



## BACnet Interface Description



### Air quality sensors 22DTH-..6.., 22DTM-..6, 22UTH-..60X

Edition 2024-08 / V4.1

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# Protocol Implementation Conformance Statement – PICS

## General information

Date	02.08.2022
Vendor Name	BELIMO Automation AG
Vendor ID	423
Product Name	Sensor
Product Model Number	22DTH-16M, 22DTM-16, 22UTH-160X 22DTH-56M, 22DTM-56, 22UTH-560X
Application Software Version	2.3
Firmware Revision	2.3
BACnet Protocol Revision	1.14
Product Description	BACnet Smart sensor (B-SS)
BACnet Standard Device Profile	BACnet Application Specific Controller (B-ASC)
Segment Capability	No
Data Link Layer Options	MS/TP Manager
Device Addressing Binding	No static device binding supported
Networking Options	None
Character Sets Supported	UTF-8

## 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 Unsubscribed-B (DS-COVU-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
Number of Nodes	Max. 32 (without repeater)



Depending on the sensor type and the version, not all the measured values and configuration parameters listed in this document are available. The values available for the respective sensor, can be taken from the respective sensor data sheet, or via the "Out of Service" flag of the corresponding object via BACnet.

## Standard object types supported

### Object processing

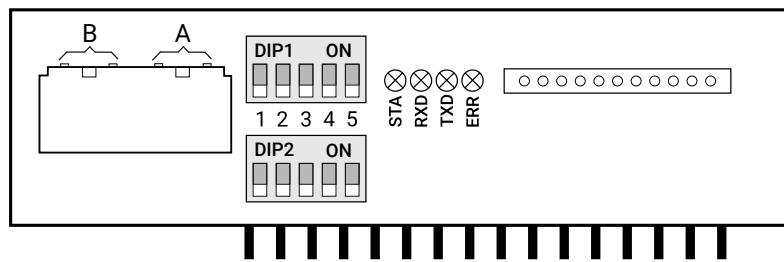
Object type	Optional properties	Writeable properties
Device	Description Max Manager Max Info Frames	Description
Analog Input [AI]	Description COV Increment	COV Increment
Analog Value [AV]	Description	Present Value
Binary Input [BI]	Description Active Text Inactive Text	–
Binary Value [BV]	Description Active Text State Text	Present Value
Multi-state Value [MV]	Description State Text	Present Value

The specified maximum length of writable strings in the Device Object are based on single byte characters and support up to 32 characters.

# Operating elements for addressing and parametrisation

## RS 485 module

In addition to the basic board, each BACnet sensor is equipped with a RS-485 module. The BACnet communication lines A (D +) and B (D -) are connected to the module. Furthermore, on the two DIP switches, the MAC address of the BACnet sensor can be selected and the communication parameters can be set.

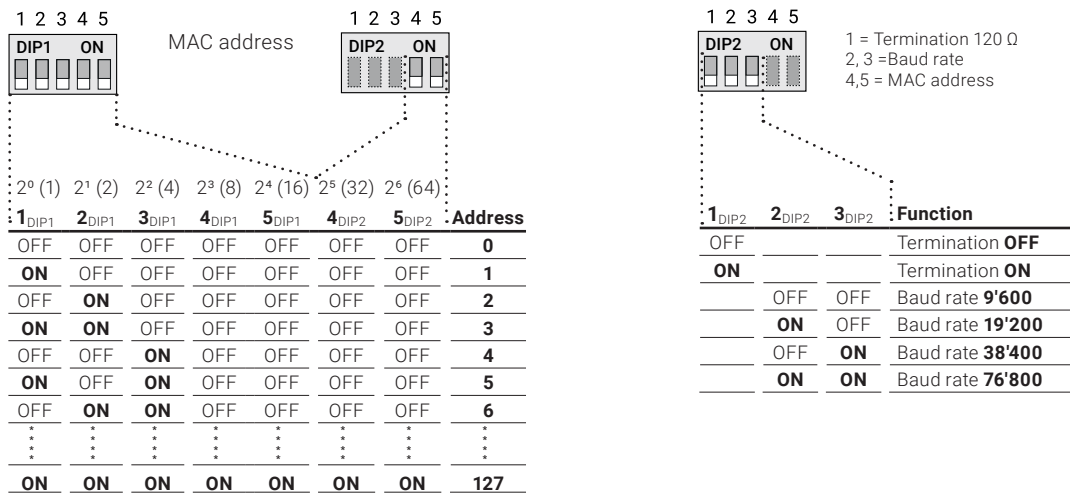


## Functions of DIP switch 1 and DIP switch 2

DIP switch **DIP1** (switch 1–5) is used to set the MAC address together with switch **DIP2** (switch 4 and 5) binary coded in a range of 1...127 (Address 0 is reserved and can't be set).

DIP switch **DIP2** (switch 1, 2, 3) is used to parametrise termination (120 Ω) and baud rate.

All DIP switches are factory set to the OFF position.



## LED functions

The four LEDs on the RS-485 module show the actual operating status of the RS-485 module.

- STA** During normal operation the LED is flashing.  
LED is turned ON during sensor initialization after Power ON of the device.
- RXD** LED is turned ON if bus telegrams are received by the RS-485 module.
- TXD** LED is turned ON if bus telegrams are sent by the RS-485 module.
- ERR** LED is turned ON in case of a faulty bus configuration or in case of internal errors.

# BACnet object descriptions

## Information

Depending on the device type or version, not all measured values or configuration parameters listed in this document are available. Which values are available for your device can be found in the relevant device data sheet, or via the "Out of Service" flag of the corresponding object via BACnet.

## Sensor values

Via the objects analog inputs AI[0]...AI[11] the various sensor measuring values can be read out.

→ Selection of unitary system SI or Imperial see description of object analog value AV[38].

Object type [Instance]	Description Comment, Status_Flags	COV increment	Values	Access
Device [x]	<b>Device Object</b>	–	–	R
AI[0]	<b>Value temperature SI in °C and Imperial in °F</b>	0...250 °C [0...480 °F]	-50°C...+250°C [-30°F...+480°F]	R
AI[1]	<b>Value relative humidity in % RH</b>	0...100%	0...100% RH	R
AI[2]	<b>Value absolute humidity SI in g/m<sup>3</sup> and Imperial in gr/ft<sup>3</sup></b>	0...80 g/m <sup>3</sup> [0...35 gr/ft]	0...80 g/m <sup>3</sup> [0...35 gr/ft]	R
AI[3]	<b>Value enthalpy SI in kJ/kg and Imperial in BTU/lb</b>	0...85 kJ/kg [0...40 BTU/lb]	0...85 KJ/kg [0...40 BTU/lb]	R
AI[4]	<b>Value dew point SI in °C and Imperial in °F</b>	0...80°C [0...200°F]	-20°C...+80°C [0°F...+200°F]	R
AI[5]	<b>Value CO<sub>2</sub> in ppm</b>	0...5'000 ppm	0...5'000 ppm	R
AI[6]	<b>Value VOC in %</b>	0...100 %	0...100 %	R
AI[7]	<b>Value CO<sub>2</sub> VOC Mix in %</b>	0...100 %	0...100 %	R
AI[8]	Not supported on this device type	–	–	–
AI[9]	Not supported on this device type	–	–	–
AI[10]	Not supported on this device type	–	–	–
AI[11]	Not supported on this device type	–	–	–

Description Access: R = Read, W = Write

## Offset and correction values

Via the objects analog outputs AV[0]...AV[5] offset and correction values for the individual measuring values can be defined.

→ Selection of unitary system SI or Imperial see description of object analog value AV[38].

Object type [Instance]	Description Comment, Status_Flags	Values	Access
AV[0]	<b>Offset temperature SI in °C and Imperial in °F</b>	-3°C...+3°C [-6°F...+6°F]	R / W
AV[1]	<b>Offset relative humidity in %</b>	-5% RH...+5% RH	R / W
AV[2]	<b>Offset CO<sub>2</sub> in ppm</b>	-150 ppm...+150 ppm	R / W
AV[3]	<b>Offset VOC in %</b>	-15 %...+15 %	R / W
AV[4]	Not supported on this device type	–	–
AV[5]	Not supported on this device type	–	–

Description Access: R = Read, W = Write

## Upper / lower limit of measuring values

Via the objects analog outputs AV[6]...AV[25] upper / lower limits of measuring values can be set in a certain range.

Furthermore the scaling of the two analogue 0–10 V outputs of the sensor are defined via these objects analog outputs.

→ Selection of unitary system SI or Imperial see description of object analog value AV[38].

Object type [Instance]	Description Comment, Status_Flags	Values	Access
AV[6]	<b>Lower limit temperature SI in °C and Imperial in °F</b>	-50°C...+250°C [-30°F...+480°F]	R / W
AV[7]	<b>Upper limit temperature SI in °C and Imperial in °F</b>	-50°C...+250°C [-30°F...+480°F]	R / W
AV[8]	<b>Lower limit relative humidity in %</b>	0...100% RH	R / W
AV[9]	<b>Upper limit relative humidity in %</b>	0...100% RH	R / W
AV[10]	<b>Lower limit absolute humidity in SI in g/m<sup>3</sup> and Imperial in gr/ft<sup>3</sup></b>	0...80 g/m <sup>3</sup> [0...35 gr/ft]	R / W
AV[11]	<b>Upper limit absolute humidity SI in g/m<sup>3</sup> and Imperial in gr/ft<sup>3</sup></b>	0...80 g/m <sup>3</sup> [0...35 gr/ft]	R / W
AV[12]	<b>Lower limit enthalpy SI in kJ/kg and Imperial in BTU/lb</b>	0...85 KJ/kg [0...40 BTU/lb]	R / W
AV[13]	<b>Upper limit enthalpy SI in kJ/kg and Imperial in BTU/lb</b>	0...85 KJ/kg [0...40 BTU/lb]	R / W
AV[14]	<b>Lower limit dew point SI in °C and Imperial in °F</b>	-20°C...+80°C [0°F...+200°F]	R / W
AV[15]	<b>Upper limit dew point SI in °C and Imperial in °F</b>	-20°C...+80°C [0°F...+200°F]	R / W
AV[16]	<b>Lower limit CO<sub>2</sub> in ppm</b>	0...5'000 ppm	R / W
AV[17]	<b>Upper limit CO<sub>2</sub> in ppm</b>	0...5'000 ppm	R / W
AV[18]	<b>Lower limit VOC in %</b>	0...100 %	R / W
AV[19]	<b>Upper limit VOC in %</b>	0...100 %	R / W
AV[20]	<b>Lower limit CO<sub>2</sub> VOC Mix in %</b>	0...100 %	R / W
AV[21]	<b>Upper limit CO<sub>2</sub> VOC Mix in %</b>	0...100 %	R / W
AI[22]	Not supported on this device type	–	–
AI[23]	Not supported on this device type	–	–
AI[24]	Not supported on this device type	–	–
AI[25]	Not supported on this device type	–	–

Description Access: R = Read, W = Write



## Selection of sensor channels of measuring values

Via objects analog outputs AV[26]...AV[37] the individual measured values can be assigned to channels. This can be used to assign the two analog outputs to the corresponding measured value (channel # 1 = AOU1, channel # 2 = AOU2). In addition, 4 fields of the LCD display (optional) can be assigned to measured values by using the corresponding channel #.

Default settings	Object type [Instance]	Description	Access
<b>Channel temperature</b>	<b>Default value channel#</b>		
Sensor 22DTH-..6..	<b>2 (AOU2)</b>		
Sensor 22UTH-..60X	<b>2 (AOU2)</b>	AV[26]	R / W
Sensor 22DTM-..6	<b>2 (AOU2)</b>		
<b>Channel relative humidity</b>	<b>Default value channel#</b>		
Sensor 22DTH-..6..	<b>1 (AOU1)</b>		
Sensor 22UTH-..60X	<b>1 (AOU1)</b>	AV[27]	R / W
Sensor 22DTM-..6	<b>3</b>		
<b>Channel absolute humidity</b>	<b>Default value channel#</b>		
Sensor 22DTH-..6..	0		
Sensor 22UTH-..60X	0	AV[28]	R / W
Sensor 22DTM-..6	0		
<b>Channel enthalpy</b>	<b>Default value channel#</b>		
Sensor 22DTH-..6..	0		
Sensor 22UTH-..60X	0	AV[29]	R / W
Sensor 22DTM-..6	0		
<b>Channel dew point</b>	<b>Default value channel#</b>		
Sensor 22DTH-..6..	0		
Sensor 22UTH-..60X	0	AV[30]	R / W
Sensor 22DTM-..6	0		
<b>Channel CO<sub>2</sub></b>	<b>Default value channel#</b>		
Sensor 22DTH-..6..	0		
Sensor 22UTH-..60X	0	AV[31]	R / W
Sensor 22DTM-..6	<b>1 (AOU1)</b>		
<b>Channel VOC</b>	<b>Default value channel#</b>		
Sensor 22DTH-..6..	0		
Sensor 22UTH-..60X	0	AV[32]	R / W
Sensor 22DTM-..6	0		

**Channel Selection #**  
**Valid values 1, 2, 3 or 4**  
The channels with channel #1 and #2 are output both via BACnet objects analog inputs AI[0]...AI[9] and via the analog outputs AOU1 and AOU2.

**4 fields of the LCD-display** (optional) can be assigned to measured values by using the corresponding channel #.

Unused channels are set to zero.

Assignment:  
LCD fields to channel #

Field 1 (channel 1)	Field 3 (channel 3)
Field 2 (channel 2)	Field 4 (channel 4)

Example →

22DTM-..Sensor			
CO <sub>2</sub>	ppm	Temp	°C
	1278		23.7
RH	%		
	63		

Default settings	Object type [Instance]	Description	Access										
<b>Channel CO<sub>2</sub> VOC Mix</b>	<b>Default value channel#</b>	<b>I Selection #</b> <b>Valid values 1, 2, 3 or 4</b> The channels with channel #1 and #2 are output both via BACnet objects analog inputs AI[0]...AI[9] and via the analog R / W outputs AOU1 and AOU2.  <b>4 fields of the LCD-display</b> (optional) can be assigned to measured values by using the corresponding channel #.											
Sensor 22DTH-..6..	0												
Sensor 22UTH-..60X	0		AV[33]										
Sensor 22DTM-..6	0												
<b>Channel differential pressure 1</b>	<b>Default value channel#</b>	Unused channels are set to zero.											
Not supported on this device type	-		AV[34]	-									
<b>Channel volumetric flow 1</b>	<b>Default value channel#</b>	Assignment: LCD fields to channel #											
Not supported on this device type	-		AV[35]	-									
<b>Channel differential pressure 2</b>	<b>Default value channel#</b>	<table border="1"> <tr> <td>Field 1 (channel 1)</td> <td>Field 3 (channel 3)</td> </tr> <tr> <td>Field 2 (channel 2)</td> <td>Field 4 (channel 4)</td> </tr> </table> Example →	Field 1 (channel 1)	Field 3 (channel 3)	Field 2 (channel 2)	Field 4 (channel 4)							
Field 1 (channel 1)	Field 3 (channel 3)												
Field 2 (channel 2)	Field 4 (channel 4)												
Not supported on this device type	-	AV[36]	-										
<b>Channel volumetric flow 2</b>	<b>Default value channel#</b>	<table border="1"> <tr> <td colspan="2">22DTM-..Sensor</td> </tr> <tr> <td>CO<sub>2</sub> ppm</td> <td>Temp °C</td> </tr> <tr> <td>1278</td> <td>23.7</td> </tr> <tr> <td>RH %</td> <td></td> </tr> <tr> <td>63</td> <td></td> </tr> </table>	22DTM-..Sensor		CO <sub>2</sub> ppm	Temp °C	1278	23.7	RH %		63		
22DTM-..Sensor													
CO <sub>2</sub> ppm	Temp °C												
1278	23.7												
RH %													
63													
Not supported on this device type	-	AV[37]	-										

Description Access: R = Read, W = Write

**Channel Selection #**  
**Valid values 1, 2, 3 or 4**

The channels with channel #1 and #2 are output both via BACnet and via the analog outputs AOU1 and AOU2. **4 fields of the LCD display** (optional) can be assigned to measured values by using the corresponding channel #.

## Sensor configuration

Via objects analog outputs AV[38]...AV[44] the required unitary system (SI or Imperial) can be selected and further. Sensor parameters can be chosen.

Object type [Instance]	Description Comment, Status_Flags	Values	Access
AV[38]	Not supported on this device type	–	–
AV[39]	Not supported on this device type	–	–
AV[40]	Not supported on this device type	–	–
AV[41]	Not supported on this device type	–	–
AV[42]	Not supported on this device type	–	–
AV[43]	Not supported on this device type	–	–
AV[44]	Not supported on this device type	–	–
AV[45]	Not supported on this device type	–	–
..	–	–	–
AV[85]	Not supported on this device type	–	–
AV[86]	Not supported on this device type	–	–

Description Access: R = Read, W = Write

## General device information

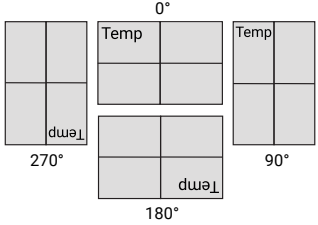


Via objects analog outputs AV[46]...AV[51] general device information can be read out or can be written.

Object type [Instance]	Object type [Instance]	Values	Access
AV[46]	<b>Offset device ID</b> Valid range: 0...4'194'175 Device ID = Offset device ID + MAC address	–	R / W
AV[47]	<b>Unconfirmed COV</b>	0 = Disabled 1 = Enabled	R / W
AV[48]	<b>Minimum output voltage in volt</b>	0...10 V	R / W
AV[49]	<b>Operating hours [h]</b>	uint32_t (0...4'294'967'295)	R / W
AV[50]	<b>Set a maintenance time in hours [h]</b> after which sensor shall be checked: After countdown time has expired a new countdown value in hours [h] has to be set.	uint32_t (0...999'999 h)	R / W
AV[50]	<b>Set a maintenance time in hours [h]</b> after which sensor shall be checked: After countdown time has expired a new countdown value in hours [h] has to be set.	uint32_t (0...999'999 h)	R / W

Description Access: R = Read, W = Write

## LCD-display configuration

Via objects analog outputs AV[52]...AV [67] display parameters of the optional LCD can be adjusted and the values to be displayed can be specified.

Object type [Instance]	Object type [Instance]	Values	Access
AV[52]	<b>Enable LCD</b>	0 = Disabled 1 = Enabled	R / W
AV[53]	<b>Brightness LCD</b>	0..100%	R / W
AV[54]	<b>Rotation LCD</b>	 <p>0 = 0° 1 = 90° 2 = 180° 3 = 270°</p>	R / W
AV[55]	<b>Enable LCD traffic light function</b>	0 = Disabled 1 = Enabled	R / W
AV[56]	<b>Enable symbol maintenance on LCD</b> If the countdown time set value of AV[50] has expired, the symbol will be shown on the LCD-display.	 0 = Disabled 1 = Enabled	R / W
AV[57]	<b>Enable symbol symbol maintenance on LCD</b> If the countdown time set value of AV[50] has expired, the symbol will be shown on the LCD-display.	 0 = Disabled 1 = Enabled	R / W
AV[58]	<b>Enable LCD channel 1</b>	0 = Disabled 1 = Enabled	R / W
AV[59]	<b>Enable LCD channel 2</b>	0 = Disabled 1 = Enabled	R / W
AV[60]	<b>Enable LCD channel 3</b>	0 = Disabled 1 = Enabled	R / W
AV[61]	<b>Enable LCD channel 4</b>	0 = Disabled 1 = Enabled	R / W
AV[62]	<b>Channel assignment for traffic light function</b> Input AV[26] to AV[35] (Example: channel temperature AV[26])	0 = Off 1 = Green 2 = Yellow 3 = Red	R / W
AV[63]	<b>Traffic light function color range 1</b> Definition of color of LCD back lightning	4 = Blue 5 = Magenta 6 = Cyan	R / W
AV[64]	<b>Traffic light function color range 1</b> Definition of color of LCD back lightning	7 = White	R / W
AV[65]	<b>Traffic light function color range 1</b> Definition of color of LCD back lightning		R / W
AV[66]	<b>Setting for threshold</b> (range 1 → 2) For color change of LCD back lightning. The value input is done in the basic unit based on the value of objects analog inputs AI[0]...AI[9]	–	R / W
AV[67]	<b>Setting for threshold</b> (range 1 → 2) For color change of LCD back lightning. The value input is done in the basic unit based on the value of objects analog inputs AI[0]...AI[9]	–	R / W

Description Access: R = Read, W = Write

# All inclusive.

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

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



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