

BACnet gateway



1. Overview

BACnet support for up to 4 units with double flow and heat recovery equipped with TAC5 control boards and SAT ETHERNET. The BACnet Standardized Device Profile (Annex L) of the BACnet device is: BACnet Application Specific Controller (B-ASC). The supported Data Link Layer Options are BACnet / IP and MS/TP slave.

2. Standard objects supported

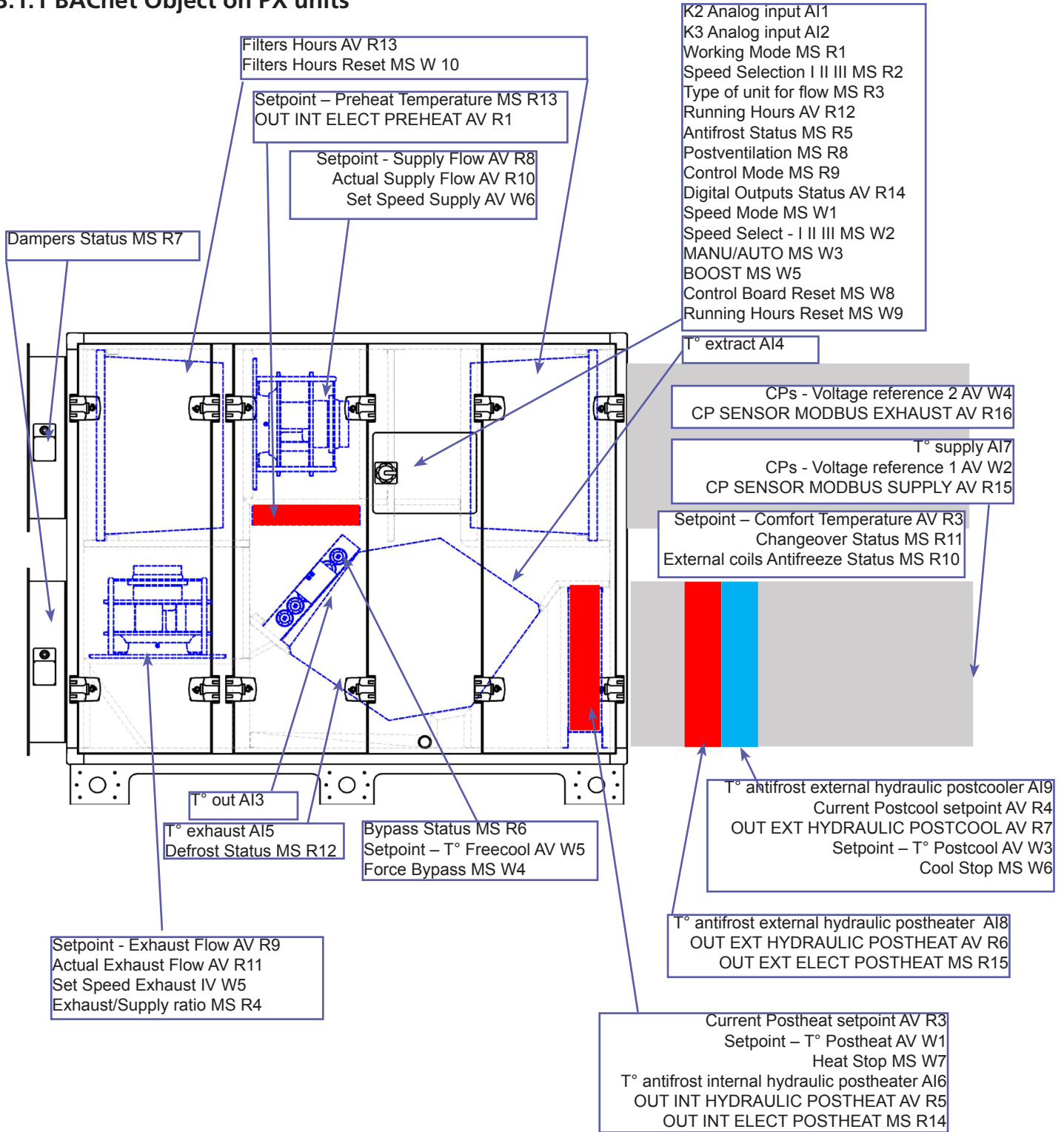
Object Type	
Analog Input	Object_Identifier, Object_Name, Object_Type, Present_Value, Status_Flags, Event_State, Out_Of_Service, Units, Description.
Analog Value	Object_Identifier, Object_Name, Object_Type, Present_Value, Status_Flags, Event_State, Out_Of_Service, Units, Description.
Integer Value	Object_Identifier, Object_Name, Object_Type, Present_Value, Status_Flags, Event_State, Out_Of_Service, Units, Description.
Device	Object_Identifier, Object_Name, Object_Type, System_Status, Vendor_Name, Vendor_Identifier, Model_Name, Firmware_Revision, Application_Software_Version, Protocol_Version, Protocol_Revision, Protocol_Services_Supported, Protocol_Object_Types_Supported, Object_List, Max_APDU_Length_Accepted, Segmentation_Supported.

3. Objects Description

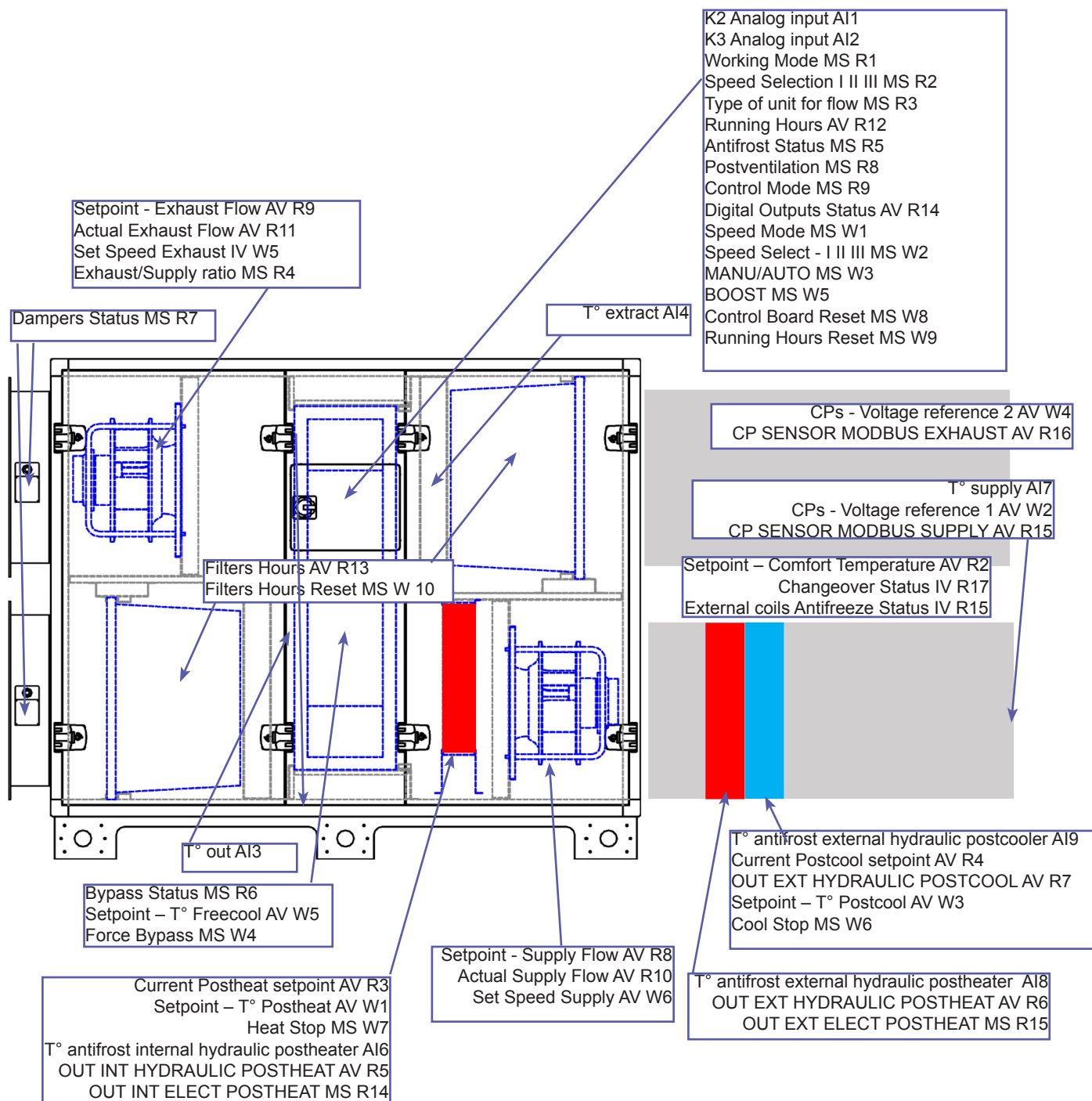
3.1 Overview

The function of each objects is shown here bellow for each unit type, PX (unit with plate heat exchanger), RX (unit with rotor heat exchanger) or SD (compo).

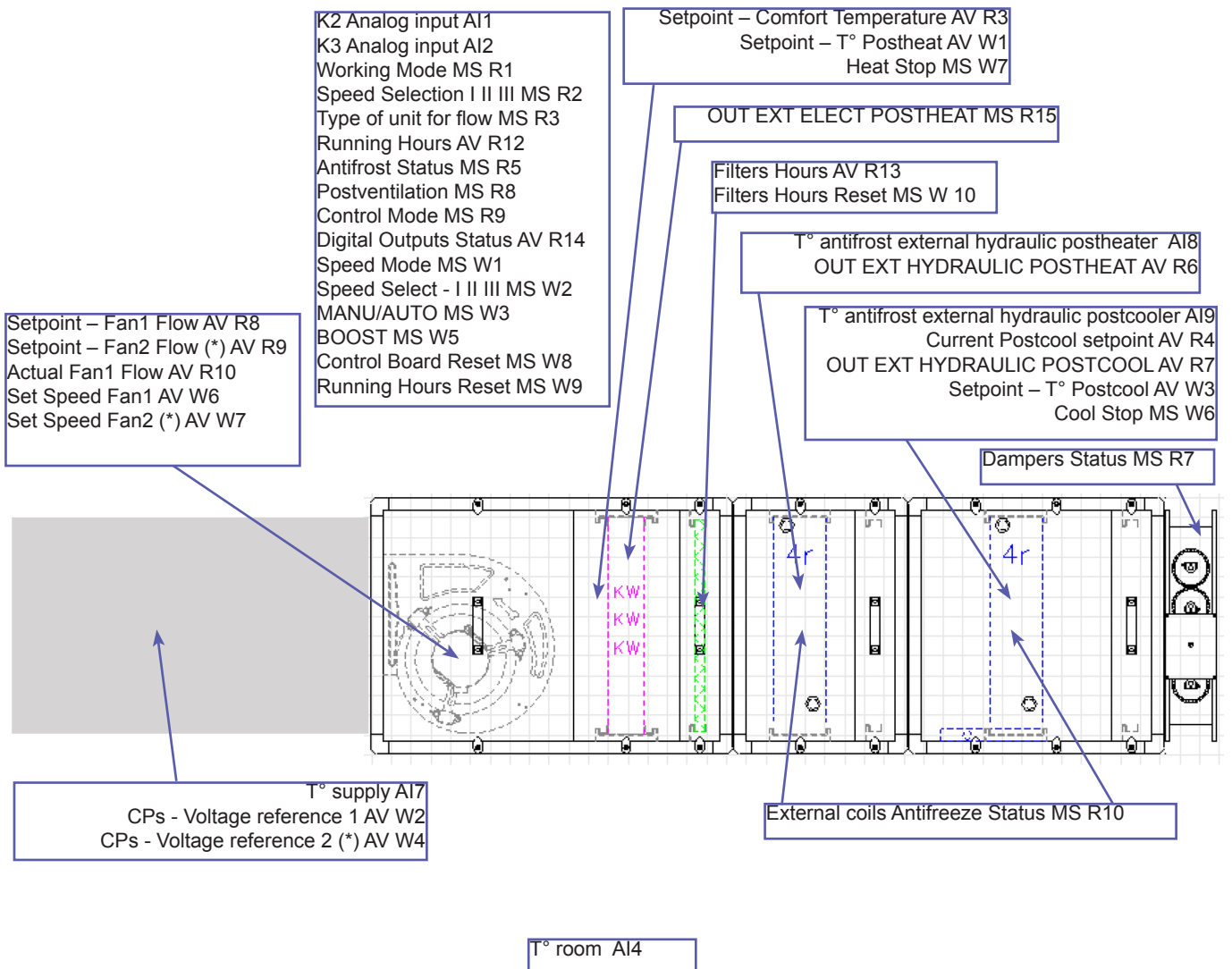
3.1.1 BACnet Object on PX units



3.1.2 BACnet Object on RX units



3.1.3 BACnet Object on SD (compo) units



*Only when 2 fans are used

3.2 BACnet objects tables

Here follows the description of the BACnet objects divided into tables with same data type.



At each object row description, a cross marked on PX, RX or SD indicates that the corresponding unit type does not use this specific object.

3.2.1 Analogue Input (RO): AI

Object Instance	Object Name	Min/Max
1	K2 Analog input	0-10,0 [V]
PX RX SD	Analog input on K2 contact	
2	K3 Analog input	0-10,0 [V]
PX RX SD	Analog input on K3 contact	
3	T° out	-99,9-99,9 [°C]
PX RX SD	Outside temperature measured on T1 sensor (-999=open, +999=short circuit)	
4	T° extract/room	-99,9-99,9 [°C]
PX RX SD	Extract/room temperature measured on T2 sensor (-999=open, +999=short circuit)	
5	T° exhaust	-99,9-99,9 [°C]
PX RX SD	Exhaust temperature measured on T3 sensor (-999=open, +999=short circuit)	
6	T° antifrost internal hydraulic postheater	-99,9-99,9 [°C]
PX RX SD	Temperature for the antifrost protection of the hydraulic postheater inside the unit measured on T4 sensor (-999=open, +999=short)	
7	T° supply	-99,9-99,9 [°C]
PX RX SD	Supply temperature measured on T5 sensor (-999=open, +999=short)	
8	T° antifrost external hydraulic postheater	-99,9-99,9 [°C]
PX RX SD	Temperature for the antifrost protection of the hydraulic postheater external to the unit measured on T7 sensor (-999=open, +999=short)	
9	T° antifrost external hydraulic postcooler	-99,9-99,9 [°C]
PX RX SD	Temperature for the antifrost protection of the hydraulic postcooler external to the unit measured on T8 sensor (-999=open, +999=short)	

3.2.2 Analogue Value (RO): AV R

Object Instance	Object Name	Min/Max
1	Setpoint – Preheat Temperature	-9,9-9,9 [°C]
PX <input checked="" type="checkbox"/> RX <input checked="" type="checkbox"/> SD <input checked="" type="checkbox"/>	Preheat T° setpoint	
2	Setpoint – Comfort Temperature	0,1-99,9 [°C]
PX <input type="checkbox"/> RX <input type="checkbox"/> SD <input type="checkbox"/>	Current Comfort T° setpoint (KWout/NV/BA+/BA-) (0=OFF)	
3	Current Postheat setpoint	0,1-99,9 [°C]
PX <input type="checkbox"/> RX <input type="checkbox"/> SD <input type="checkbox"/>	Current Postheat setpoint (KWout/NV/BA+/KWext) (0=OFF)	
4	Current Postcool setpoint	0,1-99,9 [°C]
PX <input type="checkbox"/> RX <input type="checkbox"/> SD <input type="checkbox"/>	Current PostCooling setpoint (BA-) (0=OFF)	
5	OUT INT HYDRAULIC POSTHEAT	0-10,0 [V]
PX <input type="checkbox"/> RX <input checked="" type="checkbox"/> SD <input checked="" type="checkbox"/>	Output for the power control of the hydraulic postheater inside the unit	
6	OUT EXT HYDRAULIC POSTHEAT	0-10,0 [V]
PX <input type="checkbox"/> RX <input type="checkbox"/> SD <input type="checkbox"/>	Output for the power control of the hydraulic postheater external to the unit	
7	OUT EXT HYDRAULIC POSTCOOL	0-10,0 [V]
PX <input type="checkbox"/> RX <input type="checkbox"/> SD <input type="checkbox"/>	Output for the power control of the hydraulic postcooler external to the unit	
8	Setpoint - Supply Flow. <i>Note for SD units: the supply fan corresponds to fan1.</i>	0-99999
PX <input type="checkbox"/> RX <input type="checkbox"/> SD <input type="checkbox"/>	Current setpoint for the supply fan (unit defined in object "Type of unit for flow"). <i>Note for SD units: the supply fan corresponds to fan1.</i>	
9	Setpoint - Exhaust Flow <i>Note for SD units: the exhaust fan corresponds to fan2, if present.</i>	0-99999
PX <input type="checkbox"/> RX <input type="checkbox"/> SD <input type="checkbox"/>	Current setpoint for the exhaust fan (unit defined in object "Type of unit for flow"). <i>Note for SD units: the exhaust fan corresponds to fan2, if present.</i>	
10	Actual Supply Flow. <i>Note for SD units: the supply fan corresponds to fan1.</i>	0-99999
PX <input type="checkbox"/> RX <input type="checkbox"/> SD <input type="checkbox"/>	Actual Supply Flow (unit defined in object "Type of unit for flow"). <i>Note for SD units: the supply fan corresponds to fan1.</i>	
11	Actual Exhaust Flow. <i>Note for SD units: the exhaust fan corresponds to fan2, if present.</i>	0-99999
PX <input type="checkbox"/> RX <input type="checkbox"/> SD <input type="checkbox"/>	Actual Exhaust Flow (unit defined in object "Type of unit for flow"). <i>Note for SD units: the exhaust fan corresponds to fan2, if present.</i>	
12	Running Hours	0-999999 [H]
PX <input type="checkbox"/> RX <input type="checkbox"/> SD <input type="checkbox"/>	Run time, working hours	
13	Filters Hours	0-999999 [H]
PX <input type="checkbox"/> RX <input type="checkbox"/> SD <input type="checkbox"/>	Filters alarm: hours count	

Object Instance	Object Name	Min/Max
14	Digital Outputs Status	0-65536
PX RX SD	Contains a bit for each of the digital outputs: bit0="AL1 (alarm)" bit6="OR1 SAT "pressure alarm"" bit7="OR2 SAT "fan on"" bit8="OR3 SAT "water pump internal water postheater" bit9="OR4 SAT "bypass on"" bit10="SATBA WP": water pump external water postheater/postcooler"	
15	CP SENSOR MODBUS SUPPLY	0-9999 [Pa]
PX RX SD	Pressure measured by the Modbus sensor located on the supply duct	
16	CP SENSOR MODBUS EXHAUST	0-9999 [Pa]
PX RX SD	Pressure measured by the Modbus sensor located on the exhaust duct	

3.2.3 Multi State (RO): MS R

Object Instance	Object Name	Min/Max
1	Working Mode	0-9
PX RX SD	Current Working mode (0=OFF 1=CA 2=LS 3=CPf 4=CPs (5=CAs) 6=TQ 9=InitPa)	
2	Speed Selection I II III	0-3
PX RX SD	Current speed (0=STOP 1=LOW/I 2=MEDIUM/II 3=HIGH/III)	
3	Type of unit for flow	0-4
PX RX SD	Current main Setpoint unit (0= m3/h 1=Pa 2=0,1V 3=torque% 4=l/s)	
4	Exhaust/Supply ratio. <i>Note for SD units: the exhaust fan corresponds to fan1 and the exhaust fan corresponds to fan2, if present.</i>	5-127
PX RX SD	% (F3F4/F1F2) for PX, RX; %F2/F1 for SD.	
5	Antifrost Status	0-2
PX RX SD	0=OFF 1=REC ON 2=NV ON	
6	Bypass Status	0-2
PX RX SD	0=CLOSED/OFF 1=OPEN/ON 2=PARTIALLY OPEN	
7	Dampers Status	0-2
PX RX SD	0=CLOSED 1=OPENING/CLOSING 2=OPEN	
8	Postventilation	0-1
PX RX SD	Post ventilation status (0=NO 1=YES)	
9	Control Mode	0-10
PX RX SD	Control by (1=ERROR 2=FIREALARM 3=VIEWER 4=CBR 5=VIEWSCHED 6=MBSCHED 7=MB40201 8=BYPASS 9=BOOST 10=MB40204). <u>Can be used to check whether the unit is in alarm (then value will be 1 or 2 if fire alarm).</u>	
10	External Batteries Antifreeze Status	0-3
PX RX SD	BA+ BA- Antifreeze status (0=OFF, 1=BA+ ON or BA+/- ON, 2=BA- ON, 3=BA+ and BA- ON)	
11	Changeover Status	0-1
PX RX SD	Automatic changeover between heating and cooling (0=inactive, 1=heating, 2=cooling)	
12	Defrost Status	0-2
PX RX SD	0=IDLE, 1=ACTIVE, 2=STOP to drain water	
13	OUT INT ELECT PREHEAT	0-100
PX RX SD	Output percentage for the power control of the electrical preheater	
14	OUT INT ELECT POSTHEAT	0-100
PX RX SD	Output percentage for the power control of the electrical postheater inside the unit	
15	OUT EXT ELECT POSTHEAT	0-100
PX RX SD	Output percentage for the power control of the electrical postheater external to the unit	

3.2.4 Analogue Value (R/W): AV W

Object Instance	Object Name	Min/Max
1	Setpoint – T° Postheat	0-99,9 [°C]
PX RX SD	Postheating T° setpoint (0=OFF)	
2	CPs - Voltage reference 1	0-10,0 [V]
PX RX SD	CPs mode: setpoint voltage for [CPs on SUP] or [CPs on EXH]	
3	Setpoint – T° Postcool	0-99,9 [°C]
PX RX SD	Postcooling T° setpoint (0=OFF)	
4	CPs - Voltage reference 2	0-10,0 [V]
PX RX SD	CPs mode: setpoint voltage for [CPs on SUP + EXH]	
5	Setpoint – T° Freecool	0-99,9 [°C]
PX RX SD	Freecooling T° setpoint (0=OFF)	
6	Set Speed Supply. <i>Note for SD units: the supply fan corresponds to fan1.</i>	0-99999
PX RX SD	Set supply Flow (m3/h or l/s) or Torque (%). <i>Note for SD units: the supply fan corresponds to fan1.</i>	
7	Set Speed Exhaust. <i>Note for SD units: the exhaust fan corresponds to fan2, if present.</i>	0-99999
PX RX SD	Set exhaust Flow (m3/h or l/s) or Torque (%). <i>Note for SD units: the exhaust fan corresponds to fan2, if present.</i>	

3.2.5 Multi State (R/W): MS W

Object Instance	Object Name	Min/Max
1	Speed Mode	0-3
PX RX SD	Communication determines speed (0=NO 1=Predefined Speed I-II-III 2=TIMETABLE 3=set values in objects)	
2	Speed Select - I II III	0-3
PX RX SD	Selection of predefined speed (0=OFF 1=LOW 2=MEDIUM 3=HIGH)	
3	MANU/AUTO	0-1
PX RX SD	MANUAL/AUTO mode (0=MANUAL 1=AUTO/Time scheduler)	
4	Force Bypass	0-2
PX RX SD	Override: force bypass ON or OFF, 0=normal, 1=force_on, 2=force_off	
5	BOOST	0-1
PX RX SD	Force boost mode, 0/1	
6	Cool Stop	0-1
PX RX SD	Override: force cooling to stop if set to 1. Note that cooling will start if this object is set to 0 and if Heat Stop object is set to 1.	
7	Heat Stop	0-1
PX RX SD	Override: force heating to stop if set to 1.	
8	Control Board Reset	0-1
PX RX SD	Do RESET of controller, clear alarms (0=NO, 1=RESET). Autoreset on the control board, so it is necessary to put back value 0 after a few seconds to avoid continuous reset.	
9	Running Hours Reset	0-1
PX RX SD	Do reset of run time, working hours (0=NO, 1=RESET). Autoreset on the control board, so it is necessary to put back value 0 after a few seconds to avoid continuous reset.	
10	Filters Hours Reset	0-1
PX RX SD	Do reset of filters hours (0=NO, 1=RESET). Autoreset on the control board, so it is necessary to put back value 0 after a few seconds to avoid continuous reset.	

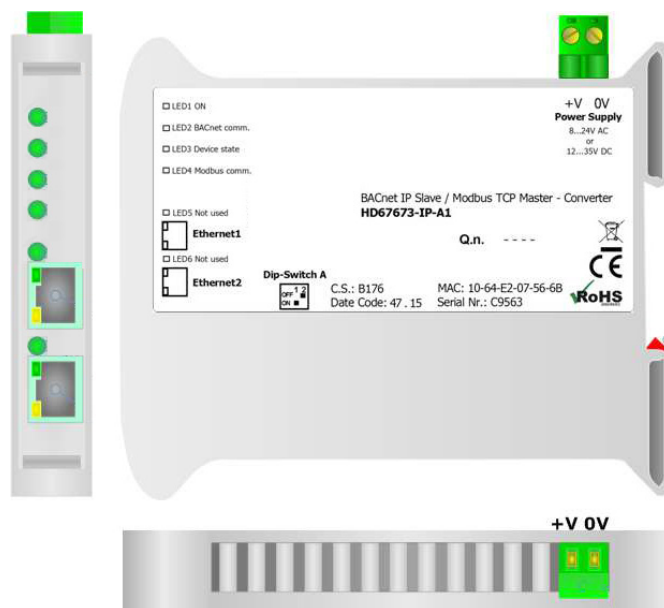
4. Installation

- LED 1 - GREEN: ON
- LED 2 - GREEN: BACnet comm.
- LED 3 - Device state
- LED 4 - GREEN: Modbus comm.
- LED 5 - GREEN: Not used
- LED 6 - GREEN: Not used
- Connector 3: Ethernet 1 Port (RJ45 Plug)
- Connector 4: Ethernet 2 Port (RJ45 Plug)

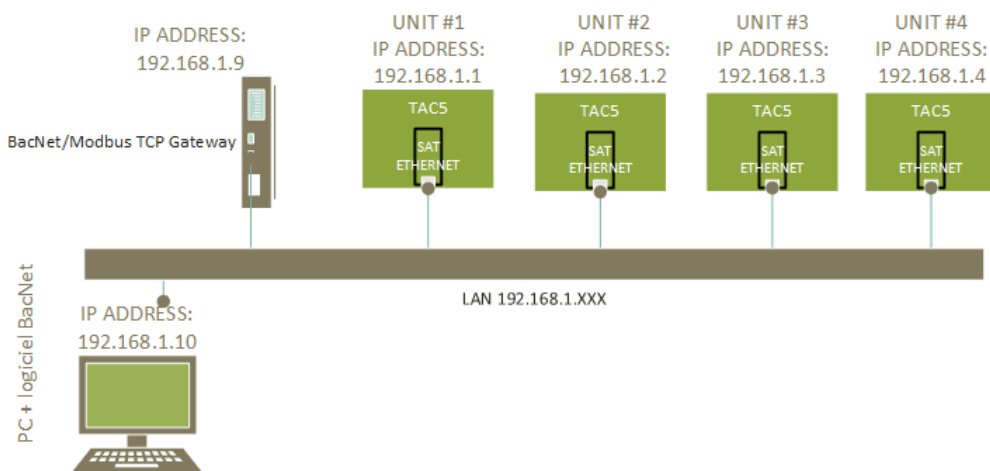
Power supply:

- 0V = Ground
- +V = Positive wire

- VAC : min 8V ; max 24V
- VDC : min 12V ; max 25V



4.1 Topology



5. Configuration

5.1 Default configuration

The default configuration is indicated in the following table:

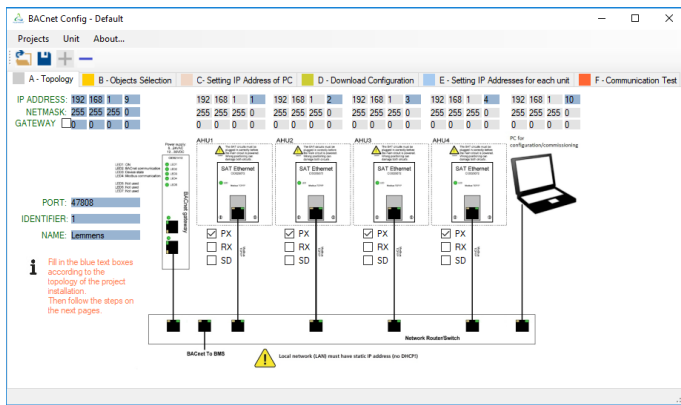
- | | | |
|-----------------------------------|---|-----------------------------------|
| BACnet gateway: | - | Unit n°1: IP ADDRESS: 192.168.1.1 |
| o IP ADDRESS gateway: 192.168.1.9 | - | Unit n°2: IP ADDRESS: 192.168.1.2 |
| o SUBNET MASK: 255.255.255.0 | - | Unit n°3: IP ADDRESS: 192.168.1.3 |
| o GATEWAY: 0.0.0.0 | - | Unit n°4: IP ADDRESS: 192.168.1.4 |
| o PORT: 47808 | | |
| o BACnet device name: Lemmens | | |
| o Device Identifier: 1 | | |

5.2 Custom configuration

It is possible to reduce the number of units that will be controlled through the Bacnet gateway, or to change the IP address of the gateway and of the units as well.

- Download from www.lemmens.com website "BACnet config".
- Proceed with installation.

Start BACnet config.exe:



- With the interface it is possible to:
- o Remove a unit or add a unit
 - o Change the gateway IP configuration
 - o Change the gateway communication port
 - o Change the last number of the IP address of the units on the corresponding row inside the table.
- N.B.: for the units, only the last number of the IP address can be changed since it must be within the same range of the gateway IP address.
- o Choose for each unit its type: PX (default), RX or SD.
 - o Select/unselect objects (tab 'B')
 - o Save the configuration
 - o Open a previously saved configuration

5.3 Download configuration

The module has a default configuration loaded, so there should be no need to make any changes if the default configuration can be used.

Procedure to change the configuration of the module:

1. Set up first the computer used for downloading in order to be able to communicate with the gateway:
 - Follow step C of BACnetConfig application or Set directly IP address of the computer to 192.168.1.10.
 - The net mask will be 255.255.255.0.
 - The gateway: 0.0.0.0.
2. Follow Step D of BACnet Config application

5.4 Resetting the IP address:

The gateway comes with default IP address 192.168.1.9. If this address has been changed later on and the address is not known anymore, follows this procedure to set the back the factory address.

1. Turn off the Device;
2. Put Dip2 of 'Dip-Switch A' at ON position
3. Turn on the device
4. Connect the Ethernet cable;
5. Insert the IP "192.168.2.205";
6. Press the "Ping" button, must appear "Device Found!"
7. Press the "Next" button;
8. Check all operations;
9. Press the "Execute update firmware" button to start the upload;
10. When all the operations are "OK" turn off the Device;
11. Put Dip2 of 'Dip-Switch A' at OFF position
12. Turn on the device.
13. Upload a configuration (see 5.2).



Data Link Layer Options:

BACnet IP, (Annex J)

MS/TP slave (Clause 9), baud rate(s): 9600, 19200, 38400, 57600, 76800, 115200

Point-To-Point, EIA 232 (Clause 10), baud rate(s): 9600, 115200

Character Sets Supported:

ISO 10646 (UTF-8)

Network Security Options:

Non-secure Device - is capable of operating without BACnet Network Security