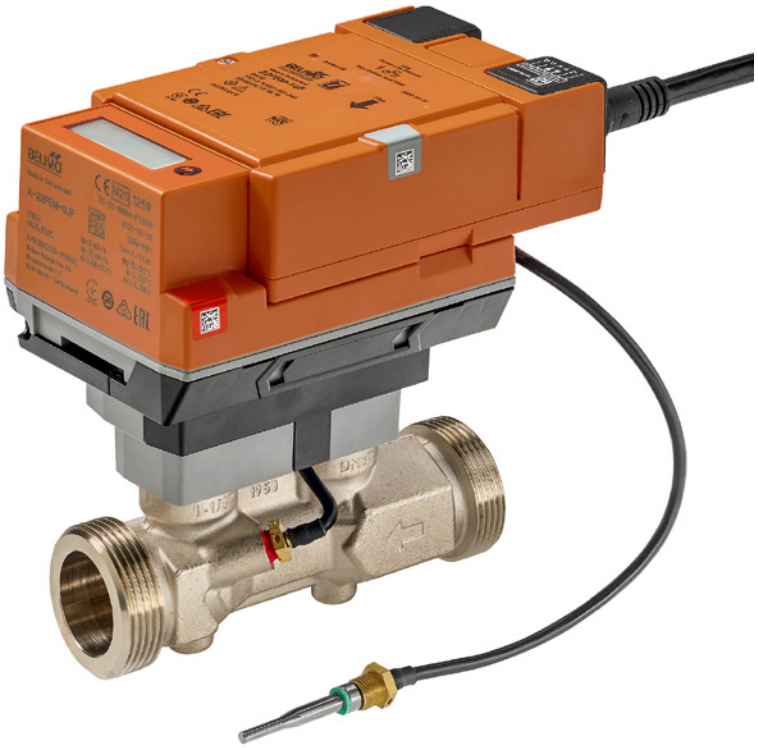

# BACnet Interface Description

# Thermal Energy Meter (TEM), DN 15...50 (Version 4)

Edition 2025-11/ V4.2.0

# Table of contents

# PICS
# Protocol Implementation Conformance Statement

## General information

| | |
|---|---|
| Date | 24/04/2024 |
| Vendor Name | BELIMO Automation AG |
| Vendor ID | 423 |
| Product Name | Thermal Energy Meter |
| Product Model Number | 22PE…-1U.. e.g. 22PEM-1UC |
| Application Software Version | 04.02.0000 |
| Firmware Revision | 14.10.0002 |
| BACnet Protocol Revision | 1.14 |
| Product Description | Thermal energy meter MID |
| BACnet Standard Device Profile | BACnet Application Specific Controller (B-ASC) |
| Segmentation Capability | No |
| Data Link Layer Options | MS/TP Manager<br>BACnet IP, (Annex J)<br>BACnet IP, (Annex J), Foreign Device |
| Device Address Binding | No static device binding supported |
| Networking Options | None |
| Character Sets Supported | ISO 10646 (UTF-8) |
| Gateway Options | None |
| Network Security Options | Non-secure device |
| Conformance | Listed by BTL |

## BACnet Interoperability Building Blocks supported (BIBBs)

Data sharing — ReadProperty-B (DS-RP-B)
Data sharing — ReadPropertyMultiple-B (DS-RPM-B)
Data sharing — WriteProperty-B (DS-WP-B)
Data sharing — COV-B (DS-COV-B)
Device management — DynamicDeviceBinding-B (DM-DDB-B)
Device management — DynamicObjectBinding-B (DM-DOB-B)
Device management — DeviceCommunicationControl-B (DM-DCC-B)

## BACnet MS/TP

| | |
|---|---|
| Baud Rates | 9'600, 19'200, 38'400, 76'800, 115'200 (Default: 38'400) |
| Address | 0...127 (Default: 1) |
| Number of Nodes | Max. 32 (without repeater), 1 full bus load |
| Terminating Resistor | 120 Ω |
| Port | Open (Default: 47'808) |

## Configuration

| | |
|---|---|
| Tool | Belimo Assistant 2 or integrated web server |

All writeable objects with instance number ≥90 are persistent and are **not** supposed to be written on a regular basis. Designated data points are highlighted in colour in the document.

## Standard object types supported

| Object type | Optional properties | Writeable properties |
|---|---|---|
| Device | Description<br>Location<br>Active COV Subscriptions<br>Max Manager<br>Max Info Frames<br>Profile Name | Object Identifier<br>Object Name<br>Location<br>Description<br>APDU Timeout (1'000...60'000)<br>Number of APDU Retries (0...10)<br>Max Manager (1...127)<br>Max Info Frames (1...30) |
| Analog Input [AI] | Description<br>COV Increment | COV Increment |
| Analog Output [AO] | Description<br>COV Increment | Present Value<br>COV Increment<br>Relinquish Default |
| Analog Value [AV] | Description<br>COV Increment | Present Value<br>COV Increment |
| Binary Input [BI] | Description<br>Active Text<br>Inactive Text | – |
| Binary Value [BV] | Description<br>Active Text<br>State Text | Present |
| Multi-state Input [MI] | Description<br>State Text | – |
| Multi-state Output [MO] | Description<br>State Text | Present Value<br>Relinquish Default |
| Multi-state Value [MV] | Description<br>State Text | Present Value |
| Positive Integer Value [PIV] | Description | – |

The device does not support the services CreateObject and DeleteObject.

The specified maximum length of writeable strings is based on single-byte characters.
– Object name 32 char
– Location 64 char
– Description 64 char

## Service processing

The device supports the DeviceCommunicationControl services.
No password is required.

A maximum of 6 active COV subscriptions with a lifetime of 1...28'800 s (max. 8 hours) are supported.

# Object descriptions

## Control and general settings

These objects can be used to control and configure the fundamental functionalities and read the corresponding feedback values of the Thermal Energy Meter.

| Object name | Object type [Instance] | Description Comment Status_Flags | Values | COV increment | Access |
|---|---|---|---|---|---|
| Device_Name | Device [Inst.No] | BACnet internetwork-wide unique number for device identification. | 0...4'194'302 Default: 1 | – | R / W |
| BusTermination | BV[99] | **Bus termination** Indicates if bus termination (120 Ω) is enabled. Bus termination can be set with Belimo Assistant 2. | 0: Disabled 1: Enabled Default: 0 | – | R |

Access definition: R = Read, W = Write

**Note:** According to the present configuration settings of the product (e.g. DN size), the HVAC application may perform a size limitation within the indicated BACnet value range.

## Flow

These objects can be used to configure and read values related to Flow control.

| Object name | Object type [Instance] | Description Comment Status_Flags | Values | COV increment | Access |
|---|---|---|---|---|---|
| RelFlow | AV[10] | **Relative volumetric flow in % of qp** (Related to qp) → Unit can be selected by AV[100]: Nominal volumetric flow (qp) in selected unit | 0...150 | 0.01...150 Default: 1 | R |
| AbsFlow_UnitSel | AV[19] | **Absolute volumetric flow in selected unit** Sensor reading up to 2.5* V'nom possible. Make sure to use the device within the specified parameters (see datasheet). → Unit can be selected by MV[123]: Unit selection volumetric flow | 0...0.015 $m^3/s$ 0...56.750 $m^3/h$ 0...15.762 l/s 0...945.832 l/min 0...56'750.000 l/h 0...249.862 gpm 0...33.400 cfm | 0...56'750 Default: 1 | R |
| Vnom_UnitSel | AV[100] | **Nominal volumetric flow (qp) in selected unit** → Unit can be selected by MV[123]: Unit selection volumetric flow. | 0...0.006 $m^3/s$ 0...22.700 $m^3/h$ 0...6.305 l/s 0...378.333 l/min 0...22'700.000 l/h 0...99.945 gpm 0...13.360 cfm | 0.001...22'700 Default: 1 | R |
| UnitSelFlow | MV[123] | **Unit selection volumetric flow** The selected unit is valid for: AV[19]: Absolute volumetric flow in selected unit AV[100]: Nominal volumetric flow (qp) in selected unit | 1: $m^3/s$ 2: $m^3/h$ 3: l/s 4: l/min 5: l/h 6: gpm 7: cfm Default: 5 | – | R / W |
| Volume_UnitSel | AV[52] | **Accumulated volume in selected unit** → Unit can be selected by MV[126]: Unit selection volume See also MV[200]: Select meter register | 0...42'000'000 $m^3$ 0...42'000'000'000 l 0...11'095'226'199 gal 0...1'483'216'002.3 cf | 42'000'000'000 Default: 1 | R |

| Object name | Object type [Instance] | Description Comment Status_Flags | Values | COV increment | Access |
|---|---|---|---|---|---|
| VolumePIV_ UnitSel | PIV[50] | **Accumulated volume in selected unit**<br>→ Unit can be selected by MV[126]: Unit selection volume<br><br>See also MV[200]: Select meter register | 0...42'000'000 $m^3$<br>0...42'000'000'000 l<br>0...11'095'226'199 gal<br>0...1'483'216'002 cf | – | R |
| UnitSelVolume | MV[126] | **Unit selection volume**<br>The selected unit is valid for<br>AV[52]: Accumulated volume in selected unit<br>PIV[50]: Accumulated volume in selected unit | 1: $m^3$ Default: 1<br>2: Litre<br>3: Gallon<br>4: Cubic Foot | – | R / W |
| GlycolConcentra-tion | AV[60] | **Glycol concentration in %**<br>Actual measuring range depends on device type (see data sheet). | 0...60 | 0.01...60<br>Default: 1 | R |
| StatusSensor | MV[103] | **Status sensor**<br>Indicates information within the flow sensor and the flowbody temperature sensor.<br><br>2: Air in the system, error occurred during flow measurement.<br>3: Error with embedded temperature sensor.<br><br>4: No connection to external temperature sensor.<br>5: Internal communication to flow sensor interrupted. | <br>1: OK<br><br>2: Flow measurement error<br><br>3: Flowbody temperature not OK<br>4: Remote temperature not OK<br>5: Communication to flow sensor interrupted | – | R |
| StatusFlow | MV[104] | **Status flow**<br>2: Actual flow exceeds the designed nominal flow.<br><br><br>5: Reverse flow detected. Pump pressure too low; high resistance in the flow circuit; flushing bypass open. | 1: OK<br>2: Actual flow exceeds nominal flow<br>3: –<br>4: –<br>5: Reverse flow | – | R |
| StatusMedia | MV[105] | **Status media**<br>2: Medium contains glycol.<br>3: Measured temperature and glycol concentration indicate that grease ice can build up. | 1: OK<br>2: Glycol detected<br>3: Freeze warning | – | R |

Access definition: R = Read, W = Write

**Note:** According to the present configuration settings of the product (e.g. DN size), the HVAC application may perform a size limitation within the indicated BACnet value range.

# Power

These objects can be used to configure and read values related to the Power Management.

| Object name | Object type [Instance] | Description Comment, Status_Flags | Values | COV increment | Access |
|---|---|---|---|---|---|
| CoolingPower_ UnitSel | AV[45] | **Absolute power cooling in selected unit**<br>→ Unit can be selected by MV[124]: Unit selection power | 0...3'990'000 W<br>0...3'990 kW<br>0...3.99 MW<br>0...13'614'444 BTU/h<br>0...13'614 kBTU/h<br>0...1'134 ton | 0.1...3'990'000<br>Default: 1 | R |
| HeatingPower_ UnitSel | AV[46] | **Absolute power heating in selected unit**<br>→ Unit can be selected by MV[124]: Unit selection power | 0...3'990'000 W<br>0...3'990 kW<br>0...3.99 MW<br>0...13'614'444 BTU/h<br>0...13'614 kBTU/h<br>0...1'134 ton | 0.1...3'990'000<br>Default: 1 | R |
| UnitSelPower | MV[124] | **Unit selection power**<br>The selected unit is valid for<br>AV[45]: Absolute power cooling in selected unit<br>AV[46]: Absolute power heating in selected unit<br>AV[116]: Nominal power in selected unit | 1: W<br>2: kW<br>3: MW<br>4: BTU/h<br>5: kBTU/h<br>6: ton<br>Default: 2 | – | R / W |
| Pnom_UnitSel | AV[116] | **Nominal power in selected unit**<br>→ Unit can be selected by MV[124]: Unit selection power | 0...1'330'000 W<br>0...1330 kW<br>0...1.33 MW<br>0...4'538'148 BTU/h<br>0...4'538 kBTU/h<br>0...378 ton | 0.1...1'330'000<br>Default: 1 | R |

Access definition: R = Read, W = Write

**Note:** According to the present configuration settings of the product (e.g. DN size), the HVAC application may perform a size limitation within the indicated BACnet value range.

# Energy

These objects can be used to configure and read values related to the energy monitoring function.

| Object name | Object type [Instance] | Description Comment, Status_Flags | Values | COV increment | Access |
|---|---|---|---|---|---|
| CoolingEnergy_ UnitSel | AV[47] | **Absolute energy cooling in selected unit**<br>→ Unit can be selected by MV[125]: Unit selection energy<br><br>See also MV[200]: Select meter register | 0...2'147'483'647 | 0...2'147'483'647<br>Default: 1 | R |
| HeatingEnergy_ UnitSel | AV[48] | **Absolute energy heating in selected unit**<br>→ Unit can be selected by MV[125]: Unit selection energy]<br><br>See also MV[200]: Select meter register | 0...2'147'483'647 | 0...2'147'483'647<br>Default: 1 | R |
| UnitSelEnergy | MV[125] | **Unit selection energy**<br>The selected unit is valid for<br>AV[47]: Absolute energy cooling in selected unit<br>AV[48]: Absolute energy heating in selected unit<br>PIV[31]: Absolute energy cooling in selected unit<br>PIV[32]: Absolute energy heating in selected unit | 1: J<br>2: kJ<br>3: MJ<br>4: GJ<br>5: Wh<br>6: kWh<br>7: MWh<br>8: BTU<br>9: kBTU<br>10: tonh<br>Default: 6 | – | R / W |
| SelectMeterRe-gisters | MV[200] | **Select meter register**<br>Select between certified meter register and lifetime register.<br><br>Value 1 only available for models with MID certification 22PEM-..<br>For non-MID-certified models, value 2 is defined as default.<br>1: The certified meter register will be reset when the sensor module is replaced.<br>2: The lifetime register is compensated for glycol (if applicable).<br><br>Avoid toggling between the two registers as this will affect data logging.<br><br>The following objects depend on the selected meter register:<br>AV[47]: Absolute energy cooling in selected unit<br>AV[48]: Absolute energy heating in selected unit<br>AV[52]: Accumulated volume in selected unit | 1: Certified meter register<br>2: Lifetime meter register<br>Default: 1 | – | R / W |
| CoolingEnergy-PIV_ UnitSel | PIV[31] | **Absolute energy cooling in selected unit**<br>→ Unit can be selected by MV[125]: Unit selection energy.<br><br>See also MV[200]: Select meter register | 0...2'147'483'647 | 1...2'147'483'647 | R |
| HeatingEnergy-PIV_ UnitSel | PIV[32] | **Absolute energy heating in selected unit**<br>→ Unit can be selected by MV[125]: Unit selection energy<br><br>See also MV[200]: Select meter register | 0...2'147'483'647 | 1...2'147'483'647 | R |

| Object name | Object type [Instance] | Description Comment, Status_Flags | Values | COV increment | Access |
|---|---|---|---|---|---|
| MeterSerialNo_ Part1 | PIV[201] | **Energy meter serial number first digits** ProductionOrderNumber | – | – | R |
| MeterSerialNo_ Part2 | PIV[202] | **Energy meter serial number last digits** ProductionSequenceNumber | – | – | R |

## Temperature

The measured temperature values can be read out via the object below.

| Object name | Object type [Instance] | Description Comment Status_Flags | Values | COV increment | Access |
|---|---|---|---|---|---|
| T1_UnitSel | AI[22] | **Temperature 1 (remote) in selected unit** →► Unit can be selected by MV[127]: Unit selection temperature sensors | –20...150°C 253.15...423.15 K –4...302°F | 0.01...306 Default: 1 | R |
| T2_UnitSel | AI[23] | **Temperature 2 (flow body) in selected unit** →► Unit can be selected by MV[127]: Unit selection temperature sensors | –20...150°C 253.15...423.15 K –4...302°F | 0.01...306 Default: 1 | R |

Access definition: R = Read, W = Write

**Note:** According to the present configuration settings of the product (e.g. DN size), the HVAC application may perform a size limitation within the indicated BACnet value range.

## Conversion of sensor signals

These objects can be used to configure the additional Sensor 1 Input on Y3 and related values.

| Object name | Object type [Instance] | Description Comment Status_Flags | Values | | COV increment | Access |
|---|---|---|---|---|---|---|
| Sens1Active_ Volt | AI[20] | **Sensor 1 as voltage in V** If MV[220]: Sensor 1 Type is not = 2: Active, then Out_Of_Service is TRUE. | 0...15 | | 0.01...15 Default: 1 | R |
| Sens1Passive_ Ohm | AI[21] | **Sensor 1 as resistance in Ω** If MV[220]: Sensor 1 Type is not = 4: Passive, then Out_Of_Service is TRUE. | 0.1...1'000'000 | | 0.1...1'000'000 Default: 1 | R |
| Sens1Temp_ UnitSel | AV[20] | **Sensor 1 as temperature in selected unit** ➞ Unit can be selected by MV[127]: Unit selection temperature sensors<br><br>If MV[221]: Sensor 1 passive type is 1: None or MV[220]: Sensor 1 type is not 4: Passive, then Out_Of_Service is TRUE | −20...150°C<br>253.15...423.15 K<br>−4...248°F<br>Default: 0 | | 0.01...252 Default: 1 | R |
| Sens1Switch | BI[20] | **Sensor 1 as switch** If MV[220]: Sensor 1 type is not 5: Switch, then Out_Of_Service is TRUE | 0: Inactive<br>1: Active | | – | R |
| UnitSelTemperature | MV[127] | **Unit selection temperature sensor** The selected unit is valid for:<br>AV[20]: Sensor 1 as temperature in selected unit<br>AI[22]: Temperature 1 (remote) in selected unit<br>AI[23]: Temperature 2 (flow body) in selected unit | 1: °C<br>2: K<br>3: °F | Default: 1 | – | R / W |
| Sens1Type | MV[220] | **Sensor 1 type** Additional sensor input | 1: None<br>2: Active Volt<br>3: – | 4: Passive<br>5: Switch<br>Default: 1 | – | R / W |
| Sens1TempType | MV[221] | **Sensor 1 passive type** Values related to MV[127]: Unit selection temperature sensor. Only available if MV[220] Sensor 1 type is set to value 4 "Passive". | 1: None<br>2: PT1000<br>3: Ni1000EU<br>4: –<br>5: – | 6: –<br>7: –<br>8: NTC10k2<br>9: NTC10k3<br>Default: 1 | – | R / W |

Access definition: R = Read, W = Write

**Note:** According to the present configuration settings of the product (e.g. DN size), the HVAC application may perform a size limitation within the indicated BACnet value range.

# Health state

This object allows to determine malfunctions, service information and error state of the Thermal Energy Meter.

| Object name | Object type [Instance] | Description Comment Status_Flags | Values | COV increment | Access |
|---|---|---|---|---|---|
| ErrorState | AV[140] | **Error state**<br>Value is bit-coded. More than one bit can be set to 1.<br>Not all bits mentioned are used for this product range.<br>3: Reverse flow is detected. Pump pressure too low; high resistance in the flow circuit; flushing bypass open.<br>6: Actual flow exceeds the designed nominal flow.<br>7: Air in the system, error occurred during flow measurement. Water contamination, not specified fluid used.<br>8: No connection to external temperature sensor.<br>9: Error with embedded temperature sensor.<br>10: Internal communication to flow sensor interrupted.<br>11: Measured temperature and glycol concentration indicate that grease ice can build up.<br>12: Medium contains glycol.<br>14: MID only. The sensor module must be replaced. | Bitmask =<br>0: –<br>1: –<br>2: –<br>3: Reverse flow<br>4: –<br>5: –<br>6: Flow actual exceeds flow nominal<br>7: Flow measurement error<br>8: Remote temperature error<br>9: Flowbody temperature error<br>10: Communication to sensor interrupted<br>11: Freeze warning<br>12: Glycol detected<br>13: –<br>14: Device end of life reached<br>15: – | 1...16'383<br>Default: 0 | R |
| SummaryStatus | MV[99] | **Summary status**<br>Summarises all status:<br>MV[103]: Status sensor<br>MV[104]: Status flow<br>MV[105]: Status media | 1: Ok<br>2: Warning<br>3: Not Ok | – | R |

Access definition: R = Read, W = Write

**Note:** According to the present configuration settings of the product (e.g. DN size), the HVAC application may perform a size limitation within the indicated BACnet value range.

# All inclusive.

Belimo is the global market leader in the development, production, and sales of field devices for the energy-efficient control of heating, ventilation and air-conditioning systems. The focus of our core business is on damper actuators, control valves, sensors and meters.

Always focusing on customer 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 – 2025-11/B – Subject to technical modifications

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