

COPA-XL

Electromagnetic Flowmeter
Model DL43F
For Software Revisions A3.X and higher

Operating Instruction

D184B118U02

Rev. 01



CE

ABB

Electromagnetic Flowmeter COPA-XL

Operating Instruction

PART No. D184B118U02

Issue Date: 11.01
Revision: 01

Manufacturer

ABB Automation Products GmbH
Dransfelder Str. 2
D-37079 Göttingen, Germany

Telephone: +49 (0) 55 19 05- 0
Telefax: +49 (0) 55 19 05- 777

© Copyright 2001 by ABB Automation Products GmbH
Revision reserved

This Operating Instruction is copyright protected. Translation, reproduction and distribution in any form - including editing or abstracts - and in particular, duplicating, photocopying, electronic distribution or storing in data processing installations without the express consent of the copyright holder is strictly forbidden and may lead to civil and criminal proceedings.

1.	Safety Information	5
1.1.	Regulated Usage	5
1.2.	Safety Markings and Symbols	5
1.3.	Installation, Start-Up, Operation and Maintenance Requirements	5
1.4.	Safe Operation	6
1.5.	Returns	6
2.	Technical Description	7
2.1.	Functional Description	7
2.2.	Operating Principle	7
2.3.	Construction	7
3.	Assembly and Installation	8
3.1.	Inspection	8
3.2.	Installation Requirements, Flowmeter Primary	8
3.2.1	Installing the Flowmeter Primary	11
3.2.2	Installations in Larger Size Pipelines	12
3.2.3	Flowmeter Sizes, Pressure Ratings, Flow Ranges	13
4.	Programming the Converter	14
4.1.	Overview of the Converter Factory Settings	14
5.	Data Entry in „Condensed Form“	15
6.	Data Entry	16
7.	Circuit Boards	20
7.1.	Fuse Locations on the Converter Circuit Board	20
8.	Ordering Information	21
9.	Error Messages	22
10.	Accuracy	23
11.	Safety Relevant Portion of the Instruction Bulletin	24
11.1.	Grounding the Flowmeter Primary	24
11.2.	Grounding Instruments with Hard Rubber Liners	26
12.	Electrical Connections	27
12.1.	Interconnection Diagram	27
12.2.	Signal Outputs and Supply Power	28
13.	Start-Up	29
13.1.	Preliminary Checks of the Flowmeter Measurement System	29
13.1.1	Checking the Flowmeter Primary COPA-XL	29
13.2.	System Zero Check/Adjustment	29
13.3.	Maintenance / Repair	30
13.4.	Rotating the Display	30
13.5.	Replaceable Parts, Flowmeter Primary	30
14.	Converter Specifications	31



EG-Konformitätserklärung EC-Certificate of Compliance



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: DL43...
Model:

Richtlinie: EMV Richtlinie 89/336/EWG *
Directive: EMC directive 89/336/EEC *

Europäische Norm: EN 50081-1, 3/93 * EN 50081-2, 3/94 *
European Standard: EN 50082-1, 3/93 * EN 61000-6-2, 3/00 *

* einschließlich Nachträge
including alterations

Göttingen, 14.11.2001


.....
Unterschrift / Signature

BZ-13-5031, Rev.1, 4052

ABB Automation Products GmbH

Postanschrift:
D-37070 Göttingen

Telefon:
+49(0)551 905-0
Telefax:
+49(0)551 905-777
<http://www.abb.de/automation>
UST-IdNr.: DE 115 300 097

Sitz der Gesellschaft:
Göttingen
Registergericht:
Göttingen
Handelsregister:
HRB 423

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

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




1 Safety Information

1.1 Regulated Usage

The operating, maintenance and installation requirements in this Instruction Bulletin must be followed. Any damages resulting from improper or non-specified usage are not the responsibility of the manufacturer.

1.2 Safety Markings and Symbols

Observe the safety information identified in this Instruction Bulletin by the following symbols:

	<p>Hazardous electrical voltages</p>	<p>Warning! Personnel contact with the electrical connections can result in severe burns and in life threatening injuries. Install the instrument before energizing the supply power. Turn off the supply power prior to opening the housing or removing the converter!</p>
	<p>Warning!</p>	<p>This symbol is shown at sections which require particular attention. Follow these instructions exactly, otherwise inaccurate operation may result or the instrument may be damaged. Read the instructions carefully.</p>
	<p>Information!</p>	<p>Information concerning important tasks or procedures. Proceed exactly as indicated, otherwise operation may be directly affected or an unanticipated instrument response may occur.</p>

1.3 Installation, Start-Up, Operation and Maintenance Requirements

- The electrical installation, start-up and maintenance operations are only to be conducted by qualified personnel, who have been authorized by the facility operator. The technical personnel must have read and understood the contents of this Instruction Bulletin and must follow the instructions described.
- The technical personnel have the responsibility to assure that the electrical connections to the measurement system have been made correctly.
- Observe the warning information in the Instruction Bulletin regarding the use and connection of the supply power.
- Observe in particular the applicable national standards regarding installation, functional testing, repair and maintenance of electrical equipment.

1.4 Safe Operation

- This instrument has not been approved for installation in explosion hazardous locations. The instrument may only be installed in areas outside of the Ex-Zone and has been designed for Protection Class IP 65.
- The Electromagnetic Flowmeter is manufactured to the latest state of the art design and safety standards. The instrument was tested for compliance with the safety requirements at the factory and shipped in proper operating condition.
- This Instruction Bulletin contains information concerning start-up and testing and in addition includes the specifications for this instrument design. The manufacturer reserves the right to make revisions to the software and hardware resulting in technical improvements. Information about updates and possible new expanded features may be obtained from the factory in Göttingen, Germany or from your local ABB-Sales Bureau.

1.5 Returns

If it is necessary to return an instrument to the ABB factory in Göttingen, Germany for repair or recalibration, use the original or other suitable protective packing material. Please include the reason for the return.

1 Technical Description

1.1 Functional Description

The Electromagnetic Flowmeters (EMF) from ABB are the ideal flow measurement instruments for liquids, slurries and sludges which have a specific minimum electrical conductivity. The flowmeters measure accurately, create no pressure drop and include no moving parts or components which extend into the flow stream.

The ABB EMFs have been proven over decades and are the preferred flowmeters in the chemical, pharmaceutical and cosmetic industries, municipal water and waste treatment facilities, food industry and paper industry.

1.2 Operating Principle

The operation of the electromagnetic flowmeter is based on Faraday's Laws of Induction which states that a voltage is generated in a conductor as it moves through a magnetic field.

This principle is applied in this flowmeter to a conductive fluid as it moves through a magnetic field generated perpendicular to the flow direction (see Schematic, Fig. 1).

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

The voltage induced in the fluid is measured at two electrodes installed opposite to each other. The signal voltage U_E is proportional to the magnetic induction B , the electrode spacing D and the average flow velocity v . Recognizing that the magnetic induction B and the electrode spacing D are constant values indicates that the signal voltage U_E is directly proportional to the average flow velocity v . The equation for calculating the volume flowrate*) shows that the signal voltage $U_E \sim q_v$, i.e., the signal voltage U_E is linearly proportional to the volume flowrate.

1.3 Construction

The converter in the COPA-XL is mounted directly on the flowmeter primary.

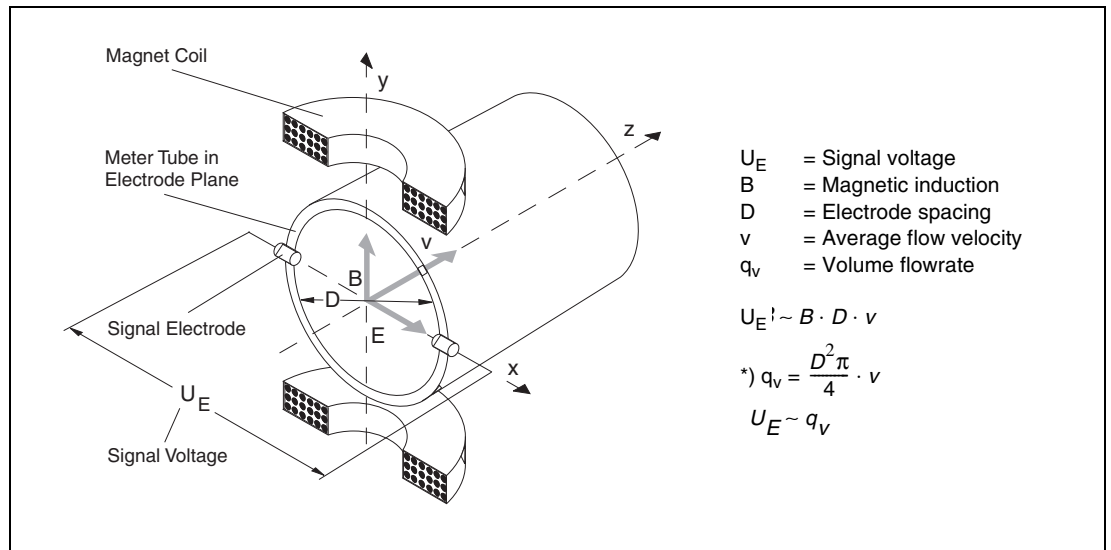


Fig. 1: Schematic: Electromagnetic Flowmeter

2 Assembly and Installation

2.1 Inspection

Before installing the flowmeter primary, check for mechanical damage due to possible improper handling during shipment. All claims for damage are to be made promptly to the shipper prior to installing the meter.

2.2 Installation Requirements, Flowmeter Primary

The flowmeter primary should not be installed in close proximity to strong electromagnetic fields.

The flowmeter primary must be installed so that the meter tube is always completely filled with fluid. Valves or other shut off devices should be installed downstream from the EMF. It is advantageous for eliminating gas pockets to slightly slope the pipeline, approx. 3° (Fig. 2).

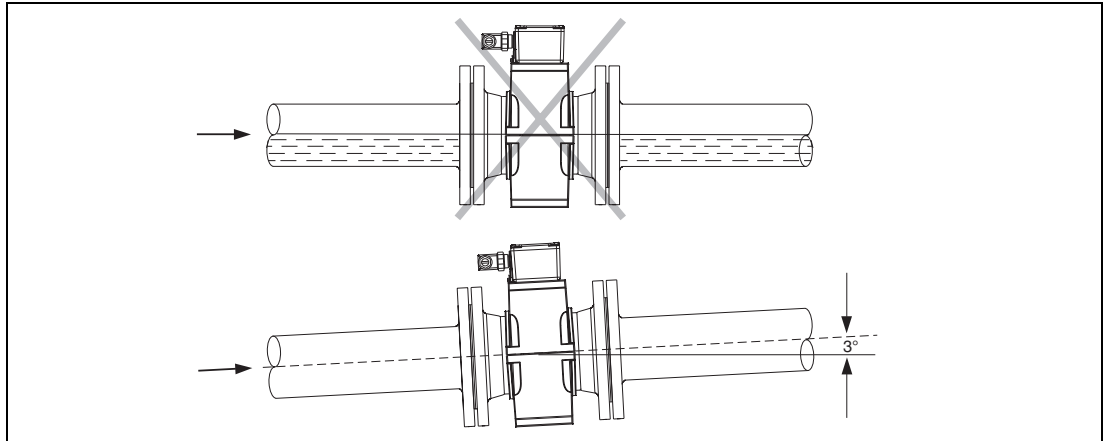


Fig. 2:

Installations in vertical pipelines are ideal when the flow is upward. Installations in drop lines, i.e. downward flow, should be avoided. Experience has shown that in these pipelines a completely full meter tube condition cannot be guaranteed because an equilibrium condition may exist between the downward flowing fluid and an upward flowing gas (Fig. 3).

The flowmeter primary should be installed in the pipeline so that the cable connector points downward (Fig. 3 & Fig. 5).

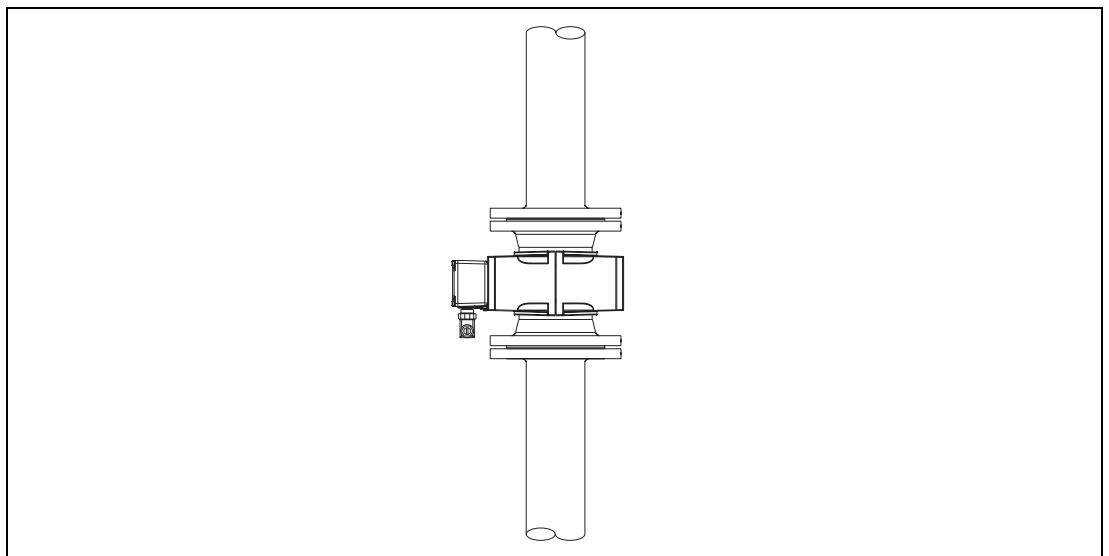


Fig. 3:

Assure that the imaginary line connecting the electrodes is horizontal, if possible, when the flowmeter primary is installed in horizontal pipelines so that any air or gas bubbles which may be present in the fluid do not disrupt the measurement of the flow signal by the electrodes. The position of the electrode axis is shown in Fig. 4.

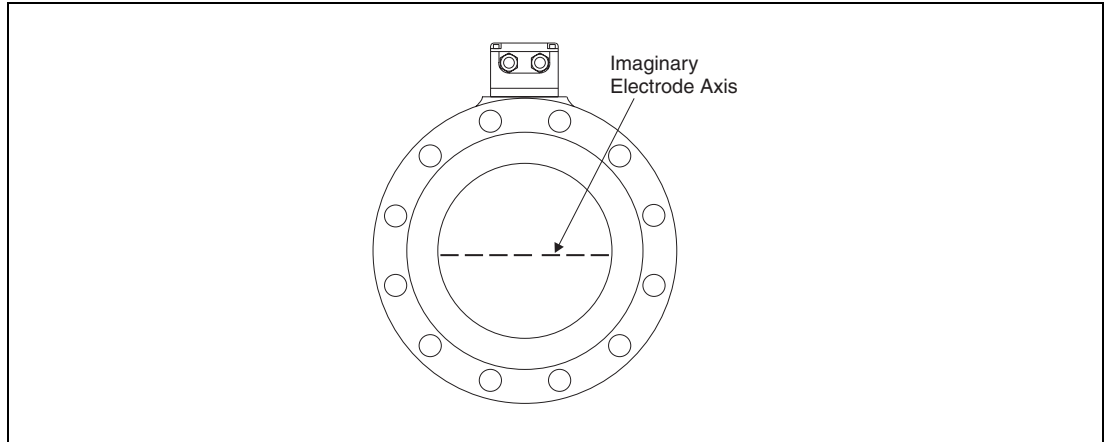


Fig. 4:

For free in- or outflow an invert should be provided to assure that the flowmeter primary is always completely full (Fig. 5).

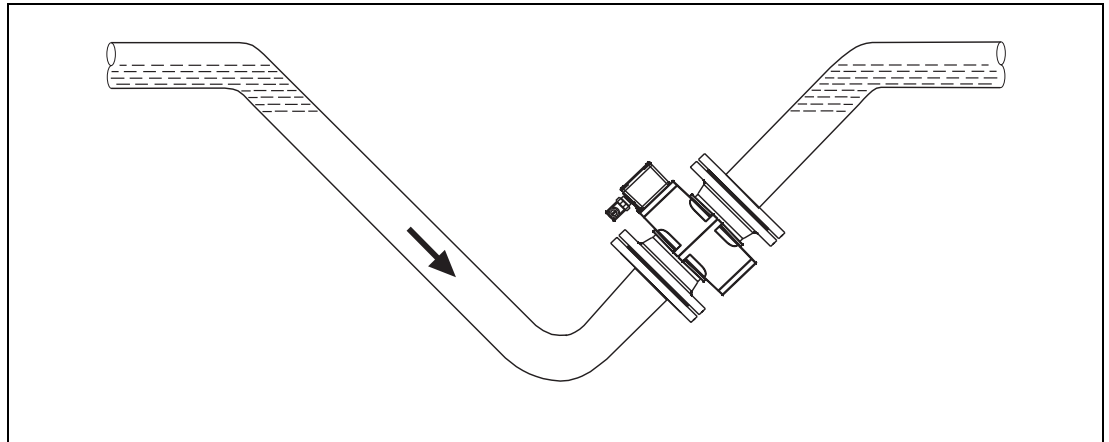


Fig. 5:

For free outflow (drop line) the flowmeter primary should not be installed at a high point or in the discharge end of the pipeline (meter tube may drain, air bubbles Fig. 6).

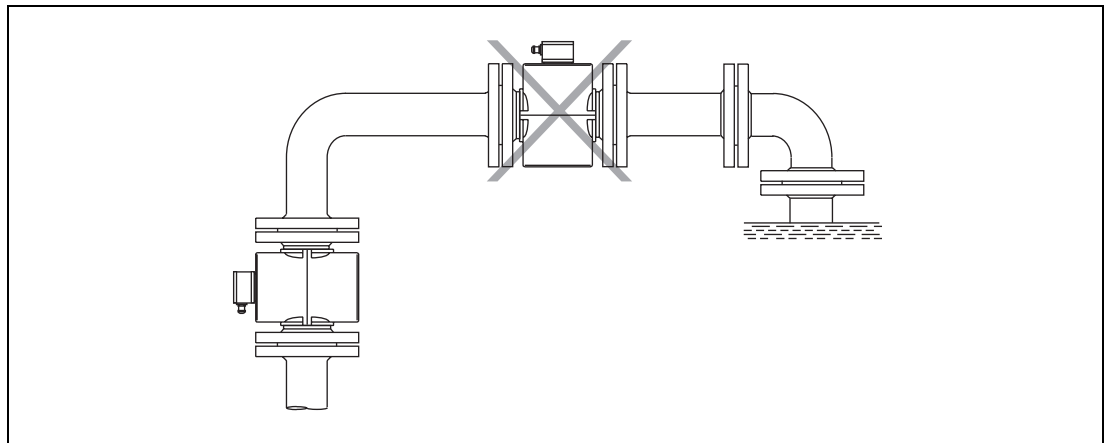


Fig. 6:

The measurement principle is independent of flow profile effects as long as standing eddies do not extend into the measurement section (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 $3 \times D$ and a straight downstream section of $2 \times D$ is sufficient (D = flowmeter primary size) Fig. 7.

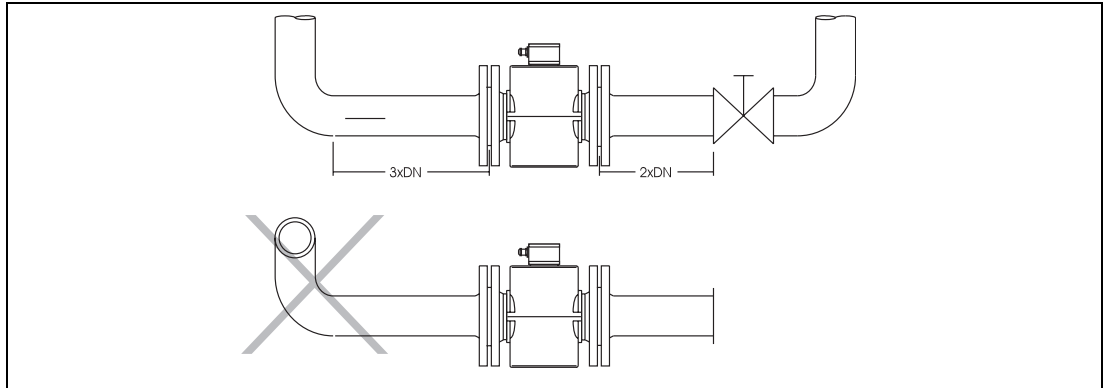


Fig. 7:

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

For highly contaminated fluids a bypass line similar to that shown in Fig. 8 is recommended, so that during a mechanical cleaning procedure the operation of the process need not be interrupted.

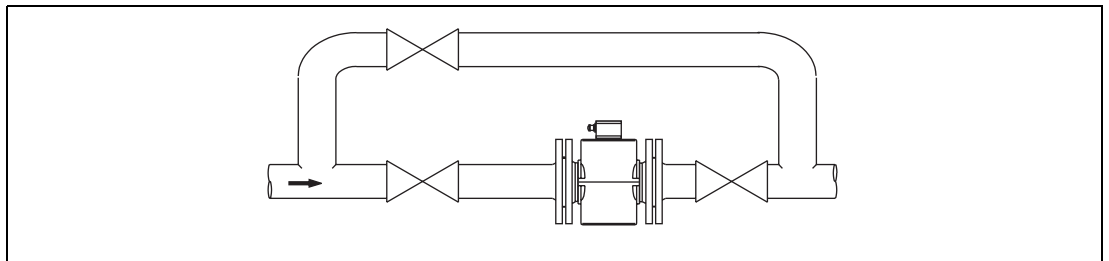


Fig. 8:

For flowmeter primaries which are to be installed in the vicinity of pumps or other vibration generating equipment, the use of mechanical snubbers is advantageous (Fig. 9).

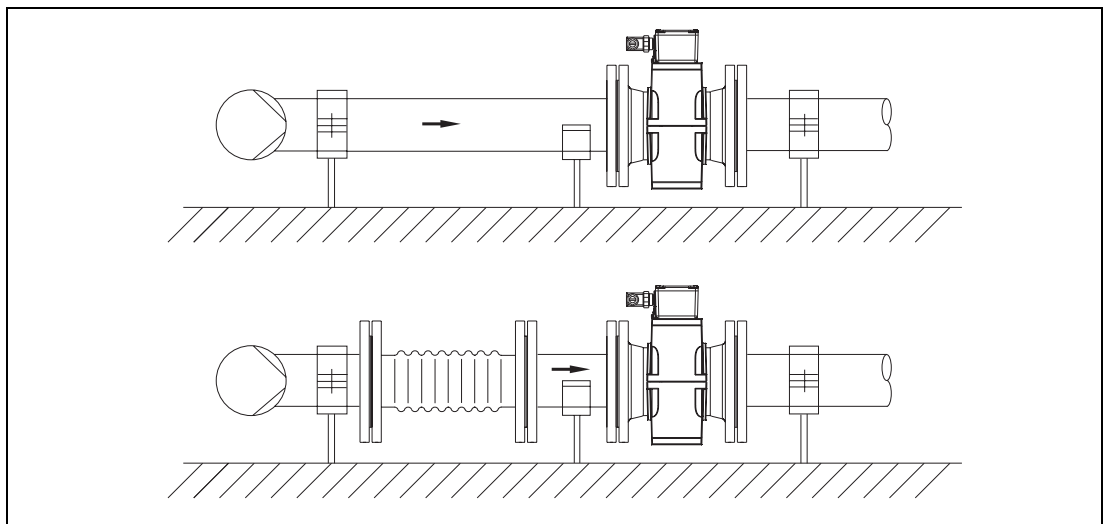


Fig. 9:

2.2.1 Installing the Flowmeter Primary

The electromagnetic flowmeter can be installed at any arbitrary location in the pipeline as long as the installation requirements (see 2.2) are satisfied.

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



Warning

Graphite should not be used to lubricate the flange or process connection gaskets because, under certain circumstances, an electrically conductive coating may form on the inside surface of the meter tube affecting operation.

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 the temperature are to be used. Only then can leaks be avoided. The flange gaskets for the flowmeter primary must be installed concentrically to achieve optimum measurement results.

Protection Plates

The protection plates for the flowmeter primaries are installed to prevent damage to the liner during shipment. Remove the protection plates only when ready to install the meter in the pipeline. Be careful not to cut or otherwise damage the liner in order to avoid leaks.

Flange Bolt Torque Specifications

The flange bolts are to be tightened equally in the usual manner without excessive one-sided tightening. It is recommended that the bolts be greased prior to tightening and that they be tightened using a wrench with a normal length, in a crisscross pattern as shown in Fig. 10. 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:

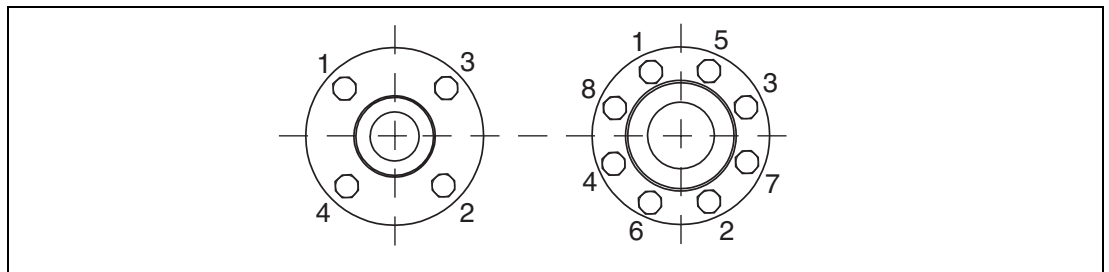


Fig. 10:

Flange Bolt Torque Specifications

Liner	Meter Size		Process Connection	Bolts	Torque max. Nm	Press. Rating bar	
	mm	Inch					
PTFE/ Hard rubber	10	3/8	Flanges	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		4 x M16	39	40	
	80	3		8 x M16	49	40	
					8 x M16		
		100		4	8 x M16	47	16
		125		5	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		

Table 1

2.2.2 Installations in Larger Size Pipelines

The flowmeter can readily be installed in larger size pipelines by utilizing of flanged transition sections (e.g. Flanged Reducers per DIN 28545). The pressure drop resulting from the reduction can be determined from the Pressure Drop Nomograph Fig. 11 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 flowrate. The flow velocity can also be determined from the Flowrate Nomograph Fig. 12.
3. The pressure drop can be read on the -Y- axis at the intersection of the flow velocity value and the "Diameter Ratio d/D " value on -X- axis in Fig. 11.

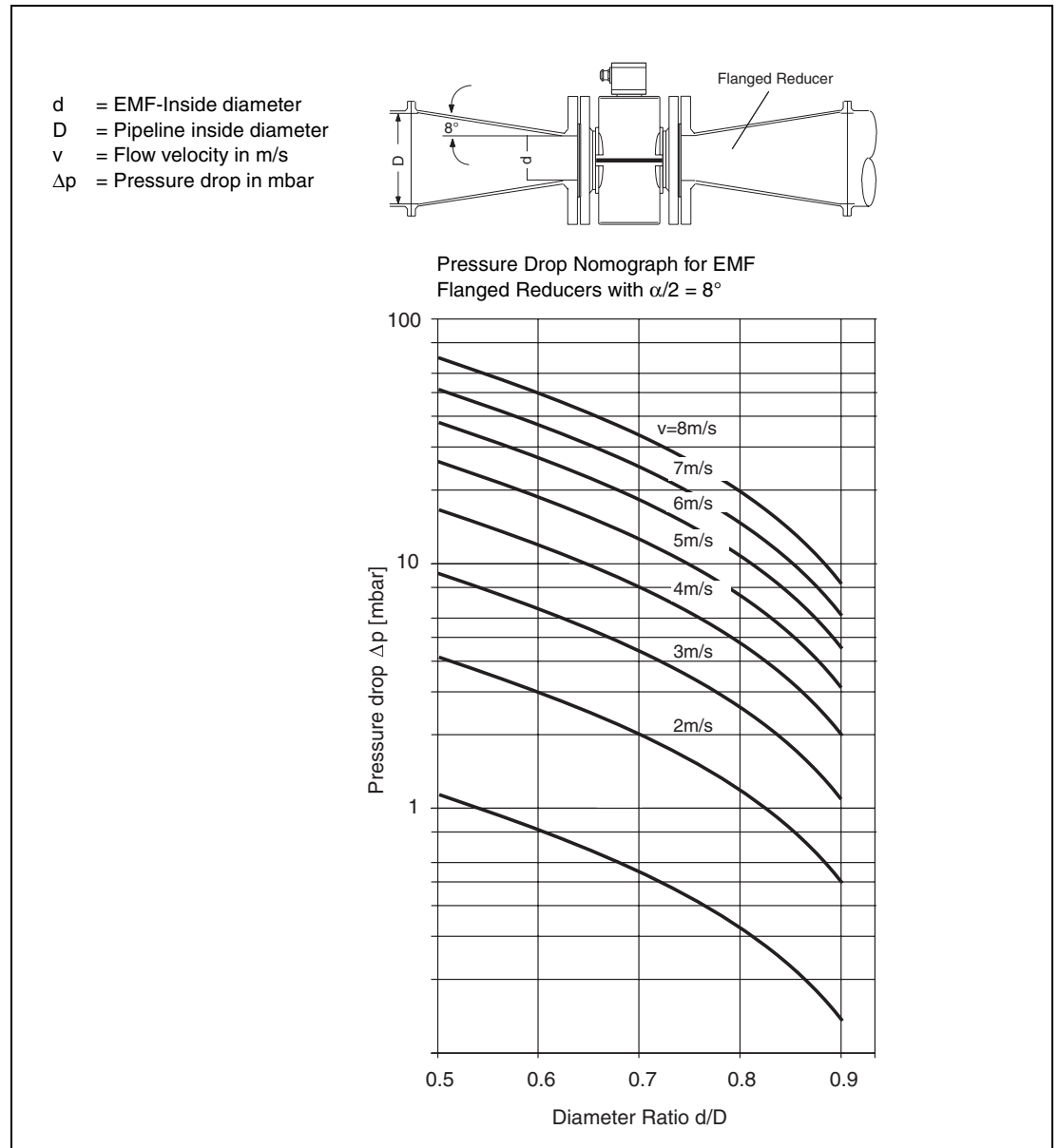


Fig. 11: Nomograph for Calculating the Pressure Drop for EMF Flowmeters - Flanged Reducers with $\alpha/2 = 8^\circ$

2.2.3 Flowmeter Sizes, Pressure Ratings, Flow Ranges

Meter Size		Standard Pressure Rating PN	Min. Flow Range		Max. Flow Range	
DN	Inch		Flow Velocity: 0 to 0.5 m/s		Flow Velocity: 0 to 10 m/s	
10	3/8	40	0	to 2.25	l/min	0 to 45 l/min
15	1/2		0	to 5.0	l/min	0 to 100 l/min
20	3/4		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		0	to 20	l/min	0 to 400 l/min
40	1-1/2		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		0	to 6	m ³ /h	0 to 120 m ³ /h
80	3		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		0	to 21	m ³ /h	0 to 420 m ³ /h
150	6		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		0	to 90	m ³ /h	0 to 1800 m ³ /h
300	12		0	to 120	m ³ /h	0 to 2400 m ³ /h

Flowrate Nomograph

The volume flowrate is a function of the flow velocity and the size of the flowmeter primary. The Flowrate Nomograph below indicates the flow range for a specific flowmeter size as well as the flowmeter sizes suitable for a specific flowrate.

Example:

Flowrate = 7 m³/h (maximum value = flow range end value). Suitable are flowmeter sizes DN 20 to DN 65 / 3/4" to 2-1/2" for flow velocities from 0.5 to 10 m/s.

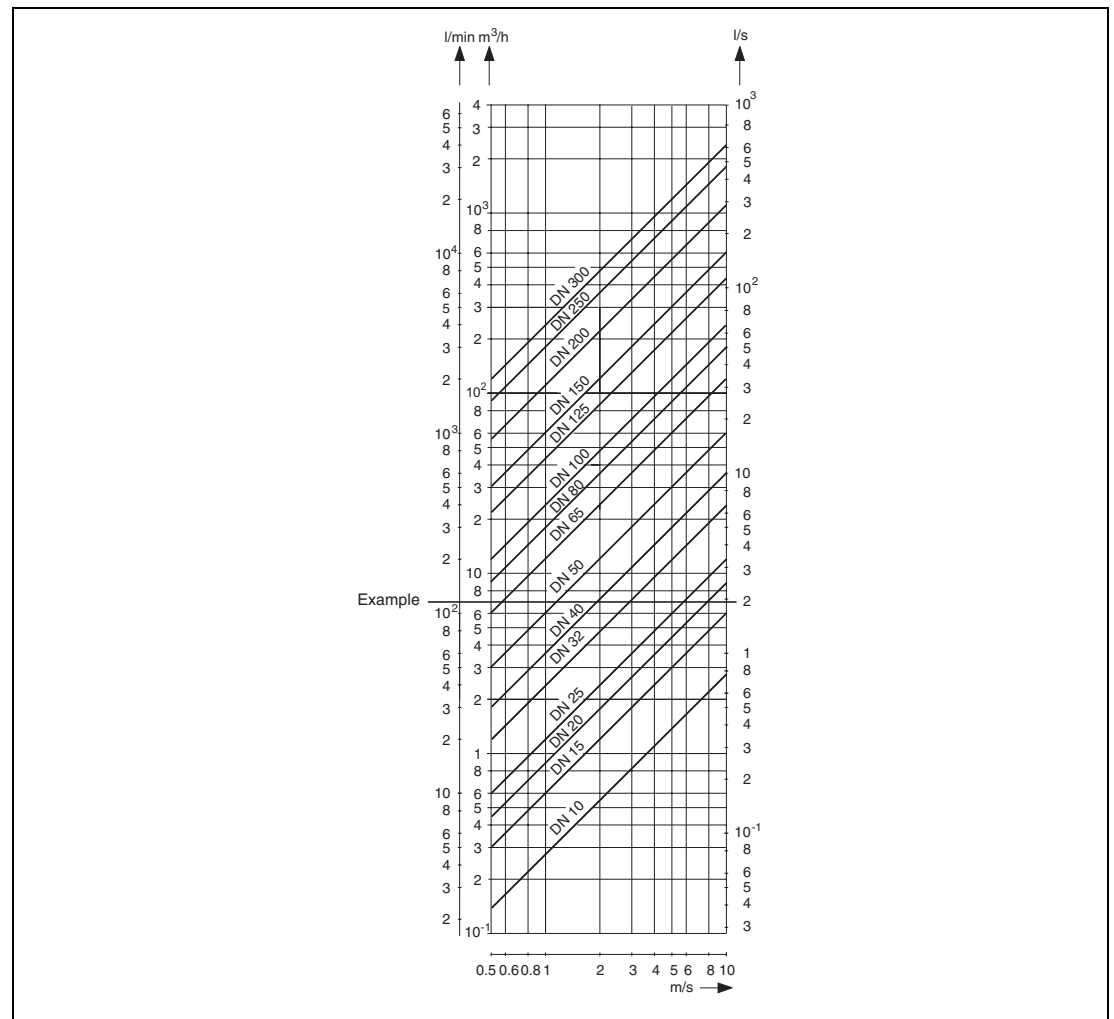


Fig. 12: Flowrate Nomograph DN 10 to DN 300 / 3/8" to 12"

3 Programming the Converter

3.1 Overview of the Converter Factory Settings

The COPA-XL is shipped with a converter which has been preset at the factory. The factory settings can be changed at the site. An overview of the factory settings is shown in the following table:

Factory Settings

Flow Range			Flow Range	
DN 10	3/8"	2.7 m ³ /h	DN 125	5"
DN 15	1/2"	6 m ³ /h	DN 150	6"
DN 20	3/4"	9 m ³ /h	DN 200	8"
DN 25	1"	12 m ³ /h	DN 250	10"
DN 32	1-1/4"	24 m ³ /h	DN 300	12"
DN 40	1-1/2"	36 m ³ /h	Units	m ³ /h
DN 50	2	60 m ³ /h	Current output	4 - 20 mA
DN 65	2-1/2"	120 m ³ /h	Damping	5 sec.
DN 80	3	180 m ³ /h	Pulse output	1 pulse/m ³
DN 100	4	240 m ³ /h		

Table 1:

Display and Operator Controls

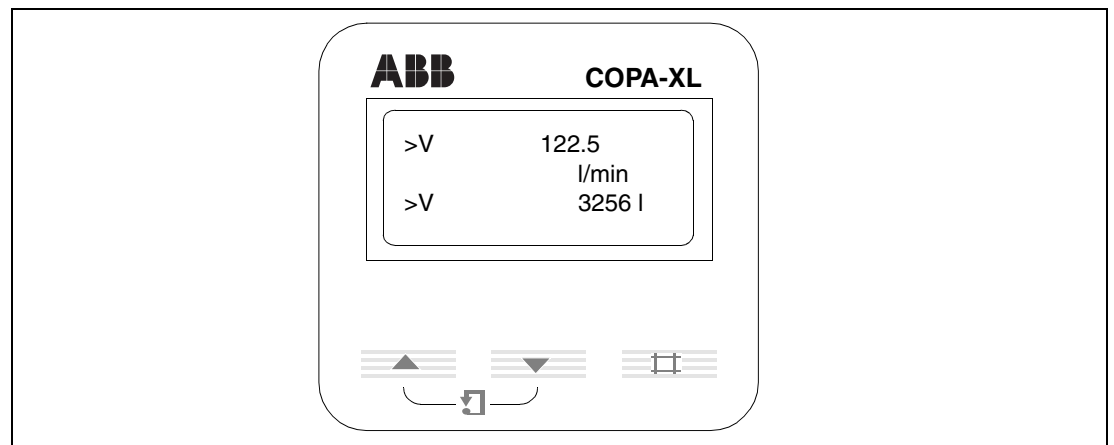


Fig. 13:

Data Entry

The converter remains on-line during data entry, i.e., the current and pulse outputs continue to indicate the actual present operating status. The functions of the individual keys are described below:



The Clear-Key is used to cycle between the operating mode and the menu



The Arrow-Keys are used to scroll through the menu



The ENTER-Function is activated by simultaneously pressing both Arrow-Keys. ENTER is used to turn the program protection on and off. ENTER is also used to access the parameter to be changed and to accept the new value.

Rotating the Display

The display is mounted on the inside of the cover.

The orientation of the display can be changed by repositioning the cover.

Warning:

Close the cover carefully, only then will the Protection Class be maintained!

4 Data Entry in „Condensed Form“

Action	Using Key =	Display Information
Starting point "Process information"		→ F 233.55 l/min → F 3225 l
Example: Change flowrate end value Qmax	#	An arbitrary parameter is displayed
Find parameter "Program protection"	↓	*Program protection* on
"Program protection"	↵	*Program protection* off

Direct Numeric Entry			Selection from a Table		
Action	using Key =	Display Info	Action	using Key =	Display-Info
Find parameter "Qmax"	Arrow Keys ↓	→ V 233.55 l/min → V 3225 l	Find submenu "Current output"	Arrow Keys ↓	Submenu Current output
Change parameter "Qmax"	ENTER ↵	Qmax - l/min	Access parameter "Current output"	ENTER ↵	Current output 0 - 20 mA
		Qmax 6 2 0 l/min	Change Current output from 4-20 mA to 4-20 mA	ENTER ↵	Current output 0 - 20 mA
6 x	↑	6	In table select new	Arrow Keys ↓	Current output 4 - 20 mA
Enter desired numbers in sequence	↓		Current output 4- 20 mA		
2 x	↑	2	Accept new "Current output"	ENTER ↵	Current output 4 - 20 mA
	↓				
Accept new Qmax value	ENTER ↵	Qmax 6 2 0 l/min			

Exit from parameter Qmax Find parameter Program protection	↓	*Program protection* off
Turn Program protection on again	↵	*Program protection* on
Exit point Process information	#	→ F 233.55 l/min → F 3225 l

5 Data Entry

Parameter	Entry Mode	Comments
Prog. protection off	from table	ON / OFF Data can be entered only after the Program Protection has been turned off. To exit the submenu use #
Language English	from table	German / English / French / Spanish (Default value is German)
Size DN 15 1/2in	from table	DN 10 to DN 300 / 3/8" to 12" see Instrument Tag
RangeDN 100 l/min	only for information	Maximum flow range end value for the selected flowmeter size (= 10 m/s). Automatically set for the active flowmeter size.
RangeDN 60 l/min	numeric	Flow range end value for forward and reverse directions (Default value is RangeMax) Min. flow range 0 - 0.5 m/s; Max. flow range 0 - 10 m/s. The units can be selected in the submenu „Units“.
Unit l/min	from table	m ³ /h; m ³ /min; m ³ /s; l/s; l/min; l/h, gal/s; gal/min; gal/h (Default value is m ³ /h)
Damping 5.0 s	numeric	Can be set between 5 and 40 seconds. The damping corresponds to the response time of the current output to a 0-99 % flowrate change. (Default value is 5 sec.)
Low flow cutoff 1 %	numeric	Low flow cutoff range 0 - 10 %, applies to the display indication and all outputs. When the flowrate is below the low flow cutoff value the flow is no longer measured. Switching hysteresis for the low flow cutoff is : 1 % (Default value for the Low flow cutoff is 1 %)

Parameter	Entry Mode	Comments
	<p>from table</p>	<p>Selections available are: pulse output; fwd/rev direction signal; min. alarm; max. alarm; min./max. alarm; general alarm or no function. <i>Default value for Prog. output is „Pulse“</i></p>
<p>Pulse factor 1.0 /l</p>	<p>from table</p>	<p>Selectable pulse factor 0.01 / 0.1 / 1 / 10 / 100 pulses per selected unit. The units are selected in the submenu „Units“.</p>
<p>Pulse width 600 ms</p>	<p>only for information</p>	<p>Only for information, no selections available, The pulse width is automatically set as a function selected flow range end value. Pulse on/off ratio 1:1 as long as the pulse width is within the range from 2550 ms (max. pulse width) and 20 ms (min. pulse width). If a different pulse width is required, the pulse factor or flow range end value (RangeMax) must be changed.</p>
<p>MAX Alarm 105 %</p>	<p>numeric</p>	<p>Can be set between 0 and 105 % of the active flow range end value. The alarm messages are always indicated in the display, but only transmitted as an electrical output signal when Min. Alarm, Max. Alarm, or Min./Max. Alarm have been selected in the submenu „Prog.output“ <i>(Default value for Max. Alarm is 105 %)</i> Pin settings see Interconnection Diagram.</p>
<p>MIN Alarm 0 %</p>	<p>numeric</p>	<p>Can be set between 0 and 105 % of the active flow range end value. The alarm messages are always indicated in the display, but only transmitted as an electrical output signal when Min. Alarm, Max. Alarm, or Min./Max. Alarm have been selected in the submenu „Prog.output“ <i>(Default value for Min. Alarm is 0 %)</i> Pin settings see Interconnection Diagram.</p>

Parameter	Entry Mode	Comments
<p>Current output 4 - 20 mA</p> <p>↓</p> <p>↵</p> <p>Current output 4 - 20 mA</p> <p>↓</p> <p>Current output 0 - 20 mA</p>	<p>from table</p>	<p>Selections available: 0 - 20 mA or 4 - 20 mA Default value for Current output is „4 - 20 mA“</p> <p>To exit the submenu use # or accept the new value using ↵</p>
<p>Out at Alarm 21 mA</p>	<p>from table</p>	<p>Current output during an alarm condition. The following output current settings are available for the 4-20 mA option: 0 mA; 3.6 mA; 21 mA The following output current settings are available for the 0-20 mA option: 0 mA; 21 mA Default value for Out at Alarm is „21 mA“</p>
<p>Totalizer reset</p> <p>↓</p> <p>↵</p> <p>Totalizer reset yes --> Enter</p>		<p>The totalizer in the display functions as a difference totalizer, i.e., the forward and reverse totals are displayed on a single counter. To reset the totalizer to zero use ↵</p>
<p>System zero adj. 2.0000 Hz</p> <p>↓</p> <p>↵</p> <p>System zero manual</p> <p>↓</p> <p>System zero automatic</p>	<p>from table</p>	<p>To exit the submenu use #</p> <p>Manual entry of a zero value</p> <p>Valve must be closed. Pipeline must be completely full and at zero flowrate. The automatic adjustment is initiated by using ENTER. The limit for the zero value is 50 Hz. If the value exceeds this limit, the adjustment is not completed. To exit the submenu use #</p>
<p>Flow indication Standard</p>		<p>Standard/Opposite Definition of the forward flow direction for an installed instrument Standard = no change, Opposite = reversed indication</p>
<p>Display Q [units]</p> <p>↓</p> <p>↵</p> <p>Display Q [units]</p> <p>↓</p> <p>Display Q [%]</p>		<p>Units for the display indications (instantaneous flowrate and totalizer values). In % or direct reading in the units selected in the submenu „Units“.</p> <p>Accept using ENTER or to exit the submenu use #</p>

Parameter	Entry Mode	Comments
		<p>Set using the arrow keys.</p> <p>Flowrate simulator on/off. Can be utilized to test the 20 mA loop, the pulse output, the flow direction signal, and the min. and max. alarms. A flowrate value can be set using the arrow keys. The flowrate in both directions can be simulated. After the Simulation is turned on, set the flowrate value in % and use ENTER to accept. Use # to return to the display. The text „Simulation“ is displayed. The instrument is no longer on-line. The arrow keys can now be used to change the flowrate value up or down. After the test phase has been completed the Simulation mode should be turned off.</p> <p>Flowmeter Model; Software release date Part No. for the software; Revision level</p> <p>Only for ABB Service</p>

6 Circuit Boards

6.1 Fuse Locations on the Converter Circuit Board

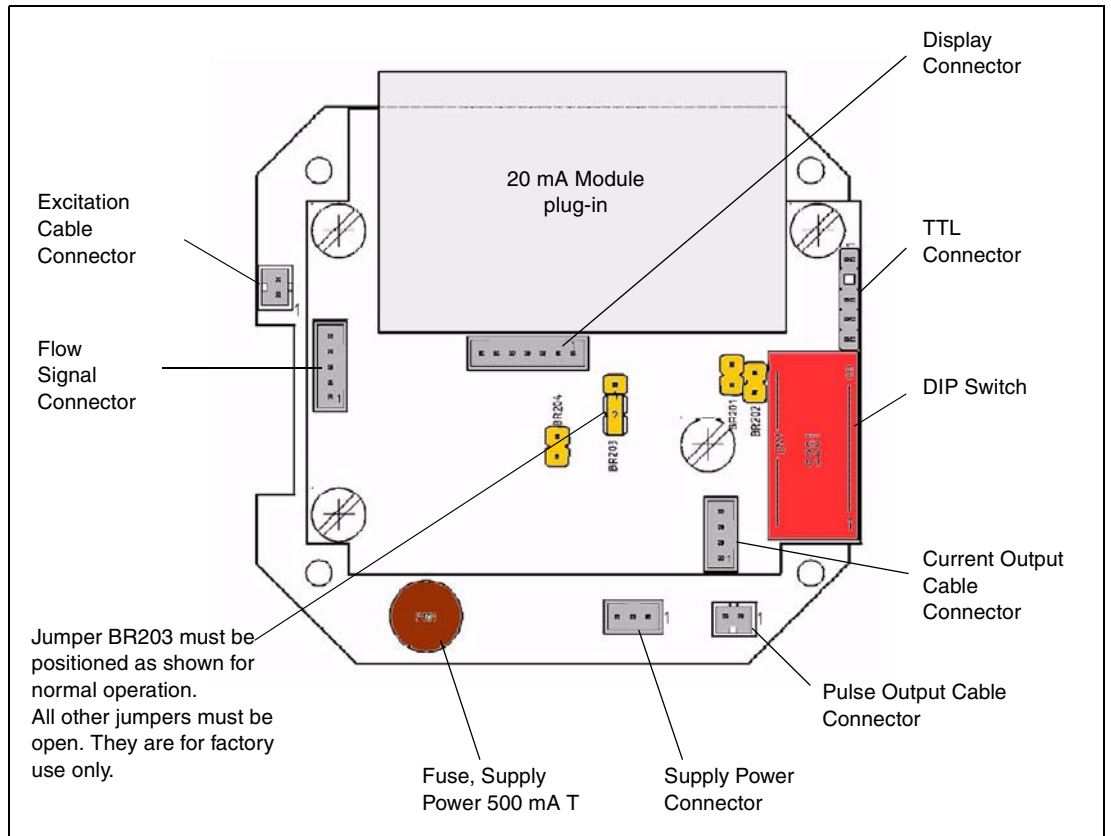


Fig. 14:

7 Ordering Information

Ordering Number						DL43F								
Liner	DN	Inch	Electrodes	Press. Rtg.	Flanges									
PTFE	10	3/8	Hast. C-4	PN 40	Flange 1.4751/316Ti	T10HF3								
PTFE	15	1/2	Hast. C-4	PN 40	Flange 1.4751/316Ti	T15HF3								
PTFE	20	3/4	Hast. C-4	PN 40	Steel flange	T20HF1								
PTFE	25	1	Hast. C-4	PN 40	Steel flange	T25HF1								
PTFE	25	1	Hast. C-4	CL 150	Steel flange	T25HP1								
PTFE	32	1-1/4	Hast. C-4	PN 40	Steel flange	T32HF1								
PTFE	40	1-1/2	Hast. C-4	PN 40	Steel flange	T40HF1								
PTFE	40	1-1/2	Hast. C-4	CL 150	Steel flange	T40HP1								
PTFE	50	2	Hast. C-4	PN 40	Steel flange	T50HF1								
PTFE	50	2	Hast. C-4	CL 150	Steel flange	T50HP1								
PTFE	65	2-1/2	Hast. C-4	PN 40	Steel flange	T65HF1								
PTFE	80	3	Hast. C-4	CL 150	Steel flange	T80HP1								
PTFE	80	3	Hast. C-4	PN 40	Steel flange	T80HF1								
PTFE	100	4	Hast. C-4	PN 16	Steel flange	T1HHD1								
PTFE	100	4	Hast. C-4	CL 150	Steel flange	T1HHP1								
Hard rubber	100	4	SS 1.4571/316Ti	PN 16	Steel flange	H1HSD1								
PTFE	125	5	Hast. C-4	PN 16	Steel flange	T1QHD1								
Hard rubber	125	5	SS 1.4571/316Ti	PN 16	Steel flange	H1QSD1								
PTFE	150	6	Hast. C-4	PN 16	Steel flange	T1FHD1								
PTFE	150	6	Hast. C-4	CL 150	Steel flange	T1FHP1								
Hard rubber	150	6	SS 1.4571/316Ti	PN 16	Steel flange	H1FSD1								
PTFE	200	8	Hast. C-4	PN 10	Steel flange	T2HHC1								
PTFE	200	8	Hast. C-4	PN 16	Steel flange	T2HHD1								
Hard rubber	200	8	SS 1.4571/316Ti	PN 10	Steel flange	H2HSC1								
Hard rubber	200	8	SS 1.4571/316Ti	PN 16	Steel flange	H2HSD1								
Hard rubber	200	8	SS 1.4571/316Ti	CL 150	Steel flange	H2HSP1								
PTFE	250	10	Hast. C-4	PN 10	Steel flange	T2FHC1								
PTFE	250	10	Hast. C-4	PN 16	Steel flange	T2FHD1								
Hard rubber	250	10	SS 1.4571/316Ti	PN 10	Steel flange	H2FSC1								
Hard rubber	250	10	SS 1.4571/316Ti	PN 16	Steel flange	H2FSD1								
Hard rubber	250	10	SS 1.4571/316Ti	CL 150	Steel flange	H2FSP1								
Hard rubber	300	12	SS 1.4571/316Ti	PN 10	Steel flange	H3HSC1								
Hard rubber	300	12	SS 1.4571/316Ti	PN 16	Steel flange	H3HSD1								
Accessories														
None														A
Temperature range														
DN 10 - 250 / 3/8" - 10" max. 80 °C; DN 300 / 12" max. 60 °C														S
Certifications														
None														A
Calibration Certification														
Standard														A
Supply Power														
Low voltage 16.8 - 26.4 V AC / 16.8 - 31.2 V DC														K
Display / Signal Outputs														
With / Pulse output Opto + 20 mA Signal														04
Design Level														A
Electrode Design														
Standard														1
Excitation Frequency														
6 1/4 Hz (DN 10 - 300 / 3/8" - 12")														1

A conductive element is integrated in the liner as standard in flowmeter sizes DN 125 - 300 [5" - 12"] with hard or soft rubber liners. Grounding electrodes are not required.
 If a flowmeter (DN 10 - DN 100 / 3/8" - 4") is installed in a plastic pipeline a ground plate is required. Please order separately!

8 Error Messages

Descriptions of the error messages for the Error Codes shown in the display are listed below.

There are two error messages possible in the COPA-XL.

Error 1

is displayed when the A/D converter is saturated.

The current output in response to Error 1 is set to the value selected in the submenu „Iout at Alarm“.

When the 4 - 20 mA current output option is selected the following current values can be selected in the submenu „Iout at Alarm“, 0, 3.6 or 21 mA.

When the 0 - 20 mA current output option is selected the following current values can be selected in the submenu „Iout at Alarm“, 0, or 21 mA.

Error 3

is displayed when the flow range is exceeded.

This error occurs when the actual flowrate is greater than 105 % of the flow range end value.

During this error condition the current output is always set to 21 mA.

9 Accuracy

Reference Conditions per EN 29104

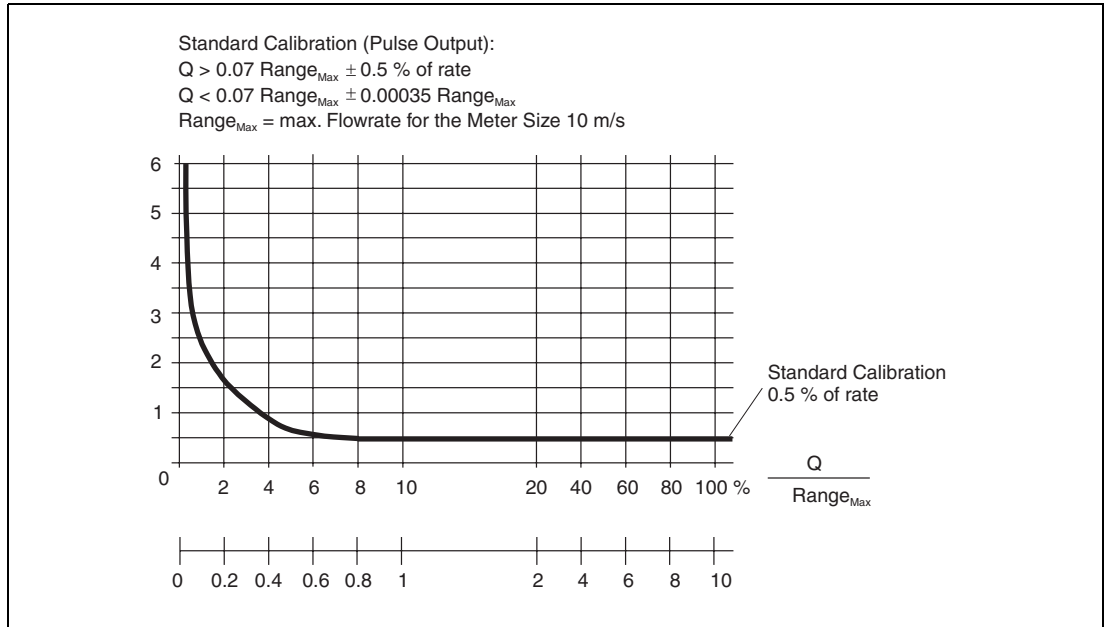


Fig. 15: Measurement System Accuracy

Analog Output Accuracy

Same as pulse output plus $\pm 0.2 \% \text{ of rate} \pm 0.15 \% \text{ of max.}$

10 Safety Relevant Portion of the Instruction Bulletin

10.1 Grounding the Flowmeter Primary

The grounding procedure described is to be observed. In accordance with VDE 0100, Part 540 a Cu-wire with a cross section of at least 2.5 mm² is to be connected between the ground screw on the flowmeter primary (on the flange and the converter housing) and earth. Grounding the converter housing is necessary to achieve the EMC-Protection. For measurement reasons the ground potential should be identical to the pipeline potential if possible. An additional ground to the connection terminals is not required.

For plastic pipelines or pipelines with insulating liners the fluid is grounded by the grounding plate or by the grounding electrodes. When there are stray currents in the pipeline it is recommended that grounding plates be installed at both ends of the flowmeter primary.

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

a) Metal pipeline with fixed flanges

- 1) Drill blind holes in the flanges on the pipeline (18 mm deep).
- 2) Thread holes, (M6, 12 mm deep).
- 3 Attach the ground strap to the flange using a screw (M6), spring washer and flat washer and connect to the ground connection on the flowmeter primary.
- 4) Connect a 2.5 mm² CU wire between the ground connection on the flowmeter primary and earth.

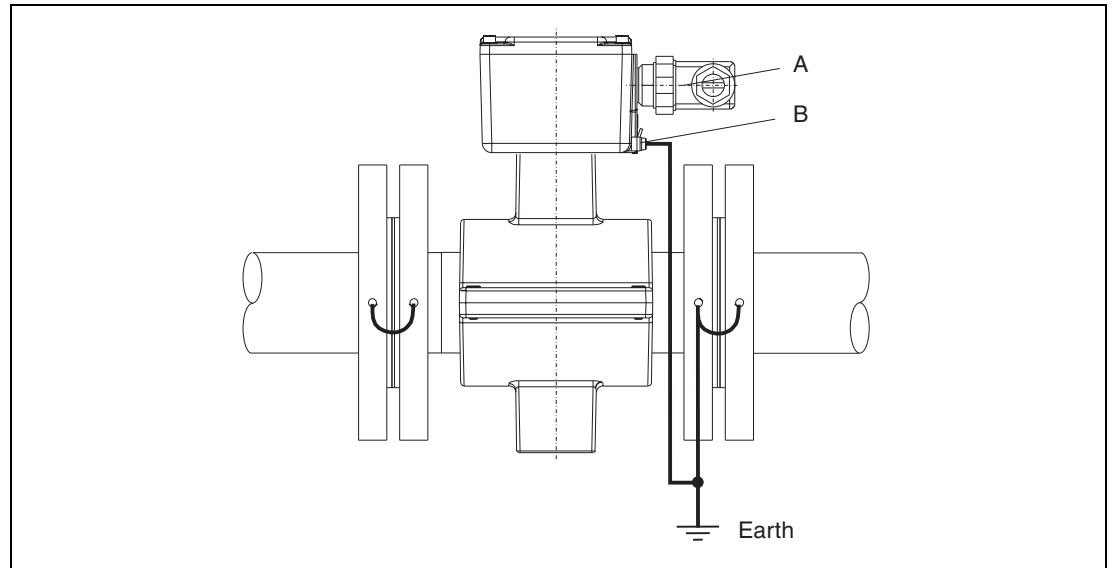


Fig. 16: Grounding the Flowmeter Primary

When installing the instrument potential equalization corresponding the above figure is to be established.



Warning

If in conjunction with the supply power (left plug) a ground is connected at the plug (point A), then the lead connected to point B must be at the same potential as point A.

If this cannot be assured then only one connection should be made - either at the plug (point A) or externally on the instrument (point B).

It is recommended that the ground connection be made at point B.

b) Metal Pipeline with Loose Flanges

- 1) In order to assure a trouble free ground connection to the fluid and the flowmeter primary in a pipeline with loose flanges, 6 mm threaded studs should be welded to the pipeline.
- 2) Attach the ground strap to the flange using a nut, spring washer and flat washer and connect to the ground connection on the flowmeter primary.
- 3) Connect a 2.5 mm² CU wire between the ground connection on the flowmeter primary and a good ground.

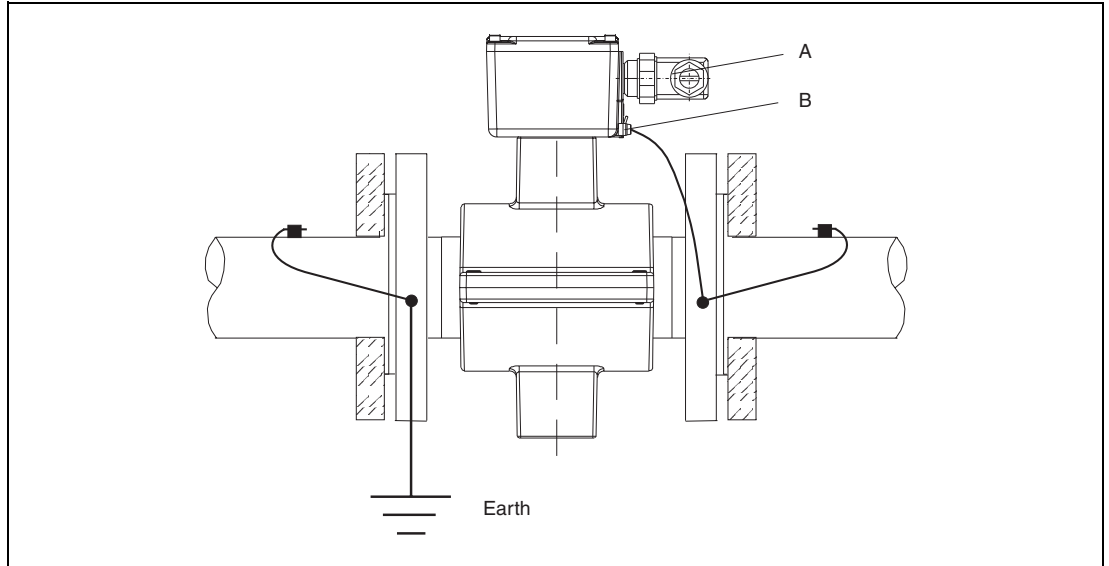


Fig. 17: Flowmeter Primaries DN 10 - DN 100 / 3/8" - 4" Flanged



Warning

If in conjunction with the supply power (left plug) a ground is connected at the plug (point A), then the lead connected to point B must be at the same potential as point A.

If this cannot be assured then only one connection should be made - either at the plug (point A) or externally on the instrument (point B).

It is recommended that the ground connection be made at point B.

c) Plastic, Concrete or Pipelines with Insulating Liners.

- 1) Install EMF in pipeline with a grounding plate.
- 2) Connect the connection tab on the grounding plate to the ground connection on the flowmeter primary with a ground strap.
- 3) Connect a 2.5 mm² CU wire between the ground connection on the flowmeter primary and earth.

For plastic pipelines or pipelines with insulating liners the fluid is grounded by the grounding plate as shown in Fig. 18 or by grounding electrodes, which must be installed in the flowmeter primary (option). If grounding electrodes are installed the grounding plates shown in Fig. 18 are not required.

When there are stray currents in the pipeline it is recommended that, if grounding plates are to be used, one be installed at each of the flowmeter primary.

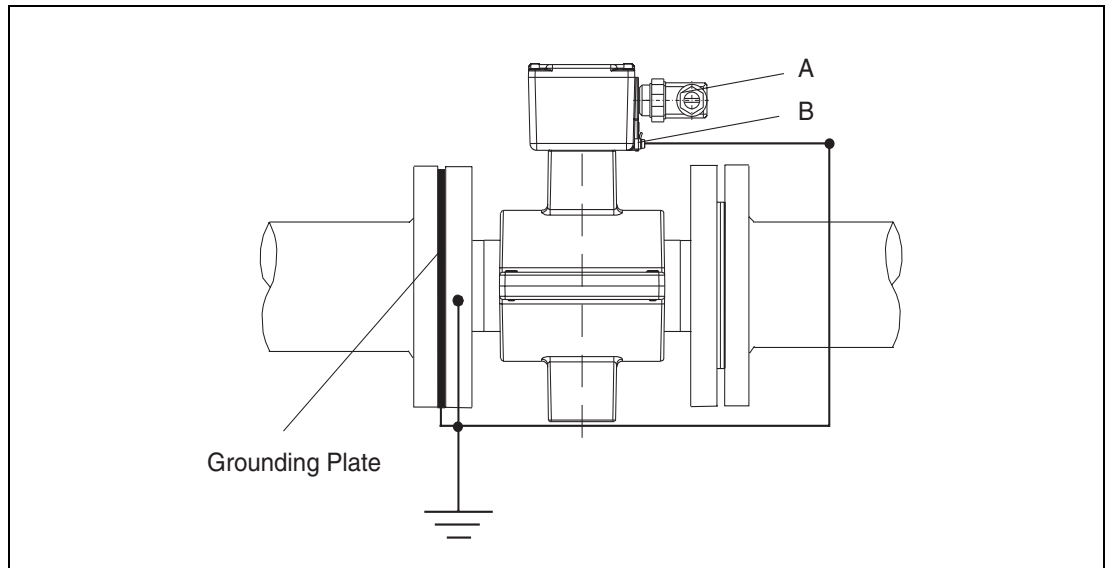


Fig. 18: Flowmeter Primaries DN 10 - DN 100 / 3/8" - 4" Flanged



Warning

If in conjunction with the supply power (left plug) a ground is connected at the plug (point A), then the lead connected to point B must be at the same potential as point A.

If this cannot be assured then only one connection should be made - either at the plug (point A) or externally on the instrument (point B).

It is recommended that the ground connection be made at point B.

10.2 Grounding Instruments with Hard Rubber Liners

A conductive element is integrated in the liner for flowmeter sizes DN 125 / 5" and up. This element grounds the fluid.

11 Electrical Connections

11.1 Interconnection Diagram

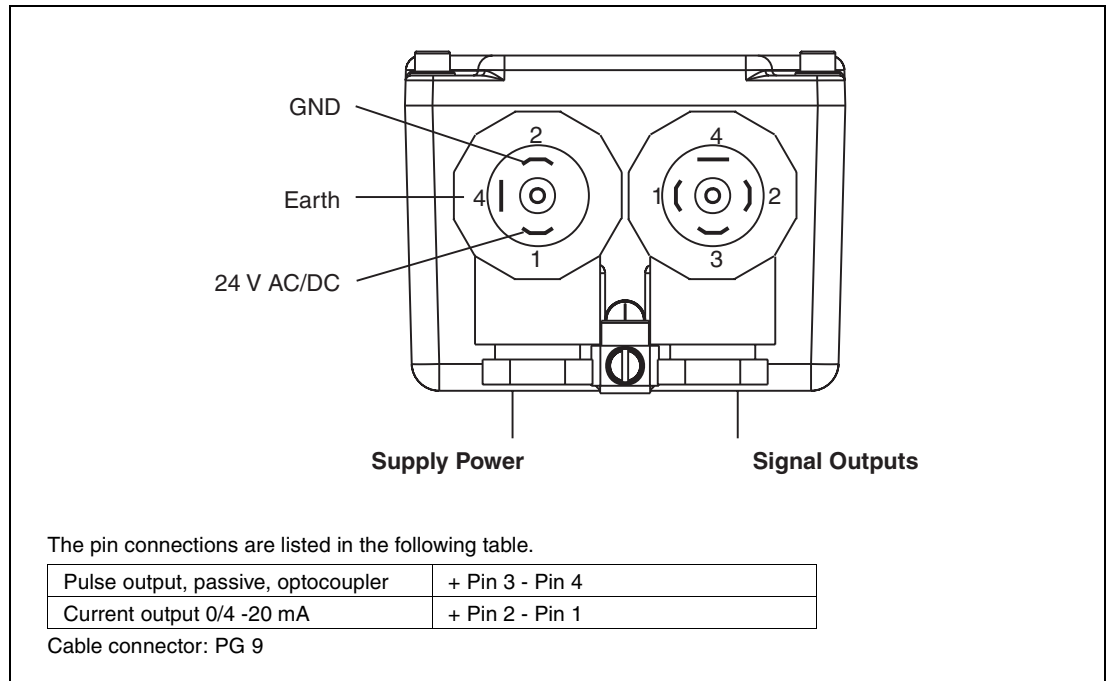


Fig. 19: Interconnection Diagram

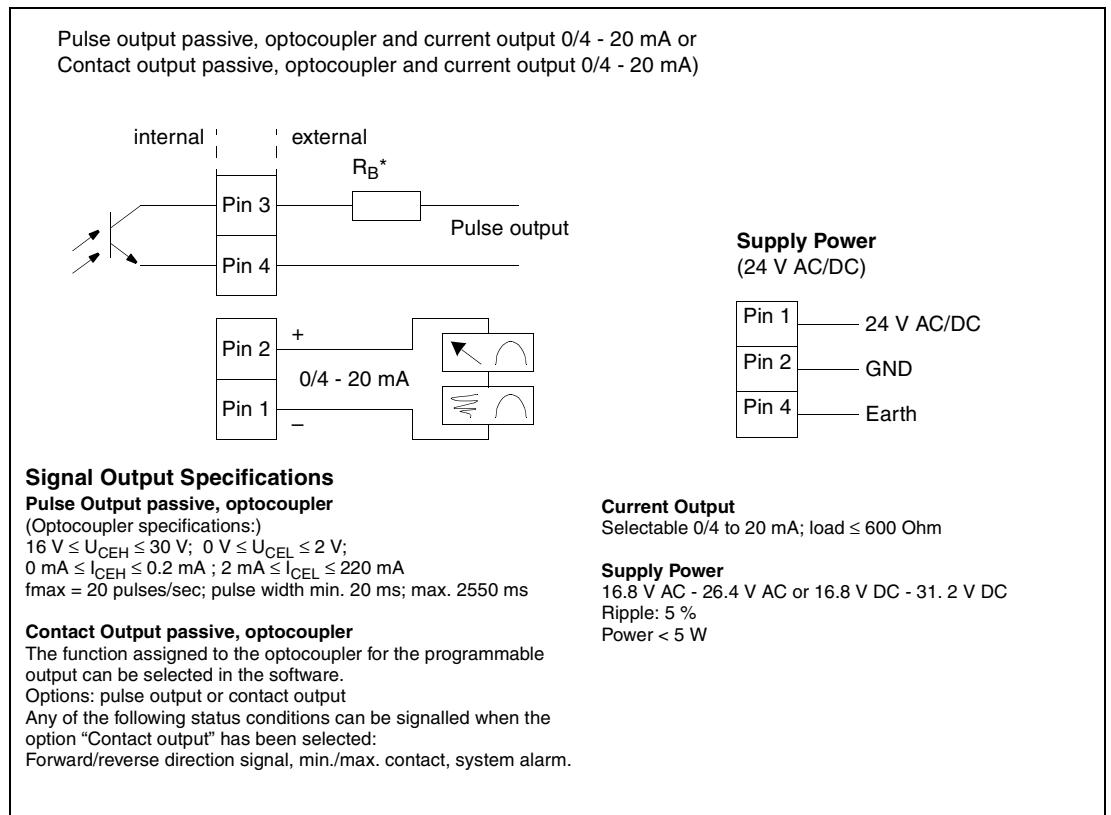


Fig. 20: Interconnection Examples for Peripherals, Signal Output Specifications

11.2 Signal Outputs and Supply Power

Connection
 Cable plug per DIN 43650 with PG 9-connector,
 Lead cross section to max. 1.5 mm², Protection Class IP 65
 Open plug and connect as follows:

Left Plug = Supply Power
 1 24 V AC/DC
 2 GND
 ⊕ Earth

Right Plug = Signal Outputs
 Pin 1+2 20 mA
 Pin 3+4 Pulse/contact output opto
 (See section „Electrical Connections“)

Assemble Plug
 1. To open the plug, screw 1.
 2. Remove the inner part 3 from the outer part 4.
 3. Connect according to the Interconnection Diagram.
 4. Reassemble in the reverse order.

Fig. 21: Interconnection Diagram; Signal Outputs and Supply Power

12 Start-Up

12.1 Preliminary Checks of the Flowmeter Measurement System

12.1.1 Checking the Flowmeter Primary COPA-XL

The start-up procedure described below follows the assembly and installation of the flowmeter.

The supply power is turned off.

- Check the grounds.
- Check the connections against the Interconnection Diagram.
- Check that the supply power is in accord with the specifications on the Instrument Tag.
- The supply power connections are made in the left plug!

Turn on the supply power!

- In order to prepare the system for operation only a few parameter selections or entries must be made. Enter the desired flow range for Qmax with the appropriate direct reading engineering units. Hydraulically ideal flow range end values are between approx. 2-3 m/s. In the submenu "Current output" select the required current output range. For the pulse output, the pulse factor (pulses per unit) should be selected.
- The system zero adjustment should be made (see Section 12.2).

12.2 System Zero Check/Adjustment

The system zero for the installation is to be set in the converter. The flowrate in the flowmeter primary must be at an absolute stand still. The meter tube of the flowmeter primary must be completely filled with fluid. The parameter "System zero" can be used to perform a manual or automatic adjustment: select the parameter with ENTER and with the arrow keys select the adjustment mode, automatic or manual. Initiate the adjustment in the automatic mode with ENTER. During the automatic adjustment the converter counts from 255 down to the actual zero value in the second line of the display, after which the system zero adjustment is completed. The adjustment takes approx.20 seconds.

12.3 Maintenance / Repair

The flowmeter primary is essentially maintenance free. An annually check 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 should be conducted.

All repairs or maintenance tasks should be performed only by qualified user service personnel.

Observe the note (Hazardous Material Regulations) when the flowmeter is to be returned to the ABB Automation Products factory for repair!



Warning / Information for Opening the Housing

The following information must be considered when the converter housing is to be opened:

- All connections must be potential free.
- When the housing is opened the EMC-Protection is voided.

12.4 Rotating the Display

The display is mounted on the inside of the cover. The orientation of the display can be changed by repositioning the cover.

When completed, carefully reinstall the cover screws. Check that the gaskets are correctly seated. Only then will Protection Class IP 67 be maintained.



Warning / General Information

In the event that the forward and reverse flow indicators in the display do not agree with the actual flow direction through the flowmeter, the parameter "Flow direction" can be used to reverse the direction indicators by switching from "normal" to "inverse".

12.5 Replaceable Parts, Flowmeter Primary

If repairs to the liner, electrodes or magnet coils are required, the flowmeter primary should be returned to the ABB Automation Products factory in Göttingen, Germany. Observe the Hazardous Material Regulations information.

13 Converter Specifications

Optocoupler for

a) Pulse Output passive

(optocoupler specifications:)

$16\text{ V} \leq U_{CEH} \leq 30\text{ V}$; $0\text{ V} \leq U_{CEL} \leq 2\text{ V}$;

$0\text{ mA} \leq I_{CEH} \leq 0.2\text{ mA}$; $2\text{ mA} \leq I_{CEL} \leq 220\text{ mA}$

$f_{max} = 20\text{ pulses/sec}$;

pulse width min. 20 ms; max. 2550 ms

or

b) Contact Output passive

The function assigned to the output is selectable: forward/reverse flow direction signal, min./ max. contact, system alarm. For optocoupler specifications: see pulse output

The function assigned to the optocoupler output can be selected at the site in the software: min./max. alarm etc. The optocoupler output can be assigned to the function "Pulse Output" or the function "Contact Output".

Current Output

Selectable 0/4 to 20 mA; load $\leq 600\text{ Ohm}$

Alarm Signal

The contact output (optocoupler) can be configured as a system alarm. For optocoupler specifications: see pulse output

Load

Max. load for the current output: $\leq 600\text{ Ohm}$

Low Flow Cutoff

The low flow cutoff value can be set by the user.

Factory default setting: 1%

Reproducibility

$\leq 0.2\%$ of rate

Response Time

For a step change 0-99 % (corresp. $5\tau \geq 5\text{ s}$)

Excitation frequency : 6 1/4 Hz

Ambient Conditions

Ambient Temperature

-25 °C to 50 °C

Protection Class

IP 65 (per EN 60529)

Electromagnetic Compatibility

The instrument corresponds to the NAMUR-Recommendations NE21. Electromagnetic Compatibility of Equipment in Processes and Laboratories 5/93 and EMC Guideline 89/336/EWG (EN50081-1, EN 50082-2).



Warning

The EMC-Protection is voided when the housing cover is opened.

Conductivity

Min. 20 $\mu\text{S/cm}$



Rights to make technical revisions reserved.

This document is copyrighted. Translating, copying or distributing it in any form –as well as revisions or excerpts – and specifically including reprints, photomechanical or electronic reproductions or storage in data processing systems or data networks is strictly prohibited without the express permission from the owner of the copyright and any violations will be prosecuted.



ABB Automation Products GmbH
Dransfelder Str. 2, D-37079 Goettingen
Tel.: +49 (0) 5 51 9 05 - 0
Fax: +49 (0) 5 51 9 05 - 777
<http://www.abb.com>

Printed in the Fed. R. of Germany
D184B118U02 Rev. 01
Edition 11.01