Thermal energy meter

Thermal energy meter providing precise fluid and energy measurement in a heating or cooling system. Equipped with automatic temperature and glycol compensation that ensures reliable measurement. Optional PoE (Power over Ethernet) simplifies installation. Seamless integration via BACnet, Modbus and MP-BUS. Parameters can be easily set using NFC or web server. Connection to Belimo Cloud supports remote IoT metering and billing.
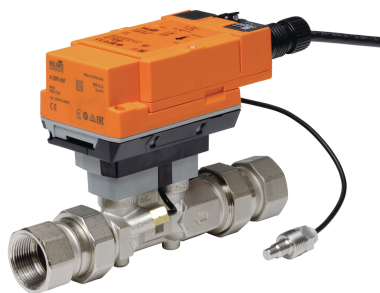
5-year warranty

Type Overview

| Type	DN	DN ["]	qp [GPM]	qs [GPM]	qi [GPM]	Δp [psi]
22PE-5UC	15	1/2	6.6	13.2	0.066	2.2
22PE-5UD	20	3/4	11.0	22.0	0.110	1.7
22PE-5UE	25	1	15.4	30.8	0.154	1.0
22PE-5UF	32	1 1/4	26.4	52.8	0.264	2.0
22PE-5UG	40	1 1/2	44.0	88.1	0.440	2.6
22PE-5UH	50	2	66.0	132.1	0.660	3.2
22PE-5UHH	50	2	100	132.1	1.0	7.3

qp = Design flow

qs = Highest flow

qi = Lowest flow

Δp = Pressure drop at design flow qp

Structure

Components The thermal energy meter 22PE-5U... consists of a logic and a sensor module.

The logic module provides the power supply, the communication interface and the NFC connection of the energy meter.

External temperature sensor T1
Integrated temperature sensor T2
Logic module 1
Sensor module 2
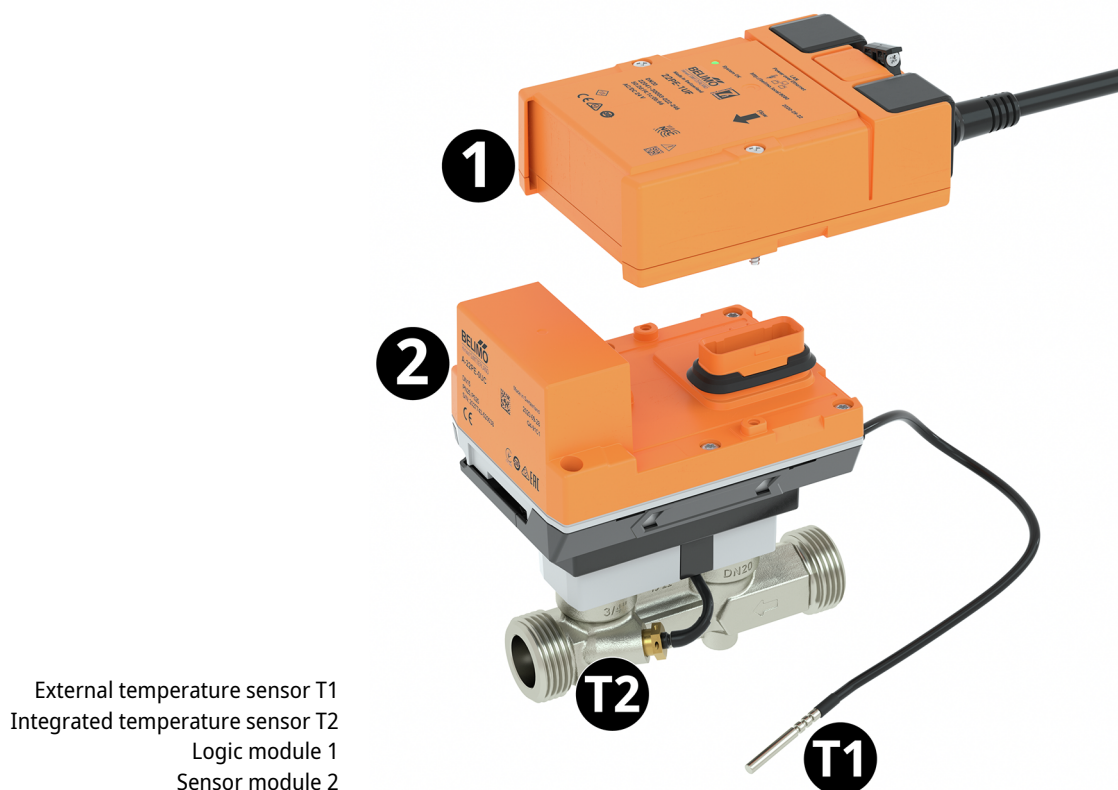
Technical data

Electrical Data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Nominal voltage range	AC 19.2...28.8 V / DC 21.6...28.8 V
	Power consumption AC	Mains power: 3 VA
	Power consumption DC	Mains power: 1.5 W
	Power consumption PoE	PoE mode: 2.2 W
	Connection supply	cable 1 m, 6 x 0.75 mm²
	Connection Ethernet	RJ45 socket
	Power over Ethernet PoE	DC 37...57 V IEEE 802.3af / at Type 1, Class 3 11 W (PD13W)
	Conductors, cables	24 AC/DC, cable length <330 ft [<100 m], no shielding or twisting required Shielded cables are recommended for supply via PoE
	Annual energy consumption	With external energy supply 13.2 kWh
Functional Data	Application	water water glycol mixture
	Communication	BACnet IP BACnet MS/TP Modbus TCP Modbus RTU MP-Bus
	Communication note	M-Bus via Converter G-22PEM-A01

Functional Data	Configuration	via NFC, Belimo Assistant App
		via integrated web server
	Voltage output	1x 0...10 V, 10 V = 1.2 * qp
	Pipe connection	external thread according to ISO 228-1
	Servicing	maintenance-free
Measuring Data	Measured values	Flow
		Temperature
	Measuring principle	Ultrasonic volumetric flow measurement
	Measuring accuracy flow	± (2 + 0.02 qp/q) % of the measured value
	Behavior at flow rate greater than qs	Limitation at 2.5 x qp
	Dynamic range qi:qp	1:100
	Temperature sensor T1 / T2	Pt1000 - EN60751, 2 conductor technology, inseparably connected
		Cable length external sensor T1: 10ft [3m]
Materials	Fluid wetted parts	Brass nickel-plated, Brass, Stainless steel, PEEK, EPDM
Safety Data	Ambient humidity	Max. 95% RH, non-condensing
	Ambient temperature	-22...122°F [-30...50°C]
	Fluid temperature	-5...250°F [-20...120°C]
	Storage temperature	-40...176°F [-40...80°C]
	Protection class IEC/EN	III, Protective Extra-Low Voltage (PELV)
	Certification IEC/EN	IEC/EN 60730-1:11 and IEC/EN 60730-2-15:10
	Degree of protection IEC/EN	IP54
	Degree of protection note	IP54 when using protective cap or protective grommet for RJ45 socket
	Pressure equipment directive	CE according to 2014/68/EU
	EMC	CE according to 2014/30/EU
	Quality Standard	ISO 9001
	Mode of operation	Type 1
	Pollution degree	3
	Rated impulse voltage supply	0.8 kV

Safety Notes

⚠️ This device has been designed for use in stationary heating, ventilation and air-conditioning systems and must not be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.

Outdoor applications: Only possible where (sea) water, snow, ice, sunlight or aggressive gases cannot interfere directly with the device and it can be guaranteed that the ambient conditions remain at all times within the thresholds according to the data sheet.

Only authorized specialists may carry out installation. All applicable legal or institutional installation regulations must be complied during installation.

The device contains electrical and electronic components and must not be disposed of as household refuse. All locally valid regulations and requirements must be observed.

Product Features

Mode of operation	The thermal energy meter consists of a volume measuring section, evaluation electronics and two temperature sensors. One temperature sensor is integrated in flow sensor, the other temperature sensor is installed as an external sensor.
	The device determines the thermal energy supplied to heat exchange or coil from the volumetric flow and the temperature difference between supply and return flow.
	The thermal energy meter can be operated as a heat meter, cooling meter or heat/cooling meter. In addition, it can be installed either in the return or in the supply of the system. The corresponding application must be set via NFC when activated with the Belimo Assistant App.
Calibration certificate	A calibration certificate is available in the Belimo Cloud for each thermal energy meter. If required, this can be downloaded as a PDF with the Belimo Assistant App or via the Belimo Cloud frontend.
Energy metering	The energy meter can be programmed as a combined heat/cooling meter via NFC and the Belimo Assistant App.
Flow measurement	The thermal energy meter measures the current flow rate every 0.1 s in mains operation.
Power calculation	The thermal energy meter calculates the current thermal power based on the current flow rate and the measured temperature difference.
Invoicing energy consumption	The energy consumption data can be read out as follows: - Bus - Cloud API - Belimo Cloud Account of the device owner - Belimo Assistant App - Integrated web server
Belimo cloud	The "Terms of Use for Belimo Cloud Services" in their currently valid version apply to the use of cloud services.
	Note: The connection to the Belimo Cloud is available. Activation takes place via web server or the Belimo Assistant App.
PoE (Power over Ethernet)	If necessary, the thermal energy meter can be supplied with power via the Ethernet cable. This function can be enabled via the Belimo Assistant App or the web server.
	DC 24 V (max. 8 W) is available at wires 1 and 2 for power supply of external devices (e.g. actuator or active sensor).
	Caution: PoE may only be enabled if an external device is connected to wires 1 and 2 or if wires 1 and 2 are insulated!
Commissioning report	Once commissioning has been completed, a commissioning report is available via the web server or the Belimo Assistant App, in which all settings and basic data are presented in a clear and structured manner. The commissioning report can be saved as a pdf file.

Pressure drop
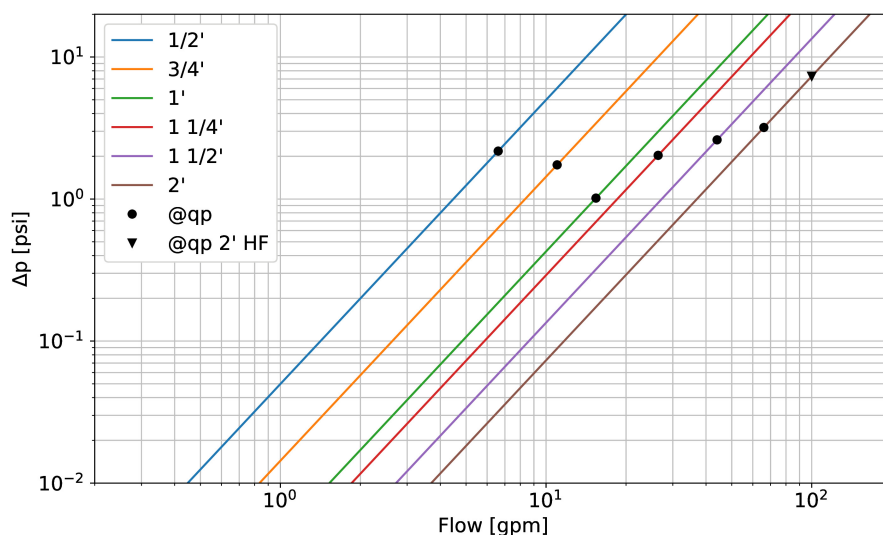
Measuring accuracy

Measuring accuracy for water:
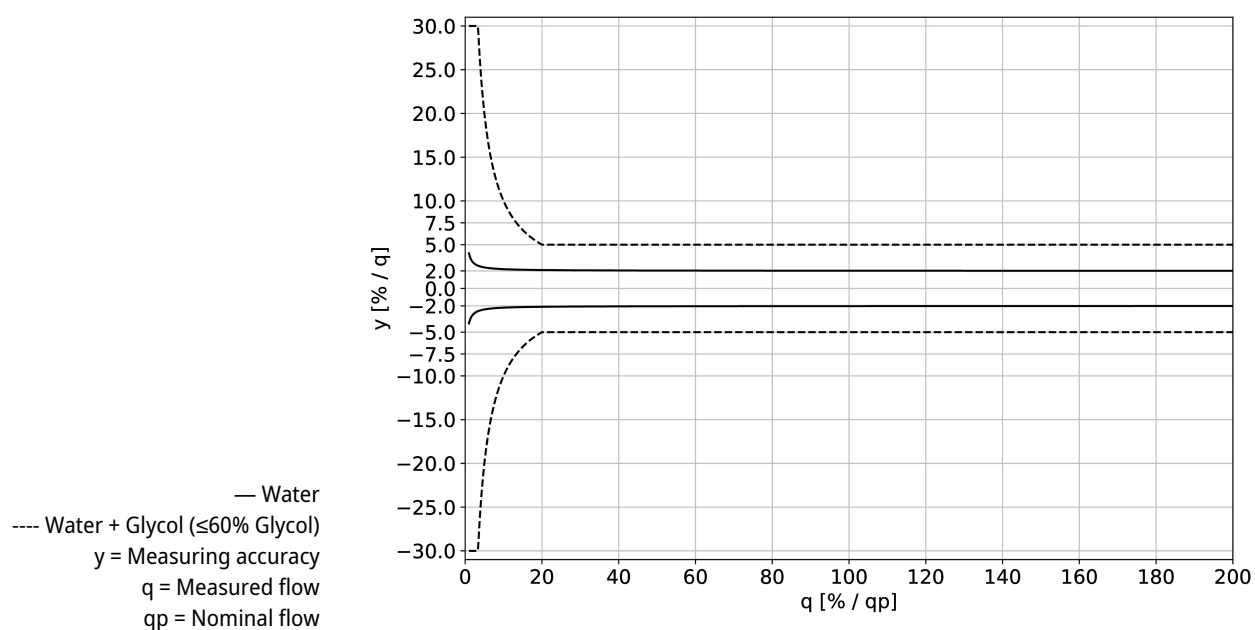
$\pm(2 + 0.02\ q_p/q)$ % of the measured value q
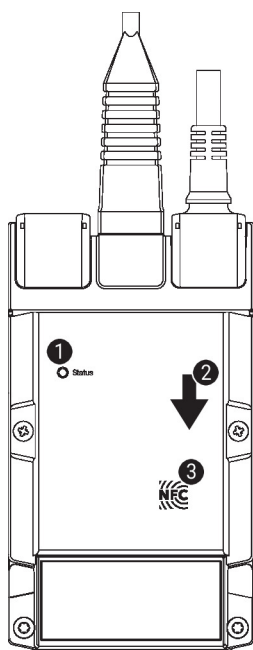
At a temperature range of 5…120°C.

Measuring accuracy for water + glycol (≤60% glycol):

$\pm5\%$ from q @ $0.2q_p…q_p$

$\pm0.1q_p$, but not more than 30% of q @ $q_i…0.2q_p$

At a temperature range of -20…120°C.

— Water
---- Water + Glycol (≤60% Glycol)
y = Measuring accuracy
q = Measured flow
qp = Nominal flow

Operating controls and indicators

1 **LED display green**

On:	Device starting up
Flashing:	In operation (Power ok)
Off:	No power

2 **Flow direction**

3 **NFC interface**

Installation notes

Recommended installation positions

The sensor can be installed upright to horizontal. The sensor may not be installed in a hanging position.
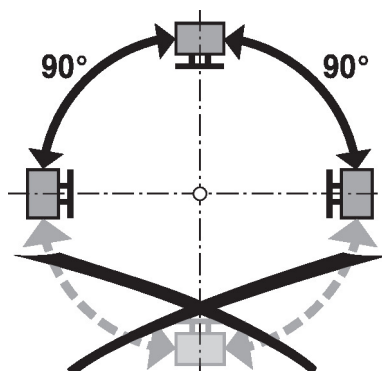
Installation in return

Installation in the return is recommended.

Inlet section

In order to achieve the specified measuring accuracy, a flow-calming section or inflow section in the direction of the flow is to be provided upstream from the flow sensor. Its dimensions should be at least 5x DN.

a) Recommended mounting positions

b) Prohibited mounting position due to the danger of air accumulation

c) Installation immediately after valves is prohibited. Exception: If it is a shut-off valve without constriction and it is 100% open

d) Installation on the suction side of a pump is prohibited
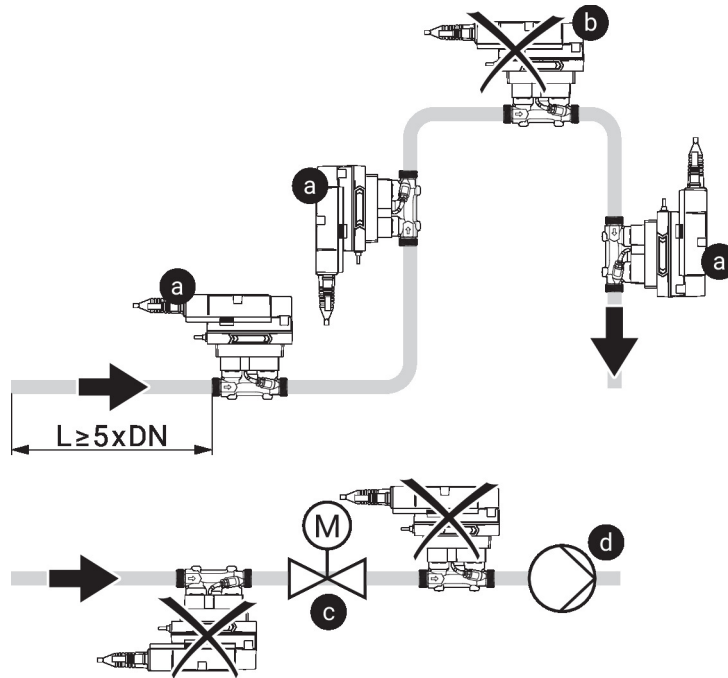
DN	L min.
1/2" [DN15]	5 x 1/2" = 2 1/2" [64 mm]
3/4" [DN20]	5 x 3/4" = 3 3/4" [95 mm]
1" [DN25]	5 x 1" = 5" [127 mm]
1 1/4" [DN32]	5 x 1 1/4" = 6 1/4" [159 mm]
1 1/2" [DN40]	5 x 1 1/2" = 7 1/2" [191 mm]
2" [DN50]	5 x 2" = 10" [254 mm]

Water quality requirements

The water quality requirements specified in VDI 2035 must be adhered to.

Servicing

Thermal energy meter are maintenance-free.

Before any service work on the thermal energy meter is carried out, it is essential to isolate the thermal energy meter from the power supply (by unplugging the electrical cables if necessary). Any pumps in the part of the piping system concerned must also be switched off and the appropriate slide valves closed (allow all components to cool down first if necessary and always reduce the system pressure to ambient pressure level).

The system must not be returned to service until the thermal energy meter has been correctly reassembled in accordance with the instructions and the pipeline has been refilled by professionally trained personnel.

Flow direction

The direction of flow, specified by an arrow on the housing, is to be complied with, since otherwise the flow rate will be measured incorrectly.

Avoiding cavitation

To avoid cavitation, the system pressure at the outlet of the thermal energy meter must be a minimum of 14.5 psi [1.0 bar] at qs (highest flow) and temperatures up to 195°F [90°C].

At a temperature of 250°F [120°C] the system pressure at the outlet of the thermal energy meter must be at least 36.3 psi [2.5 bar].

Cleaning of pipes

Before installing the thermal energy meter, the circuit must be thoroughly rinsed to remove impurities.

Prevention of stresses   The energy meter must not be subjected to excessive stress caused by pipes or fittings.

Scope of delivery

Scope of delivery	Description	Type
	Grommet for RJ connection module with clamp	A-22PEM-A04

Accessories

Optional accessories	Description	Type
	T-piece with thermowell DN 1/2 [15]	A-22PE-A09
	Insulation shell for thermal energy meter DN 15...25	A-22PEM-A01
	Converter M-Bus	G-22PEM-A01
	T-piece with thermowell DN 3/4 [20]	A-22PE-A10
	T-piece with thermowell DN 1 [25]	A-22PE-A11
	T-piece with thermowell DN 1 1/4 [32]	A-22PE-A12
	Insulation shell for thermal energy meter DN 32...50	A-22PEM-A02
	T-piece with thermowell DN 1 1/2 [40]	A-22PE-A13
	T-piece with thermowell DN 2 [50]	A-22PE-A14

Service tools	Description	Type
	Converter Bluetooth / NFC	ZIP-BT-NFC

Wiring Diagram

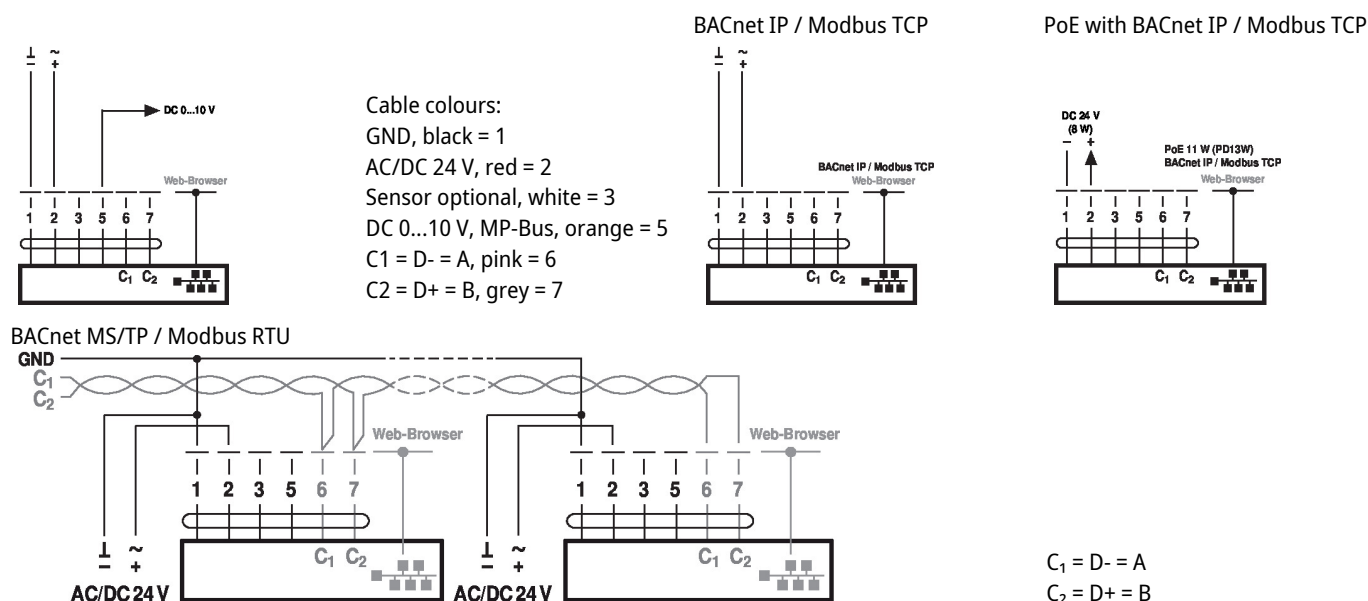**Notes**   Supply from isolating transformer.

⚠️

The wiring of the line for BACnet MS/TP / Modbus RTU is to be carried out in accordance with applicable RS485 regulations.
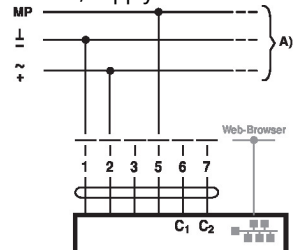
Modbus / BACnet: Supply and communication are not galvanically isolated. Connect earth signal of the devices with one another.

Sensor connection: An additional sensor can optionally be connected to the thermal energy meter. This can be a passive resistance sensor Pt1000, Ni1000, NTC10k (10k2), an active sensor with output DC 0...10 V or a switching contact. Thus the analogue signal of the sensor can be easily digitised with the thermal energy meter and transferred to the corresponding bus system.

Analog output: An analog output is available on the thermal energy meter. This can be selected as DC 0...10 V, DC 0.5...10 V or DC 2...10 V. For example, the flow rate or the temperature of the temperature sensor T1 / T2 can be output as an analog value.
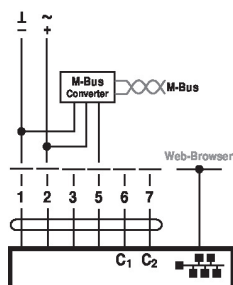
BACnet IP / Modbus TCP   PoE with BACnet IP / Modbus TCP

Cable colours:
GND, black = 1
AC/DC 24 V, red = 2
Sensor optional, white = 3
DC 0...10 V, MP-Bus, orange = 5
C_1 = D- = A, pink = 6
C_2 = D+ = B, grey = 7

BACnet MS/TP / Modbus RTU

C_1 = D- = A
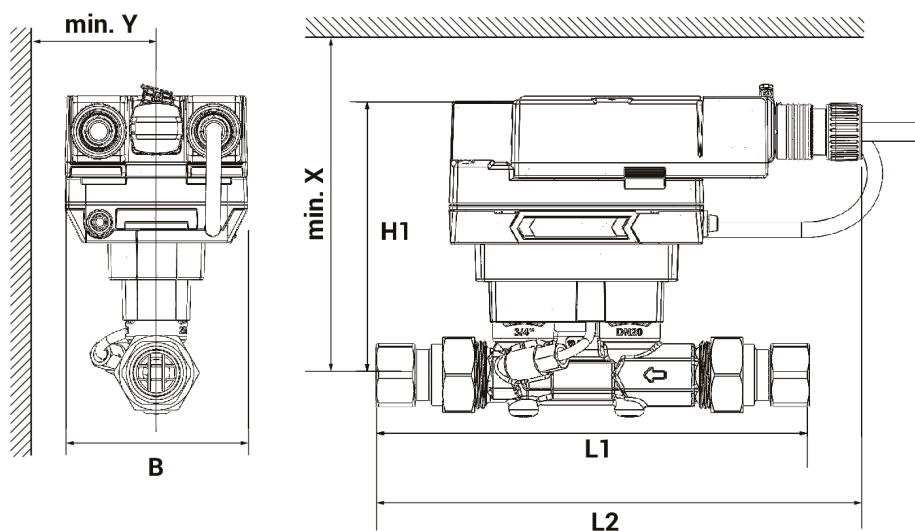C_2 = D+ = B

MP-Bus, supply via 3-wire connection

A) additional MP-Bus nodes (max. 8)

MP-Bus via 2-wire connection, local power supply
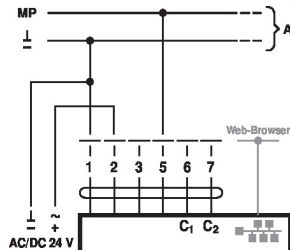
A) additional MP-Bus nodes (max. 8)

M-Bus with converter

Connection with active sensor
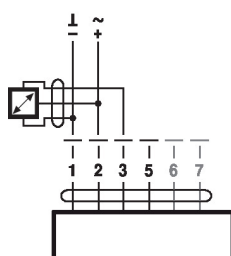
Connection with passive sensor
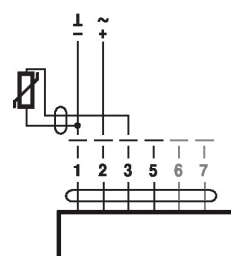
Connection with switching contact
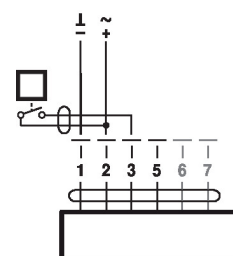
Dimensions

Type	DN	DN ["]	L1 [mm]	L1 ["]	L2 [mm]	L2 ["]	B [mm]	B ["]	H1 [mm]	H1 ["]	X [mm]	X ["]	Y [mm]	Y ["]	Weight
22PE-5UC	15	1/2	184	7.2	230	9.0	230	9.0	136	5.3	206	8.1	85	3.3	2.8 lb [1.3 kg]
22PE-5UD	20	3/4	213	8.4	230	9.0	230	9.0	136	5.3	206	8.1	85	3.3	3.2 lb [1.5 kg]
22PE-5UE	25	1	225	8.9	230	9.0	230	9.0	140	5.5	210	8.2	85	3.3	3.6 lb [1.6 kg]
22PE-5UF	32	1 1/4	242	9.5	230	9.0	230	9.0	143	5.6	213	8.3	85	3.3	3.9 lb [1.8 kg]
22PE-5UG	40	1 1/2	249	9.8	230	9.0	230	9.0	147	5.8	217	8.5	85	3.3	4.6 lb [2.1 kg]
22PE-5UH	50	2	213	8.4	230	9.0	230	9.0	152	5.9	222	8.7	85	3.3	5.6 lb [2.5 kg]
22PE-5UHH	50	2	213	8.4	230	9.0	230	9.0	152	5.9	222	8.7	85	3.3	5.6 lb [2.5 kg]