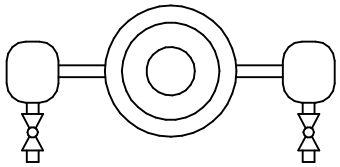
autarkon® Measuring System

Flow / Energy Meter for Vapours, Liquids and Technical Gases
- EDZ / EWZ 1x0.1 and
- EDZ / EWZ 1x7.1

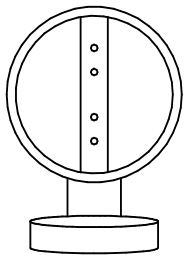
with Microprocessor Technology

Application

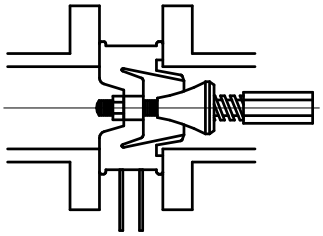
Measuring and registering the standard volume, the volume or the mass of vapours, liquids and technical gases in conjunction with freely selected differential pressure devices (with pressure and temperature compensation).



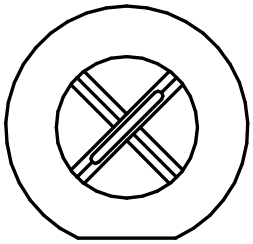
Ring chamber standard orifice plate



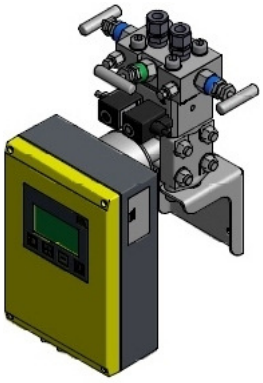
Dynamic pressure probe



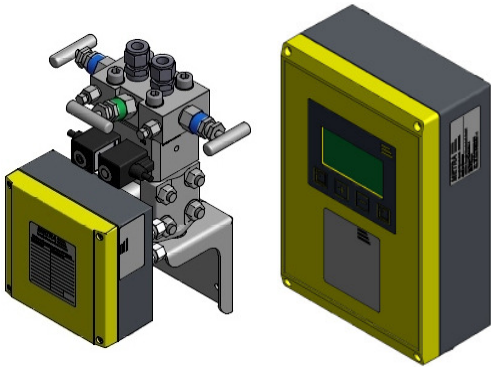
Gilflo



METRA cross probe



EDZ / EWZ 1x0.1 offset



**EDZ / EWZ 1x7.1 offset,
with separate ERW 700 calculation unit**

Special features

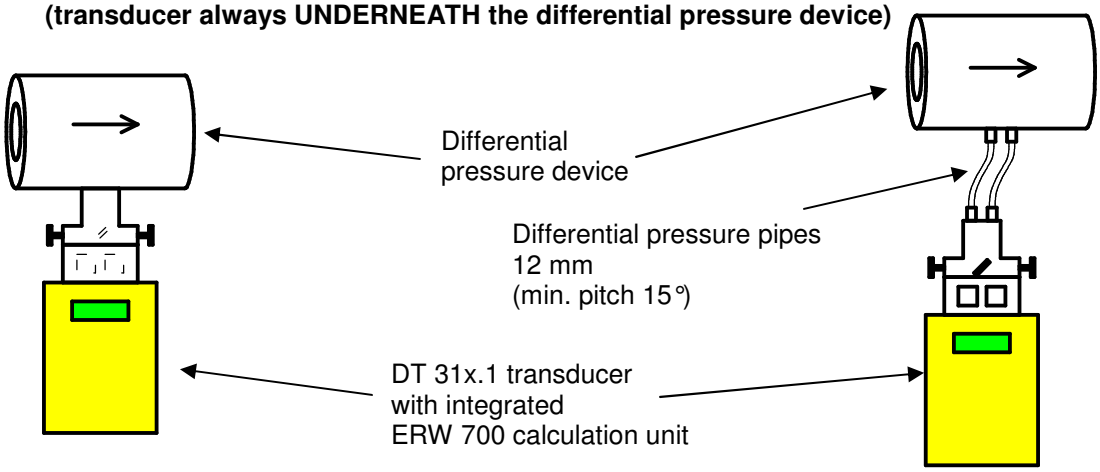
- Option for conducting plausibility and accuracy tests during operation
- Compact design, no moving parts
- No maintenance, no wear
- Large measuring dynamics with minimum measuring uncertainty
- Suitable for billing purposes
- Inlet / Outlet section in accordance with DIN EN ISO 5167 required
- Compact, highly-integrated measuring system (pressure and temperature compensation integrated in the measuring device, ensuring simple and inexpensive installation)
- Robust and fail-safe measuring system
- Automatic correction of the flow coefficients and expansion number
- Communication: - Analogue output signals 4 - 20 mA / digital outputs
  - MBus / Modbus interface
  - Numerous add-ons

Type overview

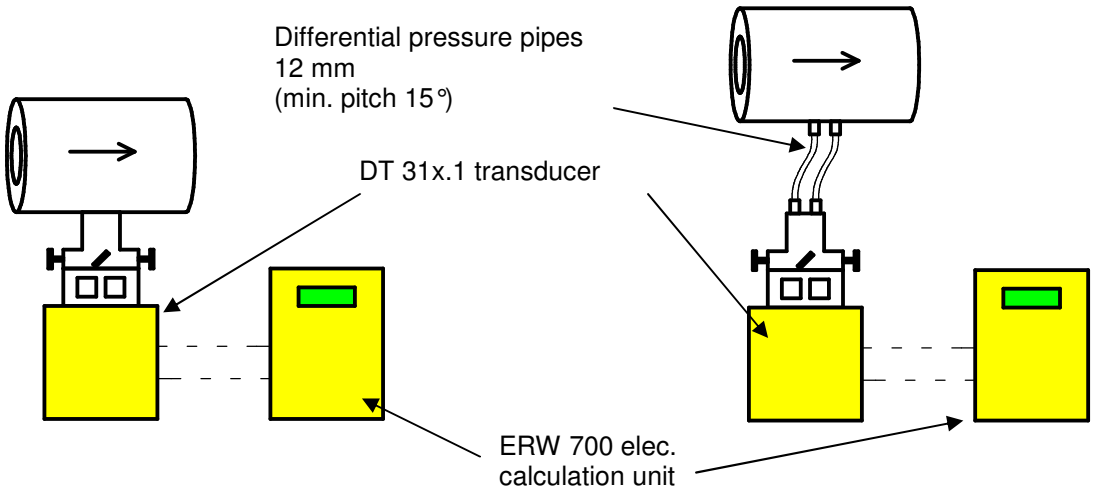
With ERW 700 calculation unit (integrated in the transducer)
- EDZ / EWZ 110.1, differential pressure device METRA measuring ring / cross probe (compact or offset)
- EDZ / EWZ 120.1, differential pressure device METRA measuring orifice (compact or offset)
- EDZ / EWZ 130.1, differential pressure device METRA venturi nozzle (compact or offset)
- EDZ / EWZ 140.1, freely selected differential pressure device (only offset)
- EDZ / EWZ 150.1, differential pressure device METRA venturi tube (compact or offset)

With separate ERW 700 calculation unit
- EDZ / EWZ 117.1, differential pressure device METRA measuring ring / cross probe (compact or offset)
- EDZ / EWZ 127.1, differential pressure device METRA measuring orifice (compact or offset)
- EDZ / EWZ 137.1, differential pressure device METRA venturi nozzle (compact or offset)
- EDZ / EWZ 147.1, freely selected differential pressure device (only offset)
- EDZ / EWZ 157.1, differential pressure device METRA venturi tube (compact or offset)

Examples: For liquids and vapours
(transducer always UNDERNEATH the differential pressure device)

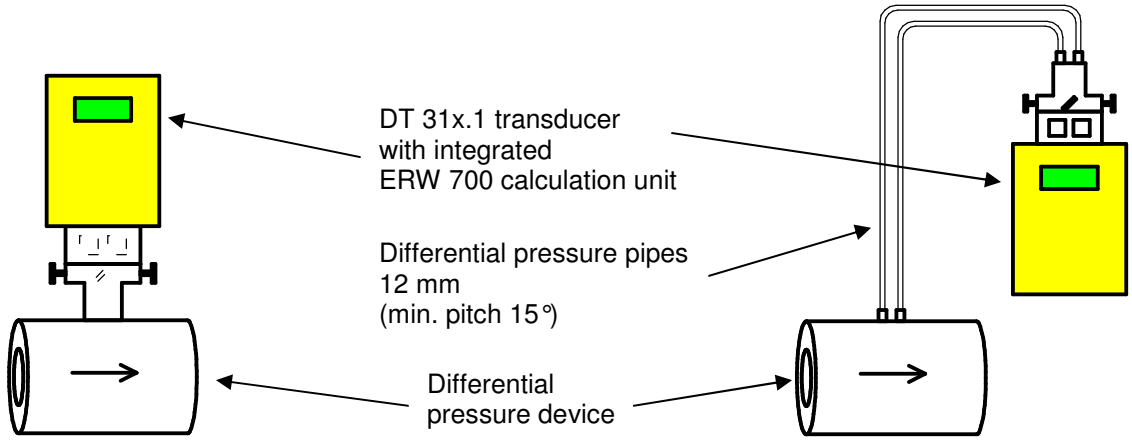


EDZ / EWZ 120.1 compact **EDZ / EWZ 120.1 offset**

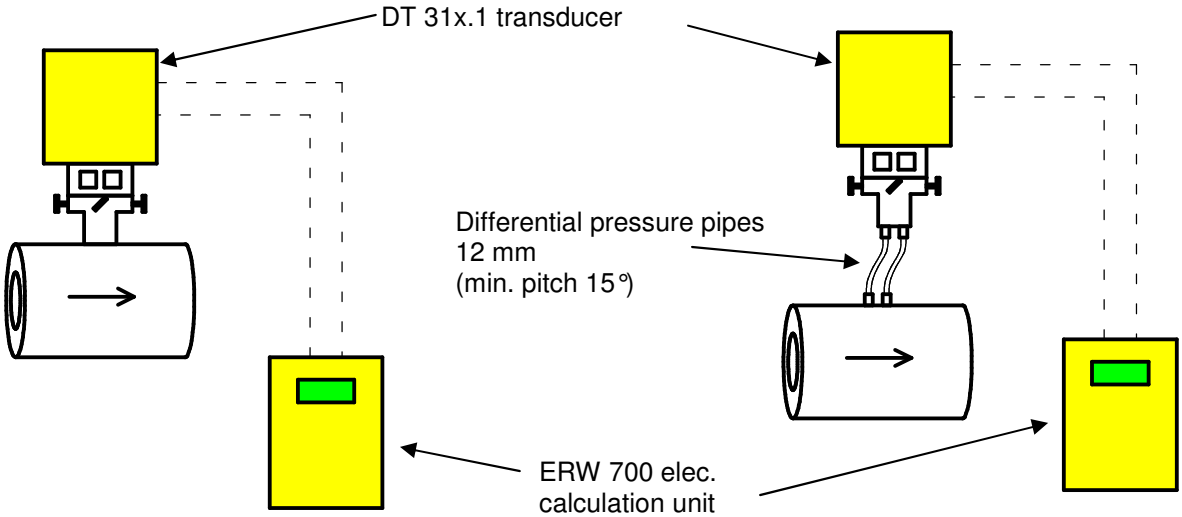


EDZ / EWZ 127.1 compact **EDZ / EWZ 127.1 offset**

Examples: for technical gases
(transducer always ABOVE the differential pressure device!)



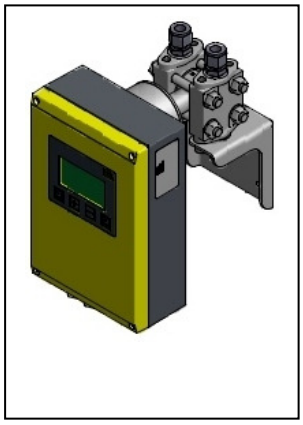
EDZ / EWZ 120.1 compact **EDZ / EWZ 120.1 offset**



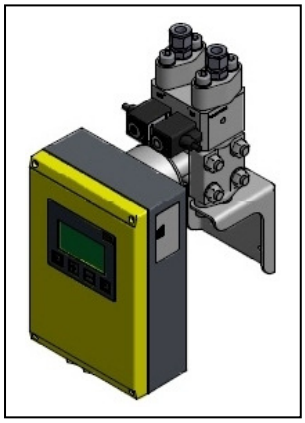
EDZ / EWZ 127.1 compact **EDZ / EWZ 127.1 offset**

EDZ / EWZ 1x0.1 versions

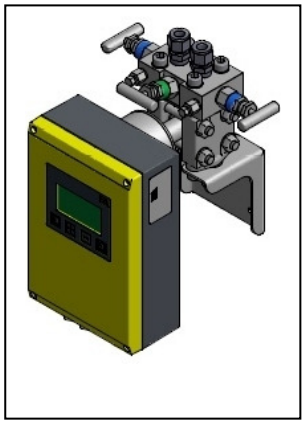
Offset version



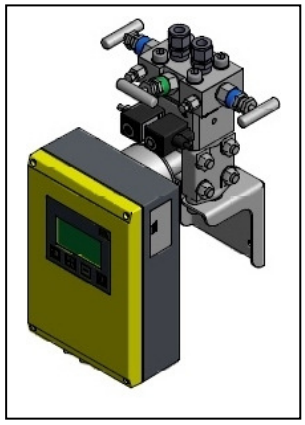
Version 1 – offset without balancing module, without shut-off module



Version 2 – offset with balancing module



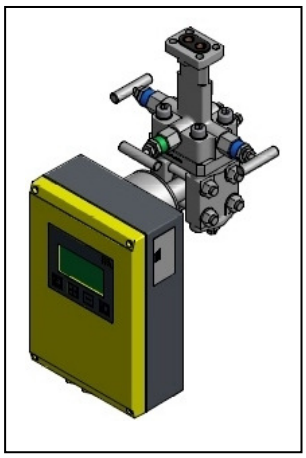
Version 3 – offset with threefold shut-off module



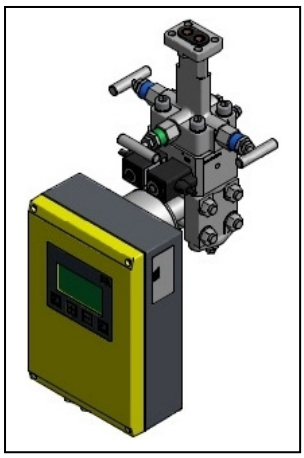
Version 4 – offset with balancing module and threefold shut-off module

Compact version (only in conjunction with METRA measuring orifice / cross probe)

for vapours and liquids

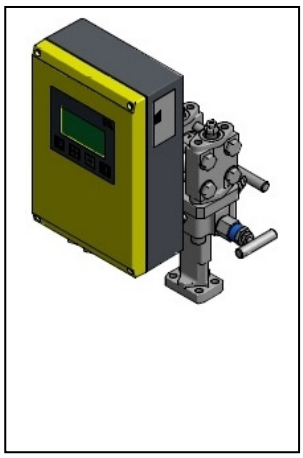


Version 5 – compact with threefold shut-off module

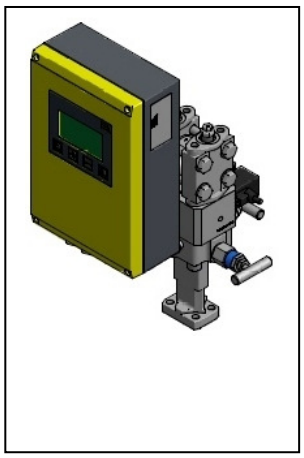


Version 6 – compact with balancing module and threefold shut-off module

for technical gases



Version 7 – compact with threefold shut-off module

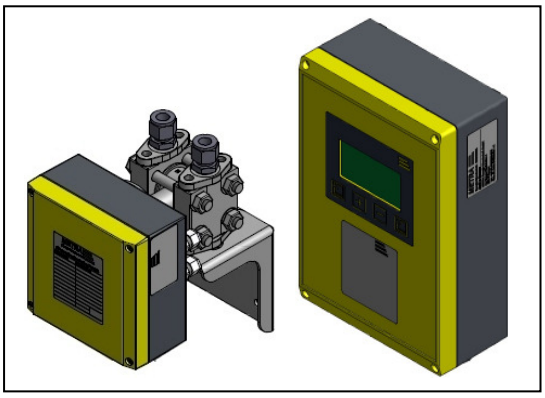


Version 8 – compact with balancing module and threefold shut-off module

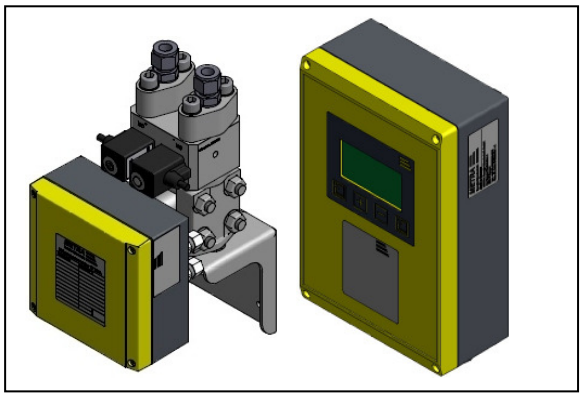
(optionally available with fivefold shut-off block)

EDZ / EWZ 1x7.1 versions

Offset version

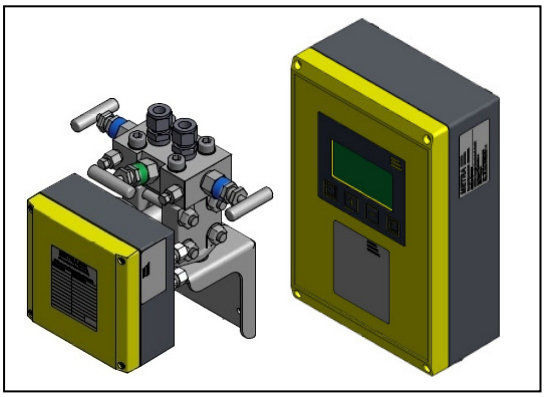


Version 1 - offset without balancing module, without shut-off module

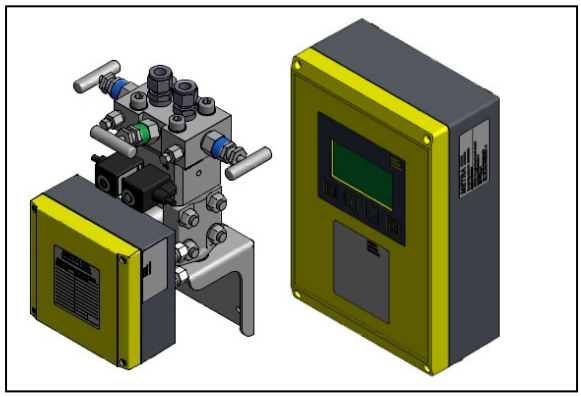


Version 2 - offset with balancing module

Offset version

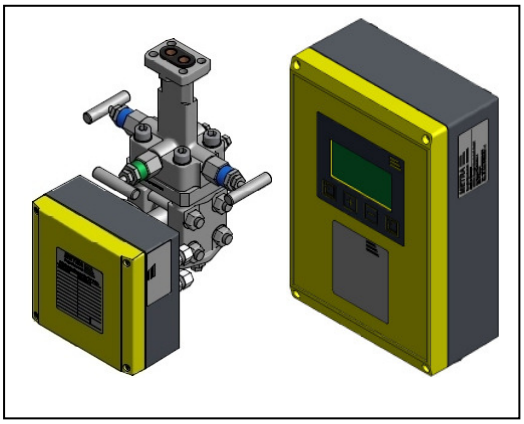


Version 3 – offset with threefold shut-off module



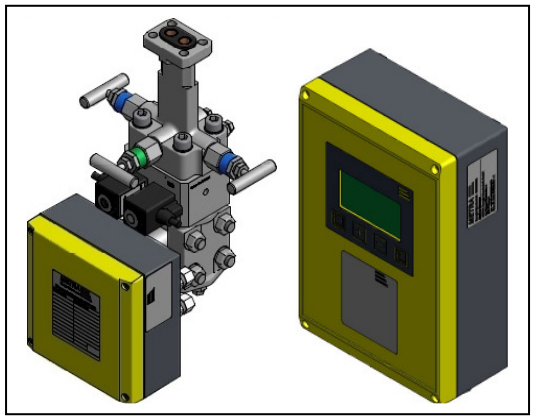
Version 4 – offset with balancing module and threefold shut-off module

Compact version (only in conjunction with METRA measuring orifice / cross probe)



Version 3 – compact with threefold shut-off module

(also available with fivefold shut-off block)



Version 4 - compact with balancing module and threefold shut-off module

General

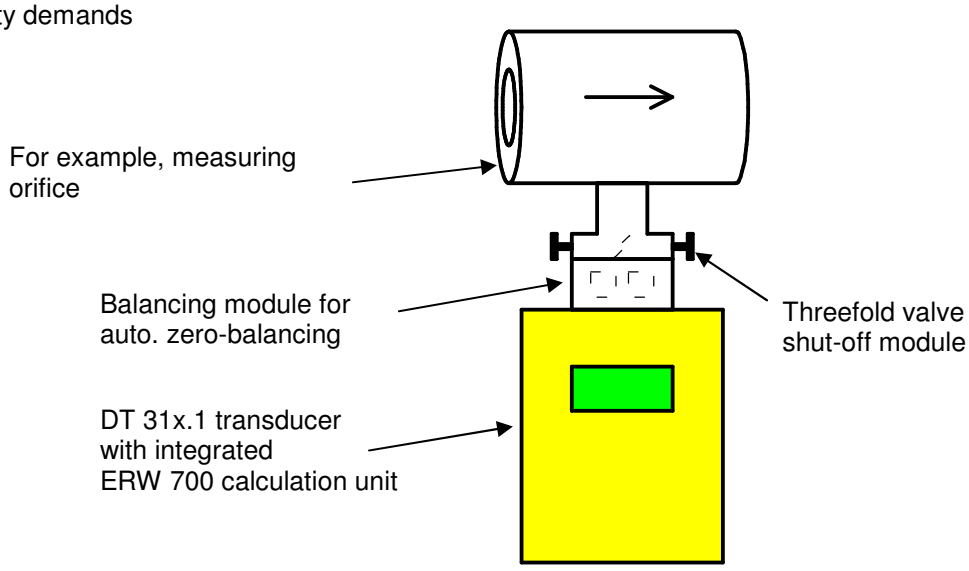
EDZ 1x0.1 / EDZ 1x7.1 is a modular measuring system based on the differential pressure method. Flow measurements with differential pressure devices are based on the principle of narrowing the pipe cross section at one point, thus increasing the flow velocity. The flow rate increase causes the pressure to decrease in the narrowest profile section. The differential pressure thus generated is a measurement of the flow. The measuring system can be combined with any differential pressure or dynamic pressure device. The differential pressure device provides a high differential pressure that equates to a large measuring range. Transducing the differential pressure into a signal proportional to the volume flow is realised in a differential pressure device with hydraulic zero-balancing. A hydraulic short circuit is generated automatically via the differential pressure device (depending on the flow). This zero-balancing compensates all disturbance variables that influence the zero point and long-term stability (e.g. ageing, temperature changes, changes in static pressure). This means that EDZ 1x0.1 / EDZ 1x7.1 can measure accurately within the smallest differential pressure ranges while exhibiting excellent long-term stability. Recording of static pressure and the media temperature is integrated in the overall system. Calculation of the mass flow or nominal volume flow occurs in the directly mounted flow/energy meter.

The required inlet section is a function of the diameter ratio of the differential pressure device (diameter ratio = d/D; d = bore diameter, D = internal diameter of pipe).

Accuracy testing of EDZ 1x0.1 / EDZ 1x7.1 can be conducted on-site at any time, even during operation.

Applications

- Measuring of vapour, water, water-glycol mixture and thermo-oil, compressed air, nitrogen, etc.
- Measurements for billing purpose for vapours, liquids and technical gases for the highest accuracy and plausibility demands



EDZ 1x0.1 / EDZ 1x7.1 is equipped with an automatic balancing module as standard. This ensures maximum measuring accuracy and a large measuring range. The device functions with absolute zero point and long-term stability thanks to the balancing module. EDZ 1x0.1 / EDZ 1x7.1 can also be checked for plausibility and correctness at any time - even during operation - due to the threefold valve shut-off module.

Each measuring system is calibrated at an accredited test bench. Achievable measuring accuracy is ≤ 1% of the **current value** at measuring dynamics of 30: 1 relative to the nominal flow rate.

Special features

- Can be combined with all common differential pressure devices (orifice, nozzle, venturi, cross probe, dynamic pressure probe, V-cone, etc.)
- Measured materials: gases, vapours and liquids
- Large backlit graphical display, flexible configuration, can be offset
- Excellent zero point and long-term stability and a large measuring range thanks to the balancing module
- Measuring range 30:1 relative to the volume and mass flow
- Integrated absolute pressure transmitter (optional)
- Automatic correction of the flow coefficient and expansion number
- Wetted parts are made of stainless steel
- Robust and fail-safe measuring system
- Overload proof on one side up to max. 63 bar (higher pressure available on request)
- Simple operation and parameterization (via software or manually via keyboard)
- Logger functions for record date, monthly values, period log, error log, parameter log and min/max log
- Easy installation
- Option for conducting plausibility and accuracy tests during operation
- Transmission behaviour 4 - 20 mA (Δp) linear or square rooted
- Communication: - Analogue current outputs 4 - 20 mA
  - Digital outputs
  - MBus / Modbus interface
  - Numerous additional add-ons
- Fault message via current output in accordance with NAMUR NE43

Special features with the balancing module

The differential pressure devices of the DT 31x.1 series with a balancing module are characterised by their large dynamic range and outstanding measuring accuracy.

Thanks to the automatic zero-balancing, the devices offer zero point stability and achieve the highest level of measuring accuracy even in the lower differential pressure range.

Factors which influence the zero point, such as temperature, pressure changes and ageing, are fully compensated.

The long-term stability of the device series is unequalled due to the constantly recalibrating system.

The influence of temperature and pressure changes on the measuring span is negligible due to the piezo-resistive measuring cell.

Long-term stability with the balancing module

Long-term stability is one of the key measuring criteria for the quality of a differential pressure device. An undetected zero point drift of the differential pressure device can have serious implications for the overall measuring accuracy of a billing measurement, in particular when the device is an integral part of a high-quality differential pressure billing measurement.

These zero point drifts can be caused by temperature and pressure changes, ageing or by undefined operating conditions or errors which result in application of the measuring membrane.

The system is constantly calibrated by integrating automatic zero-balancing. The DT series, therefore, offers zero-point stability and guarantees overall measuring accuracy for many years.

Application

Measuring and counting of vapours, liquids and technical gases in conjunction with freely-selected differential pressure devices

Technical data DT 31x.1

Model	DT 310.1	DT 311.1	DT 312.1
Measuring span	0 – 100 mbar	0 – 1000 mbar	0 – 2000 mbar
The balancing module is only controlled by the ERW 700 elec. calculation unit			
Set measuring range (with balancing module)	0.5 – 100 mbar	0.8 – 1000 mbar	2 – 2000 mbar
Measuring uncertainty* (with balancing module) relative to the current value * within the set measuring range	± **current value** x 0.1% + 0.03 mbar	± **current value** x 0.1% + 0.05 mbar	± **current value** x 0.1% + 0.2 mbar
Set measuring range (without balancing module)	0 – 100 mbar	0 – 1000 mbar	0 – 2000 mbar
Measuring uncertainty* (without balancing module) relative to the final value * within the set measuring range	± 0.1%	± 0.1%	± 0.1%
Temperature range in the transmitter	-25 to +80°C + 4 to + 80°C (for water)	-25 to +80°C + 4 to + 80°C (for water)	-25 to +80°C + 4 to + 80°C (for water)
	Caution: If the transducer is filled with water, precautions to prevent freezing are necessary at temperatures < 4°C		
Max. operating pressure	63 bar with balancing module, 250 bar without balancing module	63 bar with balancing module, 250 bar without balancing module	63 bar with balancing module, 250 bar without balancing module
Measurement report	3-point calibration protocol (Δp)		
Integrated absolute pressure transmitter (optional)	Pabs1 or Pabs2	± 0.5% to the final value ± 0.1% to the final value	

Measuring uncertainty considerations

Comparison of METRA differential pressure device DT 311.1 (set measuring range 0-800 mbar) with fictitious competitor A and/or competitor B.

All measuring uncertainty details from METRA refer to the current value and not to the final value as is the general case.

Working point	METRA DT 311.1 ± MW x 0.1% + 0.05 mbar (**with** balancing module)	METRA DT 311.1 ± 0.1% to the final value (**without** balancing module)	Manufacturer A ± 0.1% to the final value	Manufacturer B ± 0.3% to the final value
800 mbar	0.11%	0.10%	0.10%	0.3%
100 mbar	0.15%	0.80%	0.80%	3.00%
50 mbar	0.20%	1.60%	1.60%	6.00%
10 mbar	0.60%	8.00%	8.00%	30.00%
1 mbar	5.10%	80.00%	80.00%	300.00%

Integrated absolute pressure transmitter (Pabs option)

Versions	
Pabs 1	± 0.5% to the final value
Pabs 2	± 0.1% to the final value

Maximum operating pressure

Model	Without balancing module	With balancing module
DT 310.1	250 bar	63 bar *
DT 311.1	250 bar	63 bar *
DT 312.1	250 bar	63 bar *

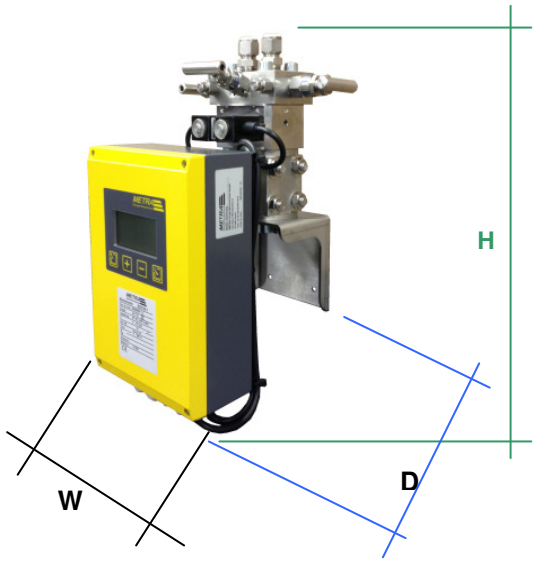
* max. 100 bar possible (an individual pressure test is required for this (option))

Measurement dynamics

DT 310.1	(max. 200 : 1) relative to Δp
DT 311.1	(max. 1250 : 1) relative to Δp
DT 312.1	(max. 1250 : 1) relative to Δp

Dimensions

Width W: 160 mm (stop valves 200 mm)
Height H: 370 mm
Depth D: 200 mm



Assembly instructions

Application of a threefold shut-off module is necessary in order to carry out commissioning, assembly and maintenance without process interruptions.
With the offset version, layout of the differential pressure pipes must be realized in accordance with DIN 19210 “Differential pressure piping for flow measurement devices”. To prevent blind areas in the differential pressure piping, the differential pressure pipes must be installed with an incline of at least 15% when connecting the differential pressure device and the transmitter.

Suitable anti-freeze protection must be provided when assembling EDZ / EWZ 100.1 in temperatures < 4°C.
This can be realized with a pipe heating system and a heated cabinet.

Measuring assembly

Caution:
EDZ / EWZ 100.1 is installed underneath the differential pressure device for liquids and vapours.
EDZ / EWZ 100.1 is installed above the differential pressure device for gases.

Please pay attention to the operating instructions!!

Description of the energy and flow computer

The directly mounted energy and flow computer ERW 700 uses input variables, such as differential pressure, pressure, temperature, to calculate the volume, standard volume, mass and energy of liquids, gases and vapours.

Calculations

- Volumetric flow rate
- Standard volumetric flow rate
- Mass flow rate
- Heat flow/Cold flow

Counters

- Operating volume
- Standard volume
- Mass
- Heat quantity/Cold quantity
- Tariff counter, fault counter
  Balance counter, energy difference

Inputs

- Current 0/4-20 mA, incl. transducer supply
- Frequency
- Pulse
- Temperature Pt100/500/1000 in 4-wire system passive or active.

Outputs

- Current 0/4-20 mA
- Pulse
- Digital (MBus, Modbus)
- Auxiliary power

Calculation methods

Liquids

- Density determination via algorithms and tables
- Thermal capacity via algorithms and tables

Water / Vapour

Calculation standard IAP WS IF-97 (water vapour table)

Gases

- Ideal gas law
- Flow correction considering temperature, pressure and compressibility
- Redlich-Kwong
- GERG 88

Input

Measured variable / Measuring uncertainty

Electrical measured variables:
Current, pulse, frequency, resistance, contact (status)
Physical measured variables:
Temperature, pressure, differential pressure, volume (flow), mass (flow), density

Special feature:
2 independent 24 Bit AD converters for resistance (temperature) and current.

Measured variable	Input parameter
Resistance	Model: PT 100, PT500, PT1000 4-wire measurement Overload protection: ± 24 V Measuring uncertainty T: 0.1% of MV ± 0.1 K Measuring uncertainty ΔT: 0.1% of MV ± 0.02 K Temperature influence T: 0.0025% / K Temperature influence ΔT: 0.0010 % / K Resolution: 24 Bit Measuring rate: approx. 16 / s Sensor break monitoring
Current	Measuring range: 0...0.22 mA Overload protection: ± 24 V Error detection 3.6 mA in accordance with Namur NE43 Measuring uncertainty: 0.01 % of MV ± 0.001 mA Temperature influence: 0.0025% / K Resolution: 24 Bit Measuring rate: approx. 16 / s
Frequency Pulse Status	Frequency measurement: 0.1 Hz ...15 kHz Metering: 0 ... 15 kHz Min. measuring time can be set: (0.1 s, 1 s, 2 s) Measuring uncertainty: 0.01 % of MV Temperature influence: 0.0025% / K Resolution: 0.001% of MV Switchable hardware filter: Without, 50 Hz (for suppressing contact bounces) Active signals: Voltage Lo (Us approx. 2 V), Hi (Us approx. 9 V) Passive signals: O.C, relay, Namur

Input variables (basic device)

2 x Pt 100 / 500 / 1000
2 x 0/4 – 20 mA, 2 x transducer supply
2 x pulse / frequency

Expansion stage input variables (basic device plus additional input card)

2 x Pt 100 / 500 / 1000
4 x 0/4 – 20 mA, 4 x transducer supply
2 x pulse / frequency

Output

Measured variable / Measuring uncertainty

Current, pulse, switching output/status, transducer supply

Output variable	Output parameter
Current	Range: 0…0.22 mA, active Max. load: > 500 Ω (U0 approx. 12V) Galvanic isolation among each other and to the basic device Error signals: 3.5 mA and 22 mA in accordance with NAMUR NE43 Accuracy: 0.02% of MV ± 0.002 mA Temperature influence: 0.005 % / K Resolution: 16 Bit
Pulse / Status	Type: Open collector, passive, galvanically isolated Frequency range: 0 ... 100 Hz Min. pulse width: 5 ms 500 ms Overload protection: ± 24 V Internal resistance 70 Ω Residual voltage < 1.2 V I_{max}: 20 mA U_{max}: 24 V

Number: (basic device)

2 x 0/4 – 20 mA
2 x pulse / status
1 x MBus
1 x RS 232 Modbus
1 x auxiliary power

Basic device plus one additional input card

4 x 0/4 – 20 mA
4 x pulse / status
1 x MBus
1 x RS 232 Modbus
1 x auxiliary power

Basic device plus two additional input cards

6 x 0/4 – 20 mA
6 x pulse / status
1 x MBus
1 x RS 232 Modbus
1 x auxiliary power

Reference conditions

Voltage supply: 230 VAC ±10%, 50 Hz ±0.5 Hz
Warm-up time: 10 min
Ambient temperature: 25°C ± 5°C
Humidity: 39% ±10% r. h.

Failure signal

- Error signal 3.5 mA and 22 mA in accordance with Namur NE43
- Error contact

Load

>= 500 Ohm (U0 approx. 12V)

Operating behaviour

- Accuracy class as heat meter in accordance with EN 1434-1
- Otherwise the behaviour depends on the medium and operating mode - typically 0.1%

Application limits

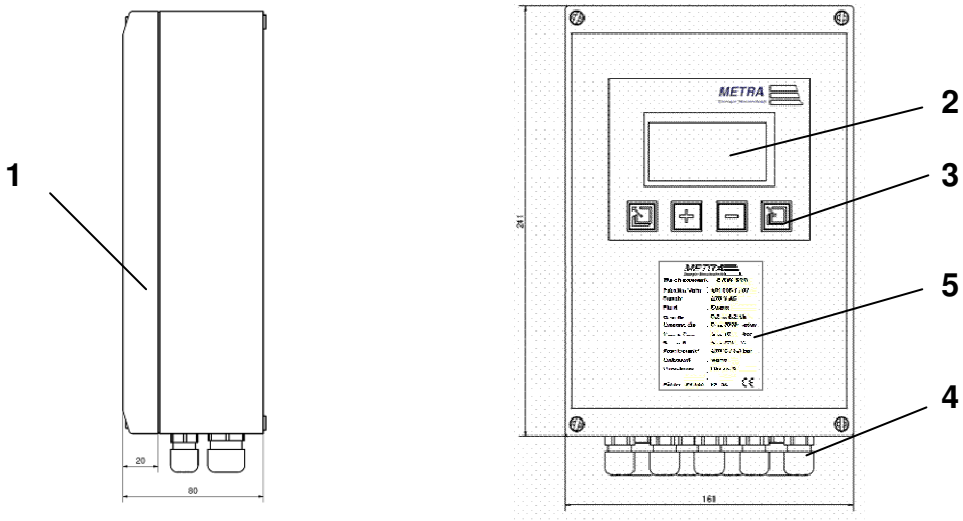
Fluid	Variable	Range
Liquids Gases Vapours	Temperature	Pt 100: -100°C to 600°C Pt 500: -100°C to 500°C Pt 1000: -100°C to 300°C
	Pressure	0 to 150 bar

Ambient conditions

Ambient temperature: 0°C to 55°C
Storage temperature: -30°C to 70°C
Climate class: in accordance with EN 1434 Class C
Degree of protection: IP54 IEC 529 / EN 60529

Design

Wall installation in plastic housing



1 Housing cover with display
2 Display
3 Keypad
4 Cable gland
5 Type plate

Ambient conditions

Ambient temperature range

0℃ to 55℃, climate class C in accordance with EN 1434

Storage temperature

-30℃ to 70℃

Electromagnetic compatibility

Interference emit: EN 61326 Class A

Interference stability:

- Power failure: 20 ms, no influence
- Electromagnetic fields: 10 V/m (80 ... 2700 MHz) in accordance with EN 61000-4-3
- Electromagnetic fields: 30 V/m (800 ... 2,000 MHz) in accordance with EN 61000-4-3
- Conducted HF: 0.15 to 80 MHz, 10 V in accordance with EN 61000-4-6
- Electrostatic discharge: 4 kV contact / 8 kV indirect in accordance with EN 61000-4-2
- Burst (AC and DC supply): 4 kV in accordance with EN 61000-4-4
- Burst (signal): 1 kV / 2 kV in accordance with EN 61000-4-4
- Surge (AC and DC supply): 1 kV / 2 kV in accordance with EN 61000-4-5
- Surge (signal): 500 V / 1 kV in accordance with EN 61000-4-5
- EN1434-4 Class C

Medium

Medium temperature range

Measuring ranges: -100℃ to 600℃

PT 100: -100℃ to 600℃
PT 500 -100℃ to 500℃
PT 1000: -100℃ to 300℃

Medium pressure range

0-150 bar

Physical condition

Liquids, vapours, gases

Display and user interface

- Large backlit graphical display, flexible configuration
- Can be offset, distance max. 5 m (switch cabinet door installation)
- Parameterization and operation via PC software and/or via a keyboard (4 keys)

Auxiliary power

Transducer supply and auxiliary power

Output variable	Output parameter
Transducer supply (MUS)	Voltage: 24 V DC Current: Max. 30 mA, short circuit proof
Auxiliary power	Voltage: 24 V DC Current: Max. 250 mA, short circuit proof

autarkon EDZ / EWZ 1x0.1 and EDZ / EWZ 1x7.1 flow/energy meter with microprocessor technology, consisting of:

Order information / Tendering text

Transducer:
Freely selected differential pressure device (e.g. ring chamber standard orifice plate, dynamic pressure probe, Gilflo, METRA cross probe, etc.)

Medium: _____

Type of operation (energy/flow): _____

Differential pressure device: _____

Operating pressure: _____ bar (abs.)

Operating temperature: _____ °C

Place of installation (supply/return): _____

Installation position (horizontal/vertical): _____

Direction of flow (left to right, right to left,
from bottom to top, from top to bottom?) _____

*possible versions / models:

- ☐ EDZ / EWZ 1x0.1, compact (only possible in conjunction with METRA measuring orifice / cross probe)
  Differential pressure device with directly mounted transducer DT 31x.1,
  ERW 700 calculation unit integrated in the transducer housing

- ☐ EDZ / EWZ 1x7.1, compact (only possible in conjunction with METRA measuring orifice / cross probe)
  Differential pressure device with directly mounted transducer DT 31x.1,
  with separate ERW 700 calculation unit

- ☐ EDZ / EWZ 1x0.1, offset
  Differential pressure device connected to transducer DT 31x.1 via differential pressure pipes,
  ERW 700 calculation unit integrated in the transducer housing

- ☐ EDZ / EWZ 1x7.1, offset
  Differential pressure device connected to transducer DT 31x.1 via differential pressure pipes,
  with separate ERW 700 calculation unit

- Measuring dynamics of 30:1 relative to the volume flow
- Measuring uncertainty of ≤ 1% relative to the **current value**
- 230 V AC supply
- IP 65, max. ambient temperature 50°C
- Measuring orifice including threefold valve shut-off module with test connection, suitable for plausibility tests during operation
- Including a balancing module for automatic zero balancing (for large measuring dynamics and high measuring accuracy)
- Temperature sensor Pt 500 integrated in the measuring device
- Elec. calculation unit with multi-functional LCD for all relevant values (meter, current values, error status). Large illuminated graphics display, flexible configuration (logger functions for record date, monthly values, period log, error log, parameter log and min/max. log)
- Correction of the flow coefficients, expansion number and the temperature-dependent expansion of the venturi tube and pipework
- 3-point measurement report at an accredited test bench, water based

Output:
- Error status, freely assignable
- 1x MBus interface
- 1x Modbus interface

Basic equipment:
- 2x analogue current output 4-20 mA, each current value is freely assignable, galvanically isolated
- 2x pulse output (optocoupler) for volume / standard volume / mass

with an additional output module:
- 4x analogue current output 4-20 mA, each current value is freely assignable, galvanically isolated
- 4x pulse output (optocoupler) for volume / standard volume / mass

with two additional output modules:
- 6x analogue current output 4-20 mA, each current value is freely assignable, galvanically isolated
- 6x pulse output (optocoupler) for volume / standard volume / mass

System test, start-up and instruction of personnel by METRA customer service technicians

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