

- **Coriolis Mass Flowmeters are used for the measurement of the mass flow and density to the highest accuracy. The fluid need not be electrically conductive.**
- **No moving parts, no wear, no maintenance**
- **Ex-Design TÜV 99 ATEX 1443X [Europe]**
 - II 2G EEx emd [ib] IIC T6: (\leq DN 40 [1-1/2"])
 - II 1/2G EEx emd [ib] IIC T6: (DN 50 [2"] – DN150 [4"])
 - II 2 D T115 °C ... T_{Medium} IP67
- **Ex-Design FM [USA]**
 - Class I, Div. 1
 - Class I, Zone 1
 - Class I, Div. 2
 - Class I, Zone 2
- **Converter with DSP-Technology**
 - the latest digital filter technology assures detection of even the weakest sensor signals
- **Operate using a Magnet Stick without opening the housing**
- **Simultaneous measurement of the mass flowrate, density and temperature**
- **Type-tested according NAMUR**
- **Option**
 - Expanded density calibration with temperature compensation
 - Housing as secondary containment
 - EHEDG-Certified



**4-Wire Compact Design
Digital-Signal-Processor
Converter Technology**

ABB

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General

The FCM2000 is the economical and uncomplicated ABB Mass Flowmeter with the new DSP-converter mounted integral or remote from the flowmeter primary. The compact design reduces the installation and cabling expenses. The flowrate information can be viewed directly at the meter site and the meter can be installed in your system in a more space efficient manner.

The FCM2000 operates according to the Coriolis Principle. The design offers the following features:

- Space saving, rugged design.
- Wide flow range; meter size „S“ (DN 1,5 [1/16"]) to meter size „L“ (DN 150 [6"]).
- Variety process connection options.
- Two separate current outputs for flowrate and density as well as a pulse output.
- Contact in- and outputs.
- HART-Protokoll, PROFIBUS PA, FOUNDATION Fieldbus.
- Ex-Approval: The Ignition Protection Type of the output circuits can be user selected as „i“ or „e“ and is determined by the Ignition Protection Type of the circuits connected. The Ignition Protection Type can be changed after the installation has been completed. The contact outputs can be configured as NAMUR-Outputs by the user.
- Allowable fluid temperatures up to 180 °C, CIP-capable
- Lighted, 2-line display with data entry using a Magnet Stick without opening the housing.
- Certified per EHEDG

Mass Converter with Digital Signal Processor (DSP)

The converter for the FCM2000 incorporates a digital signal processor (DSP) with which it is possible to measure the mass flow and density values to the highest precision. The Coriolis sensor signals are immediately converted into digital information without any intermediate analog steps.

Excellent long term stability and reliability together with fast signal processing are achieved with the new DSP-Converter.

Self diagnostic functions for the flowmeter primary and the converter coupled with absolute zero stability are the essential advantages, which are necessary, if reliance on the measurements is to be assured.

The FCM2000 converter provides advantages to the user, especially

- when mass flowrate is to be metered to the highest accuracy.
- when the fluid density must be determined.
- when the components of a recipe are to be mixed together.
- when metering non-conductive or highly viscous fluids or solids loaded liquids.
- in batch filling systems.

Operating Principle

When a mass flows through a vibrating pipe, Coriolis forces are generated which bend and twist the pipe. These very small pipe deformations are measured by optimally mounted sensors and electronically evaluated. Because the measured phase shift of the sensor signals is proportional to the mass flowrate, the Coriolis Mass Flowmeter measures the mass flowrate in the flowmeter directly. The metering principle is independent of the density, temperature, viscosity, pressure and conductivity of the fluid.

The meter tubes always vibrate at resonance. This resonant frequency, at the operating conditions, is a function of the meter tube geometry, the characteristics of the flowmeter materials and the mass of the fluid in the meter tube, which is also vibrating. It provides an accurate measure of the density of the fluid being metered. Summarizing, it is possible to simultaneously measure the mass flowrate, fluid density and temperature with the Coriolis Mass Flowmeter.

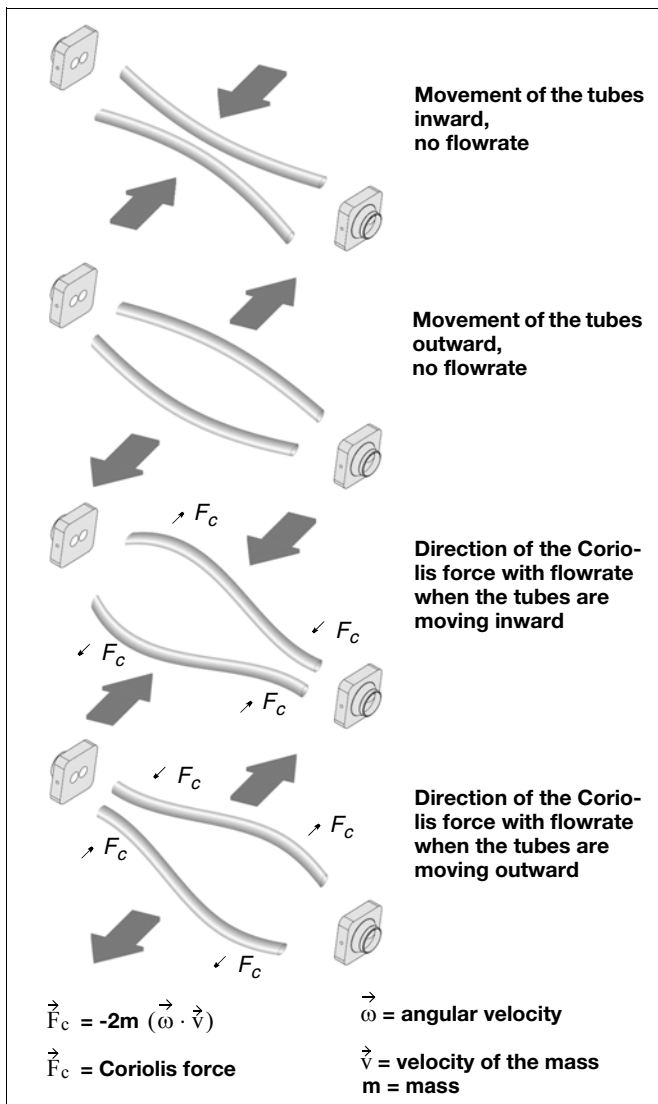


Fig. 1: Simplified Representation of the Coriolis Forces

System Design

The flowmeter primary consists of two one piece, formed meter tubes arranged in parallel through which the fluid flows. A twist and bend resistant mounting structure, which connects the in- and outlet of the flowmeter, is especially designed to isolate the meter tube from external forces and moments.

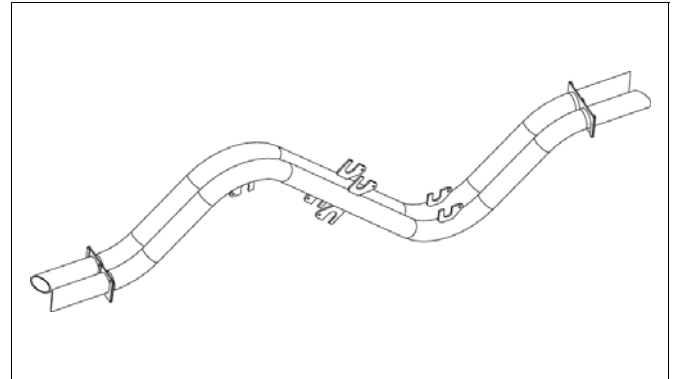


Fig. 2: FCM2000 Parallel Meter Tube Design

The meter tubes are welded at their in- and outlet ends to flow splitters. Therefore there is no direct coupling to the process connections. This approach appreciably minimizes the effects of external vibrations on the measurements.

Long life is assured by elimination of weld seams in the highly stressed areas and by hard silver soldering, under vacuum, the mounts for the meter tube, drivers and sensors. Exceptional long term stability is assured by vacuum stress relieving the meter tubes.

Easy installation, wide flow ranges and a variety of process connections and last, but not least, the quick amortization of the costs make the FCM2000 an instrument which can be optimally applied in production processes.

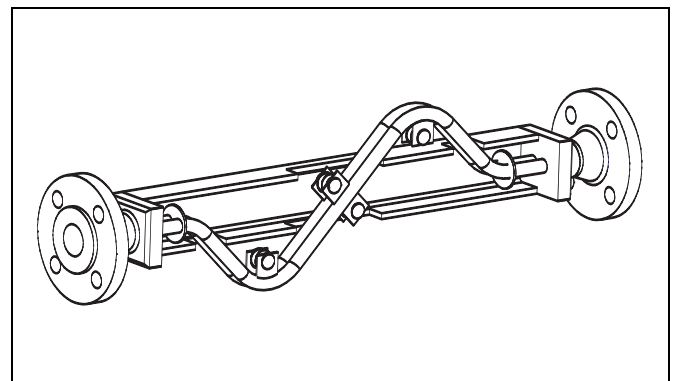


Fig. 3: Double Tube Flowmeter Primary FCM2000

Assembly and Installation Flowmeter Primary

Inspection

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

Installation Requirements/System Design Information

The FCM2000 is suitable for both in- and outdoor installations. The standard instrument meets the requirements of Protection Class IP 67. The primary is bidirectional and can be installed in any orientation. It is important to assure that the meter tubes are always completely filled with fluid.

The corrosion resistance of the fluid wetted materials must be evaluated.

The following points are to be considered during installation:

The preferred flow direction is indicated by the arrow on the flowmeter primary. Flow in this direction will be indicated as positive (a forward/reverse flow calibration is available as an option).

Installation Orientation

- The FCM2000 operates in all orientations. The optimal installation orientation is vertical with the flow upwards.

Supports

- In order to support the weight of the flowmeter primary and to assure reliable measurements when adverse external effects exist (e.g. vibrations), the primary should be installed in rigid pipelines. Two supports or hangers should be installed symmetrically and stress free in close proximity to the in- and outlet process connections.

Shut Off Devices

- To conduct a system zero adjustment, shut off devices are required in the pipeline.
 - in horizontal installations at the outlet
 - in vertical installations at the inlet
- When possible, shut off devices should be installed both up- and downstream of the flowmeter primary.

Inlet Straight Sections

- The mass flowmeter does not require any flow conditioning inlet straight sections. Care should be exercised to assure that any valves, gates, sight glasses etc. do not cavitate and are not set into vibration by the flowmeter primary.

System Design Information

- The presence of gas bubbles in the fluid can result in erroneous measurements, particularly in the density measurement. Therefore the flowmeter primary should not be installed at the highest point in the system. Advantageous are installations in low pipeline sections, e.g. at the bottom of a U-section in the pipeline (invert).
- Long drop lines downstream from the flowmeter primary should be avoided to prevent the meter tube from draining.
- **The pipelines should be connected in a stress free manner.**
- The flowmeter primary should not come in contact with any other objects. Attachments to the housing are not permissible.
- When the cross-section of the connecting pipeline is larger than the flowmeter primary size, suitable standard reducers can be installed.
- If strong vibrations exist in the pipeline they should be damped using elastic pipeline elements. The damping devices must be installed beyond the supported flowmeter section and outside of the section between the shut off devices. The direct connection of flexible elements to the flowmeter primary should be avoided.
- Care should be exercised to assure that any dissolved gases, which may be present in many liquids, do not outgas. The back pressure at the outlet should be at least 0.2 bar.
- Assure that operation below the vapor pressure cannot occur when a vacuum exists in the meter tube.
- The flowmeter primary should not be installed in the vicinity of strong electromagnetic fields, e.g. near motors, pumps, transformers etc.
- When operating more than one meter in one or multiple interconnected pipelines, the meter primaries should be spaced distant from each other or the pipelines should be decoupled to prevent cross talk.
- Request special installation requirements for meter size „L“.

Zero Adjustment

- In order to adjust the zero under operating conditions it must be possible to reduce the flowrate „ZERO“ while the meter tube remains completely filled. A bypass line is optimal when the process cannot be shut down. It is important for accurate measurements that during the zero adjustment there are no gas bubbles in the flowmeter primary. It is also important that the pressure and temperature in the meter tube be the same as those which exists during operation.

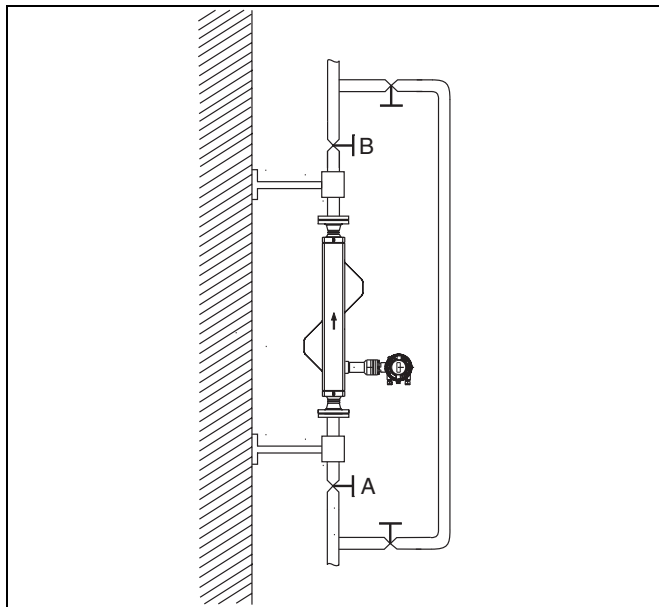


Fig. 4: Zero Adjustment with a By-Pass Line

Installation Instructions MC2 Flowmeter primary

Vertical Installations

The optimal installation orientation is a vertical installation with an upward flow as shown in the following figure. This has the advantage that any solids contained in the fluid will settle downward and any gas bubbles will move upward out of the meter tube when the flowrate is zero. Additionally, it is easy to drain the meter tube. Deposits can thereby be avoided.

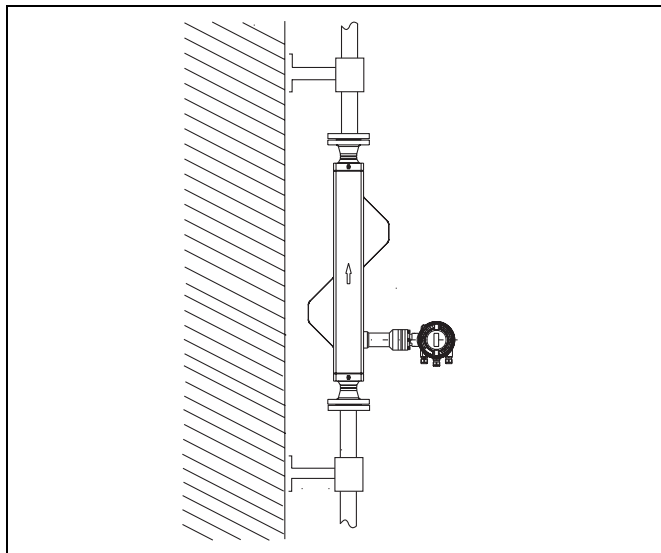


Fig. 5: Vertical Installation, Self-Draining (upward flow)

Horizontal Installations

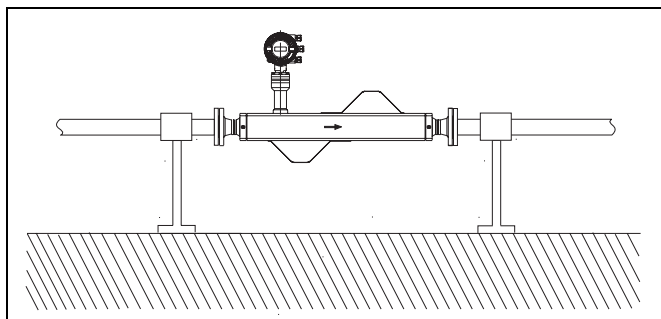


Fig. 6: Horizontal Installation

Horizontal Installation, Self Draining

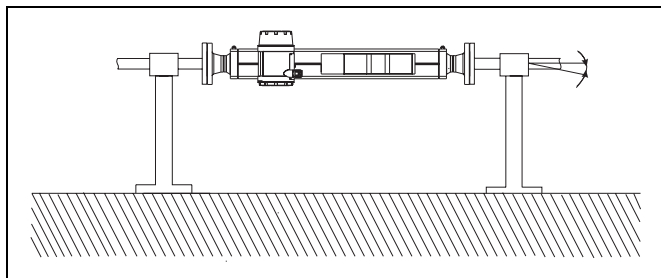


Fig. 7: Horizontal Installation, Self Draining, α 2 – 4°

Installation in a Drop Line

The installation recommendation shown in the following figure is only possible if a pipeline reduction or orifice with a smaller cross-section can be installed to prevent the flowmeter primary from partially draining during the measurements.

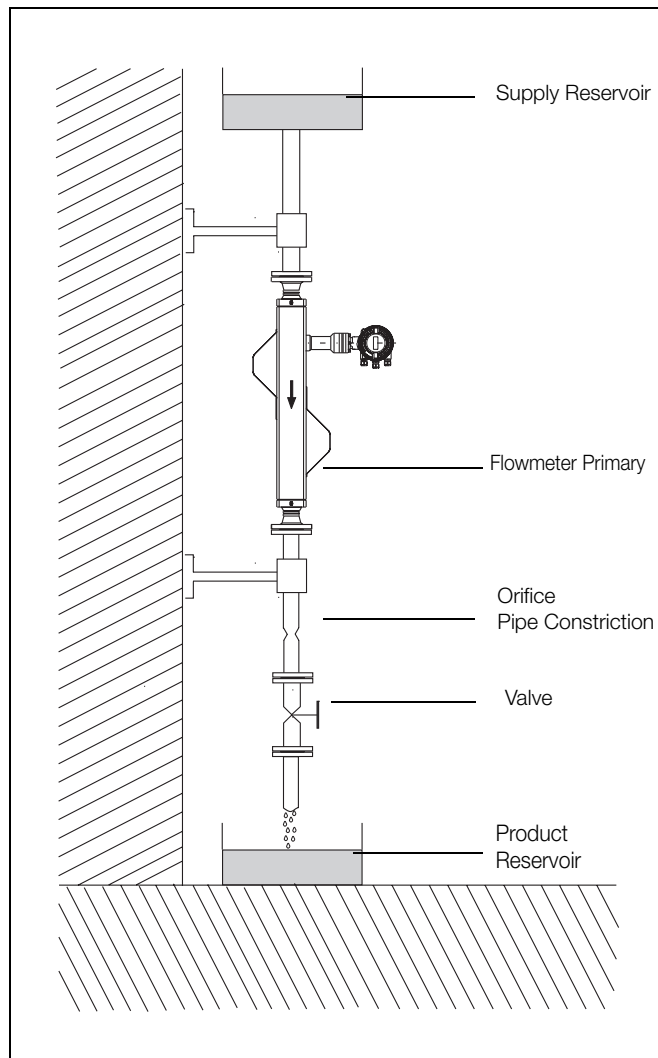


Fig. 8: Installation in a Drop Line

Difficult Installation Locations

The accumulation of air or gas bubbles in the meter tube can lead to increased inaccuracies. Some difficult installations are shown in the following figure.

Installations at the highest point in the pipeline (Figure A) can result in the formation of air pockets which can lead to appreciable inaccuracies.

Another difficult installation condition is immediately upstream of a free discharge (Figure B) in a drop line.

Information:

Check that the coordination between the flowmeter primary and the converter is correct. The instruments which belong together have the same end characters on the Instrument Tag, e.g., X001 with Y001 or X002 with Y002.

Pressure Drop

The pressure drop through the instrument is a function of the properties of the fluid and the flowrate. The Selection Program CD-CALC can be used to calculate the pressure drop.

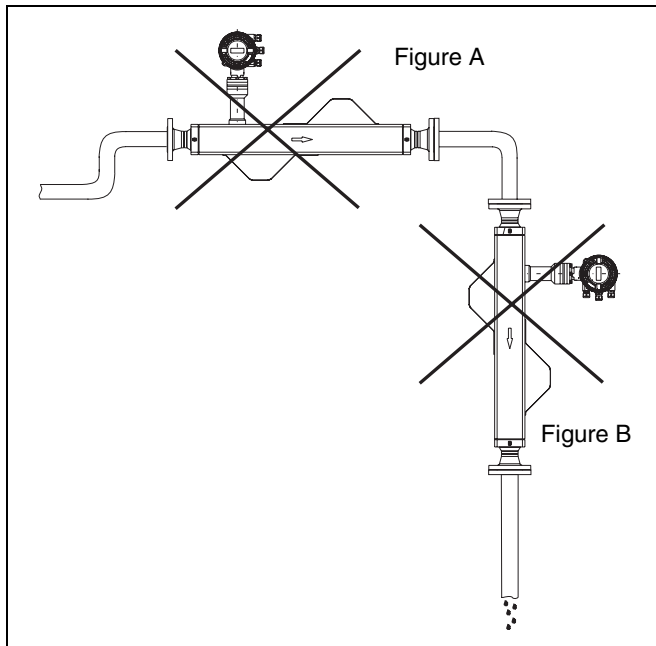
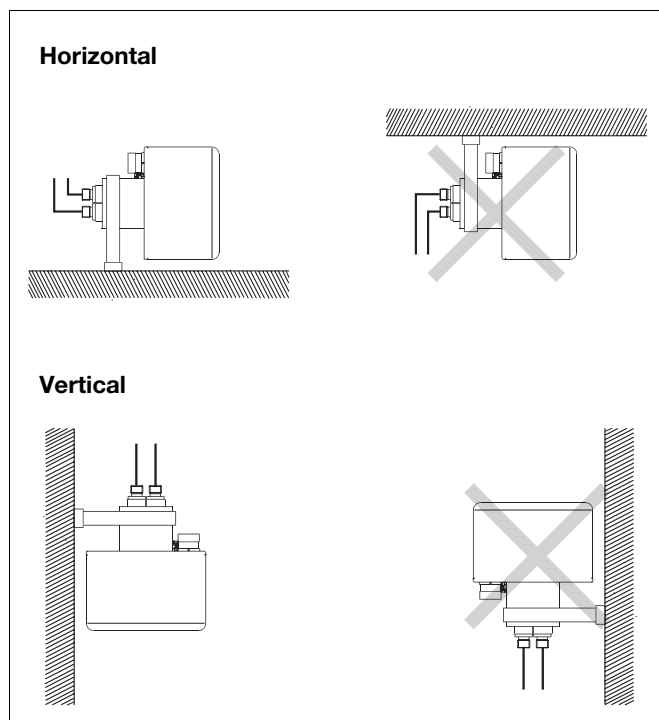


Fig. 9: Difficult Installation Conditions

MS2 Flowmeter primary

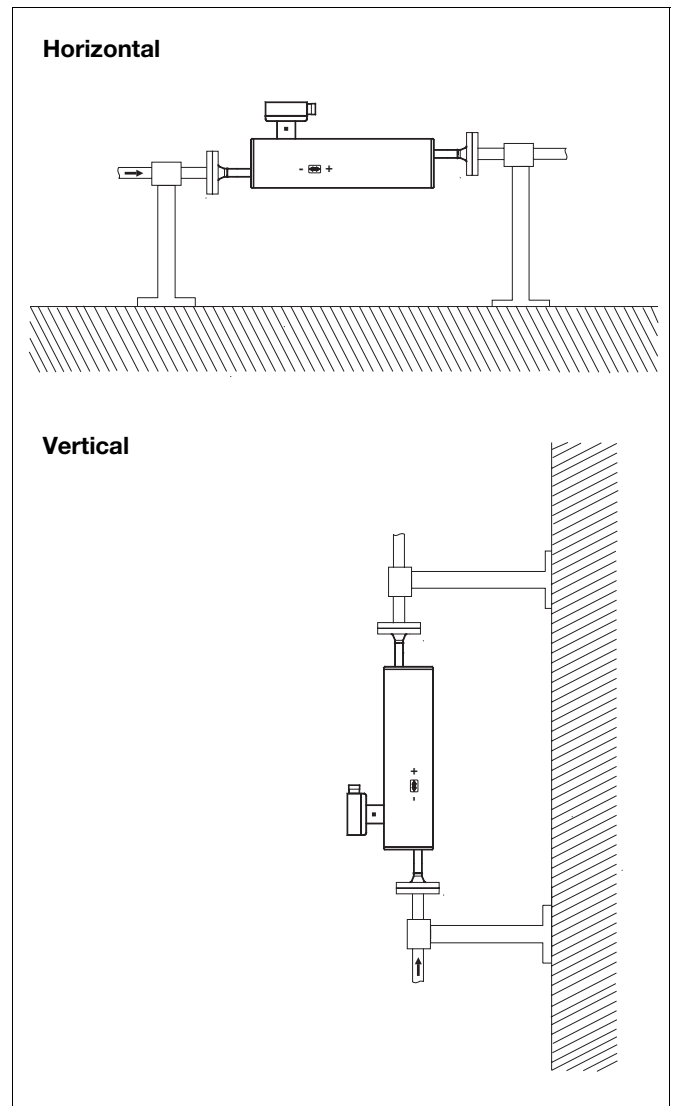
Flowmeter primary MS2 DN1.5 installation

- Horizontal installation is recommended. If vertical installation is required, a flow direction from below to above is recommended for better elimination of air bubbles. In order for air to be removed from the flowmeter primary, the flow speed in the flowmeter primary must be at least 1 m/s. If the fluid contains solid particles, especially in conjunction with too little flow, a level installation location of the flowmeter primary and positioning of the input flange completely on top is recommended so that the particles can be more easily flushed out. In order to avoid a partial emptying of the flowmeter primary, a sufficient back pressure must be present at the unit (min. 0.1... 0.2 bar / 1.45 ... 2.9 psi).
- Install the flowmeter primary in a vibration-free way to a wall or a steel frame.
- Position the flowmeter primary at a low location in the system in order to avoid a negative pressure in the flowmeter primary, that could lead to air or gas separation in the fluid.
- Ensure that the flowmeter primary is not run empty (in the normal operation) as this can lead to inaccurate measurements.



Flowmeter primary MS2 DN3/DN6 installation

For light flow, a horizontal installation location is recommended since air bubbles are easier to remove in this position. If the fluid is non-permanent or contains solid particles, a vertical installation is not recommended.



Specifications: Flowmeter primary FCM2000-MC2



Fig. 10: Flowmeter Primary FCM2000-MC2

Meter Sizes

„E“ (DN 20 [3/4"]); „F“ (DN 25 [1"]); „G“ (DN 40 [1-1/2"]); „H“ (DN 50 [2"]); „I“ (DN 65 [2-1/2"]); „J“ (DN 80 [3"]); „K“ (DN 100 [4"]); „L“ (DN 150 [6"])

Flow Ranges

Meter Size		Max. Flow Range [Q _{max}]		
DN	Inch	[kg/min]		[lbs./min]
„E“	20	3/4	0 to 100	0 to 220
„F“	25	1	0 to 160	0 to 352
„G“	40	1-1/2	0 to 475	0 to 1045
„H“	50	2	0 to 920	0 to 2024
„I“	65	2-1/2	0 to 1890	0 to 4158
„J“	80	3	0 to 2460	0 to 5412
„K“	100	4	0 to 4160	0 to 9152
„L“	150	6	0 to 11000	0 to 24200

Enclosure classification: IP65/IP67, NEMA 4X

Accuracy, Flowrate > DN 20 (sizes „F“, „G“, „H“, „I“, „J“, „K“)

± 0.4 % of rate ± 0.02 % of Q_{max}
 ± 0.25 % of rate ± 0.02 % of Q_{max}
 ± 0.15 % of rate ± 0.01 % of Q_{max}
 (Accuracy of measured value + zero deviation)

Accuracy, Flowrate DN 20 (size „E“)

± 0.4 % of rate ± 0.01 % of Q_{max}
 ± 0.25 % of rate ± 0.01 % of Q_{max}
 ± 0.15 % of rate ± 0.005 % of Q_{max}
 (Accuracy of measured value + zero deviation)

Accuracy, Flowrate DN 150 (size „L“)

± 0,4% of rate ± 0,05% v. Q_{max}
 ± 0,25% of rate ± 0,05% v. Q_{max}
 ± 0,15% of rate ± 0,05% v. Q_{max}

Influence of medium temperature

± 0,004 % of Q_{max}/1K

Reproducibility, Flowrate

0.1 % of rate for nom. deviation ± 0.15 %
 0.15 % of rate for nom. deviation ± 0.25 % and 0.4 %

Measurement Range, Density

0.5 kg/dm³ to 3.5 kg/dm³

Accuracy, Density

Standard calibration ± 5 g/l
 Expanded density calibration ± 1 g/l
 With separated technique to signal cable is included in calibration and may neither be shortened nor extended after-wards!

Reproducibility, Density

± 0.1 g/l

Accuracy, Temperature

-50 °C to +180 °C < 1.0 °C

Reference Conditions

Calibration medium

Water 20 °C, (+ 10 K/- 5 K)
 Pressure 0.5 ... 6 bar

Ambient Temperature

20 °C, (+ 10 K/- 5 K)

Power Supply

Nominal voltage per name plate U_N ± 1 %

Warm-up Time

30 Min.

Installation according to this specifications

no visible gas phase
 no external mechanic or hydraulic interferences,
 specifically cavitation

Output at calibration

Pulse output

Analog output effects

Same as pulse output ± 0.1 % of rate

Materials

Flowmeter Primary

Fluid wetted parts
 Stainless steel 1.4571 / 316 Ti
 1.4435 / 316L
 Hastelloy C4/2.4610
 EHEDG Certified for flowmeter primary made of 1.4435 / 316L
 Option: fluid wetted parts acc. to NACE MR0175 (ISO15156)
 Housing
 Stainless steel 1.4301

Converter

Housing
 light metall casting, painted
 central part: RAL 7012
 top cover: RAL 9002
 thickness of painting: 80-120 µm

Fluid Temperature

Standard: -50 °C to 180 °C;
 Ex: -20 °C to +150 °C/180 °C for ATEX and FM
 Ex: opt. -40 °C to +150 °C/180 °C for ATEX and FM

Ambient Temperature

-25 °C to +60 °C;
 Ex: -20 °C to +60 °C for ATEX and FM
 Ex: opt. -40 °C to +60 °C for ATEX and FM

Process Connections

- Flanges DIN/ASME
- Tri-Clamp DIN 32676
 - DN 15 - DN 50: Series 3
 - DN 65 - DN 100: Series 1
- Food Industry fittings DIN 11851

The max. allowable operating pressure is a function of the process connection type, the fluid temperature, the bolts and the gaskets.

Pressure Rating

- PN 16, PN 40, PN 100 (to DN 80 [3"])
- CL 150, CL 300, CL 600 (to DN 80 [3"])

Housing as secondary containment

max. 40 bar

Pressure Equipment Directive 97/23/EG

Conformity evaluation category III, fluid group 1, gas, diagramme 6

Corrosion resistance of measuring pipe material to measuring medium has to be considered.

Material strength for process connections

Process connection	Size		PS _{max.} [bar]	TS _{max.} [°C]	TS _{min.} [°C]
	DN	Inch			
Thread acc. DIN 11851	15 - 40	1/2" - 1 1/2"	40	140	-40
	50 - 100	2" - 4"	25	140	-40
Tri-Clamp acc. DIN 32676	15 - 50	1/2" - 2"	16	120	-40
	65 - 100	2 1/2" - 4"	10	120	-40

Material Loads Curves for Flanged Flowmeters

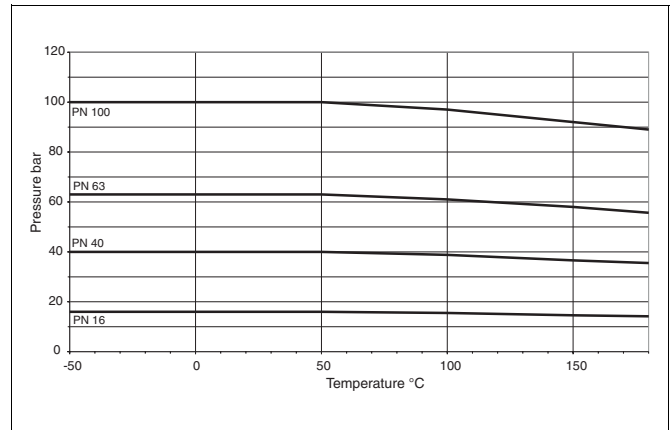


Fig. 11: DIN-Flanges SS 1.4571 [316Ti] to DN 100 [4"]

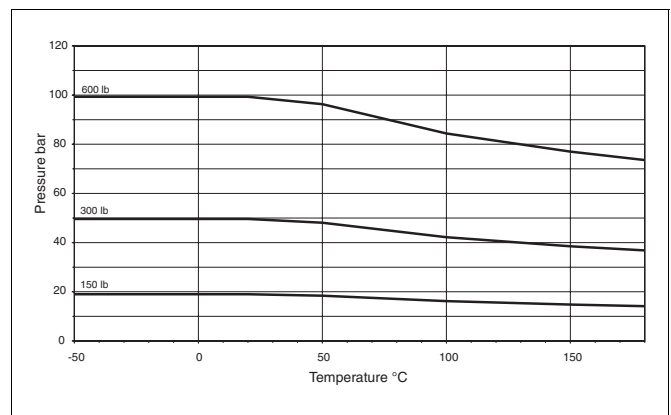


Fig. 12: ASME-Flanges SS 1.4571 [316Ti] to DN 100 [4"]

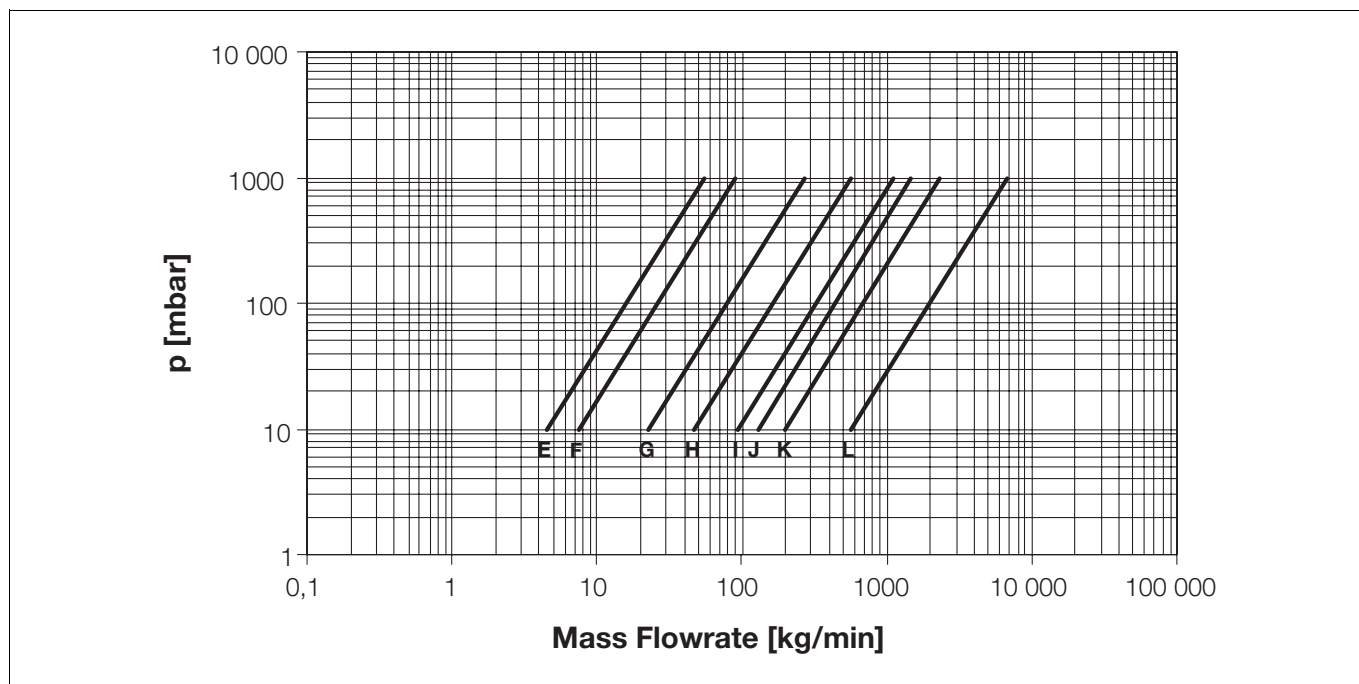


Fig. 13: Pressure Drop Curves FCM2000

Viscosity Range

Max. dyn. viscosity: ≤ 1 Pas (= 1000 mPas = 1000 cP)
for higher viscosities, please contact ABB-Sales offices.

Ex-Approval ATEX, MC26B, MC27B

EU-Type Examination Certificate:

TÜV 99 ATEX 1443 X
II 2G EEx emd [ib] IIC T6: (\leq DN 40 [1-1/2"])
II 1/2G EEx emd [ib] IIC T6: DN 50 [2"]–DN 150 [6"]
The internal volume for meter sizes „H“ DN 50 [2"] to „L“ DN 150 [6"] corresponds to Category 1 (Zone 0).
II 2D T115°C ... T_{Medium} IP67 (T_{Ambient} -20 °C ... +60 °C)

Maximum Allowable Fluid Temperatures as a Function of the Ambient Temperature, Temperature Class and the Flowmeter Size

Meter Size	DN 20 [3/4"]–DN 150 [6"]			
	Ambient Temperature	40 °C	50 °C	60 °C
Temperature Class				
T2	180 °C	–	–	
T3	165 °C	140 °C	–	
T4	100 °C	100 °C	80 °C	
T5	65 °C	65 °C	65 °C	
T6	50 °C	50 °C	50 °C	

These values also apply to insulated Mass Flowmeters.

Ex-Zulassung FM, MC26C, MC27C

Explosion Proof	XP-IS/I, II, III/1/BCDT/T* TA = *; Type NEMA 4X
Dust Ignition Proof	DIP/II, III/1 EFG/T* TA = *; Type NEMA 4X
Intrinsically Safe	IS/I, II, III/1/BCDEFG/T* TA = *; Type NEMA 4X
Non-Incendive	NI/I, II, III/2/ABCDFG/T* TA = *; Type NEMA 4X

T* see FM Temperature Class

In case of a remote installation the length of the provided cable between sensor and transmitter must be at least 5 m.

FM Temperature Class and Ambient temperature

Meter Size	DN 20 [3/4"]–DN 150 [6"]			
	Ambient Temperature	-40 °C to +40 °C	-40 °C to +50 °C	-40 °C to +60 °C
Temperature Class				
T2	180 °C	–	–	
T3	165 °C	140 °C	–	
T4	100 °C	100 °C	80 °C	
T5	65 °C	65 °C	65 °C	
T6	50 °C	50 °C	50 °C	

Ex-Approval FM, MC210, MC230

Nonincendive Class I,II, III, Division 2, Groups A, B, C, D, F, G/T6
Ta = 60 °C, NEMA 4X.

Specifications: Flowmeter Primary MS21



Fig. 14: Flowmeter Primary MS2000

Meter Sizes

„S“ (DN 1,5 [1/16“]); „T“ (DN 3 [1/8“]); „U“ (DN 6 [1/4“])

Flow Ranges

Meter Sizes	Max. Flow Range [Q _{max}]	
	[kg/h]	[lbs./min]
„S“ DN 1,5 [1/16“]	0 to 65	0 to 143
„T“ DN 3 [1/8“]	0 to 250	0 to 550
„U“ DN 6 [1/4“]	0 to 1000	0 to 2200

Enclosure classification: IP65

Accuracy, Flowrate

± 0.4 % of rate ± 0.02 % of Q_{max}
 ± 0.25 % of rate ± 0.02 % of Q_{max}
 ± 0.15 % of rate ± 0.01 % of Q_{max}
 (Accuracy of measured value + zero deviation))

Reproducibility, Flowrate

0.1 % of rate for nom. deviation ± 0.15 %
 0.15 % of rate for nom. deviation ± 0.25 % and 0.4 %

Measurement Range, Density

0.5 kg/dm³ to 3.5 kg/dm³

Accuracy, Density

Standard calibration ± 10 g/l
 Temperature range 0 to 100 °C
 Expanded density calibration upon request
 With separated technique to signal cable is included in calibration
 and may neither be shortened nor extended after-wards!

Accuracy, Temperature

-50 °C to +180 °C < 1.0 °C

Reference Conditions

Calibration medium

Water 20 °C, (+ 10 K/- 5 K)
 Pressure 0,5 ... 6 bar

Ambient Temperature

20 °C, (+ 10 K/- 5 K)

Power Supply

Nominal voltage per name plate U_N ± 1 %

Warm-up Time

30 Min.

Installation according to this specifications

no visible gas phase
 no external mechanic or hydraulic interferences,
 specifically cavitation

Output at calibration

Pulse output

Analog output effects

Same as pulse output ± 0.1 % of rate

Materials

Flowmeter Primary

Fluid wetted parts
 1.4435 / 316L
 Housing Stainless steel 1.4404

Fluid Temperature

Standard: -50 °C to 180 °C: DN 3, DN 6
 -50 °C to +125 °C: DN 1.5

Ambient temperature

-25 °C to +60 °C

Process Connections

G1/4“ ISO 228-1
 1/4“ NPT ASME B1.201
 Flanges DIN/ASME for DN 6 [1/4“]
 Food Industry fittings DIN 11851 for DN 6 [1/4“]
 The max. allowable operating pressure is a function of the process
 connection type, the fluid temperature, the bolts and the gaskets.

Pressure Rating

Flanges PN 40, CL 150,
 Thread G 1/4“, 1/4“ NPT, PN 100

Installation

For detailed installation instructions please refer to the operating
 instructions.

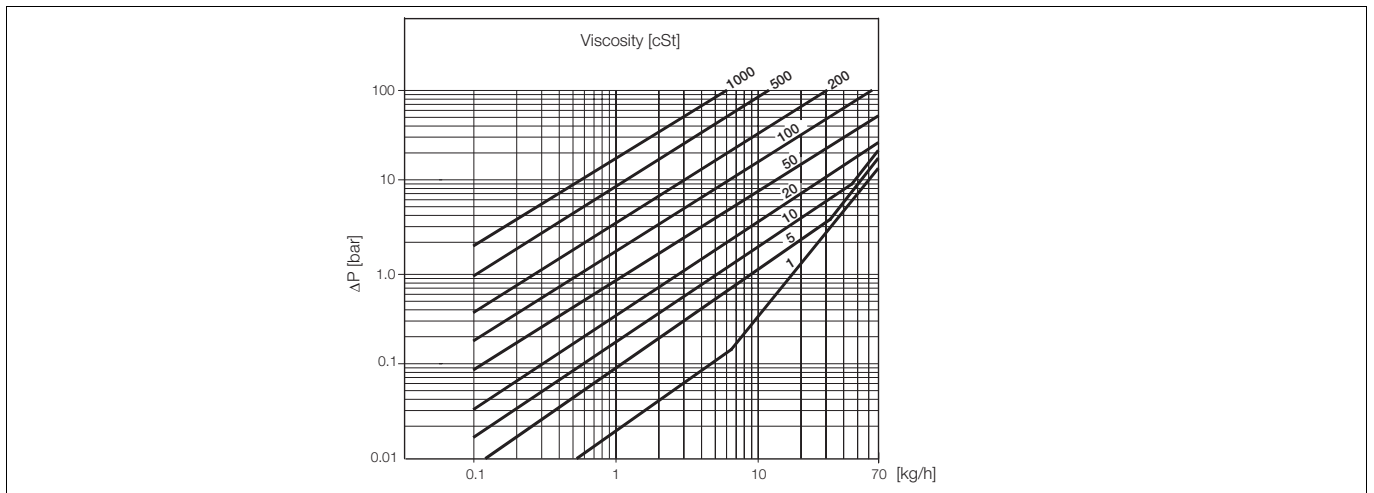


Fig. 15: Pressure Drop MS21, DN 1,5 [1/16"]

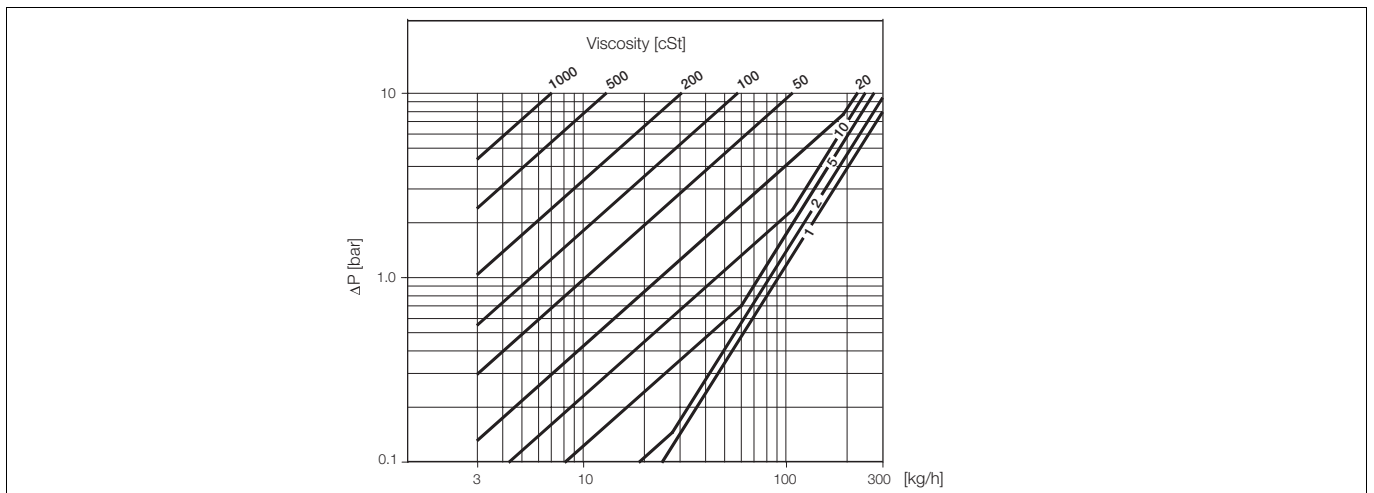


Fig. 16: Pressure Drop MS21, DN 3 [1/8"]

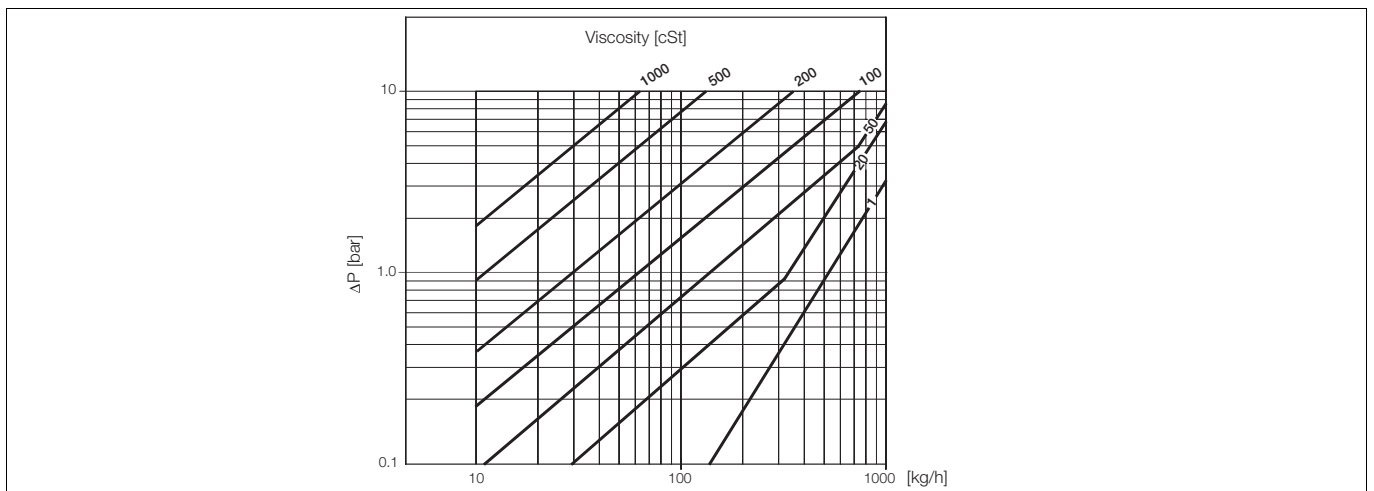


Fig. 17: Pressure Drop MS21, DN 6 [1/4"]

Specifications: Converter FCM2000-ME2



Fig. 18: Converter FCM2000 Field Mount Housing, rectangular

Flow Range

User selectable between 0.01 Q_{max} and 1 Q_{max}

Protection Class

IP65 / IP67, NEMA 4X

Electrical Connections

Cable connectors M20 x 1.5 or 1/2" NPT
Max. signal cable length for remote mounted design 50 m (for longer length upon request)

Supply Power

Power Supply Voltage 85–253 V AC, 47–63 Hz
20,4–26,4 V AC, 47–63 Hz
20,4–31,2 V DC
Ripple: 5 %

Power

$S \leq 25 \text{ VA}$

Response Time

For a 0–99 % step change (corresponds 5τ) $\geq 1 \text{ s}$

Ambient Temperature

-20 °C to 60 °C

Construction

Cast light metal field mount housing, painted
Center section: RAL 7012, dark gray
Cover: RAL 9002, light gray
Farbanstrich: 80 – 120 μm thick

Forward/Reverse Flow Metering

The flow direction is indicated in the display by a direction arrow and is signaled by an optocoupler for an external alarm.

Display

2x16-character LCD-Dot-Matrix display with LED background lighting. Both lines can be user configured for the indication of mass flowrate, volume flowrate, density or temperature. Flow totalization, 7-digit with overflow counter in mass or volume units.

Ex Approval FM, ME210

Nonincendive Class I, II, III Division 2, Groups A, B, C, D, F, G/T6
 $T_a = 60 \text{ °C}$, NEMA 4X

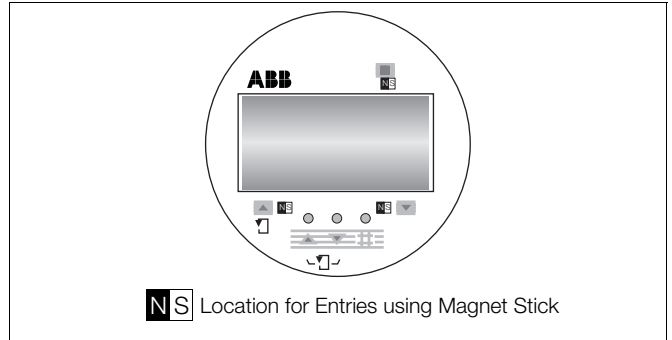


Fig. 19: Converter Keypad and Display

After the four mounting screws (1-4) have been loosened the converter can be repositioned in 4 orientations to assure optimum readability.



Fig. 20: Magnet Stick Operation

Magnetic stick operation makes it possible to configure the converter and enter data without removing the housing cover.

Setting Parameters

Data can be entered in a number of different languages using the 3 buttons on the converter. The converter housing can be rotated in each direction by approx. 180°. There are four positions into which the display can be plugged to assure optimum readability. In the multiplex mode the flowrate in %, direct reading engineering units or as a bargraph, the totalizer values forward or reverse and the TAG-No. can be alternately displayed in addition to the display selections for the 1st and 2nd lines.

Data Protection

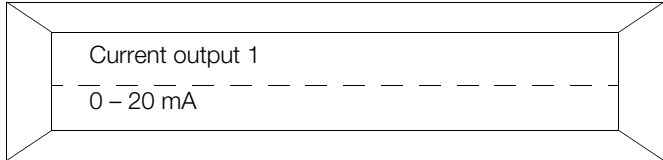
All data values are stored in an NV-RAM for 10 years without supplementary power when the instrument is turned off or during a power outage. Additional process information safeguards are provided by a serial EEPROM in the converter which incorporates data up- and download features. Hard- and Software coding according to NAMUR-recommendation NE53.

Information:

The instrument meets the NAMUR-recommendations NE21. electromagnetic compatibility of equipment of process- and laboratory technique and EMV guideline 89/336/EG (EN 50081-1, EN 50082-2) as well as low voltage guideline 73/23/EG (EN 61010-1).

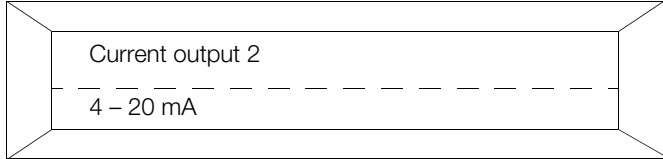


Current Output 1



Function: active
0/4–20 mA, selectable
Load: $0 \Omega \leq R_B \leq 560 \Omega$
Terminals: 31/32
Measurement uncertainty < 0.1 % of rate
For output of mass flowrate, volume flowrate, density and temperature.
Function user selectable in the software.

Current Output 2



Function: Passive
Current Output 4–20 mA
Load: $0 \Omega \leq R_B \leq 600 \Omega$
Source voltage: $12 V \leq U_s \leq 30 V$
Terminals: 33/34
Measurement uncertainty < 0.1 % of rate
For output of mass flowrate, volume flowrate, density and temperature.
Function user selectable in the software.

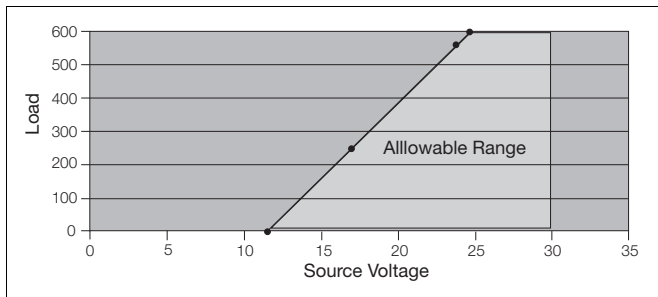
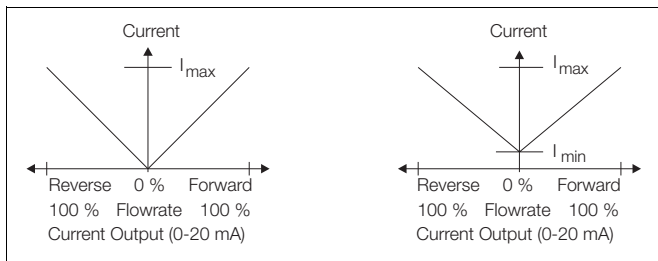
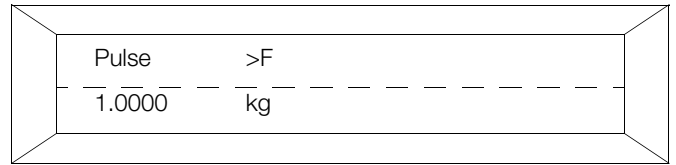


Fig. 21: Allowable Source Voltage as a Function of the Load Resistance at $I_{max} = 22 \text{ mA}$



Information:

Measurement uncertainty according to NAMUR-recommendation NE43.



Scaled Pulse Output

Scaled pulse output (max. 5 kHz) with a selectable pulse factor between 0.001 – 1000 pulses per selected engineering unit. The pulse width can be set from 0.1 to 2000 ms. The output is galvanically isolated from Current Output 1 and from Current Output 2.

Design	Passive	Active
Terminals	51, 52	51, 52
Operating voltage	$16 V \leq U_{CEH} \leq 30 V \text{ DC}$ $0 V \leq U_{CEL} \leq 2 V$	$16 V \leq U \leq 30 V \text{ DC}$ Load $\geq 150 \text{ Ohm}$ fmax = 5 kHz
Operating current	$0 \text{ mA} \leq I_{CEH} \leq 0.2 \text{ mA}$ $2 \text{ mA} \leq I_{CEL} \leq 220 \text{ mA}$	
When using a mechanical counter pulse widths $\geq 30 \text{ ms}$ and fmax $\leq 3 \text{ Hz}$ are recommended		
fmax	5 kHz	5 kHz
Pulse width	0.1 ms–2000 ms	0.1 ms–2000 ms

Contact Output

The following functions can be assigned to the contact output in the software:

- System monitor: Normally open or normally closed contact
- Forward/reverse direction indication: closed for forward direction
- Max-Min alarm: Normally open or normally closed contact

Terminals: 41, 42

“closed” $0 V \leq U_{CE_L} \leq 2 V$
 $2 \text{ mA} \leq I_{CE_L} \leq 220 \text{ mA}$
“open” $16 V \leq U_{CE_H} \leq 30 V$
 $0 \text{ mA} \leq I_{CE_H} \leq 0.2 \text{ mA}$

Contact Input

The following functions can be assigned to the contact input in the software:

- Ext. Zero Return. When the meter tube empties the output signals can be turned off.
- Ext. Totalizer Reset. The internal totalizers can be reset from an external contact.

Terminals: 81, 82

“ON” $16 V \leq U_{KL} \leq 30 V$
“OFF” $0 V \leq U_{KL} \leq 2 V$
Internal resistance: $R_i = 2k\Omega$

All signal In-/Outputs are galvanically isolated from the input circuit and each other.

For MC27 please refer to page 21.

Interconnection Examples for Peripherals, Standard

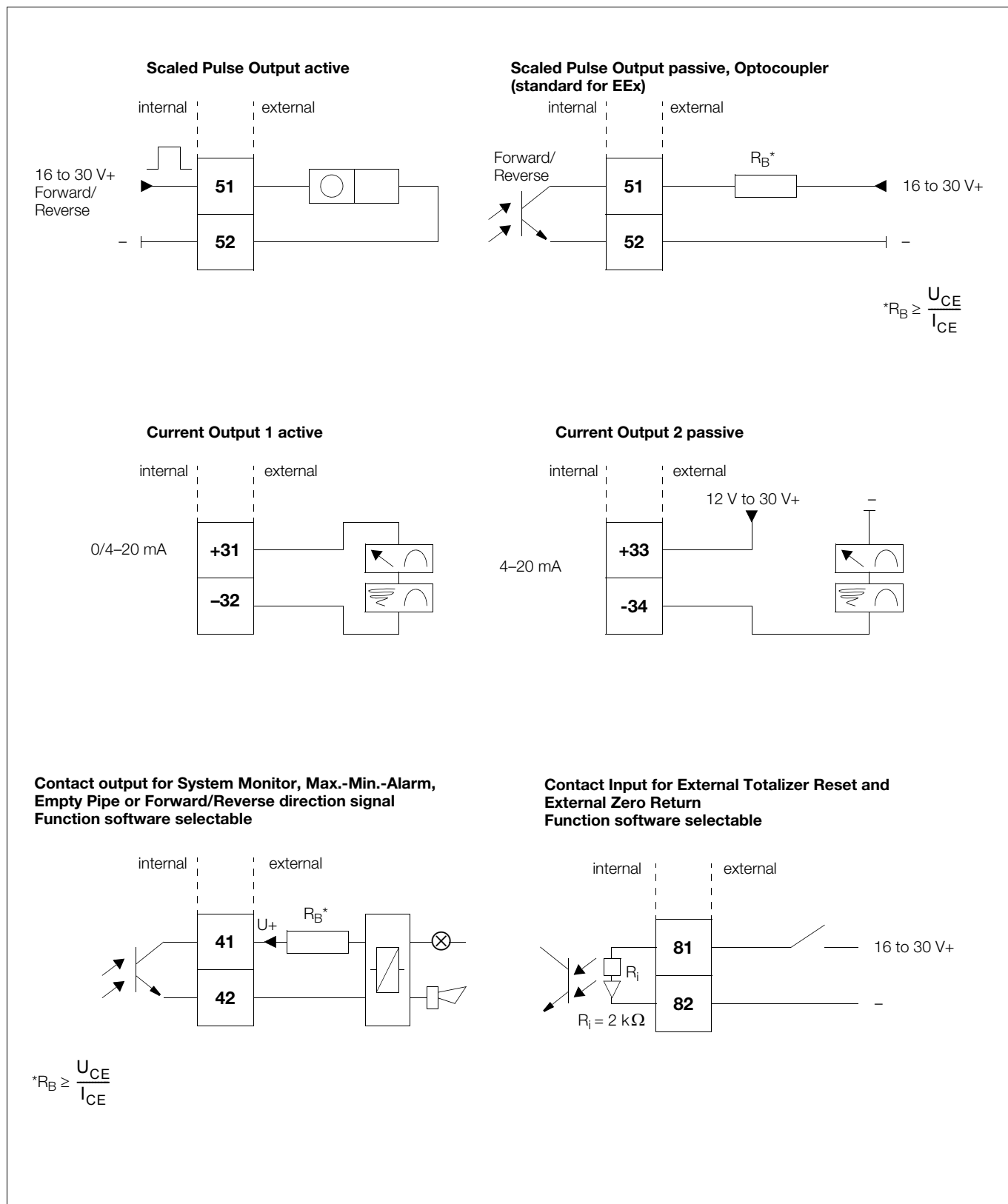


Fig. 22: Interconnections Examples for Peripherals

Technical Specifications: Converter

The converter has three alternatives for digital communication:

The HART® protocol

The HART® protocol is used for communication between a process control system, handheld terminal and the field device. The digital communication uses an ac voltage superimposed on the current output which does not affect the connected instrumentation. This design is only available with the 4-20 mA current output option. The device configuration is performed via the three buttons directly on the device or alternatively via the configuration and operation SMART VISION® software and the associated HART DTM for SMART VISION®. (Further information see below) or separate interface description part no. D184B108U07. The system is registered with the HART Communication Foundation.

HART® protocol

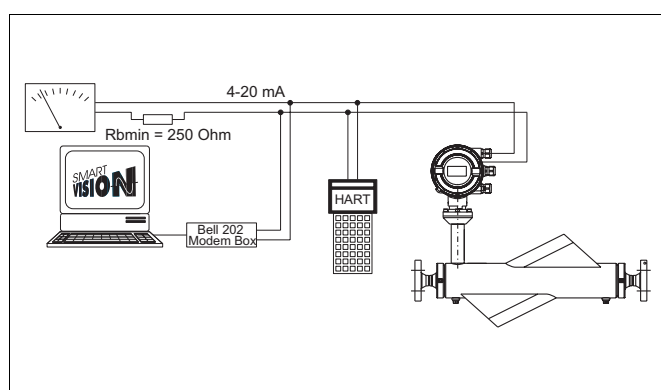


Fig. 23: Communication via HART protocol

Transmission method

FSK modulation on voltage output 4-20 mA according to Bell 202 standard.

Max. signal amplitude	1.2 mA _{SS}
Resistance voltage outputmin.	250 Ω, max. = 560 Ω
	(Ex: max. 300 Ω)
Cable	AWG 24 twisted
Max. cable length	1500 m
Baud rate	1200 Baud
Display	Log. 1: 1200 Hz
	Log. 0: 2200 Hz

The PROFIBUS PA protocol

The digital communication occurs according to IEC 61158-2. The device configuration is performed via the three buttons directly on the device or alternatively via the configuration and operation SMART VISION® software and the associated PROFIBUS PA DTM. Further information see separate PROFIBUS PA interface description part no. D184B093U35.

FOUNDATION Fieldbus FF

The digital communication occurs according to IEC 61158-2. The device configuration is performed via the three buttons directly on the device or via the system-integrated services or via the national configurator. Further information see separate interface description part no. D184B093U31.

System integration

In conjunction with the DTM (Device Type Manager) to the device, the communication (configuration, parameterization) can occur with the corresponding framework applications according to FDT 0.98 or 1.2 respectively. Other desired tool/system integrations (e.g. AMS-/ Siemens S7) are available.

SMART VISION®, the ABB communication tool for HART® including all DTMs, is also available as a free 90-day test version.

PROFIBUS PA protocol

The PROFIBUS PA FCM2000 interface conforms to the Profile 3.0 (Standard PROFIBUS, EN 50170, DIN 19245 [PRO91]). The converter transmission signal is designed according to IEC 61158-2. The manufacturer-specific PROFIBUS PA Ident-No. of the FCM2000 is: 0849 hex. The device can be operated alternatively with the PROFIBUS standard Ident-No. 9700 hex or 9742 hex. Further information see separate interface description part no. D184B093U35. Stored data is preserved in the event of a power failure.

Bus cable

A shielded, twisted cable is recommended (in accordance to IEC 61158-2, types A or B are preferred). You can find further configuration information in detail in the "PROFIBUS suggested installation" brochure from ABB. Supplemental information is also available on our homepage www.abb.de/Feldbus as well as on the PROFIBUS international organization homepage www.profibus.com.

Information on voltage/current consumption

The middle current consumption of the FCM2000 amounts to 14 mA. In the event of an error, the integrated FDE function (= Fault Disconnection Electronic) integrated in the device is ensures that the current consumption can rise to a maximum of 26 mA. The upper limit of the voltage is electronically limited. The voltage on the bus line must lie in the range of 9-32 V.

Bus topology

Tree and or line structure is possible. The bus termination must take place passively on both wire ends of the bus main wire (RC-element $R = 100 \Omega$, $C = 1 \mu F$).

FOUNDATION Fieldbus

The FOUNDATION field bus interface of the FCM2000 is compliant to the specifications FF-890/891 as well as FF-902. The transmission signal of the converter is designed according to IEC 61158-2. The device is registered with the Fieldbus FOUNDATION. The registration is recorded at the Fieldbus FOUNDATION under the manufacturer ID: 0x000320 and the Device ID 0x0018.

Bus address settings

The bus address is automatically allocated at the FF. However, it can also be manually set in the system. The device detection occurs via an explicit combination of manufacturer ID, device ID and device serial number.

Information on voltage/current consumption

The middle current consumption of the FCM2000 amounts to 14 mA. In the event of an error, the integrated FDE function (= Fault Disconnection Electronic) integrated in the device is ensures that the current consumption can rise to a maximum of 26 mA. The upper limit of the voltage is electronically limited. The voltage on the bus line must lie in the range of 9-32 V.

System integration

For integration into a process control system, a DD file (device description), which contains the device description, as well as a CFF file (common file format) are required. The CFF file is required for the segment engineering. The engineering can be undertaken online or offline.

You can find both files, as well as the interface description on the supplied CD (part no.: D699D002U01). When needed, this can be re-ordered at any time from ABB at no cost. The files needed for operation can also be downloaded at www.abb.de/durchfluss -> Coriolis Masse -> Fieldbus & HART Files.

Bus topology

Tree and or line structure is possible. The bus termination must take place passively on both wire ends of the bus main wire (RC-element $R = 100 \Omega$, $C = 1 \mu F$).

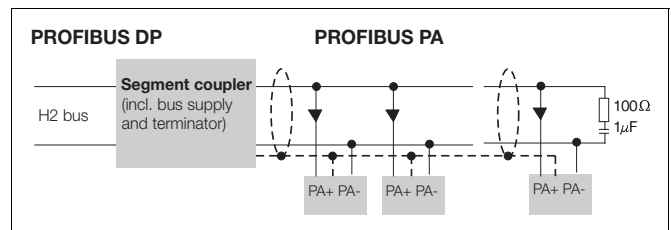


Abb. 24: Example for PROFIBUS PA interface connection

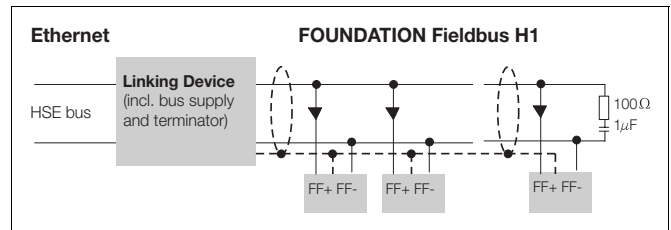


Abb. 25: Example for FOUNDATION Fieldbus interface connection

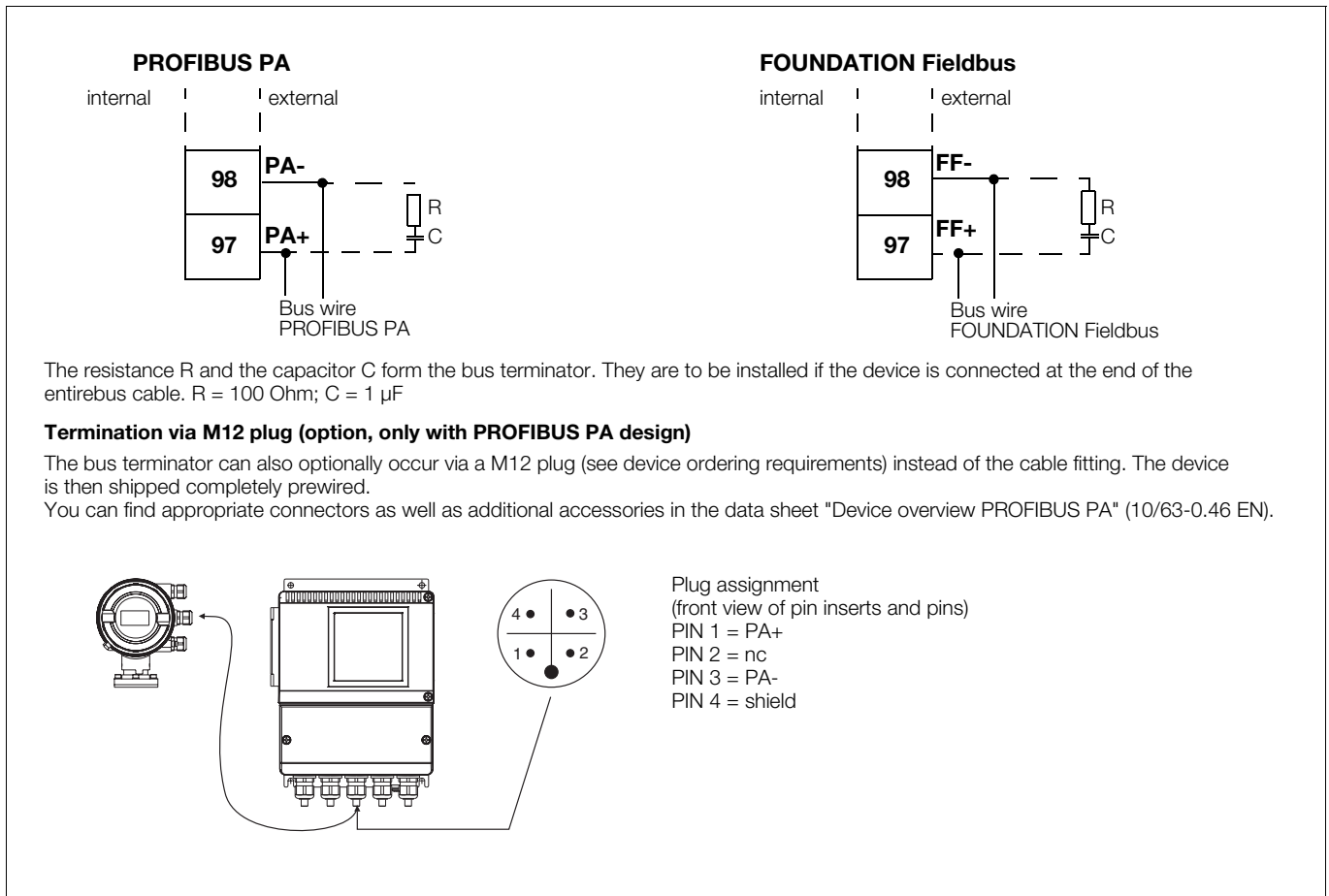


Fig. 26: Connection example for peripherals with PROFIBUS PA or FOUNDATION Fieldbus

Interconnection Diagram: Flowmeter Primary MC2/Converter ME2

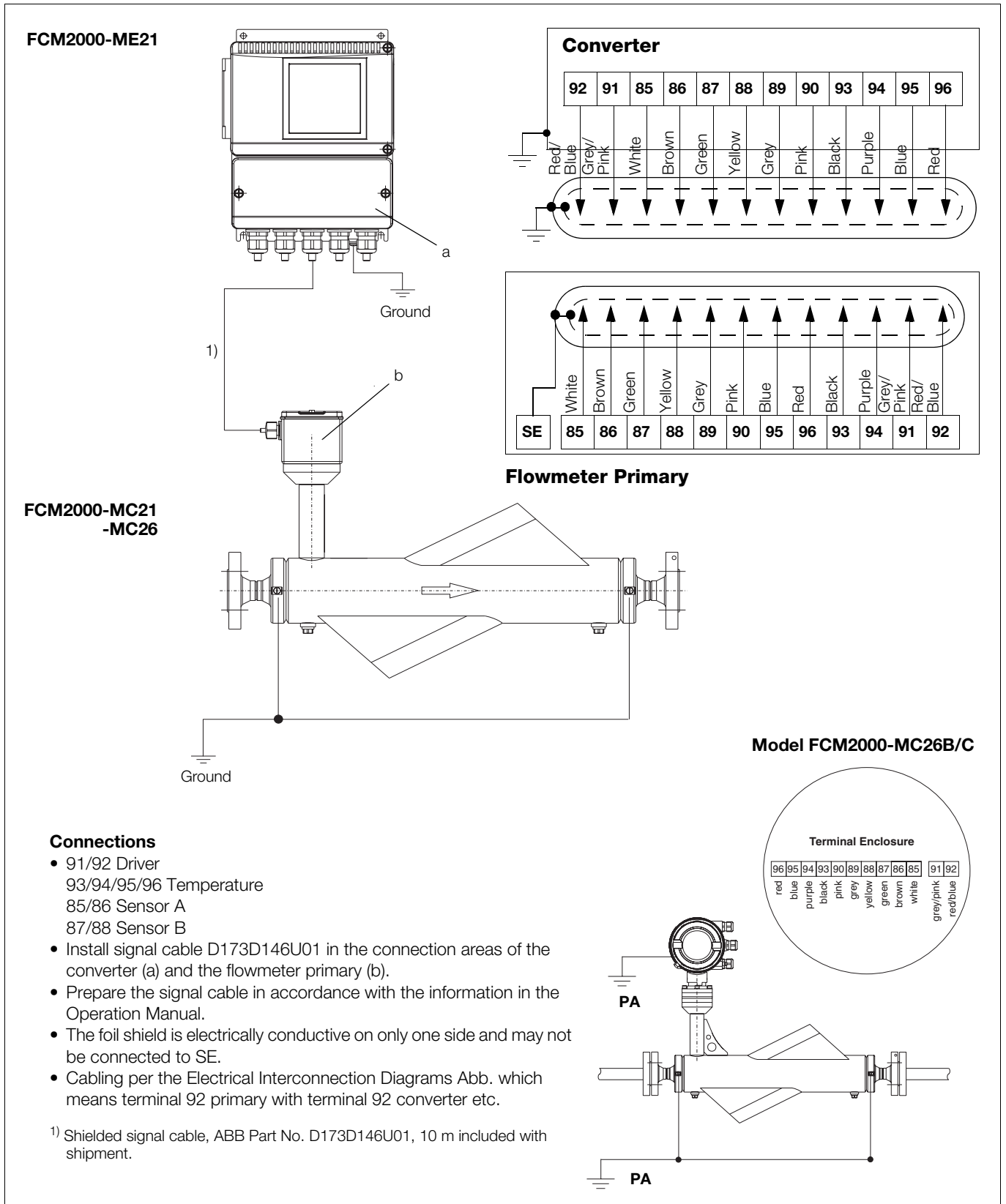


Fig. 27: Interconnection Diagram, Flowmeter Primary/Converter

Interconnection Diagram: Flowmeter Primary MS2/Converter ME2

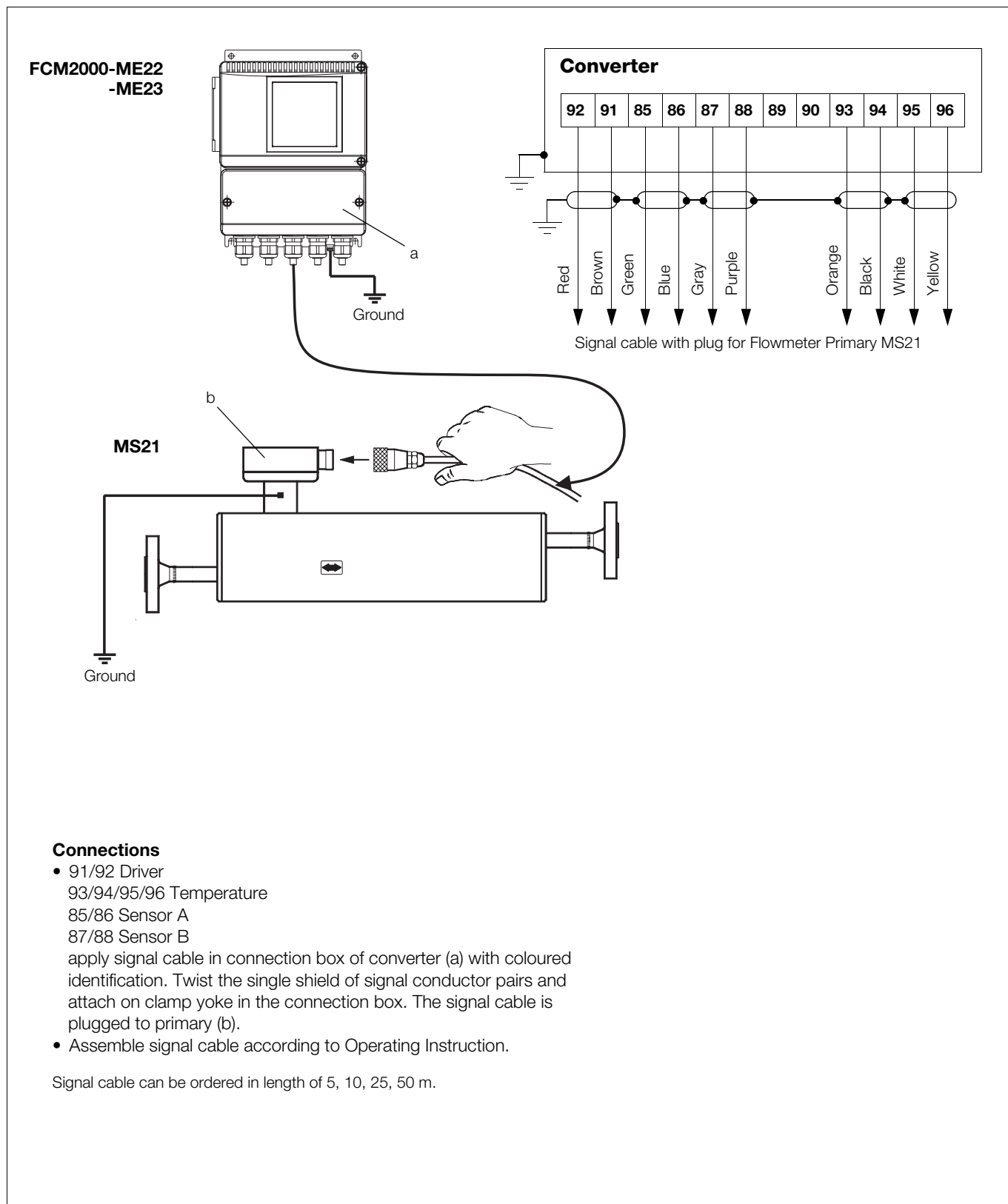


Fig. 28: Interconnection Diagram, Flowmeter Primary MS21/Converter FCM2000-ME21

Interconnection Diagram: Input and Output Signals, Supply Power MC2/ME2

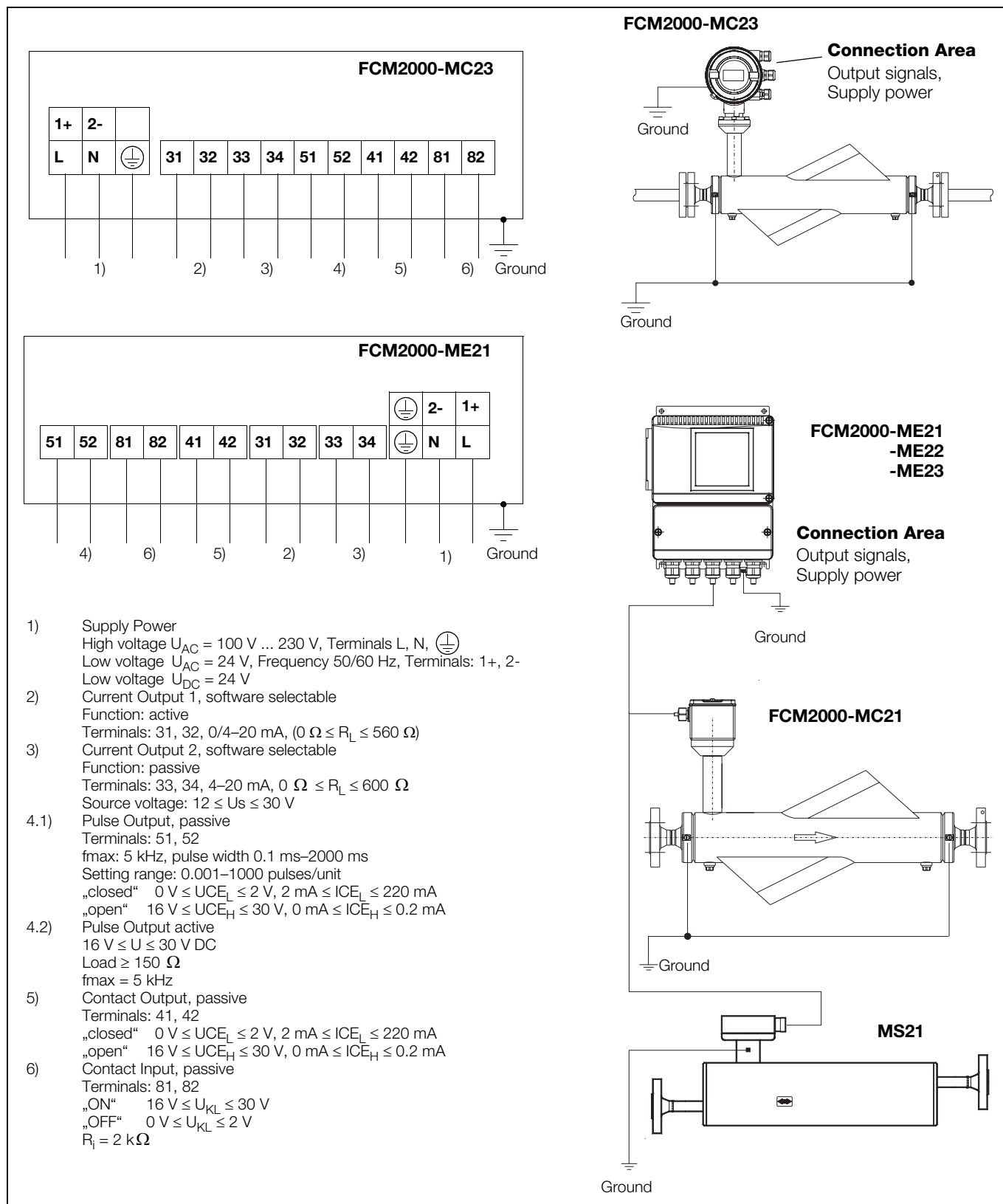


Fig. 29: Interconnection Diagram

Interconnection Diagram: PROFIBUS PA/FOUNDATION Fieldbus, Supply Power

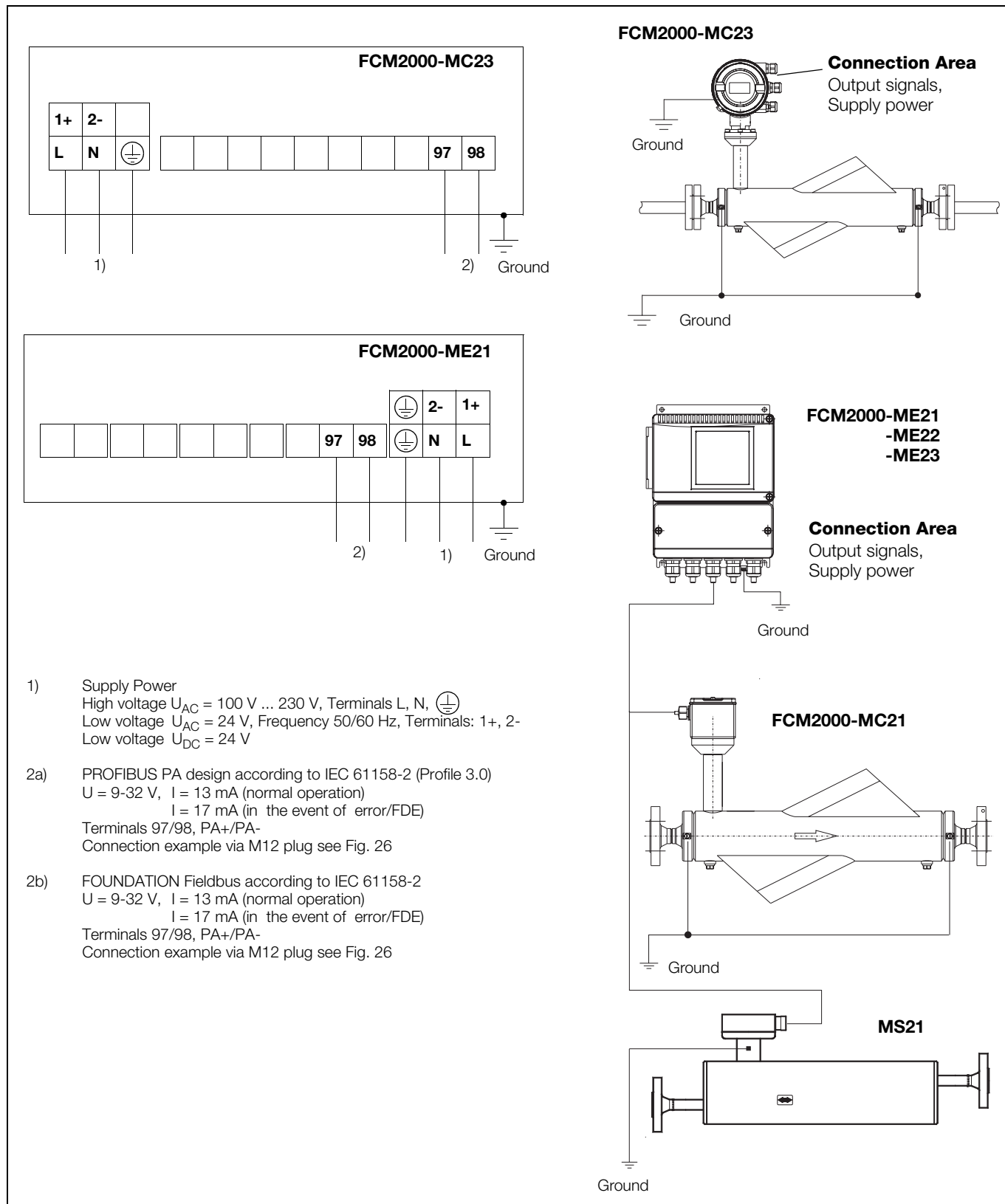


Fig. 30: Interconnection Diagram

Interconnection Diagram: Ex-Design, ATEX, FM MC2

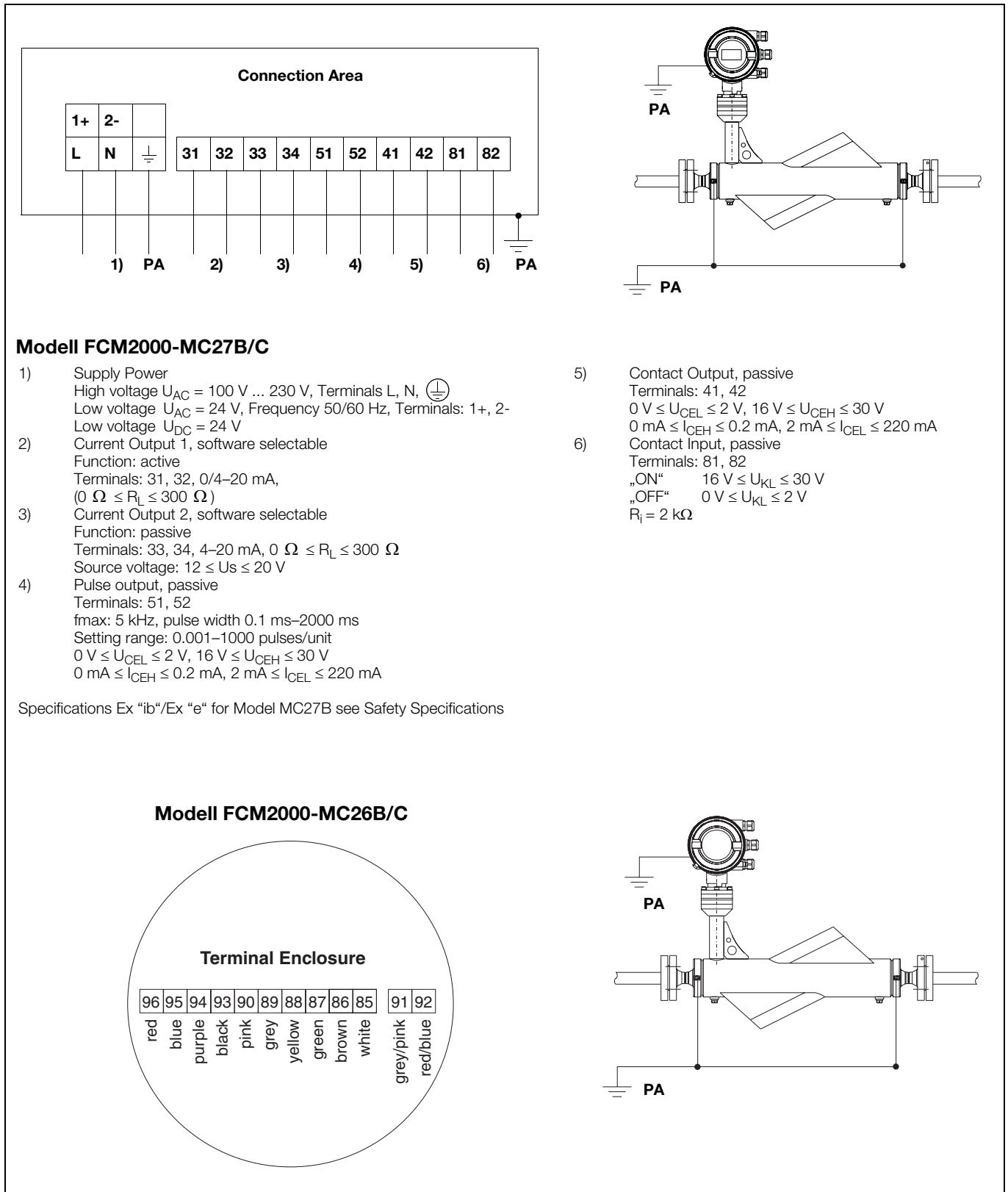


Fig. 31: Interconnection Diagram Ex-Design, ATEX, FM

Safety Specifications for the In- and Outputs, Model FCM2000-MC27B

	MC27B						MC27B
Current Output	Intrinsically Safe EEx ib IIC/IIB						Non-intrinsically safe $U_T = 60\text{ V}$
Current output active Terminals 31/32 Terminal 32 is to be connected to PA.	$U_O = 20\text{ V}$						$U_T = 30\text{ V}$ $I_T = 30\text{ mA}$
	I_O [mA]	P_O [mW]	EEx ib IIC C_O [nF] L_O [mH]		EEx ib IIB C_O [nF] L_O [mH]		
	100	500	217	3.8	1400	14.8	
	Curve: linear Internal capacitance $C_1 = 2.4\text{ nF}$, internal inductance $L_1 = 0.17\text{ mH}$ Only for connection to a passive, intrinsically safe circuit or intrinsically safe circuits with the following maximum values: $U_I = 60\text{ V}$						
Current output passive Terminals 33/34 Terminal 34 is connected to PA.	$U_I = 30\text{ V}$ $I_I = 100\text{ mA}$		$C_1 = 2.4\text{ nF}$ $L_1 = 0.17\text{ mH}$				$U_T = 30\text{ V}$ $I_T = 30\text{ mA}$
Contact output Terminals 41/42 Pulse output Terminals 51/52	$U_I = 15\text{ V}$ $I_I = 30\text{ mA}$ $P_I = 115\text{ mW}$		$C_1 = 2.4\text{ nF}$ $L_1 = 0.17\text{ mH}$				$U_T = 30\text{ V}$ $I_T = 220\text{ mA}$
Contact input passive Terminals 81/82	$U_I = 30\text{ V}$ $I_I = 250\text{ mA}$ $P_I = 1.1\text{ W}$		$C_1 = 2.4\text{ nF}$ $L_1 = 0.17\text{ mH}$				$U_T = 30\text{ V}$ $I_T = 10\text{ mA}$

Special Requirements:

The output circuits are designed to be connected to either intrinsically safe or non-intrinsically safe circuits. A combination of intrinsically safe and non-intrinsically safe circuits is not permissible. For intrinsically safe current outputs Potential Equalization must exist along the entire circuit. The test voltage for non-intrinsically safe circuits is $U_T = 60\text{ V}$.

The contact output and pulse output can be configured internally (Terminals 41/42, 51/52) as NAMUR-Contacts for connection to a NAMUR-Amplifier.

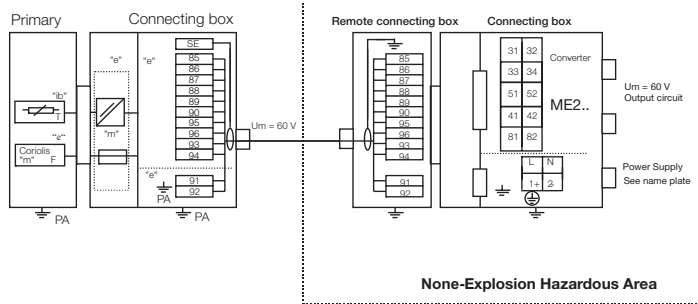
The meters are shipped with the black cable connectors installed. If the signal outputs are connected to intrinsically safe circuits, it is recommended that the light blue cable connectors included with the shipment be installed for the corresponding cable entries.

Important:

If the ground wire PE in connection box of flowmeter is connected it has to be assured that no dangerous potential difference between the ground PE and potential balance can show up in the explosive area.

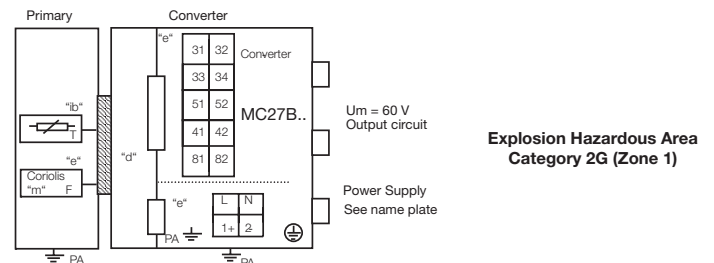
MC26B

- II 2G EEx em [ib] IIC T6
- II 1/2G EEx em [ib] IIC T6
- II 2D T115°C...Tmed IP67



MC27B..

- II 2G EEx emd [ib] IIC T6
- II 1/2G EEx emd [ib] IIC T6
- II 2D T115°C...Tmed IP67



Isolation: MC26.., MC27..

Insulation: MC26.., MC27..

The pipeline and the flowmeter primary insulation should be installed as shown. The max. insulation thickness at the flowmeter primary is 100 mm.

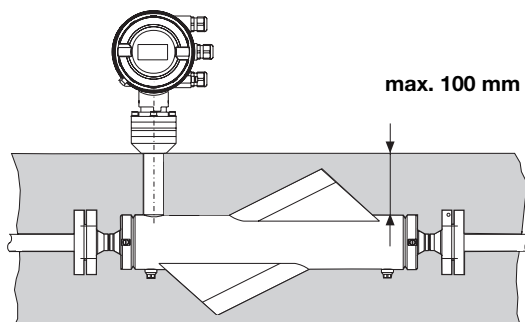
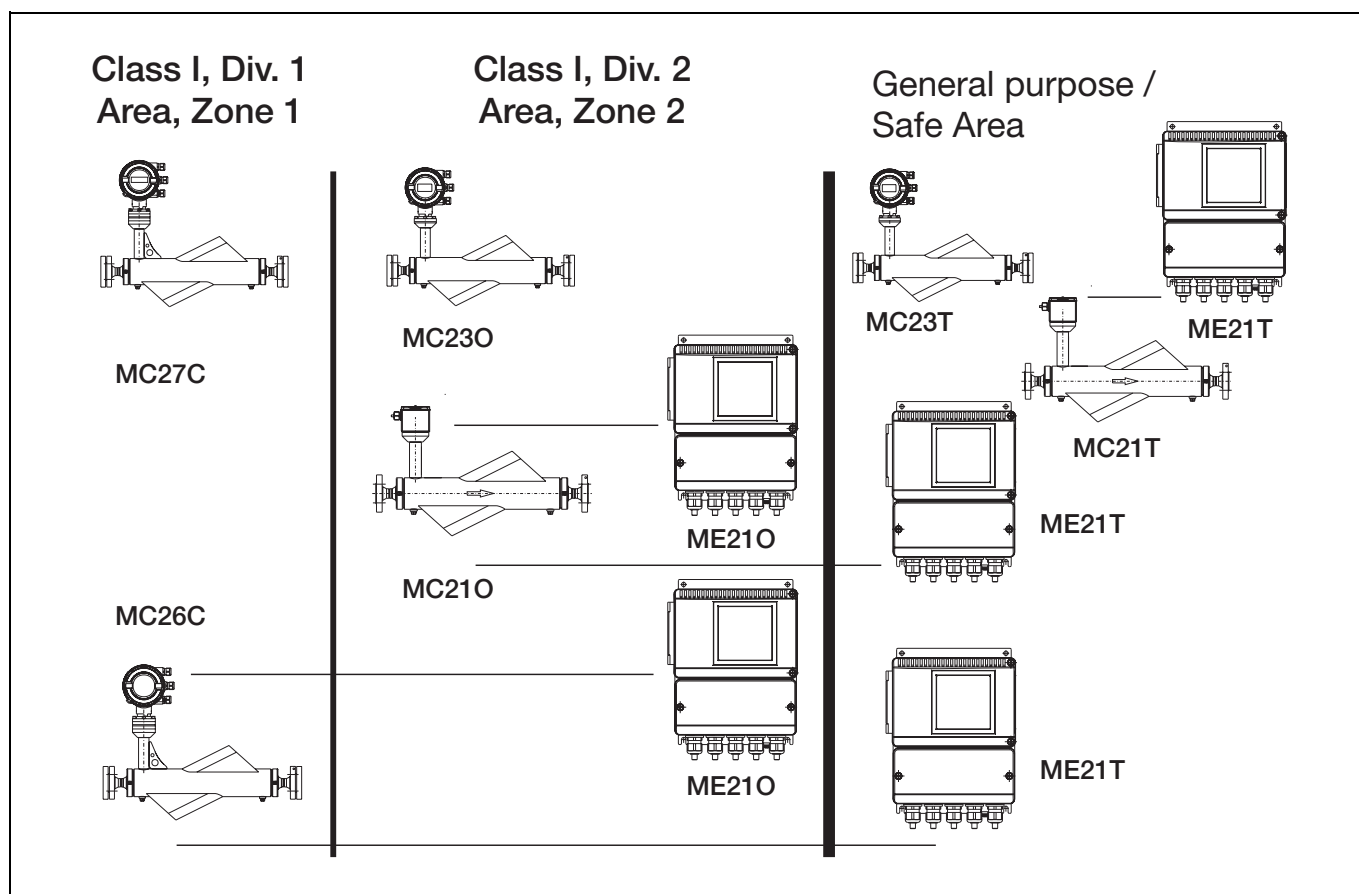
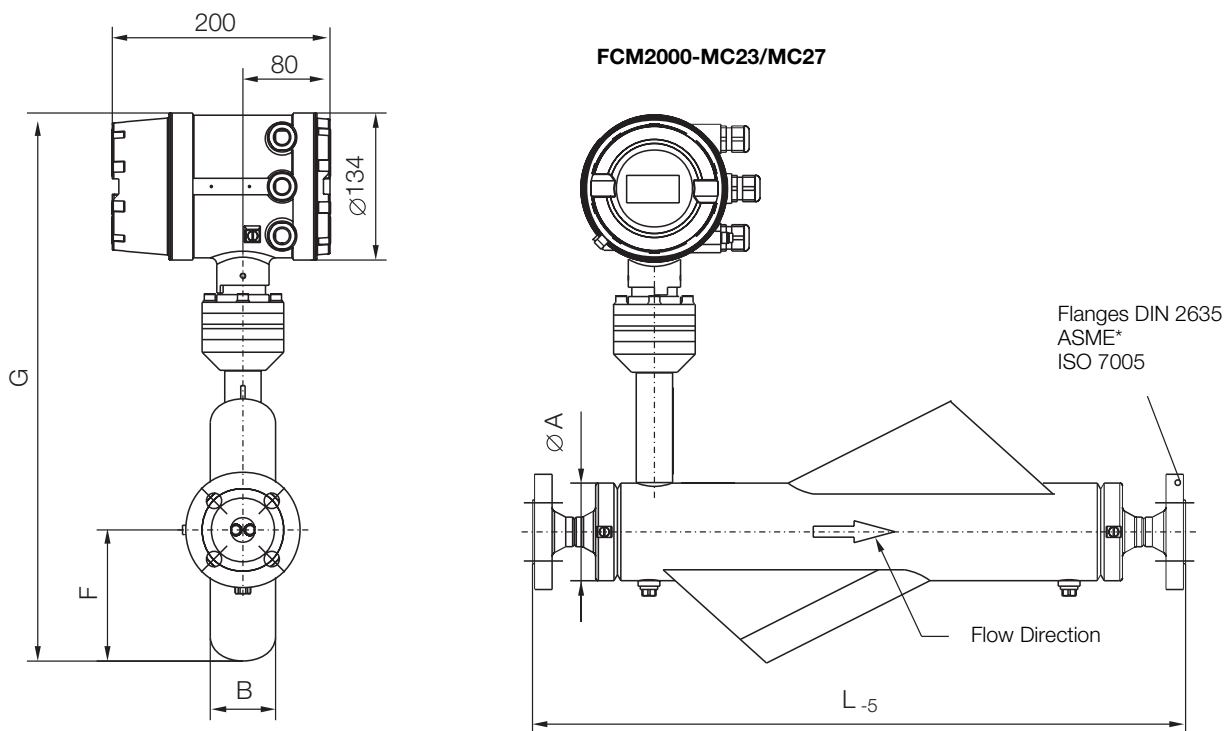


Fig. 32:

FM Installation Class I, Div.1/ Div.2 FCM2000



Dimensions Compact Design, Flanged Construction „E“ to „F“, DIN/ASME



Meter Size DN Size) Inch	A	F	B	G MC23	G MC27	Process Conn's DN	L ₅						Weight appr. kg
							DIN 2635 PN 40	DIN 2636 PN 64	DIN 2637 PN 100	ASME CL 150	ASME CL 300	ASME CL 600	
20 („E“) 3/4	89	127	66	470	494	15 [1/2"]	693	705	705	708	718	730	16
						20 [3/4"]	598	–	–	618	628	645	16
						25 [1"]	698	735	735	728	738	753	17
25 („F“) 1	89	127	66	470	494	20 [3/4"]	758	–	–	778	788	802	17
						25 [1"]	658	693	693	688	698	710	17
						40 [1-1/2"]	808	840	840	838	855	868	20

* Connecting dimensions for flanges according to ASME B16.5 (ANSI)



Fig. 33: Dimensions Compact Design, Flanged Construction „E“ to „F“, DIN/ASME

Dimensions, Remote Design, Flanged Construction „E“ to „F“, DIN/ASME

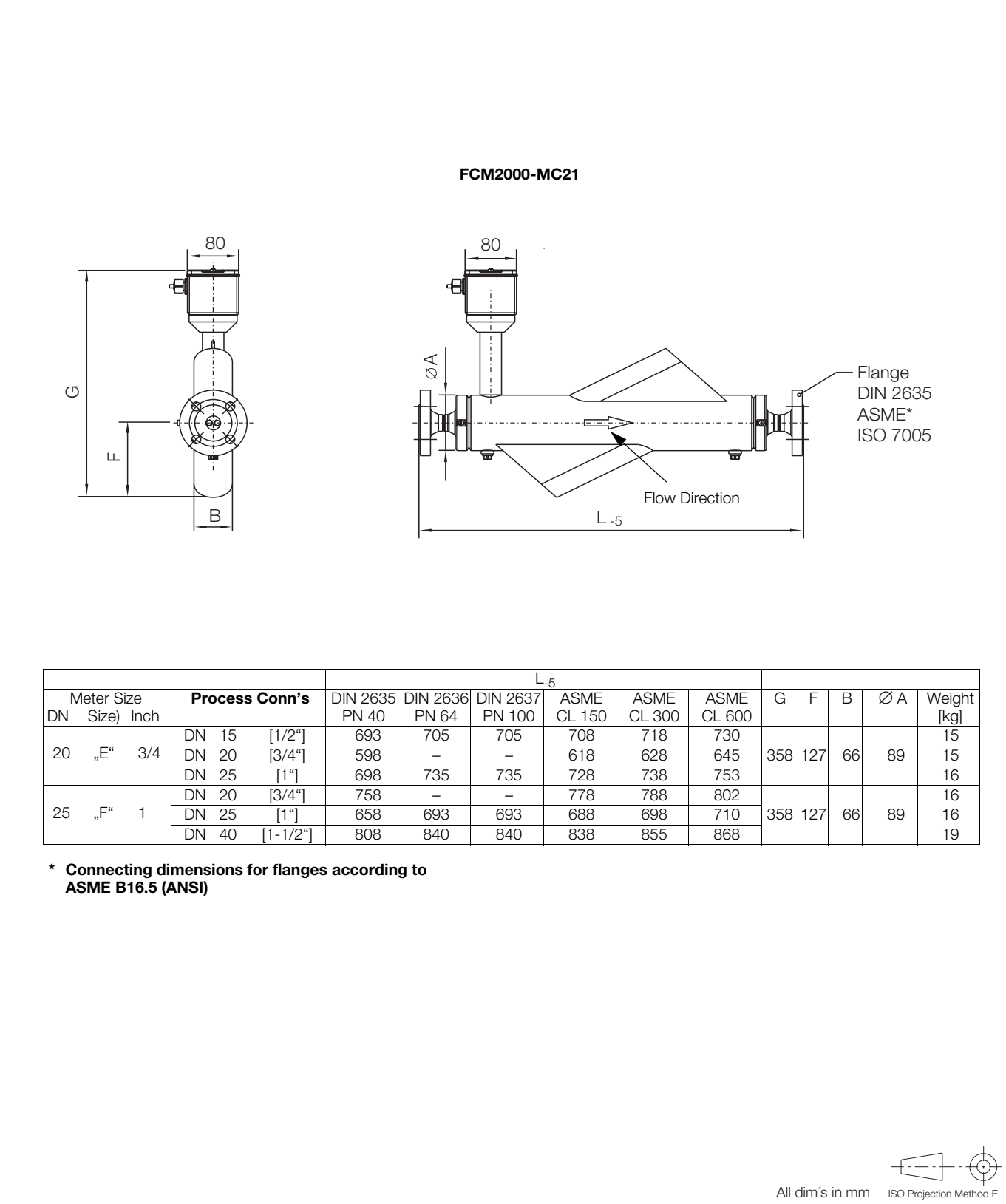


Fig. 34: Dimensions, Remote Design, Flanged Construction „E“ to „F“, DIN/ASME

Dimensions, Compact Design, Flanged Construction „G“ to „L“, DIN/ASME

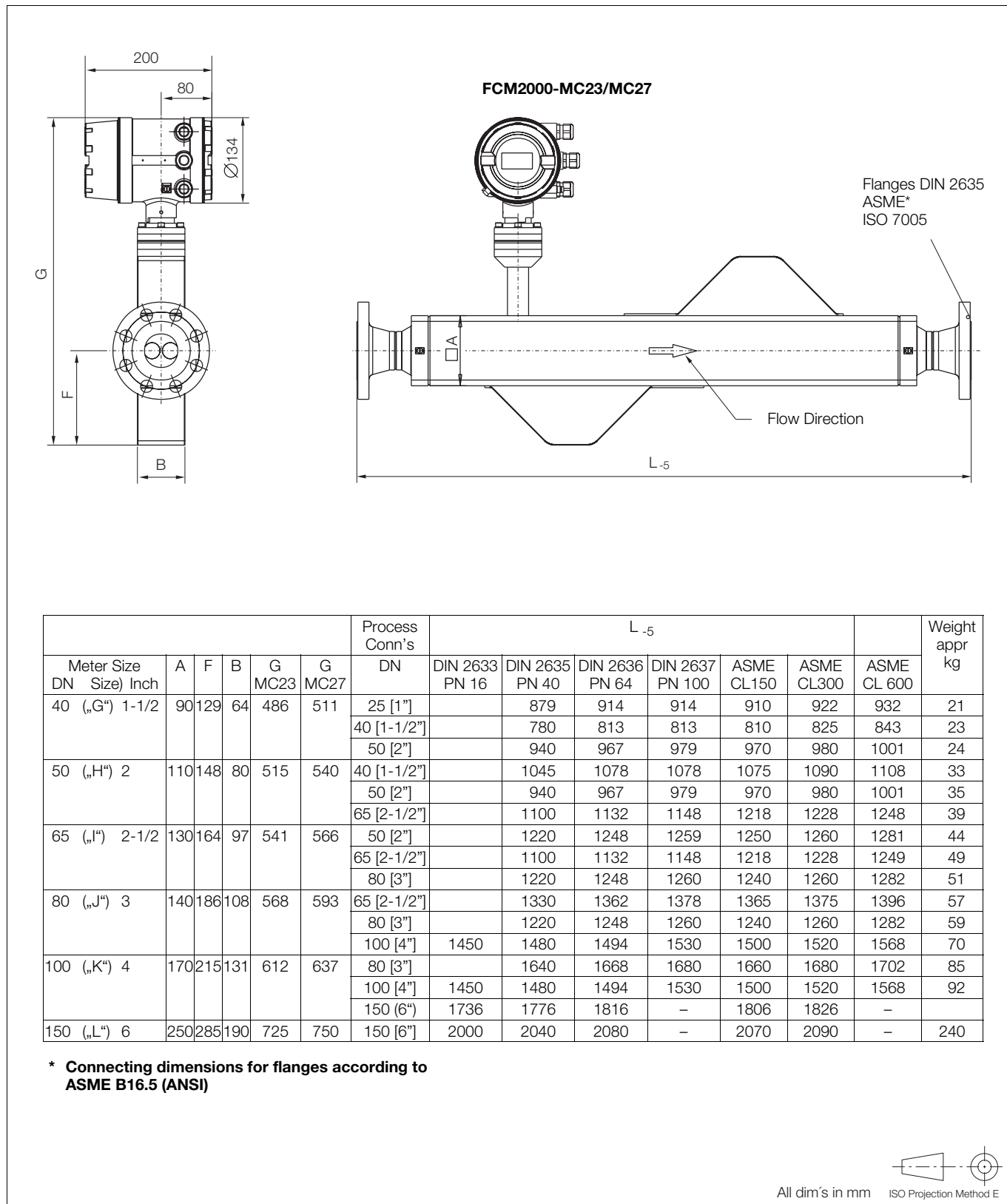


Fig. 35: Dimensions, Compact Design, Flanged Construction „G“ to „L“, DIN/ASME

Dimensions, Remote Design, Flanged Construction „G“ to „L“, DIN/ASME

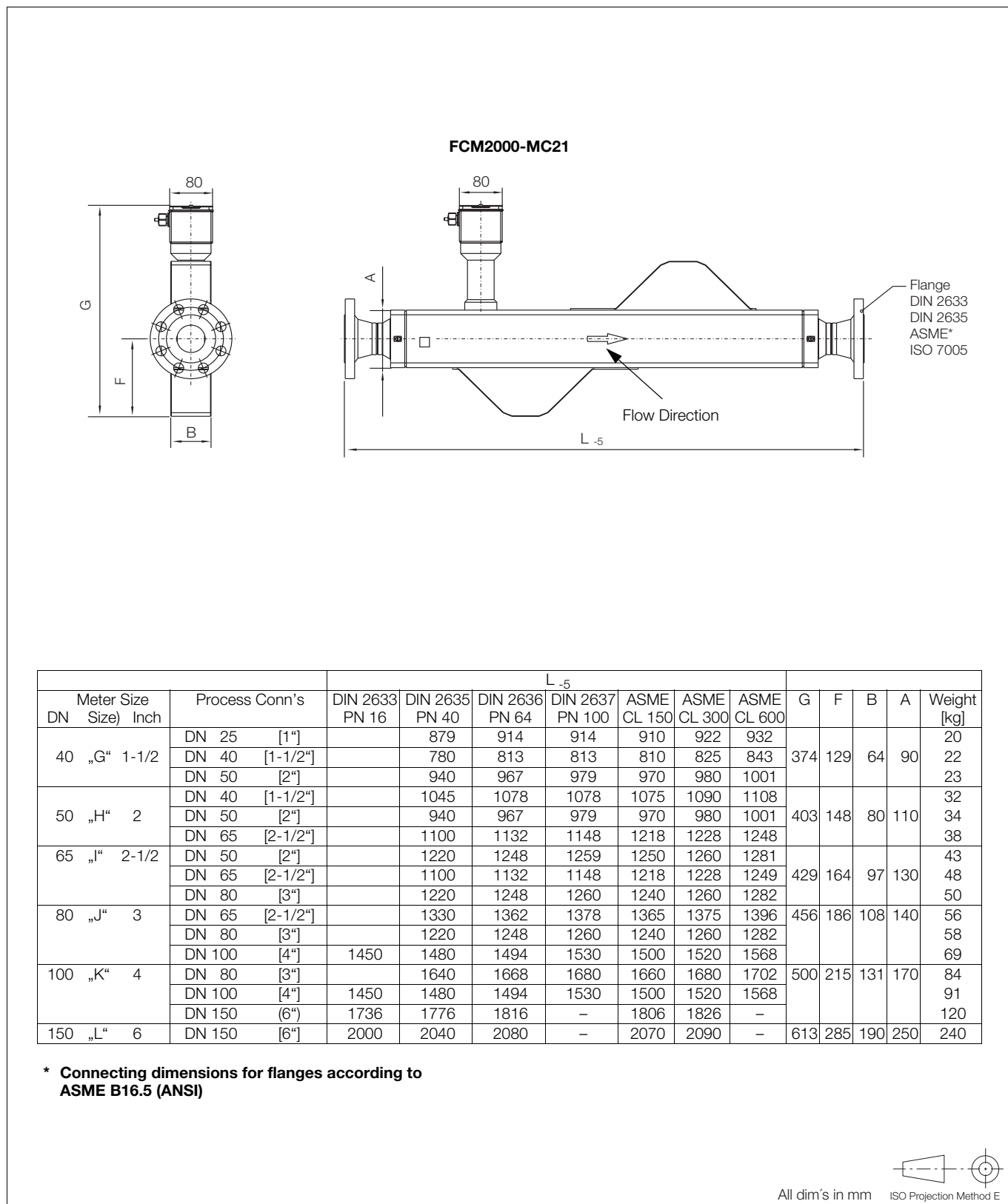


Fig. 36: Dimensions, Remote Design, Flanged Construction „G“ to „L“, DIN/ASME

Dimensions, Compact Design, Food Industry Fitting „E“ to „F“, DIN 11851

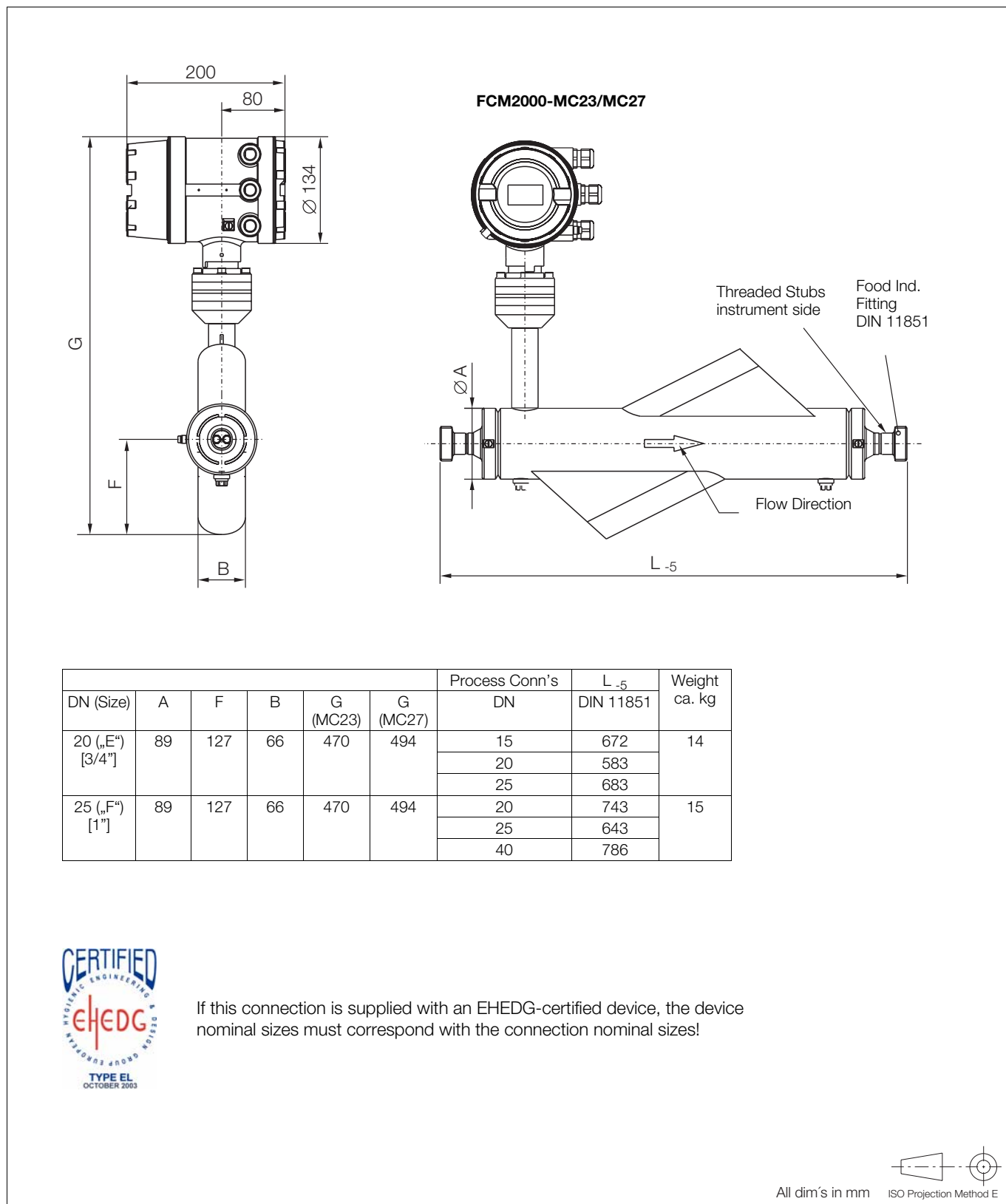
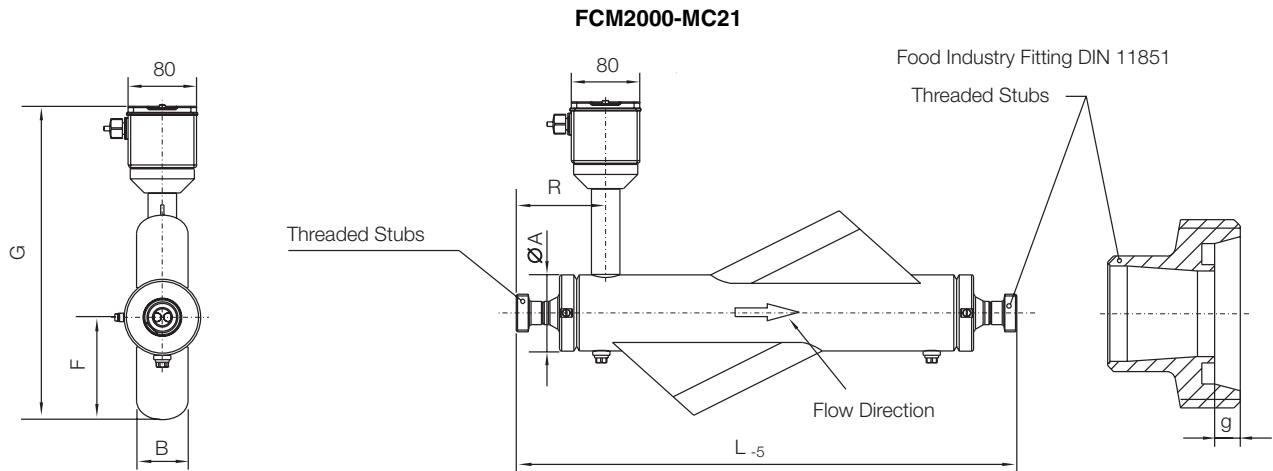


Fig. 37: Dimensions, Compact Design, Food Industry Fitting „E“ to „F“, DIN 11851

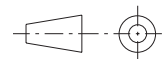
Dimensions, Remote Design, Food Industry Fitting „E“ to „F“, DIN 11851



DN (Size)	Process Conn's	L ₋₅	g	G	F	B	Ø A	R	Weight [kg]
20 („E“ [3/4“])	DN 15 / [1/2“] Rd 34 x 1/8	672	4	358	127	66	89	152	13
	DN 20 / [3/4“] Rd 44 x 1/6	583	6						
	DN 25 / [1“] Rd 52 x 1/6	683	7						
25 („F“ [1“])	DN 20 / [3/4“] Rd 44 x 1/6	743	6	358	127	66	89	162	14
	DN 25 / [1“] Rd 52 x 1/6	643	7						
	DN 40 / [1-1/2“] Rd 65 x 1/6	786	7						



If this connection is supplied with an EHEDG-certified device, the device nominal sizes must correspond with the connection nominal sizes!



All dim's in mm ISO Projection Method E

Fig. 38: Dimensions, Remote Design, Food Industry Fitting „E“ to „F“, DIN 11851

Dimensions, Compact Design, Food Industry Fitting „G“ to „K“, DIN 11851

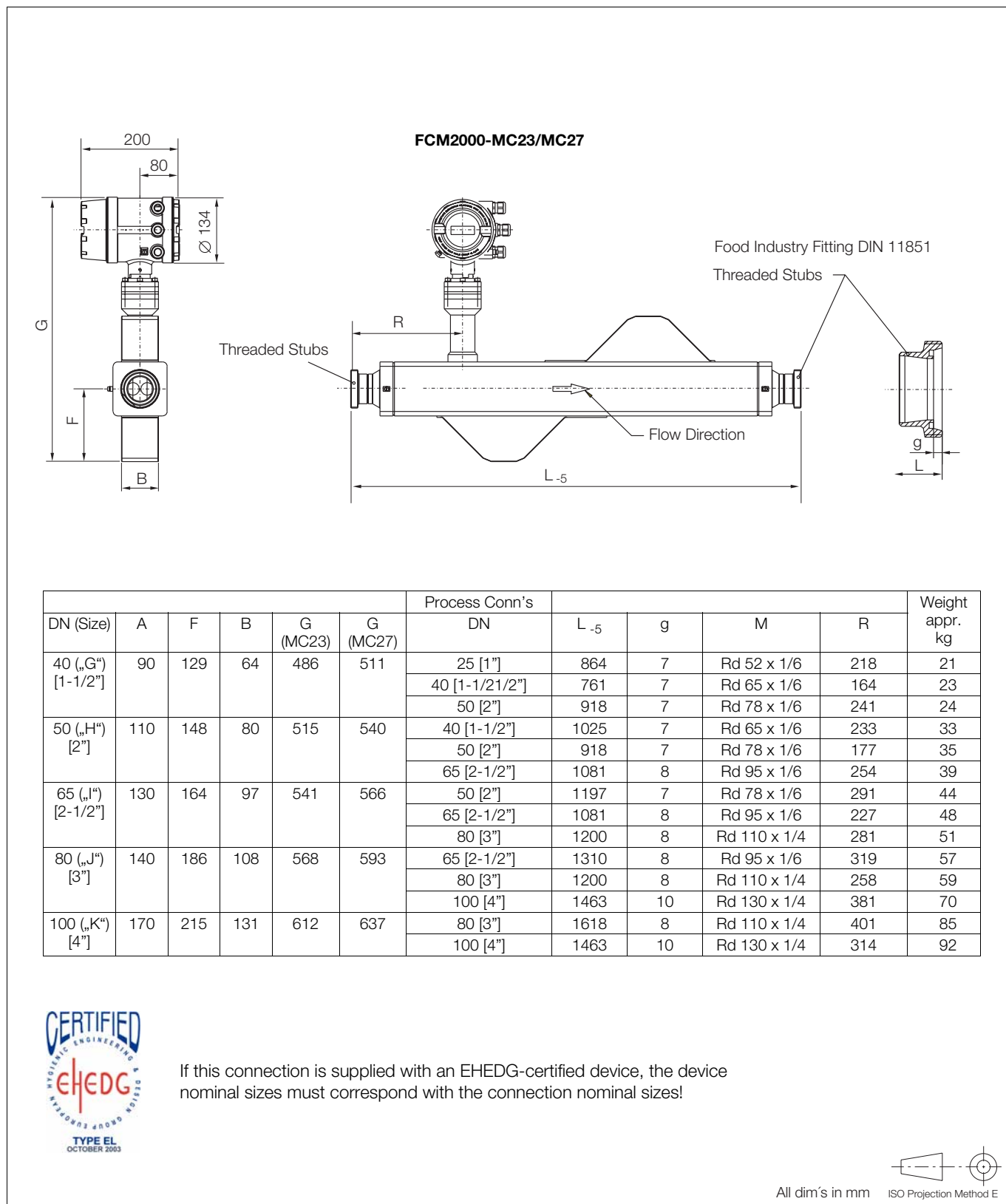


Fig. 39: Dimensions, Compact Design, Food Industry Fitting „G“ to „K“, DIN 11851

Dimensions, Remote Design, Food Industry Fitting „G“ to „K“, DIN 11851

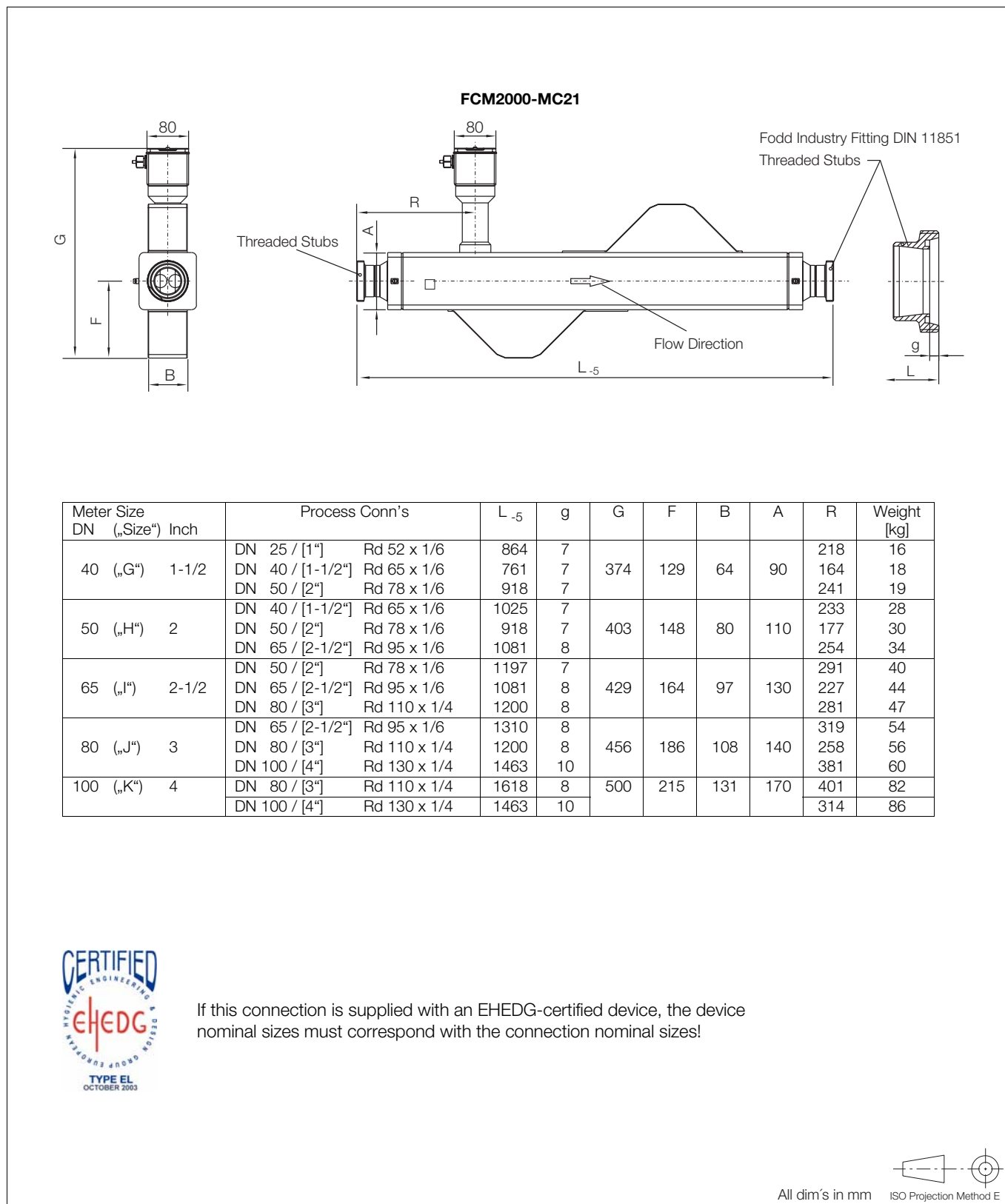


Fig. 40: Dimensions, Remote Design, Food Industry Fitting „G“ to „K“, DIN 11851

Dimensions, Compact Design, Tri-Clamp DIN 32676 „E“ to „F“

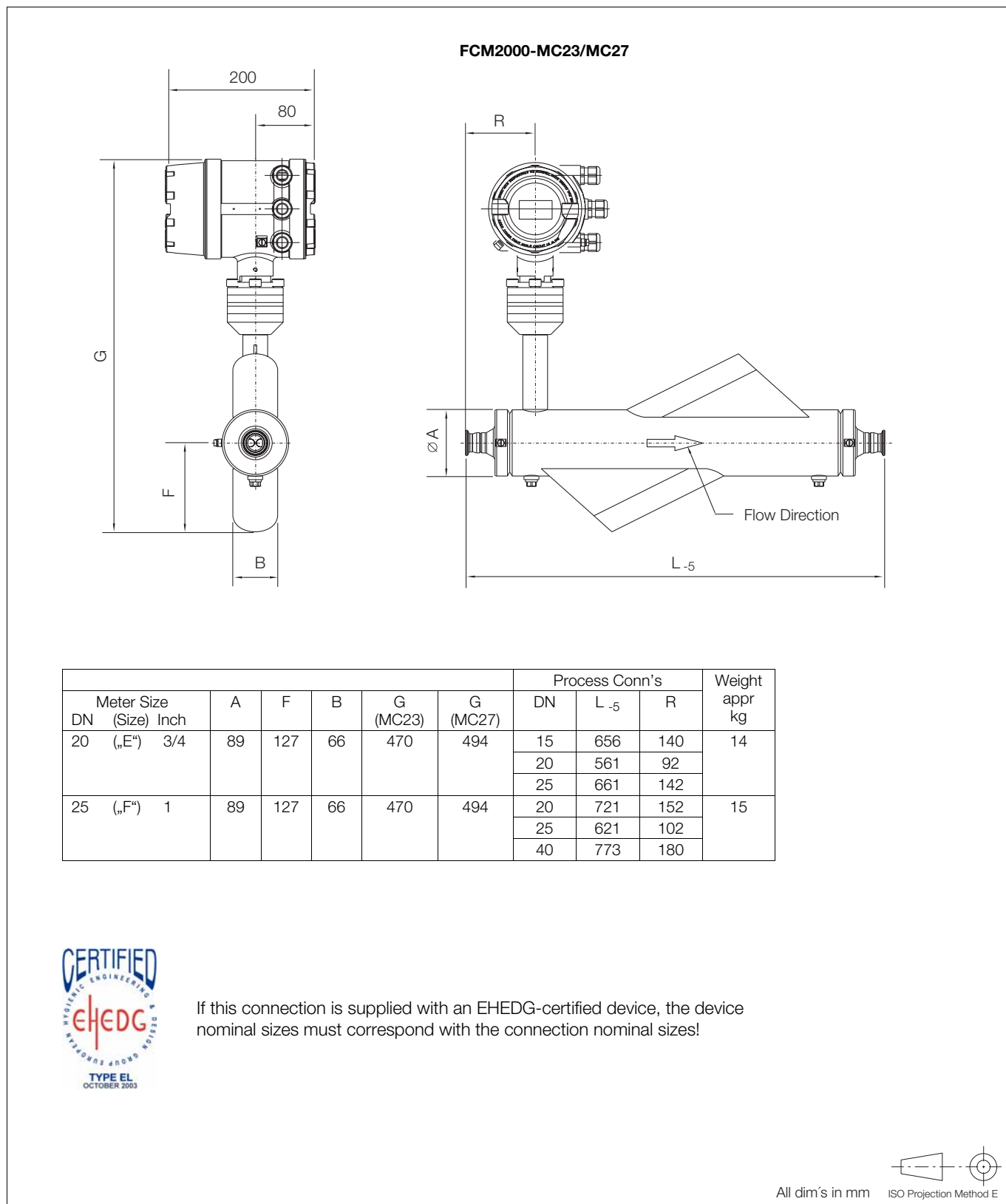


Fig. 41: Dimensions, Compact Design, Tri-Clamp DIN 32676 „E“ to „F“

Dimensions, Remote Design, Tri-Clamp DIN 32676 „E“ to „F“

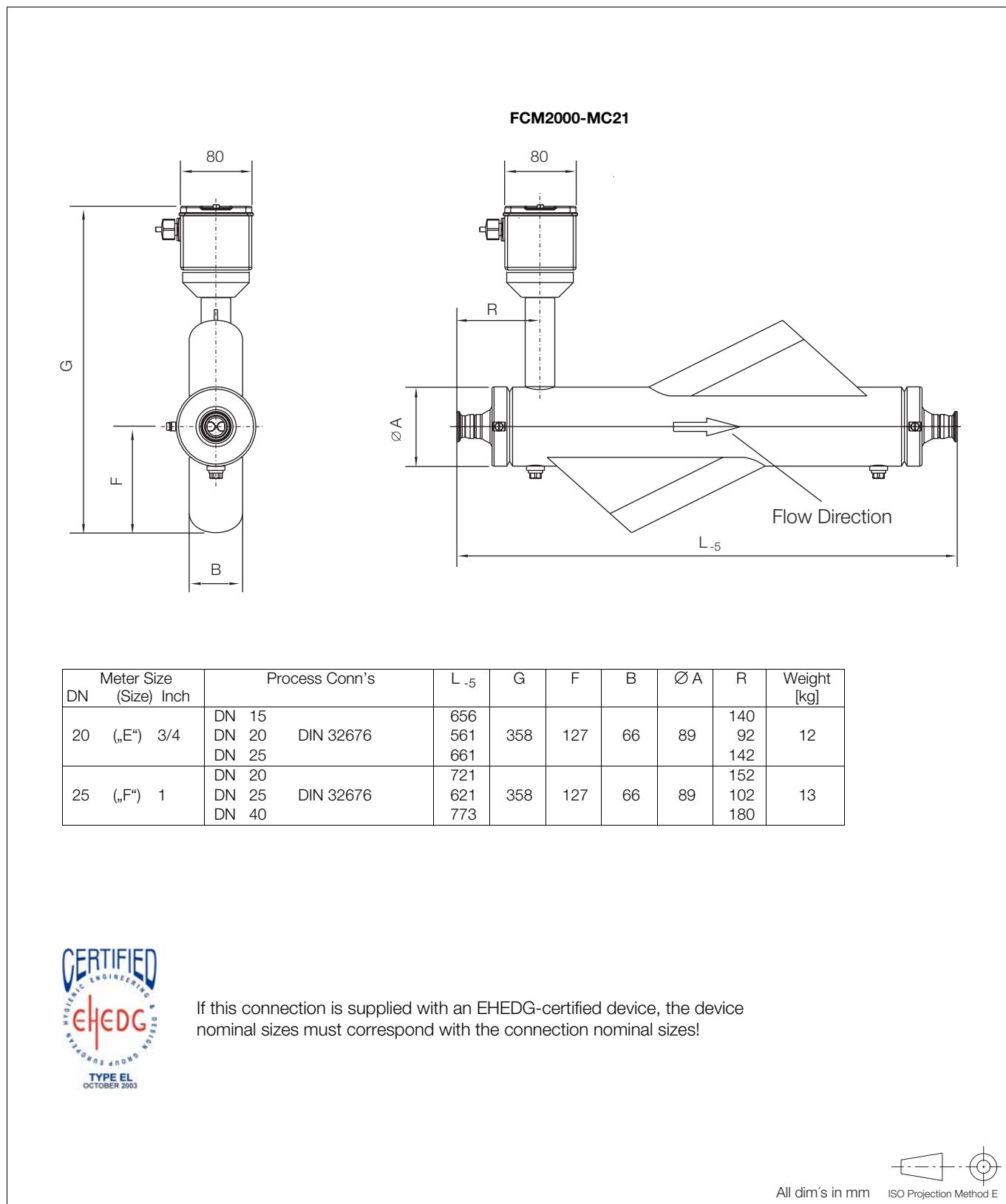


Fig. 42: Dimensions, Remote Design, Tri-Clamp DIN 32676 „E“ to „F“

Dimensions, Compact Design, Tri-Clamp DIN 32676 „G“ to „K“

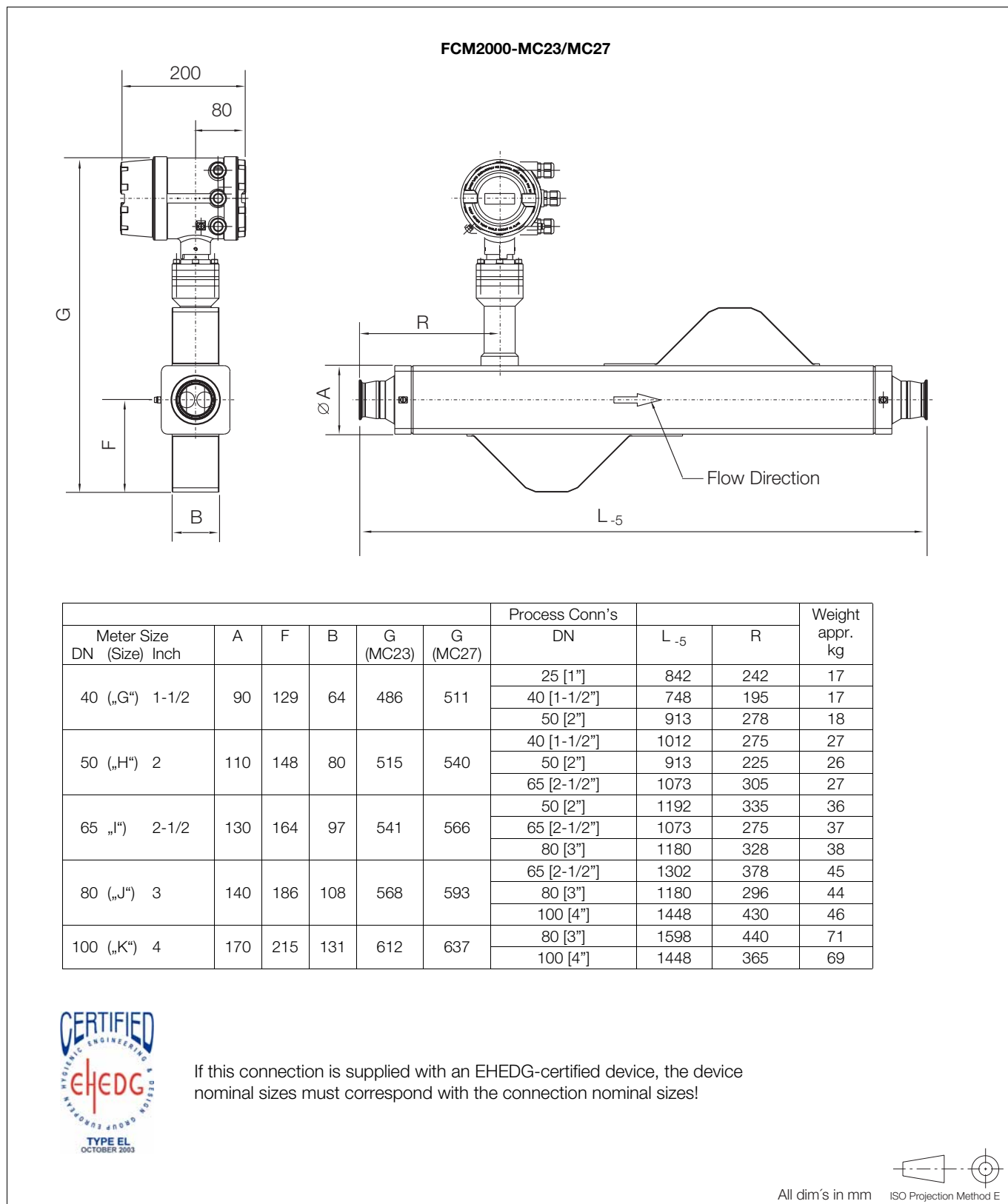
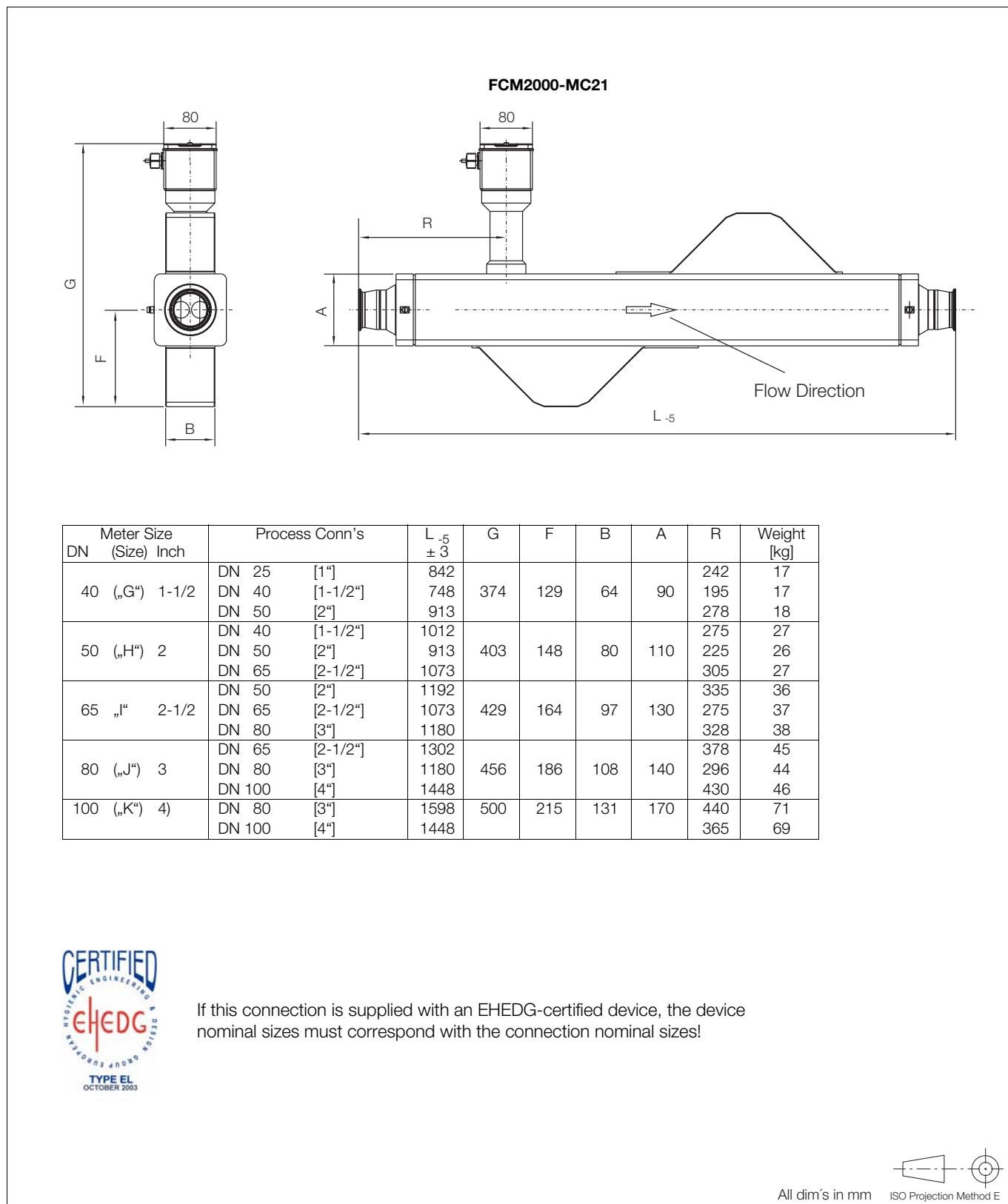
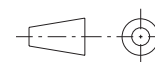


Fig. 43: Dimensions, Compact Design, Tri-Clamp DIN 32676 „G“ to „K“

Dimensions, Remote Design, Tri-Clamp DIN 32676 „G“ to „K“



If this connection is supplied with an EHEDG-certified device, the device nominal sizes must correspond with the connection nominal sizes!



All dim's in mm

ISO Projection Method E

Fig. 44: Dimensions, Remote Design, Tri-Clamp DIN 32676 „G“ to „K“

Dimensions, Remote Design, MS21

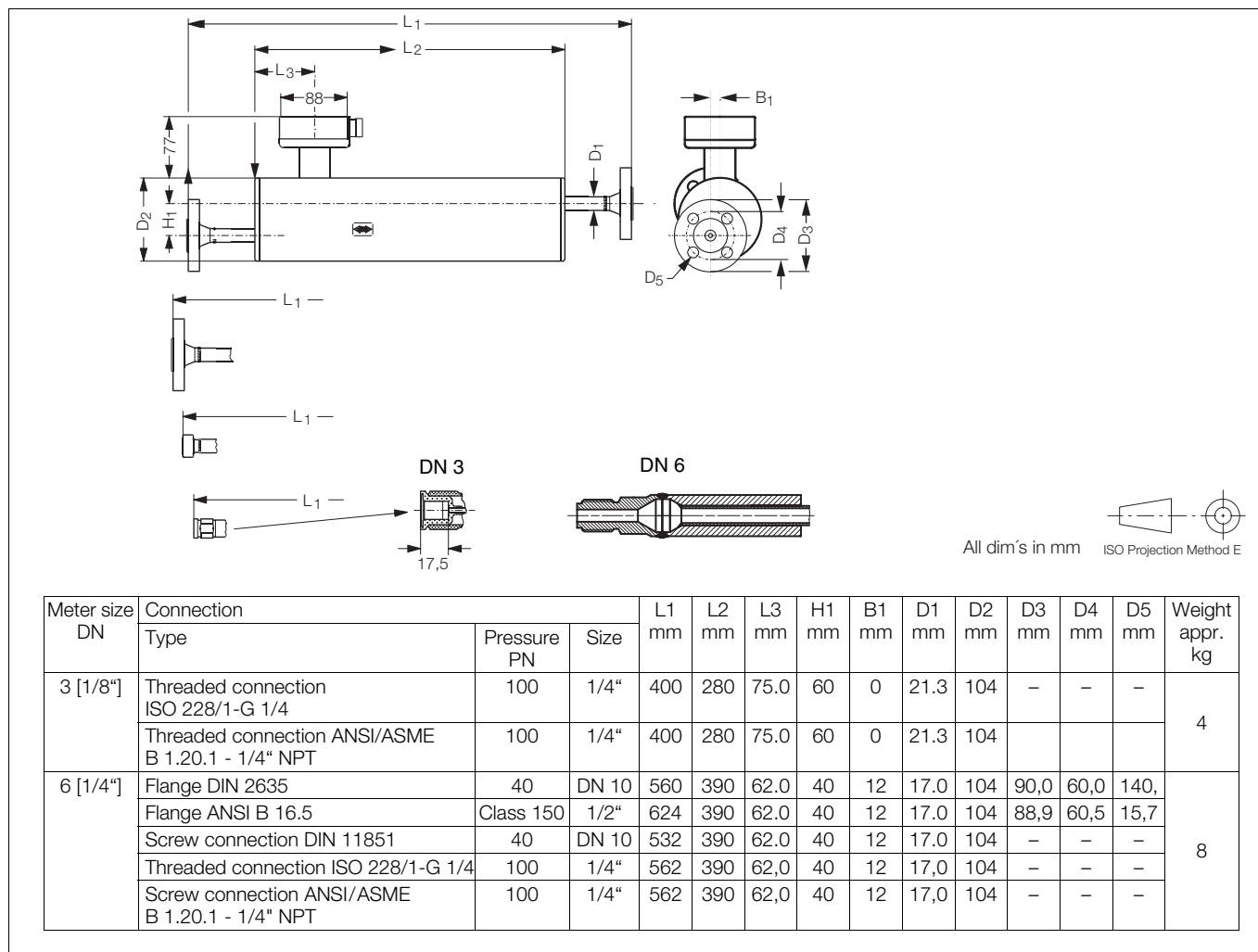


Fig. 45: Dimensions, Remote Design, MS21 DN 3 [1/8"], DN 6 [1/4"]

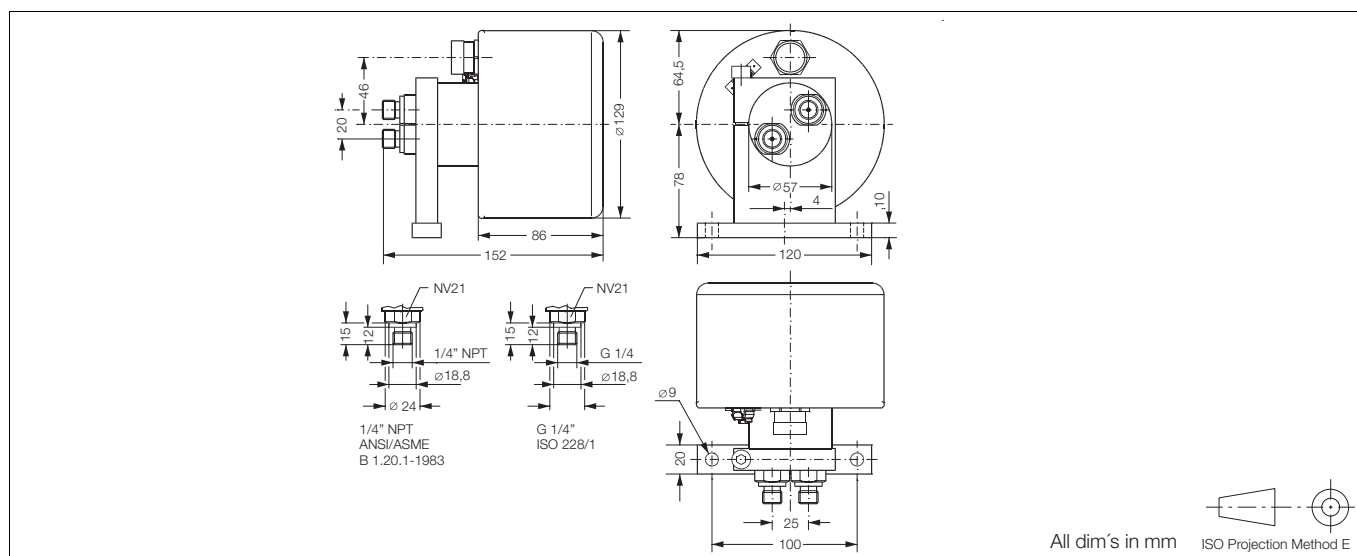


Fig. 46: Dimensions, Remote Design, MS21 DN 1.5 [1/16"]

Dimensions, Converter Field Mount Housing, Rectangular

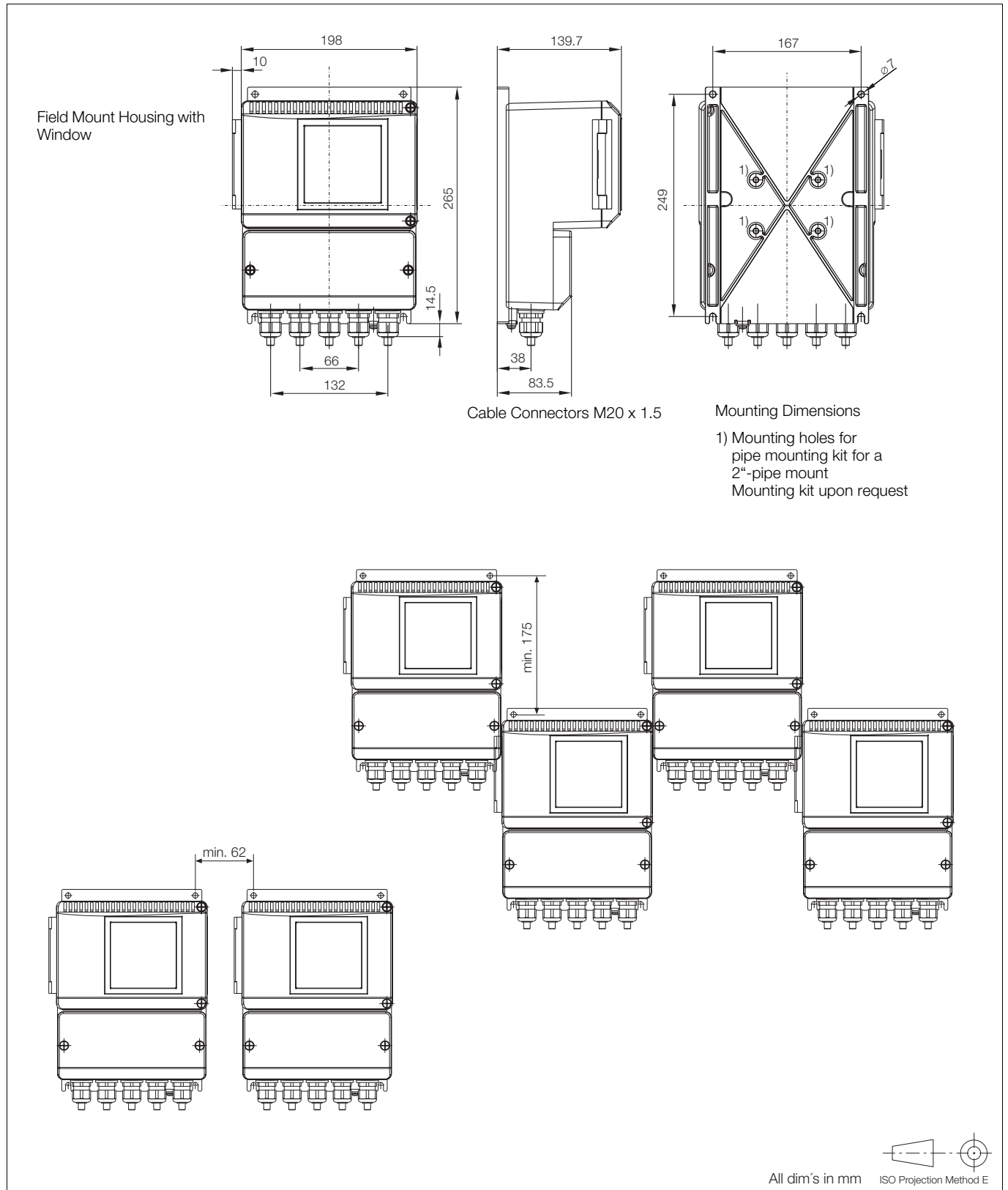


Fig. 47: Dimensions, Converter Field Mount Housing, Rectangular

Ordering information

Coriolis Mass Flowmeter		Variant digit No.		1-4	5	6	7	8	9	10	11	12	13	14			
FCM2000-MC2		Catalog No.		MC2-													
Design																	
Remote design					1												
Compact (Integral) design					3												
Ex, remote design, ATEX, FM Class I, Div. 1		3) 4)			6												
Ex, compact (Integral) design, ATEX, FM Class I, Div. 1					7												
Explosion Protection / Connection / Ambient Temperature																	
none / connection M20 x 1.5 / Standard				A													
none / connection NPT 1/2 in. / Standard				T													
none / connection M20 x 1.5 / extended -40 ... 60 °C				1) U													
none / connection NPT 1/2 in. / extended -40 ... 60 °C				1) X													
ATEX / connection M20 x 1.5 / Standard				2) B													
ATEX / connection M20 x 1.5 / extended -40 ... 60 °C				2) E													
FM Class I, Div. 1, Zone 1 / connection NPT 1/2 in. / Standard				2) C													
FM Class I, Div. 2, Zone 2 / connection NPT 1/2 in. / Standard				O													
FM Class I, Div. 1, Zone 1 / connection NPT 1/2 in. / extended -40 ... 60 °C				2) Y													
FM Class I, Div. 2, Zone 2 / connection NPT 1/2 in. / extended -40 ... 60 °C				1) V													
Certificate, material / pressure tests																	
Standard					1												
EN 10204 3.1 B					2												
Material certificate 3.1.B + pressure test AD-2000					3												
Pressure test per AD-2000					4												
Certificate NACE material					5												
Certificate NACE + Pressure test					6												
Tube material																	
CrNi 1.4571 / 316Ti (Stainless Steel)					1												
1.4435 (316L)EHEDG design only with process connection DIN 11851 or Tri-Clamp and size "E" ... "J" (DN 20 ... DN 80, 3/4 ... 3 in.)					3												
Hastelloy C4 (2.4610) only DIN PN 40 / ASME CL 150 and size "E" ... "K" (DN 20 ... DN 100, 3/4 ... 4 in.)					4												
Measuring range																	
Max. measuring range		Size		Connection size													
kg/min	lbs./min	kg/min	lbs./min														
0 ... 75	0 ... 165	0 ... 100	0 ... 220	"E"	DN 20	0.75 in.	E	2	0								
0 ... 125	0 ... 275	0 ... 160	0 ... 352	"F"	DN 25	1 in.	F	2	5								
0 ... 365	0 ... 803	0 ... 475	0 ... 1045	"G"	DN 40	1.5 in.	G	4	0								
0 ... 710	0 ... 1562	0 ... 920	0 ... 2024	"H"	DN 50	2 in.	H	5	0								
0 ... 1450	0 ... 3190	0 ... 1890	0 ... 4158	"I"	DN 65	2.5 in.	I	6	5								
0 ... 1890	0 ... 4158	0 ... 2460	0 ... 5412	"J"	DN 80	3 in.	J	8	0								
0 ... 3200	0 ... 7040	0 ... 4160	0 ... 9152	"K"	DN 100	4 in.	K	1	H								
0 ... 8500	0 ... 18700	0 ... 11000	0 ... 24200	"L"	DN 150	6 in.	L	1	F								
0 ... 75	0 ... 165	0 ... 100	0 ... 220	"E"	DN 15	0.5 in.	E	1	5								
0 ... 125	0 ... 275	0 ... 160	0 ... 352	"F"	DN 20	0.75 in.	F	2	0								
0 ... 365	0 ... 803	0 ... 475	0 ... 1045	"G"	DN 25	1 in.	G	2	5								
0 ... 710	0 ... 1562	0 ... 920	0 ... 2024	"H"	DN 40	1.5 in.	H	4	0								
0 ... 1450	0 ... 3190	0 ... 1890	0 ... 4158	"I"	DN 50	2 in.	I	5	0								
0 ... 1890	0 ... 4158	0 ... 2460	0 ... 5412	"J"	DN 65	2.5 in.	J	6	5								
0 ... 3200	0 ... 7040	0 ... 4160	0 ... 9152	"K"	DN 80	3 in.	K	8	0								
0 ... 75	0 ... 165	0 ... 100	0 ... 220	"E"	DN 25	1 in.	E	2	5								
0 ... 125	0 ... 275	0 ... 160	0 ... 352	"F"	DN 40	1.5 in.	F	4	0								
0 ... 365	0 ... 803	0 ... 475	0 ... 1045	"G"	DN 50	2 in.	G	5	0								
0 ... 710	0 ... 1562	0 ... 920	0 ... 2024	"H"	DN 65	2.5 in.	H	6	5								
0 ... 1450	0 ... 3190	0 ... 1890	0 ... 4158	"I"	DN 80	3 in.	I	8	0								
0 ... 1890	0 ... 4158	0 ... 2460	0 ... 5412	"J"	DN 100	4 in.	J	1	H								

- 1) only in combination with design code 3
- 2) only in combination with design code 7
- 3) with converter ME21 for non-hazardous area
- 4) FM in preparation

Continued on next page

Ordering information (continued)

Coriolis Mass Flowmeter	Variant digit No.	1-4	12	13	14	15	16	17	18	19	20	21				
FCM2000-MC2	Catalog No.	MC2-														
Process connection																
Flange DIN PN 16																
Flange DIN PN 40																
Flange DIN PN 100	5)															
Flange ASME CL 150																
Flange ASME CL 300																
Flange ASME CL 600	6)															
Tri-Clamp acc. to DIN 32676	5)															
Pipe connection acc. to DIN 11851	5)															
Housing (primary)																
Standard			1													
Housing as secondary containment 40 bar (565 psi)	5)		2													
Heating / Cooling																
without			1													
Calibration																
Flow forward ± 0,40 % of flow rate / density (± 5 g/l)																
Flow forward ± 0,25 % of flow rate / density (± 5 g/l)																
Flow forward ± 0,15 % of flow rate / density (± 5 g/l)	5)															
Flow forward ± 0,40 % of flow rate / density (± 1 g/l)	5)															
Flow forward ± 0,25 % of flow rate / density (± 1 g/l)	5)															
Flow forward ± 0,15 % of flow rate / density (± 1 g/l)	5)															
Flow forward/reverse ± 0,40 % of flow rate / density (± 5 g/l)																
Flow forward/reverse ± 0,25 % of flow rate / density (± 5 g/l)																
Flow forward/reverse ± 0,15 % of flow rate / density (± 5 g/l)	5)															
Flow forward/reverse ± 0,40 % of flow rate / density (± 1 g/l)	5)															
Flow forward/reverse ± 0,25 % of flow rate / density (± 1 g/l)	5)															
Flow forward/reverse ± 0,15 % of flow rate / density (± 1 g/l)	5)															
Name plate / Documentation																
German																
English																
Design Level (specified by ABB)																
End of ordering information for remote design, continue only with compact design																
Operating mode / Software version																
Standard software (Mass and density measurement)																
Outputs additional to current output I (active), contact output (passive) and contact input (passive)																
Current output II (passive), pulse output (active) (Ex not possible)																
Current output II (passive), pulse output (passive)																
Current output I (passive) current output II (passive), pulse output (passive) (only with MC27)	7)															
Communication																
without																
HART protocol																
PROFIBUS PA																
FOUNDATION Fieldbus																
PROFIBUS PA with M12 plug																
Power supply																
High voltage 85 ... 235 V AC																
Low voltage 24 V AC/DC																

Accessories																
Signal cable (10 m included in base price)	Price per meter	D173D146U01														

5) not for size "L" (DN 150 / 6 in.)
6) not for size "L" (DN 150 / 6 in.). Size "K" (DN 100 / 4 in.) on request
7) in preparation

Ordering information

Coriolis Mass Flowmeter		Variant digit No.		1-4	5	6	7	8	9	10	11	12	13	14	15	16	17			
FCM2000-MS2		Catalog No.		MS2-																
Design		Remote design		1																
Application		Standard		A																
Certificate		Standard		1																
Tube material		316L / 1.4435		3																
Measuring range [kg/h]		0 ... 65 DN 1.5							S											
		0 ... 250 DN 3							T											
		0 ... 1000 DN 6							U											
Temperature version		max. 125 °C (only DN 1.5)							1											
		max. 180 °C (DN 3 and DN 6)							2											
Process connection		G 1/4 in. ISO 228-1, PN 100								A										
		1/4 in. NPT, ANSI / ASME B 1.20.1, PN 100								B										
		Flange DN 10, PN 40 (only DN 6)								C										
		Flange 1/2 in., Class 150 (only DN 6)								I										
		DN 10, DIN 11851, PN 40 (only DN 6)								M										
Construction		Standard								1										
Heating / Cooling		without									0									
Calibration		0.40 % / 10 g/l Forward flow												A						
		0.25 % / 10 g/l Forward flow												B						
		0.15 % / 10 g/l Forward flow												C						
		0.40 % / 10 g/l Forward / reverse flow												G						
		0.25 % / 10 g/l Forward / reverse flow												H						
		0.15 % / 10 g/l Forward / reverse flow												I						
Name plate		German													G					
		English													E					
Design Level		(specified by ABB)													*					
Signal cable		with plug at primary																		
		5 m														1				
		10 m														2				
		25 m														3				
		50 m														4				

Ordering information

Coriolis Mass Flowmeter FCM2000-ME2	Variant digit No.	1-4	5	6	7	8	9	10	11	12			
	Catalog No.	ME2-											
Design (converter) Remote design in combination with flowmeter primary MC21 or MC26 Remote design in combination with flowmeter primary MS2, DN 1.5 Remote design in combination with flowmeter primary MS2, DN 3 and DN 6		1 2 3											
Explosion Protection / Connection / Ambient Temperature none / connection M20 x 1.5 / Standard none / connection NPT 1/2 in. / Standard FM Class I, Div. 2, Zone 2 / connection NPT 1/2 in. / Standard		A T O											
Housing Field housing, rectangular		3											
Operating mode / Software version Standard software (Mass and density measurement)		A											
Outputs additional to current output I (active), contact output (passive) and contact input (passive) Current output II (passive), Pulse output (active) (Ex not possible) Current output II (passive), Pulse output (passive)		A B											
Communication without HART protocol PROFIBUS PA FOUNDATION Fieldbus PROFIBUS PA with M12 plug					1)			0 1 3 5 7					
Power supply High voltage 85 ... 235 V AC Low voltage 24 V AC/DC								G K					
Name plate German English								G E					

1) in preparation

Questionnaire: Coriolis Mass Flowmeter FCM2000

Customer:	Date:	
Mr./Mrs./Ms.:	Department:	
Telephone:	Telefax:	
<hr/>		
Fluid:	Liquid component:	Gas component:
Flowrate: (Min, Max, Operating)	kg/h	
Density: (Min, Max, Operating)	kg/m ³	
Dyn. Viscosity: (Min, Max, Operating)	mPas / cP	
Fluid Temperature: (Min, Max, Operating)	°C	
Ambient Temperature:	°C	
Pressure: (Min, Max, Operating)	bar	
Flow:	<input type="checkbox"/> Steady	<input type="checkbox"/> Pulsating
Batch Operation:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Concentration Calculations:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Converter Design:	<input type="checkbox"/> Compact	<input type="checkbox"/> Remote
Ex-Protection:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Supply Power:	High voltage: <input type="checkbox"/> 100 V to 240 V AC, 50/60 Hz	Low voltage: <input type="checkbox"/> 24 V AC/DC, 50/60 Hz
Electrical Outputs:	Communication:	
	<input type="checkbox"/> Current output 1: 0/4–20 mA	
	<input type="checkbox"/> Current output 2: 0/4–20 mA	
	<input type="checkbox"/> Pulse output, active	<input type="checkbox"/> HART
<input type="checkbox"/> Pulse output, passive		
Additional Specifications:		
Pipeline diametermm inch	
Process connections	

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ABB Ltd.

Oldends Lane, Stonehouse
Gloucestershire, GL 10 3TA
UK

Tel: +44(0)1453 826661
Fax: +44(0)1453 829671

ABB Inc.

125 E. County Line Road
Warminster, PA 18974
USA

Tel: +1 215 674 6000
Fax: +1 215 674 7183

ABB Automation Products GmbH

Dransfelder Str. 2
37079 Goettingen
GERMANY

Tel: +49 551 905-534
Fax: +49 551 905-555

CCC-support.deapr@de.abb.com