Operating Instruction

D184B094U02

Electromagnetic Flowmeter FXT4000 (COPA-XT) in 2-Wire Technology with Pulsed DC Magnetic Fields

Valid for Software Versions from A.3X

HART® FIELD COMMUNICATIONS PROTOCOL

ABB

Product Designation
FXT4000

Operating Instruction

Part No. D184B094U02

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Specifications

Electromagnetic Flowmeter in a 2-Wire Design with Pulsed DC Magnetic Field in a Compact Design FXT4000 (COPA-XT) see Data Sheet Part No. D184S043U02

12 Safety Information

12.1 Basic Safety Requirements

12.1.1 Safety Standards for the Instrument

- This instrument complies with the safety requirements of the Pressure Equipment Directive and state of the art technology. It was tested and shipped from our factory in a safe operating condition. In order to maintain this condition during operation, the requirements listed in this Operation Manual must be observed and followed.
- The instrument satisfies the EMC-Requirements in EN61326 / NAMUR NE21.
- When a power interruption occurs, all instrument parameters are stored in a NVRAM. After the power is restored, the instrument is ready for operation immediately.

12.1.2 Regulated Usage

This instrument is to be used for

transporting the flowrate of electrically conductive liquids, slurries or sludges and metering:

- the volumetric flow or
- the mass flow (at constant density) when mass engineering units have been selected

The regulated usages include:

- installation within the specification limits
- observing and following the information in the Operation Manual
- observing and following the information in the accompanying documentation (Specifications, Diagrams, Dimensions)

The following usages of the instrument are not permissible:

- operation as an elastic compensation member in the pipeline, e.g. to compensate for pipe misalignment, pipeline vibrations, pipeline expansions, etc.,
- use as a climbing support, e.g. for assembly purposes,
- use as a support for external loads , e.g. support for the pipeline, etc.,
- material addition by painting over the factory tag or adding parts by welding or soldering
- material removal, e.g., by drilling into the housing
- repairs, modifications and expansions and the use of replacement parts is only permissible as described in the Operation Manual. Extensive activities must be approved by us. Excepted are repairs made in locations authorized by ABB. For unauthorized activities we accept no liability.

The operation and maintenance requirements in this Operation Manual must be observed. For damage resulting from improper or non-regulated usage the manufacturer assumes no liability.

12.1.3 Specification Limits

The instrument is to be used exclusively within the limits specified on the factory tag and listed in the Operation Manual. The following limits are to be observed:

- The allowable pressure (PS) and the allowable fluid temperature (TS) may not exceed the pressure/temperature values (p/T-ratings) listed in this Operation Manual.
- The max. and min. operating temperatures listed in the instrument specifications may not be exceeded.
- The allowable ambient temperature listed in the instrument specifications may not be exceeded.
- The Protection Class is IP 67 per EN60529.
- Graphite may not be used for the gaskets because, under certain conditions it may be possible that an electrically conductive coating may form on the interior of the meter pipe.
- The flowmeter may not be installed near strong electromagnetic fields, e.g. motors, pumps, transformers. A minimum distance of 100 mm should be maintained. For installations on or to steel parts (e.g. steel supports) a minimum distance of approx. 100 mm should be maintain. **(Values were determined based on IEC801-2 or IEC TC 77B (SEC 101))**.

12.1.4 Allowable Fluids

- Only such fluids should be metered for which assurance is available, either based on state of the art technology or past experience by the user, that the required chemical and physical resistance of the materials of the fluid wetted parts (electrodes, grounding electrodes, liner, process connections, grounding plates or protection plates) will not be adversely affected during the operating life of the instrument.
- Fluids with unknown characteristics may only be metered if the user initiates a regular and suitable inspection program to assure the safe condition of the instrument.
- The specifications on the factory tag are to be observed.

12.1.5 Safety Marks, Symbols, Type and Factory Tags and CE-Mark

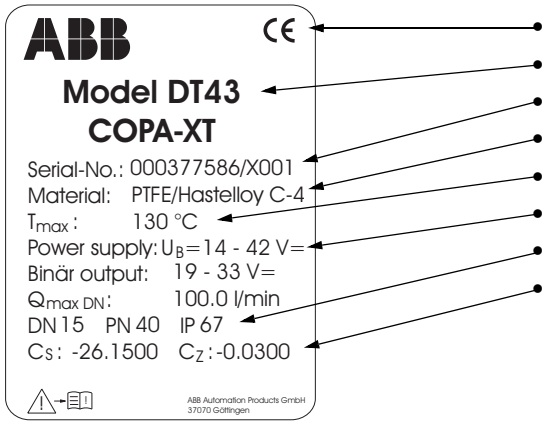
All safety marks, symbols and the factory and type tags should be maintained in a readable state and protected from damage or loss. Note the following generalized information:

	**Warning!**	Information indicating that a risk or danger exists which could result in serious or fatal injuries to personnel.
	**Caution!**	Information indicating a possible dangerous situation. If not corrected, the product or something in its vicinity may damaged.
	**Informa-tion!**	The Information symbol is a user tip or other particularly important information, which if ignored could result in loss of operating ease or affect the instrument functionality.
	**CE-Mark**	The CE-Mark identifies compliance of the instrument with the following guidelines and the satisfying the basic safety directives: • CE-Mark on the type tag (on the converter) – Compliance with the EMC-Directive 89/336/EWG – Compliance with the Low Voltage Directive 73/23/EWG • CE-Mark on the factory tag (on the flowmeter primary) – Compliance with the Pressure Equipment Directive PED/DGRL) 97/23/EU Pressure equipment will not have a CE-Mark on the factory tag if: – the max. allow, pressure (PS) is less than 0.5 bar. – there are minimal pressure risks (meter sizes ≤ DN 25 [1"]). For this equipment a certification procedure is not required

12.1.6 Type and Factory Tags

12.1.6.1 Type Tag Specifications

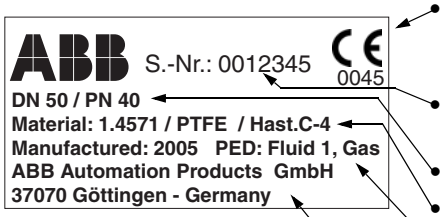
The type tag is located on the converter housing.



12.1.6.2 Factory Tag Specifications

The factory tag is located on the flowmeter primary housing. There are two different factory tags dependent on whether the instrument falls into the applicability range of the PED, (see also Sect. 3 Par. 3 PED/DGRL 97/23/EU), :

a) Pressure Equipment within the Applicability Range of PED/DGRL



The factory tag contains the following specifications:

- CE-Mark (with the number identifying the testing agency) to certify compliance of the instrument with the requirements of the Pressure Equipment Directive 97/23/EU.
- Serial number provided by the manufacturer to identify the pressure equipment.
- Meter size and pressure rating of the pressure equipment
- Flange, liner and electrode materials (fluid wetted).
- Year of manufacture of the pressure equipment and specification of the Fluid Group per PED/DGRL (**P**ressure **E**quipment **D**irective) Fluid Group 1 = hazardous liquids, gases
- Manufacturer of the pressure equipment.

b) Pressure Equipment not within the Applicability Range of PED/DGRL

The factory tag includes essentially the same specifications as the one described in a) above with the following differences:

- There is no CE-Mark for the pressure equipment per Sect. 3 Par. 3 of the PED/DGRL because the pressure equipment is not within the applicability range of the Pressure Equipment Directive 97/23/EU.
- In the PED the basis for the exception is given in Sect. 3 Par. 3 of the PED/DGRL. The pressure equipment is categorized under the section SEP (=**S**ound **E**ngineering **P**ractice).

12.1.7 Qualification of the Personnel

- The electrical installation, start-up and maintenance of the instrument should only be carried out by trained personnel authorized by the system operator. The personnel must read and understand the Operation Manual and follow its instructions.

12.1.8 Responsibilities of the Operator

- Before metering corrosive or abrasive fluids the operator must evaluate the resistance of the fluid wetted parts. ABB will gladly provide assistance in their selection, but cannot assume any liability.
- Observe the national standards in your country applicable to testing the operation, repair and maintenance of electrical instruments.

12.1.9 Possible Dangers When Transporting the Instruments

Note when transporting the instrument to the installation site:

- the center of gravity may be off-center.
- the protection plates or caps mounted on the process connections for PTFE/PFA lined meters should only be removed just prior to installing the instrument in the pipeline.
- care must be exercised to assure that the liner is not cut off or damaged during installation to avoid leaks.

12.1.10 Possible Dangers During Installation

Before installing assure that:

- the flow direction corresponds with the arrow on the instrument, if present.
- the maximum torque vales are observed for all flange bolts.
- the instrument is installed in a stress free manner (torsion, bending), flanged and wafer design instruments are installed with axisymmetric, parallel mating flanges and gaskets are used that are suitable for the anticipated operating conditions.

12.1.11 Possible Dangers During Electrical Installation

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

- In particular observe the information regarding the electrical connections in this Operation Manual, otherwise the electrical protection type may be adversely affected.
- Ground the flowmeter system.

Attention!

When the housing cover is removed, EMC and personnel protection are no longer provided.

- There are circuits inside the housing which are dangerous to touch. Therefore, before opening the housing cover the supply power should be turned off.
- Installation and maintenance tasks may only be performed by trained personnel.

12.1.12 Possible Dangers During Normal Operation

- When metering hot fluids, touching the flowmeter primary surface could cause burns.
- Aggressive or corrosive fluids could cause damage to the liner or electrodes resulting is unexpected leakage of fluid under pressure.
- Due to fatigue of the flange gasket leaks of the fluid under pressure could occur.
- The internal flat gaskets in Models DE21 and DE23 can be come brittle due to the CIP/SIP process.

12.1.13 Possible Dangers During Inspection and Maintenance

- Before removing the instrument assure that the instrument and the adjacent piping or tanks have been depressurized.
- Before removing the instrument, check if the instrument was used to meter dangerous fluids. It may be possible that hazardous residues may still be present in the instrument which could exit when the meter is uninstalled.
- We recommend when pipeline vibrations exist to secure the flange bolts and nuts against loosening.
- Within the framework of user responsibilities, perform a regular inspection of the instrument including:
  - the pressure containing walls/liners of the pressure equipment
  - the proper metering function
  - the seal integrity
  - wear (corrosion)

12.1.14 Returns

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

Information! EU-Hazardous Material Directives

The owner of special wastes is responsible for its decontamination and must satisfy the following requirements before shipping the materials:

- All flowmeter primaries and/or flowmeter converters which are returned to ABB for repair are to be free of any hazardous materials (acids, bases, solvents, etc.). This includes flushing and decontaminating the hazardous materials which may be present in the cavities in the primaries between the meter pipe and the housing. 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, Flowmeter Primary and Converter Coordination

2.1 Principle of Operation

The ABB Automation Products electromagnetic flowmeters are the ideal instruments for metering the flowrate of liquids, slurries and sludges with a specific minimum electrical conductivity. These flowmeters measure accurately, produce no additional pressure drop, contain no moving or protruding parts, are wear and corrosion resistant. They can be installed in any existing installation without difficulty.

The ABB Automation Products “EMF” has proven itself over many years and is the preferred flowmeter in the chemical industry, the 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 the 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 through the metering tube perpendicular to the direction of the magnetic field, see schematic.

$$U_E \sim B \cdot D \cdot v$$

The voltage induced in the fluid is measured by two electrodes located diametrically opposite to each other. This flow 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 flow signal voltage $\mathbf{U_E}$ and the average flow velocity **v**. From the equation for calculating the volume flow rate *) it follows that $\mathbf{U_E} \sim \mathbf{q_v}$, that is, the flow signal voltage $\mathbf{U_E}$ is linear and proportional to the volumetric flow rate.

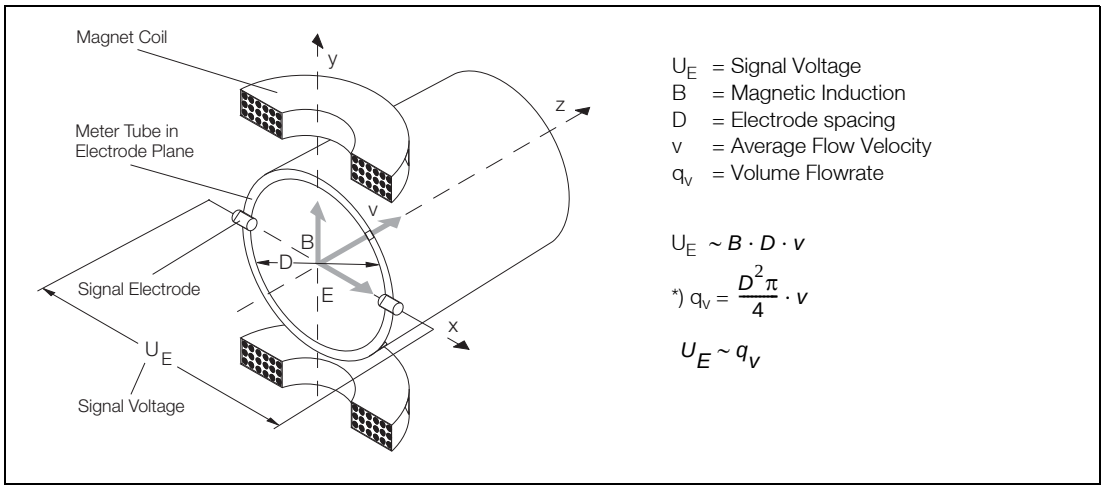


Fig. 1: Electromagnetic Flowmeter Schematic

2.3 Design

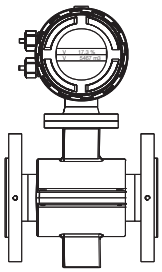
An electromagnetic flowmeter system always consists of a flowmeter primary and a converter. In the Compact Design the flowmeter primary and the converter constitute a single entity. This feature coupled with the 2-Wire technology in which the supply power and the outputs are carried on the same cable results in appreciably lower installation expenses than for the conventional instruments.

2.4 Flowmeter Primary and Converter Coordination

Compact Design FXT4000 (COPA-XT)

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

Model:
Metering system DT43F



Flanged

2.5 Data Security

All data is stored in a FRAM when the power is turned off or a power interruption occurs. The parameter settings, process information and flowmeter primary specific calibration data are stored in a FRAM as well as in an external EEPROM. Therefore, when an electronic module and its memory module is exchanged all the stored data can be uploaded at any time.

Important Start-Up Information!

Data Memory Module (external EEPROM)

The converter is shipped with its appropriate EEPROM installed in the socket on the converter display plate. Please check that the correct coordination is maintained between the flowmeter primary and the converter. The converters are identified by the end numbers, A1, A2 etc. listed on the converter Instrument Tag and in addition, the Order Number is noted on the memory module.

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 when transporting the instrument to the meter installation site:

- the center of gravity may be off-center.
- the protection plates or caps mounted on the process connections for PTFE/PFA lined meters should only be removed just prior to installing the instrument in the pipeline.
- care must be exercised to assure that the liner is not cut off or damaged during installation to avoid leaks
- flanged meters should not be lifted by the converter housing or connection box.
- when transporting flanged instruments please use lifting straps and position them around both process connections (Fig. 2). Chains are to be avoided since they might damage the housing.

Warning!

The center of gravity of the complete instrument may be above the lifting points of the straps. Injury may result if the instrument moves! Assure that the instrument does not unintentionally slip or rotate during transport.

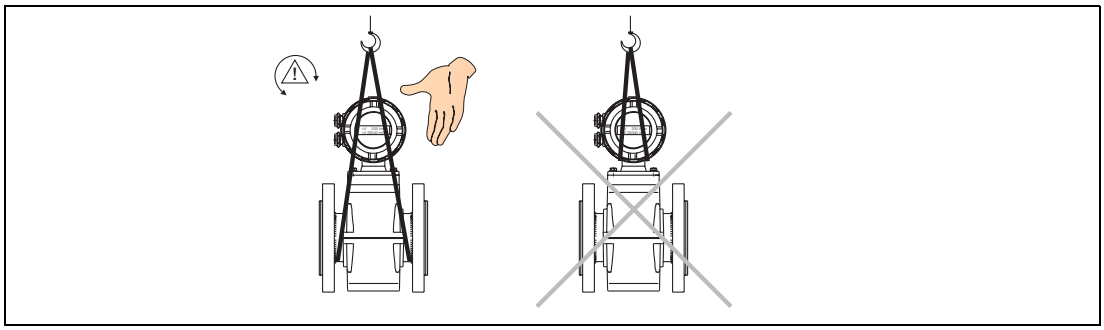


Fig. 2: Transport of Flanged Instrument]

3.2.1 Recommended Installation Conditions

The flowmeter primary should not be installed in the vicinity of strong electromagnetic fields.

The electromagnetic flowmeter primary must be installed so that the metering tube is always filled with fluid. Valves or other shut off devices should be installed downstream from the EMF so that the flowmeter primary cannot drain. A slight upward slope of approx. 3 % is desirable to preventing gas build up in the flowmeter (Fig. 3).

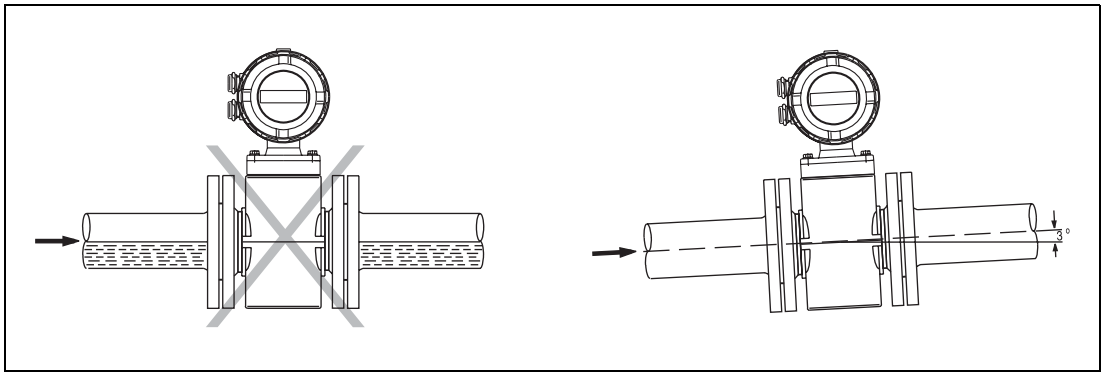


Fig. 3:

Vertical installations are ideal when the fluid flows in an upward direction. Installations in drop lines, i.e. the fluid flows from the top to the bottom are to be avoided because experience has shown that it is not possible to guarantee that the pipeline will remain full and that an equilibrium condition between the upward flowing gas and the downward flowing liquid will not occur (Fig. 4).

The flowmeter primary should generally be installed so that the electrical connectors (Pg) point downward (Fig. 4 and Fig. 6).

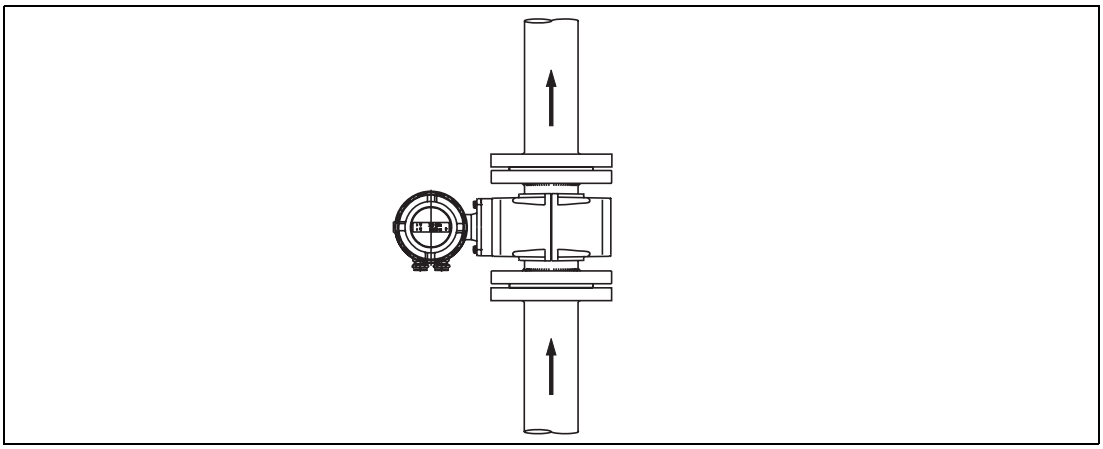


Fig. 4:

In horizontal installations the imaginary line connecting the electrodes should be horizontal so that air or gas bubbles cannot influence the flow signal voltage that is measured at the electrodes. The electrode orientation is shown in Fig. 5.

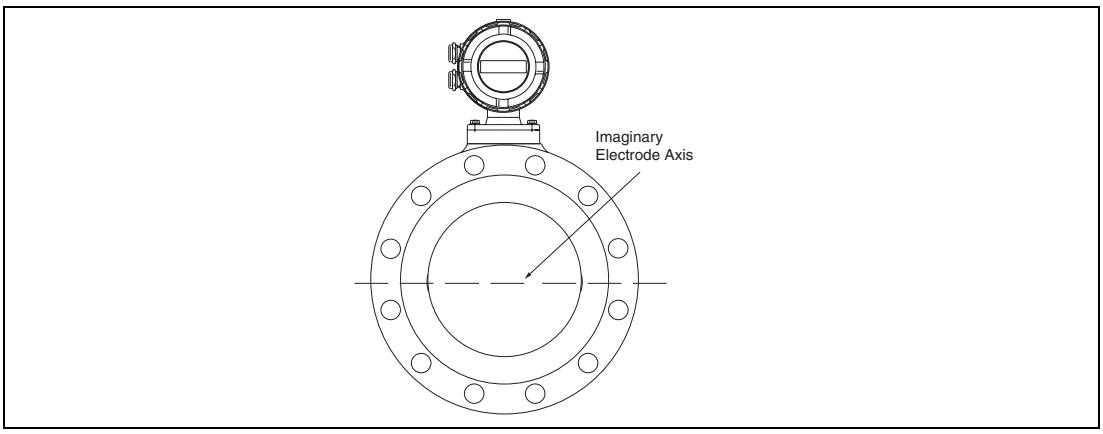


Fig. 5:

For a free flow in- or outlet an invert should be provided to assure that the flowmeter primary is always filled with fluid (Fig. 6).

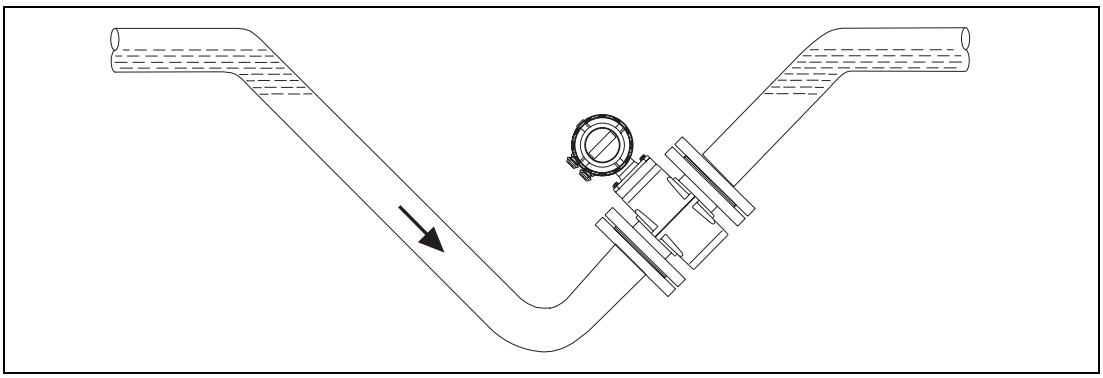


Fig. 6:

In a free flow outlet (drop line) the flowmeter primary should be not be installed in the highest point or in the discharge of the pipeline (metering spool could drain, air bubbles, Fig. 7

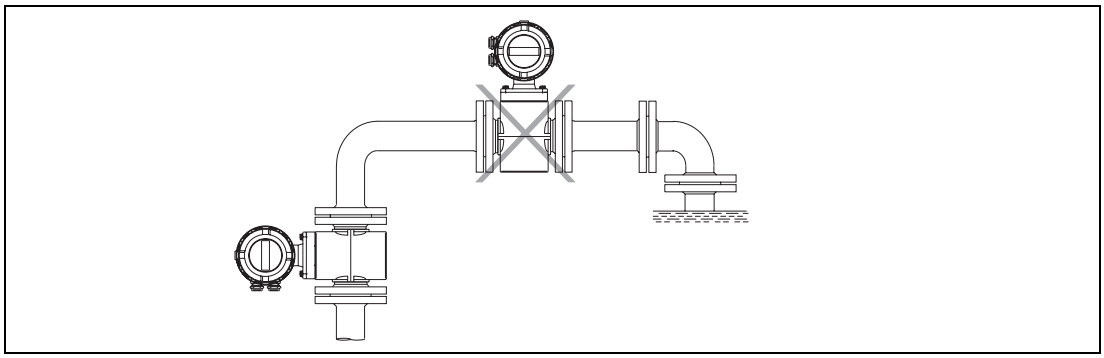


Fig. 7:

3.2.2 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 profile should be employed. Experience indicates that in most cases a straight upstream section with a length of 3 x DN and a downstream section of 2 x DN are sufficient (DN = flowmeter primary size) Fig. 8. In calibration stands the reference conditions of EN 29104 require straight lengths of 10 x DN upstream and 5 x DN downstream.

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.

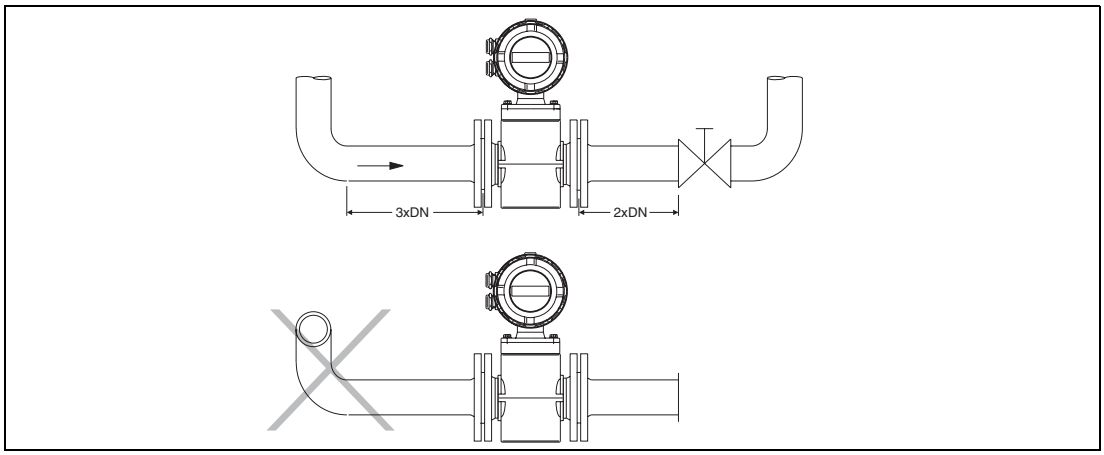


Fig. 8:

For heavily contaminated fluids a bypass line as shown in Fig. 9 is recommended so that when mechanical cleaning is required operation can continue uninterrupted.

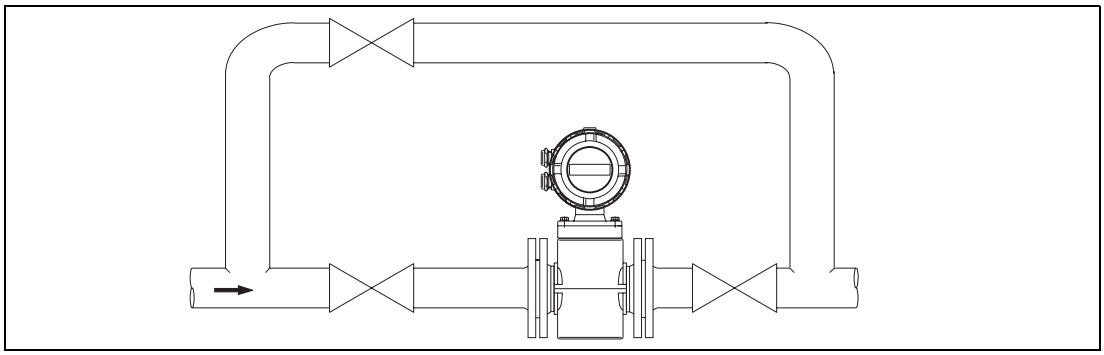


Fig. 9:

For flowmeter primaries which are to be installed in the vicinity of pumps or other vibration generating equipment, the utilization of mechanical dampers is advantageous (Fig. 10).

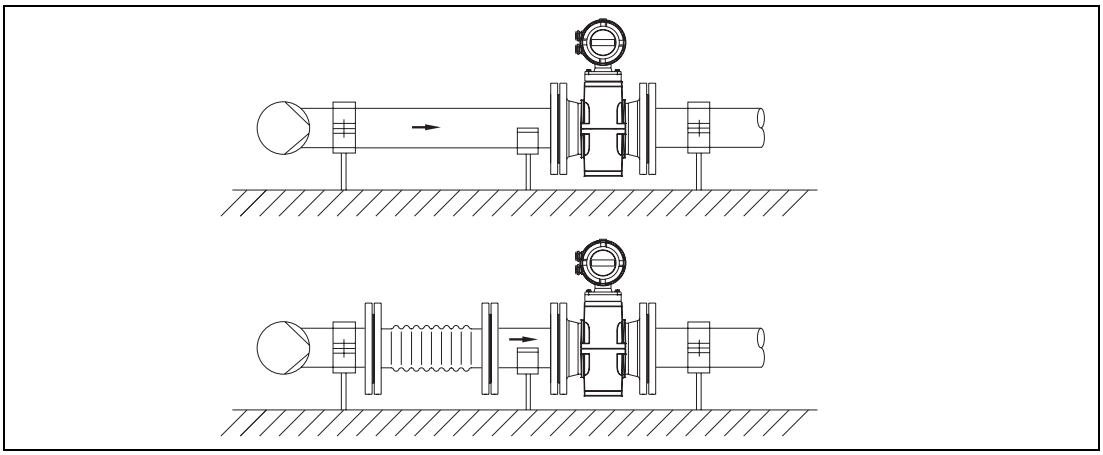


Fig. 10:

3.2.3 Installation of the Flowmeter Primary

The electromagnetic flowmeter can be installed at any arbitrary location in the pipeline as long as the installation requirements (see 3.2.1) 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.

Notice!

Graphite should not be used for the flange or process connection gaskets, because under certain conditions it may cause an electrically conductive coating to form on the inside of the metering spool. Vacuum shocks in the pipeline should be avoided to prevent damage to the liners.

Gasket Surfaces on the Mating Flanges

In all installations parallel mating flange surfaces should be provided and gaskets made from materials suitable for the fluid and the 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 flowmeter primary liner during transport. Remove the protection plates only when ready to install the flowmeter in the pipe line. Be careful not to cut or otherwise damage the liner in order to prevent leakage.

3.2.4 Torque Values

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 criss-cross pattern as shown in Fig. 11. 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 table.

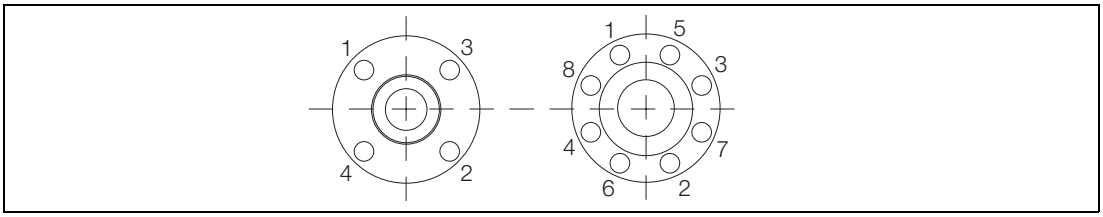


Fig. 11:

Torque Specifications for Flanged Flowmeters

Nominal size DN		Pressure	Screws	Max. tightening torque
mm	inch	PN		Nm
3 - 10 [1]	1/10“ - 3/8“	40	4 x M12	8
		CL150	4 x M12	6
		CL300	4 x M12	7
15	1/2“	40	4 x M12	10
		CL150	4 x M12	6
		CL300	4 x M12	7
20	3/4“	40	4 x M12	16
		CL150	4 x M12	8
		CL300	4 x M16	13
25	1“	40	4 x M12	21
		CL150	4 x M12	10
		CL300	4 x M16	18
32	1 1/4“	40	4 x M16	34
		CL150	4 x M12	15
		CL300	4 x M16	27
40	1 1/2“	40	4 x M16	43
		CL150	4 x M12	20
		CL300	4 x M20	43
50	2“	40	4 x M16	56
		CL150	4 x M16	39
		CL300	4 x M16	28
65	2 1/2“	16	4 x M16	34
		40	4 x M16	39
		CL150	4 x M16	49
		CL300	8 x M20	43
80	3“	40	8 x M16	49
		CL150	4 x M16	69
		CL300	8 x M20	62
100	4“	16	8 x M16	47
		40	8 x M20	77
		CL150	8 x M16	49
		CL300	8 x M20	92
125	5“	16	8 x M16	62
		40	8 x M24	120
		CL150	8 x M20	76
		CL300	8 x M20	120
150	6“	16	8 x M20	83
		40	8 x M24	155
		CL150	8 x M20	96
		CL300	12 x M20	100

[1] Connection Flange DIN/EN 1092-1 = DN10 (3/8“). Connectionflange ASME = DN15 (1/2“)

3.2.5 Installations in Larger Size Pipelines

The flowmeter can readily be installed in larger size pipe lines through the use of flanged transition sections (e.g. Flanged Reducers). The pressure drop resulting from the reduction can be determined from the Nomograph Fig. 12. The pressure drop can be determined using the following procedure:

1. Calculate the diameter ratio d/D.
2. Calculate the flow velocity as a function of the meter size and the flow rate:
   The flow velocity can also be determined from a Flow Rate Nomograph, see Specification Sheet.
3. The pressure drop can be read on the -Y- axis at the intersection of the “Flow Velocity” curve and the "Diameter Ratio d/D" value on -X- axis in Fig. 12.

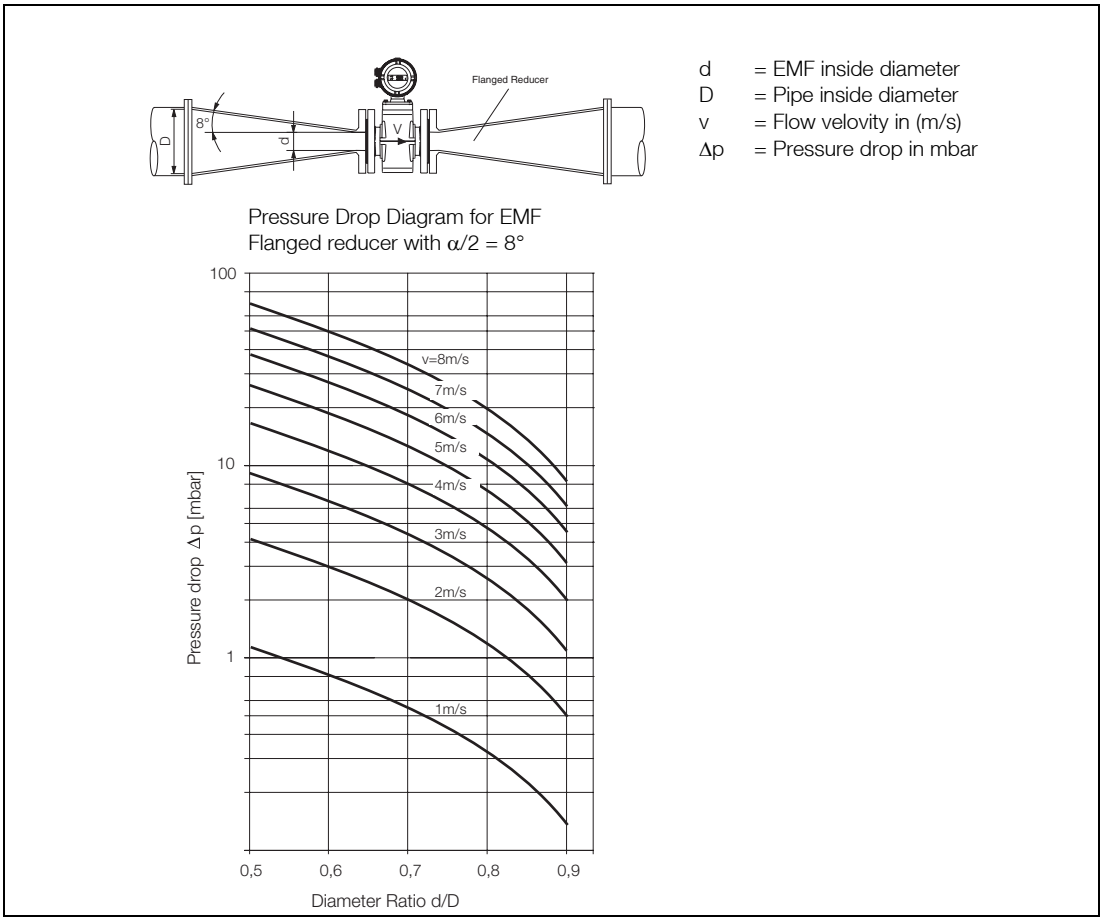


Fig. 12: Nomograph for Pressure Drop Determinations

3.2.6 Meter Sizes, Pressure Ratings, Flow Ranges and Flowrate Nomograph

Meter Size		Standard Press. Rating	min. Flow Range Flow Velocity	max. Flow Range Flow Velocity
DN	inch	PN	(0 to 0.5) m/s	(0 to 10) m/s
10		40	0 to 2.25 l/min	0 to 45 l/min
15		40	0 to 5 l/min	0 to 100 l/min
20		40	0 to 7.5 l/min	0 to 150 l/min
25		40	0 to 10 l/min	0 to 200 l/min
32		40	0 to 20 l/min	0 to 400 l/min
40		40	0 to 30 l/min	0 to 600 l/min
50		40	0 to 3 m^3/h	0 to 60 m^3/h
65		40	0 to 6 m^3/h	0 to 120 m^3/h
80		40	0 to 9 m^3/h	0 to 180 m^3/h
100		16	0 to 12 m^3/h	0 to 240 m^3/h
125		16	0 to 21 m^3/h	0 to 420 m^3/h
150		16	0 to 30 m^3/h	0 to 600 m^3/h

Flowrate Nomograph

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

Example:

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

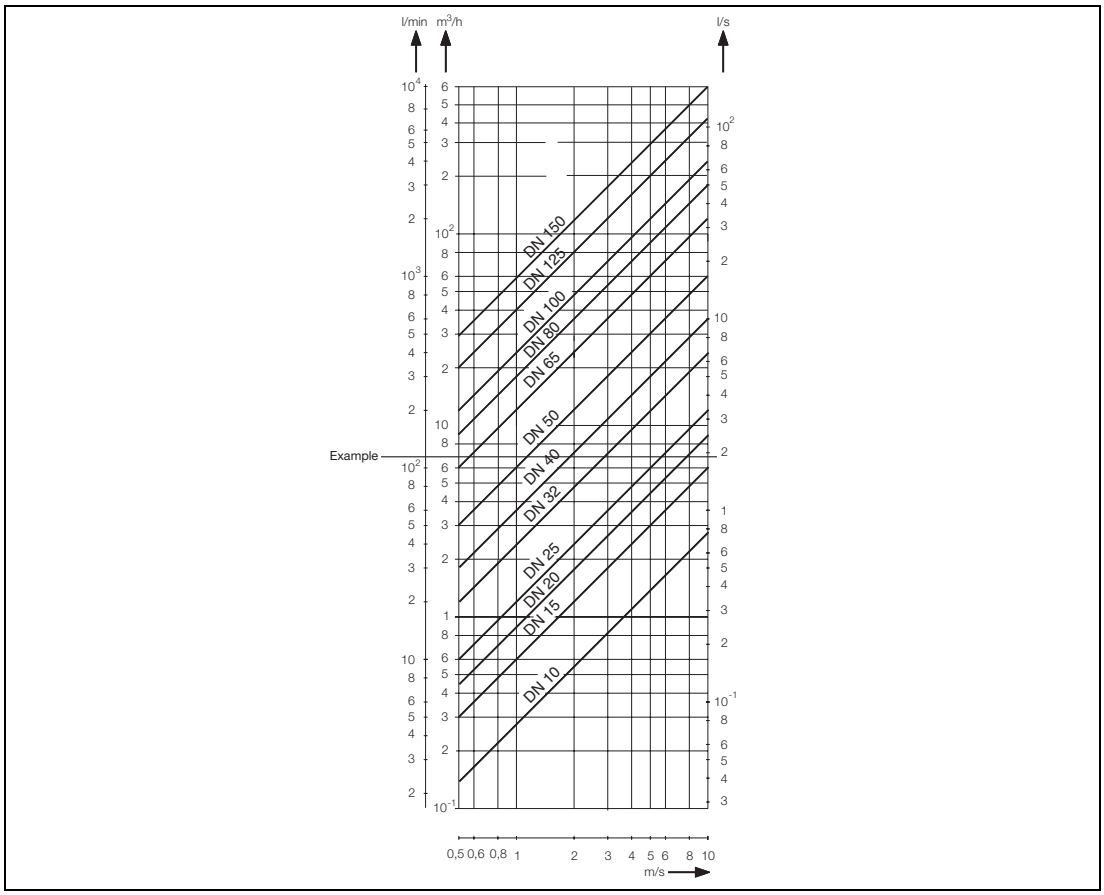


Fig. 13: Flowrate Nomograph DN 10 to DN 150 [3/8" to 6"]

4 Electrical Connections, Grounding

4.1 Grounding the Flowmeter

The ground connections described herein are to be observed. In accordance with VDE 0100, Part 540 a Cu-wire with a cross section of at least 4 mm^2 is to be connected between the ground screw on the flowmeter primary (at the flange or the converter housing) and ground. Grounding of the converter is essential in order to achieve EMC-Interference resistance. For measurement reasons the potential of the ground should be the same as the pipeline potential. An additional grounding at the connection terminals is not required.

For plastic pipelines or pipelines with insulating liners the ground connection is made to a grounding plate or grounding electrode. If there are stray currents present in the pipeline, a grounding plate up- and downstream of the flowmeter primary is recommended.

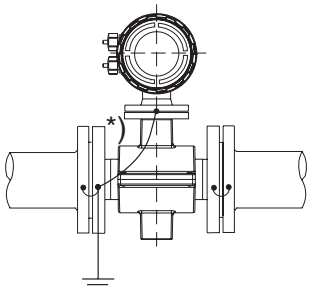
Three grounding methods are describing in the following. In examples a) and b) the fluid is in electrical contact with the pipeline. In examples c) and d) the fluid is insulated from the pipeline.

Important!

If the flowmeter primary is installed in plastic or earthenware pipelines, or in pipelines with an insulating lining, transient current may flow through the grounding electrode in special cases. In the long term, this may destroy the flowmeter primary, since the ground electrode will in turn degrade electrochemically. In these special cases, the connection to the ground must be performed using grounding plates.

a) Metal Pipeline

1. Drill blind holes into the flanges (18 mm deep).
2. Thread the holes, (M6 = 12 mm deep).
3. Using a screw (M6), spring washer and flat washer attach the ground strap and connect it to the ground connection on the flowmeter primary.
4. Connect a 4 mm^2 Cu-wire between the ground connection on the flowmeter primary and ground.



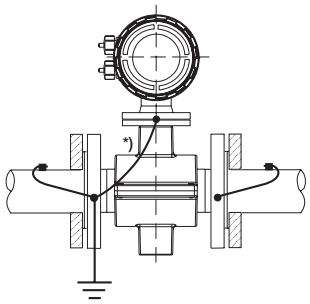
*) Use the green/yellow cable included with the shipment for these connections.

Fig. 14: Flanged Primary DN 10 to 150 [3/8“ to 6“]

b) Metal Pipeline with Loose Flanges

1. In order to assure problem free grounding of the fluid and the flowmeter primary in pipelines with loose flanges, a 6 mm threaded stud should be welded to the pipeline.
2. Using a nut, spring washer and flat washer attach the ground strap and connect it to the ground connection on the flowmeter primary.

3. Connect a 4 mm^2 Cu-wire between the ground connection on the flowmeter primary and ground.

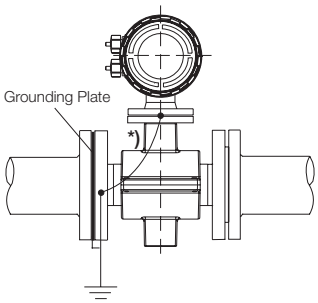


*) Use the green/yellow cable included with the shipment for these connections.

Fig. 15: Fixed Flange Flowmeter Primary

c) Plastic, Concrete or Pipelines with Insulating Liners

1. Install EMF in pipeline with grounding plate. A grounding plate is not required for flowmeters with grounding electrodes.
2. Connect the ground strap between the connection tab on the grounding plate and the ground connection on the flowmeter primary.
3. Connect a 4 mm^2 Cu-wire between the ground connection on the flowmeter primary and ground.

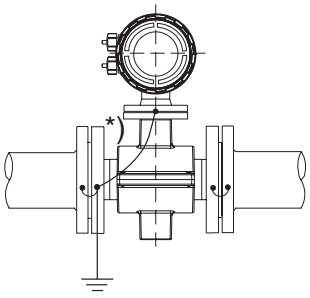


*) Use the green/yellow cable included with the shipment for these connections.

Fig. 16: Fixed Flange Flowmeter Primary

d) Plastic, Concrete or Pipelines with Insulating Liners. Fluid not in contact with pipeline. Flowmeter Primary with Grounding Electrode(s)

1. Connect a 4 mm^2 Cu-wire between the ground connection on the flowmeter primary and ground.



*) Use the green/yellow cable included with the shipment for these connections.

Fig. 17: Fixed Flange Flowmeter Primary

4.1.1 Ground connection for devices with hard rubber lining

For devices with meter sizes DN 125 and larger, the liner contains a conductive element. This element grounds the measuring agent.

Fig. 18: Protection Plates

The protection plates protect the edges of the liners, e.g. for abrasive fluids. In addition they also provide the same function as a grounding plate. Connect these protection plates in the same manner as the grounding plates when used with plastic pipelines or pipelines with electrically insulated liners.

4.1.2 Grounding with Conductive PTFE-Grounding Plates

As an option in the meter size range DN 10-150 [3/8" - 6"] grounding plates made of conductive PTFE are available. Install as shown in Fig. 19, and connect electrically as shown in Fig. 21.

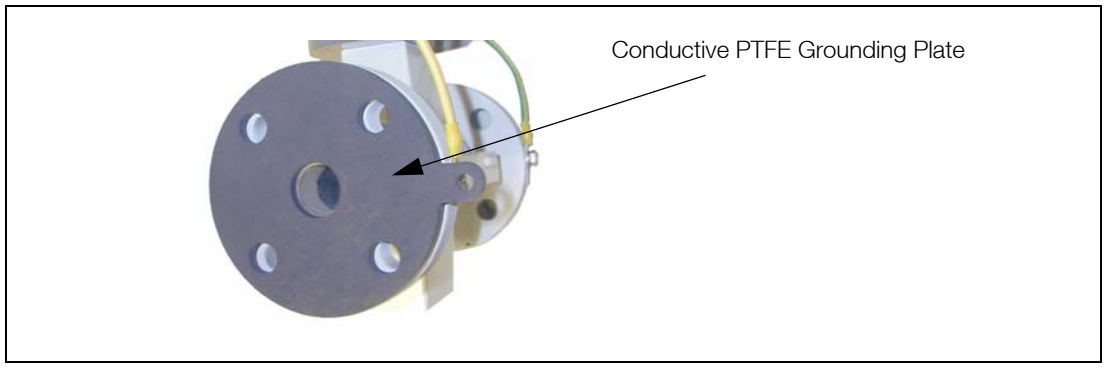


Fig. 19: Protection Plate / Grounding Plate Made of PTFE

4.2 Electrical Connections

4.2.1 Supply Power Connections

The FXT4000 (COPA-XT) flowmeter is designed as a 2-Wire system, i.e. the supply power and measurement output signal (4-20 mA w/wo HART-Protocol) are transmitted over the same set of leads.

a) Supply Power from a Central Voltage Source 6

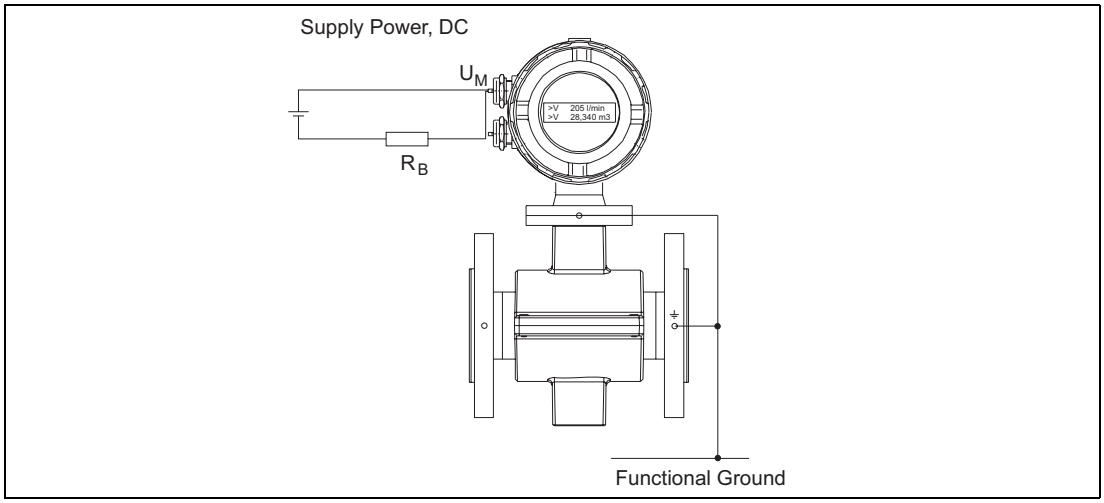


Fig. 20:

U_M = Supply power FXT4000 (COPA-XT), U_M = 14 V DC

U_S = Voltage supply, U_S = 14-55 V DC

R_B = Max. allow. load for voltage supply instrument (e.g. indicator, recorder, cable resistance)

R = Max. allow. load for output circuit – a function of the voltage supply instrument (e.g. indicator, recorder, etc.)

Important!

The switch-on current is electronically limited to 27 mA

b) Supply Power from Power Supply Instrument

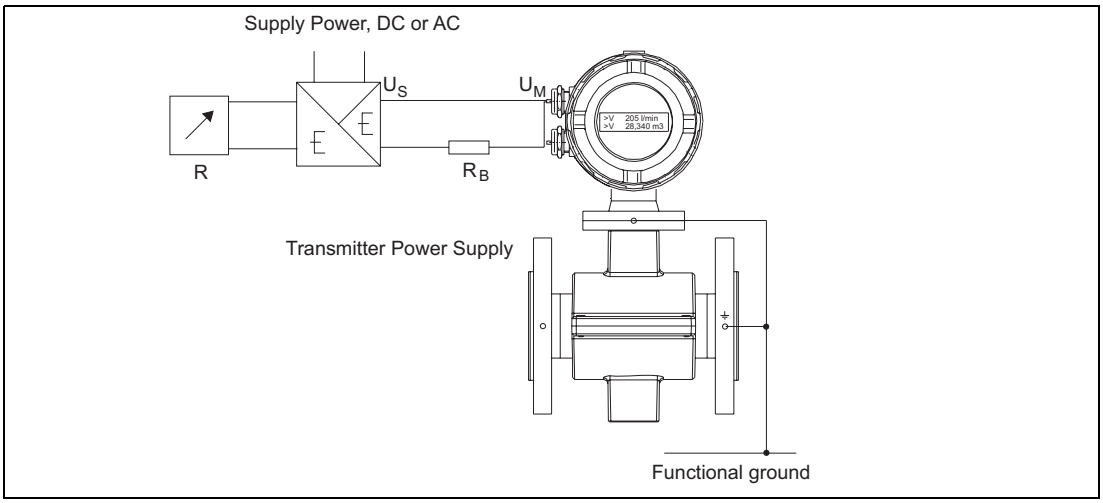


Fig. 21:

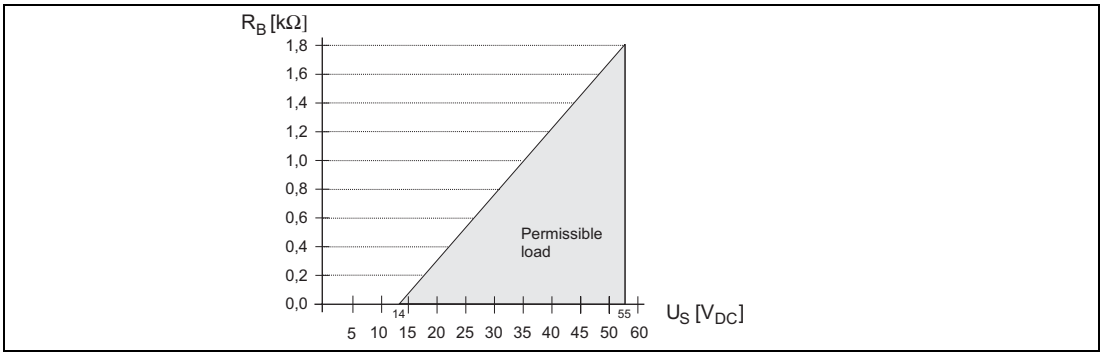


Fig. 22: Load Diagram

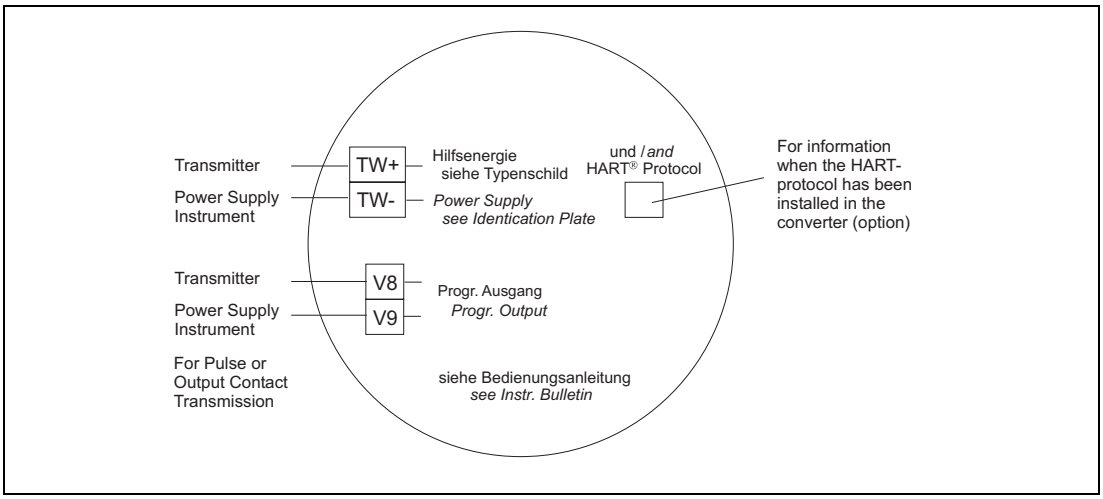


Fig. 23: Interconnection Diagram (see Page 24)

Care should be exercised when reinstalling the housing cover to be certain that the gaskets are properly seated. Only then is Protection Class IP 67 assured.

Notice!

During installation it is important to provide a water trap in the cable to the flowmeter primary (Fig. 24).

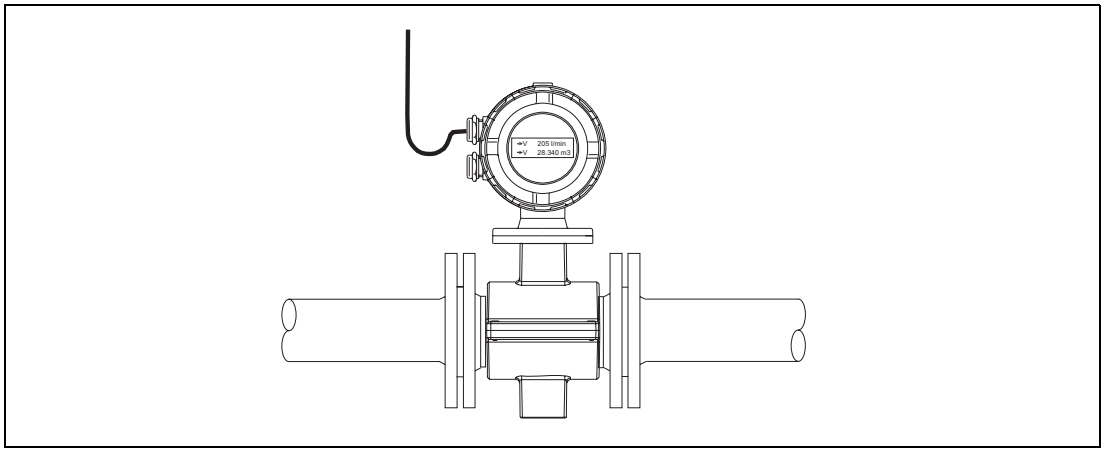


Fig. 24: Cable Installation with a Water Trap

4.2.2 Binary Output (Terminals V8, V9)

The output can be configured as a pulse or system alarm output. The output conforms to the Standard VDI/VDE 2188.

Scaled Pulse Output (Terminals V8, V9)

Scaled pulse output max. 100 Hz, pulse factor between 0.001 and 1000 as a multiplier for the value indicated in the display (1 pulse/m^3 * 1000). The pulse width can be set from 0.100 ms to 2000 ms..

Configuration	Optocoupler passive (Standard)
Terminal function	V8, V9
Operating voltage	16 V ≤ U_{CEH} ≤ 30 V 0 V ≤ U_{CEL} ≤ 2 V
Operating current and frequency	0 mA ≤ U_{CEH} ≤ 0,2 mA 2 mA ≤ U_{CEL} ≤ 220 mA f_{max} ≤ 100 Hz

Contact Output (terminals V8, V9)
The following functions can be assigned in the software:
System Monitor closed or open contact
Forward/Reverse, closed for forward flow direction
Max-Alarm, Min-Alarm, closed or open contact

4.2.3 HART-Protocol

The HART-Protocol provides for communication between a process control system or handheld terminal and an EMF field instrument. The digital communication utilizes an AC signal superimposed on the current output which does not affect any other instruments connected to the current output circuit. Current output 4-20 mA. terminals: +/-

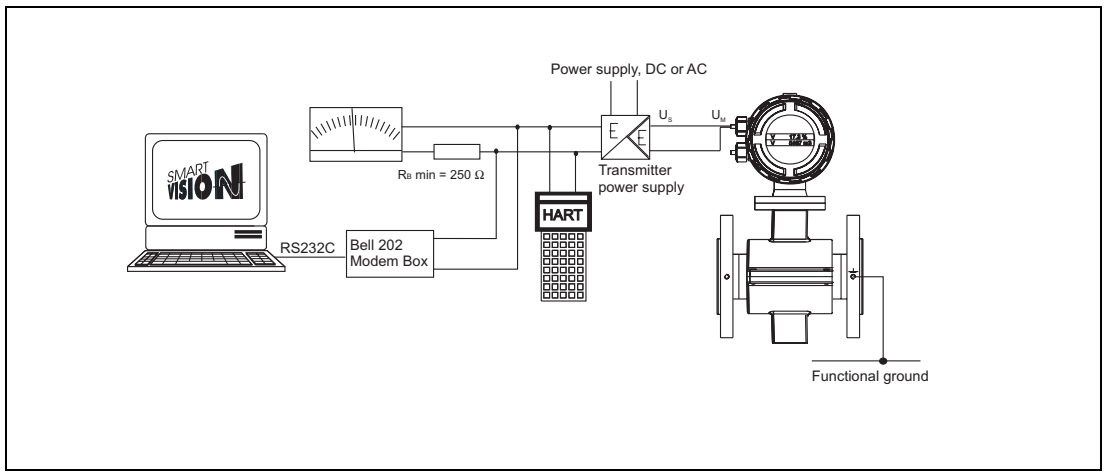


Fig. 25: Communication mit HART-Protocol

Transmission Mode

FSK-Modulation on the 4-20 mA current output per Bell 202
Standard. max. signal ampl. 1,2 mA_{pp}

Load (Current output)

Min.: > 250 Ω, max. see Fig. 22.

Cable

AWG 24 twisted

Max. cable length

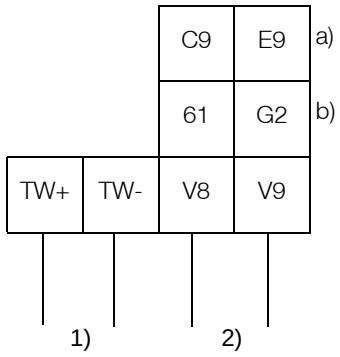
1500 m

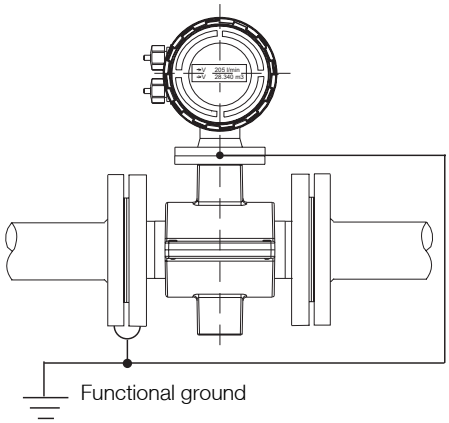
Baudrate

1200 Baud. Logic 1: 1200 Hz; Logic 0: 2200 Hz

4.3 Interconnection Diagram

4.3.1 Interconnection Diagram FXT4000 (COPA-XT)





1) Supply power from transmitter power supply, TW+, TW-, 14-55 V DC
2a) Contact output, function configurable in the software for system monitoring, or F/R flow direction signal*). Output closed at alarm. Function C9, E9 or
b) Scaled pulse output, passive, pulse width can be set from 0.1 ms to 2000 ms, terminals: V8, V9 Function 61, G2, optocoupler, fmax 100 Hz.
Optocoupler, passive, terminals V8, V9
$0\ V \le U_{CEL} \le 2\ V$, $16\ V \le U_{CEH} \le 30\ V$
$0\ mA \le I_{CEH} \le 0{,}2\ mA$, $2\ mA \le I_{CEL} \le 220\ mA$

*) The factory setting is no function for binary contact output.

Comment: To maintain the EMC-Requirements the instrument must be connected to ground.

Fig. 26: Interconnection Diagram FXT4000 (COPA-XT)

4.3.2 Interconnection Examples for Peripherals

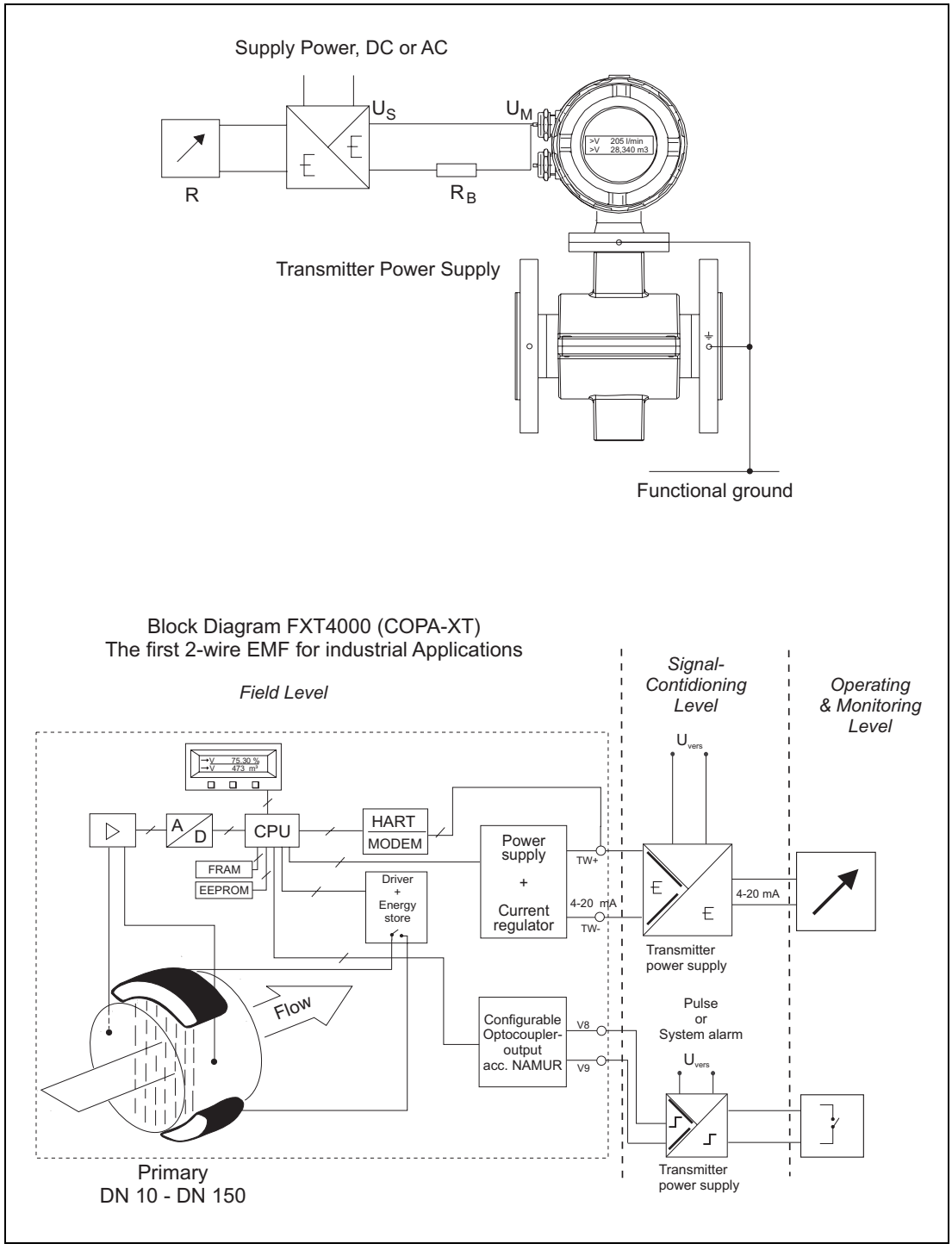


Fig. 27: Interconnection Diagram for Peripherals

5 Start-up

5.1 Preliminary Flowmeter System Checks

5.1.1 Checking the Flowmeter Primary FXT4000 (COPA-XT)

The start-up procedures described below are to be followed after the assembly and installation of the flowmeter have been completed.

The supply power is to be turned off

- Check the ground connections.
- Compare connections against the Interconnection Diagram.
- Check that the supply power values agree with the specifications listed on the Instrument Tag.

The supply power is to be turned on!

General Tip:

If the forward and reverse flow direction indicators in the display do not agree with the actual flow direction, change “Normal” to ‘Inverse” in the submenu Operating Mode.

- After the supply power is turned on, the data in the external EEPROM are compared to the values stored internally. If the values are not identical an automatic upload of the data is initiated. The converter displays the message “Primary data loaded”. The meter is now ready for operation.
- The process information must be displayed, e.g. Page 30.
  In order to operate the system, it is necessary to first select or enter a few parameters. The flow range is automatically set to 10 m/s. Enter the desired flow range for Qmax with the appropriate engineering units. Hydraulically ideal flow range end values lie between approx. 2-3 m/s. The current output is set for 4-20 mA. The pulses per flow unit and the pulse width are to be set for pulse output and the selections in “Totalizer” submenu completed.
- After completion of the start-up procedure, call the submenu “Store data in ext. EEPROM” in order to save the settings which were entered during start-up. When a converter is exchanged the EEPROM is removed from the old converter and installed in the new one (see 5.2).

Important!

Below 5 % of Q_{max} the display switched off (energy management) of HART-Communication enabled on. Instrument continues to work within its specified accuracy, the current output and HART-Communication aren´t influenced by it. In case you need a display information below 5 % of Q_{max}, the HART-Communication must be turned off (see under submenu data link).

5.2 Converter Exchange

All the parameter settings are stored in an external EEPROM installed on the display plate. When a converter is exchanged, all the parameter settings can be uploaded into the new converter by interchanging the external EEPROMs. Converter specific data are automatically updated.

Important!

After the configuration has been completed, all the parameter settings should be stored in the external EEPROM.

5.3 Memory Module Socket (external EEPROM)

The socket for the ext. EEPROM is located on the front of the display plate.

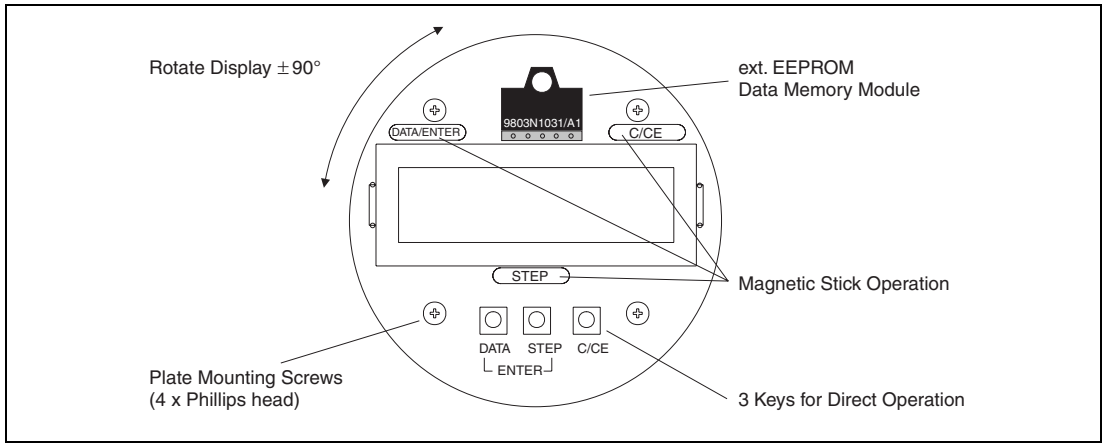


Fig. 28: Display Plate

Attention!
Information for Opening the Housing

The following information must be observed when the housing for the converter is opened:

- All connections must be potential free.
- When the housing cover is removed, EMC and personnel protection are no longer provided.

5.4 Rotate Display / Rotate Housing

Warning!

Turn off the supply power!

Unscrew the housing cover. The display board is secured by 4 Phillips head screws.

After the screws are removed the display can be pulled off and rotated 90° to the left or 90° to the right. Carefully plug in the display again and reinstall the screws. Carefully reinstall the cover. Check that the gaskets are properly seated. Only then will Protection Class IP 67 be maintained.

The converter housing can be rotated 90° to the left after the two screws have been loosened.

Fig. 29:

6 Operation, Data Entry and Configuration

6.1 Available Display Formats

After the supply power is turned on, the model number of the converter is displayed in the 1st line and the software version number and its revision level in the 2nd line. Subsequently, the process information from the flowmeter is displayed.

The present flow direction is indicated in the first line of the display (→F for forward or ←R for reverse) together with the instantaneous flow rate value in percent or in direct reading engineering units. The totalizer value, with max. seven digits, for the present flow direction is displayed in the second line followed by the units.

Independent of the pulse factor, the totalizer value always indicates the actual measure flow quantity with its corresponding units. This display configuration is defined as process information in the following text.

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

→V	98.14 l/s
→**V**	12.30000 m3

1st Line Instantaneous forward flow rate
2nd Line Forward totalizer value

→V	98.14 l/s
←**R**	516.0000 m3

1st Line Instantaneous forward flow rate
2nd Line Reverse totalizer value (multiplex operation)

→V	70.01 l/s
→**V**	10230 **m3**

1st Line Instantaneous forward flow rate
2nd Line Totalizer overflow. →F and m^3 blink.

A totalizer overflow occurs whenever 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 (e.g. m^3) blink in the 2nd line. The totalizer can register a max. of 250 overflows software wise. The overflow indication can be reset separately for each flow direction by pressing ENTER.

An error message is displayed in the 1st line of the display when an error condition exists.

Flowrate	>103 %
→V	10.230 m3

This message is displayed alternately in clear text and then with the corresponding error number. Only the clear text message for the error with the highest priority is displayed, while all errors detected are indicated in the display by their error number.

Error Number	Clear Text	Cause
1	A/D converter override	Flowrate too high / empty measuring tube
5	EEPROM	Data in internal EEPROM corrupted.
C	Primary data	Error in external EEPROM or not installed.
3	Flowrate > 103 %	Flowrate greater than 103 %.
6	Totalizer	Totalizer values corrupted.
9	Excitation	Contact ABB -Service
A	Max. Alarm	Max. alarm limit exceeded.
B	Min. Alarm	Min. alarm limit exceeded

Error Table by Priority

In addition to the display of the error messages, an alarm signal is transmitted over the optocoupler and the current and pulse outputs are set (does not apply to Errors 6).

The pulse output is always set to 0.
The current output is set 4 mA or 21,5 mA.

6.2 Data Entry

The data is entered using the three keys STEP ↓, DATA ↑ and C/CE located on the Operator Unit plugged into the converter.

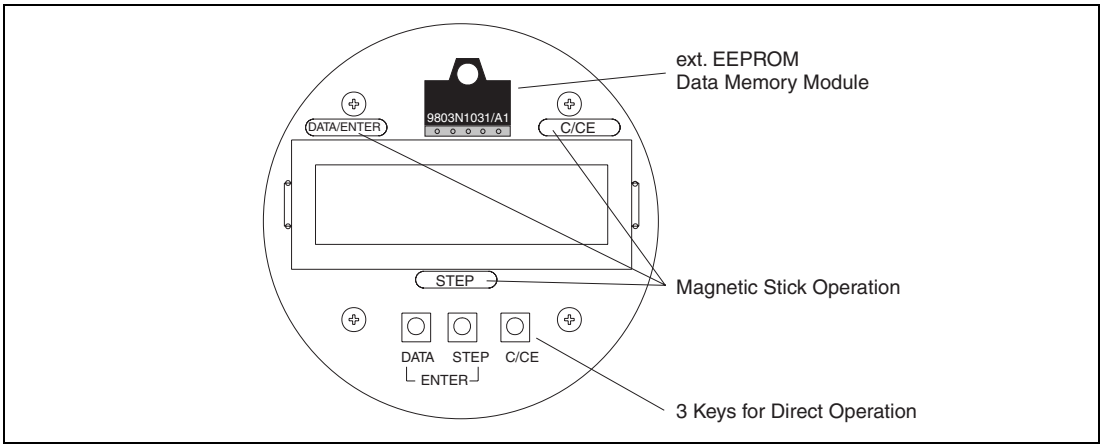


Fig. 30: Converter Keypad and Display

It is possible to configure the converter without removing the housing cover by utilizing the magnetic stick.

The converter remains on-line during data entry, i.e. the current and pulse outputs continue to represent the operating conditions. A description of the functions of the keys follows:

C/CE	The C/CE key is used to switch between the operating mode and the menus.
STEP ↓	The STEP key, one of two arrow keys. The STEP key is used to scroll forward through the menus. All desired parameters can be accessed with the STEP key.
DATA ↑	The STEP key, one of two arrow keys. The STEP key is used to scroll backward th-rough the menus. All desired parameters can be accessed with the STEP key.
ENTER	The ENTER function is initiated by simultaneously pressing the two arrow keys STEP and DATA. The program protection is turned on or off with ENTER. Access the parameter to be changed with ENTER and accept the new value or selection with EN-TER The ENTER function is only active for approx. 10 seconds. If no entry is made during this time it must be pressed again.

The ENTER Function with Magnetic Stick Operation

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

Data is entered by two different entry modes:

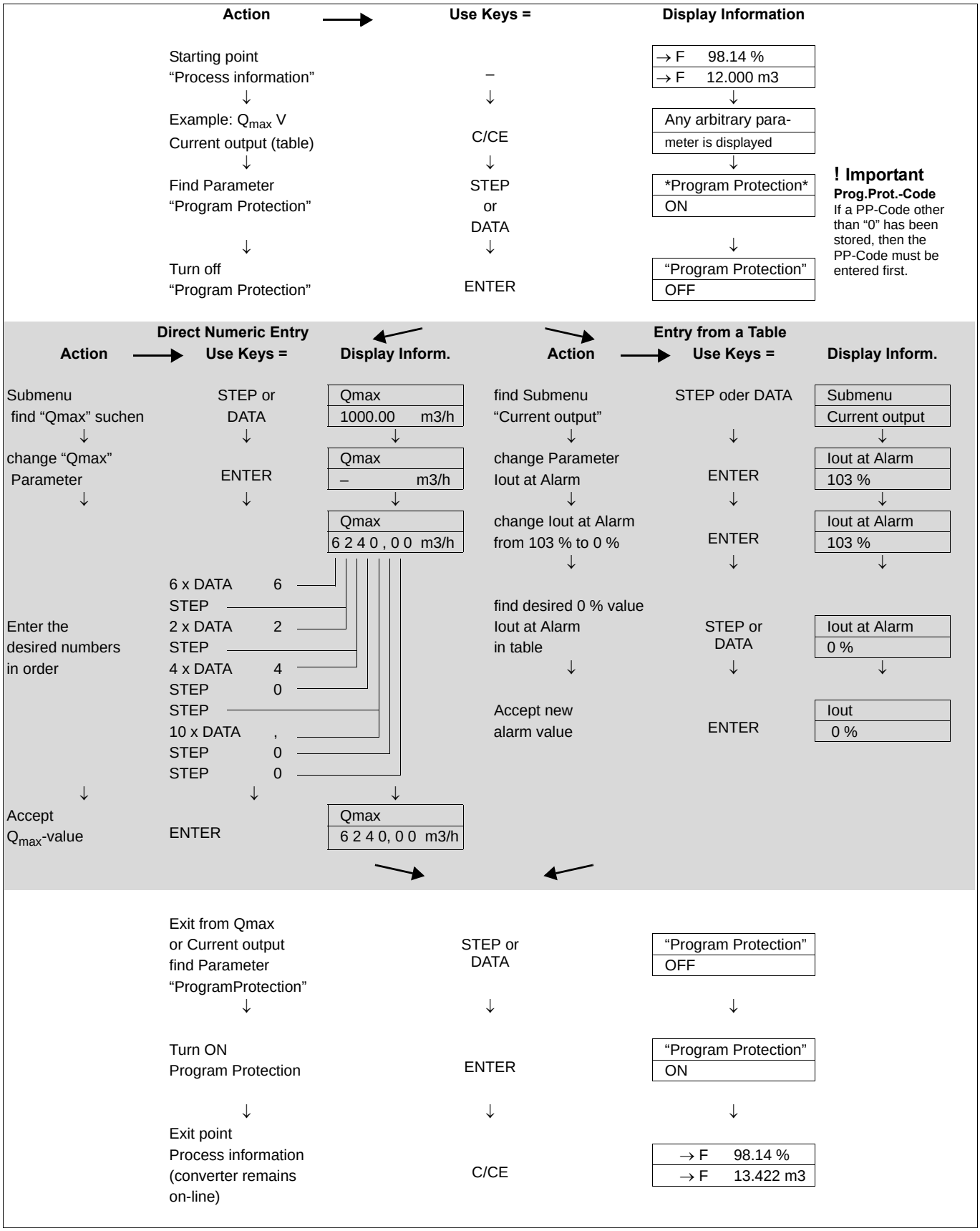
- Direct numerical entry
- Entry from a predefined table.

Important!

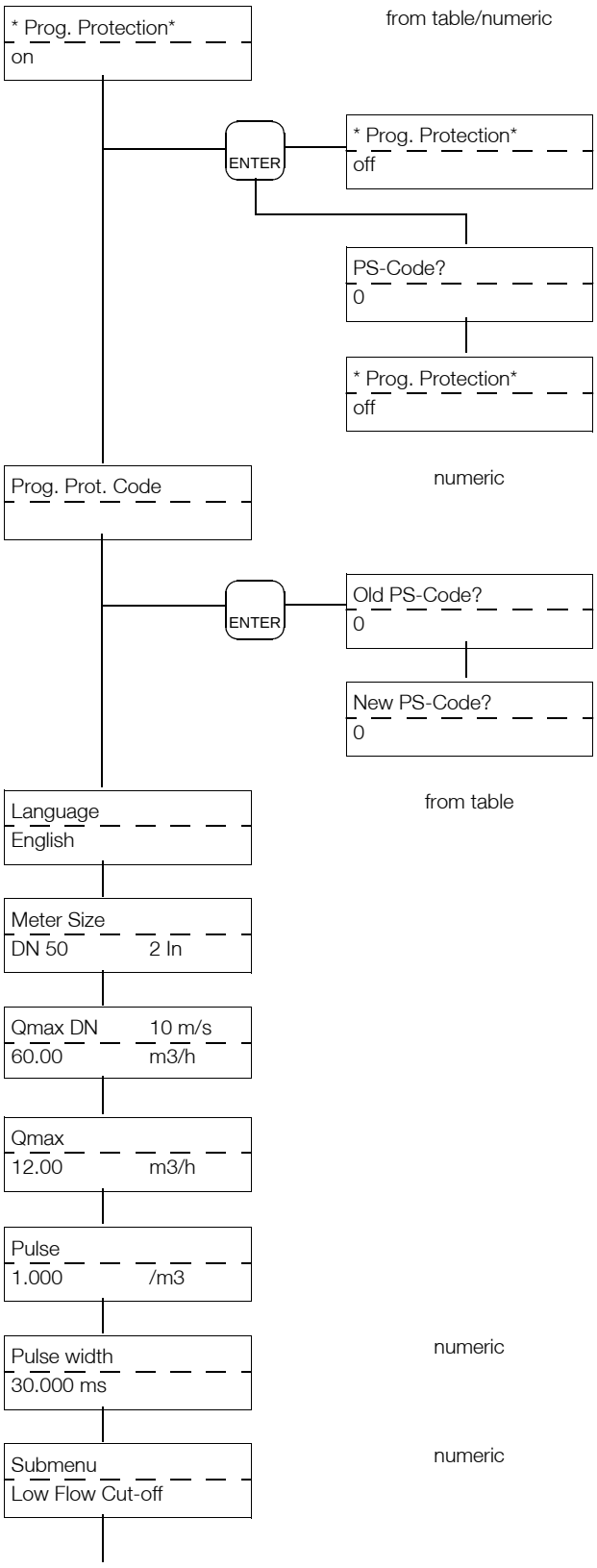
The values entered are checked for plausibility, and if necessary, are rejected with an appropriate message.

If no entries are made within a 10 second period. the converter displays the old value. After an additional 10 seconds, the process information display reappears.

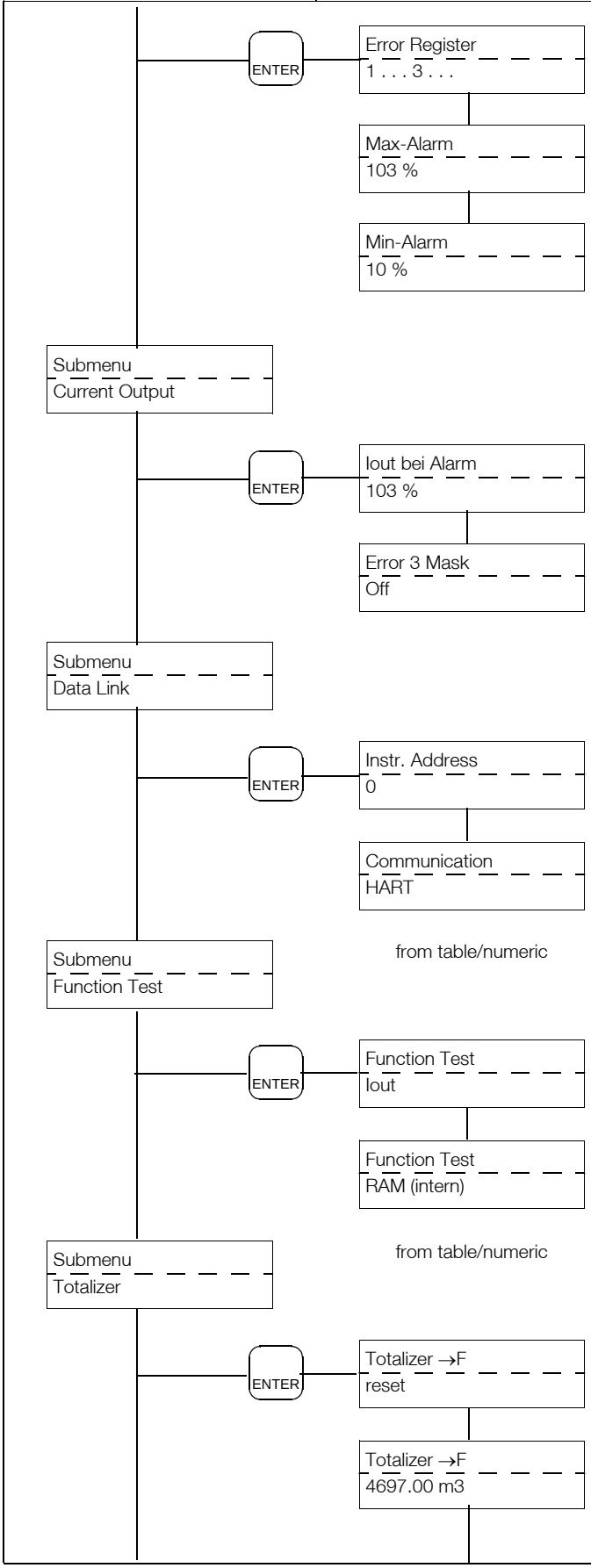
6.3 Data Entry in „Condensed Form“



6.4 Parameter and Data Entry in "Condensed Form"

Submenu/Parameter	Entry Type	Comments
	from table/numeric numeric from table numeric numeric	Data can only be entered after the program protection has been turned off. on/off If a PP-Code other than "0" (factory setting) has been stored, then the program protection can only turned off after the appropriate PP-Code (1-255) has been entered. When the program protection is turned off, parameters can be changed. When the program protection is turned off, it is possible to enter a new PP-Code. Enter old PP-Code 0 = factory setting Enter new PP-Code (0-255) German, English The meter size of the flowmeter See Instrument Tag Automatic flow range end value setting determined form the meter size selection Flow range end value can be set from 0.05 $Q_{max\ DN}$ to 1 $Q_{max\ DN}$ Flow range for forward and reverse flow directions Min. flow range setting 0 - 0.5 m/s Max. flow range setting 0 - 10 m/s Flow range end value can be set between 0.5 and 10 m/s For int. and ext. flow totalization, range 0.001 - 1000 pulses per selected units, max. count Frequency 100 Hz. For external pulse output, Range 0.1 ms - 2000 ms C/CE Exit from Submenu

Submenu/Parameter	Entry Type	Comments
ENTER → Low Flow Cut-off 1.000 %		A low flow cut-off value from 0.5 to 10 % of amx can be set (applies to the current an pulse output). The minimum low flow cut-off value is calculated as follows: $\frac{Q_{maxDN}}{Q(\text{flow range setting})} \times 0,5\ \%$
Damping 10.0000 s	numeric	Range 2.0 - 100 s, Response time for 0 - 99 % of the flow change
Filter ein	numeric	On/off. Standard off, when output signals are noisy turn on the filter and set damping time to > 2.4 s.
Density 2.54300 g/cm3	numeric	Range 0.01 - 5 g/cm^3. For mass flowrate display indication and totalization in g, kg, t or pounds.
System_Zero 3.5 Hz		Zero check (only available at Software A.1X)
ENTER → Adjust manual		Manual entry, e.g. after a converter is exchanged 0 Hz must be set
Adjust automatic		
Prog. Output Pulse Output	from table	Contact output terminals V8/V9 can be configured as: Max. alarm[1)], Min. alarm[1)], Max.-Min. alarm[1)], General alarm[1)], F/R direction signal[1)], Pulse output or no function [1)] Contact output can be configured to “open or close”.
Submenu Units	from table/numeric	C/CE → Exit from Submenu
ENTER → Units Qmax l/s		lbs/s, lbs/min, lbs/h, l/s, l/min, l/h, m^3/s, m^3/min, m^3/h, m^3/d, igps, igpm, igph, igpd, mgd, gpm, gph, bbl/s, bbl/min, bbl/h, bbl/d, kg/s, kg/min, kg/h, kg/d, t/min, t/h, t/d, g/s, g/min, g/h, kga/s, kga/min, kga/h
Totalizer Units m3		l, igal, gal, bbl, kg, t, g, lbs, kga, m^3
Units Factor 3785.41 Liter		User configurable flowrate units, based on liters; The value shown is for kgal (factory setting).
Unit name kga /s /min /h		Four character name for the user configurable units.
Prog. Units without Density		Programmable units for mass (with density) or volume (without density) flowrate units
Submenu Alarm	from table/numeric	C/CE → Exit from Submenu


Submenu/Parameter
Entry Type
Comments
ENTER
Error Register
1 . . . 3 . . .
All detected errors (Error 1-9, A, B, C) are stored.
The error register can be cleared with ENTER.
Max-Alarm
103 %
Alarm limit, range 0 - 103 % of the flow range setting.
Min-Alarm
10 %
Alarm limit, range 0 - 103 % of the flow range setting.
Submenu
Current Output
C/CE
Exit from Submenu
ENTER
Iout bei Alarm
103 %
Current output during an alarm condition, can be set to 0 % or 103 %
Error 3 Flowrate > 103 %, always set to 21,5 mA %
Error 3 Mask
Off
Deactivates error 3 (when masking = on)
Submenu
Data Link
C/CE
Exit from Submenu
ENTER
Instr. Address
0
Instrument address: 0-99
If multiple instruments are connected to a single bus, then each instrument must have a unique address.
Communication
HART
Activate the HART-Communication:
HART or off
Submenu
Function Test
from table/numeric
C/CE
Exit from Submenu
ENTER
Function Test
Iout
Function test of current output, enter value in mA
Function test of pulse output 1 Hz
For detailed information see Sect. 6.2
Function Test
RAM (intern)
Function test of the int. subassemblies, auto. tests, RAM (internal), EPROM (Progr.), lower EEPROM, upper EEPROM, Ext. EEPROM, Terminals V8/V9, Pulse Output (1 Hz), Display HART-Transmitter, HART-Command, Simulation and Test Mode.
Submenu
Totalizer
from table/numeric
C/CE
Exit from Submenu
ENTER
Totalizer →F
reset
The overflow counter can be reset with ENTER key.
If the overflow counter > 0, then the message Overflow >F reset is displayed.
Totalizer →F
4697.00 m3
Preset the totalizer (any totalizer value can be entered)
2nd line = present value

Submenu/Parameter	Entry Type	Comments
Overflow →F 250		Overflow counter max. 250, 1 overflow = pulse totalizer >9,999,999 units (displayed totalizer value is reset and one overflow is registered).
Totalizer ←R reset		See forward direction totalizer
Totalizer ←R 625.000 m3		See forward direction totalizer
Overflow ←R 004		See forward direction overflow counter
Tot. Function Standard		Standard = separate forward and reverse flow totals each on its own totalizer. Diff. totalizer = Forward and reverse flow totals are registered on a single totalizer and the difference displayed.
Submenu Display	from table	C/CE Exit from Submenu
ENTER 1 Line Q [%]		Selections for the 1st line of the display: Flowrate in %, eng'g units, mA, bargraph, totalizer, forward totalizer, reverse totalizer, TAG-Number or blank line.
2 Line Totalizer		See 1st Line
1 Line multipl. Q [Bargraph]		In the multiplex mode it is possible to display an additional value in the 1st line: Flowrate in %, Eng'g units, mA, bargraph, totalizer, forward totalizer, reverse totalizer, TAG-Number or blank line. Display alternates every 10 seconds, See 1st line multiplex
2 Line multipl. off		
Submenu Operating Mode	from table	C/CE Exit from Submenu
ENTER Direction Forward/Reverse		Select flow direction to be measured, both forward and reverse or forward only.
Displ. Direction normal		Normal/Inverse Reverse the flow direction indicators in the display normal = flow direction same as arrow on flowmeter inverse = flow direction opposite to arrow on flowmeter
Load data from ext. EEPROM	from table	When a converter is exchanged, the data stored in the external EEPROM are automatically uploaded. It is also possible to upload the data stored in the external EEPROM by using this command.
Store data in ext. EEPROM	from table	After the start-up has been completed, the meter location parameters stored in the converter can be downloaded into the external EEPROM.

Submenu/Parameter	Entry Type	Comments
Model Number Part Number	–	Identification of the installed software version. Date of issue and Revision level
TAG Number	numeric	An alphanumeric TAG-Number with a maximum of 16 characters, upper and lower case letters and/or numbers can be entered.
Service-Kode	numeric	Only for ABB Automation Products Service.

7 Parameter Entry

7.1 User Configurable Units

With this function it is possible to configure any desired engineering units.The following three parameters are available for this purpose:

a) **Units Factor**

b) **Unit Name**

c) **Programmable Units with/without Density**

Important:

Entries as described in a), b) and c) are only required if the desired unit is not listed in the table.

7.1.1 Units factor / Numeric Entries

Units Factor
3785,41 Liter

In this parameter enter the factor which converts the new units to liters. The default entry is for kgal units: kgal = 3785.41 liters. **kga = Kilo gallons**

7.1.2 Unit Name / Entry from table

Unit name
kgal /s /min /h

The selection is made using the STEP and DATA keys. Use DATA to scroll forward through the alphabet, first the lower case letters are displayed, then the upper case. The entry location can be shifted by pressing the STEP key. A max. of 4 characters can be entered.

The time units, /s, /min and /h can be assigned to the engineering units

7.1.3 Programmable Units / Entry from table

Prog. Units
without Density

This function is utilized to define whether the new units are gravimetric (with density) or volumetric (without density) flowrate units.

7.2 Submenu Function Test / Numeric Entries only for I_{out}

Submenu
Function Test

The Function Test menu includes 13 functions to test the instrument independent of the existing operating conditions.

When the Function Tests are active the converter is no longer on-line (current and pulse output values do not correspond to the present operating conditions). The individual test routines can be selected using the STEP and DATA keys.

I_{Out}, RAM (internal), EPROM (Program), lower EEPROM, upper EEPROM, external EEPROM, Terminals V8/V9, Display, Pulse output 1 Hz, Simulation and Test Mode.

The function tests can be terminated by pressing the C/CE key.

I_{Out} select, press ENTER and enter the desired value in mA. Measure the output value for agreement with the setting at the + and – connections with a digital voltmeter (mA range) or with the process instrumentation. Note: No automatic return to process measurements. Terminate by pressing the C/CE key

RAM (ASIC) select, press ENTER. The computer automatically tests the RAM and displays its diagnosis.

EPROM (Program) select, press ENTER. The computer automatically tests the EPROM and displays its diagnosis.

EEPROM select, press ENTER. The computer automatically tests the EEPROM and displays its diagnosis.

Klemme V8/V9 select, press ENTER. The STEP or DATA keys can be used to toggle the contact on or off. Use a test meter to monitor the status at the terminals V8/V9.

Pulse Output select, press ENTER. A signal with a frequency of 1 Hz is transmitted over the scaled pulse output with a pulse width of 500 ms.

Display select, 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. The operation of the dot matrix control can be visually checked.

****Simulation**** select, press ENTER. The simulation can be turned “on or off” using the STEP or DATA keys.

If the Simulation is turned on use C/CE to return to process measurements. Any desired flowrate value can be entered using the STEP (+) and DATA (-) keys in 1 % steps. The output values correspond the entered values. The message **Simulation** is displayed in the 2nd line for information alternately with the integrated totalizer value. The parameter **Simulation** should be turned off after the simulation routine has been completed.

Test Mode When the converter is to be checked with a Simulator[1)], the parameter Test Mode **must** be switched to "**on**". **Note**: No automatic return to process measurements. Terminate using the C/CE key.

1) Simulator upon request

8 Error Messages and Tests

8.1 Error Messages of Data Entry

In the list below the Error Codes shown in the display are described. **Error Codes 1 to 9, A, B, C, E, F do not apply to data entry.**

Error Code	Detected System Errors	Corrective Measures
0	Not used	Not used
1	A/D converter override	Reduce flowrate, fill pipeline
2	Not used	Not used
3	Flowrate greater than 103 %.	Reduce flowrate, change flow range
4	Not used	Not used
5	RAM corrupted 1. Error 5 is displayed 2. Error appears only in the Error Register	Program must be reinitiallized; Contact ABB Service department; Information: Corrupted data in RAM.
7	Not used	Not used
8	Not used	Not used
6	Error Totalizer → V	Reset forward totalizer or enter new value in the preset totalizer.
	Error Totalizer ← R	Reset reverse totalizer or enter new value in the preset totalizer.
	Error Totalizer	Forward, reverse or difference totalizer defective, Reset forward/reverse totalizer.
9	Excitation defective	Contact ABB -Service department.
A	MAX-Alarm limit value	Reduce flowrate
B	MIN-Alarm limit value	Increase flowrate
C	Primary data invalid	The flowmeter primary data in the external EEPROM are invalid. Contact ABB -Service department.
E	Error Totalizer→ V	Reset forward totalizer or preset new values in totalizer
F	Error Totalizer ← R	Reset reverse totalizer or preset new values in totalizer.
10	Entry >1.00 Q_{max} DN >10 m/s.	Reduce flow range Q_{max} .
11	Entry <0.05 Q_{max} DN <0.5 m/s.	Increase flow range Q_{max}.
16	Entry >10 % Low flow cut-off.	Reduce entry value.
17	Entry < 0 % Low flow cut-off.	Increase entry value.
20	Entry ≥ 100 s Damping. Entry < 2 s	Reduce/increase entry value.
22	Entry >99 Instrument address.	Reduce entry value.
38	Entry >1000 Pulses/unit. Entry < 0.001 Pulses/unit.	Reduce/increase entry value.
40	Max. count frequency exceeded, scaled pulse output,	Reduce pulse factor.
41	Frequency below min. count frequency <0.00016 Hz.	Increase pulse factor.
42	Entry >2000 ms Pulse width. Entry < 01 ms	Reduce/increase entry value.
44	Entry >5.0 g/cm^3 Density.	Reduce entry value.
45	Entry <0.01 g/cm^3 Density. Entry < 0.01 g/cm^3	Reduce/increase entry value.
54	Flowmeter primary zero > 50 Hz	Check ground and ground signals. The adjustment can be made when the flowmeter is filled with fluid and the flowrate is at an absolute standstill.
74/76	Entry > 103 % MAX - or MIN-Alarm	Reduce entry value
99	Entry too large	Reduce entry value
99	Entry too small	Increase entry value

9 Maintanance and Repair

9.1 General Information

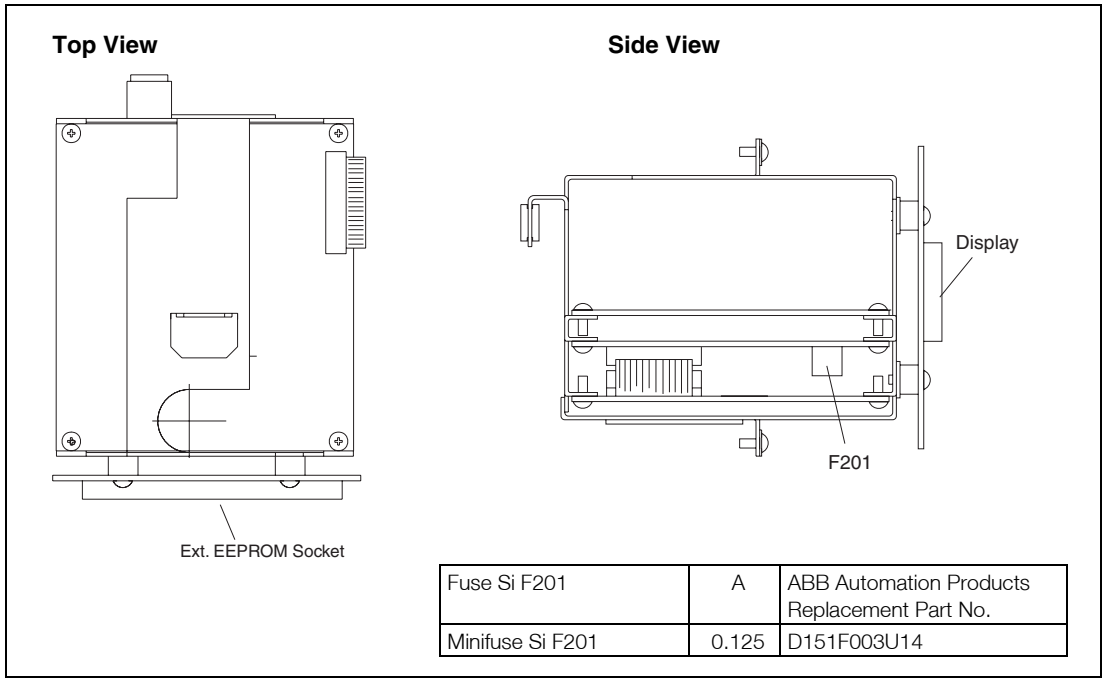
Before opening the housing all connection leads should be potential free. When the housing is opened, the EMC protection is limited and the personnel contact protection is no longer provided.

9.1.1 Flowmeter Primary

The flowmeter primary is essentially maintenance free. An annual check should be made of the ambient conditions (air flow, humidity), the seal integrity of the process connections, the condition of the cable connectors and the tightness of the screws and bolts, safety of the supply power, lightning protection and the earth connections. All repair and maintenance tasks should only be performed by qualified personnel.

If repairs to the liner, electrodes or the magnet coils are required, the flowmeter primary should be returned to the ABB Automation Products factory. Please see the note Hazardous Material Information. Refer to 1.1.14 returns.

9.2 Converrter Circuit Boards



Fuse Si F201	A	ABB Automation Products Replacement Part No.
Minifuse Si F201	0.125	D151F003U14

Fig. 31: Converter Insert FXT4000 (COPA-XT)

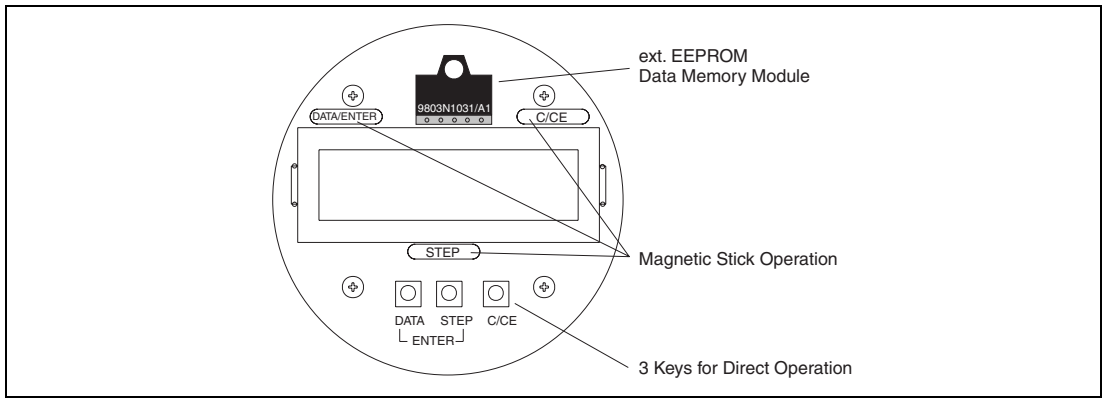


Fig. 32: Display Plate and ext. EEPROM Socket Location

10 Overview, Parameter Settings and Options

Meter location:			TAG-Nr.:	
Primary typ:			Converter typ:	
Order-No.:	Meter-No.:		Order-No.:	Meter-No.:
Fluid-Temp.:			Supply Voltage:	
Liner:	Electrodes:			
C_{zero}:	C_{span}:			

Parameter		**Entry Range**
Prog. Prot. Code	.....	0-255 (0=Factory setting)
Language	.....	English,German
Meter size	.....	DN 10 – 150
Q_{max} :	.....	0.05 Q_{maxDN} -1 Q_{maxDN}
Pulse factor:	.....	0.001 – 1000 pulses./eng´g unit
Pulse width:	.....	0,1 – 2000 ms
Low flow cut-off:	.....	0 – 10 % flow range end value
Damping:	.....	2 – 100 Seconds
Filter:	.....	ON/OFF
Dichte:	.....	0.01 g/cm^3 – 5.0 g/cm^3
Units Q_{max}.:	.....	l/s, l/min, l/h, m^3/s, m^3/min, m^3/h, m^3/d, igps, igpm, igph, igpd, mdg, gpm, gph, bbl/s, bbl/min, bbl/h, bls/day, bls/min, bls/h, kg/s, kg/min, kg/h, kg/d, t/min, t/h, g/s, g/min, g/h, lbs/s, lbs/min, lbs/h, kga/s, kga/min, kga/h,
Units totalizer:	.....	l, m^3, iga, gal, bbl, g, kg, t, lbs, kga
Max. Alarm:	.....	%
Min. Alarm:	.....	%
Terminals V8/V9:	.....	Max. Alarm, Min. Alarm, Max./Min. Alarm, General alarm, F/R-Direction signal, no funktion
Current output:	.....	4-20 mA
I_{out} at alarm:	.....	0 %, 103 %
Totalizer function:	.....	Standard, Difference totalizer
1st Display line:	.....	Q (%), Q (Units), Q (mA), Totalizer F/R, TAG-Number Blank line, Bargraph
2nd Display line:	.....	Q (%), Q (Units), Q (mA), Totalizer F/R, TAG-Number Blank line, Bargraph
1st Zeile multiplex:	.....	ON/OFF
2nd Zeile multiplex:	.....	ON/OFF
Flow direction:	.....	Forward/Reverse Forward
Direction indication:	.....	Normal, Invers
Store data in ext. EEPROM:	.....	Yes/No

Pulse output:	❑ Yes	❑ No
Contact output:	❑ Yes	❑ No
Communication:	❑ HART-Protocol	❑ No

11 Certificates

11.1 EC-Certificate of Compliance

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:*	DT4...	
Richtlinie: *Directive:*	EMV Richtlinie 89/336/EWG * EMC directive 89/336/EEC *	
Europäische Norm: *European Standard:*	EN 50081-1, 3/93 * EN 50082-1, 3/93 *	EN 50081-2, 3/94 * EN 50082-2, 2/96 *

* einschließlich Nachträge
including alterations

Göttingen, 12.05.2000

.....
Unterschrift / Signature

BZ-13-5027, Rev.1, 1699

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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)

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