



## Sensor BACnet PICS

- **22DTH-..6..**  
Duct sensor humidity / temperature
- **22UTH-..60X**  
Outdoor sensor humidity / temperature
- **22DTM-..6**  
Duct sensor CO2 / humidity / temperature

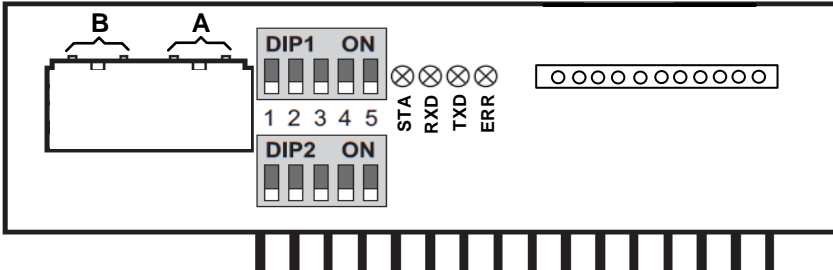
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1. Operating elements for addressing and parametrization

1.1 RS 485 module

In addition to the basic board, each BACnet sensor is equipped with a RS485 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.



1.2 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 & 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 parametrize termination (120 Ω) and baud rate.

1 2 3 4 5

MAC address

1 2 3 4 5

1 2 3 4 5

1 = Termination 120 Ω  
2, 3 = Baud rate  
4, 5 = MAC address

2 <sup>0</sup> (1)	2 <sup>1</sup> (2)	2 <sup>2</sup> (4)	2 <sup>3</sup> (8)	2 <sup>4</sup> (16)	2 <sup>5</sup> (32)	2 <sup>6</sup> (64)	Address
1 DIP1	2 DIP1	3 DIP1	4 DIP1	5 DIP1	4 DIP2	5 DIP2	0
OFF	OFF	OFF	OFF	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	OFF	OFF	OFF	2
ON	ON	OFF	OFF	OFF	OFF	OFF	3
OFF	OFF	ON	OFF	OFF	OFF	OFF	4
ON	OFF	ON	OFF	OFF	OFF	OFF	5
OFF	ON	ON	OFF	OFF	OFF	OFF	6
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
ON	ON	ON	ON	ON	ON	ON	127

1 DIP2	2 DIP2	3 DIP2	Function
OFF			Termination OFF
ON			Termination ON
	OFF	OFF	Baud rate 9'600
	ON	OFF	Baud rate 19'200
	OFF	ON	Baud rate 38'400
	ON	ON	Baud rate 76'800

1.3 LED Functions

The four LEDs on the RS485 module show the actual operating status of the RS485 module.

**STA** During normal operation the LED is flashing.  
green 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 RS485 module.  
orange

**TXD** LED is turned ON if bus telegrams are sent by the RS485 module.  
orange

**ERR** LED is turned ON in case of a faulty bus configuration or in case of internal errors.  
red

## 2. Protocol Implementation Conformance Statement - PICS

<b>General information</b>	<b>Date:</b>	16.11.2017
	<b>Vendor Name:</b>	BELIMO Automation AG
	<b>Vendor ID:</b>	423
	<b>Product Name:</b>	Sensor
	<b>Product Model number:</b>	22DTM-16 22DTM-56 22DTH-16M 22DTH-56M 22UTH-160X 22UTH-560X
	<b>Application Software Version:</b>	2.1
	<b>Firmware Revision:</b>	2.1
	<b>BACnet Protocol Revision:</b>	1.12
	<b>Product Description:</b>	Sensor device with BACnet MS/TP RS485 Interface
	<b>BACnet Standard Device Profile:</b>	BACnet Smart sensor (B-SS)
	<b>BACnet Interoperability Building Blocks supported:</b>	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)
	<b>BACnet Standard Application Services Supported:</b>	ReadProperty ReadPropertyMultiple WriteProperty DeviceCommunicationControl WhoHas Whols
	<b>Segmentation Capability:</b>	No
	<b>Data Link Layer Options:</b>	MS/TP Master, Baud rates 9'600, 19'200, 38'400, 76'800 Max. 32 nodes (without repeater)
	<b>Device Address Binding:</b>	No static device binding supported
	<b>Networking Options:</b>	None
	<b>Character Sets Supported:</b>	UTF-8

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.

## Protocol Implementation Conformance Statement – PICS (continued)

## Object processing

Object type	Optional properties	Writeable properties
Analog Input [AI]	COV Increment Description	COV Increment
Analog Value [AV]	Description	Present_Value
Device	Description Max Master Max Info Frames	Description

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

### 3. BACnet objects description

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.

#### 3.1 Sensor values

Via the objects analog inputs AI [0] ... AI [9] 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	COV Increment	Values	Relinquish Default	Access
Device [x]	Device Object		-	-	R
AI [0]	Value temperature SI in °C and Imperial in °F	0 ... 250 °C [0 ... 480 °F]	-50 °C to +250°C [-30 °F to +480 °F]	-	R
AI [1]	Value relative humidity in % rH	0 ... 100 %	0 to 100% rH	-	R
AI [2]	Value absolute humidity SI in g/m <sup>3</sup> and Imperial in gr/ft <sup>3</sup>	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]	Value enthalpy SI in kJ/kg and Imperial in BTU/lb	0 ... 85 kJ/kg [0 ... 40 BTU/lb]	0 ... 85 KJ/kg [0 ... 40 BTU/lb]	-	R
AI [4]	Value dew point SI in °C and Imperial in °F	0 ... 80 °C [0 ... 200 °F]	-20 °C to 80°C [0 °F to 200 °F]	-	R
AI [5]	Value CO2 in ppm	0 ... 5000 ppm	0 ... 5000 ppm	-	R
AI [6]	Value VOC in %	0 ... 100 %	0 ... 100	-	R
AI [7]	Value CO2 VOC Mix in %	0 ... 100 %	0 ... 100	-	R
AI [8]	Not used				
AI [9]	Not used				
AI [10]	Not used				
AI [11]	Not used				

### 3.2 Offset and correction values

Via the objects analog outputs AV [0] ... AV [4] 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	Values	Relinquish Default	Access
AV [0]	Offset temperature SI in °C and Imperial in °F	-3 °C to +3°C [-6 °F to +6 °F]	-	R/W
AV [1]	Offset relative humidity in %	-5%rH to +5%rH	-	R/W
AV [2]	Offset CO2 in ppm	-150ppm to +150ppm	-	R/W
AV [3]	Offset VOC in %	-15% to +15%	-	R/W
AV [4]	Not used			
AV [5]	Not used			

### 3.3 Upper +/- lower limit of measuring values

Via the objects analog outputs AV [6] ... AV [23] upper +/- lower limits of measuring values can be set in a certain range.

Furthermore the scaling of the two analogue 0 - 10 Volt 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	Values	Relinquish Default	Access
AV [6]	Lower limit temperature SI in °C and Imperial in °F	-50 °C to +250°C [-30 °F to +480 °F]	-	R/W
AV [7]	Upper limit temperature SI in °C and Imperial in °F	-50 °C to +250°C [-30 °F to +480 °F]	-	R/W
AV [8]	Lower limit relative humidity in %	0 to 100%	-	R/W
AV [9]	Upper limit relative humidity in %	0 to 100%	-	R/W
AV [10]	Lower limit absolute humidity in SI in g/m <sup>3</sup> and Imperial in gr/ft <sup>3</sup>	0 ... 80 g/m <sup>3</sup> [0... 35 gr/ft <sup>3</sup> ]	-	R/W
AV [11]	Upper limit absolute humidity SI in g/m <sup>3</sup> and Imperial in gr/ft <sup>3</sup>	0 ... 80 g/m <sup>3</sup> [0... 35 gr/ft <sup>3</sup> ]	-	R/W
AV [12]	Lower limit enthalpy SI in kJ/kg and Imperial in BTU/lb	0..85 KJ/kg [0..40 BTU/lb]	-	R/W
AV [13]	Upper limit enthalpy SI in kJ/kg and Imperial in BTU/lb	0..85 KJ/kg [0..40 BTU/lb]	-	R/W
AV [14]	Lower limit dew point SI in °C and Imperial in °F	-20 °C to 80°C [0 °F to 200 °F]	-	R/W
AV [15]	Upper limit dew point SI in °C and Imperial in °F	-20 °C to 80°C [0 °F to 200 °F]	-	R/W
AV [16]	Lower limit CO2 in ppm	0 ... 5000 ppm	-	R/W
AV [17]	Upper limit CO2 in ppm	0 ... 5000 ppm	-	R/W
AV [18]	Lower limit VOC in %	0 ... 100	-	R/W
AV [19]	Upper limit VOC in %	0 ... 100	-	R/W
AV [20]	Lower limit CO2 VOC Mix in %	0 ... 100	-	R/W
AV [21]	Upper limit CO2 VOC Mix in %	0 ... 100	-	R/W
AV [22]	Not used			
AV [23]	Not used			
AV [24]	Not used			
AV [25]	Not used			

**3.4 Selection of sensor channels of measuring values**

Via objects analog outputs AV [26] ... AV [35] 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	Relinquish Default	Access																				
<b>Channel temperature</b>	<b>Default value channel #</b>	AV [26]	<p><b>Selection channel #</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 outputs AOU1 and AOU2.</p> <p><b>4 fields of the LCD display</b> (optional) can be assigned to measured values by using the corresponding channel #.</p> <p>Unused channels are set to zero.</p> <p>Assignment LCD fields to channel #</p> <table border="1" style="margin-left: 20px;"> <tr> <td>field 1 (channel 1)</td> <td>field 2 (channel 2)</td> </tr> <tr> <td>field 3 (channel 3)</td> <td>field 4 (channel 4)</td> </tr> </table> <p>Example                      22DTM-..Sensors</p> <table border="1" style="margin-left: 20px;"> <tr> <td>CO2</td> <td>ppm</td> <td>Temp</td> <td>°C</td> </tr> <tr> <td></td> <td>1278</td> <td></td> <td>23.7</td> </tr> <tr> <td>rH</td> <td>%</td> <td></td> <td></td> </tr> <tr> <td></td> <td>63</td> <td></td> <td></td> </tr> </table>	field 1 (channel 1)	field 2 (channel 2)	field 3 (channel 3)	field 4 (channel 4)	CO2	ppm	Temp	°C		1278		23.7	rH	%				63			-	R/W
field 1 (channel 1)	field 2 (channel 2)																								
field 3 (channel 3)	field 4 (channel 4)																								
CO2	ppm			Temp	°C																				
	1278			23.7																					
rH	%																								
	63																								
Sensor 22DTH-..6..	<b>2 (AOU2)</b>																								
Sensor 22UTH-..60X	<b>2 (AOU2)</b>																								
Sensor 22DTM-..6	<b>2 (AOU2)</b>																								
<b>Channel relative humidity</b>	<b>Default value channel #</b>	AV [27]			-	R/W																			
Sensor 22DTH-..6..	<b>1 (AOU1)</b>																								
Sensor 22UTH-..60X	<b>1 (AOU1)</b>																								
Sensor 22DTM-..6	<b>3</b>																								
-	-																								
<b>Channel absolute humidity</b>	<b>Default value channel #</b>	AV [28]					-	R/W																	
Sensor 22DTH-..6..	0																								
Sensor 22UTH-..60X	0																								
Sensor 22DTM-..6	0																								
-	-																								
<b>Channel enthalpy</b>	<b>Default value channel #</b>	AV [29]								-	R/W														
Sensor 22DTH-..6..	0																								
Sensor 22UTH-..60X	0																								
Sensor 22DTM-..6	0																								
-	-																								
<b>Channel dew point</b>	<b>Default value channel #</b>	AV [30]			-	R/W																			
Sensor 22DTH-..6..	0																								
Sensor 22UTH-..60X	0																								
Sensor 22DTM-..6	0																								
-	-																								
<b>Channel CO2</b>	<b>Default value channel #</b>	AV [31]					-	R/W																	
Sensor 22DTH-..6..	0																								
Sensor 22UTH-..60X	0																								
Sensor 22DTM-..6	<b>1 (AOU1)</b>																								
-	-																								
<b>Channel VOC</b>	<b>Default value channel #</b>	AV [32]								-	R/W														
Sensor 22DTH-..6..	0																								
Sensor 22UTH-..60X	0																								
Sensor 22DTM-..6	0																								
-	-																								
<b>Channel CO2 VOC Mix</b>	<b>Default value channel #</b>	AV [33]			-	R/W																			
Sensor 22DTH-..6..	0																								
Sensor 22UTH-..60X	0																								
Sensor 22DTM-..6	0																								
-	-																								
<b>Channel differential pressure</b>	<b>Default value channel #</b>	AV [34]					-	R/W																	
Sensor 22DTH-..6..	0																								
Sensor 22UTH-..60X	0																								
Sensor 22DTM-..6	0																								
-	-																								
<b>Channel volumetric flow</b>	<b>Default value channel #</b>	AV [35]								-	R/W														
Sensor 22DTH-..6..	0																								
Sensor 22UTH-..60X	0																								
Sensor 22DTM-..6	0																								
-	-																								
-	-	AV [36]		Not used	-	-																			
-	-	AV [37]		Not used	-	-																			



### 3.5 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	Values	Relinquish Default	Access
AV [38]	Selection of the unitary system (SI or Imperial)	1 = SI	-	R/W
		2 = Imperial		
AV [39]	Not used			
AV [40]	Not used			
AV [41]	Not used			
AV [42]	Not used			
AV [43]	Not used			
AV [44]	Not used			
AV [45]	Not used			

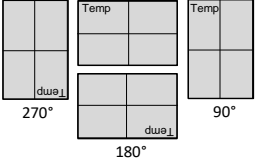

### 3.6 General device information

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

Object type / Instance	Description	Values	Relinquish Default	Access
AV [46]	Offset device ID Valid range: 0...4194175 Device ID = Offset device ID + MAC address	-	-	R/W
AV [47]	Unconfirmed COV	0 = disabled	-	R/W
		1 = enabled		
AV [48]	Minimum output voltage in volt [V]	0 ... 10 V	-	R/W
AV [49]	Operating hours [h]	uint32_t (0... 4294967295)	-	R
AV [50]	Set a maintenance time in hours [h] after which sensor shall be checked (After	uint32_t (0... 999'999 h)	-	R/W
AV [51]	Set a calibration time in hours [h] after which sensor shall be checked (After count down time has expired a new	uint32_t (0... 999'999 h)	-	R/W

### 3.7 LCD display configuration

Via objects analog outputs AV [52] ... AV [68] display parameters of the optional LCD can be adjusted and the values to be displayed can be specified.

Object type / Instance	Description	Values	Relinquish Default	Access
AV [52]	Enable LCD	0 = disabled	-	R/W
		1 = enabled		
AV [53]	Brightness LCD	0...100 %	-	R/W
AV [54]	Rotation LCD 	0 = 0°	-	R/W
		1 = 90°		
		2 = 180°		
		3 = 270°		
AV [55]	Enable LCD traffic light function	0 = disabled	-	R/W
		1 = enabled		
AV [56]	If the countdown time (set value of AV [50] or AV [51] has expired the symbol will be shown on the LCD display. 	0 = disabled	-	R/W
1 = enabled				
AV [57]		0 = disabled	-	R/W
		1 = enabled		
AV [58]	Enable LCD channel 1	0 = disabled	-	R/W
		1 = enabled		
AV [59]	Enable LCD channel 2	0 = disabled	-	R/W
		1 = enabled		
AV [60]	Enable LCD channel 3	0 = disabled	-	R/W
		1 = enabled		
AV [61]	Enable LCD channel 4	0 = disabled	-	R/W
		1 = enabled		
AV [62]	Channel assignment for traffic light function. Input AV [26] to AV [35] (example: channel temperature AV [26])	-	-	R/W
AV [63]	Traffic light function color range 1 Definition of color of LCD back lightning	0 = off 1 = green 2 = yellow 3 = red 4 = blue 5 = magenta 6 = cyan 7 = white	-	R/W
AV [64]	Traffic light function color range 2 Definition of color of LCD back lightning			
AV [65]	Traffic light function color range 3 Definition of color of LCD back lightning			
AV [66]	Setting for threshold (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]			
AV [67]	Setting for threshold (range 2 → 3) 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