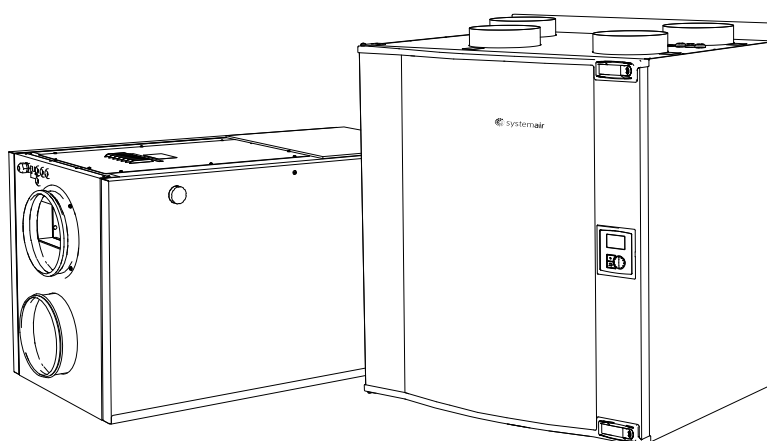


# Modbus for Residential units



## **GB** User Manual

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# 1 Introduction

The unit works as a Modbus slave and complied with MODBUS over serial line specification and implementation guide V1.0 if nothing else is mention in this manual.

## 2 Transmission modes

Modbus RTU.

Supported function codes:

- 1: Read Coils
- 2: Read Discrete Input
- 3: Read Holding Register
- 4: Read Input Register
- 5: Write Single Coil
- 6: Write Single Register
- 15: Write Multiple Coils
- 16: Write Multiple Registers

## 3 Physical layer

Two wire RS-485.

The supported communication parameters are:

9600 Bd or 19200 Bd.

No parity, even parity or odd parity.

## 4 Address

Slave address 1 to 247.

The following exception codes are generated by the slave:

- 1. ILLEGAL FUNCTION: when using any of the functions code not listed above.
- 2. ILLEGAL DATA ADDRESS: when addressing any register, coil or digital input higher than the highest address or lower than the lowest address.
- 3. ILLEGAL DATA VALUE: when the format of the Modbus message is faulty (e.g. wrong message length).

## 5 Notes

Coils and digital inputs are always available as register as well. The address of the coil or digital input can be calculated as follows:

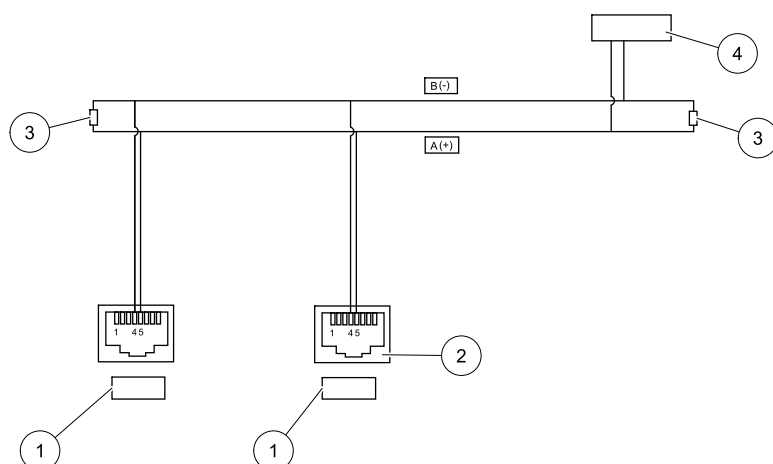
$\text{Address} - (\text{Register Address} * 16) - 15$

Reading any registers, inputs or coils that are not mentioned in the tables below will result in reading 0. Writing to any address that is not listed as writeable in the tables below, or is not listed at all, will have no effect.

Addressing any register, coil or digital input higher than the highest address will result in error 02, "Illegal Data Address" in the Modbus response.

The column “NVM” indicates if the value is stored in a non-volatile memory (i.e. EEPROM) when writing to it.

## 6 Wiring



**Fig. 1 Modbus wiring**

Position	Description
1	VTC unit.
2	RJ45 on PCB, seen from the top.
3	Termination resistor, close to the end of the line.
4	Modbus master.

## 7 Modbus variable list

### 7.1 Registers for fan control

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_FAN_SPEED_LEVEL	101	R/W	Y <sup>1</sup>	Reg	0: Fans off 1: Fans on low speed 2: Fans on normal speed 3: Fans on high speed
REG_FAN_SF_FLOW_LOW	102	R		Reg	Supply air fan speed for low speed
REG_FAN_EF_FLOW_LOW	103	R/W	Y <sup>1</sup>	Reg	Extract air fan speed for low speed
REG_FAN_SF_FLOW_NOM	104	R/W	Y <sup>1</sup>	Reg	Supply air fan speed for nominal speed
REG_FAN_EF_FLOW_NOM	105	R/W	Y <sup>1</sup>	Reg	Extract air fan speed for nominal speed
REG_FAN_SF_FLOW_HIGH	106	R		Reg	Supply air fan speed for high speed
REG_FAN_EF_FLOW_HIGH	107	R/W	Y <sup>1</sup>	Reg	Extract air fan speed for high speed
REG_FAN_FLOW_UNITS	108	R/W	Y	Reg	0: l/s 1: m <sup>3</sup> /h
REG_FAN_SF_PWM	109	R		Reg	0..100: 0-10V
REG_FAN_EF_PWM	110	R		Reg	0..100: 0-10V
REG_FAN_SF_RPM	111	R		Reg	Rotations per minute
REG_FAN_EF_RPM	112	R		Reg	Rotations per minute
REG_FAN_SPEED_LVL_CD	113	R		Reg	Speed level as shown on CD.
REG_FAN_ALLOW_MANUAL_FAN_STOP	114	R/W	Y	Reg + Coil	Coil 1809: manual fan stop allowed. 0: CD cannot set fan speed to off. 1: CD can set fan speed to off.
REG_FAN_SPEED_LOG_RESET	115	W	N	Reg	By writing the value 90 to this register, the values of REG_FAN_SPEED_LOG_xF_LVLx will be cleared.
REG_FAN_SPEED_LOG_SF_LVL1	116	R		Reg	Fan speed log values for supply fan, speed level 1.
REG_FAN_SPEED_LOG_SF_LVL2	117	R		Reg	Fan speed log values for supply fan, speed level 2.
REG_FAN_SPEED_LOG_SF_LVL3	118	R		Reg	Fan speed log values for supply fan, speed level 3.
REG_FAN_SPEED_LOG_SF_LVL4	119	R		Reg	Fan speed log values for supply fan, speed level 4.
REG_FAN_SPEED_LOG_SF_LVL5	120	R		Reg	Fan speed log values for supply fan, speed level 5.
REG_FAN_SPEED_LOG_EF_LVL1	121	R		Reg	Fan speed log values for extract fan, speed level 1.
REG_FAN_SPEED_LOG_EF_LVL2	122	R		Reg	Fan speed log values for extract fan, speed level 2.
REG_FAN_SPEED_LOG_EF_LVL3	123	R		Reg	Fan speed log values for extract fan, speed level 3.
REG_FAN_SPEED_LOG_EF_LVL4	124	R		Reg	Fan speed log values for extract fan, speed level 4.

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_FAN_SPEED_LOG_EF_LVL5	125	R		Reg	Fan speed log values for extract fan, speed level 5.
REG_FAN_SPEED_LOG_SF_NR_LVL1	126	R		Reg	Fan speed log values for supply fan, speed level 1, non-resettable.
REG_FAN_SPEED_LOG_SF_NR_LVL2	127	R		Reg	Fan speed log values for supply fan, speed level 2, non-resettable.
REG_FAN_SPEED_LOG_SF_NR_LVL3	128	R		Reg	Fan speed log values for supply fan, speed level 3, non-resettable.
REG_FAN_SPEED_LOG_SF_NR_LVL4	129	R		Reg	Fan speed log values for supply fan, speed level 4, non-resettable.
REG_FAN_SPEED_LOG_SF_NR_LVL5	130	R		Reg	Fan speed log values for supply fan, speed level 5, non-resettable.
REG_FAN_SPEED_LOG_EF_NR_LVL1	131	R		Reg	Fan speed log values for extract fan, speed level 1, non-resettable.
REG_FAN_SPEED_LOG_EF_NR_LVL2	132	R		Reg	Fan speed log values for extract fan, speed level 2, non-resettable.
REG_FAN_SPEED_LOG_EF_NR_LVL3	133	R		Reg	Fan speed log values for extract fan, speed level 3, non-resettable.
REG_FAN_SPEED_LOG_EF_NR_LVL4	134	R		Reg	Fan speed log values for extract fan, speed level 4, non-resettable.
REG_FAN_SPEED_LOG_EF_NR_LVL5	135	R		Reg	Fan speed log values for extract fan, speed level 5, non-resettable.
REG_FAN_SYSTEM_CURVE_SF	136	R/W	Y	Reg	System curve for supply fan. Value can be from 1 to 20.
REG_FAN_SYSTEM_CURVE_EF	137	R/W	Y	Reg	System curve for extract fan. Value can be from 1 to 10.

1. Stored by writing to register 549 (REG\_STORE\_NVM).

## 7.2 Registers for heater control

Name	Register address	R or R/W	NVM	Scaling	Access (Reg./Coil)	Description/remarks
REG_HC_HEATER_TYPE	201	R/W	Y	1	Reg	0: no heater 1: Water heater 2: Electrical heater 3: Contactor
REG_HC_COOLER_TYPE	202	R/W	Y	1	Reg	0: no cooler 1: water cooler
REG_HC_WCWH_STATE	203	R		1	Reg	State of water heater/cooler
REG_HC_WC_SIGNAL	204	R		1	Reg	Signal to cooler
REG_HC_WH_SIGNAL	205	R		1	Reg	Signal to water heater
REG_HC_FPS_LEVEL	206	R/W	Y	1	Reg	Frost protection level. Allowed values: 70, 80, 90, 100, 110, 120 = 7, 8, 9, 10, 11, 12 °C.
REG_HC_TEMP_LVL	207	R/W	Y <sup>1</sup>		Reg	Temperature set point level: 0: Manual summer mode.  1 to 5: correspond to temperature levels as given by REG_HC_TEMP_LVL1 to REG_HC_TEMP_LVL5.
REG_HC_TEMP_SP	208	R		1	Reg	Temperature set point.
REG_HC_TEMP_LVL1	209	R		10	Reg	Temperature level 1 * 10.
REG_HC_TEMP_LVL2	210	R		10	Reg	Temperature level 2 * 10.
REG_HC_TEMP_LVL3	211	R		10	Reg	Temperature level 3 * 10.
REG_HC_TEMP_LVL4	212	R		10	Reg	Temperature level 4 * 10.
REG_HC_TEMP_LVL5	213	R		10	Reg	Temperature level 5 * 10.
REG_HC_TEMP_IN1	214	R		10	Reg	Temperature on sensor 1 * 10. Supply air sensor.
REG_HC_TEMP_IN2	215	R		10	Reg	Temperature on sensor 2 * 10. Extract air sensor.
REG_HC_TEMP_IN3	216	R		10	Reg	Temperature on sensor 3 * 10. Exhaust air sensor.
REG_HC_TEMP_IN4	217	R		10	Reg	Temperature on sensor 4 * 10. Overheating/Frostprotection sensor.
REG_HC_TEMP_IN5	218	R		10	Reg	Temperature on sensor 5 * 10. Outdoor air sensor.
REG_HC_TEMP_STATE	219	R		1	Reg + Coil	Coil 3489: State of temperature sensor on input 1  Coil 3490: State of temperature sensor on input 2  Coil 3491: State of temperature sensor on input 3  Coil 3492: State of temperature sensor on input 4  Coil 3493: State of temperature sensor on input 5  Coil state: 0: no sensor fault 1: sensor fault

1. Stored by writing to register 549 (REG\_STORE\_NVM).

## 7.3 Registers for the damper

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_DAMPER_PWM	301	R		Reg	Output value for damper. 0-100 correspond to 0 to 10V.

## 7.4 Registers for the rotor

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_ROTOR_STATE	351	R		Reg	State for the rotor control state machine. 0: Normal 1: Rotor fault assumed 2: Rotor fault detected 3: Summer mode conditions valid, but summer mode not yet active. 4: Summer mode 5: Waiting to go out of Manual summer mode due to temperature conditions 6: Manual summer mode 7: Rotor cleaning during summer mode 8: Rotor cleaning during manual summer mode 9: Fans off 10: Rotor cleaning during fans off 11: Rotor fault, conditions for rotor fault not valid anymore
REG_ROTOR_RELAY_ACTIVE	352	R		Reg + Coil	Coil 5617: rotor relay active. 0: not active 1: active.

## 7.5 Registers for the week program

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_WP_ACTIVE	401	R		Reg + Coil	Coil address: 6401 0: week program not active 1: week program active
REG_WP_ON_LVL	402	R/W	Y	Reg	Week program active speed level.
REG_WP_OFF_LVL	403	R/W	Y	Reg	Week program inactive speed level.
REG_WP_WD1_PRD1_START_H	404	R/W	Y	Reg	Start of week program, day 1, period 1, hour
REG_WP_WD1_PRD1_START_M	405	R/W	Y	Reg	Start of week program, day 1, period 1, minute.  Allowed values: 0, 10, 15, 20, 30, 40, 45, 50



Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_WP_WD1_PRD1_END_H	406	R/W	Y	Reg	End of week program, day 1, period 1, hour
REG_WP_WD1_PRD1_END_M	407	R/W	Y	Reg	End of week program, day 1, period 1, minute. Allowed values: 0, 10, 15, 20, 30, 40, 45, 50
REG_WP_WD1_PRD2_START_H	408	R/W	Y	Reg	
REG_WP_WD1_PRD2_START_M	409	R/W	Y	Reg	
REG_WP_WD1_PRD2_END_H	410	R/W	Y	Reg	
REG_WP_WD1_PRD2_END_M	411	R/W	Y	Reg	
REG_WP_WD2_PRD1_START_H	412	R/W	Y	Reg	
REG_WP_WD2_PRD1_START_M	413	R/W	Y	Reg	
REG_WP_WD2_PRD1_END_H	414	R/W	Y	Reg	
REG_WP_WD2_PRD1_END_M	415	R/W	Y	Reg	
REG_WP_WD2_PRD2_START_H	416	R/W	Y	Reg	
REG_WP_WD2_PRD2_START_M	417	R/W	Y	Reg	
REG_WP_WD2_PRD2_END_H	418	R/W	Y	Reg	
REG_WP_WD2_PRD2_END_M	419	R/W	Y	Reg	
REG_WP_WD3_PRD1_START_H	420	R/W	Y	Reg	
REG_WP_WD3_PRD1_START_M	421	R/W	Y	Reg	
REG_WP_WD3_PRD1_END_H	422	R/W	Y	Reg	
REG_WP_WD3_PRD1_END_M	423	R/W	Y	Reg	
REG_WP_WD3_PRD2_START_H	424	R/W	Y	Reg	
REG_WP_WD3_PRD2_START_M	425	R/W	Y	Reg	
REG_WP_WD3_PRD2_END_H	426	R/W	Y	Reg	
REG_WP_WD3_PRD2_END_M	427	R/W	Y	Reg	
REG_WP_WD4_PRD1_START_H	428	R/W	Y	Reg	
REG_WP_WD4_PRD1_START_M	429	R/W	Y	Reg	
REG_WP_WD4_PRD1_END_H	430	R/W	Y	Reg	
REG_WP_WD4_PRD1_END_M	431	R/W	Y	Reg	
REG_WP_WD4_PRD2_START_H	432	R/W	Y	Reg	
REG_WP_WD4_PRD2_START_M	433	R/W	Y	Reg	
REG_WP_WD4_PRD2_END_H	434	R/W	Y	Reg	
REG_WP_WD4_PRD2_END_M	435	R/W	Y	Reg	
REG_WP_WD5_PRD1_START_H	436	R/W	Y	Reg	
REG_WP_WD5_PRD1_START_M	437	R/W	Y	Reg	
REG_WP_WD5_PRD1_END_H	438	R/W	Y	Reg	
REG_WP_WD5_PRD1_END_M	439	R/W	Y	Reg	
REG_WP_WD5_PRD2_START_H	440	R/W	Y	Reg	
REG_WP_WD5_PRD2_START_M	441	R/W	Y	Reg	
REG_WP_WD5_PRD2_END_H	442	R/W	Y	Reg	
REG_WP_WD5_PRD2_END_M	443	R/W	Y	Reg	
REG_WP_WD6_PRD1_START_H	444	R/W	Y	Reg	
REG_WP_WD6_PRD1_START_M	445	R/W	Y	Reg	

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_WP_WD6_PRD1_END_H	446	R/W	Y	Reg	
REG_WP_WD6_PRD1_END_M	447	R/W	Y	Reg	
REG_WP_WD6_PRD2_START_H	448	R/W	Y	Reg	
REG_WP_WD6_PRD2_START_M	449	R/W	Y	Reg	
REG_WP_WD6_PRD2_END_H	450	R/W	Y	Reg	
REG_WP_WD6_PRD2_END_M	451	R/W	Y	Reg	
REG_WP_WD7_PRD1_START_H	452	R/W	Y	Reg	
REG_WP_WD7_PRD1_START_M	453	R/W	Y	Reg	
REG_WP_WD7_PRD1_END_H	454	R/W	Y	Reg	
REG_WP_WD7_PRD1_END_M	455	R/W	Y	Reg	
REG_WP_WD7_PRD2_START_H	456	R/W	Y	Reg	
REG_WP_WD7_PRD2_START_M	457	R/W	Y	Reg	
REG_WP_WD7_PRD2_END_H	458	R/W	Y	Reg	
REG_WP_WD7_PRD2_END_M	459	R/W	Y	Reg	

## 7.6 Registers for system parameters

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_SYSTEM_TYPE	501	R/W	Y	Reg	4: VTC300 5: VTC700 8: VR400 9: VR700 12:VTR150K 13:VTR200B 14:VSR300 15:VSR500 All other values are not allowed.
REG_SYSTEM_PROG_V_HIGH	502	R		Reg	Main program version, high number
REG_SYSTEM_PROG_V_MID	503	R		Reg	Main program version, middle number
REG_SYSTEM_PROG_V_LOW	504	R		Reg	Main program version, low number
REG_SYSTEM_BOOT_PROG_V_HIGH	505	R		Reg	Boot program version, high number
REG_SYSTEM_BOOT_PROG_V_MID	506	R		Reg	Boot program version, middle number

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_SYSTEM_BOOT_PROG_V_LOW	507	R		Reg	Boot program version, low number
REG_STORE_NVM	549	W	N	Reg	<p>Write value 165 will stores the following parameters in NVM:</p> <ul style="list-style-type: none"> <li>• REG_FAN_SPEED_LEVEL</li> <li>• REG_HC_TEMP_LVL</li> <li>• REG_FAN_SF_FLOW_LOW</li> <li>• REG_FAN_SF_FLOW_NOM</li> <li>• REG_FAN_EF_FLOW_NOM</li> <li>• REG_FAN_SF_FLOW_HIGH</li> </ul> <p>All other values: no functionality.</p> <p><b>Can only be activated by addressing with Function Code 6 ("Write single register").</b></p>

## 7.7 Registers for clock

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_CLK_S	551	R/W	Y	Reg	Clock: seconds (0..59)
REG_CLK_M	552	R/W	Y	Reg	Clock: minutes (0..59)
REG_CLK_H	553	R/W	Y	Reg	Clock: hours (0..23)
REG_CLK_D	554	R/W	Y	Reg	Clock: day of month (1..31)
REG_CLK_MNTH	555	R/W	Y	Reg	Clock: month (1..12)
REG_CLK_Y	556	R/W	Y	Reg	Clock: year (0 = 2000)
REG_CLK_WD	557	R		Reg	Clock: day of week (0..6: Monday..sunday)

## 7.8 Registers for the filter

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_FILTER_PER	601	R/W	Y	Reg	Filter replace time in months
REG_FILTER_DAYS	602	R/W	Y	Reg	Elapsed days since last filter replacement

## 7.9 Registers for defrosting

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_DEFR_STATE	651	R		Reg	State of defrosting state machine. 0: No defrosting ongoing 1: Reduced flow defrosting 2: Bypass defrosting 3: Stop defrosting
REG_DEFR_CONFIGURATION	652	R		Reg	Defrosting configuration. 0: A 1: B 2: C 3: D
REG_DEFR_UNBAL_ALLOWED	653	R/W	Y	Reg + Coil	Coil 10433: Unbalance allowed. 0: Unbalance not allowed. 1: Unbalance allowed.
REG_DEFR_MODE	654	R/W	Y	Reg	Defrosting mode. Allowed values: 1-5.

## 7.10 Registers for the digital inputs

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_DI_ALL	701	R/W		Reg + Coil	Digital inputs. Coil 11201: input 1. Coil 11202: input 2. Coil 11203: input 3. Coil 11204: input 4. Coil 11205: input 5. Coil 11206: input 6. Note: read only! Coil 11207: input 7. Coil value 0: input inactive. Coil value 1: input active.
REG_DI_EXT_RUNNING_M	702	R/W	Y	Reg	Extended running time in minutes
REG_DI_EXT_RUNNING_SPEED_LVL	703	R/W	Y	Reg	Fan speed level during extended running: 0: Off 1: Low speed 2: Normal speed 3: High speed
REG_DI1_SF_LVL	704	R/W	Y	Reg	Supply fan speed level at activated digital input 1
REG_DI1_EF_LVL	705	R/W	Y	Reg	Extract fan speed level at activated digital input 1
REG_DI2_SF_LVL	706	R/W	Y	Reg	Supply fan speed level at activated digital input 2

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_DI2_EF_LVL	707	R/W	Y	Reg	Extract fan speed level at activated digital input 2
REG_DI3_SF_LVL	708	R/W	Y	Reg	Supply fan speed level at activated digital input 3
REG_DI3_EF_LVL	709	R/W	Y	Reg	Extract fan speed level at activated digital input 3

## 7.11 Registers for PCU-PB

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_PCU_PB_RELAYS	751	R		Reg + Coil	Coil Address 12001: relay for preheater on Coil Address 12002: relay for reheater on Coil Address 12003: common relay for heater and preheater on

## 7.12 Registers for alarms

Name	Register address	R or R/W	NVM	Access (Reg./Coil)	Description/remarks
REG_ALARMS_ALL	801	R		Reg + Coil	Coil Address 12801: Filter alarm Coil Address 12802: Fan alarm Coil Address 12803: Not used Coil Address 12804: Rotor alarm Coil Address 12805: Frost alarm Coil Address 12806: PCU-PB alarm Coil Address 12807: Temperature sensor alarm Coil Address 12808: Emergency Thermostat alarm Coil Address 12809: Damper alarm Coil value 0: alarm not active Coil value 1: alarm active
REG_ALARMS_RELAY_ACTIVE	802	R		Reg + Coil	Coil address 12817: alarm relay active. 0: Relay not active. 1: Relay active.

Systemair AB reserves the right to make changes and improvements to the contents of this manual without prior notice.



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