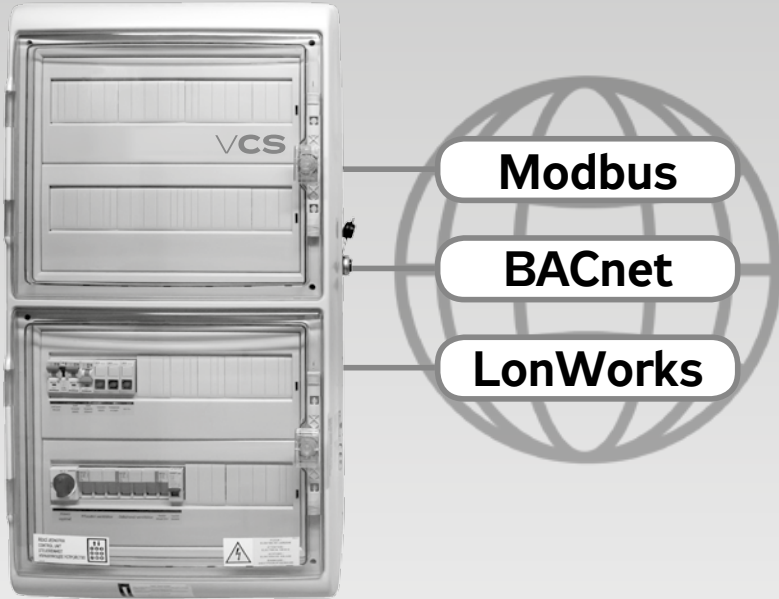


REMAK



Connection to master system

Control units

VCS

Connection to the Master System (ModBus Standard)

Modbus (BMS)

The VCS control unit enables integration of the centralized BMS (Building Management System) using the Modbus communication bus ((Modbus RTU and/or ModbusTCP). Using a suitably integrated system, it is possible to control the air-handling device operating state. Specifications of the variables (data points) used for integration are described in the section Description of Pre-defined Variables in the Modbus Network. The final functionality, monitoring and control options will be dependent on the integrator used to ensure connection to the master BMS system.

Generally

Modbus is a worldwide recognized standard defined by Modbus Organization, Inc.

The Modbus Organization is a group of independent suppliers of automation devices. The Modbus Organization administers and develops communication systems for distributed automation systems. It also provides information to obtain and share information about the protocols, their application and certification to simplify implementation by users with the aim to reduce expenses for communication. For detailed information on the Modbus protocol, refer to www.modbus.org.

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Modbus RTU

The Modbus communication protocol works using the Master/Slave principle. The Slave function is used for the VCS control unit communication with the master system. Thus, the VCS control unit behaves like a Slave during communication and expects requests from the Master (master system).

There are two variants of the Modbus protocol serial transfer mode. The VCS control unit uses the RTU (Remote Terminal Unit) mode. Therefore, a unique Modbus RTU identification is very important.

The RS 485 standard is used to transfer the data through a half-duplex twin-lead.

The transfer lead (cable) must be selected depending on this standard and other conditions. For more information, refer to www.modbus.org

Correct wiring must be carried out to ensure proper operation – 115/230 VAC must be strictly isolated from 24 V SELV AC. There are three terminals, "+", "-", and reference voltage terminal "REF", available in the control unit to connect the VCS control unit to the bus.

To ensure correct functioning of the bus, the first and last device on the bus must be fitted with a terminal resistor. Therefore, it is possible to perform software settings of the terminal resistor in the VCS control unit for the Modbus Slave (see the Data Points in the VCS Installation and Operating Instructions).

It is also necessary to set other communication parameters in the VCS control unit data points (section – Communication with Modbus RTU Master System).

Default values of the data points for the Slave Modbus RTU:

- Slave address – 1
- Baud rate – 9600 Bd
- Parity - None
- Number of stop bits – 2
- Response time limit – 5 s

For more information, refer to the List of Data Points Note: Once these data points have been set, the device must be restarted. After the restart, the device is ready to communicate in accordance with the set parameters.

Modbus TCP

This is the second Modbus communication option available with the VCS control system. In this case, Ethernet (TCP/IP) is used for data transfer and works on Client/Server principle. For communication with the parent system, VCS is a Server function.

VCS default settings:

Fixed IP (DHCP is possible), address: 192.168.1.199, mask 255.255.255.0, gateway 0.0.0.0, Modbus TCP – port 502 (fixed).

The settings can be made by see. appropriate paragraph according to the used driver (eg HMI TM, DM, Web - Connection - LAN connection menu).

Note: you must restart the device after setting these data points. After this restart, VCS is ready to communicate according to the set value.

Modbus Registers

The Modbus registers are divided according to their properties. For a general description and explanation of the registers, refer to the table below:

Table 8 – Modbus registers

ModbusType	Reference	Description
Coil Status	0xxxx	Read/Write Discrete Outputs or Coils.
Input Status	1xxxx	Read Discrete Inputs.
Input Register	3xxxx	Read Input Registers.
Holding Register	4xxxx	Read/Write Output or Holding Registers.

Data types used to transfer the values:

- 16-bit for real values (Unsigned Word)
- 16-bit for status values (Signed Word)
- 1-bit for status values like 0=Off (switched off) and 1=On (switched on)
- 1-bit for alarm values like 0=Alarm and 1=Normal (OK)

Divisor (Multiplier):

The so-called Divisor (Multiplier) is used for values which need the decimal numbers to be transferred. For example, for temperatures the value Divisor (Multiplier) of 10 is used to enable a one decimal place value to be transferred.

For example, a temperature of 23.2°C is transferred by the Modbus as 232. The number must be divided by 10 to get the correct value. For information indicating this fact, refer to the note for a particular data point.

Connection to the Master System (ModBus Standard)

Description of Pre-defined Variables in the Modbus Network

This section includes a description of variables (registers) according to the assigned REMAK data points. The list below includes specifications of variables for different VCS control system variants at the discretion of REMAK a.s.

For example, if the VCS control system (air-handling device) has not been equipped with gas heating, it will not be possible to use these variables.

Coil status (Read/Write)

Adress	Description	Values/Units	Remarks
0x0001	Alarm acknowledge	0-1	Off*On
0x0015	Fire alarm	0-1	OK*Alarm

Input states (Read)

Adress	Description	Values/Units	Remarks
1x0001	Alarm class danger (A)	0-1	Off*On
1x0002	Alarm class critical (A)	0-1	Normal*Alarm
1x0003	Alarm class low (B)	0-1	Normal*Alarm
1x0004	Alarm class warning (B)	0-1	Normal*Alarm
1x0012	Ext control input 1	0-1	Off*On
1x0013	Ext control input 2	0-1	Off*On
1x0026	Fan alarm	0-1	OK*Alarm
1x0027	Supply fan alarm	0-1	OK*Alarm
1x0030	Exhaust fan alarm	0-1	OK*Alarm
1x0033	Fan op hours alarm	0-1	Passive*Active
1x0036	Cooling DX alarm	0-1	OK*Alarm
1x0038	Cooling pump alarm	0-1	OK*Alarm
1x0039	HeatPumpFrstAlm	0-1	OK*Alarm
1x0040	Heat recovery alarm	0-1	OK*Alarm
1x0041	Heat recovery pump alarm	0-1	OK*Alarm
1x0043	Hrec frost monitor	0-1	OK*Alarm
1x0045	Htg pump alarm	0-1	OK*Alarm
1x0047	Htg frost monitor	0-1	OK*Frost
1x0048	El htg alarm	0-1	OK*Alarm
1x0049	HeatPumpPool.BlkTout	0-1	Passive*Active
1x0050	HeatPumpPool.BlkHrecPrs	0-1	Passive*Active
1x0051	HeatPumpPool.Blk	0-1	OK*Alarm
1x0056	El heating 2 alarm	0-1	OK*Alarm
1x0070	Filter alarm	0-1	OK*Alarm
1x0071	Supply filter alarm	0-1	OK*Alarm
1x0072	Exh filter alarm	0-1	OK*Alarm
1x0073	Fire alarm	0-1	OK*Alarm
1x0074	Supply tmp fire alm	0-1	OK*Alarm
1x0075	Exh tmp fire alarm	0-1	OK*Alarm
1x0076	Přívodní teplota (protimrazová ochrana)	0-1	OK*Alarm
1x0078	Modbus comm alarm	0-1	OK*Alarm
1x0080	Outside air temp	°C	OK*Alarm
1x0081	Supply air temp	°C	OK*Alarm

Connection to the Master System (ModBus Standard)

Adress	Description	Values/Units	Remarks
1x0082	Heating frost tmp	°C	OK*Alarm
1x0083	Room temperature	°C	OK*Alarm
1x0084	Room temperature 2	°C	OK*Alarm
1x0085	Return air temp	°C	OK*Alarm
1x0086	Exhaust air temp	°C	OK*Alarm
1x0092	Outs air hum rel	%r.H.	OK*Alarm
1x0093	Sply air hum rel	%r.H.	OK*Alarm
1x0094	Room humidity rel	%r.H.	OK*Alarm
1x0095	Supply air flow	m3/h	OK*Alarm
1x0096	Exhaust air flow	m3/h	OK*Alarm
1x0097	Supply air pressure	Pa	OK*Alarm
1x0098	Exhaust air press	Pa	OK*Alarm
1x0100	Air quality	ppm	OK*Alarm
1x0102	RmUTmp1	°C	OK*Alarm
1x0103	RmUTmp2	°C	OK*Alarm
1x0104	BmrFlueTmp	°C	OK*Alarm
1x0105	PreElHtgTmp	°C	OK*Alarm
1x0106	PreEtrHtgTmp	°C	OK*Alarm

Input register (Read)

Adress	Description	Values/Units	Remarks
			Unsigned Word
3x0001	General status (Word 1)	0-65535	0-1 for each bit or counted binary to a decimal number
Bit0	Alarm class danger (A)		
Bit1	Alarm class critical (A)		
Bit2	Alarm class low (B)		
Bit3	Alarm class warning (B)		
Bit4			
Bit5			
Bit6			
Bit7			
Bit8			
Bit9			
Bit10			
Bit11	Actual control temp, room		
Bit12	Actual control temp, exh		
Bit13	Actual control temp, sply		
Bit14			
Bit15			
Adress	Description	Values/Units	Remarks
			Unsigned Word
3x0005	Digital inputs (Word 1)	0-65535	

Connection to the Master System (ModBus Standard)

Bit0			
Bit1	External control 1		
Bit2	External control 2		
Bit3			
Bit4			
Bit5			
Bit6			
Bit7			
Bit8			
Bit9			
Bit10			
Bit11			
Bit12			
Bit13			
Bit14			
Bit15			
Adress	Description	Values/Units	Remarks
			Unsigned Word
3x0009	Digital outputs (Word 1)	0-65535	
Bit0	Supply (Exhaust) dampers		
Bit1			
Bit2			
Bit3			
Bit4	Supply fan, running		
Bit5	Supply fan, off		
Bit6			
Bit7			
Bit8			
Bit9	Exhaust fan, running		
Bit10	Exhaust fan, off		
Bit11			
Bit12			
Bit13			
Bit14			
Bit15			
3x0010	Digital outputs (Word 2)	0-65535	0-1 for each bit or counted binary to a decimal number
Bit0	Cooling pump		
Bit1	Cooling DX, off		
Bit2	Cooling DX, stage 1		
Bit3	Cooling DX, stage 2		
Bit4			
Bit5			
Bit6			
Bit7			

Connection to the Master System (ModBus Standard)

Bit8	Heating pump		
Bit9			
Bit10	Electrical heating, off		
Bit11	Electrical heating, st1		
Bit12			
Bit13			
Bit14			
Bit15			
3x0011	Digital outputs (Word 3)	0-65535	0-1 for each bit or counted binary to a decimal number
Bit0	Heat pump DO 2		
Bit1			
Bit2			
Bit3			
Bit4			
Bit5			
Bit6	Heat pump DO 1		
Bit7			
Bit8	Extra el heating, off		
Bit9	Extra el heating, stage 1		
Bit10			
Bit11			
Bit12			
Bit13	Humidity command		
Bit14			
Bit15			
3x0012	Digital outputs (Word 4)	0-65535	0-1 for each bit or counted binary to a decimal number
Bit0			
Bit1			
Bit2	Burner heating, st1		
Bit3	Burner heating, st2		
Bit4	Burner heating, Mod+		
Bit5	Burner heating, Mod-		
Bit6			
Bit7			
Bit8	Alarm output, high		
Bit9	Alarm output, low		
Bit10			
Bit11			
Bit12			
Bit13	Heating demand		
Bit14	PreWtrHeating		
Bit15	PreEl.Heating		

Connection to the Master System (ModBus Standard)

Adress	Description	Values/Units	Remarks
			Unsigned Word
3x0013	Alarms (Word 1)	0-65535	0-1 for each bit or counted binary to a decimal number
Bit0			
Bit1			
Bit2	Burner failure		
Bit3	Supply fan		
Bit4	Exhaust fan		
Bit5	Fan operating hours		
Bit6	Supply back up		
Bit7	Exhaust back up		
Bit8	Cooling		
Bit9	OverHeat Burner heating		
Bit10	Heating recovery		
Bit11			
Bit12	Heating recovery frost		
Bit13			
Bit14	Heating recovery damper		
Bit15	Flue-gas high temperature, heater shut down		
3x0014	Alarms (Word 2)	0-65535	0-1 for each bit or counted binary to a decimal number
Bit0	Heating pump		
Bit1			
Bit2	Electrical Heating		
Bit3	Burner fan overrun TH		
Bit4	Heat pump cooling		
Bit5			
Bit6	Heat pump heating		
Bit7			
Bit8	Extra Electrical Heating		
Bit9			
Bit10			
Bit11	Humidity command		
Bit12	PreWtrHeating		
Bit13	Fire Alarm (external alarm)		
Bit14	Electric pre-heating		
Bit15	Filter Alarm		
3x0015	Alarms (Word 3)	0-65535	0-1 for each bit or counted binary to a decimal number
Bit0	Out temperature		
Bit1	Supply temperature		
Bit2	Heating frost temperature		
Bit3	Room1 temperature		
Bit4	Room2 temperature		

Connection to the Master System (ModBus Standard)

3x0018	Act fan step	0-5	Off*Stage1*Stage2*Stage3*Stage4*Stage5
3x0020	Op mode man st/tmp	0-11	Auto*Off*Eco St1*Comf St1*Eco St2*Comf St2*Eco St3*Comf St3*Eco St4*Comf St4*Eco St5*Comf St5
3x0021			
3x0022	TSP steps/tmp	0-10	Off*Eco St1*Comf St1*Eco St2*Comf St2*Eco St3*Comf St3*Eco St4*Comf St4*Eco St5*Comf St5
3x0023	Act Opmode ext ctrl	0-6	Auto*Off*Stage 1*Stage 2*Stage 3*Stage 4*Stage 5
3x0025	Supply (Exhaust) air damper cmd	0-1	Off*On
3x0026	CirculationDamper - pool	0-1	Off*On
3x0027	Pool pump	0-1	Off*On
3x0028	Supply fan cmd	0-6	NULL*Off*Stage1*Stage2*Stage3*Stage4*Stage5
3x0029	Sply fan outp sign	0-100%	
3x0030	Exhaust fan cmd	0-6	NULL*Off*Stage1*Stage2*Stage3*Stage4*Stage5
3x0031	Exh fan outp signal	0-100%	
3x0032	Damper summer block (pool v4)	0-1	On*Off
3x0033	Cooling outp signal	0 - 100%	
3x0034	Cooling pump cmd	0-1	Off*On
3x0035	Cooling DX cmd	0-2	Off*Stage 1*Stage 2
3x0036	Hrec outp signal	0 - 100%	
3x0038	Hrec dmpr outp sign	0 - 100%	
3x0039	Damper supply / exhaust (pool)	0 - 100%	
3x0040	Heating outp signal	0 - 100%	
3x0041	Htg pump cmd	0-1	Off*On
3x0042	El htg outp signal	0 - 100%	
3x0043	El heating cmd	0-15	NULL*Off*St1*St2*St3*St4*St5*St6*St7*St8*St9*St10*St11*St12*St13*St14
3x0044	Heat pump Cooling	0 - 100%	
3x0045	Heat pump	0 - 100%	
3x0046	Heat pump state	0-2	None*Cooling*Heating
3x0047	Heat pump Heating	0 - 100%	
3x0048	Heat pump Heating	0-1	None*Heating
3x0049	El htg 2 outp sign	0 - 100%	
3x0050	El heating 2 cmd	0-15	NULL*Off*St1*St2*St3*St4*St5*St6*St7*St8*St9*St10*St11*St12*St13*St14
3x0051	Damper summer block (pool v4)	0-1	Off*On
3x0052	Hum outp signal	0 - 100%	
3x0053	Humidifier cmd	0-1	Off*On
3x0055	Act dehum value	0 - 100%	
3x0057	Heating mixing set valve position - wather reheater	0 - 100%	
3x0058	Heating pump - wather reheater	0-1	Off*On

Connection to the Master System (ModBus Standard)

3x0060	Alarm output	0-1	Normal*Alarm
3x0062	Heat pump Heating 2	0 - 100%	
3x0063	Heat pump Heating 2	0-2	None*Cooling*Heating
3x0064	Act airquality comp	0 - 100%	
3x0065	Act fan clg value	0 - 100%	
3x0066	Act fan htg value	0 - 100%	
3x0067	Act fan comp tmp	0 - 100%	
3x0068	Act fan comp hum	0 - 100%	
3x0069	Heat pump Heating 3	0 - 100%	
3x0070	Heat pump Heating 3	0-2	None*Cooling*Heating
3x0071	Act Dhrec comp hum	0 - 100%	
3x0072	Outside air temp	`-x.y - +x.y °C	(factor 10)
3x0073	Supply air temp	`-x.y - +x.y °C	(factor 10)
3x0074	Heating frost tmp	°C	(factor 10)
3x0075	Valid room tmp	°C	(factor 10)
3x0076	Return air temp	°C	(factor 10)
3x0077	Exhaust air temp	°C	(factor 10)
3x0078	Return air temp 2	°C	(factor 10)
3x0079	Return air temp 3	°C	(factor 10)
3x0080	Valid return air temp	°C	(factor 10)
3x0081	Room humidity rel 2	%r.H.	
3x0082	Room humidity rel 3	%r.H.	
3x0083	Valid Room humidity rel	%r.H.	
3x0084	Outs air hum rel	%r.H.	
3x0085	Outs air hum abs	`-x.y - +x.y g/kg	(factor 10)
3x0086	Outs air enthalpy	`-x.y - +x.y kJ/kg	(factor 10)
3x0087	Supply air hum rel	%r.H.	
3x0088	Supply air hum abs	`-x.y - +x.y g/kg	(factor 10)
3x0089	Supply air enthalpy	`-x.y - +x.y kJ/kg	(factor 10)
3x0090	Room humidity rel	%r.H.	
3x0091	Room humidity abs	`-x.y - +x.y g/kg	(factor 10)
3x0092	Room enthalpy	`-x.y - +x.y kJ/kg	(factor 10)
3x0093	Dew point	`-x.y - +x.y °C	(factor 10)
3x0095	Supply air flow	0 - x m ³ /h	
3x0096	Exhaust air flow	0 - x m ³ /h	
3x0097	Supply air pressure	0 - x Pa	
3x0098	Exhaust air pressure	0 - x Pa	
3x0101	Air quality	0 - x ppm	
3x0104	Act heating stpt	`-x.y - +x.y °C	
3x0105	Act cooling stpt	°C	
3x0106	Act sply htg stpt	°C	
3x0107	Act sply clg stpt	°C	
3x0108	Act hum stpt	0 - x.y %r.H.	(factor 10)
3x0109	Act dehum stpt	%r.H.	(factor 10)
3x0110	Act sply hum stpt	%r.H.	(factor 10)
3x0111	Act sply dehum stpt	%r.H.	(factor 10)

Connection to the Master System (ModBus Standard)

3x0112	Act sply fan stpt	0-100% (0 - x l/s)	
3x0113	Act exh fan stpt	0-100% (0 - x l/s)	
3x0120	Hour		
3x0121	Minute		
3x0122	Second		
3x0123	Day		
3x0124	Month		
3x0125	Year		
3x0126	Water preheater	0 - 100%	
3x0127	Water preheater 0-10V	0-1	Off*On
3x0128	Preheating water preheater	0-1	Off*On
3x0130	Burner flue temp	°C	(factor 10)
3x0131	Preheating temp	°C	(factor 10)
3x0132	Temperature return water of preheating	°C	(factor 10)
3x0133	Burner damper	0-100%	
3x0150	Cooling 2	0 - 100%	
3x0151	Cooling 2	0-1	Off*On
3x0152	Cooling 3	0 - 100%	
3x0153	Cooling 3	0-1	Off*On
3x0154	Cooling 4	0 - 100%	
3x0155	Cooling 4	0-1	Off*On
3x0200	RoomUnitsActRmUMode	0-3	Auto*Comf*StBy*Eco
3x0210	RoomUnitsActSpvShift	°C	(factor 10)
3x0211	RmUTmp1	°C	(factor 10)
3x0212	RmUTmp2	°C	(factor 10)

Holding register (Read/Write)

Adress	Description	Values/Units	Remarks
			Unsigned Word
			Present value
4x0005	BMS TSP steps	0-6	Auto*Off* St1* St2* St3* St4* St5
4x0006	BMS TSP steps/tmp	0-11	Auto*Off*Eco St1*Comf St1*Eco St2*Comf St2*Eco St3*Comf St3*Eco St4*Comf St4*Eco St5*Comf St5
4x0008	Op mode man st	0-6	Auto*Off* St1* St2* St3* St4* St5
4x0009	Op mode man st/tmp	0-11	Auto*Off*Eco St1*Comf St1*Eco St2*Comf St2*Eco St3*Comf St3*Eco St4*Comf St4*Eco St5*Comf St5
			Signed Word
			PresentValue
4x0022	Comfort htg stpt	°C	(factor 10)
4x0023	Comfort clg stpt	°C	(factor 10)
4x0026	Economy htg stpt	°C	(factor 10)
4x0027	Economy clg stpt	°C	(factor 10)
4x0034	Supply temperature min limit	-x.y - +x.y °C	(dělitel 10) Low limit - bazén VCS
4x0035	Supply temperature max limit	-x.y - +x.y °C	(dělitel 10) Higt limit - bazén VCS

Connection to the Master System (ModBus Standard)

Adress	Description	Values/Units	Remarks
4x0036	Sply max limit	`-x.y - +x.y °C	(factor 10) Higt limit
4x0037	Sply min limit	`-x.y - +x.y °C	(factor 10) Low limit
4x0039	Hum stpt rel comfot	0 - x %r.H.	
4x0040	Dehum stpt rel comfort	0 - x %r.H.	
4x0041	Hum stpt rel economy	0 - x %r.H.	
4x0042	Dehum stpt rel economy	0 - x %r.H.	
4x0050	Sply fan st1 stpt	0-100% (0 - x l/s)	%, Pa or l/s
4x0051	Sply fan st2 stpt	0-100% (0 - x l/s)	%, Pa or l/s
4x0052	Sply fan st3 stpt	0-100% (0 - x l/s)	%, Pa or l/s
4x0053	Sply fan st4 stpt	0-100% (0 - x l/s)	%, Pa or l/s
4x0054	Sply fan st5 stpt	0-100% (0 - x l/s)	%, Pa or l/s
4x0056	Exh fan st1 stpt	0-100% (0 - x l/s)	%, Pa or l/s
4x0057	Exh fan st2 stpt	0-100% (0 - x l/s)	%, Pa or l/s
4x0058	Exh fan st3 stpt	0-100% (0 - x l/s)	%, Pa or l/s
4x0059	Exh fan st4 stpt	0-100% (0 - x l/s)	%, Pa or l/s
4x0060	Exh fan st5 stpt	0-100% (0 - x l/s)	%, Pa or l/s
4x0062	Air quality stpt CO	0 - x ppm	
4x0063	Air quality stpt CO2, VOC	0 - x ppm	
4x0064	Outside air temp	`-x.y - +x.y °C	(factor 10)
4x0065	Return humidity rel	%r.H.	(factor 10)
4x0066	Room temperature	°C	(factor 10)
4x0069	Return air temperature	°C	(factor 10)
4x0090	Minimum limit fresh air - Econom	0 - 100%	
4x0091	Minimum limit fresh air - Comfort	0 - 100%	
4x0091	Minimum limit fresh air - Comfort	0 - 100%	

Connection to the Master System (BacNet Standard)

BACnet/IP (BMS)

The VCS control unit enables integration of the centralized BMS (Building Management System) using the BACnet/IP communication standard. Using a suitably integrated master system, it is possible to control the air-handling device's operating state.

Generally

BACnet is a standard communication protocol for Building Automation and Control Networks developed by ASHRAE (American Society of Heating, Refrigerating and Air-conditioning Engineers). The main goal was to create a protocol which enables the integration of systems from different manufacturers intended for building automation. For detailed information on the BACnet protocol, refer to the following websites:

www.bacnet.org
www.bacnetinternational.net

VCS and BACnet/IP

The control unit can be equipped with various implementation variants of this protocol depending on customer requirements. The basic standard is the protocol already implemented in the Climatix POL6x series controller (Native BACnet). However, this version does not support EDE file generation, scheduling, alarms, or trends. Another variant is the specialized Climatix POL908 add-on module, which offers advanced integration capabilities for the

BACnet protocol. A general description of each variant (PICS document) and further details can be found on the official website for BACnet certified products:

<https://www.bacnetinternational.net/btl/>

Configuration and Activation Protocol settings and activation are performed using one of the following interfaces: HMI DM, TM, or Web. For the POL908 specialized module variant, settings are also configured via the module's web server once communication with the module has been established. Initially, it is necessary to enable the web server or disable the firewall using the basic controllers.

Default Login Credentials:

Username: ADMIN
 Password: SBTAdmin!

In case you require support, please contact the Service Department. A general EDE file can be sent upon request.

The following table includes a list of basic data points which can be used for this communication and their description. The list includes specifications of variables for different VCS control system variants.

For example, if the VCS control system (air-handling device) has not been equipped with gas heating, it will not be possible to use these variables. The final functionality, monitoring and control options will be dependent on the integrator used to ensure connection to the master BMS system.

List and Description of Basic Data Points

Data point name	Meaning	Values/Units	Remark
Device	Device		
Diagnostic	Diagnostic		
SystemClock	SystemClock		
AirQuality	Air quality	0 – x ppm	
RoomTmp	Room temp.	°C	
RmUTmp1	Room Unit1 temp.	°C	
RmUTmp2	Room Unit2 temp.	°C	
ValidRoomTmp	Valid room temp.	°C	
ReturnAirTmp	Return air temp.	°C	
SupplyTmp	Supply	°C	
OutTmp	Outdoor	°C	
HtgFrstTmp	RetWaterHeat	°C	
ExhaustTmp	AirHeatExchan	°C	
PreIHtgTmp	Air EI. preheat	°C	
PreWtrHtgTmp	Temp return water preheat	°C	
BmrFlueTmp	FlueGas	°C	
RoomHum	Room relative	%r.H.	
SupplyHum	Supply air relative	%r.H.	
OutHum	Outs air relative	%r.H.	
RmHumAbs	Room absolut humidity	-x.y - +x.y g/kg	
SplyHumAbs	Supply air absolut humidity	-x.y - +x.y g/kg	
OutHumAbs	Outs air absolut humidity	-x.y - +x.y g/kg	
RmEnth	Room enthalpy	-x.y - +x.y kJ/kg	
OutEnth	Outs air enthalpy	-x.y - +x.y kJ/kg	
ActOpMode	ActStateEquipment	0-12	
	0=Off		
	1=On/Comfort		
	2=Economy		
	3=Na		
	4=Osstp		
	5=NightClg		
	6=UnOcc		
	7=NightKick		
	8=Not use		
	9=Fire		
	10=Stop		
	11=OverRun		
	12=StartUp		
ActFanStep	ActFanStep	0-5	Off*Stage1*Stage2*Stage3*Stage4*Stage5

Connection to the Master System (BacNet Standard)

Data point name	Meaning	Values/Units	Remark
OpModeAutoManSt.Switch	Manual mode	0-6	Auto*Off*Stage1*Stage2*Stage3*Stage4* Stage5
OpModeAutoManStTmp.Switch	Manual mode	0-11	Auto*Off*Eco St1*Comf St1*Eco St2*Comf St2*Eco St3*Comf St3*Eco St4*Comf St4*Eco St5*Comf St5
OpModeBmsTimeSt.Switch	BMS mode	0-6	Auto*Off*Stage1*Stage2*Stage3*Stage4* Stage5
OpModeBmsTimeStTmp.Switch	BMS mode	0-11	Auto*Off*Eco St1*Comf St1*Eco St2*Comf St2*Eco St3*Comf St3*Eco St4*Comf St4*Eco St5*Comf St5
TmpSpv.CoSpvHtg	Heating - Comfort	°C	
TmpSpv.CoSpvClg	Cooling - Comfort	°C	
TmpSpv.EcSpvHtg	Heating - Economic	°C	
TmpSpv.EcSpvClg	Cooling - Economic	°C	
HumSpvRel.CoSpvDehum	Dehumidity setpoint - Comfort	0 - xy %r.H.	
HumSpvRel.CoSpvHum	Humidity setpoint - Comfort	0 - xy %r.H.	
HumSpvRel.EcSpvDehum	Dehumidity setpoint - Economic	0 - xy %r.H.	
HumSpvRel.EcSpvHum	Humidity setpoint - Economic	0 - xy %r.H.	
AirQSpv	Setpoint value air quality	0 - x ppm	
ScheduleSt	CalendarWeek		
ScheduleStTmp	CalendarWeek		
CalendarEx	CalendarExcept		
CalendarOff	CalendarOff		
ActCascSpvHtg	ActCascSpvHtg	°C	
ActCascSpvClg	ActCascSpvClg	°C	
ActCascSpvDeh	ActCascSpvDeh	%r.H.	
ActCascSpvHum	ActCascSpvHum	%r.H.	
Heating_Pos	HeatingValve	0 - 100%	
ElectricalHtg_Pos	ElecHtgValve	0 - 100%	
Cooling_Pos	CoolingValve	0 - 100%	
ExtraElHtg_Pos	ExtraElHtgPos	0 - 100%	
Hrec_Pos	HeatExchangPos	0 - 100%	
HrecDamp_Pos	MixSectPosition	0 - 100%	
aoHeatPumpHtg_Pos	HeatPumpHtg	0 - 100%	
aoHeatPumpClg_Pos	HeatPumpClg	0 - 100%	
HumidityCtrl_Pos	Humidity	0 - 100%	
DeHumidity_PrVal	ActDeHumidity	0 - 100%	
AirQComp_PrVal	ActValComp	0 - 100%	
SplyFan.Cmd.St	Supply fan step	0 - 6	NULL*Off*St1*St2*St3*St4*St5
ExhFan.Cmd.St	Exhaust fan step	0 - 6	NULL*Off*St1*St2*St3*St4*St5
Heating_Pmp.Cmd.OnOff	HeatingPump	0 - 1	Off*On
ElectricalHtg.Cmd.St.St	ElectricHeater	0 - 15	NULL*Off*St1*St2*St3*St4*St5*St6*St7*St8*St9*St10*St11*St12*St13*St14
ExtraElHtg.Cmd.St.St	ElectReheating	0 - 15	NULL*Off*St1*St2*St3*St4*St5*St6*St7*St8*St9*St10*St11*St12*St13*St14
Cooling_Pmp.Cmd.OnOff	WaterCoolPump	0 - 1	Off*On
Cooling.CmdDx.St	CoolingStDXCool	0 - 2	None*Cooling*Heating
Damper.Exh.OnOff	Damper Exhaust_OnOff	0 - 2	Off*On*NULL
Damper.Sply.OnOff	Damper Supply_OnOff	0 - 2	Off*On*NULL
AlmOutHigh	AlmOutHigh	0 - 2	Normal*Alarm*NULL
AlmOutLow	AlmOutLow	0 - 2	Normal*Alarm*NULL
AlmC0	Alarm Class A	0 - 1	Normal*Alarm
AlmC1	Alarm Class A	0 - 1	Normal*Alarm
AlmC2	Alarm Class B	0 - 1	Normal*Alarm
AlmC3	Alarm Class B	0 - 1	Normal*Alarm
FireAlm	External Alarm	0 - 1	Alarm*Normal
AckAlmPls	Acknowledge alarm	0 - 1	Off*On
RmUOP35	Room temperature - OP35	°C	
InverterOnOff	Inverter cooling state	0 - 1	Off*On
InverterPos	Inverter coolin position	0 - 100%	
Inverter2OnOff	Inverter cooling 2 state	0 - 1	Off*On
Inverter2Pos	Inverter coolin 2 position	0 - 100%	
Inverter3OnOff	Inverter cooling 3 state	0 - 1	Off*On
Inverter3Pos	Inverter coolin 3 position	0 - 100%	
Inverter4OnOff	Inverter cooling 4 state	0 - 1	Off*On
Inverter4Pos	Inverter coolin 4 position	0 - 100%	
HeatPumpStpt	Heat pump state	0 - 2	None*Cooling*Heating
HeatPump2State	Heat pump position	0 - 100%	
HeatPump2Stpt	Heat pump 2 state	0 - 2	None*Cooling*Heating
HeatPump3State	Heat pump 2 position	0 - 100%	
HeatPump3Stpt	Heat pump 3 state	0 - 2	None*Cooling*Heating
HeatPump4State	Heat pump 3 position	0 - 100%	
HeatPump4Stpt	Heat pump 4 state	0 - 2	None*Cooling*Heating
WtrPreHtgAOPos	Heat pump 4 position	0 - 100%	
WtrPreHtgAOPmpCmdOnOff	Water preheating position	0 - 100%	
WtrPreHtgCmdOnOff	Water preheating pump	0 - 1	Off*On
WtrPreHtgVarPos	Water preheating state	0 - 1	Off*On
ElPreHtgPos	Electric preheating position	0 - 100%	
ElPreHtgCmdStSt	Electric preheating state	0 - 15	NULL*Off*St1*St2*St3*St4*St5*St6*St7*St8*St9*St10*St11*St12*St13*St14
ExtraWtrHtgPmpCmdOnOff	Extra water heating pump state	0 - 1	Off*On
ExtraWtrHtgPos	Extra water heating position	0 - 100%	

Connection to the Master System (LonWorks Standard)

Remote Signalling

The VCS Control unit can optionally be equipped with one or two outputs for remote signalling.

Depending on the configuration, the following:

- Only failure (non-potential contact, max. load 230 V/1 A)
- Failure and operation (2 non-potential contacts, max. load 230 V/1 A).

LonWorks Network

The VCS control unit enables integration of the centralized BMS (Building Management System) using the LonWorks communication bus. Using the suitably integrated system, it is possible to control the air-handling device operating state. For a specific description of the variables to be used for the integration, refer to the section "Description of Pre-defined Variables in the LONWorks Network". The final functionality, monitoring and control options will be dependant on the integrator used to ensure connection to the master BMS system.

Network Interface

Connection to the network is ensured by a galvanically separated FTT-10A transceiver. This Free Topology Transceiver has been designed for the LonWorks network with a TP/FT-10 type transmission channel.

This transmission channel uses a free topology network, a twisted pair and baud rate of 78 kbps.

Applicable network topologies to be used along with the FTT-10A transceiver:

- Free topology (including the star and circular topology)
 - Free topology
- Bus topology
 - Line (Bus) topology

Each device in the LonWorks network is identified by a unique neuron ID identifier. The unique neuron ID identifier assigned by the manufacturer can always be found on the Climatix controller which is a part of the VCS control unit.

For more information on the LonWorks Standard refer to: www.echelon.com www.lonmark.org

Data Point Settings for Application of Some Network Input Variables

Using the controllers along with the VCS control system, it is possible to make changes in the assignment of the functions to some network input variables (SNVT). For some input variables like outdoor temperature and fire alarm (external failure), it is necessary to select if the value is to be used from the communication or from the application in the Controller Menu. Thus it can be determined if the outdoor temperature sensor is connected directly to the VCS control unit or its temperature reading is sent through the communication (LonWorks).

Description of Pre-defined Variables in the LonWorks Network

This section includes description of SNVT variables (Standard Network Variable Types) according to assigned REMAK data points. The list below includes specifications of variables for all the VCS control system variants. For example, if the VCS control system (air-handling device) was not equipped with gas heating it is not possible to use these variables.

Input Variables

Network Variable:	nviTemps
Description:	Req. heating temperature (Comfort) Req. cooling temperature (Comfort) Req. heating temperature (Economy) Req. cooling temperature (Economy) Minimum supply air temperature Maximum supply air temperature
Object:	SNVT_temp_Setpt
Remark:	Structured Variable

Network Variable:	nviTemp01
Description:	Not used
Object:	SNVT_temp_p

Network Variable:	nviTemp02
Description:	Outdoor temperature
Object:	SNVT_temp_p

Network Variable:	nviAHum00
Description:	Humidification Reference Value
Object:	SNVT_abs_humid
Remark:	For absolute and relative

Network Variable:	nviAHum01
Description:	Dehumidification Reference Value
Object:	SNVT_abs_humid
Remark:	For absolute and relative

Network Variable:	nviPpm00
Description:	Air quality Reference Value
Object:	SNVT_count

Network Variable:	nviPress_Flow00
Description:	Not used
Object:	SNVT_count

Network Variable:	nviPress_Flow01
Description:	Not used
Object:	SNVT_count

Network Variable:	nviPress_Flow02
Description:	Not used
Object:	SNVT_count

Network Variable:	nviPress_Flow03
Description:	Not used
Object:	SNVT_count

Network Variable:	nviPress_Flow04
Description:	Not used
Object:	SNVT_count

Connection to the Master System (LonWorks Standard)

Network Variable: nviPress_Flow05
 Description: Not used
 Object: SNVT_count

Network Variable: nviResetAlarm
 Description: Failure reset
 Object: SNVT_switch
 Values:

	0	Normal
	1	Reset
	>1	Not defined
State:	0:	Inactive
	1:	Active
Default:	Value:	0
	State:	0
Remark:	The State must be set to "1" to be used for the Value	

Network Variable: nviOpMode
 Description: Stav zařízení požadovaný z BMS
 Object: SNVT_switch
 Values:

	0	Auto (interní časový program)
	1	Stop
	2	Economy, 1St
	3	Comfort, 1St
	4	Economy, 2St
	5	Comfort, 2St
	6	Economy, 3St
	7	Comfort, 3St
	8	Economy, 4St
	9	Comfort, 4St
	10	Economy, 5St
	11	Comfort, 5St
	>11	Not defined
State:	0:	Inactive
	1:	Active
Remark:	The State must be set to "1" to be used for the Value	

Network Variable: nviControl
 Description: External control
 Object: SNVT_state (16 bit)
 Bits:

Bit [0 ...15]	Binary:	*Reverse:	
	0	15	
External control 1	1	14	
External control 2	2	13	
	3	12	
	4	11	
	5	10	
	6	9	
Fire alarm	7	8	"0"=Fault, "1" No fault
	8	7	
	9	6	

Bit [0 ...15]	Binary:	*Reverse:	
	10	5	
	11	4	
	12	3	

	13	2
	14	1
	15	0

Remark: *The bit name order can be reversed in some LON software tools.

Output Variables

Network Variable: nvoTemps
 Description: Req. heating temperature (Comfort)
 Req. cooling temperature (Comfort)
 Not used
 Req. heating temperature (cascade, inlet)
 Req. cooling temperature (cascade, inlet)
 Not used
 Object: SNVT_temp_Setpt
 Remark: Structured Variable

Network Variable: nvoTemp01
 Description: Inlet temperature
 Object: SNVT_temp_p

Network Variable: nvoTemp02
 Description: Return water temperature
 Object: SNVT_temp_p

Network Variable: nvoTemp03
 Description: Outdoor temperature
 Object: SNVT_temp_p

Network Variable: nvoTemp04
 Description: Room temperature (for control)
 Object: SNVT_temp_p

Network Variable: nvoTemp05
 Description: Outlet temperature
 Object: SNVT_temp_p

Network Variable: nvoTemp06
 Description: Temperature behind the heat exchanger
 Object: SNVT_temp_p

Network Variable: nvoTemp07
 Description: Flue gas temperature
 Object: SNVT_temp_p

Network Variable: nvoTemp08
 Description: Temperature behind electric pre-heating or Return water temperature form the water heater
 Object: SNVT_temp_p

Network Variable: nvoPpm00
 Description: Air quality
 Object: SNVT_count

Connection to the Master System (LonWorks Standard)

Network Variable:	nvoPress00
Description:	Inlet pressure
Object:	SNVT_press_p
Network Variable:	nvoPress01
Description:	Outlet pressure
Object:	SNVT_press_p
Network Variable:	nvoPress02
Description:	Not used
Object:	SNVT_press_p
Network Variable:	nvoPress_Flow00
Description:	Current request for the inlet fan
Object:	SNVT_flow
Remark:	%, Pa or l/s
Network Variable:	nvoPress_Flow01
Description:	Current request for the outlet fan
Object:	SNVT_flow
Remark:	%, Pa or l/s
Network Variable:	nvo_Flow00
Description:	Inlet air-flow
Object:	SNVT_flow
Network Variable:	nvo_Flow01
Description:	Outlet air-flow
Object:	SNVT_flow
Network Variable:	nvoPerc00
Description:	Heater output
Object:	SNVT_lev_count
Network Variable:	nvoPerc01
Description:	Cooling output
Object:	SNVT_lev_count
Network Variable:	nvoPerc02
Description:	Heat exchanger output
Object:	SNVT_lev_count
Network Variable:	nvoPerc03
Description:	Mixing output
Object:	SNVT_lev_count
Network Variable:	nvoPerc04
Description:	Not used
Object:	SNVT_lev_count
Network Variable:	nvoPerc05
Description:	Electric heater output
Object:	SNVT_lev_count
Network Variable:	nvoPerc06
Description:	Inlet fan output
Object:	SNVT_lev_count

Network Variable:	nvoPerc07																												
Description:	Outlet fan output																												
Object:	SNVT_lev_count																												
Network Variable:	nvoPerc08																												
Description:	Not used																												
Object:	SNVT_lev_count																												
Network Variable:	nvoPerc09																												
Description:	Air humidity in the inlet																												
Object:	SNVT_lev_count																												
Network Variable:	nvoPerc10																												
Description:	Air humidity in the room																												
Object:	SNVT_lev_count																												
Network Variable:	nvoPerc11																												
Description:	Outdoor air humidity																												
Object:	SNVT_lev_count																												
Network Variable:	nvoPerc12																												
Description:	Humidification output																												
Object:	SNVT_lev_count																												
Network Variable:	nvoPerc13																												
Description:	Dehumidification output																												
Object:	SNVT_lev_count																												
Network Variable:	nvoPerc14																												
Description:	Electric after-heater output																												
Object:	SNVT_lev_count																												
Network Variable:	nvoAHum00																												
Description:	Absolute humidity in the inlet																												
Object:	SNVT_abs_humid																												
Network Variable:	nvoAHum01																												
Description:	Absolute humidity in the outlet																												
Object:	SNVT_abs_humid																												
Network Variable:	nvoOpMode																												
Description:	Current device state																												
Object:	SNVT_switch																												
Values:	<table border="0"> <tr><td>0</td><td>Stop</td></tr> <tr><td>1</td><td>Operation (Comfort)</td></tr> <tr><td>2</td><td>Operation (Economy)</td></tr> <tr><td>3</td><td>Not used</td></tr> <tr><td>4</td><td>Optimized start</td></tr> <tr><td>5</td><td>Night chilling</td></tr> <tr><td>6</td><td>Temperature start-up</td></tr> <tr><td>7</td><td>Night turn-over</td></tr> <tr><td>8</td><td>Not used</td></tr> <tr><td>9</td><td>Fire</td></tr> <tr><td>10</td><td>Safety stop</td></tr> <tr><td>11</td><td>Fan run-down</td></tr> <tr><td>12</td><td>Start</td></tr> <tr><td>>12</td><td>Not defined</td></tr> </table>	0	Stop	1	Operation (Comfort)	2	Operation (Economy)	3	Not used	4	Optimized start	5	Night chilling	6	Temperature start-up	7	Night turn-over	8	Not used	9	Fire	10	Safety stop	11	Fan run-down	12	Start	>12	Not defined
0	Stop																												
1	Operation (Comfort)																												
2	Operation (Economy)																												
3	Not used																												
4	Optimized start																												
5	Night chilling																												
6	Temperature start-up																												
7	Night turn-over																												
8	Not used																												
9	Fire																												
10	Safety stop																												
11	Fan run-down																												
12	Start																												
>12	Not defined																												
State:	0: Inactive :Mode Auto																												
	1: Active :Mode OS																												
Default:	Value: 0																												

Connection to the Master System (LonWorks Standard)

State:	0
Network Variable:	nvoSwitch00
Description:	Current fan state
Object:	SNVT_switch
Values:	0 Stop
	1 1St
	2 2St
	3 3St
	4 4St
	5 5St
	>5 Not defined
State:	0: Inactive
	1: Active

Network Variable:	nvoState
Description:	Alarm classes, Control mode
Object:	SNVT_state_64 (64 bit)
Bits:	
Bit [0 ...63]	Binary: *Reverse:
Alarm class - danger (A)	0 63
Alarm class - critical (A)	1 62
Alarm class - low (B)	2 61
Alarm class - warning (B)	3 60
	4 59
	5 58
	6 57
	7 56
	8 55
	9 54
	10 53
Current control temperature - room	11 52
Current control temperature - outlet	12 51
Current control temperature - inlet	13 50
Current control humidity - room	14 49
Current control humidity - inlet	15 48
	.
	.
	.
	63 0

Remark: *The bit name order can be reversed in some LON software tools

Network Variable:	nvoDO
Description:	Digital outputs
Object:	SNVT_state_64 (64 bit)
Bits:	
Bit [0 ...63]	Binary: *Reverse:
Inlet damper	0 63
Outlet damper	1 62
Fire damper	2 61
	3 60
Inlet Fan - Run	4 59
Inlet Fan - Stop	5 58
	6 57
	7 56
	8 55
Outlet Fan - Run	9 54
Outlet Fan - Stop	10 53

	11 52
	12 51
	13 50
	14 49
	15 48
Cooling - pump	16 47
Cooling DX, Stop	17 46
Cooling DX, 1st	18 45
Cooling DX, 2st	19 44
	20 43
	21 42
Heat recovery	22 41
	23 40
Water heating - pump	24 39
	25 38
Electric heating, Stop	26 37
Electric heating, 1st	27 36
	28 35
	29 34
	30 33
	31 32
Heat pump DO 2	32 31
	33 30
	34 29
	35 28
	36 27
	37 26
Heat pump DO 1	38 25
	39 24
Electric after-heating, Stop	40 23
Electric after-heating, 1st	41 22
	42 21
	43 20
	44 19
Request for humidification	45 18
Humidifier pump	46 17
	47 16
	48 15
	49 14
Gas heating, st1	50 13
Gas heating, st2	51 12
Gas heating, Mod+	52 11
Gas heating, Mod-	53 10
	54 9
	55 8
Alarm output (A failures)	56 7
Alarm output (B failures)	57 6
	58 5
	59 4
	60 3
Request for boiler room	61 2
Water pre-heating	62 1
Electric pre-heating	63 0
Remark: *The bit name order can be reversed in some LON software tools.	

Connection to the Master System (LonWorks Standard)

Network Variable:	nvoDI	
Description:	Digital Inputs	
Object:	SNVT_state_64 (64 bit)	
Bits:		
Bit [0 ...63]	Binary:	*Reverse:
	0	63
External input 1	1	62
External input 2	2	61
	.	.
	.	.
	.	.
	63	0
Remark:	*The bit name order can be reversed in some LON software tools	

Network Variable:	nvoAlarm	
Description:	Alarms	
Object:	SNVT_state_64 (64 bit)	
Bits:		
Bit [0 ...63]	Binary:	*Reverse:
Dampers	0	63
Fire dampers	1	62
Burner failure	2	61
Inlet fan	3	60
Outlet fan	4	59
Fans - operating hours	5	58
Back-up inlet fan	6	57
Back-up outlet fan	7	56
Cooling	8	55
Flue-gas high temperature - AHU shut down	9	54
Heat recovery	10	53
	11	52
Heat recovery (antifreeze protection)	12	51
	13	50
Mixing	14	49
Flue-gas high temperature - heater shut down	15	48
Heating, pump	16	47
Water heating	17	46
Electric heating	18	45
Back draught protection (TH)	19	44
Heat pump Cooling	20	43
	21	42
Heat pump, heating	22	41
	23	40
Electric after-heating	24	39
	25	38
Humidifier, pump	26	37
Humidification	27	36
	28	35
Fire	29	34
Electric pre-heating	30	33
Filters	31	32
Outdoor temperature	32	31
Inlet temperature	33	30
Return water temperature	34	29
Room temperature 1	35	28
Room temperature 2	36	27

Outlet temperature	37	26
	38	25
	39	24
	40	23
	41	22
	42	21
	43	20
	44	19
Temperature, HMI SG 1,2	45	18
Inlet temperature difference	46	17
Room temperature difference	47	16
Pressure differences (air-flow), inlet	48	15
Pressure differences (air-flow), outlet	49	14
	50	13
Outdoor air humidity	51	12
Air humidity difference, inlet	52	11
Air humidity difference, room53	10	
Dew point	54	9
	55	8
Air quality	56	7
	57	6
	58	5
	59	4
	60	3
	61	2
	62	1
	63	0
Remark:	*The bit name order can be reversed in some LON software tools	

Abbreviations

BPDEV	Plate Heat Exchanger Bypass	SCADA	Supervisory control and data acquisition
TČ	Heat Pump	BMS	Building Management System
TK	Thermocontact	ModBus RTU	Communication protocol (Remote Terminal Unit)
PMO	Antifreeze Protection	Climatix	A series of controllers providing the same features
ROV	Rotary Heat Exchanger	AHU	Air Handling Unit
VZT	Air-handling Device	SELV	Safety Extra-Low Voltage
ZZT	Heat Recovery	HMI	HumanMachineInterface – remote controller
FTT-10A	Free Topology Transceiver for channel type TP/FT-10 (LON)	BACnet	Building Automation and Control Network
TP/FT-10	Physical channel to transmit data over Twisted Pair to Free Topology networks	TCP/IP	Transmission Control Protocol, např. Ethernet/Internet
SNVT	Standard Network Variable Type (LON)		
LON	Local Operating Network		

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