ENGLISH (en)

Modbus integration guide

AirC Control Terminal

M-AirCMW-A2212

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1. About this document

1.1. Before you start

1.1.1. Validity

Name	Version
Munters AirC Control Terminal	v1.3 >

1.1.2. Prerequisites

The Modbus system integrator:

- Has general professional knowledge on planning and commissioning of dehumidifying technology measuring and control solutions.
- Has basic knowledge of Modbus.
- Has the reference addresses documentation (this document) for the specific product.

1.2. Abbreviations

The following abbreviations are used in text and illustrations:

Abbreviation	Meaning
AirC	Munters Controller family
BMS	Building Maintenance System
Gateway	A device for data transfer between different kinds of networks
HMI	Human Machine Interface
RTU	Remote Terminal Unit
TCP/IP	Transmission Control Protocol, e.g. Ethernet/Internet

1.3. Document use

Read the documents supplied with or ordered at the same time as the products (equipment, applications, tools) carefully and in full before using our products.

We assume that persons using our products and documents are authorized and trained appropriately and have the technical knowledge required to use our products as intended.

2. Modbus networks

2.1. Modbus protocol

Master/slave protocol

Modbus is a master/slave protocol. This, by definition, means that a Modbus network contains only one master and at least one slave.

Transactions on Modbus

The Modbus master uses a slave query to start transactions on the network. The slave either responds positively with the requested service (response) or transmits an "exception message".

Function codes

The type of transaction is defined by the function code transmitted in the Modbus telegrams. A function code defines the following:

- Structure of the telegram, query and response.
- Direction of data transmission (master>slave or slave>master).
- Data format of data point.

Transmission mode

RTU (Remote Terminal Unit) mode

Binary-coded data.

Start and end of telegrams marked by timed pauses (a "silent interval") between the characters transmitted.

Check sum algorithm: CRC (Cyclical Redundancy Check).

Telegrams with multiple data points

Certain types of Modbus transactions allow for transmission of a variable number of Modbus data points in a single telegram.

For more information on Modbus:

www.modbus.org

2.2. RS485 networks

2.2.1. Definition

RS485 is a balanced line, half-duplex transmission system that meets the requirements for a truly multi-point communications network. The standard specifies up to 32 drivers and 32 receivers on a single (2-wire) bus.

Half-duplex data transmission means that data can be transmitted in both directions on a signal carrier, but not at the same time.

2.2.2. RS485, cable installation

Purpose of the third wire

Handle the RS485 bus in practice as a 3-wire network even though RS485 as per EIA 485 only specifies a 2-wire connection for differential signals.

The reason is that devices with RS485 interface have a third connection named "Common", "Ground" or "REF".

This connection is not used to connect to ground, but rather for a common reference signal. Voltage on lines Tx/Rx (or +/-) are measured relative to the voltage level on the reference signal.

Screening not required

You do not need screens. The twisted cable suppresses interference more effectively than a screen.

Screening as third wire?

You can use the third wire as screen for emergencies. It is better, however, to use a wire as a screen.

Cable length and baud rates

RS485 does not specify max cable length. It depends largely on transmission rates:

The greater the transmission rate, the shorter the possible cable length.

Rule of thumb for AWG cable:

Cable length [m] x data rate [bps] < 10^8

The result is the following maximum values:

Baud rate	Cable length [m]
9600	10400
19200	5200
38400	2600

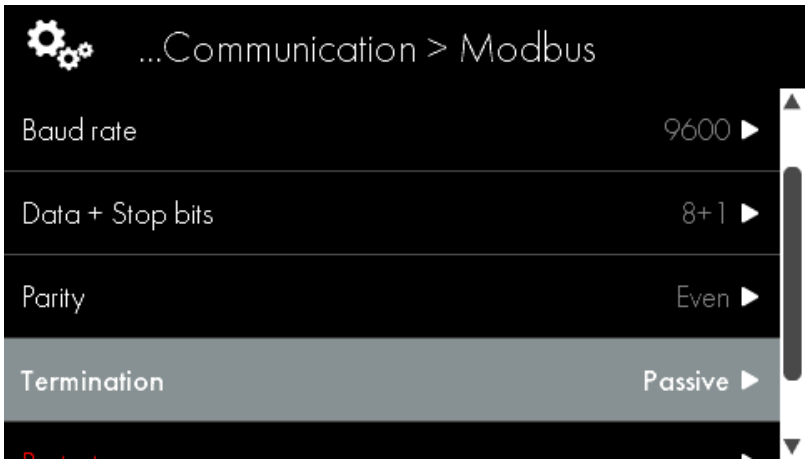
NOTE
The higher the baud rate, the more important the cable installation quality. Issues such as twisted pair cable unfolded at each resistor become more important.

2.2.3. Bus termination

Termination resistance

As Modbus RTU is based on an RS485 bus, both bus ends require terminating resistances.

In a Munters AirC controller, the resistances can be enabled or disabled via HMI. No external resistance is needed.



2.3. TCP/IP networks

Modbus TCP port

Modbus TCP in Munters AirC controller uses TCP port 502. This port number cannot be changed.

IP address

The IP address is assigned either dynamically via the DHCP server or set manually via the HMI. Normally a fixed IP address is used.

Modbus master simulation tools

Modbus slave devices can be tested with several Modbus master simulation tools such as "Modbus Poll" or "ModScan" from a computer.

A RS485/RS232 converter or a Modbus RTU/TCP gateway can be needed to connect to a computer.

3. Commissioning

3.1. General

Connection ways

There are two ways to communicate with Modbus on an AirC controller:

Onboard RTU(2/3-wire RS485)

A Modbus RTU, via RS485, interface is always available on the controller. It is always defined as a slave.

Onboard TCP(RJ45)

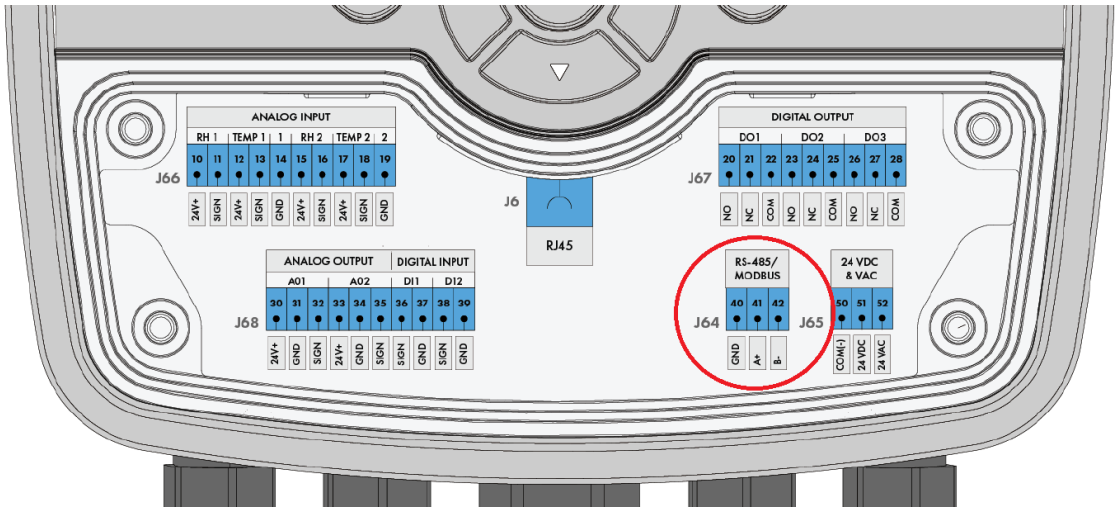
A Modbus TCP interface is available on the controller via Ethernet port. The internal Modbus TCP interface is only used for slave mode.

3.2. Commissioning of internal Modbus RTU

Connection

Follow these steps to connect the controller to the Modbus RTU bus:

1. Controller OFF.
2. Connect Modbus bus cable to terminals 41-A+ and 42-B-.
3. Controller ON.

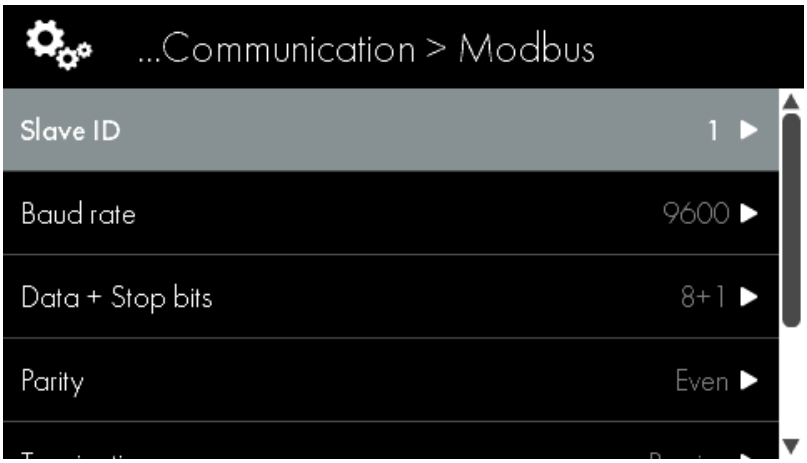


Configuration via HMI

Follow these steps to configure the controller for Modbus RTU:

1. Log in to the HMI using the password for user or higher.
2. Select **Main menu>Settings>Communication>Modbus>**
3. Select **Slave ID**: Enter the corresponding Modbus slave address (1... 247).
4. Select **Baud rate**: Enter the Modbus transmission rate (9600, 19200 or 38400). All participants must have the same setting.
5. Select **Data + Stop bits**: 8 data bits and 1 or 2 stop bits. All participants must have the same setting.

6. Select **Parity**: None, even or odd parity. All participants must have the same setting.
7. Select **Termination**: The RS485 topology must always be ended using wave resistors.
8. Select **Restart**: Restart the controller using this command.



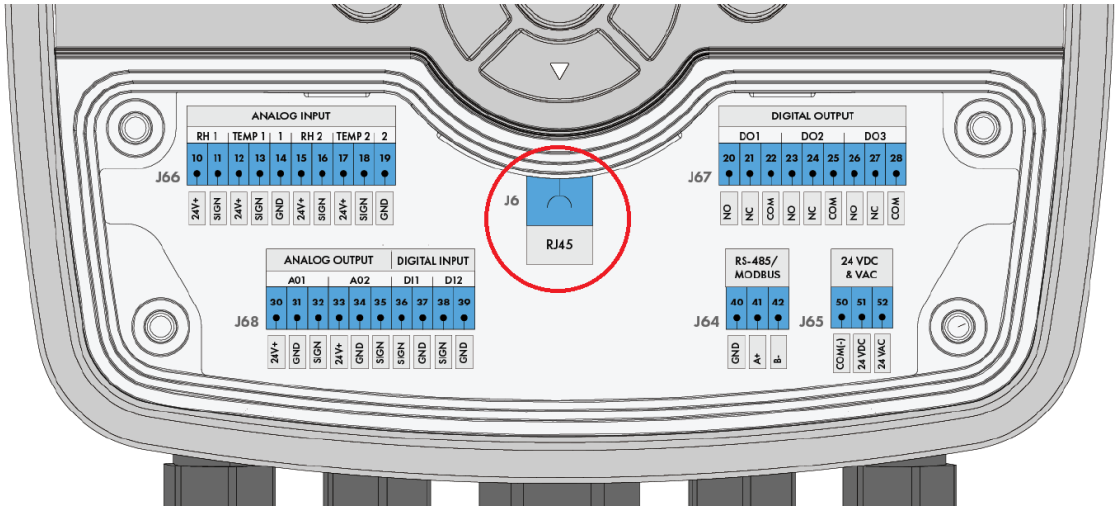
After restart, the Modbus RTU is configured and ready to use.

The controller must always be restarted with **Restart** on the HMI, or power OFF/ON, after changing any settings for communication.

3.3. Commissioning of Modbus TCP

Connection

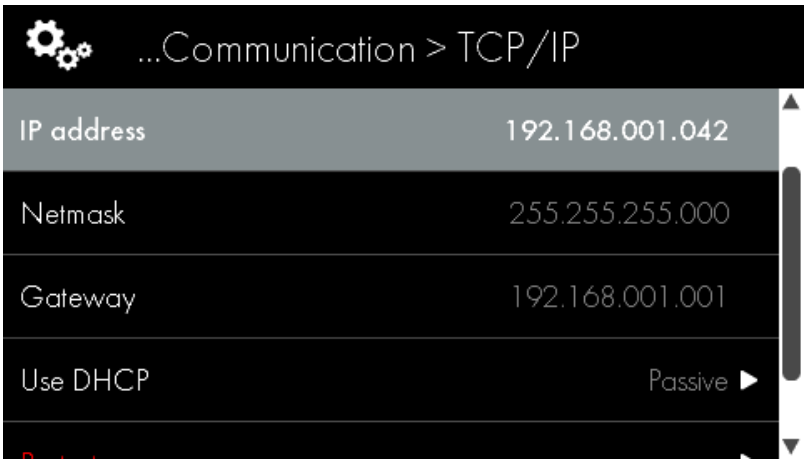
Connect the standard Ethernet cable with RJ45 connector on the product.



Configuration via HMI

Follow these steps to configure the controller for Modbus TCP:

1. Log in to the HMI using the password for user or higher.
2. Select **Main menu>Settings>Communication>TCP/IP>**



3. Set the **IP Address**: (Default 192.168.001.042)
4. Set the **Netmask**: (Default 255.255.255.000)
5. Set the **Gateway**: (Default 192.168.001.001)
6. **DHCP**: Activate the DHCP functionality if needed.
7. Select **Restart**: Restart the controller using this command.

After restart, the Modbus TCP is configured and ready to use.

The controller must always be restarted with **Restart** on the HMI, or power OFF/ON, after changing any settings for communication.

4. Integration

4.1. Map registers

Modbus data formats

Modbus reference types are identified by the leading numeric character of the reference address. xxxx represents a 4-digit reference address:

Modbus type	Reference	Description (refers to master device)
Coil status	0xxxx	Not used in Munters AirC DH application
Input status	1xxxx	Not used in Munters AirC DH application
Input register	3xxxx	Read input registers. A 3x reference register contains a 16-bit number.
Holding register	4xxxx	Read/write output or holding registers. A 4x register is used to store 16-bits of numerical data (binary or decimal), or to send the data from the CPU to an output channel.

Leading character

The leading character is generally implied by the function code and omitted from the address specified for a given function. The leading character also identifies the I/O data type.

4.2. Function codes

The functions are used to access the registers outlined in the register map of the module for sending and receiving data.

Function code	Modbus function	Modbus master application
01	Read Coil Status-Register (ID-COIL)	Not used in Munters AirC control terminal application
02	Read Input Status-Register (ID-STATE)	Not used in Munters AirC control terminal application
03	Read Holding-Register (ID-HOLD)	Read holding registers (16 bit register) from slave :(4xAdr)
04	Read Input-Register (ID-INP)	Read input registers (16 bit register) from slave: (3xAdr)
05	Write Single Coil-Register	Not used in Munters AirC control terminal application
06	Write Single Holding-Register	Write one single holding register (16 bit register) to slave: (4xAdr)
15	Write Multiple Coil-Register	Not used in Munters AirC control terminal application
16	Write Multiple Holding-Register	Write multiple holding registers (16 bit registers) to slave: (4xAdr)

5. Reference Modbus addresses

Use the document corresponding to the actual application

The reference addresses are specific for the actual application and can be found in the corresponding listing. See link at the end of this document.

All applications, and in some cases also application versions, have different reference addresses. Always use the specific listing for the actual application to find the reference addresses used.

See actual application

Use the HMI to find the actual application name and version for the unit.

Select **Main menu>Settings>General>About**

Addresses used

All reference addresses are generated and can be accessed even if not listed. As a result, multiple registers can be forced/reset even if there is a gap between two reference addresses.

Do not read/write any addresses above 0125/1000. This causes an exception and communication fails.

All address types start with 1. Due to that some Master devices start with 0, it is in that case necessary to subtract 1 from all addresses in the listing.

Presentation

16 bit real values are presented in their actual value/unit, e.g. %RH, °C, g/kg, % (Normally Signed Word).

16 bit states are presented as a number, see the reference address description (Unsigned Word). Texts for each state are represented in the remarks column (Example 0-1: 0=Off and 1=On).

Decimals

When Modbus uses a 16 bit register to handle real values, a factor is needed for decimals, e.g. factor 10 for 1 decimal, factor 100 for 2 decimals, etc.

Example 1: Present values

The present relative humidity is 45.3 %RH and is multiplied by 10 in the controller. It is presented as 453 in Modbus and must be divided by 10 in the master device to return to 45.3 %RH.

Example 2: Setpoints

To set the humidity setpoint 32.5 %RH at the master device, multiply it by 10 to present it as 325 to Modbus. The controller then divides by 10 to return to 32.5 %RH.

6. Troubleshooting

General

Always find the actual application version before contacting the support.

The controller must always be restarted with **Restart** on the HMI, or power OFF/ON, after changing any settings for communication.

Modbus communication error

Non-adherence to the following rules can result in communication errors:

The slave address must be unique in the network, valid addresses are from 1-247.

Only reference addresses that are generated can be read/write, see chapter about reference addresses for more information about the specific application.

All address types start with 1. Due to that some Master devices start with 0, it is in that case necessary to subtract 1 from all addresses in the listing.

RS485 network

Observe the following for RS485 network design and structure:

Baud rate, parity and stop bits must match network and master. All devices, including other products, on the Modbus network must have the same settings.

The 2-wire bus is NOT interchangeable and must be connected correctly.

In case of long distance and/or high baud rate, consider end-of-line resistors like 120 Ohms on both sides (according to RS485 rules). In the AirC control terminal this can be done via the HMI.

TCP/IP network

Observe the following for TCP/IP network design and structure:

Verify that the DHCP parameter is set to “Passive” when fixed IP address is used.

Try to ping the controller if the communication is not working. If the ping fails something is wrong in the network or the IP settings.

Verify that the defined TCP/UDP port is open in the firewall. For Modbus the TCP port 502 is used.

How to ping a network device

Ping the controller with the set IP address to test communications:

1. Select **Start** on the Windows start bar.
2. Enter **CMD** and click **OK**: The "CMD.exe" command prompt opens.
3. Enter **C:\>ping XXX.XXX.XXX.XXX** and press **Enter**: The ping result is displayed. (XXX.XXX.XXX.XXX is the set IP address.)

There is a network or IP settings error if the ping does not work.

7. Application

The AirC controller automatically assumes the Modbus registers required for integration as per the plant data points and functions configured and parameterized previously.

The Reference list defines the Modbus registers supporting Munters AirC DH Application to ensure standardized and simple integration.

8. Reference addresses

AirC Terminal Modbus reference addresses

Valid from the software version v1.3 (Released in October 2022)
Updated 2022-11-30

Input registers

Address	Description	Values/Units	Remarks
		Common	
3x0004	Critical Alarm	0-1	Normal*Active
3x0005	Information notification	0-1	Normal*Active
3x0006	Time for service	0-1	Normal*Active
3x0007	Wireless node fault	0-1	Normal*Active
3x0009	Time left for service		Days
		Operational	
3x0018	Operation mode	0-3	Startup*Off*Auto*Manual* Alarm*Clear alarm
3x0019	Unit status	0-6	Off*Alarm*Waiting*Standby* Starting*Running*Stopping
3x0020	Run indication	0-1	Off*On
3x0021	External start	0-1	Stop*Run
3x0027	Timer status	0-1	Not active*Active
		Humidity	
3x0036	Relative humidity sensor 1	%RH	(Factor 10)
3x0037	Relative humidity sensor 2	%RH	(Factor 10)
3x0042	Actual humidity	%RH	(Factor 10)
3x0056	Sensor fault, wired humidity 1	0-1	Normal*Active
3x0057	Sensor fault, wired humidity 2	0-1	Normal*Active
3x0063	Humidity deviation	0-1	Normal*Active
3x0064	Wireless humidity sensor 1	%RH	(Factor 10)
3x0065	Wireless humidity sensor 2	%RH	(Factor 10)
3x0066	Wireless humidity sensor 3	%RH	(Factor 10)
3x0067	Wireless humidity sensor 4	%RH	(Factor 10)
3x0068	Wireless humidity sensor 5	%RH	(Factor 10)
3x0069	Wireless humidity sensor 6	%RH	(Factor 10)
3x0070	Wireless humidity sensor 7	%RH	(Factor 10)
3x0071	Wireless humidity sensor 8	%RH	(Factor 10)

3x0072	Wireless humidity sensor 9	%RH	(Factor 10)
3x0073	Wireless humidity sensor 10	%RH	(Factor 10)
3x0074	Wireless humidity sensor 11	%RH	(Factor 10)
3x0075	Wireless humidity sensor 12	%RH	(Factor 10)
3x0076	Wireless humidity sensor 13	%RH	(Factor 10)
3x0077	Wireless humidity sensor 14	%RH	(Factor 10)
3x0078	Wireless humidity sensor 15	%RH	(Factor 10)
3x0079	Wireless humidity sensor 16	%RH	(Factor 10)
3x0080	Wireless humidity sensor 17	%RH	(Factor 10)
3x0081	Wireless humidity sensor 18	%RH	(Factor 10)
3x0082	Wireless humidity sensor 19	%RH	(Factor 10)
3x0083	Wireless humidity sensor 20	%RH	(Factor 10)
3x0084	Wireless humidity sensor 21	%RH	(Factor 10)
3x0085	Wireless humidity sensor 22	%RH	(Factor 10)
3x0086	Wireless humidity sensor 23	%RH	(Factor 10)
3x0087	Wireless humidity sensor 24	%RH	(Factor 10)
3x0088	Wireless humidity sensor 25	%RH	(Factor 10)
3x0089	Wireless humidity sensor 26	%RH	(Factor 10)
3x0090	Wireless humidity sensor 27	%RH	(Factor 10)
3x0091	Wireless humidity sensor 28	%RH	(Factor 10)
3x0092	Wireless humidity sensor 29	%RH	(Factor 10)
3x0093	Wireless humidity sensor 30	%RH	(Factor 10)
3x0094	Wireless humidity sensor 31	%RH	(Factor 10)
3x0095	Wireless humidity sensor 32	%RH	(Factor 10)
3x0114	Humidifier control	%	0-100
3x0115	Dehumidifier control	%	0-100
3x0116	Dehumidifier command (Low)	0-1	Off*On
3x0117	Dehumidifier command (High)	0-1	Off*On
Temperature			
3x0131	Temperature sensor 1	°C	(Factor 10)
3x0132	Temperature sensor 2	°C	(Factor 10)
3x0131	Actual temperature	°C	(Factor 10)
3x0158	Sensor fault, wired temp 1	0-1	Normal*Active
3x0158	Sensor fault, wired temp 2	0-1	Normal*Active
3x0513	Temperature deviation	0-1	Normal*Active
3x0179	Wireless temperature sensor 1	°C	(Factor 10)
3x0180	Wireless temperature sensor 2	°C	(Factor 10)
3x0181	Wireless temperature sensor 3	°C	(Factor 10)
3x0182	Wireless temperature sensor 4	°C	(Factor 10)
3x0183	Wireless temperature sensor 5	°C	(Factor 10)
3x0184	Wireless temperature sensor 6	°C	(Factor 10)
3x0185	Wireless temperature sensor 7	°C	(Factor 10)
3x0186	Wireless temperature sensor 8	°C	(Factor 10)
3x0187	Wireless temperature sensor 9	°C	(Factor 10)

3x0188	Wireless temperature sensor 10	°C	(Factor 10)
3x0189	Wireless temperature sensor 11	°C	(Factor 10)
3x0190	Wireless temperature sensor 12	°C	(Factor 10)
3x0191	Wireless temperature sensor 13	°C	(Factor 10)
3x0192	Wireless temperature sensor 14	°C	(Factor 10)
3x0193	Wireless temperature sensor 15	°C	(Factor 10)
3x0194	Wireless temperature sensor 16	°C	(Factor 10)
3x0195	Wireless temperature sensor 17	°C	(Factor 10)
3x0196	Wireless temperature sensor 18	°C	(Factor 10)
3x0197	Wireless temperature sensor 19	°C	(Factor 10)
3x0198	Wireless temperature sensor 20	°C	(Factor 10)
3x0199	Wireless temperature sensor 21	°C	(Factor 10)
3x0200	Wireless temperature sensor 22	°C	(Factor 10)
3x0201	Wireless temperature sensor 23	°C	(Factor 10)
3x0202	Wireless temperature sensor 24	°C	(Factor 10)
3x0203	Wireless temperature sensor 25	°C	(Factor 10)
3x0204	Wireless temperature sensor 26	°C	(Factor 10)
3x0205	Wireless temperature sensor 27	°C	(Factor 10)
3x0206	Wireless temperature sensor 28	°C	(Factor 10)
3x0207	Wireless temperature sensor 29	°C	(Factor 10)
3x0208	Wireless temperature sensor 30	°C	(Factor 10)
3x0209	Wireless temperature sensor 31	°C	(Factor 10)
3x0210	Wireless temperature sensor 32	°C	(Factor 10)
Remote			
3x0288	Remote start output	0-1	Off*On

Holding registers

Address	Description	Values/Units	Remarks
Operational			
4x0001	Alarm acknowledge	0-1	No*Execute
4x0018	External start input	0-1	Stop*Run
Humidity			
4x0030	Relative humidity setpoint	%RH	(Factor 10)
4x0044	Dehumidity hysteresis start	%RH	(Factor 10)
4x0045	Dehumidity hysteresis stop	%RH	(Factor 10)

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