

MEASURING SYSTEM "autarkon®" FLOW / ENERGY METER EDZ / EWZ 110.1 / 117.1

1. IDENTIFICATION

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Product type: Flow / energy measurement with differential pressure sensor

Product name: EDZ / EWZ 110.1 / 117.1

2. APPLICATION

Measurement and registration of the volume and energy of water, water-glycol mixtures and thermal oils
Measurement and registration of the standard volume and energy of technical gases with pressure and temperature compensation



EDZ / EWZ 110.1
attached energy and flow computer
ERW 700



EDZ / EWZ 117.1 with
separated energy and flow computer
ERW 700

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3. SPECIAL FEATURES

- minimal pressure loss
- very good long-term stability and large measuring range with the automatic zero adjustment module
- maintenance-free
- simple operation and parameterisation (via software or manually via keypad)
- Logger functions for key date, monthly values, period memory, error memory, parameter memory and min./max. memory
- Various communication interfaces such as M-Bus, Modbus, Profibus DP, Internet connection (TCP/IP)

4. MODE OF ACTION AND MEASURING PRINCIPLE

The measuring system is based on the differential pressure principle. In contrast to the standardised differential pressure transducers described in ISO 5167, the differential pressure is generated and measured in a proprietary manner. These differential pressure transducers have been on the market since the mid-1970s and are known under the name AUTARKON®.

There are 2 pressure probes in a measuring ring or measuring tube, which are used to measure the static pressure as well as the dynamic and suction pressure. The static and dynamic pressure are superimposed on the probe facing the flow, while the static and suction pressure are superimposed on the probe facing away from the flow. The difference between the two pressures results in a differential pressure, also known as differential pressure, which is proportional to the flow velocity.

Both pressures are fed to a differential pressure transmitter where they are converted into an electrical signal. To achieve high accuracy and long-term stability, the zero point of the differential pressure transmitter is automatically calibrated using a zero adjustment module.

Differential pressure, static pressure (for compressible fluids) and the temperatures are fed to the flow computer where, in conjunction with the geometry of the differential pressure transducer, they are converted into volume flow, standard volume flow, mass flow and power as well as into the integral values volume, standard volume, mass and energy using recognised methods.

5. CONSTRUCTION

The compact version of the flow meter EDZ 110.1 / 117.1 or the energy meter EWZ 110.1 / 117.1 consists of:

- Transducer (measuring ring or measuring tube with cross probes)
- Spacer
- 3-way shut-off block
- DT 311.1 differential pressure transmitter with zero adjustment module
- Integrated temperature sensor and pressure sensor (both optional)
- Flow computer ERW700 unit either attached as EDZ/EWZ 110.1 or separately as EDZ/EWZ 117.1
- Temperature sensor or temperature sensor pair PT 1000

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6. TECHNICAL DATA

EDZ / EWZ 110.1 / 117.1

Transducer

	Water, water-glycol mixtures, thermal oils, brine mixtures, etc.													
nominal size	15	20	25	32	40	50	65	80	100	125	150	200	250*	
Flow rate Q _{max}	5	10	16	24	33	57	93	130	220	350	500	880	1250	
Flow rate Q _{min}	0,2	0,3	0,5	0,8	1,1	1,9	3,1	4,4	7,4	12	17	30	42	
Gases**	Compressed air, nitrogen, carbon dioxide, etc.													
nominal size	15	20	25	32	40	50	65	80	100	125	150	200	250*	
Flow rate Q _{max} Compressed air [Nm³/h] at p = 7 bar a, T = 20°C	300	560	940	1600	2120	3450	5900	7760	12840	20780	30900	56300	84000	
Flow rate Q _{min} Compressed air [Nm³/h]	10	19	32	55	70	120	200	260	430	700	1030	1900	2800	
Nominal pressure	PN40											PN 16/25/40		
Version	as measuring ring made of 1.4571											as measuring tube***		
Pressure losses [mbar]	see diagram													
Overall length L [mm]	65											500		
Operating temperature	max. 300°C											max. 300°C		
Integrated temperature sensor (optional)	PT500, integrated in the measuring ring													

*larger DN, dimensions, higher temperatures on request

**for the design of nitrogen, carbon dioxide etc. see design diagram

***Measuring tube version only with remote measuring head

DT 311.1 differential pressure transmitter with zero adjustment module

Differential pressure	0.8 - 1000 mbar
Measurement uncertainty	± instantaneous value x 0.1 % +0.05 mbar
Auxiliary energy	24 VDC (22 - 20 VDC) is supplied by the flow computer ERW 700
Power consumption	3 15 W
Nominal pressure	PN 40
Material	Wetted parts made of stainless steel
Protection class	IP 65
Medium temperature	max. 80°C in the transmitter
Ambient temperature	Liquids > +4°C, gases > -25°C, max. +55°C
Integrated pressure sensor (optional)	0-1 bar, 0-2.5 bar, 0-4 bar, 0-10 bar, 0-16 bar, 0.25 bar, 0-40 bar, uncertainty 0.2 % or 0.5 %

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Flow computer ERW 700

Version of flow computer ERW 700	Housing for wall/panel mounting or attached to differential pressure transmitter
Material / Housing	ABS offset version, aluminium compact version
Protection class	IP 65 to IEC 529 / EN 60529 (for wall mounting in plastic housing)
Entrance	2 x analogue 0/4 - 20 mA (active or passive)
Temperature input	PT 1000 / PT 500 / PT 100 or default value
Graphic multifunction display	For P in kW or MW, Q in l/h or m³/h, tw in °C, tk in °C, Δt in K, E in kWh, V in l or m³
Output potential-free	<ul style="list-style-type: none"> - 2 x (0)4-20 mA galvanically isolated, free assignment to all important instantaneous values - 3 x open collector galvanically isolated (optocoupler). Can be freely assigned to the electrical totalizers and used as a limit contact or status signal - M-Bus (metre bus) galvanically isolated Hardware: RS 232 (Modbus RTU, Modbus ASCII)
Ambient temperature	-10°C to +55°C
Auxiliary energy	230 VAC or 24 VDC

Additional equipment for flow computer ERW 700

Output: Expansion stage 1 (basic device plus 1 additional output card) <ul style="list-style-type: none"> - 4 x (0)4 - 20 mA galvanically isolated - 5 x pulse / status, galvanically isolated (optocoupler) - 1 x M-Bus - 1 x RS 232 Modbus
Output: Expansion stage 2 (basic device plus 2 additional output cards) <ul style="list-style-type: none"> - 6 x (0)4 - 20 mA galvanically isolated - 7 x pulse / status, galvanically isolated (optocoupler) - 1 x M-Bus - 1 x RS 232 Modbus
Output: Expansion stage with special outputs (basic device plus additional output card including outputs up to expansion stage 2) <ul style="list-style-type: none"> - 2. M-Bus interface or - Ethernet interface with Modbus TCP/IP protocol - RS-485 interface - Additionally with Profibus DP module
ERW 700 version in 19" rack
Special version with additional totalizer (e.g. bidirectional measurement, limit-dependent tariff switching)
System testing, commissioning and instruction by METRA customer service

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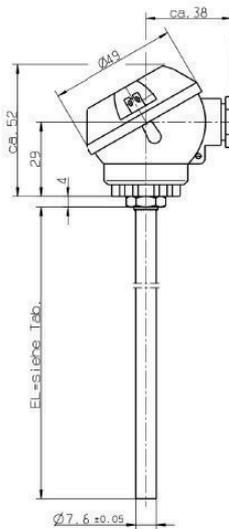
Temperature sensor with replacement sleeve

PT 1000, class AA, -50°C to +200°C

Type approval: Heat 0°C to +180°C, MID: DE-16-MI004-PTB023 Rev.0

Type approval: Cold 0°C to +120°C, national: DE-16-MI004-PTB023 Rev.0

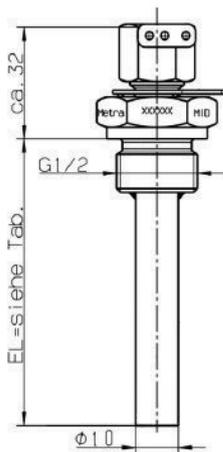
PT 100, class A, -50°C to +400°C



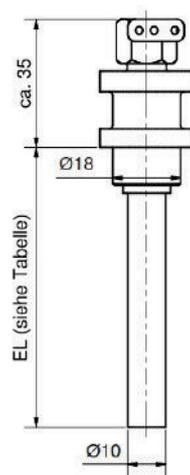
Resistance thermometer	
EL	130 mm 250 mm 300 mm Other lengths on request

Protective sleeve	
EL	75 mm 160 mm 200 mm Other lengths on request

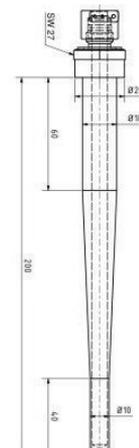
Standard protective sleeve



Weld-in protective sleeve



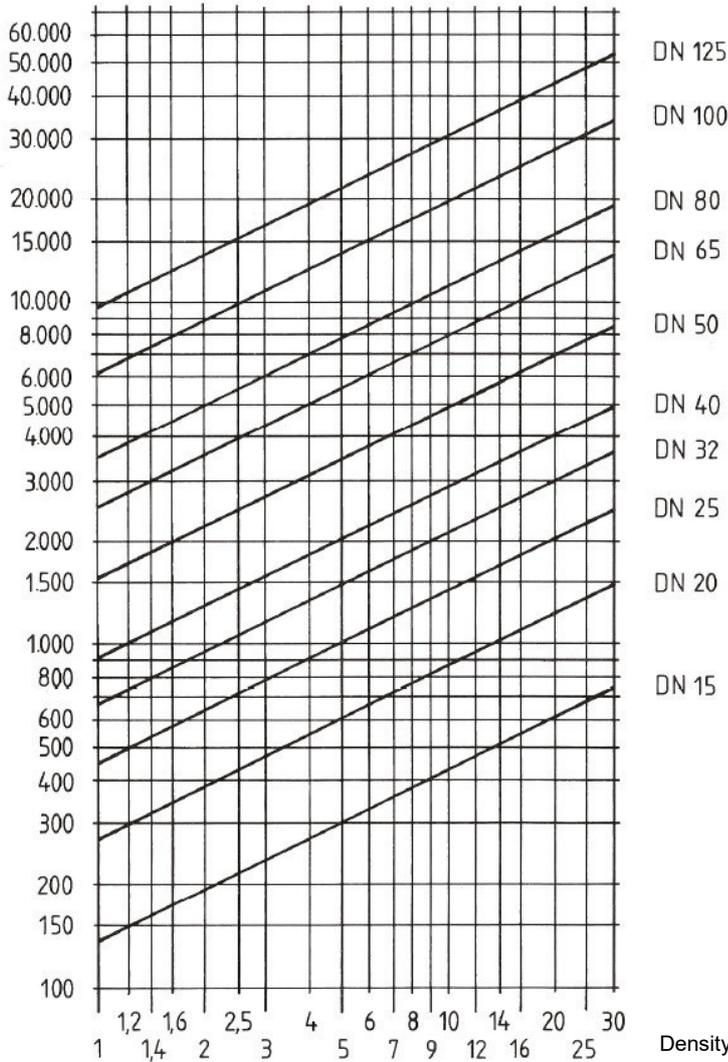
Weld-in protective sleeve (without type approval)



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Design diagram for technical gases

Standard volume flow VN (Nm³/h)
 at 0°C, 1.0132 bar



to arrive at a rough estimate of the nominal diameter, proceed as shown in the following example:

are given:
 Medium Air
 Pressure $p = 10 \text{ bar abs}$
 Temperature $T = 20^\circ\text{C}$
 Nominal volume $VN = 3000 \text{ Nm}^3/\text{h}$

The table shows a density of 11.88 kg/m^3 at 10 bar and 20°C

Use this value to go vertically into the diagram up to $3000 \text{ Nm}^3/\text{h}$. The nearest higher nominal size is DN 40

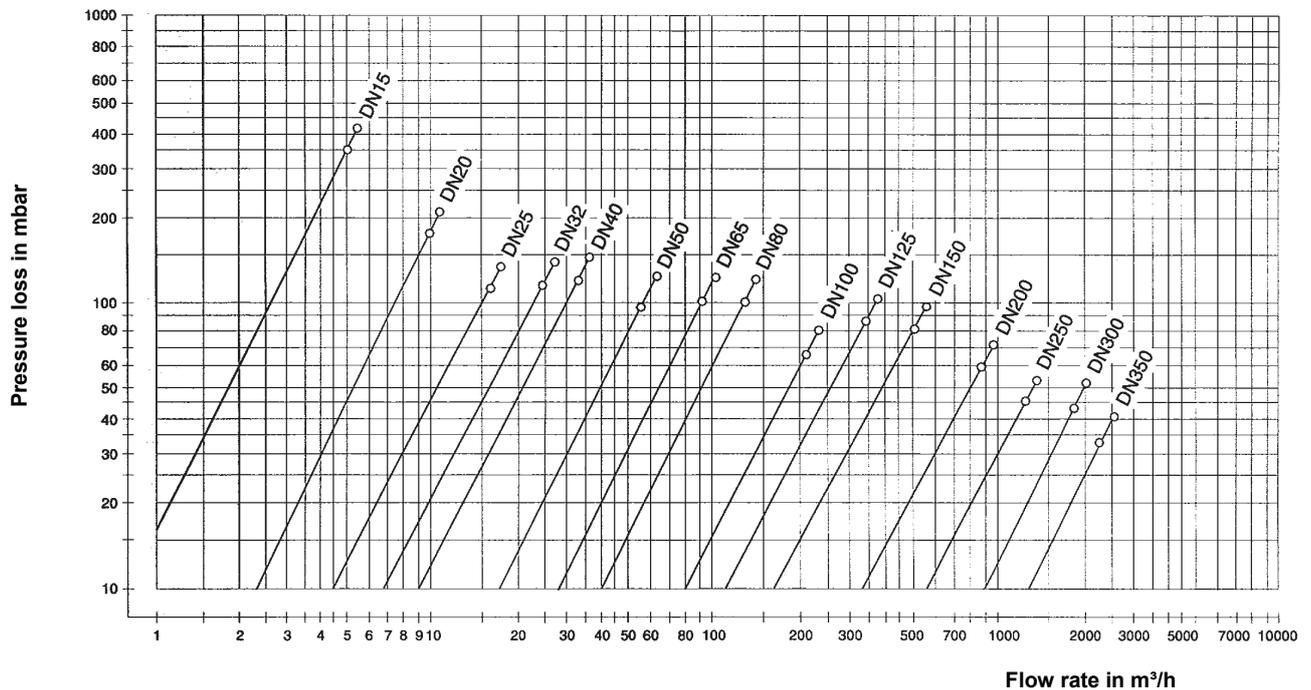
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Density of dry air as a function of pressure and temperature

Pressure p abs [bar]	Temperature t [°C]					
	0	10	20	30	40	50
1,0	1,276	1,231	1,189	1,149	1,113	1,078
2,0	2,551	2,461	2,377	2,299	2,225	2,156
3,0	3,827	3,692	3,566	3,448	3,338	3,235
4,0	5,102	4,922	4,754	4,597	4,451	4,313
5,0	6,378	6,153	5,943	5,747	5,563	5,391
6,0	7,653	7,383	7,131	6,896	6,676	6,469
7,0	8,929	8,614	8,320	8,045	7,788	7,548
8,0	10,204	9,844	9,508	9,195	8,901	8,626
9,0	11,480	11,075	10,697	10,344	10,014	9,704
10,0	12,755	12,305	11,885	11,493	11,126	10,782
11,0	14,031	13,536	13,074	11,860	12,239	11,860
12,0	15,307	14,766	14,262	13,792	13,352	12,939
13,0	16,582	15,997	15,451	14,941	14,464	14,017
14,0	17,858	17,227	16,640	16,091	15,577	15,095
15,0	19,133	18,458	17,828	17,240	16,690	16,173
16,0	20,409	19,688	19,017	18,389	17,802	17,251
17,0	21,684	20,919	20,205	19,539	18,915	18,330
18,0	22,960	22,149	21,394	20,688	20,028	19,408
19,0	24,235	22,380	22,582	21,873	21,140	20,486
20,0	25,511	24,610	23,771	22,987	22,253	21,564

Pressure losses with liquids

Pressure loss in the measuring ring (measuring tube) [mbar]



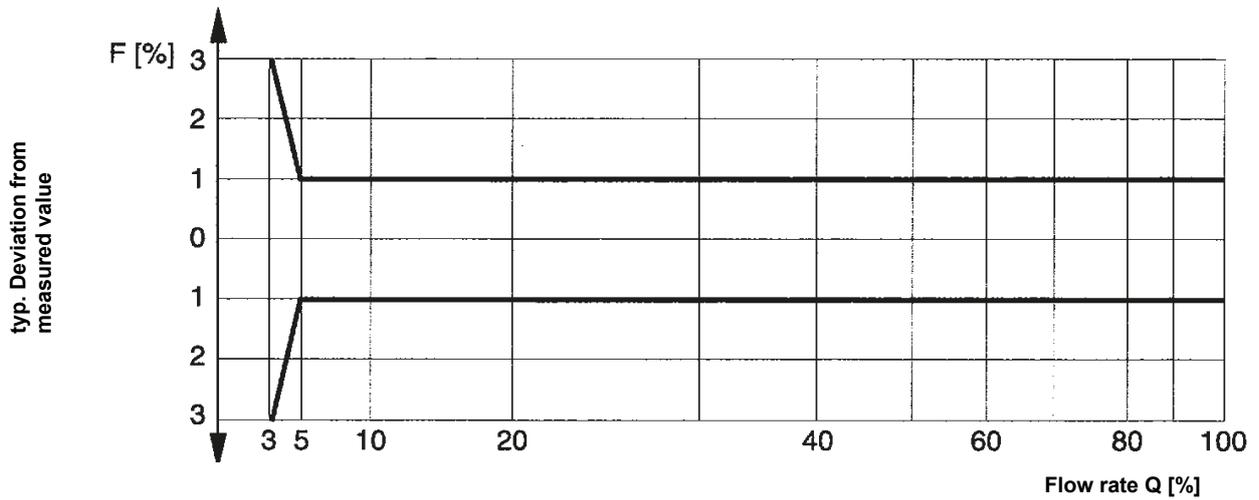
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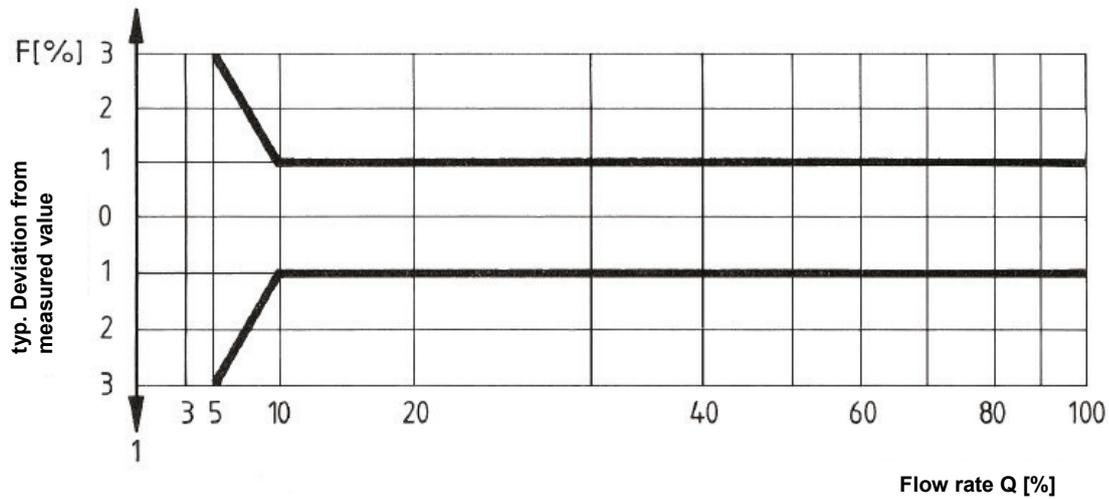
Uncertainty values

The uncertainty values refer to the overall measurement. The prerequisite is that the specified inlet and outlet sections are adhered to and the sensor is installed concentrically in the pipework.

Liquids



Technical gases



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7. INSTALLATION INSTRUCTIONS

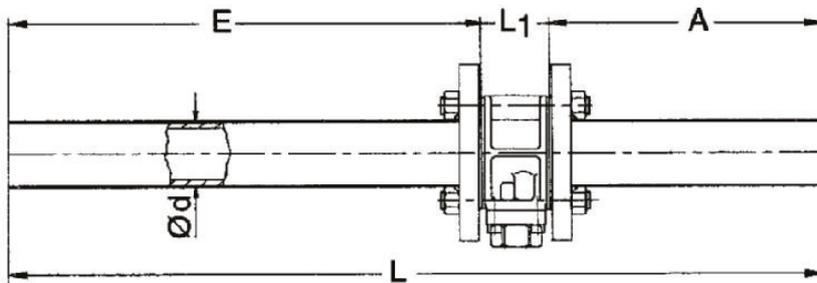
Assembly

For exact centring of the measuring ring in the pipe, we (METRA EMT) recommend using centring flanges with inlet and outlet sections including screws and seals. A fitting ring should be used to pre-assemble or press off the measuring section.

For inlet and outlet sections produced on site, care should be taken to ensure that the internal pipe diameter corresponds exactly to the measuring ring width. The measuring rings correspond to the nominal pressure rating PN 40. The matching intermediate clamping flanges can be found in the table below.

Necessary reductions and extensions must be carried out concentrically.

Dimensions of the inlet and outlet sections



nominal size	Flange
DN 15 to DN 50	PN 16, PN 25, PN 40
DN 65 to DN 125	PN 25, PN 40

nominal size	DN											Measuring tube		
		15	20	25	32	40	50	65	80	100	125	150*	200*	250*
L	mm	500	550	600	700	750	1000	1200	1400	1800	2200			
E	mm	265	300	331	404	437	621	751	891	1151	1421			
A	mm	166	181	200	227	244	310	380	440	580	710			
Inner diameter d	mm	17,3	22,3	28,5	37,2	43,1	54,5	70,3	82,5	107,1	131,7			
L ₁	mm	65 + 2 x 2 mm seal										500	500	500
Nominal pressure	PN	40										16 / 25 / 40		
Weight approx.	kg	2,5	3	4	5,5	6,5	9	14	18	27	41			

*from DN 150 measuring tube version with flanges PN 16 or PN 25 or PN 40, remote version only

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Required inlet and outlet sections

To maximise performance, straight inlet and outlet sections and an appropriate distance between the measuring ring / measuring tube, elbows, pump and valves are required. It is also important to centre the measuring ring / measuring tube in relation to the pipe flanges and seals.

Valves must always be installed downstream of the measuring ring / measuring tube. Select a position on the pipe where the inlet section to the measuring ring / measuring tube is straight, as indicated below.

Malfunction: 90° elbow

inlet section	outlet section
min 10 x Di	min 3 x Di

Malfunction: 2 x 90° elbows on the same level

inlet section	outlet section
min 10 x Di	3 x Di

Malfunction: 2 x 90° elbows on 2 levels

inlet section	outlet section
min 18 x Di	3 x Di

Fault: Valve (partially open)

inlet section	outlet section
25 x Di	3 x Di

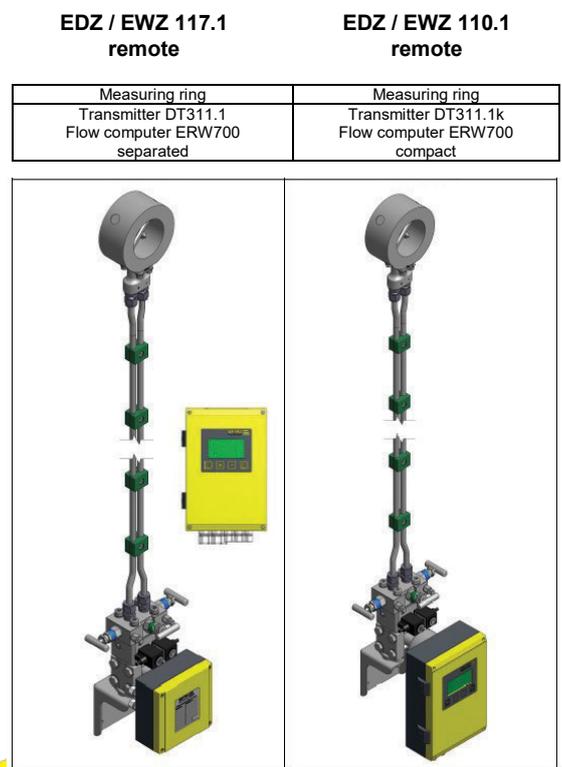
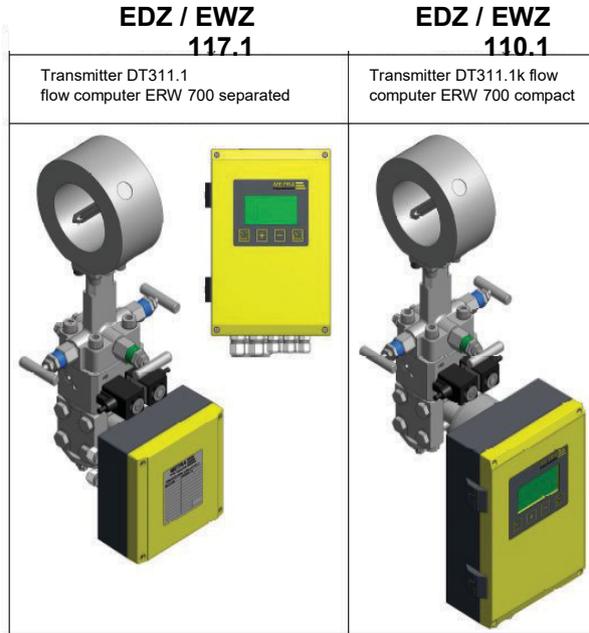
Fault: Reducer

inlet section	outlet section
10 x Di	0 x Di

Di = nominal size or inner diameter of the volume sensor

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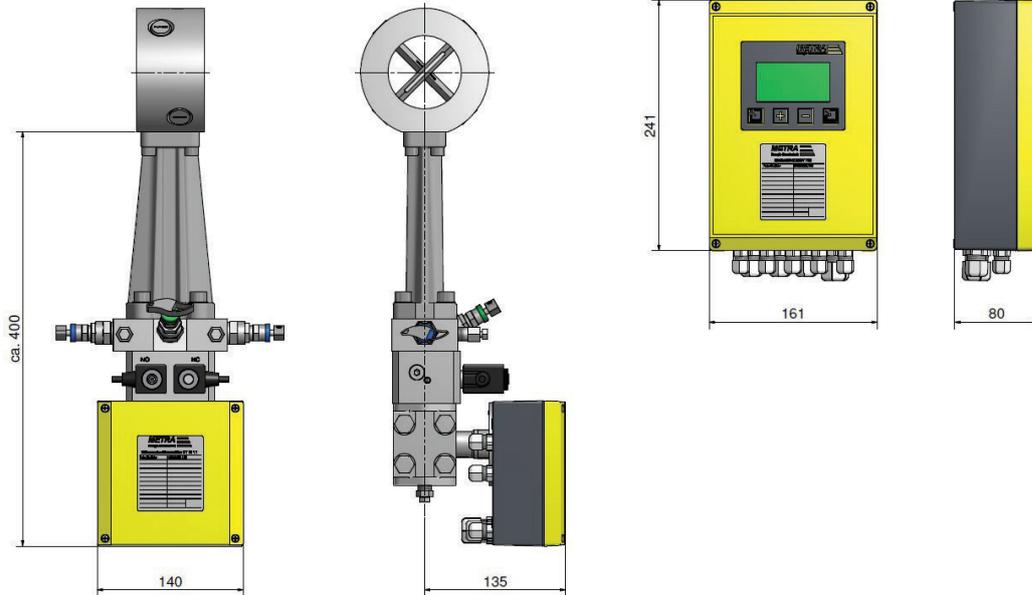
8. VARIANTS OF EDZ / EWZ 110.1 AND 117.1



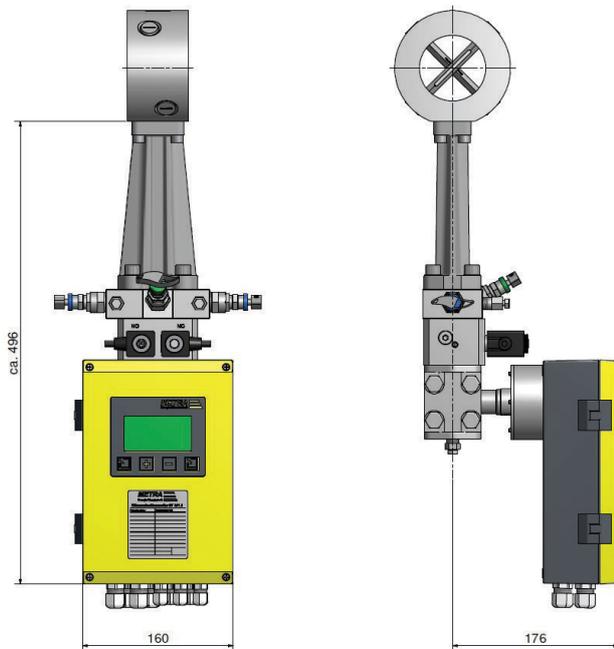
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9. DIMENSIONS

EDZ / EWZ 117.1



EDZ / EWZ 110.1



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10. ORDER AND TENDER TEXT

Flow / energy meter "autarkon®" EDZ / EWZ 110.1 and EDZ / EWZ 117.1 consisting of:

Transducer:

Cross probe for intermediate flanging (overall length 65 mm)

Medium: _____

Operating mode (energy / flow): _____

Operating pressure: _____ bar (abs.)

Operating temperature: _____ °C

Installation location (flow / return): _____

Installation position (horizontal / vertical): _____

Flow direction (from left to right, from right to left, from bottom to top, from top to bottom?) _____

*Possible versions / designs:

- EDZ / EWZ 110.1, compact
 Cross probe with directly mounted DT 311.1 transmitter, flow computer ERW 700 integrated in the transmitter housing
- EDZ / EWZ 117.1, compact
 Cross probe with directly mounted DT 311.1 transmitter, with separate flow computer ERW 700
- EDZ / EWZ 110.1, remote
 Cross probe connected to DT 311.1 transducer via differential pressure lines, flow computer ERW 700 integrated in the transmitter housing
- EDZ / EWZ 117.1, remote
 Cross probe connected to DT 311.1 transducer via differential pressure lines, with separate flow computer ERW 700

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- **Cross probe** including 3-fold valve shut-off module with test connection, suitable for plausibility checks during operation
- **DT 311.1 differential pressure transmitter** including adjustment module for automatic zero adjustment (for high measuring dynamics and maximum measuring accuracy)
- **ERW 700** flow and energy computer, suitable for wall and panel mounting
- Graphic multifunction display for all relevant display values
- Flexibly configurable (logger functions for key date, monthly values, period memory, error memory, parameter memory and min / max memory)
- Protection class IP65
- Power supply 230 VAC

Accessories

Output: Expansion stage 1 (basic device ERW 700 plus 1 additional output card) - 4x (0)4 - 20 mA galvanically isolated, - 5x pulse/status, galvanically isolated (optocoupler) - 1x M-Bus - 1x RS 232 Modbus
Output: Expansion stage 2 (basic device ERW 700 plus 2 additional output cards) - 6x (0)4 - 20 mA galvanically isolated- 7x pulse/status, galvanically isolated (optocoupler) - 1x M-Bus - 1x RS 232 Modbus
Output: Expansion stage with special outputs (basic device ERW 700 plus additional output card incl. outputs up to expansion stage 2) - 2. Mbus interface or - Ethernet TCP/IP interface or - RS-485 port Additionally with Profibus DP module
Input: Expansion stage 1 (basic device plus 1 additional input card): - 4x (0)4 - 20 mA, - 2x pulse/frequency- 4x transmitter supply
ERW 700 version in 19" rack
Special version with additional totalizer (e.g. bidirectional measurement, limit-dependent tariff switching)
System testing, commissioning and instruction by METRA customer service
Temperature sensor - 1x Pt 1000 / PT 100 - 2x Pt 1000 / PT 100 - 1x Pt 500 integrated in the cross probe
Stainless steel thermowells - Type 75 mm, type 160 mm, type 200 each G1/2" or - Type 75 mm, type 160 mm, type 200 each with weld-on end
Integrated pressure sensor (optional) 0-1 bar, 0-2.5 bar, 0-4 bar, 0-10 bar, 0-16 bar, 0-25 bar, 0-40 bar, uncertainty 0.2% or 0.5%
System testing, commissioning and instruction by METRA customer service