizer value

→F	98.14 l/h
←**R**	516.0000 **m3**

1st line Forward direction instantaneous flowrate value
2nd line Reverse totalizer value (multiplex operation)

→F	70.01 l/s
→F	10230 m3

1st line Forward direction instantaneous flowrate value
2nd Line Totalizer overflow . →F and m^3 blink

A totalizer overflow occurs when the totalizer value reaches 9,999,999 units. When the totalizer value in one flow direction exceeds 9,999,999 units, the flow direction symbol (→F or ←R) and the units text (e.g. m3) in the second line of the display blink. The totalizer can register up to 250 overflows in the software. The overflow message for each flow direction can be separately reset using ENTER.

During an error condition, a message is displayed in the 1st line.

Flowrate	>130 %
→**V**	10.230 **m3**

The error message in clear text and its Error Number are alternately displayed. During the clear text error message display only the error with the highest priority is displayed, while during the alternate display, all errors detected are displayed and identified by their Error Numbers.

Error Number	Clear Text	Cause
0	Empty pipe	Pipeline not full.
1	A/D saturated	A/D-Converter saturated.
2	Uref too small	Pos. or neg. reference too small.
3	Flowrate 130 %	Flowrate greater than 130 %.
4	Ex. zero return	Ext. zero return contact activated.
5	RAM defect	Data in RAM corrupted.
6	Totalizer	Totalizer value incorrect.
7	Urefp too large	Positive reference too large
8	Urefn too large	Negative reference too large
9	Erxcit. frequency	Frequency of the supply power or Driver-/Digital board incorrect.
A	Max. Alarm	Flowrate above max. alarm value.
B	Min. Alarm	Flowrate below min. alarm value.
C	Primary data	Error in external EEPROM or module is not installed.

Error Number Table listed by Priority

In addition to the error message in the display an alarm output over the optocoupler is activated and the current and pulse outputs are set to their alarm values (Menu „Iout at Alarm“) and the pulse output is always set to 0 Hz. (does not apply to Error 6).

8.2 Data Entry

Data can optionally be entered using a Magnet Stick without removing the housing cover. The Stick is held over the appropriate **NS** Symbol.

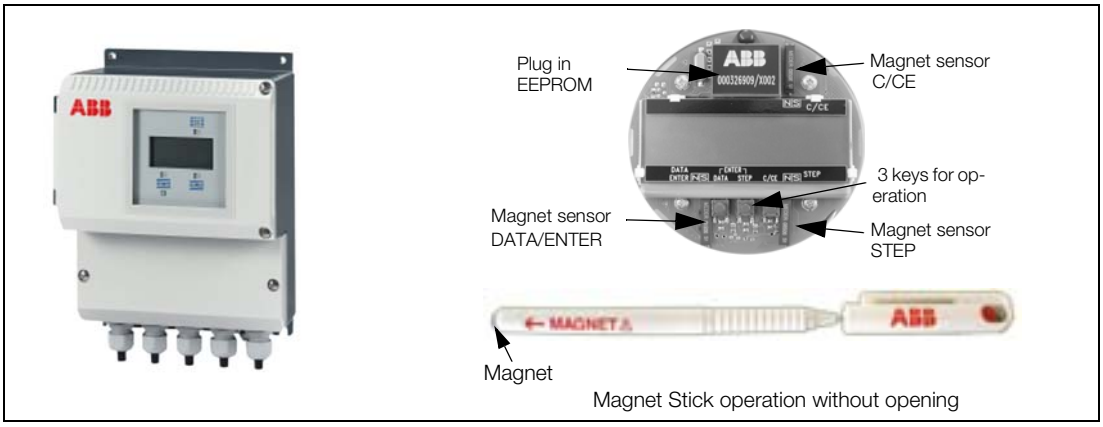


Fig. 79: Converter Keypad and Display

During data entry the converter remains on-line, i.e. the current and pulse outputs continue to indicate the present process status. Below the functions of the individual keys are explained:

C/CE	The C/CE-key is used to toggle back and forth between the operating mode and the menus.
STEP ↓	The STEP-key is one of two arrow keys. STEP is used to scroll forward through the menu. Any desired parameter can be accessed.
DATA ↑	The DATA-key is one of two arrow keys. DATA is used to scroll backward through the menu. Any desired parameter can be accessed.
	The ENTER function requires that both arrow keys, STEP and DATA, be pressed simultaneously.
ENTER	ENTER turns the Program Protection on and off. ENTER is also used to access the values in the parameter to be changed and to accept the new value or selection.
	The ENTER function is only active for approx. 10 Sec. If no entries are made during this 10 Sec. time interval the old value is redisplayed on the converter.

ENTER Function for Magnet Stick Operation

The ENTER function is initiated when the DATA/ENTER sensor is activated for more than 3 seconds. The display blinks to indicate that the function is active.

Data entry utilizes two different entry types:

- Numeric entry
- Entry from a predefined table.

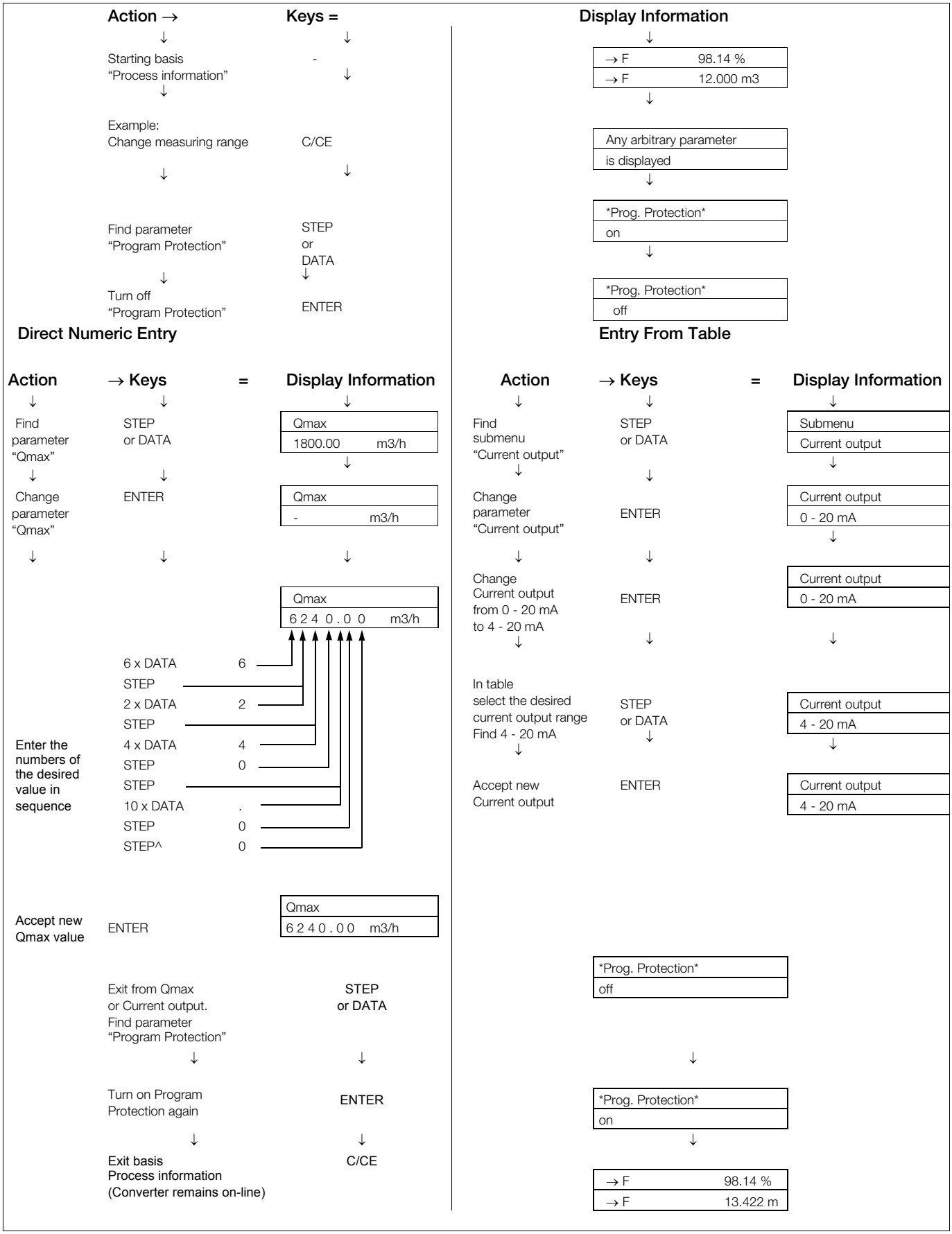
Important!

During data entry the entries are checked for plausibility and if necessary, rejected with an appropriate message.

Caution!

When the converter housing is opened, the EMC-, and the personnel contact protections are voided.

8.3 Data Entry in „Condensed Form“



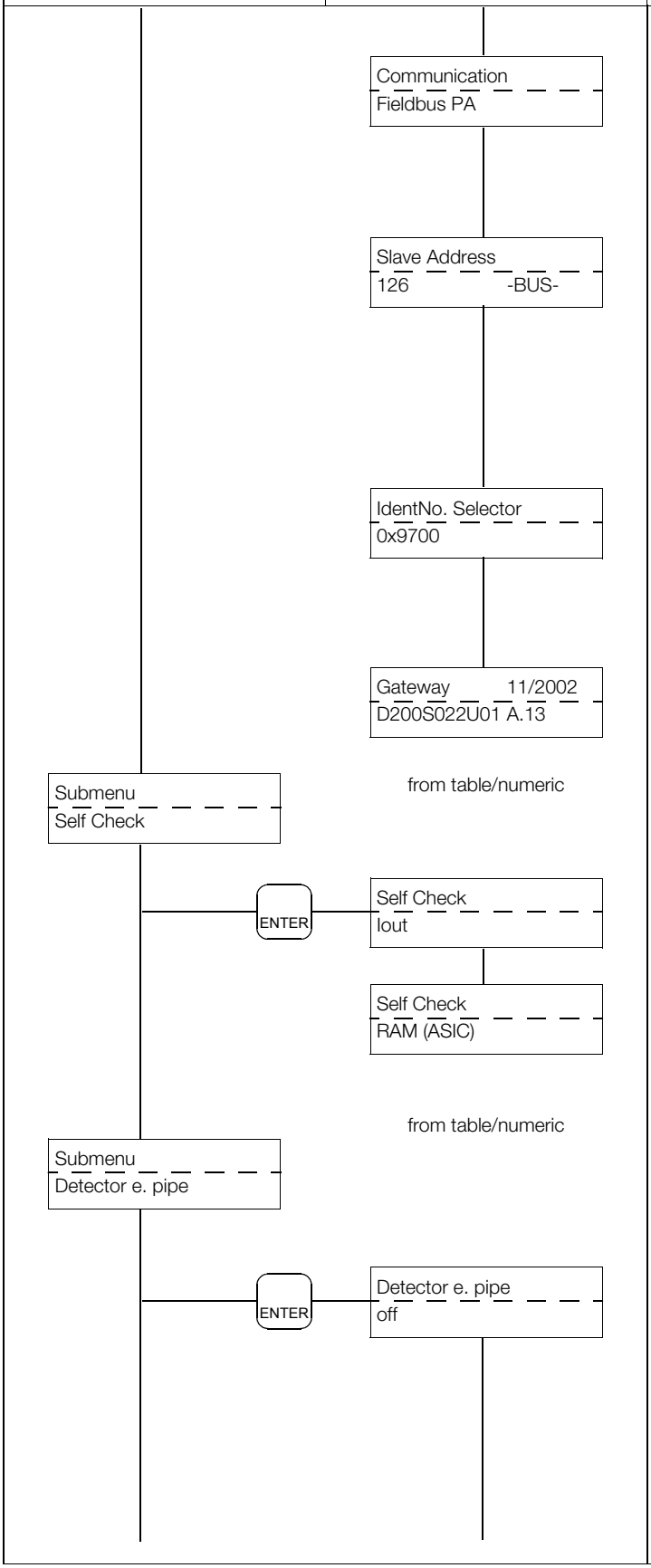
8.4 Parameter Overview and Data Entry

Submenu/Parameter	Entry Type	Comments
* Prog. Protection* off	from table/numeric	Data can only be entered or changed after the Program Protection has been turned off.
ENTER → * Prog. Protection* off	on/off	
PP-Code? 0		If a number other than „0“ (Factory setting) has been selected for the Program Protection Code, then this PP-Code (1-255) must be entered in order to turn the program protection off.
* Prog. Protection* off		Parameters can only be changed when the Program Protection is turned off.
Prog. Protection Code	numeric	After the Program Protection is turned off it is also possible to change the PP-Code.
ENTER → Old PP-Code? 0		Enter old PP-Code 0 = Factory setting
New PP-Code? 0		Enter the new PP-Code (1-255) and accept with ENTER. The new PP-Code is now active.
Language German	from table	German, English, French, Finnish, Spanish, Italian, Dutch, Danish, Swedish. For HART-Protocol PROFIBUS PA, FOUNDATION Fieldbus only German, English
Submenu Primary		This submenu includes, in addition to the meter size, other flowmeter primary related parameters. These cannot be changed. This values are those that are listed on the Name Plate on the flowmeter primary. They must be identical!
ENTER → Meter size DN 250 10 In		Present meter size, see Name Plate on flowmeter primary
Span Cs 6.25 Hz 56.123 %		Flowmeter span value Cs for the selected excitation frequency See Name Plate on flowmeter primary
Zero Cz 6.25 Hz 0.1203 %		Flowmeter zero value Cz for the selected excitation frequency See Name Plate on flowmeter primary
Short model no. DE4....		Flowmeter primary short Model Number
Order no. 000195368/X001		Order No. of the flowmeter primary. This number is identical to the number listed on the flowmeter primary Name Plate and on the sticker on the external EEPROM located above the display on the converter.

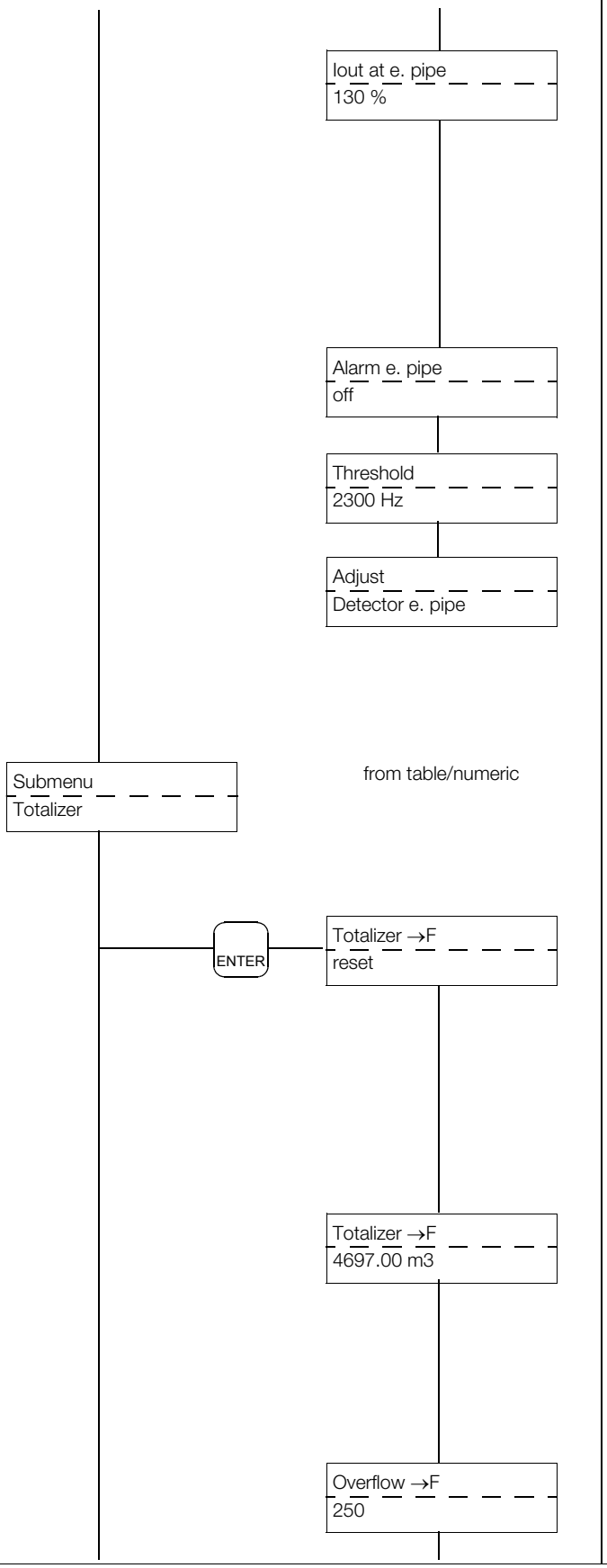
Submenu/Parameter	Entry Type	Comments
$Range_{max.}$ 10 m/s 1800.00 m3/h	numeric	$Range_{max.}$ (calibration factor) is the maximum flowrate at 10 m/s flow velocity for the meter size. The $Range_{max.}$ is automatically set when the meter size selection is made.
Qmax 400.000 m3/h		Flow range for forward and reverse flow directions. Min. flowrate end value setting 0.5 m/s Max. flowrate end value setting 10 m/s The units selection is made in Submenu Unit. (see also Chapter 9.7)
Pulse 1.0000 /m3		For int. and ext. flow totalizing, range 0.001 - 1000 pulses per unit, max. count frequency 5 kHz The units selection is made in Submenu Units. (see also Chapters 9.2 and 9.8)
Pulse width 30.000	numeric	For external pulse output, pulse width can be set from 0.1 to 2000 ms. For PROFIBUS PA and FOUNDATION Fieldbus this menu is not displayed. (see also Chapter 9.3)
Low flow cutoff 1.000 %	numeric	Range 0-10 % of the flow range set in „Qmax“. Applicable to the display indications and all outputs. If the flowrate is below the low flow cutoff setting, the flow is not measured. The current output is set to its zero value. Switching hysteresis for the low flow cutoff is 1%
Damping 10.0000 s	numeric	The damping can be set in the range from 0.5 to 99.9999 sec. The value refers to the response time for a step flowrate change from 0 to 99% . It effects the instantaneous flowrate value in the display and the current output.
Filter off	numeric	On/Off. (Factory setting = OFF). When the output signals are noisy, turn on the filter and set a damping time > 2.4 s. (see also Chapter 9.4)
Density 2.54300 g/cm3	numeric	If the flow totalization and the display are to be in mass units, g/kg/t/pound or uton, then a fixed density value must be entered for use in the conversion calculations. For converting the flowrate to mass flowrate units a density value from 0.01 to 5.0 g/cm^3 can be entered.
System zero 3.5 Hz		Zero adjustment (see also Chapter 9.6)
ENTER → Adjust manual		Manual entry
Adjust automatic		Valve must be closed. Pipeline must be full. Fluid must be at rest. The automatic adjustment is initiated by pressing ENTER.
Submenu Unit	from table/numeric	C/CE Exit the submenu (see also Chapter 9.7)
ENTER → Unit Qmax l/s		lbs/s,lbs/min, lbs/h, uton/min, uton/h, uton/day, l/s, l/min,l/h, hl/s, hl/min, hl/h, m3/s, m3/min, m3/h, igps, igpm, igph, mgd, gpm, gph, bbl/s, bbl/min, bbl/h, bbl/day, bbl/min, bbl/h, kg/s, kg/min, kg/h, t/s, t/min, t/h, g/s, g/min, g/h, kgal/s,kgal/min, kgal/h

Submenu/Parameter	Entry Type	Comments
Unit totalizer m3		ml, l, hl, m3, igal, gal, mgal, bbl, bls, kg, t, g, Ml, lb, uton, kgal
Unit factor 3785.41 Liter		If a desired unit is not listed in the table it is possible for the user to define a unit (user programmable unit) based on liters. The constant 3785.41 displayed in the example applies to kgal units (Factory setting).
Unit name kgal /s /min /h		Four character name for the user programmable unit.
Prog. Unit without density		Programmable unit for mass (with density) or volume (without density) flowrate)
Submenu Alarm	from table/numeric	C/CE Exit the submenu
ENTER → Error register 0 ... 3 ...		All detected errors (Error 0-9, A, B, C) are stored. ENTER can be used to clear the Error Register. First press ENTER and then STEP to display the clear text for every error.
Max. Alarm 130 %		The limits for the desired MAX-Alarm can be set in 1 % steps from 0 to 130 % of the flow range set in „Qmax“ . The limit applies to the forward and reverse flow directions. When the alarm selection is MAX-Alarm the contact across the terminals will be actuated when the flowrate exceeds the alarm setting value. An alarm condition is also always indicated in the display by an upward pointing, blinking arrow. →F 115.67 % →F 6789.12 l
Min. Alarm 10 %		Alarm, range 0-130 % of the flow range set in „Qmax“. The settings can be made in 1 % steps, switching hysteresis 1 % (see MAX-Alarm)
Submenu Prog. In-/Output	from table	This menu is not displayed for PROFIBUS PA and FOUNDATION Fieldbus. (see also Chapter 9.8)
ENTER → Terminal P7/G2 General alarm		The selections of signals assigned to the contact output terminals P7/G2 : General alarm[1)], empty pipe[1)], F/R-signal, no function, MAX-Alarm[1)], MIN-Alarm[1)], MAX/MIN-Alarm[1)] 1) Contact output can be configured as "normally opened or closed".
Terminal X1/G2 Ext. zero return		The selections for the functions assigned to the contact input terminals X1/G2: External zero return, Totalizer reset, external totalizer stop, no function. For HART-Protocol the external totalizer stop is not available. For PROFIBUS the contact input is not available. (see also Chapter 9.8)

Submenu/Parameter	Entry Type	Comments
Submenu Current output	from table	This menu is not displayed for PROFIBUS PA and FOUNDATION Fieldbus. For instruments which do not include the HART-Protocol option the menu structure of the Menu „Current output“ is as follows:
ENTER → Current output 0 - 20 mA		Current output 4 - 20 mA Selections 0-20 mA/4-20 mA, 0-10 mA/2-10 mA, 0-5 mA/9-10 mA, 10-20 mA/4-12 mA, 12-20 mA
Iout at Alarm 130 %		Iout at Alarm 130 % During an error condition the contact output in the converter can be actuated, and an error message displayed. The current output can also be set to a fixed value . The selections are 3.8 mA or 0 mA or 130 % of the selected current output range. For Error 3 Flowrate > 130 % the current output is always set to 130 % of the selected current output range. If „HART Communication“ was selected in the Submenu Data link (only available if this option was ordered), then the menu structure in the Menu „Current output“ is as follows: **Attention:** For HART Protocol the current output range is fixed at 4-20 mA. The value which the current output is to be set to during an error condition can be defined in the menu described below (for instruments with HART Protocol).
		Iout at Alarm Low Current output selections for an error condition are „Low“ or „High“. The „Low“ or „High“ status itself is set in the following menu.
		Low Alarm 4.000 mA User selectable range for the „Low“ status between 3.000 and 4.000 mA
		High Alarm 24.8 mA User selectable range for the „High“ status between 20.000 and 26.000 mA
		Error 3 mask off When „on“, no alarm is given if the flowrate is > 103 %
Submenu Data link	from table/numeric	The Submenu „Data link“ is only displayed when this option was ordered and is recognized by the converter. Details for HART-, PROFIBUS PA or FOUNDATION Fieldbus Communication may be found in the corresponding supplementary Operation Manuals.
ENTER → Communication HART		**1. Communication HART** (Only available when the instrument was ordered with this option).For this communication protocol the menu structure in the Submenu „Data link“ is as shown to the left: This display is for information only - there are no further selections.
Instr. address 000		For **HART-Protocol** an instrument address can be entered. The HART-Protocol has provisions for creating a bus with up to 15 instruments (1-15). **Attention:** When an address greater that 0 is set for HART-Protocol the instrument will operate in the Multidrop-Mode, i.e., the current output is fixed at 4 mA and there is only digital communication over the current output leads.

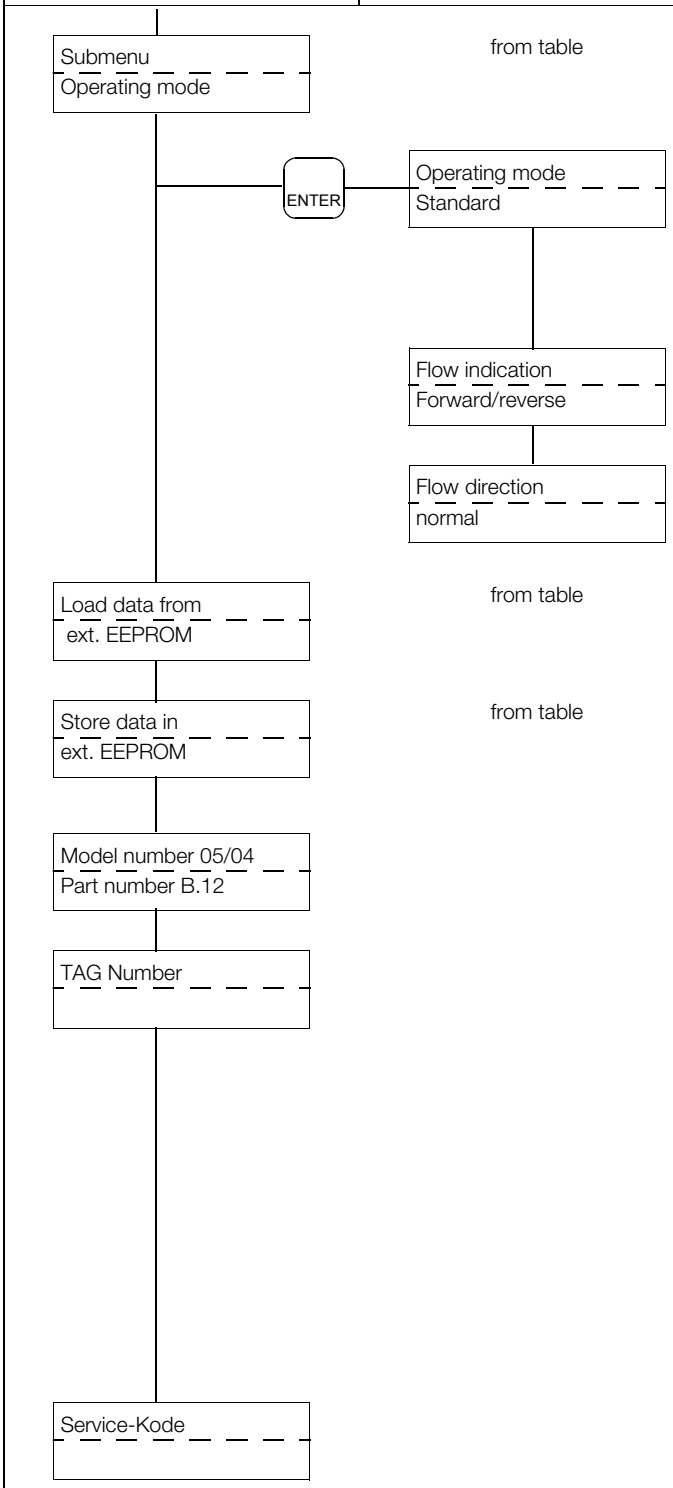


Submenu/Parameter	Entry Type	Comments
Communication Fieldbus PA		**2. Communication PROFIBUS PA 3.0/FOUNDATION Fieldbus FF** (Only available when the instrument was ordered with this option). see also Chapter 10.1. For this communication protocol the menu structure in the Submenu „Data link“ is as shown to the left: This display is for information only - there are no further selections.
Slave Address 126 -BUS-		Only for communication PROFIBUS PA (no function for FF) Display of the Slave Address. Factory setting: 126 Information for the DIP-Switches (see also Chapter 10.1) DIP-Switches 1 to 7 define the PROFIBUS Address DIP-Switch 8 defines the Address mode: **DIP-Switch 8 = Off** = Addressing over the Bus or keypad using the menus in the instrument, the message „-BUS-“ is displayed **DIP-Switch 8 = On** = Addressing using DIP-Switches 1-7, the message „-switch-“ is displayed Factory setting for DIP-Switch 8: Off
IdentNo. Selector 0x9700		Only for communication PROFIBUS PA (no function for FF) Setting the Ident-Number-Selectors. Selections are: 0x9700; 0x9740: 0x0691, 6668 Factory setting: 0x0691. A change during running cyclical communication is not possible, only during the status STOP. The Ident-Number 0x6668 assures backward compatibility with Profile 2.0
Gateway 11/2002 D200S022U01 A.13		Display of the Gateway software version Display only, no changes possible. If the instrument is not connected to the bus then the message „No Gateway“ is displayed“
Submenu Self Check	from table/numeric	
Self Check Iout	ENTER	This menu is not displayed for PROFIBUS DP/PA, FOUNDATION Fieldbus Self check current output, enter data in mA. Additional information see Chap. 9.9
Self Check RAM (ASIC)		Self check internal modules, auto. Test. RAM (ASIC), NVRAM, EPROM (Program), EEPROM, ext. EEPROM. Additional functions: Terminal P7/G2, Switch S201, display, Terminal X1/G2, HART-Command, Simulation and Test Mode. Additional information see Chap. 9.9
Submenu Detector e. pipe	from table/numeric	A full pipeline is essential for an exact measurement. If this requirement cannot be continuously fulfilled, then all the output signals can be automatically turned off when the pipe empties using the function „Detector empty pipe“.
Detector e. pipe off	ENTER	Use ENTER and confirm with STEP to turn the detector on or off. off = detector no function on = when the meter pipe is empty, a message is displayed. The following menus are displayed when the „Detector e. pipe“ is „on“.

Submenu/Parameter	Entry Type	Comments
		Current output status for an empty pipe: If for an empty pipe condition the detector and the alarm are turned on then the current output will be set as follows: For 0-20 mA, selections = 0 % = 0 mA or 130 % = 26 mA For 4-20 mA, selections = 0 % = 3.6 mA or 130 % = 26 mA For Error 3 (Flowrate >130 %) always set to 130 % = 26 mA. For HART-Protocol the selections for „Iout at e. pipe“ are „Low“ or „High“. The „Low“ or „High“ status itself is defined in the Menu „Current output“. The alarm output is actuated and the messages „Empty pipe“ and „Error 0“ are displayed. This menu is not displayed for PROFIBUS PA or FOUNDATION Fieldbus. on = when meter pipe is empty, signal over contact P7, G2 or Ux, P7 off = when meter pipe is empty, no signal over the contact This menu is not displayed for PROFIBUS PA or FOUNDATION Fieldbus. Threshold 2300 Hz for actuating the empty pipe alarm The meter pipe must be full. After pressing ENTER the following display appears (as an example) Adjust 1750 196 Use the STEP-or DATA key change the value 1750 to 2000 ± 25 Hz. Accept this value with ENTER. Now empty the pipeline/meter pipe. The value displayed must increase above the adjustment value set in the Menu „Threshold“. Then the detector empty pipe is adjusted. Exit the submenu The totalizer values and the overflow counters can be individually reset for the forward and the reverse flow directions by pressing ENTER. First the number of overflows (if there are any) are cleared and pressing ENTER again clears the totalizer values. When the totalizer has overflowed, the direction indicator and the units blink. The internal counter can register up to 250 overflows in the software. When an overflow occurs (totalizer value >9,999,999 units) the totalizer is reset and the overflow counter incremented by one. If more that 250 overflows have been registered, the message „Overflows >250“ is displayed. The forward totalizer is reset using the ENTER-key. If the overflow counter is >0, then only „Overflow” is displayed. This function is not available for certified instruments. The totalizer for „Forward“ or „Reverse“ flow directions can also be preset. Therefore when a converter is replaced the totalizer value from the old converter can be entered into the new one. Select the parameter with the arrow keys. The present totalizer value is displayed in the second line; after pressing ENTER a new totalizer value can be entered numerically, and the entry accepted using the ENTER-key. Preset totalizer (totalizer value enterable) 2nd line Display = present value This function is not available for certified instruments. Overflow max. 250, 1 Overflow = pulse counter >9,999,999 units (display value is reset and one overflow counted.

Submenu/Parameter	Entry Type	Comments
	Totalizer ←R reset	See forward totalizer
	Totalizer ←R 625.000 m3	See forward totalizer
	Overflow ←R 004	See overflow forward
	Tot. function Standard	Selections are: „Standard“ or „Difference Totalizer“ The section can be made using STEP and DATA keys and completed with ENTER. For the totalizer function „Standard“ the pulses are integrated on two separate totalizers, one each for the forward and reverse flow directions. If in the Menu „Operating Mode“ the selection „Forward“ was made, then only the forward totalizer counts. For the „Difference Tot.“ selection there is only one common internal totalizer for both flow directions. For the forward flow direction the pulses are added while for the reverse flow direction they are subtracted. The pulse output is not affected by this setting.
	Mains interrupt reset	If a blinking star is displayed in the first line, this indicates that a power outage has occurred, it can be cleared by pressing the ENTER-key. This function is only available for instruments with the HART-Protocol option.
Submenu Display	from table	C/CE Exit the submenu
ENTER	1st line Q [%]	Selection of the value to be displayed in the 1st line: flowrate in % or engineering units, totalizer forward, totalizer reverse, difference totalizer, TAG-Number or Bargraph
	2nd line Totalizer	See 1st line
	1st line multipl. Q [Bargraph]	In addition to displaying the values selected above in the 1st line it is possible to a second value to be displayed in multiple operation: flowrate in % or engineering units, totalizer forward, totalizer reverse, difference totalizer, TAG-Number, Bargraph or blank line
	2nd line multipl. off	In a 10 second cycle, the display alternates automatically between the two display selections.
		There are additional values which can be displayed for instruments with PROFIBUS PA or FOUNDATION Fieldbus: flowrate in % or engineering units, totalizer forward, totalizer reverse, difference totalizer, TAG-Number or Bargraph, plus: Slave address, Protection and Status; Channel, Mode, Status **Example when "Slave address, Protection and Status" are selected for the 1st line:** 1st line SlAdr Prot Stat This is how the information is displayed: Ad: 46 BUS Stop 1353 m3

Submenu/Parameter	Entry Type	Comments
		The first line shows the present BUS-Address of the instrument (here Ad: 46) then the Address Mode "Prot" (here: BUS; i.e. address is set over the bus and not by the DIP-Switches in the instrument. (See Chapter 10.1) When the DIP-Switch 8 is "ON", then the BUS Address is defined by the positions of DIP-Switches 1-7 and the display indicates "switch" instead of "BUS" The status of the communication is also displayed (here: Stop) (Operate, Clear or Stop) Operate for active cyclical communication. Stop when there is no cyclical communication active. The 2nd line in the above example shows the totalizer value **Example when "Channel, Mode and Status" are selected for the 1st line** 1st line Chan Mode Stat This is how the information is displayed A1 Auto Go.Cas 1353 m3 The first line indicates the channel (here A1) A1 corresponds to the AI-Block A2 corresponds to the totalizer block Tot 1 A3 corresponds to the totalizer block Tot 2 and in addition, the mode of the selected block is displayed (Auto, Manual or OOS - out of service) and its status (Go.Not = Good not cascade, Go.Cas = Good cascade, Bad, unc = uncertain) The 3 channels (A1, A2, A3) are displayed one after the other with their mode and status. **Example when "A1, Value and Unit" are selected for the 1st line** 1st line A1 Value Unit This is how the information is displayed A1 149,501 l 1353 m3 First the block is display from which the value and units originate A1 corresponds to the AI-Block A2 corresponds to the totalizer block Tot 1 A3 corresponds to the totalizer block 2 then its value is displayed (here 149,501) with engineering units (here "l" = Liter) The 3 channels (A1, A2, A3) are displayed one after the other with their value and units. **Information:** When an instrument is turned on and the BUS is not connected, a message "No Gateway" is displayed

Submenu/Parameter	Entry Type	Comments
		C/CE Exit the submenu Standard/Fast Standard: continuous flowrate measurements Fast: accelerated flowrate processing (short batch times >3 s or pulsating flow) The converter must be capable of operating at a higher excitation frequeny. In this operating mode an improved reproducibility is achieved for short metering cycles and pulsationg flows. Defining the flow direction to be metered „Forward/Reverse“ or only „Forward“. For „Forward“ the instrument only meters flow in the forward direction. The reverse flow is not metered or totalzized. „Normal“ or „Inverse“ Here the flow direction indicators in the display can be reversed. E.g. if the actual flow direction does not agree with the indicators, they can be reversed. To reverse the indicators select „inverse“ When a converter is exchanged the data stored in the ext. EERPOM will be automatically loaded into the new converter when the power is turned on. The ability also exists to store the data which exists in the converter into the external EEPROM upon command. **Important!** After start-up has been completed the settings must be stored in the external EEPROM. The same apllies whenever changes to the settings are made. Identification of the software version in the converter. 05/04 = Release date B.12 = Revision Level A max. 16-character alphanumeric TAG-Number for meter location identification can be entered with upper and lower case letters and numbers. For instruments with HART-Protocol, PROFIBUS PA or FOUNDATION Fieldbus the following menus are displayed: Communication TAG — An alphanumeric meter location identifier can be entered (8 characters) Customer TAG — An alphanumeric meter location identifier is displayed (16 characters). Can only be set over the BUS e.g. with SMART VISION Message — An alphanumeric meter location identifier is displayed (32 characters). Can only be set over the BUS e.g. with SMART VISION Only for ABB Service

9 Parameter Entries

9.1	Q_{max} / Numeric entry
9.2	Pulse Factor Forward and Reverse / Numeric entry
9.3	Pulse Width / Numeric entry
9.4	Filter (noise reduction) / Entry from table
9.5	Density / Numeric entry
9.6	System Zero / Numeric entry
9.7	Submenu Unit
9.7.1	Unit Q_{max} / Entry from table
9.7.2	Unit Totalizer / Entry from table
9.7.3	User Programmable Units
9.7.3.1	Unit Factor / Numeric entry
9.7.3.2	Unit Name / Entry from table
9.7.3.3	Prog. Unit / Entry from table
9.8	Submenu "Prog. In-/Output" / Entry from table
9.8.1	Function Terminal P7, G2 (Ux, P7 for PROFIBUS DP)
9.8.1.1	General Alarm (Error 0 to 9, A, B) / Entry from table
9.8.1.2	Empty pipe / Entry from table
9.8.1.3	F/R-Signal / Entry from table
9.8.1.4	No Function
9.8.1.5	MAX-Alarm / Entry from table
9.8.1.6	MIN-Alarm / Entry from table
9.8.1.7	MAX/MIN-Alarm / Entry from table
9.8.2	Terminal X1/G2 (not available with PROFIBUS PA/DP and FOUNDATION Fieldbus)
9.8.2.1	External Zero Return / Entry from table
9.8.2.2	External Totalizer Reset / Entry from table
9.8.2.3	External Totalizer Stop
9.8.2.4	No Function / Entry from table
9.9	Submenu Self Check / Numeric entry only for I_{out}

9.1 Q_{max} / numeric entry

The flow range end value, Qmax, applies to both flow directions. The flow range end value can be set anywhere between 0.05 $Range_{max.}$ and 1.0 $Range_{max.}$.

Qmax	
20.000	m3/min

The selection is made using the STEP and DATA keys. The units are selected in the Submenu „Unit“.

The values for the totalizer functions are checked based upon the selections for the pulse factor (0.01 to 1000 pulses/unit). the pulse width (0.1 ms to 2000 ms), the totalizer units (e.g. ml, l, m^3) or mass units (e.g. g, kg, t) together with the density correction factor. If any of these parameters are changed the resultant pulse width cannot exceed 50 % of the period of the output frequency at 100 % flowrate (on/off ratio 1:1). If the pulse width is greater, it is automatically reduced to 50 % of the period and the following message is displayed.

Attention! New
pulse width

If the output frequency is too low the following message is displayed:

Error 41
Freq. 0.00016 Hz

If the output frequency is too high the following message is displayed:

Error 40
Freq. 5 kHz

Qmax	
20.000	m3/min

9.2 Pulse Factor Forward and Reverse / numeric entry

The pulse factor is equivalent to the number of pulses for one metered flow unit transmitted on the pulse output (Terminals V8/V9) and for the internal flow totalizer. For instruments with PROFIBUS PA or FOUNDATION Fieldbus the totalizer value displayed is configured using this setting.

Pulse factor	
1.0000	/m3

If the pulse factor value is changed, the totalizer value is maintained in the selected units. The pulse factor can be set in the range from 0.001 to 1000 pulses/unit.

The pulse factor entered is checked against the selections for the flow range, the pulse width (0.1 ms to 2000 ms), the totalizer volume (e.g. ml, l, m^3) or mass units (e.g. g, kg, t) together with the density correction factor. If any of these parameters are changed, the pulse width cannot exceed 50 % of the period of the output frequency at 100 % flowrate (on/off ratio 1:1). If the pulse width is greater it is automatically reduced to 50 % of the period and the following message is displayed.

Attention! New
pulse width

If the output frequency is too low the following message is displayed:

Error 41
Freq. < 0.00016 Hz

9.3 Pulse Width / numeric entry

The pulse width (duration of the pulses) of the scaled pulse output can be set in the range from 0.1 ms to 2000 ms. For technical reasons the pulse width is always a multiple of 0.032 ms. On the one hand, the pulse width must be small enough so that at the max. output frequency (flowrate max. 130 % = 5 kHz) overlaps do not occur. On the other hand, it must be large enough so that any connected instrumentation can respond to the pulses.

Example:

Flow range = 100 l/min (Q_{max} = 100 % flow range end value)
Totalizer = 1 pulse/l

$$f = \frac{100\ \text{Pulses/min}}{60s} = 1{,}666Hz$$

and when the flow range end value is exceeded by 30 %

$$f = 1{,}666Hz \cdot 1{,}3 = 2{,}166Hz$$ (l/s) on/off ratio 1:1 (pulse width = off time duration)

$$t_p = \frac{1}{2{,}166s} \cdot 0{,}5 = 230ms$$

It is possible to set any value < 230 ms. Counters usually require a pulse width ≥ 30 ms.

Pulse width
230 ms

The converter automatically checks the pulse width selected. It may be max. 80 % of the pulse width of the output frequency at 130 % flowrate. If this limit is exceeded, the new value is rejected and the following message is displayed.

Error 46
Entry too large

For instruments with PROFIBUS PA or FOUNDATION Fieldbus the menu „Pulse width“ is not displayed.

Additional information for the active pulse output

When connecting an active or passive counter, the allowable current and frequency limits must be considered.

Example for an active pulse output:

Up to a max. output frequency of 4 Hz (4 pulses per second) the following applies: The pulse output may be loaded by the resistance of the counter with a current between 20 mA and 150 mA.

The ratio of pulse on/off may not be less than 1:4. The 24 V pulse drops off exponentially when loaded (see Fig. 80)).

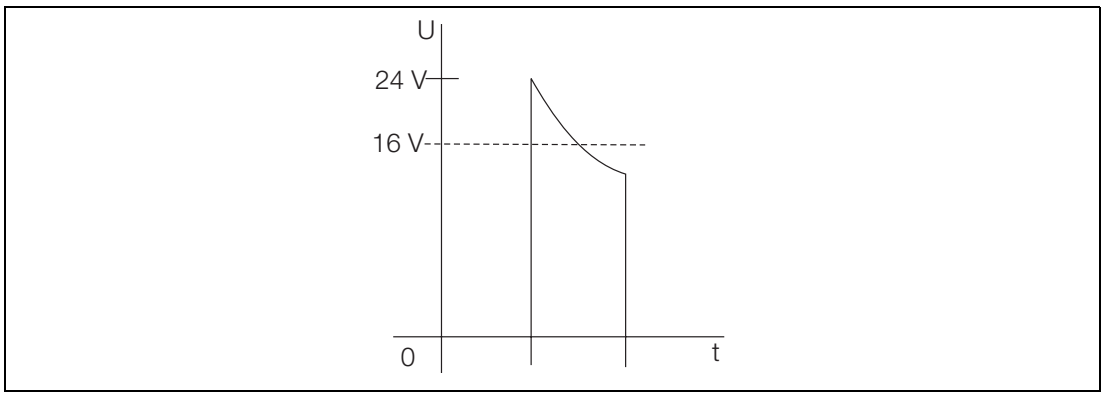


Fig. 80:

Example for a passive pulse output:

A passive 24 V counter or a SPC is connected: The max. output frequency of the flowmeter is 5 kHz (5000 pulses per second).
For this type of connection the specifications for the optocoupler (internal in the instrument) must be considered:

Optocoupler specifications:
f_{max} 5 kHz
0 V ≤ U_{CEL} ≤ 2 V, 16 V ≤ U_{CEH} ≤ 30 V
0 mA ≤ I_{CEH} ≤ 0.2 mA, 2 mA ≤ I_{CEL} ≤ 220 mA

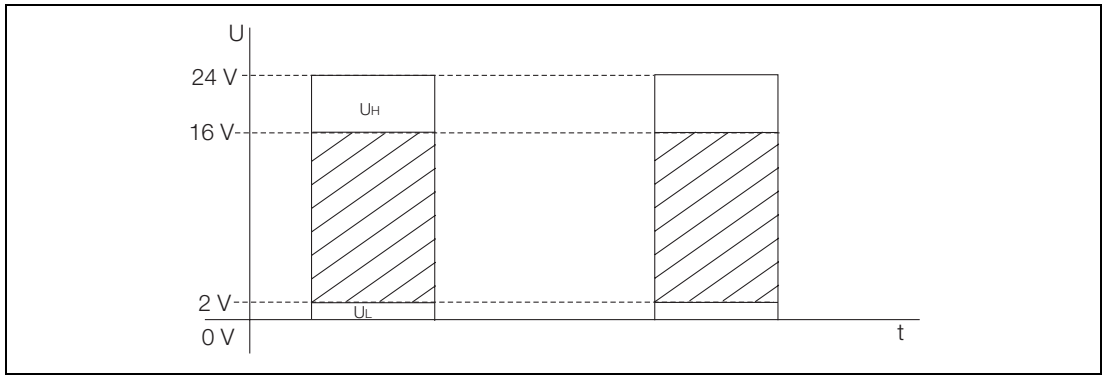


Fig. 81:

9.4 Filter (Noise Reduction) / entry from table

A digital filter is incorporated in the converter especially for pulsating flows or very noisy flow signals. The filter quiets the values in the flowrate display and smooths the current output. The damping can be reduced when the filter is turned on. The response time of the converter is not affected.

The „Filter“ is turned „on“ using the STEP or DATA keys and then pressing ENTER. The filter is active if the damping time > 2.4 s is set.

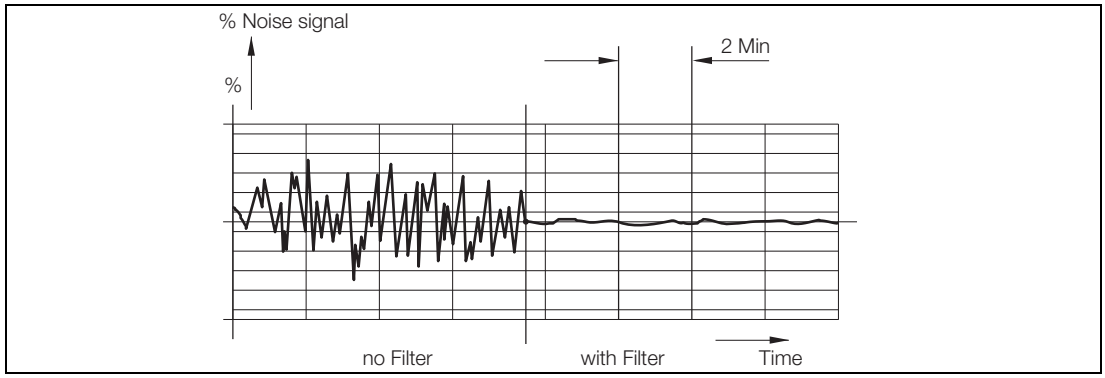


Fig. 82: Converter Output Signal with/without Filter

9.5 Density / numeric entry

Density	
2.54300	g/m3

When the flowrate indications and the totalization are to be in mass units, g., kg., t, pounds or uton, a fixed density value can be entered for the calculations. The density used for the conversion to mass flowrate can be set in the range from 0.01 to 5.00000 g/cm^3.

9.6 System zero / numeric entry

After the installation has been completed the zero should be adjusted at the converter. The flowrate is to be reduced to zero. The adjustment can be made automatically by the converter. A value can also be entered manually. The zero value can be set to 0 Hz by pressing the C/CE key. A measured output frequency value at zero flowrate can be manually entered as a correction factor.

Select the parameter "System zero" and press ENTER.

System zero
3.5 Hz

For security the following message is displayed:

The choice between “manual” and “automatic” can be made with the STEP or DATA keys.

Pressing ENTER initiates the automatic adjustment procedure in the converter. The values in the display count down from 255 to 0. This procedure is repeated 4 times. The final zero value must be within the limits set by the converter of ± 50 Hz. If the value is outside of the limits the zero value is rejected. The value determined by the converter is displayed in the 2nd line.

9.7 Submenu Unit

The following functions and parameters are included in this submenu:

- Direct reading engineering **Unit Qmax**
- Direct reading engineering **Unit totalizer**
- Direct reading engineering Unit with a user programmed **Unit factor**
- **Unit name** user selectable and
- User programmed **Prog. Unit** with/without a density correction.

Submenu
Unit

The last three entry parameters are required for any user desired units which are not included in the program or in the table in Chapter 9.7.1. When this function is utilized, the factory set unit "kgal" is replaced by the new unit.

9.7.1 Unit Q_{max} / entry from table

The units listed in the following table can be selected using the STEP and DATA keys and accepted by pressing ENTER.

Unit	Qmax
l/s	

Units	Standard	HART/PROFIBUS/FOUNDATION Fieldbus
Liter	l/s	l/s
	l/min	l/min
	l/h	l/h
Hectoliter	hl/s	
	hl/min	
	hl/h	
Cubic meter	m^3/s	m^3/s
	m^3/min	m^3/min
	m^3/h	m^3/h
Imperial-gallon per	ipgs	ipgs
	igpm	igpm
	igph	igph
U.S-mill-gallon per day	mgd	mgd
U.S.gallon per	gpm	gpm
	gph	gph
Barrel-Brewery	bbl/s	bbl/s
	bbl/min	bbl/min
	bbl/h	bbl/h
Barrel-Petrochemical	bls/day	
	bls/min	
	bls/h	
Kilogram	kg/s	kg/s
	kg/min	kg/min
	kg/h	kg/h
Ton (metric)	t/s	
	t/min	t/min
	t/h	t/h
Gram	g/s	g/s
	g/min	g/min
	g/h	g/h
Milliliter	ml/s	
	ml/min	
	ml/h	
Megaliter	Ml/min	
	Ml/h	
	Ml/day	
Pound (454 g)	lb/s	lb/s
	lb/min	lb/min
	lb/h	lb/h
US-Ton	uton/min	
	uton/h	
	Uton/day	
	kgal/s	kgal/s
	kgal/min	kgal/min
	kgal/h	kgal/h

The units selected apply to $Range_{max.}$, Q_{max} and to the instantaneous flowrate values in the display when the display is selected for direct reading engineering unit.

9.7.2 Unit totalizer / entry from table

The units listed below apply to the totalizer values in the 2nd display line and can be selected using the DATA and STEP keys. They may be different than the flowrate units. The engineering units selection is accepted by pressing ENTER.

Unit totalizer
m3

Unit: ml, Ml, lb, uton, kgal, l, hl, m3, igal, gal, mgal, bbl, lbs, kg, t, g.

The engineering units selected for the totalizer values are checked by the converter as a function of the flow range, the pulse factor (0.01 to 1000 pulses/unit), the pulse width (0.1 ms to 2000 ms) and the density correction factor when mass units (g, kg, t) have been selected. If any of these parameters are changed, the pulse width may not exceed 50 % of the period of the output frequency at 100 % flowrate (on/off ratio 1:1). If the pulse width is greater it is automatically reduced to 50 % of the period and the following message is displayed:

Attention! New
pulse width

If the output frequency is too high an error message is displayed:

Error 41
Frequency <0.00016 Hz

If the output frequency is too low following message is displayed:

9.7.3 User Programmable Units

With this function it is possible to program any desired engineering units in the converter. The following three parameters are included in the this function:

a) Unit factor

b) Unit name

c) Prog. Unit with/without density

Entering data in the parameters a), b) and c) is only necessary if the desired direct reading engineering units are not listed in the table integrated in the converter.

9.7.3.1 Unit Factor / numeric entry

This parameter displays the factor for the new unit based on liters. Factory setting is kgal = 3785.41 Liter.

9.7.3.2 Unit name / entry from table

The name selection is made using the STEP and DATA keys. Scroll through the alphabet forward with DATA. The lower case letters appear first followed by the upper case letters. Pressing the STEP key shifts the entry location. A maximum of four letters can be entered.

Unit factor
kgal /s /min /h

The time units - /s, /min and /h - can be assigned to the new programmed units.

9.7.3.3 Prog. Unit / entry from table

This function is utilized to indicate whether the programmed units are mass units (with density) or volumetric units (without density).

Prog. Unit
without density

9.8 Submenu "Prog. In-/Output" / entry from table

In this submenu the various in-/output functions can be assigned to the switch contact terminals P7/G2 or X1/G2.

Output function:	Terminal P7/G2 or Ux/V8
Input function :	Terminal X1/G2

For instruments with PROFIBUS PA or FOUNDATION Fieldbus these terminals are not available. For instruments with PROFIBUS DP is the input function (terminals X1/G2) are not available and the output function utilizes terminals Ux/P7.

9.8.1 Function Terminals P7, G2 (Ux, P7 for PROFIBUS DP only Model FXE4000-DE46F)

One of the following functions can b assigned to the switch contact P7, G2.

General alarm (Error 0-9, A, B)	(9.8.1.1)*	
Empty pipe	(9.8.1.2)*	(only available if the Detector Empty Pipe is turned on
F/R-Signal	(9.8.1.3)	
No function	(9.8.1.4)	
MAX-Alarm	(9.8.1.5)*	
MIN-Alarm	(9.8.1.6)*	
MAX/MIN-Alarm	(9.8.1.7)*	

* Can be configured as normally opened or closed. The desired configuration is selected using the STEP/ DATA keys.

Normally closed, i.e. the contact opens when the signal is applied.

Normally opened, i.e. the contact closes when the signal is applied.

9.8.1.1 General Alarm (Error 0 to 9, A, B) / entry from table

Terminal P7/G2
General alarm 

All detected errors (Error 0 to 9, A, B) are signalled over the terminals. During an error condition the contact on terminals P7, G2 is activated, in this example, opens.

9.8.1.2 Empty Pipe / entry from table

When the parameter "Detector Empty Pipe" is turned on, the current output is set to its selected alarm value and the totalization is halted. The empty pipe signal is activated, in this case the contact opens, and the messages "Empty Pipe" and "Error 0" are displayed.

Terminal P7/G2
Empty pipe 

9.8.1.3 F/R-Signal / entry from table

Terminal P7/G2
F/R-Signal

The forward and reverse flow directions are shown by a direction arrow in the display and over the contact output P7, G2.

9.8.1.4 No Function

Terminal P7/G2
No function

When "No Function" is selected no signals are transmitted over terminals P7, G2.

9.8.1.5 MAX-Alarm / entry from table

Terminal P7/G2
MAX-Alarm 

When this function is selected a signal is activated on the terminals when the flowrate exceeds the alarm value setting, in this case the contact opens.

9.8.1.6 MIN-Alarm / entry from table

Terminal P7/G2
MIN-Alarm 

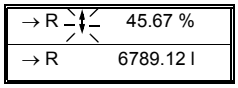
If a signal over the terminals is desired when the flowrate drops below the alarm value then MIN-Alarm should be selected, in this case the contact closes.

9.8.1.7 MAX/MIN-Alarm / entry from table

When MAX/MIN-Alarm is selected a signal is indicated when the flowrate is outside of the alarm values set in MAX-Alarm and MIN-Alarm. i.e. when the flowrate is greater than the MAX-Alarm value or less than the MIN-Alarm value.

Terminal P7/G2
MAX/MIN-Alarm

In this mode it is also possible to indicate when the flowrate is within the two alarm values set in MIN- and MAX-Alarm. For this configuration the MAX-Alarm value must be set smaller than the MIN-Alarm value. When the flowrate is within this range, a signal is indicated in the display and over the terminals P7/G2.



Example:

MAX-Alarm = 20 %
MIN-Alarm = 80 %
Blinking double arrow indicates flowrate between 20 and 80 %.

9.8.2 Terminal X1/G2 (not available with PROFIBUS PA/DP and FOUNDATION Fieldbus)

The input function to be assigned to the contact input terminals X1. G2 can be selected with the STEP/DATA keys:

- External zero return
- External totalizer reset
- External totalizer stop (not with HART-Protocol)
- No function

9.8.2.1 External Zero Return / entry from table

This input function for Terminals X1/G2 can be selected to turn off the outputs (current and pulse) when the flowmeter is empty or during a cleaning cycle (CIP).

Terminal X1/G2
Ext. zero return

The instantaneous flowrate value continues to be displayed when the zero return function has been activated.

9.8.2.2 External Totalizer Reset / entry from table

The input contact X1/G2 can be utilized to reset the forward and reverse flow totalizers and overflow counters.

Terminal X1/G2
Totalizer reset

9.8.2.3 External Totalizer Stop

When the input is activated the flow integration is halted and the message “Totalizer Stop” is displayed instead of the totalizer values. This function is not available with HART-Protocol.

Terminal X1/G2
Ext. tot. stop

9.8.2.4 No Function / entry from table

Terminal X1/G2
No Function

The input contact is inactive when “No Function" has been selected.

9.9 Submenu Self Check / numeric entry only for I_{out}

Submenu
Self Check

The Self Check offers a variety of functions to test the instrument independent of the present flowrate value. When the Self Check is active the converter in no longer on-line (current and pulse outputs no longer reflect the present operating conditions). The individual test routines can be selected with the STEP and DATA keys.

I_{Out} , RAM (ASIC), NVRAM, EPROM (Program), EEPROM, External EEPROM, Terminal P7/G2, Switch S201 (not for the certified designs), display, pulse output, Terminal X1/G2, HART Command, HART Transmitter, Simulation and Test Mode.

The Check can be terminate with the C/CE key.

Select I_{Out} and press ENTER and then enter the desired value in mA (for HART-Protocol enter in %). Check for the correct output at the connection terminals + and - with a Digital Multimeter (mA range) or with the process instrumentation.

Important!

No automatic return to process metering. Terminate by pressing the C/CE key.

Select **Pulse Output** and press ENTER. A frequency of 1 Hz with a 500 ms pulse width is applied to the scaled pulse output.

Select **Terminal P7/G2** and press ENTER. The alarm contact can be toggled on and off using the STEP or DATA keys. Monitor the response at terminals P7 and G2 with an ohmmeter.

Select **RAM** (ASIC) and press ENTER. The converter automatically tests the RAM and displays its diagnosis.

Select **NVRAM** and press ENTER. The converter automatically tests its NVRAM and displays its diagnosis.

Select **EPROM** (Program) and press ENTER. The converter automatically tests the EPROM and displays its diagnosis.

Select **EEPROM** and press ENTER. The converter automatically tests the EEPROM and displays its diagnosis.

Select **S201** and press ENTER. The settings for switch S201 on/off and the jumpers BR 201... 5 are detected by the converter and the "functions that are active" are indicated in the display by an asterisk * after the Code Number is entered.

Select **Display** and press ENTER. The converter writes the numbers 0 to 9 and the letters A to F in the 1st and 2nd lines of the display. Visually monitor for proper operation of the dot matrix.

Terminal X1/G2
Select **External Zero Return** and press ENTER. Apply an external 24 V DC voltage across terminals X1 and G2. Plus polarity to X1. The converter indicates off/on.

Terminal X1/G2
Select **Totalizer Reset** and press ENTER. Apply an external 24 V DC voltage across terminals X1 and G2. Plus polarity to X1. The converter indicates off/on.

Select ****Simulation**** and press ENTER. Use the STEP or DATA key to turn simulation "on or off".
When the simulation is turned on, press C/CE to return to process metering. Any desired flowrate value in steps of 1 % can be set. The output values correspond to the flowrate value entered. The message **Simulation** is displayed in the 2nd line alternately with the totalizer value. After completion of the simulation program the parameter **Simulation** should be turned off.

Test Mode
When the converter is to checked with an external Simulator, the parameter Test Mode must be set to "on".

Only for HART-Protocol:

HART-Command
The commands addressed to the converter are displayed. Displayed are the No. and the slot of the HART Command.

Important!

No automatic return to process metering. Terminate by pressing the C/CE key.

HART Transmitter
This function is used to check the HART Communication. Press ENTER and select „1200 Hz“ or „2200 Hz“ with STEP. The selected frequency will be transmitted continuously by the converter over the current output until the menu is closed with C/CE.

10 Communication

10.1 PROFIBUS PA (Profile 3.0)

This portion of the Operation Manual contains information for the converter design with Communication PROFIBUS PA .

The fieldbus converter is designed for connection to a Segment Coupler DP/PA as well as to the ABB Multi-barrier MB204.

The PROFIBUS PA data link in the FXE4000 (COPA-XE or MAG-XE) conforms to Profile 3.0 (Fieldbus Standard PROFIBUS, EN 50170, alias DIN 19245 [PRO91]). The transmission signal of the converter corresponds to IEC 61158-2.

The manufacturer specific PROFIBUS PA Ident-No. for the converter is : 0691 hex.

The instrument can also be operated with the PROFBUS Standard Indent Numbers 9700 or 9740. The settings in the coveter are made in the submenu „Data link“. The Ident-No. 0x6668 assures backward compatibility with Profile 2.0. If the converter is operated with 0x6668, acyclical communication is not possible.

The intrinsically safe design of the FXE4000 (COPA-XE or MAG-XE) is designed in accordance with the FISCO-Model.

10.1.1 Planning Information

The following figure show a typical PA-Network.

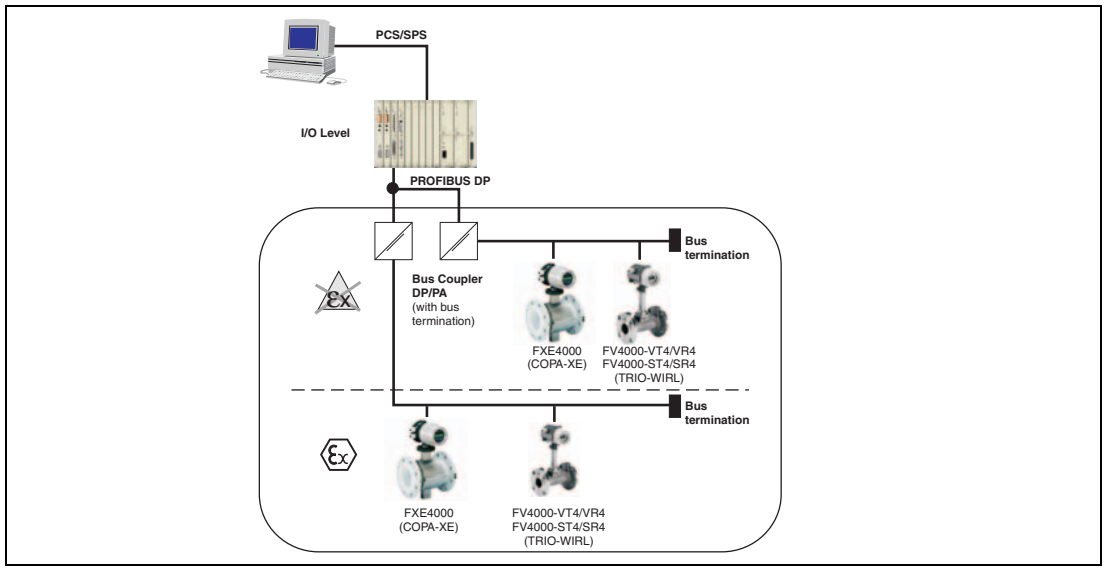


Fig. 83: Typical PA-Network

The allowable cable length for a segment including all the tap lines is, according to the FISCO-Model without any special Ex-Considerations, limited to max. 1000 m. It is a function of the cable type and Ignition TYpe (Ex-Protection). A shielded, twisted cable is recommended (based on IEC 61158-2 Types A or B are preferred).

The maximum number of participants in a segment are listed in the following table:

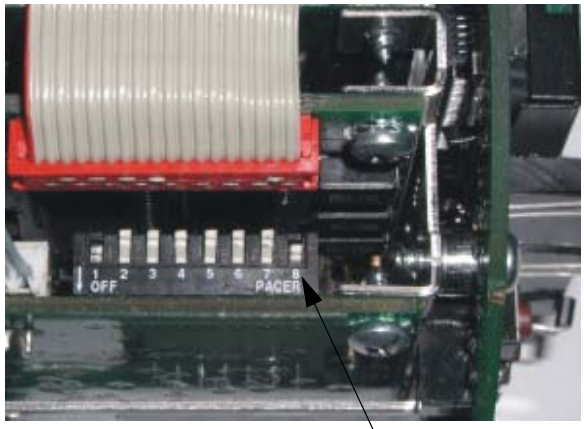
DP/PA-Segment Coupler	Type I	Type II	Type III
Application area	EEx ia/ib IIC	EEx ib IIC	EEx ib IIB
Supply voltage Us	13.5 V	13.5 V	13.5 V
Supply current Is	≤ 110 mA	≤ 110 mA	≤ 250 mA
Loop resistance Rs	≤ 40 Ω	≤ 40 Ω	≤ 18 Ω
Cable length Type B (0.5 mm^2)	≤ 500 m	≤ 500 m	≤ 250 m
Cable length Type A (0.8 mm^2)	≤ 900 m	≤ 900 m	≤ 400 m
Number of participants at 10 mA	7	7	17

Additional detailed Network Planning Information may be found in the Brochure „PROFIBUS - Solutions from ABB" (No. 30/FB-10). Accessories such a splitters, connectors and cable may be found in the Parts Listing 10/63-6.44. Also, additional expanded information may be found on our homepage at http://www.abb.de as well as on the Profibus User Organization http://www.profibus.com.

10.1.2 Setting the Bus Address for PROFIBUS Communication

If no bus address information was supplied by the customer, the instrument was shipped with its Bus-Address set to „126". This address must be reset during start-up of the FXE4000 (COPA-XE or MAG-XE) to a number within the valid range (0 - 125). An address may only be used once within a segment.
The setting can be made either locally at the instrument (using the DIP-Switches located on the digital board) or using System Tools or a Profibus DP Master Class 2, such as SMART-VISION. The factory setting is DIP-Switch 8 = Off, i.e., the address is to be set over the fieldbus. The front cover can be unscrewed to change the settings.

It is also possible to set the address on a powered instrument using the menu, accessed by the keys on the display board.



DIP-Switch 8

Example for setting the address locally (DIP-Switch 8 = On):

Switch 1,5,7 = On → 1 + 16 + 64 = Bus address 81

Switch	1	2	3	4	5	6	7	8
Status	Instrument Address							Dress Modes
Off	0	0	0	0	0	0	0	Bus
On	1	2	4	8	16	32	64	Local

DIP-Switch Settings
DIP-Switches 1 to 7:
PROFIBUS Address
Switch 8:
Defines the addressing mode:
Off = Set address over the Bus (factory setting)
On = Set address using DIP-Switches 1 - 7

Fig. 84:

Instrument Behavior when the Supply Power is Turned On.

After the supply power is turned on the DIP-Switch is interrogated.

If the **DIP-Switch 8 is set to ON**, then the address defined by DIP-Switches 1-7 is used. The address can then no longer be changed over the bus as long as the power remains on because DIP-Switch 8 is only interrogated once, when the power is turned on.

If **DIP-Switch 8 is set to OFF** (factory setting), then the converter starts with the address stored in the FRAM of the Gateway. At shipment the address is set to 126 or to the address specified by the customer. After the instrument is powered, the address can only be changed over the bus or by using the keys on the display board located on the converter. The instrument must be connected to the bus.

Instrument Behavior after a Converter Electronic Module is Exchanged.

When the power is first turned on, the data stored in the external EEPROM, which is located on the display board, are uploaded. The instrument must be connected to the bus. Since the instrument address is not stored in the external EEPROM, the converter starts with the default address 126. Therefore, after exchanging an electronic converter module, the address must first be reset in order to write it in the FRAM in the Gateway. Once this has been accomplished, the converter will always start with the correct address whenever the power is turned on. Subsequently, the Ident-No. Selector must be checked. The preset factory value is 0x0691. The Ident-No. can be set to either 0x0691, 0x9700 or 0x9740. The Ident-No. Selector 0x6668 assures backward compatibility with PROFIBUS PA Profile 2.0. If the converter is operated with 0x6668, acyclical communication is not possible.

10.1.3 Information Regarding Voltage / Current Values

The turn on behavior corresponds to the Draft Standard DIN IEC 65C/155/CDV of June 1996. The average current draw of the COPA-XE or MAG-XE is 13 mA. During an error condition the current draw is limited to max. 17 mA by an FDE-Function (= Fault Disconnection Electronic) integrated in the instrument. The upper value of the current is electronically limited. The voltage on the bus line may be within the range of 9 - 24 V DC for the intrinsically safe design in accordance with the FISCO Model.

10.1.4 System Integration

Every PROFIBUS-Instrument is assigned a unique Identification-Number by the PNO (Profibus User Organization). For the FXE4000-Converter it is 0x0691. The corresponding GSD (= Electronic Device Data Sheet File) is named ABB_0691.GSD. When this Ident-Number is used the entire functionality of the instrument is utilized: One AI-Block and two Totalizer-Blocks together with the manufacturer specific parameters.

The PNO (Profibus User Organization) has also defined standard Ident-Numbers.
The FXE4000 supports 0x9740 (one AI- and one Totalizer-block) and 0x9700 (only one AI-Block).
These profiles (0x9740 and 0x9700) assure interchangeability between instruments from different manufacturers, without requiring a configuration change in the process control system. The functionality is however restricted, because not all the special capabilities of the FXE4000 are available when using the Standard Ident-Numbers.

In order to use the entire functionality of the FXE4000, the instrument must be operated with Ident-Number 0x691.

ABB provides 3 different GSD files for System Integration (see the following table). A change can be made using the Parameter ID-Number Selector, which can only be changed acyclically.
The manufacturer specific GSD file ABB_0691 as well as the "Data Link Description PROFIBUS PA" for the FXE4000 (Part No.: D184B093U25) are included on the CD (Part No.: D699D002U01) included with the shipment .
The Standard-GSD-files PA1397xx.gsd are available on the Homepage of Profibus International - http://www.profibus.com for download.

The up to date GSD-files can also be downloaded from the ABB Homepage http://www.abb.com/Flow → Electromagnetic Flowmeter (select actual type) → read more → Fieldbus & HART Files → Version Matrix (read first: all available files and documentation are listed here) → close Version Matrix → Download Software for the selected Communication Profibus.

Function Block Numbers and Types	Ident Number	GSD File Name
1 x AI	0x9700	PA139700.gsd
1 x AI; 1 x TOT	0x9740	PA139740.gsd
1 x AI; 2 x TOT; and all manufacturer spec. parameters	0x0691	ABB_0691.gsd

10.1.5 Block Diagram for FXE4000 (COPA-XE/MAG-XE) with PROFIBUS PA

The figure shows a schematic of the functions available in the blocks in the FXE4000 (COPA-XE/MAG-XE). A communication tool or a SPC with Master Class 2 functionality can be used to access all the blocks for configuration.

Detailed Descriptions of the Blocks:

Physical Block (Instrument properties and present status)	Contains instrument specific properties such as software version, TAG-No. etc.
Transducer Block (Measurement parameters))	Contains data for the flowmeter primary such as meter size, flow range etc. together with all the manufacturer specific parameters which are not contained in the function blocks.
Analog Input Block (Output of measured values and status)	Contains the values of the instantaneous flowrate, its engineering units and status.
Totalizer Block (Totalizer)	Here it is possible to acyclically monitor the totalizer value using PROFIBUS PA-DTM in SMART-VISION. A totalizer reset and assignment of a totalizer end value can be made cyclically.

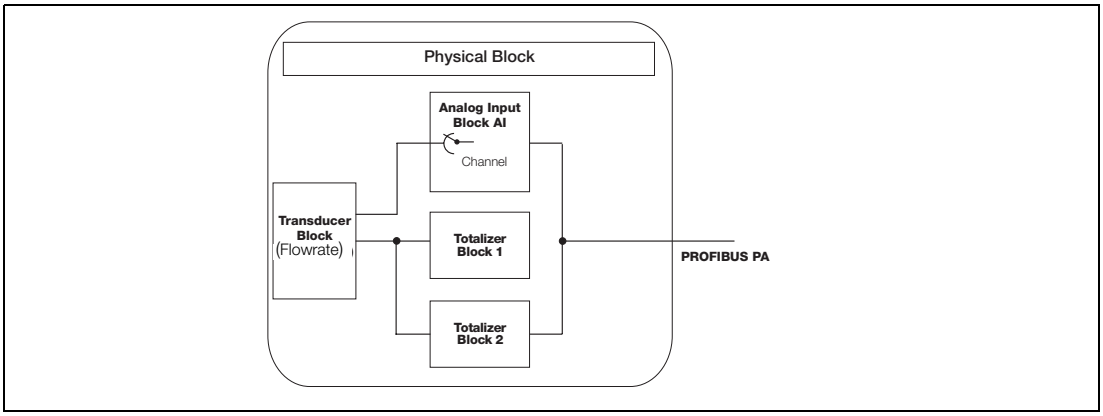


Fig. 85:

The flowrate calculation is made in a Transducer-Block. The Transducer-Block makes the measurement values available internally. The cyclical output of the measurement values to the outside is accomplished by the Analog Input Block (AI-Block). The FXE4000 has one AI-Block.

The selection of which parameter is to be outputted from the AI-Block, is made over the channel selector.

The following parameters from the Transducer Block can accessed from the Channel:

- VOLUME_FLOW
- Transducer-Block-internal totalizer for the forward direction
- Transducer-Block-internal totalizer for the reverse direction

The measured flowrate values are summed (integrated) in the Totalizer-Block, in order to determine the volume which has flowed through the meter ("totalizer value").

A detailed description of the blocks/parameters may be found in a separate document, "Data Link Description PROFIBUS PA" (Part No. D184B093U25). This is contained on the CD included with the shipment. Configuration is accomplished acyclically using PROFIBUS PA-DTM in the FXE4000 (COPA/MAG-XE).

10.2 Communication FOUNDATION Fieldbus

The Fieldbus-Converter is suitable for connection to special bus power supply instruments as well as to the ABB Multibarrier MB204. The voltage range on the bus for the intrinsically safe design must be within the range of 9 - 24 V DC in accordance with the FISCO-Model.

The FOUNDATION Fieldbus-Data Link conforms to the Standards FF-890/891 and FF-902 / 90. The transmission signal from the converter is configured in accord with IEC 61158-2. The FXE4000 (COPA/MAG - XE) is registered with the Fieldbus FOUNDATION. The Reg.-No. is: IT 008000.

The FXE4000 (COPA/MAG-XE) is registered with the Fieldbus Foundation under Manufacturer ID: 0x000320 and Device ID 0x0016. The intrinsically safe design corresponds to the FISCO-Model.

10.2.1 Planning Information

A typical FF-Network is shown in the following figure.

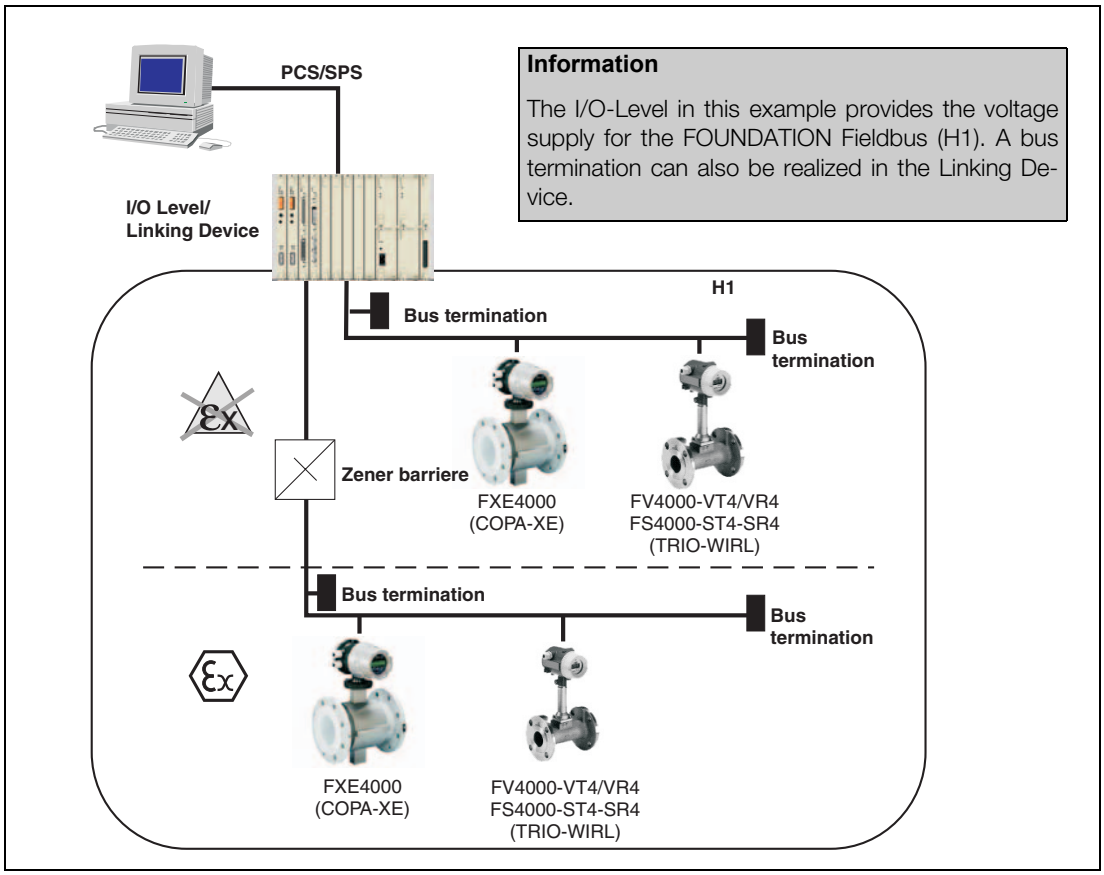


Fig. 86: Typical FF-Network

Additional detailed planning information may be found in the Brochure „FOUNDATION Fieldbus - Solutions from ABB" (No. 7592 FF Brochure). In addition, supplementary information may also be found on our home page http://www.abb.de and on the Fieldbus FOUNDATION home page at http://www.fieldbus.org.

Please observe the system requirements according to EN60079-27.

10.2.2 Setting the Bus Address for FOUNDATION Fieldbus Communication

The bus address in the FF is automatically assigned by the LAS (LinkActiveScheduler). The address recognition uses a unique number (DEVICE_ID), made up of the Manufacturer-ID, Instrument-ID and Instrument Serial-No.

10.2.3 Information Regarding Voltage/Current Values

The turn on behavior corresponds to the Draft Standard DIN IEC 65C/155/CDV of June 1996. The average current draw of the FXE4000 (COPA/MAG-XE) is 13 mA. During an error condition the current draw is limited to max. 17 mA by an FDE-Function (= Fault Disconnection Electronic) integrated in the instrument. The upper value of the current is electronically limited.

The voltage range on the bus for the intrinsically safe design must be within the range of 9 - 24 V DC in accordance with the FISCO-Model.

10.2.4 System Integration

To integrate the instrument into a process control system a DD-File (Device Description), which contains the instrument description, and a CFF-File (Common File Format) are required. The CFF-File is required to engineer the segment. The engineering can be accomplished on- or offline.

A description of the function blocks may be found in a separate document „Data Link Description FOUNDATION Fieldbus for FXE4000" (Part No. D184B093U17)

Both files as well as the data link description are contained on the CD (Part No.: D699D002U01) included with the shipment. The CD can be ordered at any time from ABB at no charge. The files can also be downloaded from http://www.fieldbus.org.

Notice!

Check the settings of the DIP-Switch in the instrument.

DIP-Switch 2 must be OFF. If it is not it, will be impossible to write data from the Process Control System to the instrument (hardware write protect).

DIP-Switch 1 must also be OFF.

DIP-Switch Functions

DIP-Switch 1:
Release the simulation of the AI-Function blocks

DIP-Switch 2:
Hardware write protect for write access over the bus (all blocks locked)

DIP-Switch	1	2
Status	Simulation Mode	Write Protect
Off	Disabled	Disabled
On	Enabled	Enabled

DIP-Switch
1 + 2 to OFF

Fig. 87: Position of the DIP-Switches in Example FXE4000 (COPA-XE)

10.2.5 Block Descriptions for FXE4000 (COPA-XE/MAG-XE) with FOUNDATION Fieldbus

The figure shows the function block diagram for available blocks in the instrument.
Communication tools such as a NI-Configurator, System Tools or a SPC with appropriate functionality can be used to acyclically access all blocks for configuration.

Detailed Description of the Blocks:

Resource Block	Includes instrument specific values such as software version, TAG-No. etc.
Transducer Block	Contains data for the flowmeter primary such as meter size, K-factor etc. together with all the manufacturer specific parameters which are not contained in AI-Blocks. This includes the parameters of the volume totalizer.
Analog Input Block	AI 1 Contains the values of the instantaneous flowrate, its engineering units and status. AI 2 Contains the totalizer values for the forward direction, its engineering units and status. AI 3 Contains the totalizer values for the reverse direction, its engineering units and status.
PID Block	The PID-Function module contains a Proportional-Integral-Differential-Controller plus all the required components for scaling, noise signal intervention, cascades, etc.

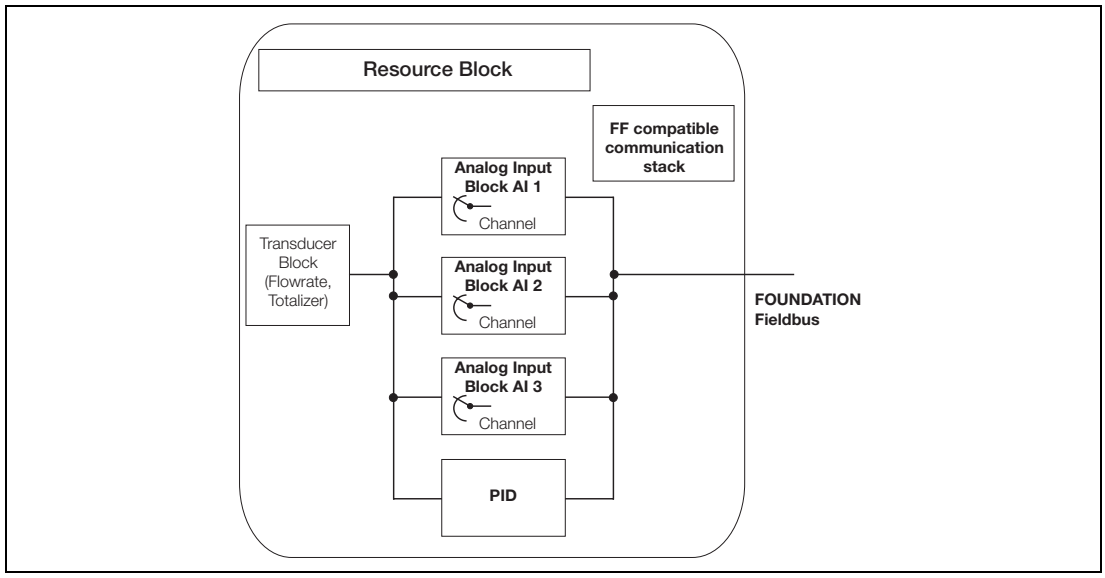


Fig. 88:

The Resource-Block, the AI-Blocks and the PID-Block are "Standard"-FF-Blocks.
These blocks correspond exactly to the FF-Specification FF-891-1.4
The flowrate calculation is made in the Transducer-Block. The Transducer-Block makes the measurement values available internally. The cyclical output of the measurement values to the outside is accomplished by the AI-Blocks).

The selection of which parameter is to be outputted from the AI-Block, is made over the channel parameter.
The PID-Function module contains a Proportional-Integral-Differential-Controller.
Details may be found in the FF-Specification FF-891.

A detailed description of the blocks/parameters may be found in a separate Data Link Description FOUNDATION Fieldbus for FXE4000 (COPA/MAG-XE) (Part No. D184B093U17). This is contained on the CD included with the shipment. Configuration is accomplished acyclically.

10.3 HART®-Communication

10.3.1 General Description

Allows simultaneous display of the process values and digital communication without additional installation expense. The analog 4–20 mA current output signal transmits the process information while allowing bidirectional digital communication. The analog process value output can be used with analog indicators, recorders and controllers while simultaneously communicating digitally using the HART-Protocol.

The HART-Protocol operates using the FSK (Frequency Shift Key) technology based on the Bell 202 Communication Standard. The digital signal is formed using two frequencies, 1200 Hz and 2200 Hz which represent the bit values 1 and 0.

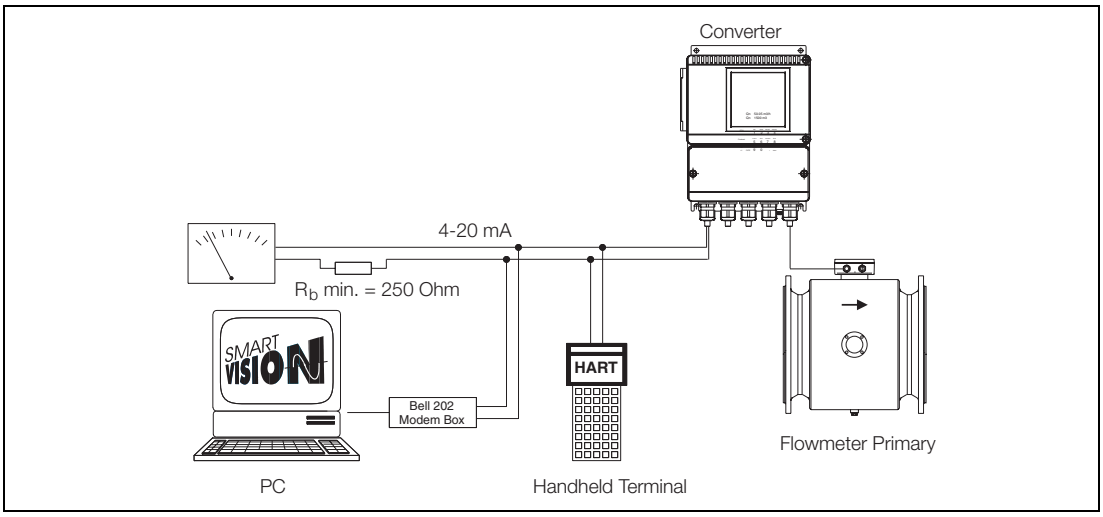


Fig. 89: Communication with HART-Protocol

10.3.2 Software SMART VISION ®

General Description

A FSK-Modem is used to connect to a PC.

The software program SMART VISION from ABB can be used to set, monitor and read the data for evaluation from field instruments. In addition to its configuration and process relevant data display capabilities, the SMART VISION Program also incorporates cyclical monitoring of the connected field instruments.

SMART VISION ® is a universal and intuitive operator friendly graphic software for intelligent field instruments.

SMART VISION ® can communicate with all HART-capable instruments using the „universal“ and „common practice“ HART-Commands. For ABB-instruments the manufacturer specific HART-Commands are also supported so that complete functionality of the instruments is accessible with one DTM.

SMART VISION ® supports both HART- and PROFIBUS-DTMs as well as all other PROFIBUS-instruments utilizing Profile 2.0/3.0 specifications.

Application Areas

- Configuration and parameter entries for field instruments.
- Diagnosis of instruments, access status messages.
- Visual graphic overview as a picture of the instrument communication connections in the system.
- Storage / management of instrument data.
- Instrument location planning and management.
- Online display of instrument data (measured values, diagnosis-, configuration-, parameter setting- and setting information) in a multivisual format.

10.4 Software history

10.4.1 For transmitters without communication or ACSII communication or PROFIBUS DP

Software D699B179U01		
Software version	**Type of changes**	**Documentation/Enhancements**
B.10	Original software Transmitter can be operated via ASCII protocol	-
B.11	Software optimization, optimization of start routine	-
B.12	Implemented slave address for PROFIBUS DP	Updated software menu for setting address
B.13	Software supports external zero point adjustment for open collector	Updated software menu for external zero point adjustment

10.4.2 For transmitters with HART protocol, PROFIBUS PA, FOUNDATION fieldbus communication

Software D699B180U01		
Software version	**Type of changes**	**Documentation/Enhancements**
X.10	-	Upgraded HART software to DN600-1000
X.20	Function enhancement	Incorporated new HART commands
X.21	Function enhancement	Implemented menu for querying analog resets in the service area
X.22	-	Message when switching on changed from “Bailey Fischer&Porter” to “ABB Automation”
X.23	Enhanced functionality of PROFIBUS PA3.0	Software menu updated to include to “PROFIBUS and FF menue”.
X.31	Software adaptation for PROFIBUS PA3.0	To enable operation of PROFIBUS PA3.0 as well as FOUNDATION fieldbus, software adaptations were performed
X.33	Function enhancement	Implementation of “ID no. selector” for purpose of backward compatibility between PA3.0 -> PA2.0
X.34	Function enhancement	Limited max. adjustable alarm current. Manufacturer specific HART commands added
X.35	Function enhancement	Enables readout of gateway software version

11 Error Messages

The following list of the error messages includes explanations of the Error Codes displayed. Error Codes 0 to 9, A, B, C do not occur during data entry.

Error Code	Detected System Errors	Corrective Measures
0	Pipeline not full.	Open shut off devices; fill pipeline; adjust Detector Empty Pipe
1	A/D-Converter	Reduce flowrate, throttle shut off devices.
2	Positive or negative reference too small.	Check connection board and converter;
3	Flowrate greater than 130 %.	Reduce flowrate, change flow range
4	External zero return contact activated.	Zero return activated by pump or field contact.
5	RAM defective 1. Error 5 appears in display 2. Error 5 appears only in Error Register	Program must be reinitialized; Contact ABB Service department; Information: Corrupted data in RAM, converter automatically executes a reset and uploads data from EEPROM.
7	Positive reference too large	Check signal cable and magnetic field excitation.
8	Negative reference too large.	Check signal cable and magnetic field excitation.
6	Error > F Error totalizer < R Error totalizer	Reset forward totalizer or preset new values in totalizer. Reset reverse totalizer or preset new values in totalizer. Forward. reverse or difference totalizer defective Reset forward/reverse totalizer.
9	Excitation frequency defective	Check line frequency for Supply Power 50/60 Hz or for AC/DC Supply Power Error in the Digital-Signal board.
A	MAX-Alarm limit value	Reduce flowrate
B	MIN-Alarm limit value	Increase flowrate
C	Primary data invalid	The data for the primary in the external EEPROM are invalid. Compare data in submenu "Primary" with data listed on the Type Plate. If the values agree, use "Store Primary" to reset the error message. If the data are not identical, then it is necessary to first reenter the primary data and then complete by using "Store Primary". Contact ABB-Service
10	Entry >1.00 $Range_{max.}$ >10 m/s.	Reduce flow range Qmax.
11	Entry <0.05 $Range_{max.}$ <0.5 m/s.	Increase flow range Qmax.
16	Entry >10 % Low flow cutoff.	Reduce entry value.
17	Entry < 0 % Low flow cutoff.	Increase entry value.
20	Entry ≥ 100 s Damping.	Reduce entry value.
21	Entry <0.5 s Damping.	Increase entry value. (as a function of the excitation frequency)
22	Entry >99 Instrument Address.	Reduce entry value.
38	Entry >1000 Pulses/Unit.	Reduce entry value.
39	Entry < 0.001 Pulses/Unit.	Increase entry value.
40	Max. pulse frequency exceeded. scaled pulse output. Pulse factor (5 kHz).	
41	Min. pulse frequency below limit <0.00016 Hz.	Reduce pulse factor. Increase pulse factor
42	Entry >2000 ms Pulse Width.	Reduce entry value.
43	Entry <0.1 ms Pulse Width.	Increase entry value.
44	Entry >5.0 g/cm^3 Density.	Reduce entry value.
45	Entry <0.01 g/cm^3 Density.	Increase entry value.
46	Entry too large	Reduce pulse width entry value
54	Zero flowmeter primary > 50 Hz	Check ground and ground signals. Adjustment can be made if the flowmeter primary is filled with fluid and the flowrate is zero.
56	Entry >3000 Threshold Detector empty pipe.	Reduce entry value, check adjust "Detector empty pipe"
74/76	Entry > 130 % MAX - or MIN-Alarm	Reduce entry value
91	Data in EEPROM incorrect	Data in internal EEPROM invalid, for corrective measures see Error Code 5.
92	Data in ext. EEPROM incorrect	Data (e.g. Qmax. Damping) in external EEPROM invalid, access possible. Occurs when function "Store data in ext. EEPROM" was not called. The error message can be cleared using the function "Store data in ext. EEPROM"
93	Ext. EEPROM incorrect or not installed	No access possible, component defective. If the component is not installed. then it is necessary that the ext. EEPROM which belongs to the flowmeter primary be installed above the display.
94	Ver. ext. EEPROM incorrect	The data base is not correct for the present software version. Calling the function "Load data from ext. EEPROM" initiates an automatic update of the external data. The function "Store data in ext. EEPROM" clears the error message.
95	External flowmeter primary incorrect	See Error Code C.
96	Ver. EEPROM incorrect	Data base in the EEPROM has a different version than the installed software. Clear the error by calling the function "Update".
97	Flowmeter primary incorrect	The flowmeter primary data in the internal EEPROM are invalid. The error can be cleared by calling the function "Load Primary". (See Error Code C).
98	Ver. EEPROM incorrect or not installed	Access is possible, component defective. If the component is not installed. then it is necessary that the ext. EEPROM which belongs to the flowmeter primary be installed.
99	Entry too large	Reduce entry value
99	Entry too small	Increase entry value

12 Maintenance and Repair

12.1 General Information

Before opening the housing all connections must be voltage free. When the housing is open the EMC-Protection, the personnel contact protection and the Ex-Protection are voided.

After the supply power is turned off wait at least 2 minutes before opening the housing.

12.1.1 Flowmeter Primary

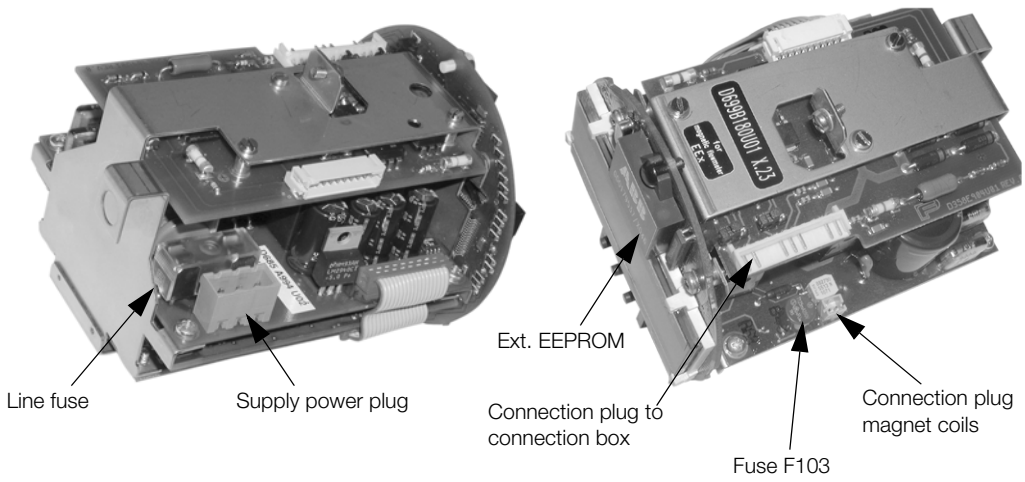
The flowmeter primary is essentially maintenance free. Annually a check should be conducted of the ambient conditions (air circulation, humidity), seal integrity of the process connections, cable connectors and cover screws, functional reliability of the supply voltage, the lightning protection and the grounds.

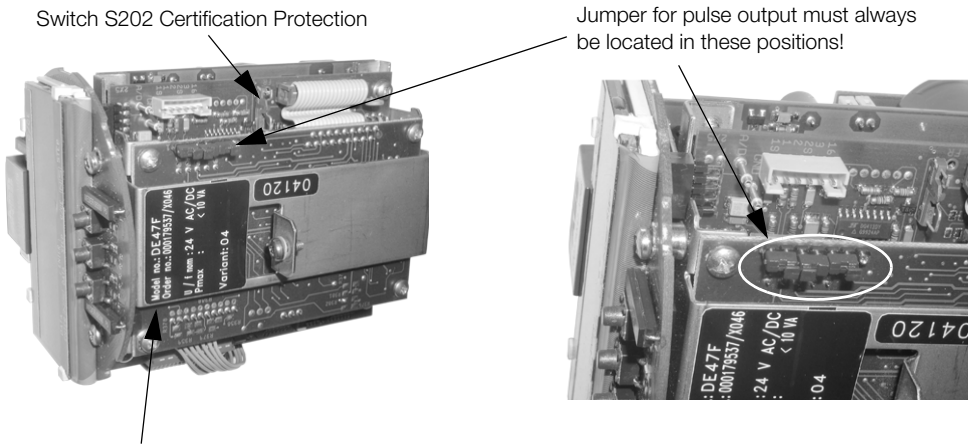
All repair or maintenance tasks should be performed by qualified user personnel.

See the note (Hazardous Material Information), if the flowmeter primary is to be returned to the ABB Automation Products factory for repairs!

12.2 Locations of the Fuses

12.2.1 Identification of the Converter Design, Socket Location for ext. EEPROM





Model No.:	DE43F
Order No.:	25702/X001
U/f_{nom}:	24 V AC, DC
Smax:	< 10 VA
Variant:	04

Line Fuses	A	Part No.
For low voltage	1A	D151B002U06
For high voltage (100 – 230 V)	0.5 A	D151B002U05
Fuse F103	0.125 A	D151F003U14

Notice!
Fuses and safety relevant parts may only be replaced by original fuses!

The identification of the converter designs is indicated on the Type Plate which is cemented to the metal frame on the converter (see Figure).

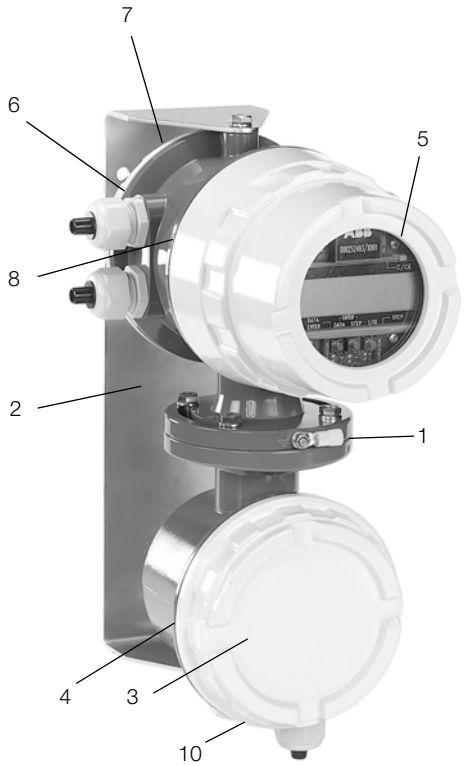
Variant 03	Current output active + pulse output passive + contact input + contact output
Variant 04	Current output active + pulse output passive + contact input + contact output + HART-Protocol
Variant 14	PROFIBUS PA (Profile 3.0)
Variant 15	FOUNDATION Fieldbus
Variant 16	PROFIBUS PA with plug M12
Variant 17	Current output passive + pulse output active + contact input + contact output

Fig. 90: Location of the Fuses, Identification of the Converter Design, Socket Location for ext. EEPROM

12.3 Replaceable Parts List

12.3.1 Replaceable Parts for Models FXE4000-DE48, FXE4000-DE47 and FXE4000-DE27

The item numbers 5 - 8 also apply to the Compact Design instruments.



Model FXE4000-DE48

Model FXE4000-DE27 / FXE4000-DE47

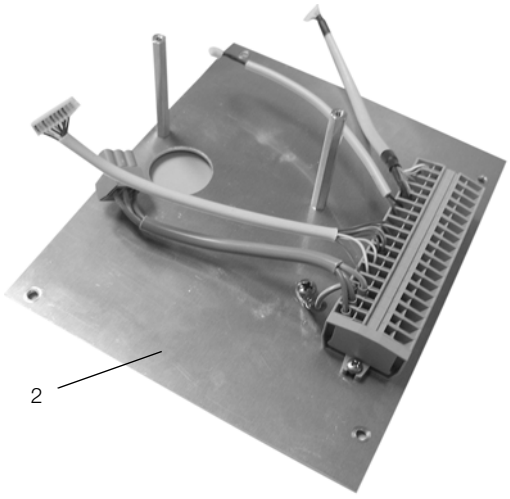
No.	Quantity	Description	Ordering No.
1	1	O-Ring 56, 74x3.53	101A806
2	1	Bracket compl.	D614L619U01
3	1	Cover for connection box	D379D134U02
4	1	O-Ring 101, 19x3.53	D101A020U01
5	1	Cover with sight window	D612A144U01
6	1	Cover „small“	D379D134U02
7/8	1	O-Ring 101, 19x3.53	D101A020U01
9	1	Cover security clamp	D353B201U01
10	1	Cover security clamp	D353B201U02

Fig. 91:

12.3.2 Replaceable Parts for Models FXE4000-E4

Replaceable Parts List for Field Mount Housing

Model FXE4000-E4



No.	Description	Ordering No.
1	Field mount housing M20x1.5 complete (empty), no converter module, no connection board	D641A033U01
2	Connection board compl. incl. cable ass'y for standard outputs incl. HART (Variants 03-04) Connection board compl. incl. cable ass'y for RS485 (Variant 05) Connection board compl. incl. cable ass'y for PROFIBUS DP (Variant 06) Connection board compl. incl. cable ass'y for PROFIBUS PA or FOUNDATION Fieldbus (Variants 14-15)	D674A861U01 D674A861U92 D674A861U03 D674A861U04
3	Cover small	D641A029U01
4	Cable connector M20x1.5	D150A008U15
5	Machine screw, Phillips, phillister head M4x10	D004G108AU01
6	Spring washer	D085D020AU20

Fig. 92:

Replaceable Parts List for Panel Mount Design

Description	Ordering No.
Panel mount housing compl. incl. cable ass'y for insert Variants 1 - 5	D674A663U01
Panel mount housing compl. incl. cable ass'y for module Variant 6	D674A663U02

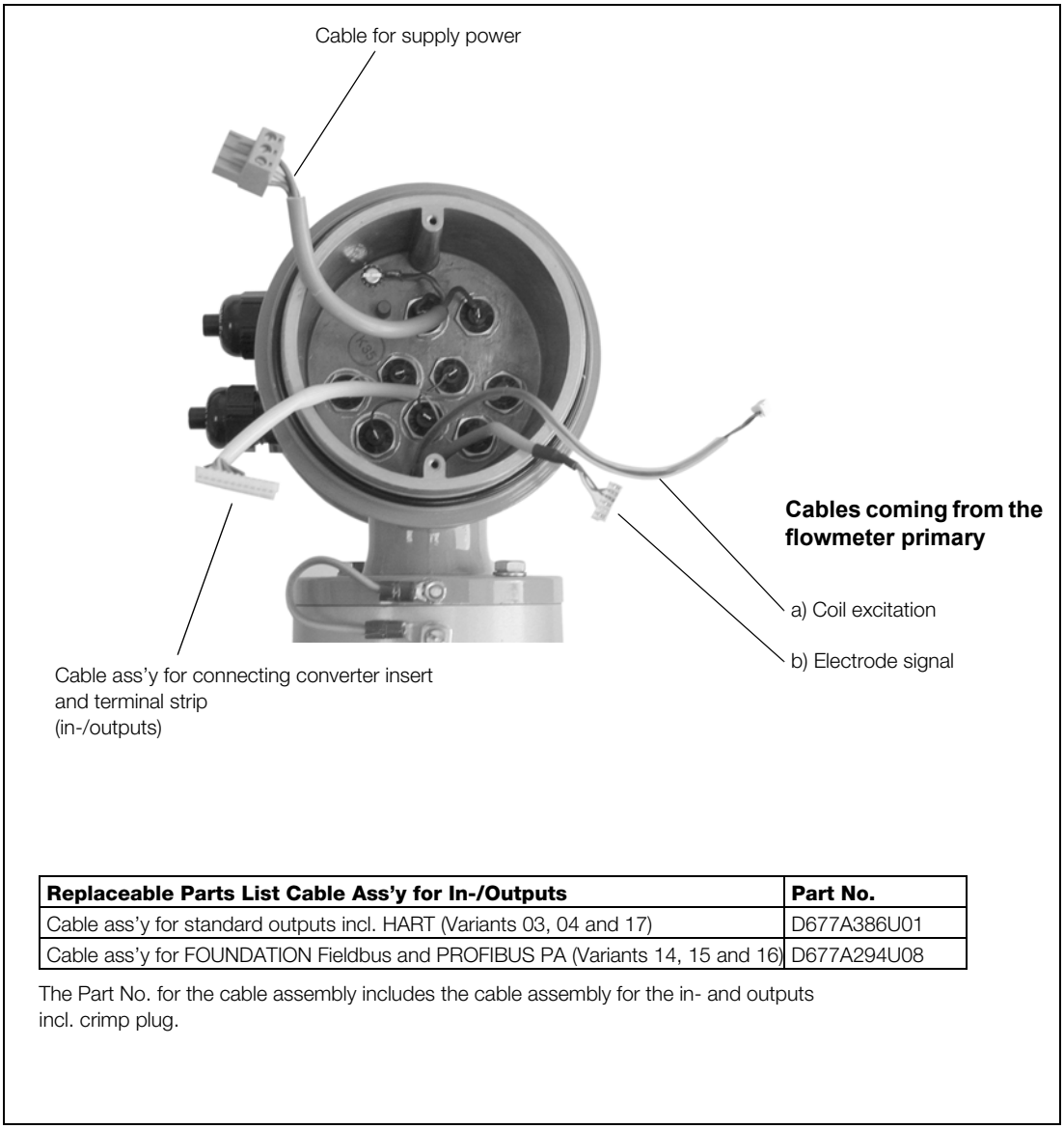
Fig. 93:

Replaceable Parts List for Rail Mount Housing

Description	Ordering No.
Rail mount housing compl. incl. cable ass'y for insert Variants 1 - 5	D674A572U03
Rail mount housing compl. incl. cable ass'y for insert Variant 6	D674A572U02

Fig. 94:

12.3.3 Replaceable Parts List (Cable Ass'y) for Models FXE4000-DE47, FXE4000-DE48, FXE4000-DE27

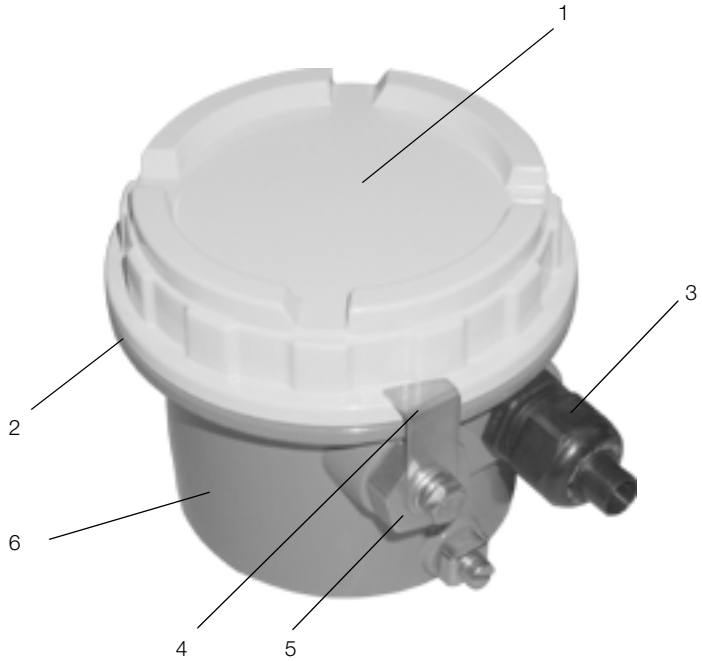


Replaceable Parts List Cable Ass'y for In-/Outputs	Part No.
Cable ass'y for standard outputs incl. HART (Variants 03, 04 and 17)	D677A386U01
Cable ass'y for FOUNDATION Fieldbus and PROFIBUS PA (Variants 14, 15 and 16)	D677A294U08

The Part No. for the cable assembly includes the cable assembly for the in- and outputs incl. crimp plug.

Fig. 95:

12.3.4 Replaceable Parts List for Flowmeter Primary FXE4000-DE46



No.	Description	Ordering No.
1	Housing cover	D379D134U02
2	Housing cover gasket (R-Ring)	D101A026U01
3	Cable connector M20x1.5	D150A004U15
4	Cover security clamp	D353B201U02
5	Seal plug M20x1.5	D366A092U01
6	Connection box, lower section	D323D607U02
	Connection box completely assembled, without connection board, without Ex-Protection circuit	D611A066U01

Fig. 96:

13 Overview Parameter Settings and Design Options

Meter location:			TAG-No.:
Flowmeter primary type:			Converter type:
Order No.:	Instrument No.:		Order No.:
Instrument No.:			
Fluid temp.:			Supply voltage:
Liner	Electrodes:		Excitation frequency:
C_{zero}:	C_{span}:		System zero:

Parameter		**Setting Range**
Prog. Prot. Code	.....	0-255 (0=Factory setting)
Language	.....	German, English, French, Finnish, Spanish, Italian, Dutch, Danish, Swedish
Meter size	.....	DN 3 - 1000 [1/10" - 40"]
Q_{max} :	.....	0.05 $Range_{max.}$ -1 $Range_{max.}$
Pulse factor:	.....	0.001 - 1000 pulses/unit
Pulse width	.....	0.100 - 2000 ms
Low flow cutoff:	.....	0 - 10 % of max
Damping:	.....	0.125 - 99.99 seconds
Filter:	.....	ON/OFF
Density:	.....	0.01 g/cm^3 - 5.0 g/cm^3
Unit Q_{max}.:	.....	l/s, l/min, l/h, hl/s, hl/min, hl/h, m^3/s, m^3/min, m^3/h, igps, igpm, igph, mdg, gpm, gph, bbl/s, bbl/min, bbl/h, bls/day, bls/min, bls/h, kg/s, kg/min, kg/h, t/s, t/min, t/h, g/s, g/min, g/h, ml/s, ml/min, ml/h, Ml/min, Ml/h, Ml/day, lb/s, lb/min, lb/h, uton/min, uton/h, uton/day, kgal/s, kgal/min, kgal/h,
Unit totalizer:	.....	l, hl, m^3, igal, gal, mgal, bbl, bls, g, kg, t, ml, uton, lb, kgal
Max. Alarm:	.....	%
Min. Alarm:	.....	%
Terminal P7/G2:	.....	Max. Alarm, Min. Alarm, Max./Min. Alarm, general alarm, empty pipe, F/R-Signal, no function
Terminal X1/G2:	.....	External zero return, totalizer reset, no function
Current output:	.....	0/4-20 mA, 0/2-10 mA, 0-5 mA, 0-10-20 mA, 4-12-20 mA
Iout at Alarm:	.....	0 %, 130 %, 3.8 mA
Detector e. pipe:	.....	ON/OFF
Alarm e. pipe	.....	ON/OFF
Iout at e. pipe:	.....	0 %, 130 %, 3.8 mA
Threshold:	.....	2300 Hz
Adj. empty pipe:	.....	Software potentiometer
Tot. function:	.....	Standard, difference totalizer
1st line Display:	.....	Q (%), Q (Unit), Q (mA), Totalizer F/R, TAG-Number blank line, bargraph
2nd line Display:	.....	Q (%), Q (Unit), Q (mA), Totalizer F/R, TAG-Number blank line, bargraph
1st line Multiplex:	.....	ON/OFF
2nd line Multiplex:	.....	ON/OFF
Operating Mode:	.....	Standard/Fast
Flow indication:	.....	Forward/Reverse, Forward
Flow direction:	.....	Normal, Inverse
Store data in ext. EEPROM:	.....	Yes/No

Pulse output:	❑ Optocoupler	❑ Active 24 V
Contact in-/output:	❑ Yes Optocoupler	❑ No
Detector empty pipe:	❑ Yes	❑ No
Communication:	❑ HART-Protocol	❑
Display type:		❑ Lighted and Magnet Stick operation

Translation: German Original

TÜV
CERT

EC-TYPE EXAMINATION CERTIFICATE

(1)

(2) Equipment or Protective Systems intended for use in potentially explosive atmospheres - **Directive 94/9/EC**

(3) EC-Type Examination Certificate Number

TÜV 97 ATEX 1173 X

(4) Equipment: Electromagnetic Flowmeters Type DE2. and DE4.

(5) Manufacturer: Bailey-Fischer & Porter GmbH

(6) Address: Dransfelder Straße 2
D 39079 Göttingen, Germany

(7) This equipment and any acceptable variations thereto are specified in the schedule to this certificate and documents therein referred to.

(8) The TÜV Hannover/Sachsen Anhalt e.V., TÜV Certification Body No. 0032 in accordance with the Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potential explosive atmospheres given in Annex II of the Directive.

The examination and test results are recorded in the confidential report No. 125/97/4070.

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

EN 50 014: 1977 + A1 ...A5 **EN 50 020: 1977 + A1 ...A5** **EN 50 019: 1977 + A1 ...A5**
EN 50 018: 1977 + A1 ...A3 **EN 50 028: 1987**

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

(11) This EC-TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified equipment or protective system. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment or protective system.

(12) The markings for the equipment or protective system shall include the following:

II 2G EEx em [ib] IIC T3...T6
or II 2G EEx emd [ib] IIC T3...T6
or II 2G EEx ed IIC T6

TÜV Hannover/Sachsen-Anhalt e.V.
TÜV Certification Authority
Am TÜV 1
D-30519 Hannover, Germany

Hannover 1997-06-06

Stürwold

Head of the Certification Body

Translation: German Original

TÜV Hannover/Sachsen-Anhalt e.V.

(13) **S C H E D U L E**

(14) **EC-Type Examination Certificate No. TÜV 97 ATEX 1173 X**

(14) Description of the Equipment

The electromagnetic flowmeters are used for measuring proportionally the flowrate of electrically conductive and flowable fluids. Flammable liquids are allowed when they are free of air or oxygen to such a degree that they do not continuously or for long periods of time form an explosive mixture.
The flowmeters consist of a flowmeter primary in sizes DN 3 to DN 3000 and their accompanying converters.
In reference to explosion protection there are 3 combinations possible:

1.
Model DE.6: A flowmeter primary connected by a signal cable to a converter which is installed outside of the area with the potentially explosive Atmosphere.
Ignition Class of the flowmeter primary: **EEx em [ib] IIC T3 ... T6**

2.
Model DE.7: Compact Design with the converter mounted directly on the flowmeter primary.
Ignition Class: **EEx emd [ib] IIC T3 ... T6**

3.
Model DE.8: Compact Design with the flowmeter primary connected by a signal cable to the converter (both equipments are in the area with the potentially explosive atmosphere).
Ignition Class of the flowmeter primary: **EEx em [ib] IIC T3 ... T6**
Ignition Class of the converter: **EEx ed IIC T6**

The ambient temperature range is -20°C ... +60°C.

The highest allowable fluid temperatures [°C] as a function of the temperature class, the highest allowable ambient temperature and the meter size are listed in the following tables:

Model	Meter Size DN	Temperature Class	Highest Allowable Ambient Temperature			
			40°C[insul.]	50°C[insul.]	60°C[insul.]	Cable Connector 80°C[insul.]
Primary DE26 DE28 DE46	3-40	T3	130 [-]	--	--	--
		T4	110	100 [95]	90 [80]	--
		T5	75	75	75	--
		T6	60	60	60	--
DE48	50-100	T3	135 [-]	135 [-]	120 [-]	--
		T4	115 [110]	115 [95]	115 [-]	--
		T5	85	85	85	--
		T6	70	70	70	--
Primary DE46 DE48	350-3000	T3	175 [-]	140 [-]	--	--
		T4	135 [110]	135 [-]	105 [-]	--
		T5	100 [95]	100 [95]	100 [-]	--
		T6	85 [80]	85 [80]	85 [80]	--

14 EU-Type Examination Certificate

Translation: German Original

TÜV Hannover/Sachsen-Anhalt e.V.

Appendix EC-Type Examination Certificate No. TÜV 97 ATEX 1173 X

Model	Meter Size DN	Temperature Class	Highest Allowable Ambient Temperature			
			40°C[insul.]	50°C[insul.]	60°C[insul.]	Cable Connector 80°C[insul.]
DE27 DE47	3-20	T3	130 [125]	130 [125]	--	130 [120]
		T4	110	110	85	110
		T5	75	75	75	75
		T6	60	60	60	60
	25-32	T3	125	125	--	120
		T4	110	110	85	110
		T5	75	75	75	75
		T6	60	60	60	60
	40-100	T3	135	125	--	120
		T4	115	115	--	115
		T5	80	80	80	80
		T6	70	70	70	70
DE47	350-3000	T3	160 [-]	--	--	135 [-]
		T4	130	120	--	130 [120]
		T5	95	95	--	95
		T6	80	80	80	80
Converters for Primaries Models DE28 and DE48: Temperature Class T6 at $T_{amb.}$ = 60°C						

Comments: The values in brackets are based on the therma l relationships for insulated pipelines; for rows without brackets the values apply to both designs.
The lowest allowable fluid temperature is -25°C.

Electrical Specifications

Model DE.6

Signal circuit (Connection terminals 1 and 2)	Non-intrinsically safe electrical circuit Max. voltage U_m = 60 V Operating values: U_b = 5 V, I_b = 50 mA
Shield of the signal circuit (Connection terminals 1S and 2S)	Non-intrinsically safe electrical circuit Max. voltage U_m = 60 V Operating values: U_b = 5 V, I_b = 0.5 mA
Signal ground (Terminal 3)	Connected to potential equalization
Excitation current circuit (Connection terminals M1 and M2)	Non-intrinsically safe electrical circuit Max. voltage U_m = 60 V Operating values: U_b = 15 V, I_b = 100 mA
Outer shield (Angle clamp SE)	Non-intrinsically safe electrical circuit

Translation: German Original

TÜV Hannover/Sachsen-Anhalt e.V.

Appendix EC-Type Examination Certificate No. TÜV 97 ATEX 1173 X

Model DE.7

Voltage supply	230 V AC ± 15 % 47 ... 64 Hz Terminals L and N 115 V AC ± 15 % 47 ... 64 Hz Terminals L and N 100 V AC ± 15 % 47 ... 64 Hz Terminals L and N 48 V AC ± 15 % 47 ... 64 Hz Terminals 1L1 and 1L2 24 V AC ± 15 % 47 ... 64 Hz Terminals 1L1 and 1L2 24 V DC ± 30 % Terminals L+ and L-
Current output & HART®-Protocol (Connection terminals + and -)	Non-intrinsically safe electrical circuit Max. voltage U_m = 60 V Operating values: U_b = 30 V, I_b = 30 mA
Pulse output OPTO/ATIVE (Connection terminals V8 and V9)	For connection to a non-intr insically safe electrical circuit Max. voltage U_m = 60 V Operating values: U_b = 30 V, I_b = 220 mA
Binary output OPTO (Connection terminals P7 and G2)	For connection to a non-intrinsically safe electrical circuit Max. voltage U_m = 60 V Operating values: 5 V≤U_b ≤30 V, 5 mA≤ I_b ≤ 220 mA
Binary input OPTO (Connection terminals X1 and G2)	For connection to a non-intrinsically safe electrical circuit Max. voltage U_m = 60 V Operating values: OFF 0 V ≤ U_b ≤ 2 V ON 16 V ≤ U_b ≤ 30 V Input resistance 2 k Ω

Model DE.8

The flowmeter primary design is the same as Model DE.6.
The safety specifications for the flowmeter primary are the same as for Model DE.6.

Converter Electronics

Voltage supply	230 V AC ± 15 % 47 ... 64 Hz Terminals L and N 115 V AC ± 15 % 47 ... 64 Hz Terminals L and N 100 V AC ± 15 % 47 ... 64 Hz Terminals L and N 48 V AC ± 15 % 47 ... 64 Hz Terminals 1L1 and 1L2 24 V AC ± 15 % 47 ... 64 Hz Terminals 1L1 and 1L2 24 V DC ± 30 % Terminals L+ and L-
Current output & HART®-Protocol (Connection terminals + and -)	Non-intrinsically safe electrical circuit Max. voltage U_m = 60 V Operating values: U_b = 30 V, I_b = 30 mA

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Pulse output OPTO/ATIVE ..... For connection to a non-intrinsically safe electrical circuit
(Connection terminals V8 and V9) Max. voltage U_m = 60 V
Operating values: U_b = 30 V, I_b = 220 mA

Binary output OPTO ..... For connection to a non-intrinsically safe electrical circuit
(Connection terminals P7 and G2) Max. voltage U_m = 60 V
Operating values: 5 V≤U_b ≤30 V, 5 mA ≤I_b ≤220 mA

Binary input OPTO ..... For connection to a non-intrinsically safe electrical circuit
(Conn. terminals X1 and G2) Max. voltage U_m = 60 V
Operating values: OFF 0 V≤U_b ≤2 V
ON 16 V≤U_b ≤30 V
Input resistance 2 k Ω

Circuit to Flowmeter Primary over a Second Connection Box

Signal circuit ..... Non-intrinsically safe electrical circuit
(Connection terminals 1 and 2) Max. voltage U_m = 60 V
Operating values: U_b = 5 V, I_b = 50 mA

Shield of the signal circuit Non-intrinsically safe electrical circuit
(Connection terminals 1S and 2S) Max. voltage U_m = 60 V
Operating values: U_b = 5 V, I_b = 0.5 mA
The circuit terminates at the terminals of the primary.

Signal ground Connected to potential equalization
(Terminal 3)

Excitation current circuit ..... Non-intrinsically safe electrical circuit
(Connection terminals M1 and M2) Max. voltage U_m = 60 V
Operating values: U_b = 15 V, I_b = 100 mA

Outer shield ..... Potential Equalization PA circuit
(Angle clamp terminal)

The listed voltage values of U_m = 60 V are the maximum values which can be safely applied to the connection terminals of the converter without jeopardizing the intrinsic safety.

100% Test

The pressure tests of individual units required by EN 50 018 can be eliminated because, based on Section 15.2, the instrument successfully passed the type test at four times the reference pressure.

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Appendix EC-Type Examination Certificate No. TÜV 97 ATEX 1173 X

(16) Test documents consisting of 20 pages and including 29 drawings and 1 Certificate of Compliance are included in the test report.

(17) Special Conditions

1.
In the areas with potentially explosion atmospheres all the outer ground connection terminals are to be connected to the potential equalization . The installation requirements currently in effect are to be observed.

2.
When the pipeline is insulated, the appropriate values are to be considered.

(18) Basic safety and health requirements

No additional

Translation of German Original

1st SUPPLEMENT to EC-Type Examination Certificate TÜV 97 ATEX 1173 X

for the company: Bailey Fischer & Porter GmbH
D-37079 Göttingen, Germany

The electromagnetic flowmeters Type DE2. and DE4. may now be manufactured corresponding to the test documents listed below. The changes concern the extension of the Type DE4_ by the addition of flowmeter sizes DN 125 to DN 300 [5" - 12"] as well as the electrical specifications.
The circuits current output, pulse output, binary output and binary input will now also be designed as Intrinsically Safe circuits; the Ignition Type changes as follows:

Model DE.8: Ignition Class of the converter: **EEx ed [ib] IIC T6**

The maximum allowable fluid temperature [°C] as a function of the Temperature Class, the maximum allowable ambient temperature, the Model No. and the pipeline size is listed in the following table:

Model	Meter Size DN	Temperature Class	Highest Allowable Ambient Temperature			
			40°C [insul.]	50°C [insul.]	60°C [insul.]	Cable Conn.. 80°C
Primary DE46.. DE48..	125-300	T3	140 [-]	140 [-]	--	--
		T4	125 [110]	125 [95]	120 [-]	--
		T5	90	90	90 [80]	--
		T6	75	75	75	--
DE47..	125-300	T3	140	140	--	145
		T4	125	125	--	125
		T5	90	90	85 [80]	90
		T6	75	75	75	75
Converter for flowmeter primary Models DE 28 and DE 48: Temperature Class T6 at $T_{amb.}$ = 60°C						

Comments: The values in brackets are based on the thermal relationships for insulated pipelines;
For rows without brackets the values apply to both designs.
The lowest allowable fluid temp erature is -25°C.

Current output ..... in Ignition Type Intrinsically Safe EEx ib IIC/IIB
(Connection terminals + and -) Maximum values:
U_o = 20 V
Curve: linear

only for connection to passive Intrinsically Safe circuits or to Intrinsically Safe circuits with the following maximum values:
U_i = 40 V
P_i = 100 mW

Translation of German Original

1st Supplement to EG-Type Examination Certificate TÜV 97 ATEX 1173 X

The values for I_o, P_o as well as the maximum external capacitance C_o and the maximum internal inductance L_o may be found in the following table and on the Instrument Tag of the manufacturer.

		EEx ib IIC		EEx ib IIB	
I_o [mA]	P_o [mW]	C_o [nF]	L_o [mH]	C_o [nF]	L_o [mH]
100	500	200	4	1000	15
80	400	200	6	1000	22
60	300	200	10	1000	40

The effective internal capacitance and inductance are negligibly small.

The current output during operation is connected to the potential equalization.

Pulse output OPTO .....
(Connection terminals V8 and V9)
in Ignition Type Intrinsically Safe EEx ib IIC/IIB
for connection to a certified, Intrinsically Safe circuit with the following maximum values:
U_i = 15 V
I_i = 30 mA
P_i = 115 mW

The pulse output OPTO is safely galvanically isolated from all other circuits to a peak voltage value of 60 V.

Binary output and binary input OPTO ...
(Connection terminals P7/G2 or X1/G2)
in Ignition Type Intrinsically Safe EEx ib IIC/IIB
for connection to a certified, Intrinsically Safe circuit with the following maximum values:
U_i = 30 V
I_i = 250 mA
P_i = 1.1 W
Effective internal capacitance: 2.4 nF
The effective internal inductance is negligibly small.

The binary output OPTO and the binary input OPTO are galvanically connected to each other and safely galvanically isolated from all other circuits to a peak voltage value of 60 V.

The "Special Conditions" are expanded as follows:

3. Because the Intrinsically Safe current output is grounded during operation, potential equalization must exist in the entire Intrinsically Safe circuit.

The "Special Conditions" No. 1 and No. 2 as well as all other specifications remain unchanged.

Translation of German Original

1st Supplement to EG-Type Examination Certificate TÜV 97 ATEX 1173 X

Examination Documents		signed on
1. Description	(8 pages)	1 Jul 1998
2. Drawing Nos.	DIA-9803	1 Jul 1998
	IDM-50-A0020	10 Jul 1998
	IDM-50-A0021	10 Jul 1998
	IDM-10-A0092	11 May1998
	IDM-10-A0093	11 May 1998
	IDM-10-A0094	11 May 1998
	IDM-10-A0095	11 May 1998
	IDM-10-A0138	11 May 1998
	IDM-10-A0139	11 May 1998
	IDM-10-A0140	11 May 1998
	IDM-10-A0091	11 May 1998

TÜV Hannover/Sachsen-Anhalt e.V.
TÜV CERT-Certification Authority
Am TÜV 1
D-30519 Hannover, Germany

Hannover, 21 Jul 1998

Stürwold

Head of the Certification Body

Page 3/3

Translated from German Original

2nd SUPPLEMENT
to
EC-Type Examination Certificate No. TÜV 97 ATEX 1173 X

Company: ABB Automation Products GmbH
Dransfelder Straße 2
D-37079 Göttingen, Germany

Formerly

Bailey Fischer & Porter GmbH
Dransfelder Straße 2
D-37079 Göttingen, Germany

The Electromagnetic Flowmeters Models DE2. and DE4. may now be manufactured in accordance with the test documentation included in the Test Report. These changes affect the electrical specifications for Models DE.7.., DE.8. . . The Ignition Protection Type for Model DE.8 .. is a function of the Ignition Protection Type of the circuits connected to the instrument:

EEx ed IIC T6 or
EEx ed [ib] IIC T6

Electrical Specifications

Supply power circuit (Terminals 1+ / 2-) As a function of the design
(Terminals L / N) U_m = 60 V AC or DC or
U_m = 253 V AC

The output circuits of all models can be selected for connection to intrinsically safe or non-intrinsically safe circuits. The maximum allowable values are listed in the following table:

Output Circuit	In Ignition Protection Type Intrinsic Safety EEx ib IIC/IIB						Connections for Increased Safety, U_m = 60 V, I_m = 35 A
Current output active Terminals +/- Terminal - is connected to PA	U_o =20 V						Operating values: U = 30 V I = 30 mA
	I_o [mA]	P_o [mW]	EEx ib IIC C_o [nF]	EEx ib IIC L_o [mH]	EEx ib IIB C_o [nF]	EEx ib IIB L_o [mH]	
	100	500	218	3.8	1400	14.8	
	80	400	218	5.8	1400	21.8	
	60	300	218	9.8	1400	39.8	
	Curve: linear Effective internal capacitance C_i = 1.2 nF Effective internal inductance L_i = 0.082 mH For connection to passive, intrinsically safe circuits or intrinsically safe circuits with maximum values: U_i = 60 V Terminal – is connected to PA.						
Pulse output Terminals V8/V9 (V9→Plus)	U_i = 15 V I_i = 30 mA P_i = 115 mW		C_i = 2.4 nF	L_i = 0.17 mH			Operating values: U = 30 V I = 220 mA
Contact output Terminals P7/G2 (P7→Plus)	U_i = 30 V I_i = 250 mA P_i = 1.1 W		C_i = 4.8 nF	L_i = 0.17 mH			Operating values: U = 30 V I = 10 mA
Contact input Terminals X1/G2 (X1→Plus)	U_i = 30 V I_i = 250 mA P_i = 1.1 W		C_i = 4.8 nF	L_i = 0.17 mH			Operating values: U = 30 V I = 10 mA

All other specifications apply unchanged.

(16) Test documents are included in the test report No. 98/PX29380.

(17) Special Conditions

The following are also applicable:

The output circuits listed in the Table may be operated only as intrinsically safe or as non-intrinsically safe circuits. A combination is not permissible. For Intrinsically safe circuits potential equalization must be established along the entire length of the current output circuit.

Due to the interconnection between the contact output and the contact input the rules for current addition must be considered when connecting intrinsically safe circuits.

TÜV Hannover/Sachsen-Anhalt e.V.
TÜV CERT-Certification Body
Am TÜV 1
D-30519 Hannover, Germany

Hannover, 10 Jan. 2000

Stürwold

Head of the
Certification Body

Translated from German Original

3rd SUPPLEMENT
to
EC-Type Examination Certificate No. TÜV 97 ATEX 1173 X

Company: ABB Automation Products GmbH
Dransfelder Straße 2
D-37079 Göttingen, Germany

Formerly: Bailey Fischer & Porter GmbH

The Electromagnetic Flowmeters Models DE2. and DE4. may now be manufactured in accordance with the test documentation included in the Test Report. These changes affect the power supply board and the output circuit of the converter, which can now also be optionally connected to a field bus in compliance with the FISCO model. The identifications for the Intrinsic Safe voltages for this design option are:

Model DE.7 **II 2 G EEx emd [ia/ib] IIC T6**
Converter DE.8 **II 2 G EEx ed [ia] IIC T6**

The identifications for flowmeter primaries DE.6 and DE.8 remain unchanged.

Electrical Specifications

The output circuit for all models can be connected to either intrinsically safe or non-intrinsically safe circuits. The maximum allowable values are listed in the following table:

Output Circuit	In Ignition Protection Type Intrinsic Safety EEx ia IIC	Non-Intrinsically Safe U_m = 60 V
Field Bus Terminals V8/V9	U_i = 60 V The effective internal capacitance and inductances are negligibly small	Operating Values: U = 9 .. 32 V I = 10 mA

All other specifications apply unchanged.

(16) The test documents are listed in the Test Report No. 01 YEX 128767.

(17) The following conditions are also applicable:

The output circuit is designed so that it can be connected to either intrinsically safe or non-intrinsically safe circuits. If, after having been connected to non-intrinsically safe circuits the design test voltage U_m = 60 V was not exceeded, the output circuit can subsequently be operated as an intrinsically safe circuit. When using a shielded connection cable for the output circuit the shield in the non-hazardous area may only be connected with potential equalization, under the prerequisite, that inside and outside of the hazardous area potential equalization exists.

TÜV Hannover/Sachsen-Anhalt e.V.
TÜV CERT-Certification Body
Am TÜV 1
D-30519 Hannover, Germany

Hannover, 9 Oct. 2001

Stürwold
Head of the Certification Body

4th SUPPLEMENT
to
EC-Type Examination Certificate No. TÜV 97 ATEX 1173 X

Company: ABB Automation Products GmbH
Dransfelder Straße 2
D-37079 Göttingen, Germany

The Electromagnetic Flowmeters Models DE2. and DE4. may now also be manufactur ed in accordance with the test documentation listed below. These changes affect the supply power board, an alternate potential free current output as well as the cable and lead entries .
The Electromagnetic Flowmeters Models DE2. and DE4. may also be insta lled in hazardous dust locations, which require Category 2.
The markings for the flowmeters is as follows:

Model DE.6..
II 2 G EEx e m [ib] IIC T3 ... T6
II 2 D T 155°C IP65

Model DE.7..
II 2 G EEx e m d [ia/ib] IIC T3 ... T6 or EEx e m d [ib] IIC T3 ... T6
II 2 D T 155°C IP65

Model DE.8.. (Converter)
II 2 G EEx e d [ia] IIC T6 or EEx e d IIC T6 or II 2 G EEx ed [ib] IIC T6
II 2 D T 155°C IP65

Model DE.8.. (Flowmeter Primary)
II 2 G EEx e m [ib] IIC T3 ... T6
II 2 D T 155°C IP65

The electrical sp ecifications are changed as follows:

Electrical Specifications

The output circuit for all models can be connected to either intrinsically safe or non -intrinsically safe circuits. They are passive circuits and are isolated from all internal non -intrinsically safe circuits and from the earth potential.
The maximum allowable values are listed in the following table:

Circuit	in Ignition Type Intrinsic Safety EEx ia IIC/IIB for connection to a certified intrinsically safe circuit	Non-intrinsically safe U_m = 60 V Operating values:
Current output (passive), terminals +/-	U_i = 60 V C_i = 24 nF L_i = 0.065 mH	U = 30 V I = 30 mA
Pulse output terminals V8/V9 (V9→Plus)	U_i = 30 V I_i = 250 mA P_i = 1.1 W C_i = 12 nF L_i : negligibly small	U = 30 V I = 220 mA

4. Supplement to Eu -Type Examination Certificate TÜV 97 ATEX 1173 X

Contact output terminals P7/G2 (P7→Plus)	U_i = 30 V I_i = 250 mA P_i = 1.1 W C_i = 24 nF Li : negligibly small	U = 30 V I = 10 mA
Contact input terminals X1/G2 (X1→Plus)	U_i = 30 V I_i = 250 mA P_i = 1.1 W C_i = 24 nF Li : negligibly small	U = 30 V I = 10 mA

Contact output and contact input are galvanically connected together. The rules for interconnecting intrinsically safe circuits are to be observed.

(16) The test documents are listed in the Test Report No. 02YEX00 24.

(17) Special Conditions

The „ Special Conditions" are changed as follows for the design of the Electromagnetic Flowmeters Models DE2. and DE4. in accordance with this 4 th supplement as follows:

Because the current output is designed as potential free per the test documentation, "Special Condition" No. 3 is dropped.

In the design which includes the connection box without cable and lead entries, the user must assure that the Protection Class for Catergory 2G instruments is at least IP 54 and for Category 2 D is at least IP 6X.

All other specifications remain unchanged.

TÜV NORD CERT GmbH & Co. KG
TÜV CERT-Certification Body
Am TÜV 1
D-30519 Hannover, Germany
Tel.: 0511 986-1470
Fax: 0511 986-2555

Hannover, 29 Nov. 2002

The Director

5th SUPPLEMENT
to
EC-Type Examination Certificate No. TÜV 97 ATEX 1173 X

Company: ABB Automation Products GmbH
Dransfelder Straße 2
D-37079 Göttingen, Germany

The Electromagnetic Flowmeters Models DE2. and DE4. may now be manufactur ed according to the test documents specified in the test report. The changes concern the power supply board, an alternative variant with hose connector as well as the "Special Conditions" .

The marking of the flow meters reads in the future also as follows:

FXE4000 Type DE2 _ or DE4 _

All other specifications remain unchanged .

The test documents are listed in the Test Report No. 03YEX550485.

Special conditions

The " Special Conditions" are supplemented as follows:

If protecti ve grounding (PE) in the connection area of the flow meter is attached, it is to be guaranteed that no dangerous difference of potential between protective grounding (PE) and the potential equalization within the explosion hazardous area can occur.

TÜV NORD CERT GmbH & Co. KG
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover
Tel.: 0511 986-1470
Fax: 0511 986-2555

Hannover, 09. July 2003

Der Leiter

TÜV NORD

Translation

6. SUPPLEMENT

to Certificate No.	**TÜV 97 ATEX 1173 X**
Equipment:	Electromagnetic Flowmeter type DE2. and DE4. resp. FXE4000 type DE2_ and DE4_
Manufacturer:	ABB Automation Products GmbH
Address:	Dransfelder Straße 2 D-37079 Göttingen
Order number:	8000553204
Date of issue:	2006-07-12

In the future, the Electromagnetic Flowmeters type DE2. and DE4. resp. FXE4000 type DE2_ and DE4_ are allowed to be manufactured according to the documents listed in the test report. The changes refer to the construction of the printed circuit board for power supply as well as the gluing and sealing material for sealing of the housing and casting of the electrode caps.

In the future, the "Special conditions for safe use" are valid according to section 17.

The electrical data and all other data apply unchanged for this supplement.

The equipment incl. of this supplement meets the requirements of these standards:

EN 50 014:1977 + A1...A5
EN 50 020:2002
EN 50 018:1977 + A1 ... A3
EN 50 028:1987
EN 50 019:1977 + A1...A5
EN 50 281-1-1:1998

(16) The test documents are listed in the test report No. 06 YEX 553204.

(17) Special conditions for safe use

1. All external earth terminals have to be connected with the potential equalization in the explosion hazardous area. The rules for the erection valid respectively have to be observed.
2. If the pipeline is insulated, the regarding values of the table in the EC-Type Examination Certificate TÜV 97 ATEX 1173 X have to be observed.
3. Because the intrinsically safe current output is earthed under normal operation conditions, potential equalization has to has to exist in the complete course of the erection of the intrinsically safe circuit. If the current output is floating, this requirement is not applicable.
4. The output circuits mentioned in the tables to the 2. supplement of TÜV 97 ATEX 1173 X are only allowed to be operated intrinsically safe or non intrinsically safe. A combination is not permissible. Due to the interconnection of the switching output and the switching input, the rules for the interconnection (current addition) have to be observed, if intrinsically safe circuits are connected.

BA 05 01.06 1.ZMO.000

TÜV NORD

5. The output circuit for a field bus connection is executed in such a manner, that he can be connected to intrinsically safe as well as to non intrinsically safe circuits. If, at connection of non intrinsically safe circuits, the rated voltage of U_m = 60 V is not exceeded, the output is allowed to be operated with intrinsically safe circuits subsequently.
6. If shielded connection cables are used, the shield is only allowed to be connected with the potential equalization outside of the explosion hazardous area under the precondition, that potential equalization is erected inside and outside of the explosion hazardous area.
7. If the protective conductor (PE) is connected internal of the connection room of the flow meter, it has to be ensured, that no hazardous potential difference between the protective conductor (PE) and the potential equalization can occur.

(18) Essential Health and Safety Requirements

no additional ones

TÜV NORD CERT GmbH, Langemarckstraße 20, 45141 Essen, accredited by the central office of the countries for safety engineering (ZLS), Ident. Nr. 0044, legal successor of the TÜV NORD CERT GmbH & Co. KG Ident. Nr. 0032

The head of the certification body

Schwedt

Hanover office, Am TÜV 1, 30519 Hanover, Tel.: +49 (0) 511 986-1455, Fax: +49 (0) 511 986-1590

BA 05 01.06 1.ZMO.000

TÜV NORD

Translation

7. SUPPLEMENT

to Certificate No.	**TÜV 97 ATEX 1173 X**
Equipment:	Electromagnetic Flowmeter type DE2. and DE4. resp. FXE4000 type DE2_ and DE4_
Manufacturer:	**ABB Automation Products GmbH**
Address:	Dransfelder Straße 2 37079 Göttingen
Order number:	8000554807
Date of issue:	04.11.2008

Amendments:

In the future, the Electromagnetic Flowmeters type DE2. and DE4. resp. FXE4000 type DE2_ and DE4_ are allowed to be manufactured according to the documents listed in the test report 08 203 554807.

In the future, the "Special conditions for safe use" are valid according to section 17.

The electrical data and all other data apply unchanged for this supplement.

The Amendments of this supplement fulfil the requirements of the following standards:

EN 60079-0:2006 **EN 60079-11:2007**

The equipment incl. this supplement meets the requirements of these standards:

EN 50 014:1977 + A1...A5 **EN 50 018:1977 + A1 ... A3** **EN 50 019:1977 + A1...A5**
EN 50 020:2002 **EN 50 028:1987** **EN 50 281-1-1:1998**

(16) The test documents are listed in the test report No. 08 203 554807.

(17) Special conditions for safe use

1. All external earth terminals have to be connected with the potential equalization in the explosion hazardous area. The rules for the erection valid respectively have to be observed.
2. If the pipeline is insulated, the regarding values of the table in the EC-Type Examination Certificate TÜV 97 ATEX 1173 X have to be observed.

3. Because the intrinsically safe current output is earthed under normal operation conditions, potential equalization has to have to exist in the complete course of the erection of the intrinsically safe circuit. If the current output is floating, this requirement is not applicable.
4. The output circuits mentioned in the tables to the 2. supplement of TÜV 97 ATEX 1173 X are only allowed to be operated intrinsically safe or non intrinsically safe. A combination is not permissible. Due to the interconnection of the switching output and the switching input, the rules for the interconnection (current addition) have to be observed, if intrinsically safe circuits are connected.
5. The output circuit for a field bus connection is executed in such a manner, that he can be connected to intrinsically safe as well as to non intrinsically safe circuits. If, at connection of non intrinsically safe circuits, the rated voltage of U_m = 60 V is not exceeded, the output is allowed to be operated with intrinsically safe circuits subsequently.
6. If shielded connection cables are used, the shield is only allowed to be connected with the potential equalization outside of the explosion hazardous area under the precondition, that potential equalization is erected inside and outside of the explosion hazardous area.
7. If the earthing equipment conductor (PE) is connected internal of the connection room of the flow meter, it has to be ensured, that no hazardous potential difference between the protective conductor (PE) and the potential equalization can occur.
8. The over voltage category III must not be exceeded by connected non mains / mains circuits.

(18) Essential Health and Safety Requirements

no additional ones

TÜV NORD CERT GmbH, Langemarckstraße 20, 45141 Essen, accredited by the central office of the countries for safety engineering (ZLS), Ident. Nr. 0044, legal successor of the TÜV NORD CERT GmbH & Co. KG Ident. Nr. 0032

The head of the certification body

i. V.

Schwedt

Hanover office, Am TÜV 1, 30519 Hanover. Tel.: +49 (0) 511 986-1455, Fax: +49 (0) 511 986-1590

15 EU-Certificate of Compliance

EG-Konformitätserklärung
EC-Certificate of Compliance

CE Ex

Hiermit bestätigen wir die Übereinstimmung der
Herewith we confirm that our

Magnetisch-induktiven Durchflussmesser
Electromagnetic Flowmeter

Modell **DE26.., DE27.., DE28.., DE46.., DE47.., DE48..** **FXE4000**
Model

mit den grundlegenden Sicherheits- und Gesundheitsanforderungen gem. der Richtlinie 94/9/EG des Rates der Europäischen Gemeinschaft. Die Sicherheits- und Installationshinweise der Produktdokumentation sind zu beachten.
are in compliance with the Essential Health and Safety Requirements with refer to the council directives 94/9/EEC of the European Community. The safety and installation requirements of the product documentation must be observed.

Die magnetisch-induktiven Durchflussmesser dienen zur durchflussproportionalen Messung leit- und fließfähiger Messstoffe. Als Messstoffe sind brennbare Medien zulässig, wenn diese soweit frei von Luft- oder Sauerstoff sind, dass sie nicht ständig oder langzeitig ein explosionsfähiges Gemisch bilden.
The electromagnetic flowmeter are utilized to meter electrical conductive fluids. As long as the combination with air or oxygen is not a permanent or long time hazardous mixture flammable fluids are allowed.

EG-Baumusterprüfbescheinigung: *EC-Type Examination Certificate:*	TÜV 97 ATEX 1173 X	
Benannte Stelle: *Notified Body:*	TÜV Hannover/Sachsen-Anhalt e.V., Kennummer 0044	
Geräte-Kennzeichnung: *Apparatus code:*	DE26.., DE46..	II 2G EEx em [ib] IIC T3...T6
	DE27.., DE47..	II 2G EEx emd [ia/ib] IIC T3...T6
	➥Feldbus PA/FF (FISCO)	II 2G EEx emd [ia/ib] IIC T6
	DE28.., DE48..	
	➥Aufnehmer / *Primary*	II 2G EEx em [ib] IIC T3...T6
	➥Meßumformer / *Converter*	II 2G EEx ed IIC T6
		II 2G EEx ed [ia] IIC T6
		II 2G EEx ed [ib] IIC T6
	➥Feldbus PA/FF (FISCO)	II 2G EEx ed [ia] IIC T6
	DE27.., DE46.., DE47.., DE48..	II 2D T155°C IP65
Sicherheitstechnische Daten: *Safety values:*	siehe EG-Baumusterprüfbescheinigung	
Angewandte Normen: *Standards:*	*refer to EC-Type Examination Certificate*	

Göttingen, 20. November 2008

BZ-13-8003, Rev.7, 12165

ppa.
Unterschrift / *Signature*
Dr. Dieter Binz
Innovation Manager DEAPR Instrumentation

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Unterschrift / *Signature*
Dipl. Ing. Karl-Heinz Rackebrandt
R&D Manager Sensors

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EG-Konformitätserklärung
EC-Certificate of Compliance

CE

Hiermit bestätigen wir die Übereinstimmung der aufgeführten Geräte mit den Richtlinien des Rates der Europäischen Gemeinschaft. Die Sicherheits- und Installationshinweise der Produktdokumentation sind zu beachten.

Herewith we confirm that the listed instruments are in compliance with the council directives of the European Community. The safety and installation requirements of the product documentation must be observed.

Modell: *Model:*	50XE4... / E4... 10DE2... / DE2... 10DX4... / DE4...
Richtlinie: *Directive:*	EMV Richtlinie 89/336/EWG * EMC directive 89/336/EEC *
Europäische Norm: *European Standard:*	EN 50081-1, 3/93 * EN 50082-2, 2/96 *
Richtlinie: *Directive:*	Niederspannungsrichtlinie 73/23/EWG * Low voltage directive 73/23/EEC *
Europäische Norm: *European Standard:*	EN 61010-1, 3/94 *

* einschließlich Nachträge
including alterations

Göttingen, 10.05.2000

.....
Unterschrift / Signature

BZ-13-5108, Rev.1, 1699

ABB Automation Products GmbH

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Registergericht:
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Handelsregister:
HRB 423

Vorsitz des Aufsichtrates:
Bengt Pihl
Geschäftsführung:
Uwe Alwardt (Vorsitz)
Burkhard Block
Erik Huggare

Commerzbank AG Frankfurt
Konto: 589 635 200
BLZ: 500 400 00

EG-Konformitätserklärung
EC-Declaration of Conformity

CE 0045

Hiermit bestätigen wir die Übereinstimmung des aufgeführten Gerätes mit den Richtlinien des Rates der Europäischen Gemeinschaft, welche mit dem CE-Zeichen gekennzeichnet sind. Die Sicherheits- und Installationshinweise der Produktdokumentation sind zu beachten.
Herewith we confirm that the listed instrument is in compliance with the council directives of the European Community and are marked with the CE markíng. The safety and installation requirements of the product documentation must be observed.

Hersteller: *manufacturer:*	ABB Automation Products GmbH, 37070 Göttingen - Germany
Modell: *model:*	D_2.., D_2_W, D_4_W, SE2.., SE2_W *D_2.., D_2_W, D_4_W, SE2.., SE2_W*
Richtlinie: *directive:*	Druckgeräterichtlinie 97/23/EG *pressure equipment directive 97/23/EC*
Einstufung: *classification:*	Ausrüstungsteile von Rohrleitungen *piping accessories*
Normengrundlage: *technical standard:*	AD 2000 Merkblätter
Konformitätsbewertungsverfahren: *conformity assessment procedure:*	B1 (EG-Entwurfsprüfung) + D (Qualitätssicherung Produktion) *B1 (EC design-examination) + D (production quality assurance)*
EG-Entwurfsprüfbescheinigung: *EC design-examination certificate:*	Nr. 07 202 0124 Z 052/2/0006
benannte Stelle: *notified body:*	TÜV Nord e.V. Rudolf-Diesel-Str. 5 37075 Göttingen - Germany
Kennnummer: *identification no.*	0045

Göttingen, den 21.05.2002

ppa .....
(K.Wiskow, Personalleiter APR Göttingen)

EG-Konformitätserklärung
EC-Declaration of Conformity

CE
0045

Hiermit bestätigen wir die Übereinstimmung des aufgeführten Gerätes mit den Richtlinien des Rates der Europäischen Gemeinschaft, welche mit dem CE-Zeichen gekennzeichnet sind. Die Sicherheits- und Installationshinweise der Produktdokumentation sind zu beachten.
Herewith we confirm that the listed instrument is in compliance with the council directives of the European Community and are marked with the CE marking. The safety and installation requirements of the product documentation must be observed.

Hersteller: *manufacturer:*	ABB Automation Products GmbH, 37070 Göttingen - Germany
Modell: *model:*	SE2_F, D_2_F, SE4_F, D_4_F *SE2_F, D_2_F, SE4_F, D_4_F*
Richtlinie: *directive:*	Druckgeräterichtlinie 97/23/EG *pressure equipment directive 97/23/EC*
Einstufung: *classification:*	Ausrüstungsteile von Rohrleitungen *piping accessories*
Normengrundlage: *technical standard:*	AD 2000 Merkblätter
Konformitätsbewertungsverfahren: *conformity assessment procedure:*	B1 (EG-Entwurfsprüfung) + D (Qualitätssicherung Produktion) *B1 (EC design-examination) + D (production quality assurance)*
EG-Entwurfsprüfbescheinigungen: *EC design-examination certificates:*	Nr. 07 202 4534 Z 0601 / 3 / H
benannte Stelle: *notified body:*	TÜV Nord e.V. Rudolf-Diesel-Str. 5 37075 Göttingen - Germany
Kennnummer: *identification no.*	0045

Göttingen, den 10.02.2003

ppa .....
(B.Kammann, Standortleiter APR Göttingen)

2310 BZ-25-0002 Rev.03

ABB has Sales & Customer Support
expertise in over 100 countries worldwide.

www.abb.com

The Company's policy is one of continuous product improvement and the right is reserved to modify the information contained herein without notice.

Printed in the Fed. Rep. of Germany (02.2009)

D184B115U02 Rev. 03

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