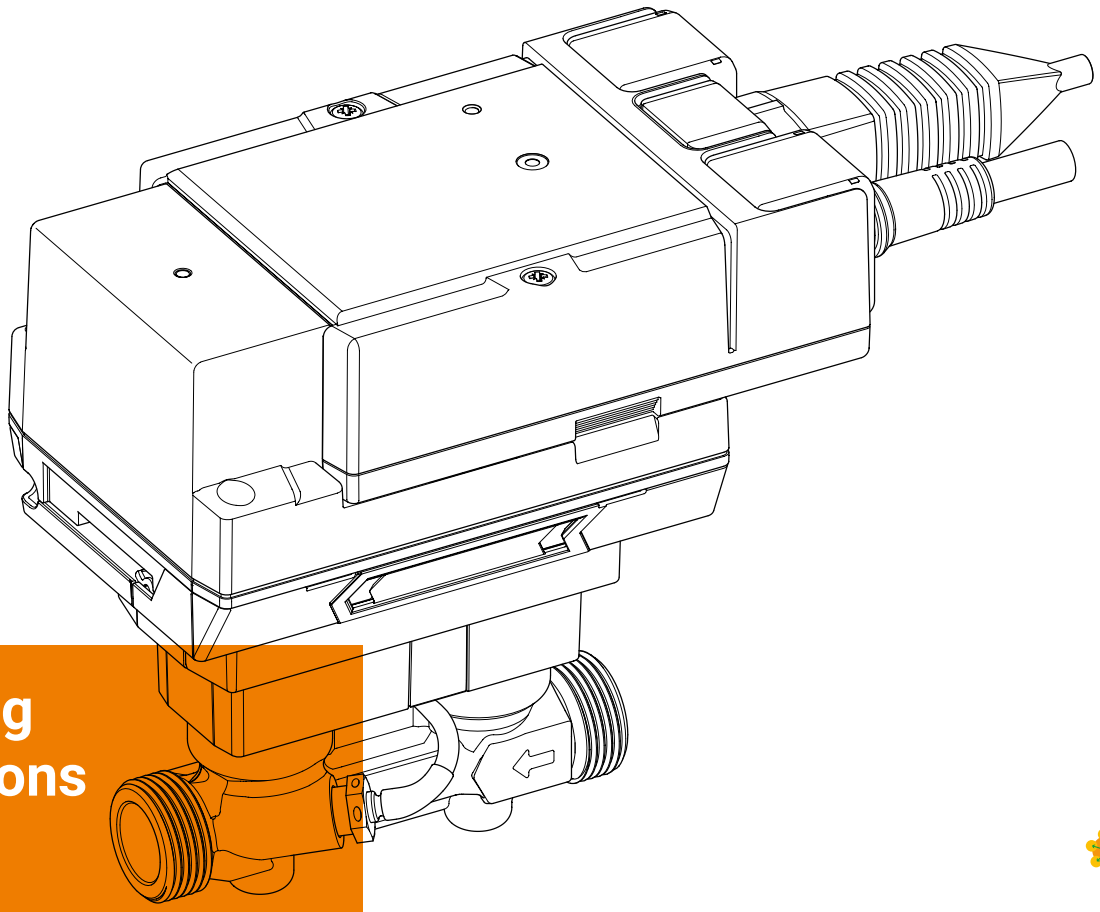


Operating instructions

Thermal Energy Meters standard 22PE-1U.. with glycol compensation

Edition 2021-09/B

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BELIMO

Notes

General information

Use and function

The thermal energy meter records the thermal energy in closed heating, cooling systems or heating/cooling systems. It is equipped with automatic glycol compensation and automatically and continuously measures the glycol content in the fluid, compensates for it and thus ensures the reliable measurement of the thermal energy. The glycol content (%) can be read out with the Belimo Assistant App and the web server. Designed as a multifunctional device, 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 choice of installation in the return or in the supply is made during commissioning with the web server or with a smartphone and the Belimo Assistant App.

Scope of delivery

- Thermal energy meter
- Insulation shell
- Silicone grommet
- Installation instructions

Water quality requirements

The measuring stability of the meter is only given if the water quality meets the conditions of AGFW recommendation FW-510 and VDI 2035.

Energy meter installation

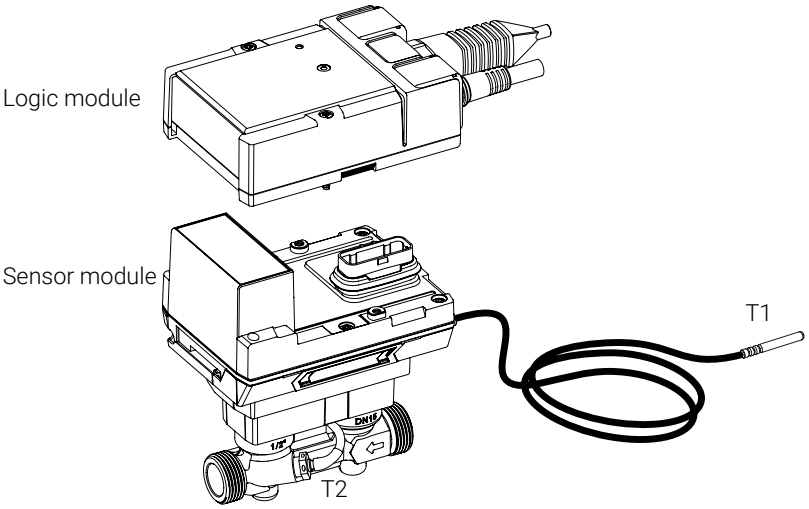
Before installing and commissioning the thermal energy meter, carefully study the operating manual to prevent errors during installation and commissioning.

The operating manual is valid for the following thermal energy meters

Product type from Belimo	DN	DN (")	G (")	Nominal flow qp (m^3/h)
22PE-1UC	15	1/2	3/4	1.5
22PE-1UD	20	3/4	1	2.5
22PE-1UE	25	1	1 1/4	3.5
22PE-1UF	32	1 1/4	1 1/2	6
22PE-1UG	40	1 1/2	2	10
22PE-1UH	50	2	2 1/2	15

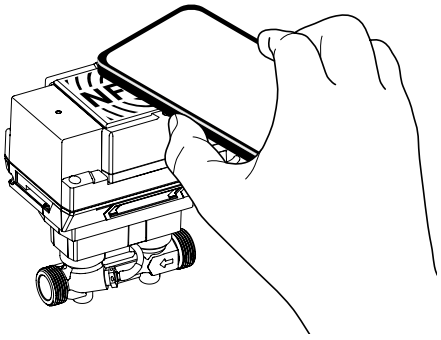
Structure of the thermal energy meter

The thermal energy meter consists of a sensor module with connected temperature sensors, which houses the calculator unit and measuring system, as well as the logic module, which connects the thermal energy meter to the power supply and provides the bus and near field communication interface. The sensor module is available as a spare part.

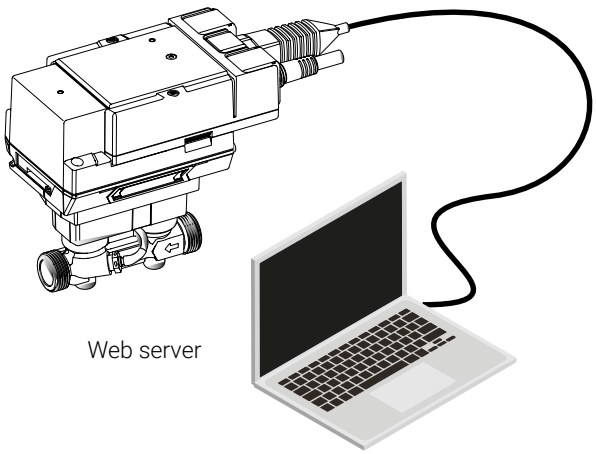


Belimo Assistant App integrated web server

When commissioning the thermal energy meter, the system-specific parameters must be defined using the Belimo Assistant App or the integrated web server. Communication from the smartphone to the thermal energy meter takes place via NFC (Near Field Communication). Communication from the web server (PC) to the thermal energy meter takes place via an Ethernet cable and the RJ45 connection. For further information on the integrated web server, please refer to the web server manual.



Belimo Assistant App



Web server

Near field communication connection

Download on the App Store

GET IT ON Google Play

NFC

The near field communication logo on the thermal energy meter indicates that the device can be operated with the Belimo Assistant App.

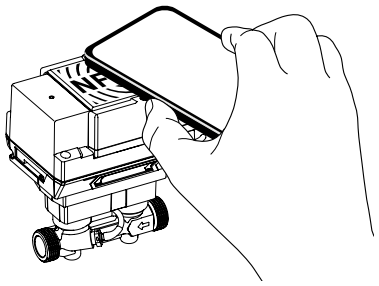
Requirement:
- Near field communication or Bluetooth-enabled smartphone
- Belimo Assistant App (Google Play and Apple App Store)

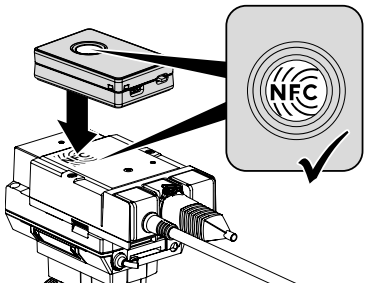
Near field communication: position the near field communication-enabled smartphone on the thermal energy meter so that both near field communication antennas of the smartphone and thermal energy meter are on top of each other.

Bluetooth: connect the Bluetooth-enabled smartphone to the thermal energy meter via the Bluetooth to near field communication converter ZIP-BT-NFC.

Technical data and operating manual can be found on the ZIP-BT-NFC data sheet.

Near field communication NFC **Bluetooth**





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.

Legal Notice

Commissioning staff

The thermal energy meter has left the factory in perfect condition. All installation work may only be carried out by a trained and authorised specialist.

Application

With regard to legal transactions, regional and local regulations must be observed. Belimo also offers thermal energy meters that have type approval as heat meters in accordance with the European Measuring Instruments Directive (MID) (part number 22PEM-1U..).

Use of Belimo Cloud Services

Use of Belimo Cloud Services is governed by the "Terms of Use for Belimo Cloud Services" in their currently valid version.

Installation notes

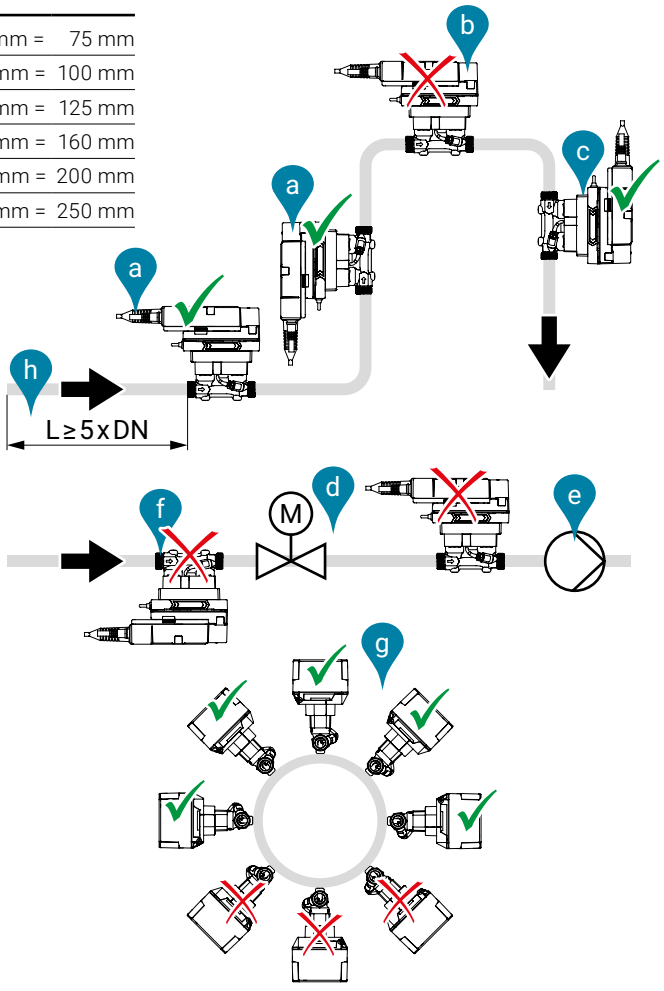
Installation position

a) Recommended installation position
b) Prohibited installation position due to the risk of air accumulation
c) Acceptable installation position in closed systems
d) Installation directly downstream from valves is prohibited.
Exception: if it is an open/close valve without constriction and is 100% open.
e) Installation on the suction side of a pump is prohibited.
f) The thermal energy meter must not be installed upside down.
g) Upright to horizontal installation is permitted, but suspended installation is prohibited.

Inlet section

h) In order to achieve the specified measuring accuracy, it is recommended to provide a straight flow calming section or inlet section in the direction of flow upstream from the thermal energy meter. This must be at least 5 x DN and have the same nominal size (DN) as the thermal energy meter.

DN	L min.
15	5 x 15 mm = 75 mm
20	5 x 20 mm = 100 mm
25	5 x 25 mm = 125 mm
32	5 x 32 mm = 160 mm
40	5 x 40 mm = 200 mm
50	5 x 50 mm = 250 mm



Direction of flow

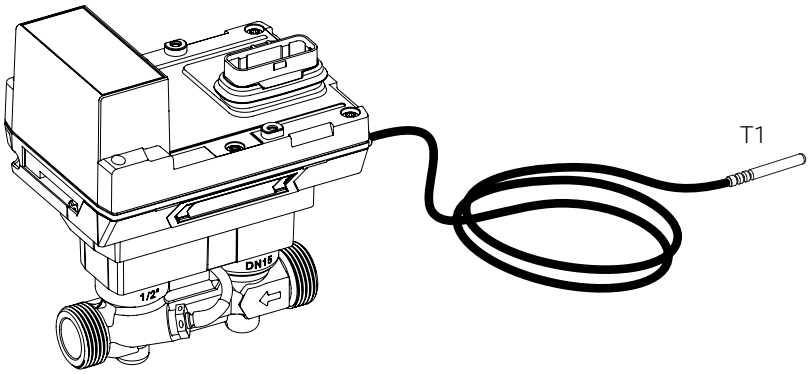
The direction of flow indicated by an arrow on the logic module and flow measuring pipe must be complied with, otherwise the flow will be measured incorrectly.

Preventing cavitation

To prevent cavitation, the system pressure at the output of the thermal energy meter must be at least 1 bar at qs (maximum flow) and temperatures up to 90°C. At a temperature of 120°C the system pressure at the output of the thermal energy meter must be at least 2.5 bar.

Installation of temperature sensor T1

The temperature sensor T1 is installed via a thermowell.



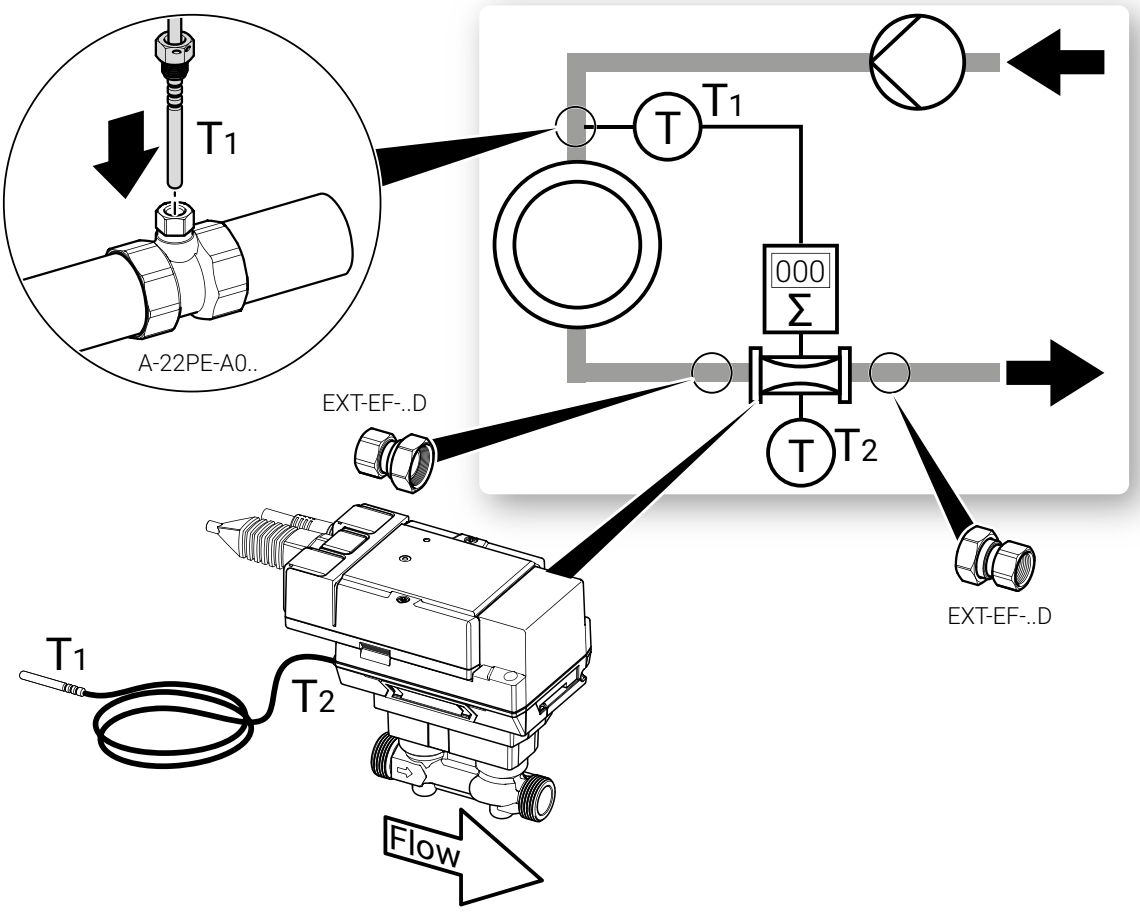
The connecting cable of temperature sensor T1 should not be laid along hot pipes or wound around them, as the wire resistance and its temperature dependency affect the measurement result of temperature sensors in two-wire technology.

Installation in the return (default)

Assignment and parametrisation
The web server or the Belimo Assistant app must be used to inform the thermal energy meter that it is in the return (see also the "Commissioning" chapter).

Picture 1 shows the principle. The thermal energy meter is located in the return of the consumer. Temperature sensor T2 installed directly in the sensor module records the return temperature. The external temperature sensor T1 can be installed via a thermowell (A-22PE-A07 for DN 15…50 included in the scope of delivery) or a T-piece with thermowell located in the supply (A-22PE-A0.. available as an accessory).

When installing the thermal energy meter, the direction of flow must be considered. The direction of flow is indicated by the arrows on the flow body (on both sides) and on the logic module. The thermal energy meter is installed between two pipe connectors (available as accessories EXT-EF-..D). Temperature sensors T1 and T2 are permanently connected to the thermal energy meter. The cable length must not be changed. If the sensor module is replaced, both temperature sensors T1 and T2 are also replaced.



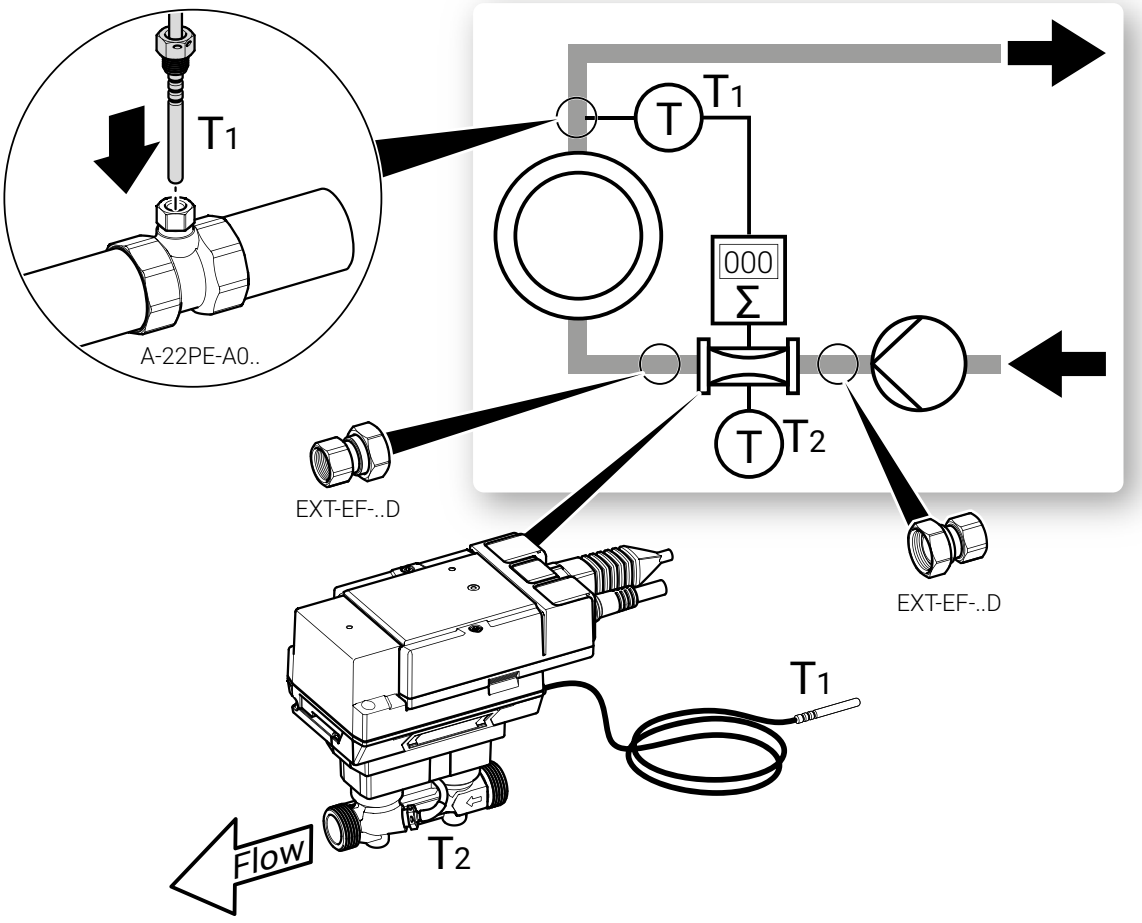
Picture 1

Installation in the supply (alternative)

Assignment and parametrisation
The web server or the Belimo Assistant app must be used to inform the thermal energy meter that it is in the supply (see also the "Commissioning" chapter).

Picture 2 shows the principle (alternative). The thermal energy meter is located in the supply. Temperature sensor T2 installed directly in the sensor module records the supply temperature. The external temperature sensor T1 can be installed via a thermowell (A-22PE-A07 for DN 15…50 included in the scope of delivery) or a T-piece with thermowell located in the return (A-22PE-A0.. available as an accessory).

When installing the thermal energy meter, the direction of flow must be considered. The direction of flow is indicated by the arrows on the flow body (on both sides) and on the logic module. The thermal energy meter is installed between two pipe connectors (available as accessories EXT-EF-..D). Temperature sensors T1 and T2 are permanently connected to the thermal energy meter. The cable length must not be changed. If the sensor module is replaced, both temperature sensors T1 and T2 are also replaced.



Picture 2

Supply voltage

Supply with AC/DC 24 V

The supply voltage of the thermal energy meter is 24 Volt AC or DC.

Supply via PoE

Alternatively, the supply can be supplied via the Ethernet socket using PoE (Power over Ethernet with standard IEEE 802.3af). Activation of the PoE-supply DC 24 V for supplying the external active sensor (see also the chapter "Wiring diagrams") is carried out via the Belimo Assistant App (regardless of whether communication takes place via Ethernet). If the thermal energy meter is supplied with voltage via PoE, DC 24 V (max. 8 W) is available at wires 1 and 2 for supplying 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!

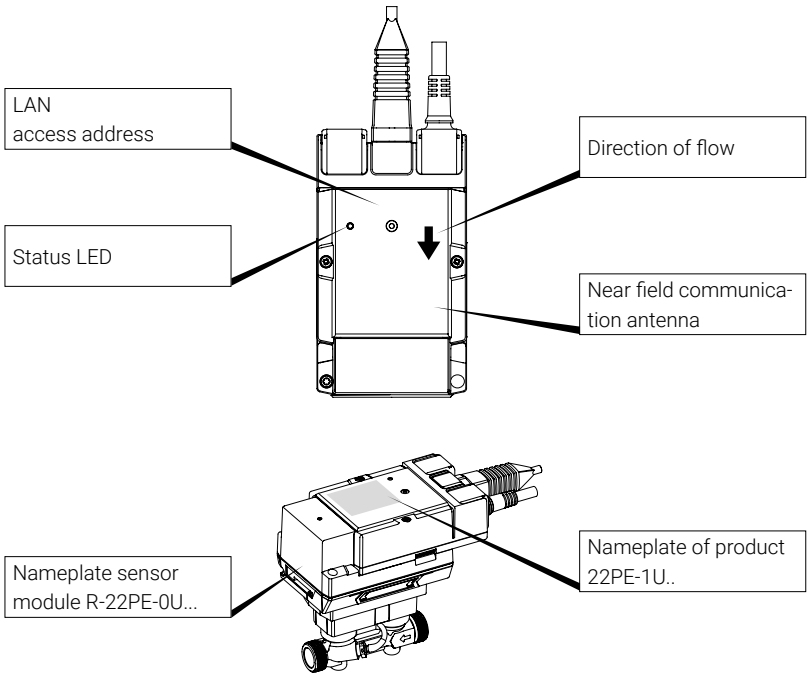
Data storage in the event of a voltage interruption

Every 120 minutes, the thermal energy meter stores the accumulated energy values (kWh) and volume (m^3) into a persistent memory. After the voltage interruption, the system continues with the last persisted meter readings.

Display and operating elements

Status LED display

LED	Status
Lights up continuously	Device starts
Flashing	Device in operation
Off	No voltage

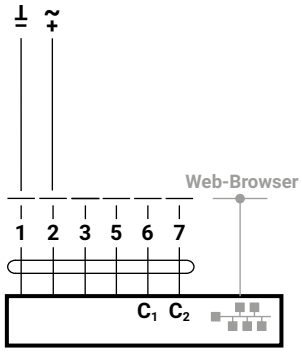


Wiring diagrams

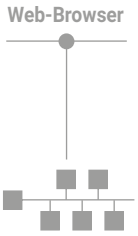
Notes

- Supply with isolating transformer
- The wiring of the line for BACnet MS/TP and Modbus RTU must be carried out according to the relevant RS485 guidelines.
- Modbus/BACnet: supply and communication are not galvanically separated. Connect earth signal for devices with one another.
- Sensor interface: a sensor can optionally be connected to the thermal energy meter. This can be a passive resistance sensor (e.g. Pt1000, Ni1000 or NTC), an active sensor (e.g. with a DC 0…10 V output) or a switching contact. As a result, the analogue signal of the sensor can be easily digitised with the thermal energy meter and transferred to the corresponding bus system.
- Analogue output: an analogue output is available at 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 or the temperature of temperature sensor T1/T2 can be output as an analogue value.
- IP protection: IP protection is only guaranteed if either the Ethernet connector socket is protected with the cover cap or a connected Ethernet cable is protected with the enclosed silicone grommet.
- The clamp that fastens the silicone grommet must be tightened to a torque of 0.3 Nm.
- Equipotential bonding: equipotential bonding must be installed on the flow body, if this is not already done via the pipeline

Connection assignment



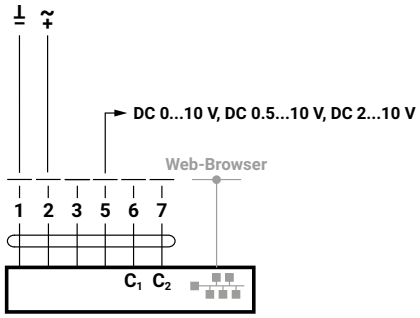
Wire colours:
1 = black, GND
2 = red, AC/DC 24 V
3 = white, sensor
5 = orange, MP, DC 0…10 V
6 = pink, C1 = D− = A
7 = grey, C2 = D+ = B



Connection RJ45
- PoE
- BACnet IP
- Modbus TCP
- TCP/IP
- Belimo Cloud
- Web server

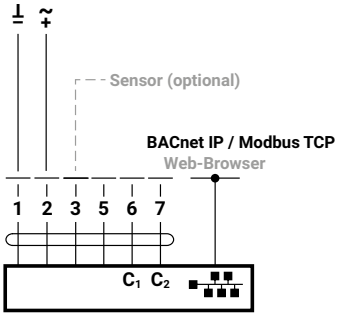
Note: the connection to the Belimo Cloud is permanently available. Activation takes place via web server or Belimo Assistant App.

Analogue output connection

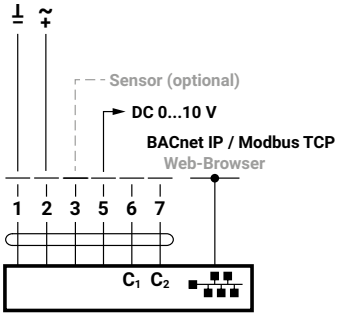


Connections BACnet, Modbus, MP-Bus

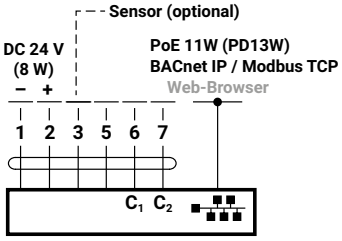
BACnet IP or Modbus TCP



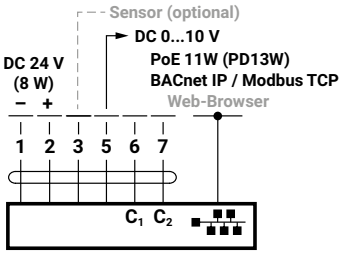
BACnet IP or Modbus TCP with analogue output



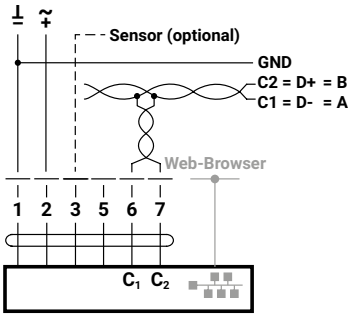
PoE with BACnet IP or Modbus TCP



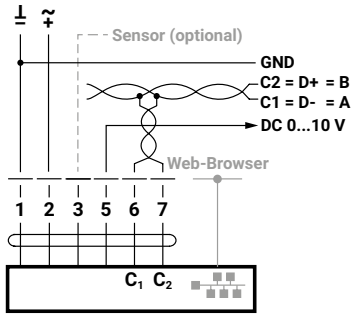
PoE with BACnet IP or Modbus TCP with analogue output



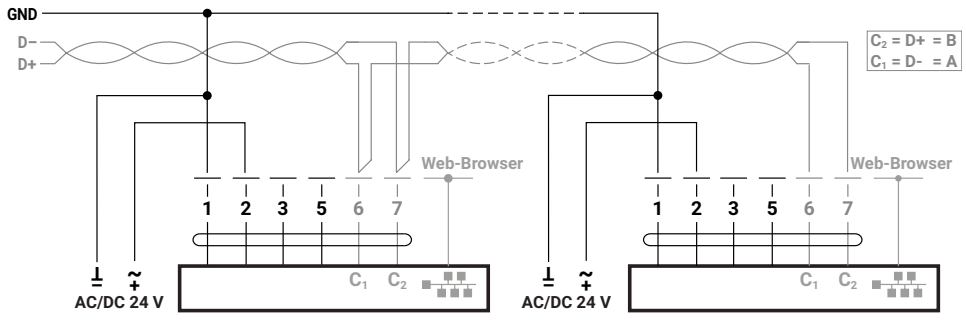
BACnet MS/TP or Modbus RTU



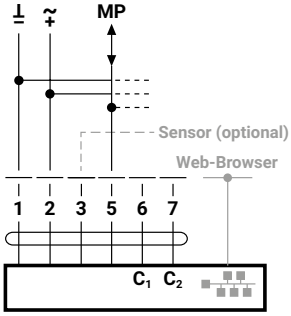
BACnet MS/TP or Modbus RTU with analogue output



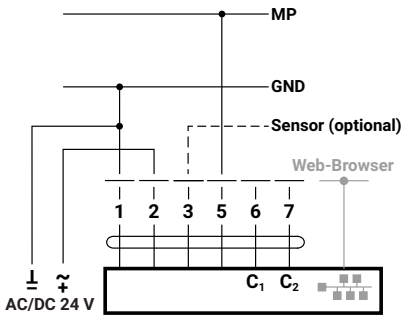
Wiring BACnet MS/TP or Modbus RTU (daisy chain)



MP-Bus, supply via 3-wire

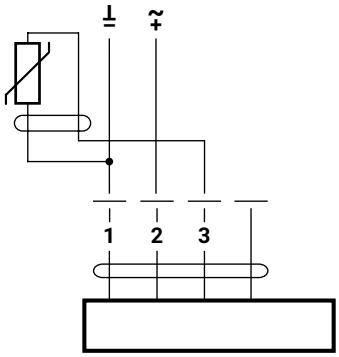


MP-Bus via 2-wire local power supply

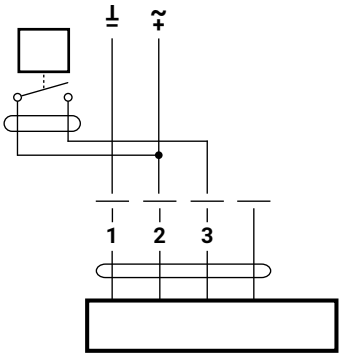


Sensor connections (optional)

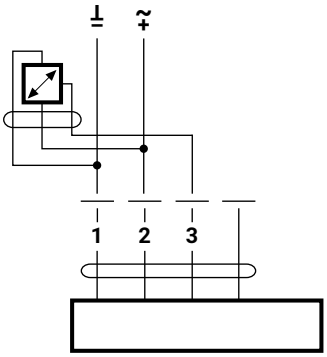
Passive sensor connection



Switch connection

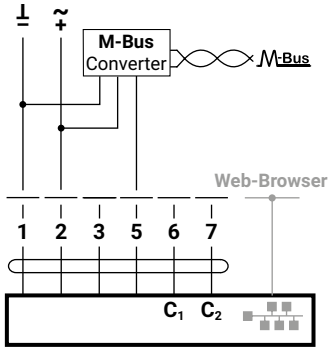


Active sensor connection



Connection to M-Bus

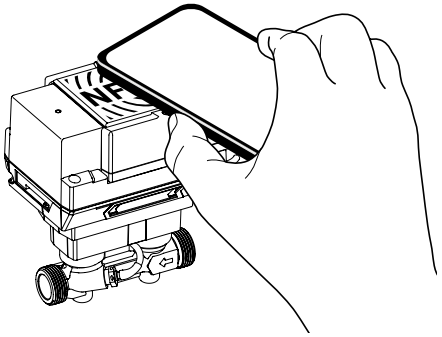
M-Bus via M-Bus converter



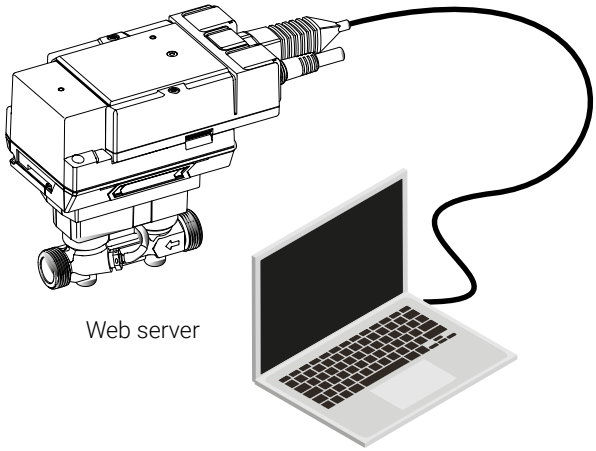
Commissioning

Definition of the plant-specific parameters

When commissioning the thermal energy meter, the system-specific parameters must be defined using the Belimo Assistant App or the integrated web server. Communication from the smartphone to the thermal energy meter takes place via NFC (Near Field Communication). Communication from the web server (PC) to the thermal energy meter takes place via an Ethernet cable and the RJ45 connection. For further information on the integrated web server, please refer to the web server manual.



Belimo Assistant App



Web server

Notes on smartphone with Bluetooth

Bluetooth-enabled smartphones can be connected to the thermal energy meter via the "Bluetooth to near field communication converter" ZIP-BT-NFC (see chapter "near field communication connection" under "General notes").

Possible settings

- Choice of installation in return or in supply
- Choice of bus system (MP-Bus/Modbus TCP/BACnet IP/Modbus RTU/ BACnet MSTP) with choice of the physical bus address
- IP setting, Belimo Cloud
- Choice of medium (water or glycol)
- Additional sensor interface
- Terminal 5 configurable as analogue output DC 0…10 V or for MP-Bus
- Choice of units, e.g. m^3/h, l/min, gpm etc.

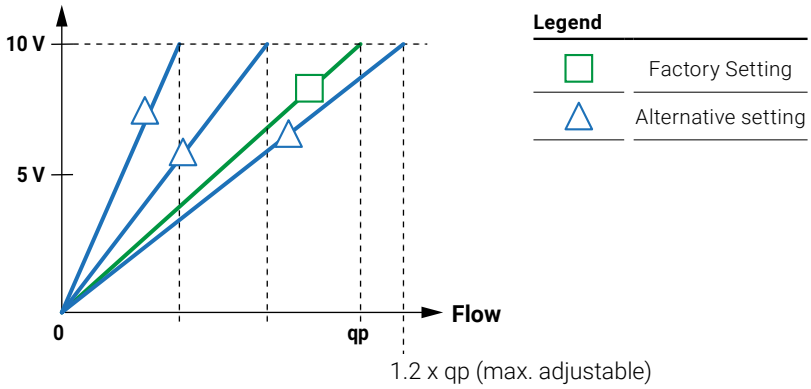
Commissioning report

Once commissioning has been completed, a commissioning report is available via the web server or Belimo Assistant App, in which all settings and basic data are displayed clearly and in a structured manner. The commissioning report can be saved as a PDF file.

Adjustable functions, analogue output

Analogue output 0…10 V, terminal U5
- Selectable as DC 0…10 V, DC 0.5…10 V or DC 2…10 V
- Configurable for output of flow rate, power, temperature of temperature sensor T1/T2 or differential temperature of temperature sensor T1/T2
- Scaling: the maximum value, i.e. the flow corresponding to 10 V, can be scaled, thus achieving an optimised resolution. The maximum value is set to qp (qp = nominal flow rate) as a factory setting. The maximum value can be increased to a maximum of 1.2 x qp.
- Flows greater than the maximum value are cut off, i.e. a voltage of 10 V is output.

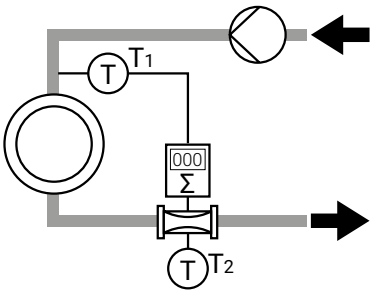
Analogue output U5



Heat/cooling meter changeover

The thermal energy meter automatically switches between heat and cooling metering.

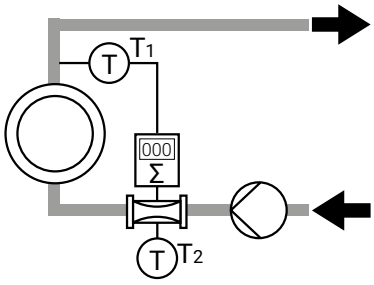
Switching criteria:



1. Installed in the return

a) If the temperature value of T1 is higher than that of T2, then the TEM counts heat energy.

b) If the temperature value of T1 is lower than that of T2, then the TEM counts cooling energy.



2. Installed in the supply

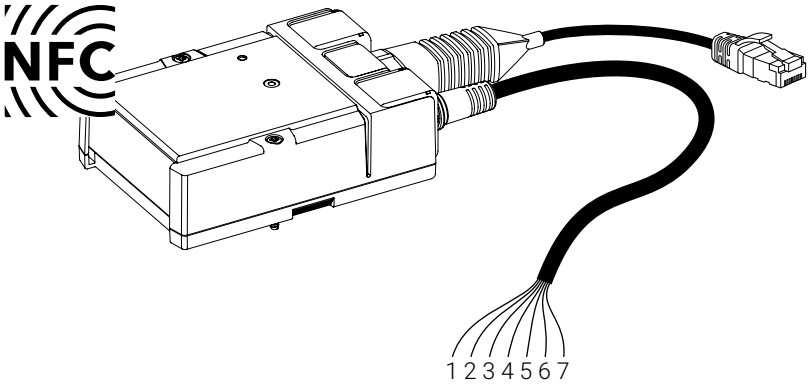
a) If the temperature value of T1 is higher than that of T2, then the TEM counts cooling energy.

b) If the temperature value of T1 is lower than that of T2, then the TEM counts heat energy.

Exchanging the sensor module

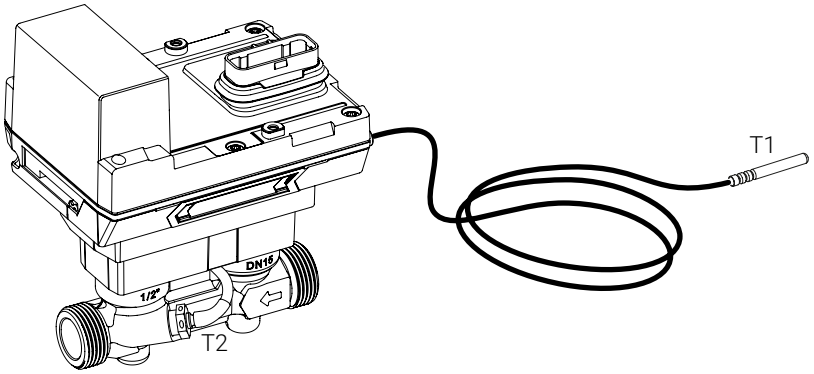
Logic module of the thermal energy meter

The thermal energy meter is supplied with voltage via the logic module. The bus and near field communication interface is also available on the logic module. If the sensor module is disconnected from the logic module during replacement, the connecting cables can remain connected to the logic module and the system.



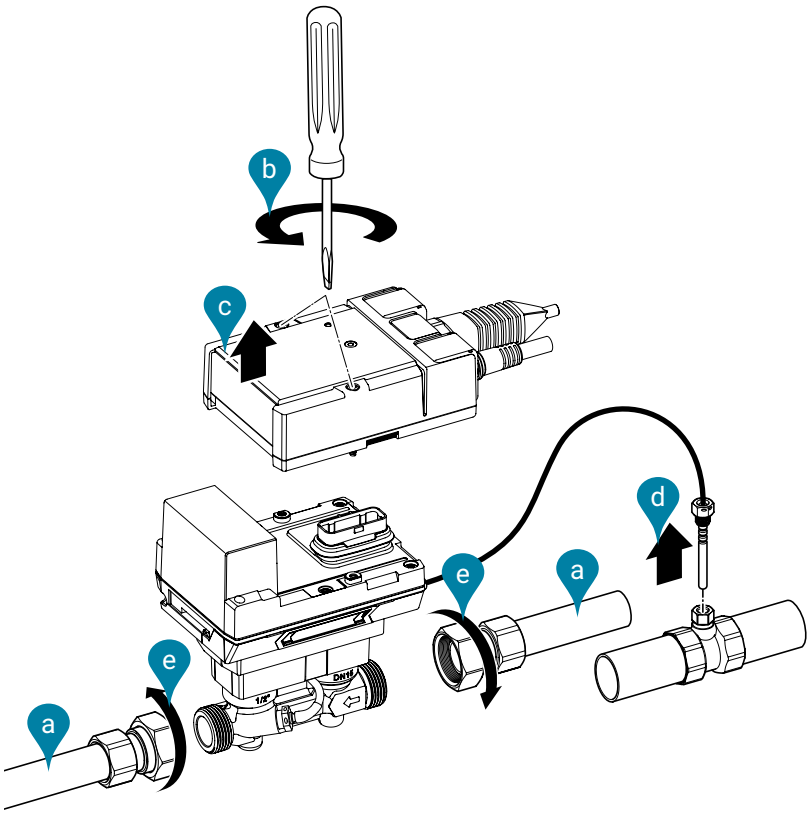
Sensor module of the thermal energy meter

The sensor module contains the integrated temperature sensor T2 and the external temperature sensor T1 is connected via a cable. If the sensor module is replaced, both temperature sensors T1 and T2 must also be replaced. The sensor module also houses the calculator unit and the ultrasonic flow measurement system.



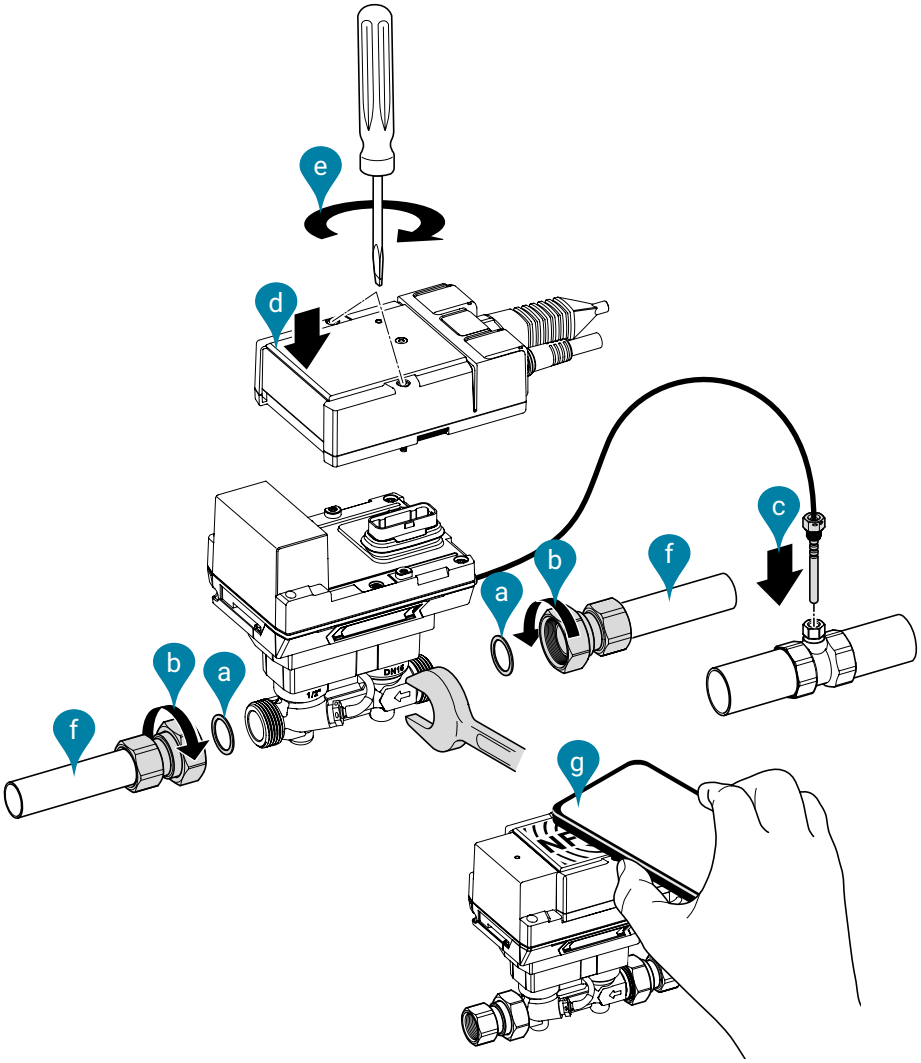
Separate the logic module and sensor module

a) Drain water circuit or close corresponding open/close valves
b) Loosen the screws of the logic module
c) Separate the logic module and sensor module
d) Loosen the plastic nut of the temperature sensor T1 and pull the sensor out of the thermowell
e) Loosen the screw connections on the sensor module and remove the sensor module



Join the logic module and sensor module

a) Place sealings (a) between the connections of the thermal energy meter and the glands
b) Tighten the union nuts (b) clockwise while holding them tight with the open-end wrench attached to the flow body of the thermal energy meter. Caution: when tightening the union nuts, do not hold against the plastic housing of the thermal energy meter. Instead, use the wrench size on the metal flow body to apply the open-end wrench.
c) Insert temperature sensor T1 into the thermowell and tighten plastic nut
d) Connect the logic module on sensor module
e) Tighten the screws of the logic module with a torque of 1.8 Nm
f) Fill water circuit or open corresponding open/close valves
g) Commissioning the thermal energy meter

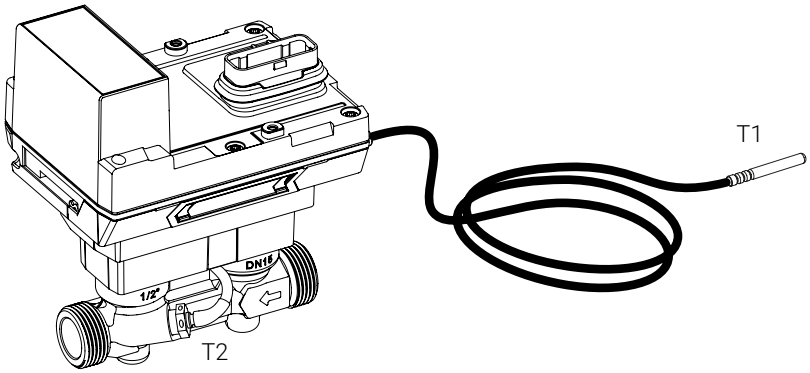


Sensor module as a spare part

Product type from Belimo	DN	DN (")	G (")
R-22PE-0UC	15	1/2	3/4
R-22PE-0UD	20	3/4	1
R-22PE-0UE	25	1	1 1/4
R-22PE-0UF	32	1 1/4	1 1/2
R-22PE-0UG	40	1 1/2	2
R-22PE-0UH	50	2	2 1/2

Comprising:

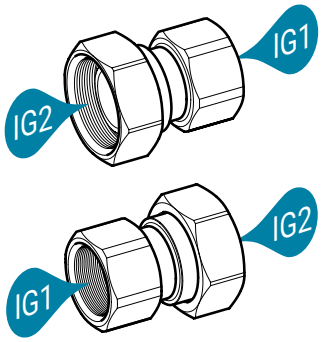
– Sensor module including the built-in temperature sensor T2 and the external temperature sensor T1



Accessories

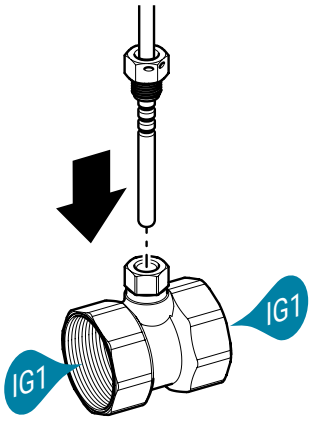
Optional accessories

Suitable pipe connectors (2 pieces)



Energy meter (DN)	Internal thread IG1 (Rp)	Internal thread IG2 (G)	Product type from Belimo
15	½"	¾"	EXT-EF-15D
20	¾"	1"	EXT-EF-20D
25	1"	1 ¼"	EXT-EF-25D
32	1 ¼"	1 ½"	EXT-EF-32D
40	1 ½"	2"	EXT-EF-40D
50	2"	2 ½"	EXT-EF-50D

T-piece with thermowell for installation of temperature sensor T1



T-piece (DN)	Internal thread IG1 (Rp)	Product type from Belimo
15	½"	A-22PE-A01
20	¾"	A-22PE-A02
25	1"	A-22PE-A03
32	1 ¼"	A-22PE-A04
40	1 ½"	A-22PE-A05
50	2"	A-22PE-A06

	Product type from Belimo	For DN
Insulation shell		
For thermal insulation of the thermal energy meter	A-22PEM-A01	15, 20, 25
	A-22PEM-A02	32, 40, 50
Thermowells with sealing washer		
For installation of temperature sensor T1 (A-22PE-A07 included in scope of delivery)	A-22PE-A07	15…50
	A-22PE-A08	65…100
Silicone grommet with clamp	A-22PEM-A04	
Converter for M-Bus	G-22PEM-A01	
Bluetooth to near field communication converter	ZIP-BT-NFC	

All inclusive.

Belimo as a global market leader develops innovative solutions for the controlling of heating, ventilation and air-conditioning systems. Actuators, valves and sensors represent our core business.

Always focusing on customer added value, we deliver more than only products. We offer you the complete product range for the regulation and control of HVAC systems from a single source. At the same time, we rely on tested Swiss quality with a five-year warranty. Our worldwide representatives in over 80 countries guarantee short delivery times and comprehensive support through the entire product life. Belimo does indeed include everything.

The “small” Belimo devices have a big impact on comfort, energy efficiency, safety, installation and maintenance.

In short: Small devices, big impact.

- 5-year warranty
- On site around the globe
- Complete product range
- Tested quality
- Short delivery times
- Comprehensive support



EN – 2021-09/8 – Subject to technical modi ications

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