**Thermal energy meter**

Thermal energy meter provides 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. Optional Thermostat Heater or Humidistat Heater to prevent condensation. Seamless integration via BACnet, Modbus and MP-Bus. Parameters can be easily set using NFC or a web server. Connection to Belimo Cloud supports remote IoT metering and billing.
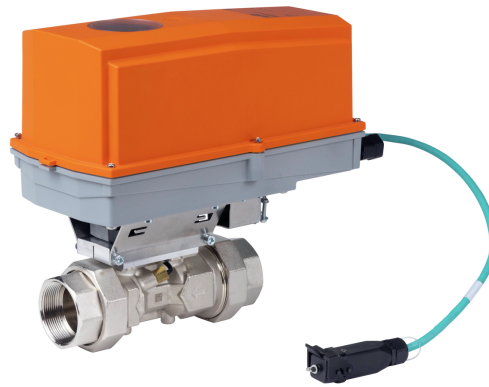
7-year warranty with cloud connectivity

Type Overview

Type	DN	DN ["]	qp [GPM]	qs [GPM]	qi [GPM]	Δp [psi]	Additional features
22PE-5XUCN	15	1/2	6.6	13.2	0.066	2.2	-
22PE-5XUCNH	15	1/2	6.6	13.2	0.066	2.2	Humidistat heater
22PE-5XUCNT	15	1/2	6.6	13.2	0.066	2.2	Thermostat heater
22PE-5XUDN	20	3/4	11.0	22.0	0.110	1.7	-
22PE-5XUDNH	20	3/4	11.0	22.0	0.110	1.7	Humidistat heater
22PE-5XUDNT	20	3/4	11.0	22.0	0.110	1.7	Thermostat heater
22PE-5XUEN	25	1	15.4	30.8	0.154	1.0	-
22PE-5XUENH	25	1	15.4	30.8	0.154	1.0	Humidistat heater
22PE-5XUENT	25	1	15.4	30.8	0.154	1.0	Thermostat heater
22PE-5XUFN	32	1 1/4	26.4	52.8	0.264	2.0	-
22PE-5XUFNH	32	1 1/4	26.4	52.8	0.264	2.0	Humidistat heater
22PE-5XUFNT	32	1 1/4	26.4	52.8	0.264	2.0	Thermostat heater
22PE-5XUGN	40	1 1/2	44.0	88.1	0.440	2.6	-
22PE-5XUGNH	40	1 1/2	44.0	88.1	0.440	2.6	Humidistat heater
22PE-5XUGNT	40	1 1/2	44.0	88.1	0.440	2.6	Thermostat heater
22PE-5XUHK	50	2	100	132.1	1.0	7.3	-
22PE-5XUHKH	50	2	100	132.1	1.0	7.3	Humidistat heater
22PE-5XUHKT	50	2	100	132.1	1.0	7.3	Thermostat heater
22PE-5XUHN	50	2	66.0	132.1	0.660	3.2	-
22PE-5XUHNH	50	2	66.0	132.1	0.660	3.2	Humidistat heater
22PE-5XUHNT	50	2	66.0	132.1	0.660	3.2	Thermostat heater

Type Overview

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.
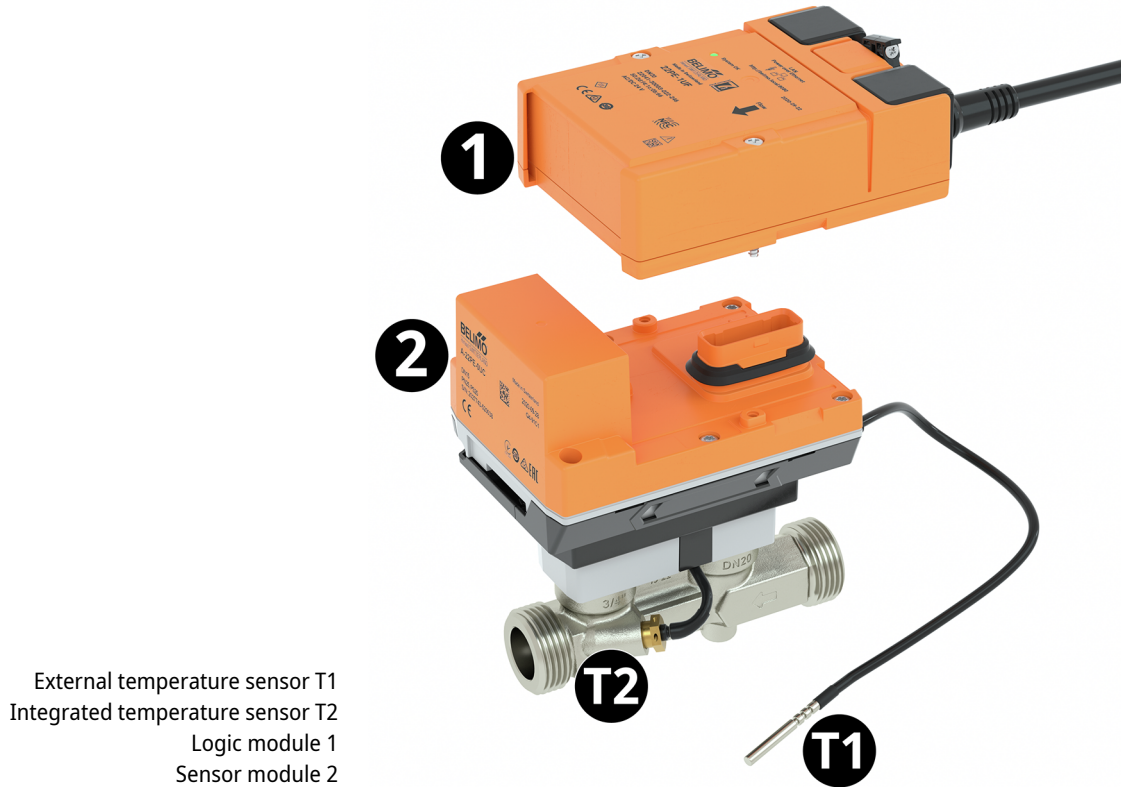
External temperature sensor T1
Integrated temperature sensor T2
Logic module 1
Sensor module 2

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	3 VA
Power consumption DC	1.5 W
Power consumption PoE	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	AC/DC 24 V, cable length <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

Data bus communication	Communication	BACnet/IP
		BACnet MS/TP
		Modbus TCP
		Modbus RTU
		MP-Bus
	Communication note	M-Bus via Converter G-22PEM-A01
	Number of nodes	BACnet / Modbus see interface description
		MP-Bus max. 8 (16)
Functional Data	Application	water
		Water-glycol mixture
	Configuration	via NFC, Belimo Assistant App
		via integrated web server
	Voltage output	1 x 0...10 V, 0.5...10 V, 2...10 V
	PN	25
	Pipe connection	External thread
		according to ISO 228-1
	Servicing	maintenance-free
Humidistat Heater	Type of contact	Normally closed contact
	Heating output	21 W
	Switch-on current	Max. 2.5
	Settings	65% RH fixed
	Switching differential humidistat (humidity)	4% RH (±3% tolerance)
	Heater	Aluminium profile, anodized
	Sensor element	Thermobimetal
Thermostat Heater	Type of contact	Normally closed contact
	Heating output	21 W
	Switch-on current	Max. 2.5
	Thermostat range	14...122°F [-10...50°C] (factory setting 86°F [30°C])
	Switching differential thermostat (temperature)	7 K (±4 K tolerance)
	Heating element	Positive temperature coefficient resistor (PTC), self-regulating, temperature-limiting
	Heater	Aluminium profile, anodized
Measuring Data	Measured values	Flow
		Temperature
	Measuring fluid	chilled or hot water, up to 60% glycol max (open loop/steam not allowed)
	Measuring principle	Ultrasonic volumetric flow measurement
Specification flow	Behavior at flow rate greater than qs	Limitation at 2.5 x qp
	Dynamic range qi:qp	1:100
	Measuring accuracy flow	±2% (of 20...100% qp) @ 20°C / glycol 0% vol.
	Measuring accuracy flow note	EN 1434 Class 2 @ 15...120°C
Specification Temperature	Temperature sensor	Pt1000 - EN 60751, 2-wire technology, inseparably connected
		Cable length external sensor T1: 3 m
Safety Data	Protection class IEC/EN	III, Protective Extra-Low Voltage (PELV)

Technical data

Safety Data	Degree of protection IEC/EN	IP67 Logic module: IP54 (with grommet A-22PEM-A04) Sensor module: IP65
	Degree of protection NEMA/UL	NEMA 4
	Pressure equipment directive	CE according to 2014/68/EU
	EMC	CE according to 2014/30/EU
	Certification IEC/EN	IEC/EN 60730-1:11 and IEC/EN 60730-2-15:10
	Quality Standard	ISO 9001
	Type of action	Type 1
	Rated impulse voltage supply	0.8 kV
	Pollution degree	3
	Ambient humidity	Max. 95% RH, non-condensing
	Ambient temperature	-22...122°F [-30...50°C]
	Fluid temperature	-5...250°F [-20...120°C] At a fluid temperature of <36°F [<2°C], frost protection must be guaranteed
	Storage temperature	-40...176°F [-40...80°C]
Materials	Fluid wetted parts	Brass nickel-plated, Brass, Stainless steel, PEEK, EPDM

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 with 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

Operating mode	The thermal energy meter consists of a flow measuring section, evaluation electronics and two temperature sensors. One temperature sensor is integrated in the flow sensor, the other temperature sensor is installed as an external sensor.
	The device determines the thermal energy supplied to the heat exchanger or coil from the flow and the temperature difference between supply and return.
	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. 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	
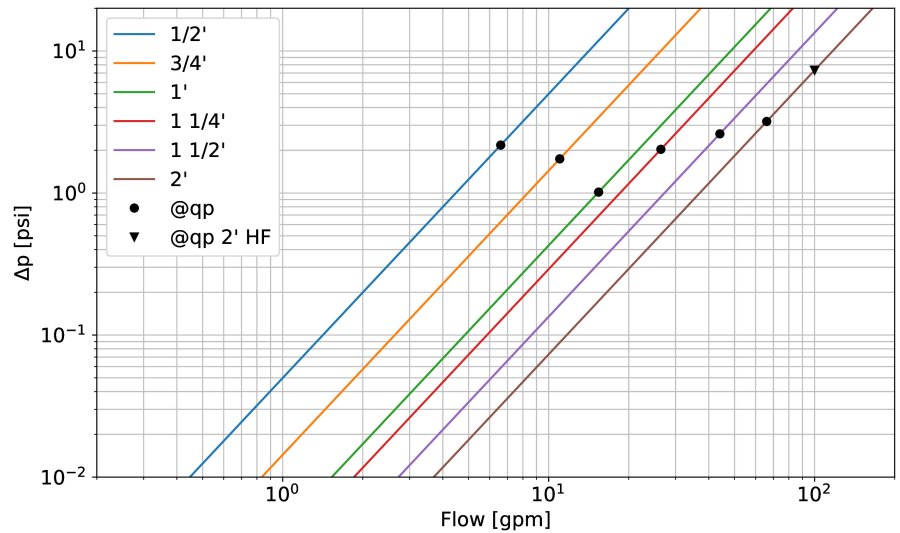
Product Features

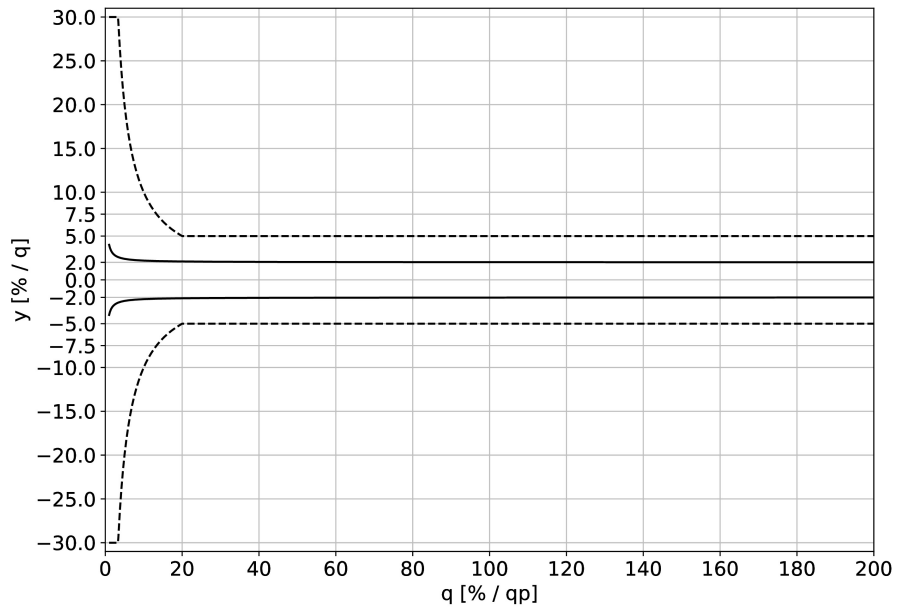**Measuring accuracy**   Measuring accuracy for water (glycol 0% vol.):

±2% (@ 20...100% qp)

At a temperature range of 15...120 °C.

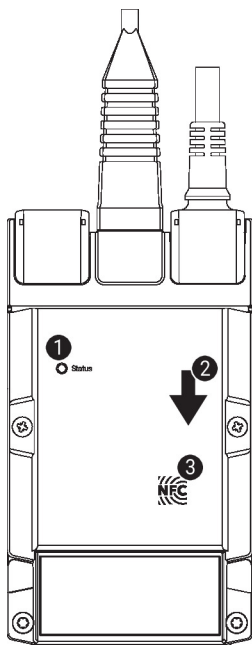Measuring accuracy for water + glycol (glycol 0...60% vol.)

±5% (@ 20...100% qp) ±0.01 qp, but not more than 30% of q (@ qi...20% qp)

At a temperature range of -20...120°C.

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

Indicators and Operation

1   **LED display green**

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

2   **Flow direction**

3   **NFC interface**

Installation notes

Permissible installation orientation

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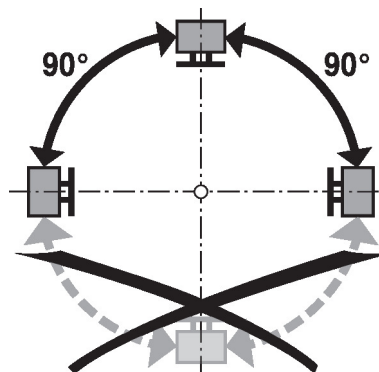
Installation in return

Installation in the return is recommended.

Dimensioning

The thermal energy meter is dimensioned to the nominal flow (qp).

The flow rate may increase to the highest flow (qs) for a short time (<1h/day).

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 installation locations

b) Prohibited installation location due to the danger of air accumulation

c) Installation located 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 not recommended
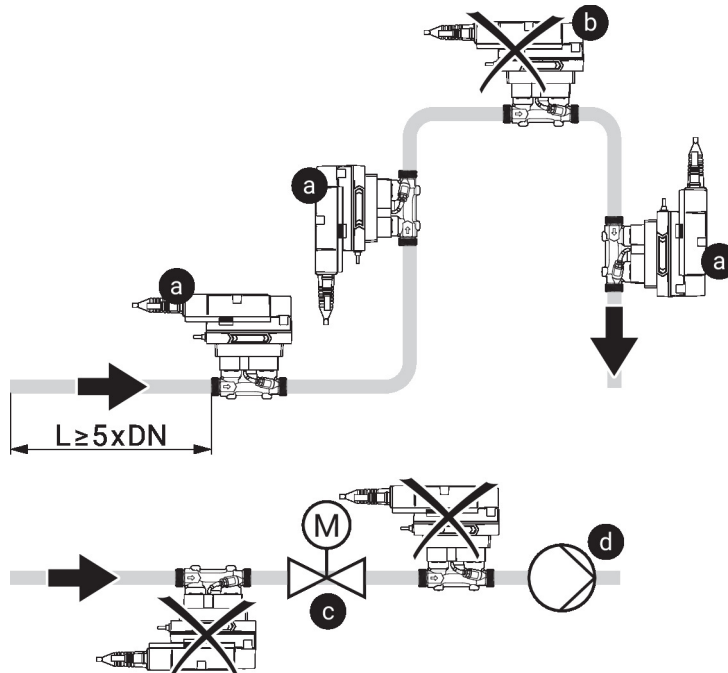
DN	L min.
1/2" [DN15]	5 x 1/2" = 2 1/2" [64 mm]
3/4" [DN20]	5 x 3/4" = 3 3/4" [95 mm]
1" [DN25]	5 x 1" = 5" [127 mm]
1 1/4" [DN32]	5 x 1 1/4" = 6 1/4" [159 mm]
1 1/2" [DN40]	5 x 1 1/2" = 7 1/2" [191 mm]
2" [DN50]	5 x 2" = 10" [254 mm]

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.

Installation notes

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.

Parts included

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

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.
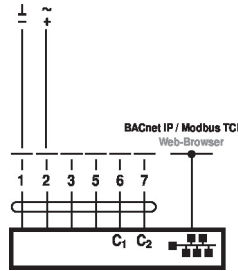
Wiring Diagram

Analog Control

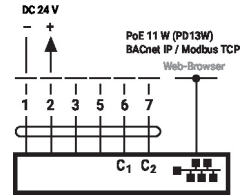Y DC (0)2...10 V
U DC 2...10 V
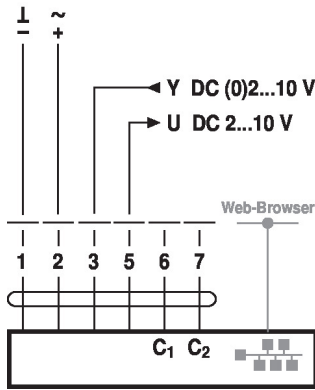
Cable colors:
1 = black, GND
2 = red, AC/DC 24 V
3 = white, Sensor optional
5 = orange, DC 0...10 V, MP-Bus
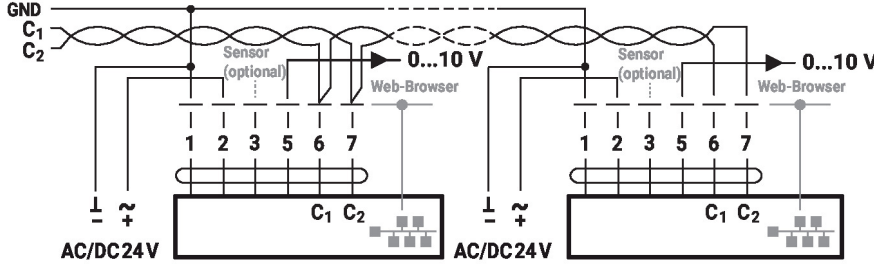6 = pink, C1 = D- = A
7 = grey, C2 = D+ = B

BACnet IP / Modbus TCP
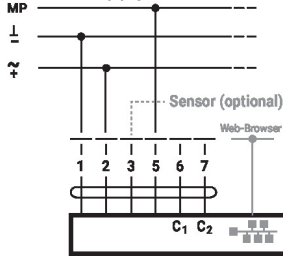

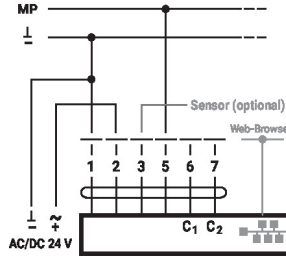### PoE with BACnet IP / Modbus TCP

BACnet MS/TP / Modbus RTU

C_1 = D- = A
C_2 = D+ = B
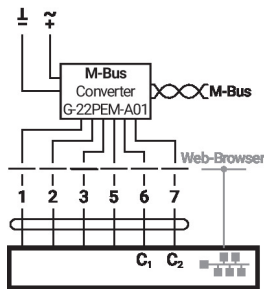
MP-Bus, supply via 3-wire connection

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

MP-Bus via 2-wire connection, local power supply

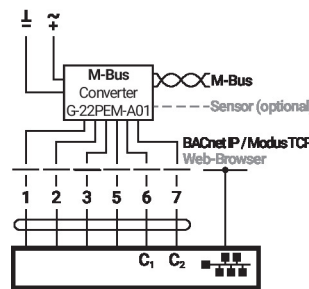A) additional MP-Bus nodes (max. 8)
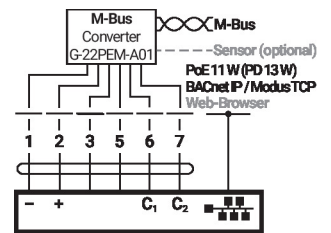
M-Bus via Converter M-Bus

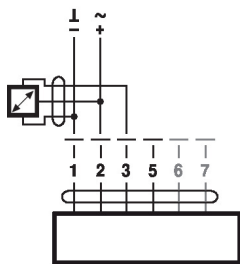### M-Bus parallel Modbus RTU or BACnet MS/TP
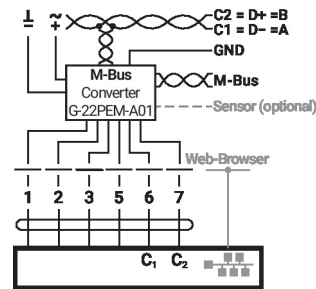
M-Bus parallel Modbus TCP or BACnet IP
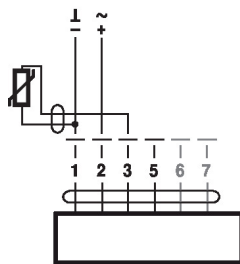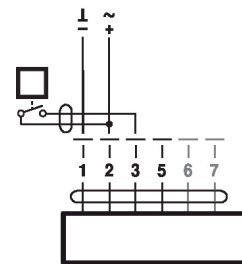

M-Bus parallel Modbus TCP or BACnet IP with PoE

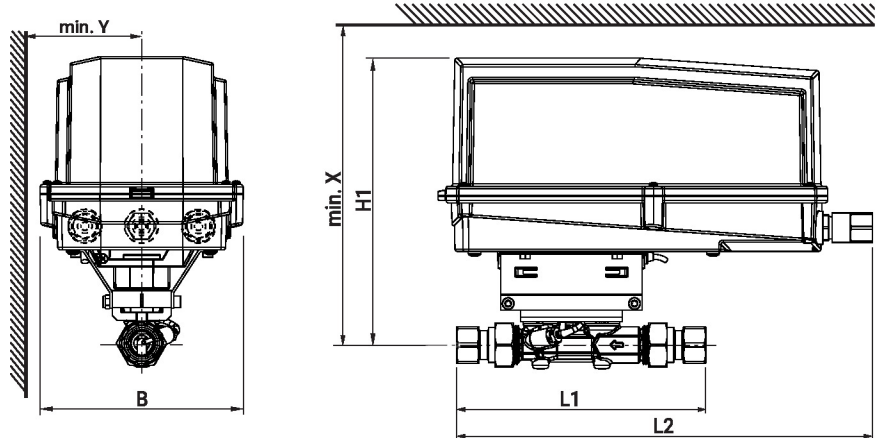### Connection with active sensor

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-5XUCN	15	1/2	184	7.2	365	14.4	174	6.9	241	9.5	312	12.3	397	15.6	2.8 lb [1.3 kg]
22PE-5XUCNH	15	1/2	184	7.2	365	14.4	174	6.9	241	9.5	312	12.3	397	15.6	2.8 lb [1.3 kg]
22PE-5XUCNT	15	1/2	184	7.2	365	14.4	174	6.9	241	9.5	312	12.3	397	15.6	2.8 lb [1.3 kg]
22PE-5XUDN	20	3/4	213	8.4	365	14.4	174	6.9	243	9.6	314	12.4	399	15.7	3.2 lb [1.5 kg]
22PE-5XUDNH	20	3/4	213	8.4	365	14.4	174	6.9	243	9.6	314	12.4	399	15.7	3.2 lb [1.5 kg]
22PE-5XUDNT	20	3/4	213	8.4	365	14.4	174	6.9	243	9.6	314	12.4	399	15.7	3.2 lb [1.5 kg]
22PE-5XUEN	25	1	225	8.9	365	14.4	174	6.9	247	9.7	318	12.5	403	15.9	3.6 lb [1.6 kg]
22PE-5XUENH	25	1	225	8.9	365	14.4	174	6.9	247	9.7	318	12.5	403	15.9	3.6 lb [1.6 kg]
22PE-5XUENT	25	1	225	8.9	365	14.4	174	6.9	247	9.7	318	12.5	403	15.9	3.6 lb [1.6 kg]
22PE-5XUFN	32	1 1/4	242	9.5	365	14.4	174	6.9	249	9.8	320	12.6	405	15.9	3.9 lb [1.8 kg]
22PE-5XUFNH	32	1 1/4	242	9.5	365	14.4	174	6.9	249	9.8	320	12.6	405	15.9	3.9 lb [1.8 kg]
22PE-5XUFNT	32	1 1/4	242	9.5	365	14.4	174	6.9	249	9.8	320	12.6	405	15.9	3.9 lb [1.8 kg]
22PE-5XUGN	40	1 1/2	249	9.8	365	14.4	174	6.9	254	10.0	325	12.8	410	16.1	4.6 lb [2.1 kg]
22PE-5XUGNH	40	1 1/2	249	9.8	365	14.4	174	6.9	254	10.0	325	12.8	410	16.1	4.6 lb [2.1 kg]
22PE-5XUGNT	40	1 1/2	249	9.8	365	14.4	174	6.9	254	10.0	325	12.8	410	16.1	4.6 lb [2.1 kg]
22PE-5XUHK	50	2	213	8.4	365	14.4	174	6.9	258	10.2	329	13.0	414	16.3	5.6 lb [2.5 kg]
22PE-5XUHKH	50	2	213	8.4	365	14.4	174	6.9	258	10.2	329	13.0	414	16.3	5.6 lb [2.5 kg]

Dimensions

Type	DN	DN ["]	L1 [mm]	L1 ["]	L2 [mm]	L2 ["]	B [mm]	B ["]	H1 [mm]	H1 ["]	X [mm]	X ["]	Y [mm]	Y ["]	Weight
22PE-5XUHKT	50	2	213	8.4	365	14.4	174	6.9	258	10.2	329	13.0	414	16.3	5.6 lb [2.5 kg]
22PE-5XUHN	50	2	213	8.4	365	14.4	174	6.9	258	10.2	329	13.0	414	16.3	5.6 lb [2.5 kg]
22PE-5XUHNH	50	2	213	8.4	365	14.4	174	6.9	258	10.2	329	13.0	414	16.3	5.6 lb [2.5 kg]
22PE-5XUHNT	50	2	213	8.4	365	14.4	174	6.9	258	10.2	329	13.0	414	16.3	5.6 lb [2.5 kg]

Further documentation

- Overview MP Cooperation Partners
- Description Data-Pool Values
- BACnet Interface description
- Modbus Interface description
- Installation instructions
- Operating instructions