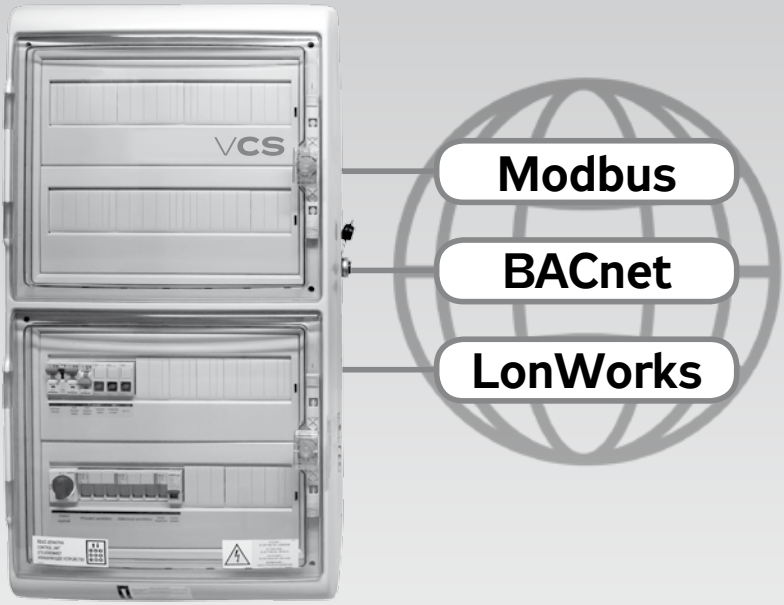
REMAK

05/2023

INSTALLATION AND OPERATING INSTRUCTIONS



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 V AC 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), adress: 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 23.2ºC 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	ºC	OK*Alarm
1x0081	Supply air temp	ºC	OK*Alarm

Connection to the Master System (ModBus Standard)

Adress	Description	Values/Units	Remarks
1x0082	Heating frost tmp	ºC	OK*Alarm
1x0083	Room temperature	ºC	OK*Alarm
1x0084	Room temperature 2	ºC	OK*Alarm
1x0085	Return air temp	ºC	OK*Alarm
1x0086	Exhaust air temp	ºC	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	ºC	OK*Alarm
1x0103	RmUTmp2	ºC	OK*Alarm
1x0104	BrnrFlueTmp	ºC	OK*Alarm
1x0105	PreElHtgTmp	ºC	OK*Alarm
1x0106	PreEtrHtgTmp	ºC	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	
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	
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)

Bit5	Exhaust temperature		
Bit6	Extract temperature		
Bit7			
Bit8			
Bit9			
Bit10			
Bit11			
Bit12			
Bit13	Room unit 1,2 - temperature		
Bit14	Supply temperature deviation		
Bit15	Room/Exh temp deviation		
3x0016	**Alarms (Word 4)**	0-65535	0-1 for each bit or counted binary to a decimal number
Bit0	Supply press/flow deviation		
Bit1	Exhaust press/flow deviation		
Bit2			
Bit3	Outside Humidity		
Bit4	Supply Humidity deviation		
Bit5	Room Humidity deviation		
Bit6	Dewpoint		
Bit7			
Bit8	Air quality		
Bit9			
Bit10			
Bit11			
Bit12			
Bit13			
Bit14			
Bit15			
Adress	**Description**	**Values/Units**	**Remarks**
			Unsigned Word
3x0017	Act operating mode	0-12	Present value
	0=Off		
	1=On/Comfort		
	2=Economy		
	3=Na		
	4=Osstp		
	5=NightClg		
	6=UnOcc		
	7=NightKick		
	9=Fire		
	10=Stop		
	11=OverRun		
	12=StartUp		

Connection to the Master System (ModBus Standard)

3x0018	Act fan step	0-5	Off*Stage1*Stage2*Stage3*Stage 4*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	Off*Stage 1*Stage 2*Stage 3*Stage 4*Stage 5
3x0029	Sply fan outp sign	0-100%	
3x0030	Exhaust fan cmd	0-6	Off*Stage 1*Stage 2*Stage 3*Stage 4*Stage 5
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	0-1	Off*On
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	0-1	Off*On
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
3x0060	Alarm output	0-1	Normal*Alarm
3x0062	Heat pump Heating 2	0 - 100%	
3x0063	Heat pump Heating 2	0-2	None*Cooling*Heating

Connection to the Master System (ModBus Standard)

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 ºC	(factor 10)
3x0073	Supply air temp	`-x.y - +x.y ºC	(factor 10)
3x0074	Heating frost tmp	ºC	(factor 10)
3x0075	Valid room tmp	ºC	(factor 10)
3x0076	Return air temp	ºC	(factor 10)
3x0077	Exhaust air temp	ºC	(factor 10)
3x0078	Return air temp 2	ºC	(factor 10)
3x0079	Return air temp 3	ºC	(factor 10)
3x0080	Valid return air temp	ºC	(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 ºC	(factor 10)
3x0095	Supply air flow	0 - x m3/h	
3x0096	Exhaust air flow	0 - x m3/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 ºC	
3x0105	Act cooling stpt	ºC	
3x0106	Act sply htg stpt	ºC	
3x0107	Act sply clg stpt	ºC	
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)
3x0112	Act sply fan stpt	0-100% (0 - x l/s)	
3x0113	Act exh fan stpt	0-100% (0 - x l/s)	
3x0120	Hour		

Connection to the Master System (ModBus Standard)

3x0121	Minute		
3x0122	Second		
3x0123	Day		
3x0124	Month		
3x0125	Year		
3x0130	Burner flue temp	ºC	(factor 10)
3x0131	PreEl. heating temp	ºC	(factor 10)
3x0132	PreWater heating temp	ºC	(factor 10)
3x0133	Burner damper	0-100%	
3x0200	RoomUnitsActRmUMode	0-3	Auto*Comf*StBy*Eco
3x0210	RoomUnitsActSpvShift	ºC	
3x0211	RmUTmp1	ºC	
3x0212	RmUTmp2	ºC	

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	ºC	
4x0023	Comfort clg stpt	ºC	
4x0026	Economy htg stpt	ºC	
4x0027	Economy clg stpt	ºC	
4x0034	Supply temperature min limit	-x.y - +x.y ºC	(dělitel 10) Low limit
4x0035	Supply temperature max limit	-x.y - +x.y ºC	(dělitel 10) Higt limit
4x0036	Sply max limit	`-x.y - +x.y ºC	(factor 10) Higt limit
4x0037	Sply min limit	`-x.y - +x.y ºC	(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

Connection to the Master System (ModBus Standard)

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	
			TrackingValueCOM
4x0064	Outside air temp	`-x.y - +x.y ºC	(factor 10)
4x0065	Room humidity rel	%r.H.	(factor 10)
4x0066	Room temperature	ºC	
4x0069	Return air temperature	ºC	(factor 10)
4x0090	Minimum limit fresh air - Econom	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

BACnet/IP Protocol

There are several variants of the BACnet protocol. The VCS control system uses BACnet/IP for the Ethernet network. The BACnet communication protocol works using the Master/Slave principle. The Server function is used for VCS unit system communication with the master system. This means that the VCS control unit behaves like a Server in the communication.
Protocol settings can be performed using one of the following controllers: HMI, DM, TM or Web. Switching on and off, restart and other settings of the BACnet server can be carried out through the web page (calling the address set in the VCS control unit). For detailed information on the BACnet/IP Standard (EDE file and others) settings and application, refer to the Siemens BACnet/IP Communication Module documentation available on the REMAK website.

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
Device	Device
Diagnostic	Diagnostics
SystemClock	System time
AirQuality	Air quality
RoomTmp	Room temperature
RmUTmp1	HMI-SG1
RmUTmp2	HMI-SG2
ValidRoomTmp	Temperature in the room after control
ReturnAirTmp	Outlet air temperature
SupplyTmp	Inlet air temperature
OutTmp	Outdoor temperature
HtgFrstTmp	Return water temperature (water heater)
ExhaustTmp	Outlet air temperature after the heat exchanger
PreElHtgTmp	Temperature, electric pre-heating
PreWtrHtgTmp	Return water temperature (water pre-heating)
BrnrFlueTmp	Flue gas temperature
RoomHum	Air humidity in the room - relative
SupplyHum	Inlet air humidity - relative
OutHum	Outdoor air humidity - relative
RmHumAbs	Absolute air humidity in the room
SplyHumAbs	Absolute inlet air humidity
OutHumAbs	Absolute outdoor air humidity
RmEnth	The room - enthalpy
OutEnth	Outdoor enthalpy
ActOpMode	Current state of the device
ActFanStep	Current state of the fans
OpModeAutoManSt.Swtch	Manual mode (control)
OpModeAutoManStTmp.Swtch	Manual mode (control)

Connection to the Master System (BacNet Standard)

List and Description of Basic Data Points *(continuation)*

OpModeBmsTimeSt.Swtch	BMS control mode (control, master system)
OpModeBmsTimeStTmp.Swtch	BMS control mode (control, master system)
TmpSpv.CoSpvHtg	Required value for heating - Comfort
TmpSpv.CoSpvClg	Required value for cooling - Comfort
TmpSpv.EcSpvHtg	Required value for heating - Economy
TmpSpv.EcSpvClg	Required value for cooling - Economy
HumSpvRel.SpvHum	Required value for humidification (relative)
HumSpvRelSpvDehum	Required value for dehumidification (relative)
AirQSpv	Required value for air quality
ScheduleSt	Weekly time schedule
ScheduleStTmp	Weekly time schedule
CalendarEx	Exception time schedule
CalendarOff	Switch-off schedule
ActCascSpvHtg	Current required heating temperature (cascade)
ActCascSpvClg	Current required cooling temperature (cascade)
ActCascSpvDeh	Current required value for dehumidification (cascade)
ActCascSpvHum	Current required value for humidification (cascade)
Heating.Pos	Heating node valve outlet position
ElectricalHtg.Pos	Electric heating outlet position
Cooling.Pos	Cooling valve outlet position
ExtraElHtg.Pos	Electric after-heating outlet position
Hrec.Pos	Heat exchanger control outlet position
HrecDamp.Pos	Mixing damper outlet position
aoHeatPumpHtg.Pos	Heat pump outlet position - heating
aoHeatPumpClg.Pos	Heat pump outlet position - cooling
HumidityCtrl.Pos	Humidification current value
DeHumidity.PrVal	Dehumidification current value
AirQCmp.PrVal	Air quality compensation current value
SplyFan.Cmd.St	Current stage, inlet fan
ExhFan.Cmd.St	Current stage, outlet fan
Heating.Pmp.Cmd.OnOff	Heating pump state
ElectricalHtg.CmdSt.St	Electric heater state
ExtraElHtg.CmdSt.St	Electric after-heater state
Cooling.Pmp.Cmd.OnOff	Water cooler pump state
Cooling.CmdDx.St	Cooling state, inverter cooling unit
Damper.Exh.OnOff	Damper, outlet
Damper.Sply.OnOff	Damper inlet
AlmOutHigh	Alarm, output A
AlmOutLow	Alarm, output B
AlmCl0	Alarm, class A
AlmCl1	Alarm, class A
AlmCl2	Alarm, class B
AlmCl3	Alarm, class B
FireAlm	External alarm
AckAlmPls	Failure release

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

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