Pluggit UVC Controller

Modbus TCP/IP

Author	Document revision	Status	Last updated	Pages
EO	3	First release version	20150821	52

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1 Revision History

Date	Author	Comment	Revision	Status
20150630	EO	First draft version	1	Draft
20150720	EO	Register addresses added. Some functionality described. App. 80% finished. Confirmed parts marked green. Not confirmed parts marked yellow. Main sections to improve: • Mode change • Alarms • HAC-module	2	Draft
20150821	EO	Updated: • Mode change • Alarms • HAC-module	3	First release

2 Introduction

The new generation of controllers in the Pluggit ventilation units has the possibility to communicate Modbus TCP/IP over the Ethernet port. This is used for Building Management Systems (BMS) or communication with smartphone apps.

The purpose of this document is to describe the functionality of this interface. Functionality has been divided into subchapters. In each subchapter there is a list of used Modbus registers. There are examples included for some of the most complex registers.

In the end of the document, there is an example of how to test the interface.

3 Registers model

3.1 Communication

For MPCB control the Modbus protocol v 1.1 is used (TCP/IP over Ethernet). System port **502** is used for communication. The ventilation unit has a maximum of 3 sockets to be connected at the same time.

Warning: If socket is unused for 1 minute and more, the connection will be closed by MPCB.

3.2 Modbus commands

The Ventilation unit supports the following commands of Modbus protocol:

- Read holding registers (0x03);
- Write multiple Holding registers (0x10).

3.3 Date storing format

3.3.1 32 bit parameters

All parameters of the ventilation unit have a 32-bits dimension. However the Modbus works with registers which have 16-bits dimension. Each parameter in the ventilation unit is therefore separated in two parts (Low and High). Modbus model stores it like two registers (R0 and R1 according), which are located together in sequence. A register with Low part of parameters has the lower address.

Example:

prmT1 – temperature T1, float, modbus addr 40089.

prmT1	bytes	Byte3	Byte2	Byte1	Byte0
	Modbus	R1 (40090)		R0 (40089)	
	Value	14.30 °C			

For changing the parameter it is necessary to send both parts of parameter in one packet.

Warning: if the two parts of one parameter are sent to the ventilation unit over different packets, then the parameter will not be written.

3.3.2 Date/Time format

All date/time parameters contain value in Unix time (amount of seconds from 1.1.1970).

3.3.3 Float

A floating point value is 32 bits, but Modbus uses 16 bit registers therefore this 32 bit value is mapped to two register. The sequence used is CDAB.

4 Modbus Registers

4.1 Communication

Network settings can be read over Modbus.

4.1.1 Functionality

Default network settings can be changed using the PC Configuration Tool. After change of network settings, the ventilation unit must be restarted.

If DHCP is enabled, then the router will assign an IP-address to the ventilation unit at start up.

If DHCP is disabled, manual set addresses will be assigned to the ventilation unit at start up.

4.1.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40027	**prmDHCPEN**	**UINT**	**Read**	1	0	DHCP enable
40029	**prmCurrentIPAddress**	**UINT**	**Read**	4294967295	0	IP address
40033	**prmCurrentIPMask**	**UINT**	**Read**	4294967295	0	IP mask
40037	**prmCurrentIPGateway**	**UINT**	**Read**	4294967295	0	Gateway
40041	**prmMACAddrHigh**	**UINT**	**Read**	4294967295	0	MAC Address [high:low]
40043	**prmMACAddrLow**	**UINT**	**Read**	4294967295	0	

4.1.3 Example: Read IP Address

Read from ventilation unit:

Register address	Parameter	Value (decimal)	Value (bin)
40029	**prmCurrentIPAddress (low)**	364	0000000101101100
40030	**prmCurrentIPAddress (high)**	49320	1100000010101000

Conversion:

40030		40029	
Byte 3	Byte 2	Byte 1	Byte 0
11000000	10101000	00000001	01101100
192	168	1	108

Current IP address is therefore:

192.168.1.108

4.1.4 Example: Read MAC Address

Read from ventilation unit:

Register address	Parameter	Value (decimal)	Value (bin)
40041	**prmMACAddrHigh (low)**	128	0000000010000000
40042	**prmMACAddrHigh (high)**	0	0000000000000000
40043	**prmMACAddrLow (low)**	34308	1000011000000100
40044	**prmMACAddrLow (high)**	57625	1110000100011001

Conversion:

40042		40041		40044		40043	
Byte 7	Byte 6	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1	Byte 0
00000000	00000000	00000000	10000000	11100001	00011001	10000110	00000100
		0	128	225	25	134	4

MAC Address is represented by Byte 0 to 5. The MAC Address is therefore: 0.128.225.25.134.4

4.2 Ventilation unit info

4.2.1 Functionality

4.2.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40003	**prmSystemID**	**UINT**	**Read**	4294967295	0	Packed System Information: - Installed components (16 bits) - future unit type (8 bits): always 0 - current unit type (8 bits) System ID: 40004 | 40003 Bytes order: Byte 3 | Byte 2 | Byte 1 | Byte 0 Values: Components | 0 | Unit type Installed components (binary fields): FP1 0x0001 Week 0x0002 Bypass 0x0004 LRSwitch 0x0008

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>Internal preheater 0x0010
Servo flow 0x0020
RH Senser 0x0040
VOC sensor 0x0080
Ext Override 0x0100
HAC1 0x0200
HRC2 0x0400
PC Tool 0x0800
Apps 0x1000
ZeegBee 0x2000
DI1 Override 0x4000
DI2 Override 0x8000

Available Unit types:
1 WG200
2 WG300
3 WG500
4 HCC 2
5 HCC 2ALU</td></tr>
<tr><td>40005</td><td>prmSystemSerialNumLow</td><td>UINT</td><td>Read</td><td>4294967295</td><td>0</td><td rowspan="2">System serial number [high:low]

SN | 40008 | 40007 | 40006 | 40005
Bytes order | Byte 7 | Byte 6 | Byte 5 | Byte 4 | Byte 3 | Byte 2 | Byte 1 | By 0</td></tr>
<tr><td>40007</td><td>prmSystemSerialNumHigh</td><td>UINT</td><td>Read</td><td>4294967295</td><td>0</td></tr>
<tr><td>40009</td><td>prmSystemName1</td><td>UINT</td><td>Write</td><td>4294967295</td><td>0</td><td rowspan="2">System name in ASCII prmSystemName[1-8] – 32 symbols. If string has a length less than 32 symbols, then last symbol is 0.</td></tr>
<tr><td>40011</td><td>prmSystemName2</td><td>UINT</td><td>Write</td><td>4294967295</td><td>0</td></tr>
</table>

40013	**prmSystemName3**	**UINT**	**Write**	4294967295	0	
40015	**prmSystemName4**	**UINT**	**Write**	4294967295	0	
40017	**prmSystemName5**	**UINT**	**Write**	4294967295	0	
40019	**prmSystemName6**	**UINT**	**Write**	4294967295	0	
40021	**prmSystemName7**	**UINT**	**Write**	4294967295	0	
40023	**prmSystemName8**	**UINT**	**Write**	4294967295	0	
40085	**prmHALLeft**	**UINT**	**Read**	1	0	1: switch in “B position”
40087	**prmHALRight**	**UINT**	**Read**	1	0	1: switch in “A position”

System Name	40009		40010		...	40022		40023	
Symbols order	Sym 1	Sym 0	Sym 3	Sym 2	...	Sym 29	Sym 28	Sym 31	Sym 30

4.2.3 Example: Read serial number

Read from ventilation unit:

Register address	Parameter	Value (decimal)	Value (bin)
40005	**prmSystemSerialNumLow (low)**	20909	0101000110101101
40006	**prmSystemSerialNumLow (high)**	12314	0011000000011010
40007	**prmSystemSerialNumHigh (low)**	327	0000000101000111
40008	**prmSystemSerialNumHigh (high)**	0	0000000000000000

Conversion:

40008		40007		40006		40005	
Byte 7	Byte 6	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1	Byte 0
0000000000000000		0000000101000111		0011000000011010		0101000110101101	
00000000000000000000000101000111001100000001101001010001101011 01							
1405261337005							

The serial number is therefore 1405261337005.

4.2.4 Example: Read unit type

Read from ventilation unit:

Register address	Parameter	Value (decimal)	Value (bin)
40003	**prmSystemID (low)**	13779	0011010111010011
40004	**prmSystemID (high)**	1024	0000010000000000

Conversion:

40004		40003	
Byte 3	Byte 2	Byte 1	Byte 0
00000100	00000000	00110101	11010011
4			

Type is represented by Byte 4 in prmSystemID. Type is therefore HCC 2

4.2.5 Example: Read Unit Name

Read from ventilation unit:

Register address	Parameter	Value (decimal)	Value (bin)
40009	prmSystemName1(low)	25942	0110010101010110
40010	prmSystemName1 (high)	29806	0111010001101110
40011	prmSystemName2 (low)	27753	0110110001101001
40012	prmSystemName2 (high)	29793	0111010001100001
40013	prmSystemName3 (low)	28521	0110111101101001
40014	prmSystemName3 (high)	8302	0010000001101110

40015	prmSystemName4 (low)	28277	0110111001110101
40016	prmSystemName4 (high)	29801	0111010001101001
40017	prmSystemName5 (low)	0	0000000000000000
40018	prmSystemName5 (high)	0	0000000000000000
40019	prmSystemName6 (low)	0	0000000000000000
40020	prmSystemName6 (high)	0	0000000000000000
40021	prmSystemName7 (low)	0	0000000000000000
40022	prmSystemName7 (high)	0	0000000000000000
40023	prmSystemName8 (low)	0	0000000000000000
40024	prmSystemName8 (high)	0	0000000000000000

Conversion:

40012		40011		40010		40009	
Byte 7	Byte 6	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1	Byte 0
01110100	01100001	01101100	01101001	01110100	01101110	01100101	01010110
116	97	108	105	116	110	101	86
t	A	l	i	t	N	E	V

40016		40015		40014		40013	
Byte 15	Byte 14	Byte 13	Byte 12	Byte 11	Byte 10	Byte 9	Byte 8
01110100	01101001	01101110	01110101	00100000	01101110	01101111	01101001
116	105	110	117	32	110	111	105
t	l	n	u		N	O	i

40020		40019		40018		40017	
Byte 15	Byte 14	Byte 13	Byte 12	Byte 11	Byte 10	Byte 9	Byte 8
00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

0	0	0	0	0	0	0	0

40024		40023		40022		40021	
Byte 15	Byte 14	Byte 13	Byte 12	Byte 11	Byte 10	Byte 9	Byte 8
00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
0	0	0	0	0	0	0	0

Unit Name is therefore “Ventilation unit”

4.2.6 Example: Read A/B switch position

Read from ventilation unit:

Register address	Parameter	Value (decimal)	Value (bin)
40085	**prmHALLeft (low)**	0	
40086	**prmHALLeft (high)**	0	
40087	**prmHALRight (low)**	1	
40088	**prmHALRight (high)**	0	

Switch position is therefore A.

4.3 Firmware versions

4.3.1 Functionality

4.3.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40025	**prmFWVersion**	**UINT**	**Read**	4294967295	0	FW version: Major(8bits) and Minor(8bits). Byte3 and Byte 2 are 0. Byte 1 is Major part. Byte 0 is minor part. For example: v. 1.169 is stored like 0x000001A8 System serial number: 40026 | 40025 Bytes order: Byte 3 | Byte 2 | Byte 1 | Byte 0 Values: 0 | 0 | Major | Minor
40193	**prmRamIdxHac1FirmwareVersion**	**UINT**	**Read**	65535	0	HAC1 FW Version

4.3.3 Example: Read firmware version

	prmFWVersion			
	high		Low	
Register address	40026		40025	
Value (decimal)	0		552	
Value (bin)	0000000000000000		0000001000101000	
Byte number	Byte 3	Byte 2	Byte 1	Byte 0
Byte (bin)	00000000	00000000	00000010	00101000
Byte (dec)			2	40

Firmware version is 2.40

4.3.4 Example: Read HAC software version

	prmFWVersion	
	high	Low
Register address	40194	40193
Value (decimal)	0	12288
Value (bin)	0000000000000000	0011000000000000
Value (hex)	0	3000

Version is stored in BCD (**binary coded decimal)** form:

`0b0011000000000000 = 0x3000`

where:

3 - first digit - major version

0 - second digit - minor version

0 - third digit - revision

0 - firth digit - beta version (isn't displayed on system devices)

HAC firmware version is therefore 3.000

Remote control will show HAC firmware version to be 300

4.4 Time & Date

4.4.1 Functionality

4.4.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40109	**prmDateTime**	**UINT**	**Read**	4294967295	0	Current Date/time in Unix time (amount of seconds from 1.1.1970)
40111	**prmDateTimeSet**	**UINT**	**Write**	4294967295	0	New date/time in Unix time
40625	**prmWorkTime**	**UINT**	**Read**	4294967295	0	Work time of system, in hours
40669	**prmStartExploitationDateStamp**	**UINT**	**Read**	4294967295	0	Date Stamp of the system start of Exploitation in Unix time (amount of seconds from 1.1.1970)

4.4.3 Example: Read time

4.4.4 Example: Read time

	prmDateTime	
	High	Low
Register address	40110	40109
Value (decimal)	21930	15962
Value (16 bit)	0101010110101010	0011111001011010
Value (32 bit)	01010101101010100011111001011010	
Value (decimal)	1437220442	
Time	18-07-2015 11:54:02	

4.4.5 Example: Set time

	prmDateTime	
	High	Low

Register address	40112	40111
Time	01-07-2015 00:00:00	
Unix time	1435708800	
Value (32 bit)	01010101100100110010110110000000	
Value (16 bit)	0101010110010011	0010110110000000
Value (decimal)	21907	11648

4.4.6 Example: Read Work time

	prmWorkTime	
	High	Low
Register address	40626	40625
Value (decimal)	0	44
Value (16 bit)	0000000000000000	0000000000101100
Value (32 bit)	00000000000000000000000000101100	
Value (decimal)	44	

4.4.7 Read date of installation

	prmStartExploitationDateStamp	
	High	Low
Register address	40670	40669
Value(decimal)	21893	24000
Value (16 bit)	0101010110000101	0101110111000000
Value (32 bit)	01010101100001010101110111000000	
Value (decimal)	1434803648	
Time	20 Jun 2015 12:34:08	

4.5 Mode of operation

4.5.1 Functionality

There are 3 basic running modes:

- Manual Mode
- Week Program Mode
- Demand Mode

Furthermore, there are some additional modes that can be selected either by the user or automatically by the ventilation unit control

	Mode		**User interfaces**						**Description**
		Vent. Unit contr.	Foil panel	Wired remote	Wireless remote	PC-Tool	HAC-module	Modbus TCP/IP	
0	Standby	--	--	--	--	--	w	r	Standby via switch connected to HAC-module
1	Manual Mode	--	w	w	w	w	--	w	In Manual Mode, the unit can run in fan step 0, 1, 2, 3 and 4. Fan step 0 can be blocked. When selecting fan step 0 or 4, there is automatic setback to fan step 3 after a fixed time period.
2	Demand Mode	--	w	w	w	w	--	w	Demand mode using one or more of the following sensors: • RH-sensor in ventilation unit • VOC-sensor in ventilation unit • CO2-sensor via HAC-module At least one sensor must be connected.
3	WeekProgram Mode	--	w	w	w	w	--	w	Ventilation unit can run predefined programs 1-10 or user defined week

									program 11.
4	Servoflow	W	(r)	W	--	r	--	r	
5	Away Mode	--	--	--	w	w	--	w	Holliday function with low fan speed.
6	Summer Mode	--	w	--	r	r	--	w	Only exhaust fan running.
7	DI Override	(w)	(r)	(r)	(r)	r	--	r	
8	Hygrostat override	--	(r)	(r)	(r)	r	w	r	
9	Fireplace Boost Mode	--	w	w	w	w	--	w	Over pressure for a limited time
10	Installer Mode	--	w	w	w	w	--	r	Calibration, Preheater test or setup via wireless remote.
11	Fail Safe 1	w	(r)	(r)	(r)	r	(r)	r	
12	Fail Safe 2	w	(r)	(r)	(r)	r	(r)	r	
13	Fail Off	w	(r)	(r)	(r)	r	(r)	r	
14	Defrost Off	w	--	--	(r)	r	--	r	Defrost function
15	Defrost	w	(r)	(r)	(r)	r	--	r	
16	Night Mode	w	(r)	(r)	r	r	--	r	Night function with low fan speed.

4.5.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40473	**prmCurrentBLState**	**UINT**	**Read**	4294967295	0	Current unit mode: 0 Standby 1 Manual 2 Demand 3 Week program 4 Servo-flow 5 Away 6 Summer 7 DI Override

						8 Hygrostat override 9 Fireplace 10 Installer 11 Fail Safe 1 12 Fail Safe 2 13 Fail Off 14 Defrost Off 15 Defrost 16 Night
40169	**prmRamIdxUnitMode**	**UINT**	**Write**	65535	0	Active Unit mode: Demand Mode 0x0002 Manual Mode 0x0004 WeekProgram Mode 0x0008 Away Mode 0x0010 Fireplace Mode 0x0040 Summer Mode 0x0800

4.5.3 Change between basic modes

Change to Demand Mode: Write 0x0002 (2) to 40169 prmRamIdxUnitMode.

Change to Manual Mode: Write 0x0004 (4) to 40169 prmRamIdxUnitMode.

Change to Week Program Mode: Write 0x0008 (8) to 40169 prmRamIdxUnitMode.

4.5.4 Start/end other modes

Start Away Mode: Write 0x0010 (16) to 40169 prmRamIdxUnitMode.

End Away Mode: Write 0x8010 (32784) to 40169 prmRamIdxUnitMode.

Start Fireplace Mode: Write 0x0040 (64) to 40169 prmRamIdxUnitMode.

End Fireplace Mode: Write 0x8040 (32832) to 40169 prmRamIdxUnitMode.

Start Summer Mode: Write 0x0800 (2048) to 40169 prmRamIdxUnitMode.

End Summer Mode: Write 0x8800 (34816) to 40169 prmRamIdxUnitMode.

4.6 Fan info

4.6.1 Functionality

Relation between fans and switch position:

	Switch position A	Switch position B
Fan 1	Extract	Supply
Fan 2	Supply	Extract

4.6.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40325	**prmRomIdxSpeedLevel**	**UINT**	**Write**	4	0	Speed level of Fans Manual mode: Fan step can be set Other modes: Fan step can be read.
40101	**prmHALTaho1**	**FLOAT**	**Read**	5000	0	Fan1 rpm
40103	**prmHALTaho2**	**FLOAT**	**Read**	5000	0	Fan2 rpm

4.7 Temperatures

4.7.1 Functionality

4.7.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40133	**prmRamIdxT1**	**FLOAT**	**Read**	327.67	-327.68	Outdoor temperature T1, °C
40135	**prmRamIdxT2**	**FLOAT**	**Read**	327.67	-327.68	Supply temperature T2 °C
40137	**prmRamIdxT3**	**FLOAT**	**Read**	327.67	-327.68	Extract temperature T3, °C
40139	**prmRamIdxT4**	**FLOAT**	**Read**	327.67	-327.68	Exhaust temperature T5, °C
40141	**prmRamIdxT5**	**FLOAT**	**Read**	327.67	-327.68	Room temperature wireless remote T5, °C

4.8 Filter

4.8.1 Functionality

4.8.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40555	**prmFilterRemainingTime**	**UINT**	**Read**	360	0	Remaining time of the Filter Lifetime (Days)
40557	**prmFilterDefaultTime**	**UINT**	**Write**	360	0	Filter Lifetime (Days)
40559	**prmFilterReset**	**UINT**	**Write**	1	0	1: Reset filter timer

4.9 Alarms

4.9.1 Functionality

4.9.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40515	**prmSetAlarmNum**	**UINT**	**Write**	15	0	Clear Alarm: 0 *None* 1 *Exhaust FAN Alarm* 2 *Supply FAN Alarm* 3 *Bypass Alarm* 4 *T1 Alarm* 5 *T2 Alarm* 6 *T3 Alarm* 7 *T4 Alarm* 8 *T5 Alarm* 9 *RH Alarm* 10 *Outdoor13 Alarm* 11 *Supply5 Alarm* 12 *Fire Alarm* 13 *Communication Alarm* 14 *FireTermostat Alarm* 15 *High waterlevel Alarm* Reset to 0 by MPCB after checking.
40517	**prmLastActiveAlarm**	**UINT**	**Read**	4294967295	0	Active Alarm:

						0 *None* 1 *Exhaust FAN Alarm* 2 *Supply FAN Alarm* 3 *Bypass Alarm* 4 *T1 Alarm* 5 *T2 Alarm* 6 *T3 Alarm* 7 *T4 Alarm* 8 *T5 Alarm* 9 *RH Alarm* 10 *Outdoor13 Alarm* 11 *Supply5 Alarm* 12 *Fire Alarm* 13 *Communication Alarm* 14 *FireTermostat Alarm* 15 *High waterlevel Alarm* If more Alarms are active, the alarm with highest number will be contained in the parameter.

4.10 Week Program

4.10.1 Functionality

There are ten predefined week programs (Week program 1-10) and one that can be user defined (Week program 11).

4.10.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40467	**prmNumOfWeekProgram**	**UINT**	**Write**	10	0	Number of the Active Week Program (for Week Program mode) Write value one lower than desired week program. For example write value 10 to select week program 11.
40627	**PrmWeekMon1**	**UINT**	**Write**	4294967295	0	Schedule of the Fan Speed in Monday of 11 Week Program: Interval — Bytes — **Address** 0-1, 1-2 — Byte 3 — **40628** 2-3, 3-4 — Byte 2 — **40628** 4-5, 5-6 — Byte 1 — **40627** 6-7, 7-8 — Byte 0 — **40627** 8-9, 9-10 — Byte 3 — **40630** 10-11, 11-12 — Byte 2 — **40630**
40629	**PrmWeekMon2**	**UINT**	**Write**	4294967295	0	
40631	**PrmWeekMon3**	**UINT**	**Write**	4294967295	0	

						12-13 Byte 1 13-14 14-15 Byte 0 15-16 16-17 Byte 3 17-18 18-19 Byte 2 19-20 20-21 Byte 1 21-22 22-23 Byte 0 23-0 **40629** **40632** **40631** Fan Speed Codes: 0 Fan Step0 1 Fan Step1 2 Fan Step2 3 Fan Step3 4 Fan Step4 5 Demand (Auto)
40633	**PrmWeekTue1**	**UINT**	**Write**	4294967295	0	Schedule of the Fan Speed in Tuesday of 11 Week Program (format similar to Monday).
40635	**PrmWeekTue2**	**UINT**	**Write**	4294967295	0	
40637	**PrmWeekTue3**	**UINT**	**Write**	4294967295	0	
40639	**PrmWeekWed1**	**UINT**	**Write**	4294967295	0	Schedule of the Fan Speed in Wednesday of 11 Week Program (format similar to Monday).
40641	**PrmWeekWed2**	**UINT**	**Write**	4294967295	0	

40643	**PrmWeekWed3**	**UINT**	**Write**	4294967295	0	
40645	**PrmWeekThu1**	**UINT**	**Write**	4294967295	0	Schedule of the Fan Speed in Thursday of 11 Week Program (format similar to Monday).
40647	**PrmWeekThu2**	**UINT**	**Write**	4294967295	0	
40649	**PrmWeekThu3**	**UINT**	**Write**	4294967295	0	
40651	**PrmWeekFri1**	**UINT**	**Write**	4294967295	0	Schedule of the Fan Speed in Friday of 11 Week Program (format similar to Monday).
40653	**PrmWeekFri2**	**UINT**	**Write**	4294967295	0	
40655	**PrmWeekFri3**	**UINT**	**Write**	4294967295	0	
40657	**PrmWeekSat1**	**UINT**	**Write**	4294967295	0	Schedule of the Fan Speed in Saturday of 11 Week Program (format similar to Monday).
40659	**PrmWeekSat2**	**UINT**	**Write**	4294967295	0	
40661	**PrmWeekSat3**	**UINT**	**Write**	4294967295	0	
40663	**PrmWeekSun1**	**UINT**	**Write**	4294967295	0	Schedule of the Fan Speed in Sunday of 11 Week Program (format similar to Monday).
40665	**PrmWeekSun2**	**UINT**	**Write**	4294967295	0	
40667	**PrmWeekSun3**	**UINT**	**Write**	4294967295	0	

4.10.3 Example: Programming week program 11

Week program Monday:

Hour	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
One hour decimal	1	1	1	1	1	2	3	3	4	4	5	5	5	5	5	5	5	4	4	3	3	3	2	1
One hour 4 bit binary	0001	0001	0001	0001	0001	0010	0011	0011	0100	0100	0101	0101	0101	0101	0101	0101	0101	0100	0100	0011	0011	0011	0010	0001
Four hour 16 bit binary	0001000100010001				0001001000110011				0100010001010101				0101010101010101				0101010001000011				0011001100100001			
Four hour decimal	4369				4659				17493				21845				21571				13089			
Register Address	40628				40627				40630				40629				40632				40631			

4.11 Night Mode

4.11.1 Functionality

4.11.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40169	**prmRamIdxUnitMode**	**UINT**	**Write**	65535	0	Night mode enable: Write the value 0x0020 (32) Night mode disable: Write the value 0x8020 (32800)
40333	**prmRomIdxNightModeStartHour**	**UINT**	**Write**	255	0	Night mode start hour (0-23)
40335	**prmRomIdxNightModeStartMin**	**UINT**	**Write**	255	0	Night mode start minute (0-59)
40337	**prmRomIdxNightModeEndHour**	**UINT**	**Write**	255	0	Night mode end hour (0-23)
40339	**prmRomIdxNightModeEndMin**	**UINT**	**Write**	255	0	Night mode end minute (0-59)

4.12 Heat recovery /bypass

4.12.1 Functionality

Bypass has to be mounted in order to use bypass functionality.

Bypass is disabled if prmBypassTmax = 0.

Automatic bypass:

The by-pass will open when all the following conditions are fulfilled:

T1 < T3-2

T1 > prmBypassTmin

T3 > prmBypassTmax

And close if one of the following conditions is fulfilled while open:

T1 > T3

T1 < (prmBypassTmin -2)

T3 < (prmBypassTmax -1)

4.12.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40445	**prmBypassTmin**	**FLOAT**	**Read**	15,0	12,0	Min temperature for outdoor air (T1)
40447	**prmBypassTmax**	**FLOAT**	**Read**	27.0	21.0 (0)	Max temperature for extract air (T3)
40199	**prmRamIdxBypassActualState**	**UINT**	**Read**	255	0	Bypass state: 0: Closed 0x0000 1: In process 0x0001 32: Closing 0x0020 64: Opening 0x0040 255: Opened 0x00FF
40265	**prmRamIdxBypassManualTimeout**	**UINT**	**Read**	480	60	Manual bypass duration in minutes
40169	**prmRamIdxUnitMode**	**UINT**	**Write**	65535	0	Manual Bypass 0x0080 (128)

4.12.3 Select/de-select manual bypass

Select manual bypass: Write 0x0080 (128) to 40169 prmRamIdxUnitMode.

Deselect Manual bypass: Write 0x8080 (32896) to 40169 prmRamIdxUnitMode.

4.13 Preheater

4.13.1 Functionality

4.13.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40161	**prmPreheaterDutyCycle**	**UINT**	**Read**	100	0	Power of Preheater in %

4.14 Commissioning setting

4.14.1 Functionality

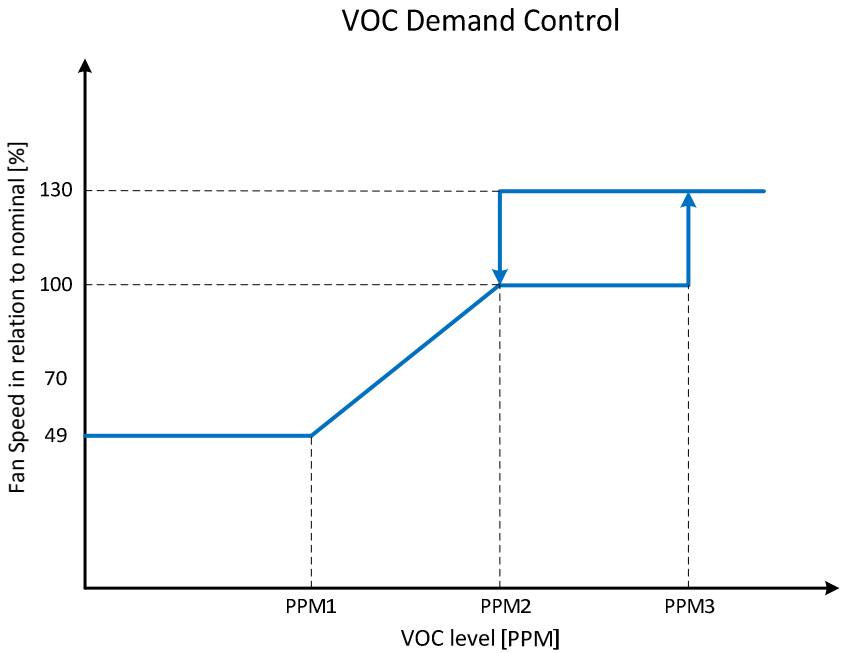
4.14.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40519	**prmRefValEx**	**UINT**	**Read**	65535	0	Reference Extract Fan Speed for Step3 (rpm).
40521	**prmRefValSupl**	**UINT**	**Read**	65535	0	Reference Supply Fan Speed for Step3 (rpm).
40541	**prmFireplacePreset**	**UINT**	**Read**	1	0	0: Fireplace not present. Unbalanced defrost allowed. 1: Fireplace present. Unbalanced defrost not allowed.

4.15 VOC sensor

4.15.1 Functionality

VOC-sensor is accessory that can be placed inside the ventilation unit in the extract side. Relation between VOC-level and fan speed is seen in the figure below:



Sensitivity is defined by the following sets of PPM settings.

VOC sensibility	Low	Medium	High
prmPPM1Unit	1000	800	600
prmPPM2Unit	1500	1200	900
prmPPM3Unit	2000	1500	1200

4.15.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40431	**prmVOC**	**UINT**	**Read**	65535	0	VOC sensor value (read from VOC); ppm. If VOC is not installed, then 0.

40563	**prmPPM1Unit**	**UINT**	**Write**	65535	0	Low Treshold of VOC (ppm)
40565	**prmPPM2Unit**	**UINT**	**Write**	65535	0	Middle Treshold of VOC (ppm)
40567	**prmPPM3Unit**	**UINT**	**Write**	65535	0	High Treshold of VOC (ppm)

4.16 RH sensor

4.16.1 Functionality

Rh-sensor can be mounted in the ventilation unit.

Functionality is implemented as a PI-controller with output range between fan step 1 and fan step 3.

The RH-controller is a part of demand mode. If either VOC- or CO2-sensor is also present, then the controller with highest output will be used.

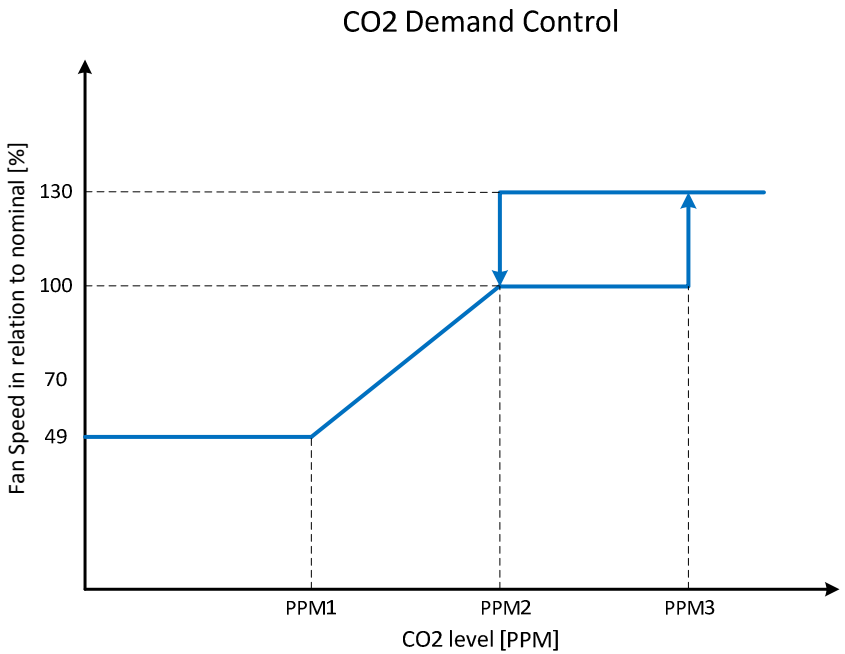
4.16.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40197	**prmRamIdxRh3Corrected**	**UINT**	**Read**	100	0	Value of RH sensor, % 0: RH sensor not connected
40341	**prmRomIdxRhSetPoint**	**UINT**	**Read**	65	35	Setpoint of RH in %

4.17 HAC parts

4.17.1 Functionality

CO2-sensor is accessory that can be connected via the HAC-module. Relation between CO2-level and fan speed is seen in the figure below:



Sensitivity is defined by the following sets of PPM settings.

CO2 sensibility	Low	Medium	High
prmPPM1External	600	600	600
prmPPM2External	1300	1100	900
prmPPM3External	1800	1600	1400

4.17.2 Parameter table

Register address	Specific Parameter Name	Type	R/W	Max	Min	Description
40611	**prmSystemIDComponents**	**UINT**	**Read**	4294967295	0	HAC1 0x0200
40575	**prmHACCO2Val**	**UINT**	**Read**	65535	0	HAC1 CO2 Level (ppm)
40569	**prmPPM1External**	**UINT**	**Write**	65535	0	Low Treshold of CO2 (ppm)
40571	**prmPPM2External**	**UINT**	**Write**	65535	0	Middle Treshold of CO2 (ppm)
40573	**prmPPM3External**	**UINT**	**Write**	65535	0	High Treshold of CO2 (ppm)
40245	**prmRamIdxHac1Components**	**UINT**	**Read**	255	0	List of the HAC1 components (binary fields): CO2 Sensor 0x0001 ok PreHeater 0x0004 PreCooler 0x0008 AfterHeater 0x0010 AfterCooler 0x0020 Hygrostat 0x0040
40345	**prmRomIdxAfterHeaterT2SetPoint**	**INT**	**Write**	30	0	Setpoint of the T2 (°C); If HAC1 AfterHeater is active (**prmRamIdxHac1ActiveComponent(40301)**) and T2 < T2Setpoint, then HAC1 AfterHeater should be turned on; If T2Setpoint is 0, then T2 is not checked
40347	**prmRomIdxAfterHeaterT3SetPoint**	**INT**	**Write**	30	0	Setpoint of the T3 (°C); If HAC1 AfterHeater is active (**prmRamIdxHac1ActiveComponent(40301)**) and T3 < T3Setpoint, then HAC1 AfterHeater should be turned on; If T3Setpoint is 0, then T3 is not checked
40349	**prmRomIdxAfterHeaterT5SetPoint**	**INT**	**Write**	30	0	Setpoint of the T5 (°C);

						If HAC1 AfterHeater is active (**prmRamIdxHac1ActiveComponent(40301)**) and T5 < T5Setpoint, then HAC1 AfterHeater should be turned on; If T5Setpoint is 0, then T5 is not checked

4.17.3 Example: Show status of HAC-module auto detection

With HAC-module connected:

	prmSystemIDComponents	
	High	Low
Register address	40612	40611
Value (decimal)	256	30471
Value (16 bit)	0000000100000000	0111011100000111
Value (32 bit)	00000001000000000111011100000111	

Without HAC-module connected:

	prmSystemIDComponents	
	High	Low
Register address	40612	40611
Value (decimal)	256	13575
Value (16 bit)	0000000100000000	0011010100000111
Value (32 bit)	00000001000000000011010100000111	

5 Test

5.1 Test setup

5.1.1 Ethernet connection

In these tests, the ventilation unit has been connected to a router via cable. The test PC has been connected to the router either via cable or via Wi-Fi.

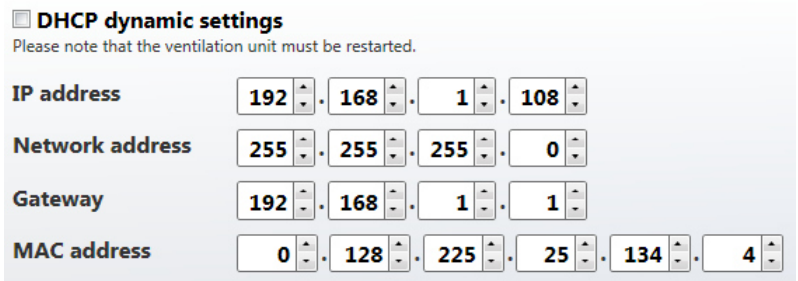
5.1.2 Test software

Modbus Poll - 64 Bit version 6.2.2 Build 871 was used for the test:

http://www.modbustools.com/

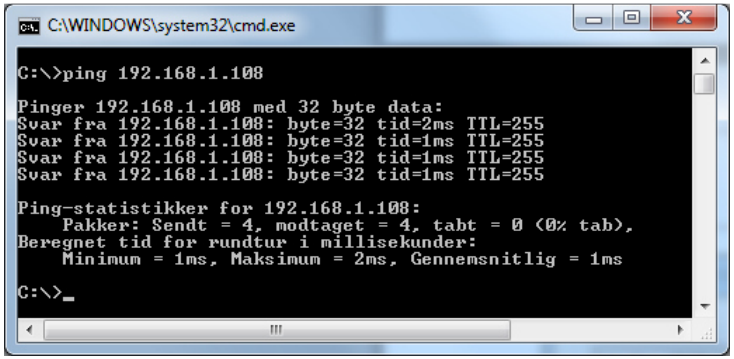
5.1.3 Network address setup

Network settings can be set using the PC-Tool:

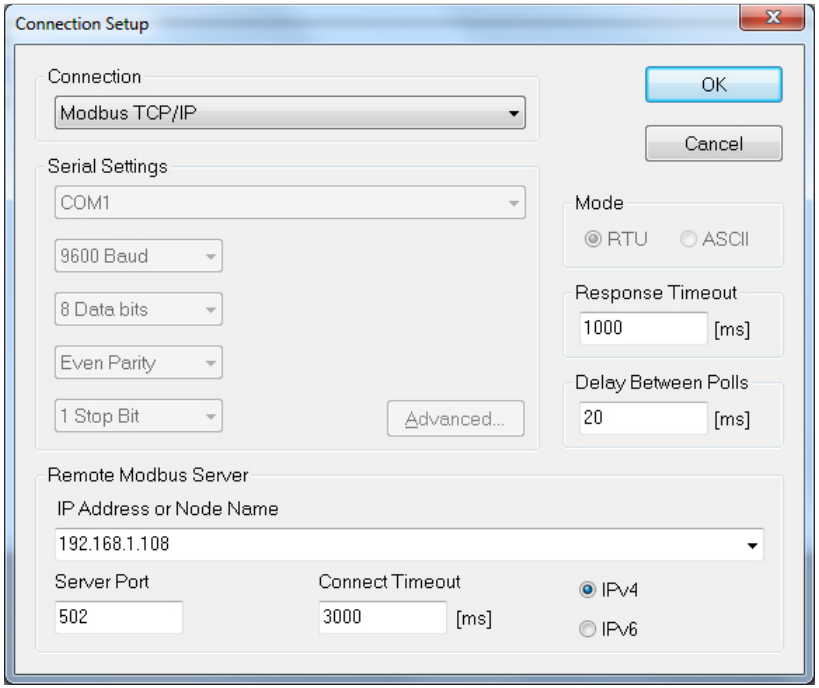


After change of network settings, the ventilation must be restarted.

Connection can be tested by opening cmd.exe in windows and use ping function.



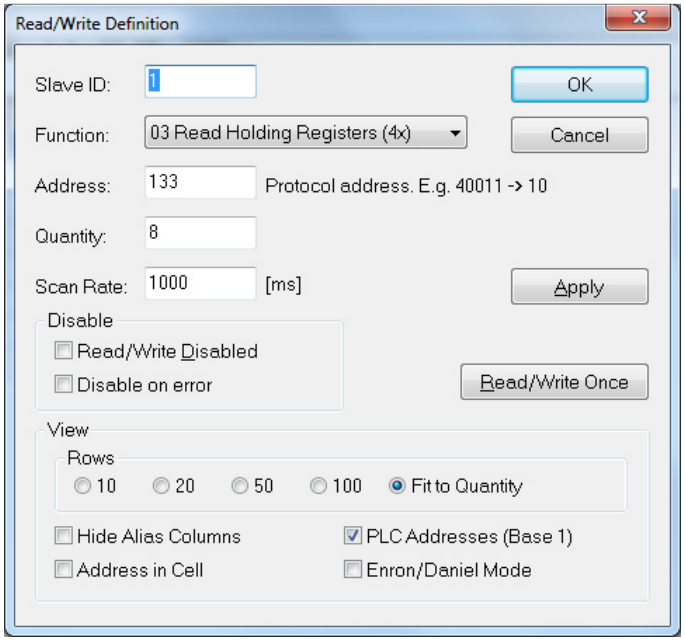
In Modbus Poll/Connection/Connect, type the IP-address of the unit:



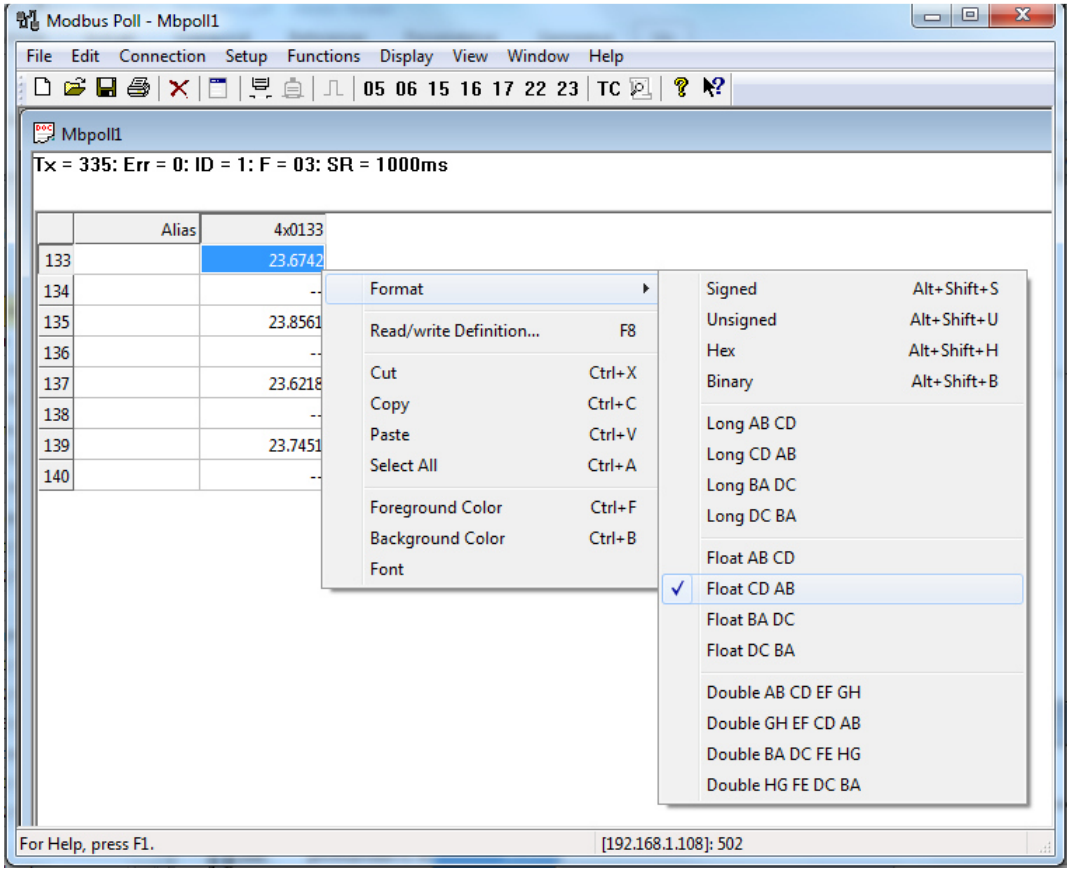
5.1.4 Example: Read Temperature values

In Modbus Poll/Set/Read/Write Definition:

- Choose 03 Read Holding Registers (4x)
- Choose start Address (last 3 digits)
- Choose Quantity (2 per parameter)
- Select PLC Addresses (Base 1). Otherwise there will be an address offset of 1



In the main window, right click on the values and select Float CD AB as format:



Notice that only some of the parameters use float values.