

MODBUS

Addendum manual for installation and operation
for use with DL, ME, RS and RO-A devices
with software version 5.9.x.x and 5.10.x.x

Thank you for choosing Condair

Installation date (MM/DD/YYYY):

Commissioning date (MM/DD/YYYY):

Site:

Model:

Serial number:

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1 Introduction

1.1 Notes on this addendum manual

This addendum manual is intended for use by engineers and properly trained technical personnel. Please read this manual thoroughly before installing and configuring the Condair Integrated Controller or a Modbus network.

If you have questions after reading this documentation, please contact your Condair representative. They will be glad to assist you.

Symbols used in this manual



The catchword "CAUTION" used in conjunction with the caution symbol in the circle designates notes in this addendum manual that, if neglected, may cause **damage and/or malfunction of the unit or other material assets**.



The catchword "WARNING" used in conjunction with the general caution symbol designates safety and danger notes in this addendum manual that, if neglected, may cause to **injury to persons**.



The catchword "DANGER" used in conjunction with the general caution symbol designates safety and danger notes in this addendum manual that, if neglected, may lead to **severe injury or even death of persons**.

Safekeeping

Please safeguard this addendum manual in a safe place, where they can be immediately accessed. If the equipment changes hands, the documentation must be passed on to the new operator.

If the documentation gets mislaid, please contact your Condair representative.

Language versions

This operation manual is available in various languages. Please contact your Condair representative for information.

2 For your safety

General

Every person working with the Condair Integrated Controller must have read and understood this addendum manual, and the installation manual and operation manual of the Condair Integrated Controller, before carrying out any work.

Knowing and understanding the contents of the manuals is a basic requirement for protecting the personnel against any kind of danger, to prevent faulty operation, and to operate the unit safely and correctly. All icons, signs and markings applied to the unit must be observed and kept in readable state.

Qualification of personnel

All work described in this addendum manual **may only be carried out by trained Condair service technicians**.

It is assumed that the service technicians working with the Condair Integrated Controller are familiar and comply with the appropriate regulations on work safety and the prevention of accidents.

Danger that may arise from the Condair Integrated Controller



DANGER!
Danger of electric hazard!

The electrical compartment where the Integrated Controller is located may have live mains voltage connected for other uses of the device. Live parts may be exposed when the control unit is open. Touching live parts may cause severe injury or danger to life.

Prevention: Before commencing any work on the control unit disconnect the mains supply voltage to the device via the electrical isolator in the mains supply line, and secure electrical isolator in "Off" position against inadvertent switching on.

Safety reporting

All persons working with the Condair Integrated Controller are obliged to report any alterations to the system that may affect safety to the owner without delay and to secure such systems against accidental power-up.

Prohibited modifications to the unit

No modifications must be undertaken on the Condair Integrated Controller without the express written consent of the manufacturer. For the replacement of defective components use exclusively original accessories and spare parts available from your Condair representative.

3 Communication interface Integrated Controller

3.1 Technical data Modbus RTU

Protocol	Modbus RTU
Interface	EIA-485 (RS485) (2-wire / GND)
Galvanic isolated	No (Galvanic isolation optional possible, see chapter 9)
Connection	Plug-in screw terminal 3-pole: Data + / Data - / GND
Telegram format	1 Start / 8 Data / 1 Parity / 1 Stop
Data check	CRC according to Modbus RTU specification
Modbus address	1 – 247 (10)
Parity	None, even, odd
Baud rate	9600 , 19200, 38400, 57600, 115200
Timeout	0-300s (300s)
Max. number of devices	32 (according to RS485 specification)
Supporting Modbus functions	3 Read Holding Registers 4 Read Input Registers 6 Write Single Registers
Register format	16-Bit UInt Register 32-Bit Float Register (only from software version 5.x.x.x or higher)
Max. cable lengths/ type	600 m Balanced twisted pair with shield, 100-120 Ohm impedance
Topology	Line (Daisy Chain)
Software version device	5.x.x.x or higher

bold data = default settings

3.2 Technical data Modbus TCP

Protocol	Modbus TCP
Interface	RJ45 Ethernet port
Port	502 (options 1 - 65535)
Modbus address	255
Max. number of devices	According Ethernet specification
Bitrate	10 / 100 Mbits/s (according to Ethernet specification)
Control signal timeout	0-300s (300s)
Supporting Modbus functions	3 Read Holding Registers 4 Read Input Registers 6 Write Single Registers
Register format	16-Bit UInt Register 32-Bit Float Register
Max. cable lengths/ type	100m, CAT5 / 6
Topology	Bus (according to Ethernet specification)
Max. number of clients	3
Software version device	Version 5.8 or higher

bold data = default settings

4 Modbus RTU

4.1 Before installation

To do installation works on the respective device you have to switch off the device and secure it from unintended switch-on according to the operation manual! Also follow any other safety instructions from the user manual. If not mentioned otherwise, the specifications of the Modbus RTU or RS485 standard apply. The installation has to be carried out in accordance with local regulations.

It's recommended to update the device software to the newest version before start the implementation of the device in a Modbus RTU network.

The respective device acts as a slave only. The Modbus RTU master - slave principle only allows the master (e.g. a control computer) to initiate data transmission. The respective slave device then reacts and exports the requested data to the master or carries out the action required by the master. In a Modbus RTU network only one master may be present.

4.2 Network structure Modbus RTU

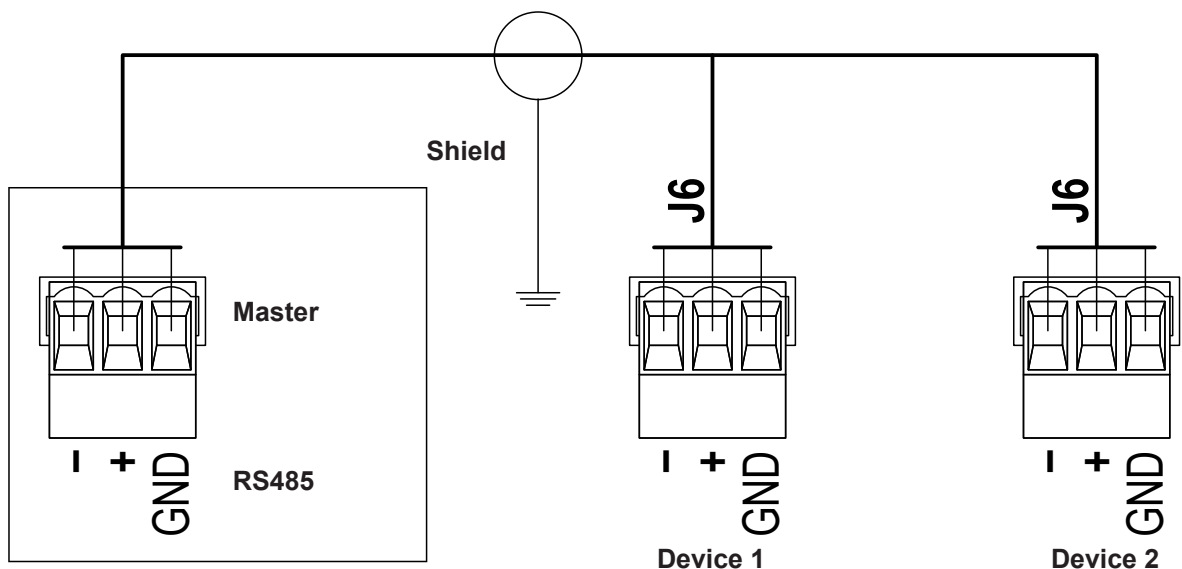
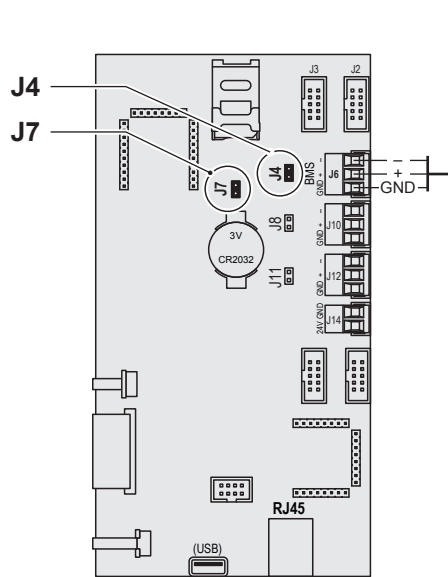


Fig. 1: Example Modbus RTU Network

- Connect the cable shield on one side with the functional earth
- Connect all GND together
- Install bus line separate from supply voltage
- Topology: Daisy chain
- All devices of the same network need the same settings concerning baud rate and parity
- Every Modbus device address can only be allocated once within the same network.

4.3 Connection and configuration of the Integrated Controller for Modbus RTU



Important: When laying the network cabling, make sure there is sufficient distance to other cables, especially if they are connected to the mains!

Fig. 2: Integrated Controller (back view)

- Modbus RTU communication via port J6 "BMS"
- Jumper J7 has to be set for **all devices**
- Jumper J4 only has to be set for the **last** devices in the net (end of line termination at the beginning and end of the Modbus net). Jumper J4 set = end of line termination resistor activated
- Jumper J4 has to be always removed by using the optional galvanic isolation (see [chapter 9](#))
- All devices have to be connected via GND
- Software Version 1.1.0.23 or higher is needed (recommended software version 5.x.x.x or higher)

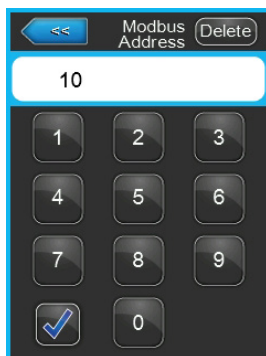
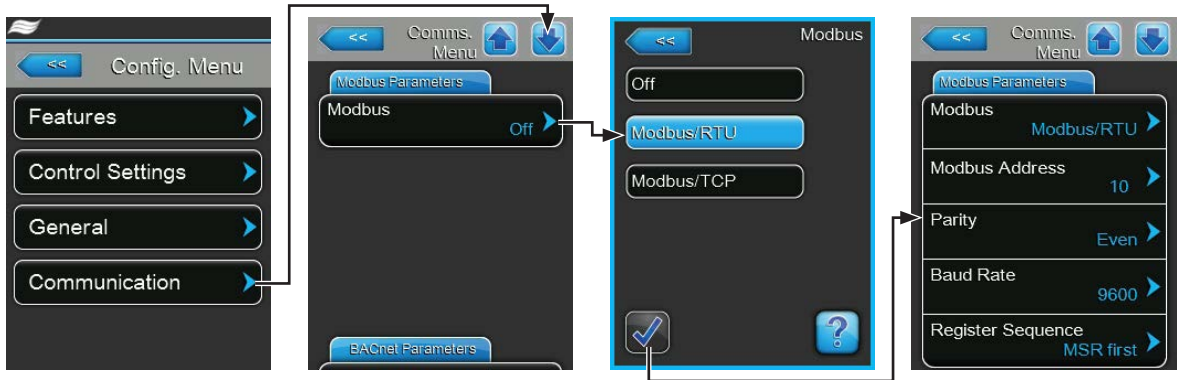
4.4 Determining the Modbus RTU interface parameters

The following interface parameters are fixed and can not be modified:

- 1 start bit
- 8 data bits
- 1 parity bit
- 1 stop bit

The following Modbus RTU settings must be specified. Changes to these settings only become effective after a restart!

Select "Communication" (Path: Menu > Password entry 0335 > Configuration > Communication). In the "Communication" submenu scroll to "Modbus-Parameter" tab. Touch the "Modbus" field, set Modbus function to "Modbus/RTU" and confirm with the check mark button. The setting parameters for the Modbus RTU communication appear.



Modbus Address: With this setting you determine the Modbus address for the device for the communication via a Modbus network.

Note: The same address may only be assigned once per Modbus network.

Factory setting: **10**

Setting range: **1 ... 247**



Parity: With this setting you set the parity bit for the data transfer.

Factory setting: **Even**

Options: **None, Even or Odd**



Baud Rate: With this setting you set the baud rate for the data transfer.

Note: In the same Modbus network the baud rate must be the same for all participants. Only use for Modbus RTU the baud rates listed under Option.

Factory setting: **9600**

Options: **9600, 19200, 38400, 57600 or 115200**



Register Sequence: With this setting you determine the register sequence for the transmission of floating-point numbers. .

Note: With Modbus communication 32 Bit floating-point numbers are transmitted in two registers of 16 Bit each. In order that sender and receiver understand each other (that means both use the identical partitioning of the 32 Bit to the two 16 Bit registers) it must be determined whether the high-order register (MSR = Most Significant Register) or the low-order register (LSR = Least Significant Register) is transmitted first.

Factory setting: **MSR first**

Options: **LSR first** (low-order register is transmitted first)

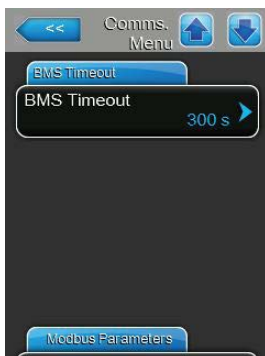
Edianness: Little Edian Byte Swapped
(Format 32 Bit Float [CD] [AB])

MSR first (high-order register is transmitted first)

Edianness: Big Endian

(Format 32 Bit Float [AB] [CD])

In the "Communication" submenu scroll to "BMS-Timeout" tab. Touch the "BMS-Timeout" field.



BMS-Timeout: With this setting you determine the timeout for the timeout for the data transfer. If the communication with the Modbus master fails longer than the set time, warning W35 "BMS Timeout" is triggered.

Note: The BMS timeout is only evaluated if the signal source (Path: Menu> Configuration> Control Settings > Source) is not set to "Analog".

Factory setting: **300 s**

Setting range: **1 ... 300 s**

Note: As of software version 5.3.x.x, the device is stopped when warning W35 occurs.

5 Modbus TCP

5.1 Before installation

To do installation works on the respective device you have to switch off the device and secure it from unintended switch-on according to the appropriate operation manual! Also follow any other safety instructions from the user manual. If not mentioned otherwise, the specifications of the Modbus TCP or Ethernet standard apply. The installation has to be carried out in accordance with local regulations.

It's recommended to update the device software to the newest version before start the implementation of the device in a Modbus TCP network. Modbus TCP is only supported as of software version 5.8.

The device acts as a server only. The Modbus TCP client - server principle only allows the client (e.g. a control computer) to initiate data transmission. The respective server (respective device) then reacts and export the requested data to the client or carries out the action required by the client.

5.2 Network structure Modbus TCP

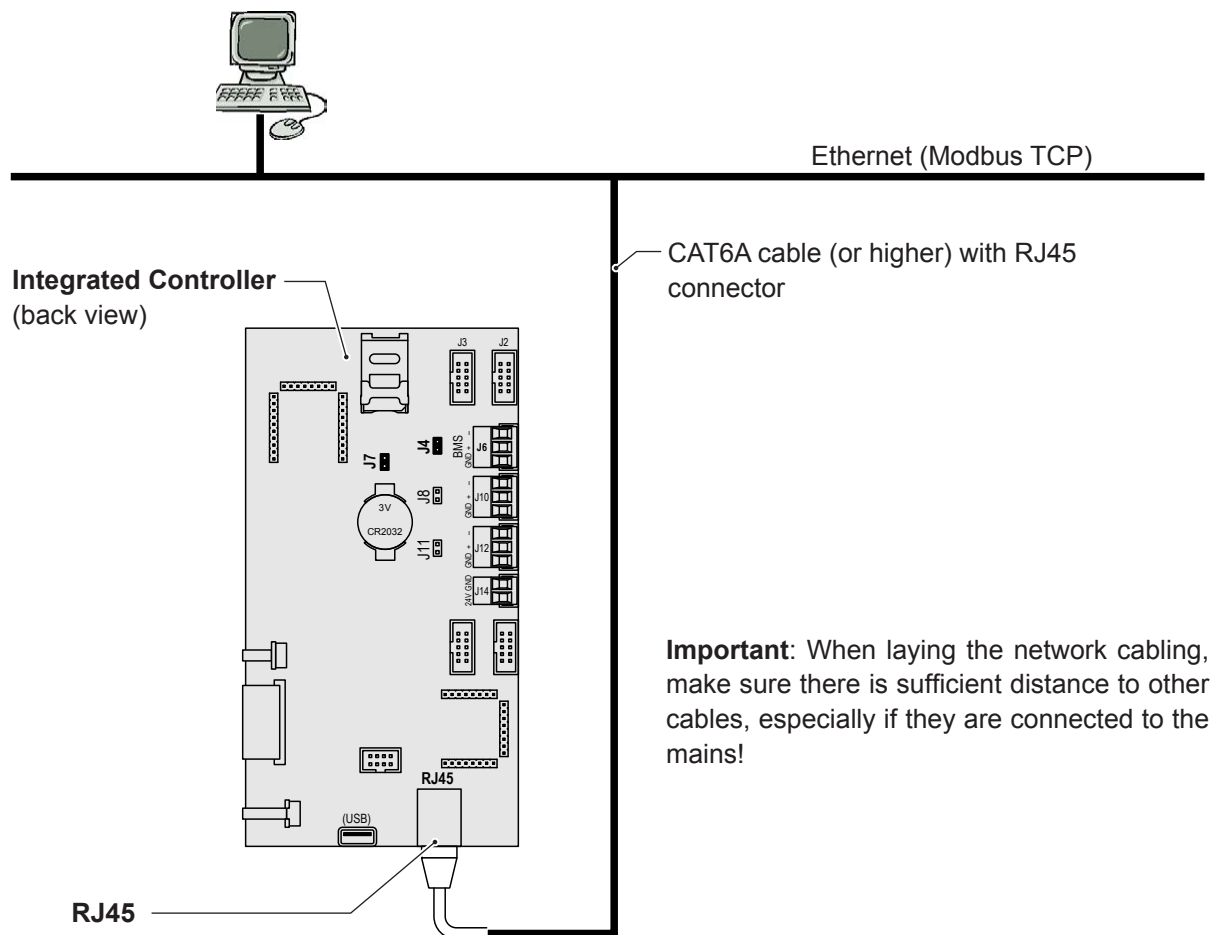


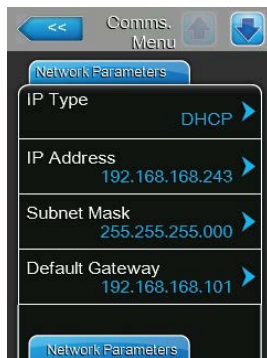
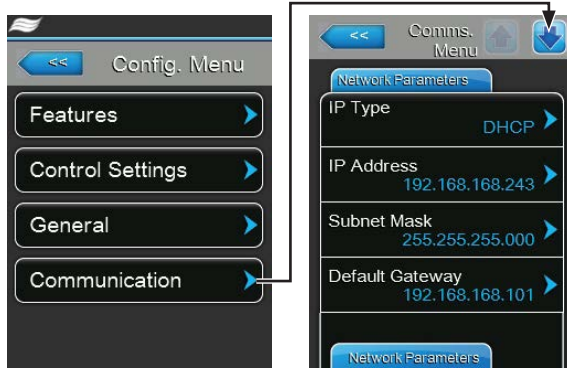
Fig. 3: Example Modbus TCP Network

5.3 Determining the Modbus TCP interface parameters

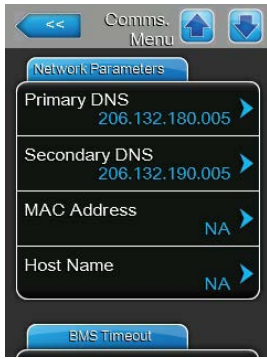
5.3.1 Setting the network parameters (or IP parameters)

The network settings (or IP settings) are used for the communication via the integrated Modbus TCP interface.

Select "Communication" submenu (Path: Menu > Password entry 0335 > Configuration > Communication). In the "Communication" submenu select the "Network Parameters" tab.



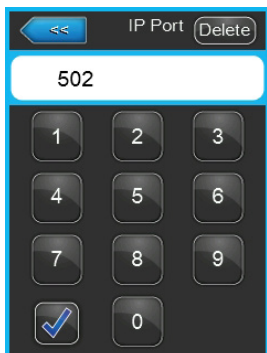
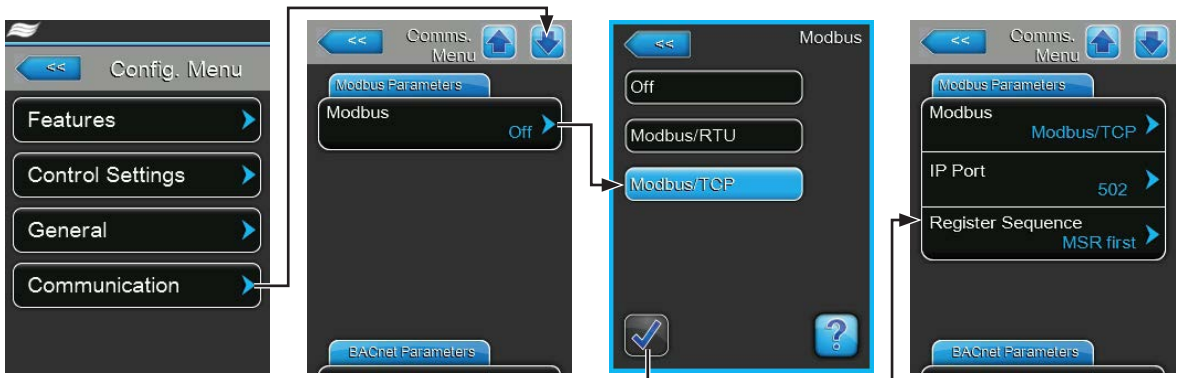
- **IP Type:** With this setting you determine whether you want to assign the IP Address, the Subnet Mask, the Standard Gateway as well as the Primary and Secondary DNS address as fixed values or whether these should be dynamically assigned via a DHCP server.
Note: After 5 unsuccessful attempts at obtaining an address with DHCP the system will revert to fixed assignment
Factory setting: **DHCP**
Options: **DHCP** (dynamic assignment)
Fixed (fixed assignment)
- **IP Address:** This field shows the actual IP address of the device assigned manually or assigned by a DHCP server.
If the parameter "IP Type" is set to "Fix", the IP address of the device can be set via this field. If the parameter "IP type" is set to "DHCP", the IP address of the device is assigned by a DHCP server.
- **Subnet Mask:** This field shows the actual subnet mask of the IP network assigned manually or assigned by a DHCP server.
If the parameter "IP Type" is set to "Fix", the subnet mask can be set via this field. If the parameter "IP type" is set to "DHCP", the subnet mask is assigned by a DHCP server.
- **Default Gateway:** This field shows the actual IP address of the default gateway assigned manually or assigned by a DHCP server.
If the parameter "IP Type" is set to "Fix", the IP address of the default gateway can be set via this field. If the parameter "IP type" is set to "DHCP", the IP address of the default gateway is assigned by a DHCP server.



- **Primary DNS:** This field shows the actual IP address of the primary domain name server (DNS) assigned manually or assigned by a DHCP server. If the parameter "IP Type" is set to "Fix", the IP address of the primary domain name server can be set via this field. If the parameter "IP type" is set to "DHCP", the IP address of the primary domain name server is assigned by a DHCP server.
- **Secondary DNS:** This field shows the actual IP address of the secondary domain name server (DNS) assigned manually or assigned by a DHCP server. If the parameter "IP Type" is set to "Fix", the IP address of the secondary domain name server can be set via this field. If the parameter "IP type" is set to "DHCP", the IP address of the secondary domain name server is assigned by a DHCP server.
- **MAC Address:** Factory set MAC Address (Media Access Control) of the device. Not modifiable.
- **Host Name:** Host Name of the device automatically generated by the control. Format: "IC_"+"Serial number of the device". Not modifiable.

5.3.2 Setting the Modbus TCP interface parameters

Select "Communication" submenu (Path: Menu > Password entry 8808 > Configuration > Communication). In the "Communication" submenu scroll to the "Modbus Parameters" tab. Touch the "Modbus" field, set Modbus function to "Modbus/TCP" and confirm with the check mark button. The setting parameters for the Modbus TCP communication appear.



IP Port: With this setting you assign a IP port number for Modbus TCP. By default, Modbus TCP uses port 502.
 Factory setting: **502**
 Setting range: **1 ... 65535**



Register Sequence: With this setting you determine the register sequence for the transmission of floating-point numbers. .

Note: With Modbus communication 32 Bit floating-point numbers are transmitted in two registers of 16 Bit each. In order that sender and receiver understand each other (that means both use the identical partitioning of the 32 Bit to the two 16 Bit registers) it must be determined whether the high-order register (MSR = Most Significant Register) or the low-order register (LSR = Least Significant Register) is transmitted first.

Factory setting: **MSR first**

Options: **LSR first** (low-order register is transmitted first)

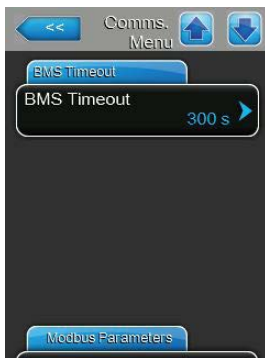
Edianness: Little Endian Byte Swapped
(Format 32 Bit Float [CD] [AB])

MSR first (high-order register is transmitted first)

Edianness: Big Endian

(Format 32 Bit Float [AB] [CD])

In the "Communication" submenu scroll to "BMS-Timeout" tab. Touch the "BMS-Timeout" field.



BMS-Timeout: With this setting you determine the timeout for the timeout for the data transfer. If the communication with the Modbus master fails longer than the set time, warning W35 "BMS Timeout" is triggered.

Note: The BMS timeout is only evaluated if the signal source (Path: Menu> Configuration> Control Settings > Source) is not set to "Analog".

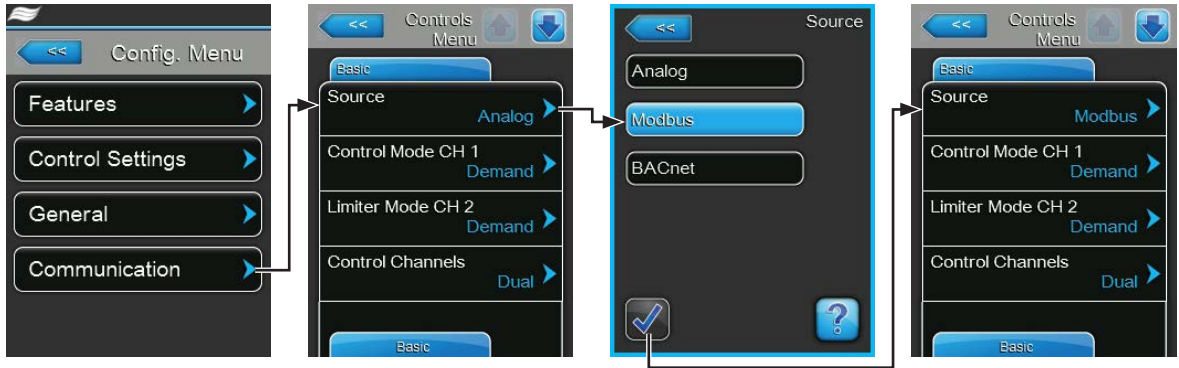
Factory setting: **300 s**

Setting range: **1 ... 300 s**

Note: As of software version 5.3.x.x, the device is stopped when warning W35 occurs.

6 Control signal settings

If the demand or control signal is also to be transmitted via Modbus, the signal source must be set to "Modbus" in "Menu> Password entry 0335> Configuration> Control Settings> Source" as shown below.



Important: If the demand or control signal via Modbus is used, no second, hard-wired demand or control signal may be connected to the driver board!

Further information on the control settings can be found in the operating instructions for the corresponding device.

Notes on monitoring of the bus communication

Monitoring of the bus communication as described below takes place only if the "Source" parameter in the "Control Settings" submenu is not set to "Analog".

As soon as the control signal (demand or humidity signal) is transmitted via Modbus RTU or Modbus TCP, the communication via the bus system is also monitored. The control signal must be periodically updated within the time set in "BMS Timeout".

If the control signal is not updated within the set time, warning W35 "BMS Timeout" will be triggered and the humidification will be stopped until the humidifier receives a valid signal into one of the writable holding registers.

This monitoring is intended to prevent the humidifier from humidifying with the last transmitted value in the event of a bus failure.

7 Notes on data register tables

7.1 Software version 1.1.x.x

- UInt16 register only
- No decimals
e.g.:
>0,1 bar ... <1,0 bar = 0
>1,0 bar ... <2,0 bar = 1
>2,0 bar ... <3,0 bar = 2
etc.
- Only imperial display via Modbus
- Pressure values in bar

7.2 Software version 4.x.x.x

- UInt16 register only
- No decimals
- Values rounded
e.g.:
>0,1 bar ... <1,5 bar = 1
>1,5 bar ... <2,5 bar = 2
>2,5 bar ... <3,5 bar = 3
etc.
- Metric or imperial units according to the control unit settings of the corresponding device

7.3 Software version 5.x.x.x

- Use of UInt16 and 32-Bit Float register
- Decimals are shown by all 32-Bit Float registers
- New register addresses for 32-Bit Float

7.4 Software version 5.3.x.x

- When warning W35 "BMS Timeout" occurs, the device is stopped. The BMS timeout is only evaluated, if the signal source under "Menu > Control Settings > Source" is not set to "Analog" (see [chapter 6](#))
- EL new register for "Operating status A unit" and "Operating status B unit"
- EL new register for internal controller settings

7.5 Software version 5.7.x.x

- ME: New unit of measure "days" at next Ag+ service and next UV bulb replacement
- EL: Various new registers, weighted hours removed, Fault and Warning implemented in maintenance and malfunction status

7.6 Software version 5.8.x.x

- Modbus TCP integrated for DL, ME, RS, EL and RO-A
- DL: New register 41707 "Manual drain"
- DL register 31010: New status "Temperature flush"
- DL register 31013: New status "Replace Ag+ cartridge" and status "Disinfection"

7.7 Software version 5.9.x.x

- DL: New register 41708 "Ceramic wash over"
- DL register 31010: New status "Ceramic wash over"

8 Data register tables

8.1 Data register DL

Description	Range	Input Register 1-based	Format
<i>Read with function 04</i>			
Max. capacity ¹⁾	2 - 1000 kg/h 4 - 2573 lb/hr	31300	32-Bit Float ⁷⁾
Actual capacity ¹⁾	0 - 1000 kg/h 0 - 2573 lb/hr	31302	
Actual humidity or demand	0 - 100 %	31304	
Operating hours	0 - 1'200'000 h	31308	
Next service	0 - 10000 h	31310	
Remaining Ag-ion capacity	0 - 58.4 Ah	31312	
Target Ag-ion current	0 - 29.2 mA	31314	
Inlet pressure PS4 ¹⁾	0 - 12.0 bar 0 - 174.0 psi ³⁾	31316	
Nozzle pressure PS5 ¹⁾	0 - 12.0 bar 0 - 174.0 psi ³⁾	31318	
Water temperatur ¹⁾	°C or °F	31320	
Conductivity	0 - x µS/cm	31322	
Pump current	0 - 5.0 A	31324	
Ag-ion current	0 - x mA	31326	
Device type	0 = Hum 1 = Hum + FC 2 = Hum + RO-C 3 = Hum + FC-off	31000	UInt16
Operating status	0 = Initializing 1 = Diagnostic 2 = Stopped 3 = Flushing 4 = Standby 5 = Flushed 6 = Humidifying 7 = Ready 8 = Refreshing 9 = Air Pressure Cleaning 10 = Filling 11 = Conductivity Flush 12 = Switched Off 13 = Remote Off 14 = Regenerating 15 = Temperature Flush 16 = Ceramic Wash Over	31010	
Maintenance and malfunctions status	0 = Service Info 1 = Warning 2 = Activation Code 3 = Out of Commissioning 4 = Refill Disinfection 5 = Service 6 = Fault 7 = Replace Ag Cartridge 8 = Disinfection	31013	
Error code ²⁾	0 = No error	31014	

Description	Range	Input Register 1-based	Format
Safety loop	0 = Open 1 = Closed (=ok)	31200	UInt16
Y1 inlet valve	0 = Closed 1 = Open	31201	
Y2 valve	0 1	31202	
Y3 valve air cleaning	0 = Closed 1 = Open	31203	
Y4 valve external pipe flush	0 = Closed 1 = Open	31204	
Y5 valve spray circuit	0 = Closed 1 = Open	31205	
Y6 valve spray circuit	0 = Closed 1 = Open	31206	
Y7 valve spray circuit	0 = Closed 1 = Open	31207	
Y8 valve spray circuit	0 = Closed 1 = Open	31208	
Y9 valve spray circuit	0 = Closed 1 = Open	31209	
Y10 valve drain (NO)	0 = Open 1 = Closed	31210	
Y11 auxiliary outlet valve	0 = Open 1 = Closed	31211	
FC enable	0 = Disable 1 = Enable	31212	

- 1) According to the settings <Metric> or <Imperial> in the DL control unit. Metric units via Modbus are not supported in software version 1.1.x.x
- 2) Error Code is not supported in software version 1.1.x.x. See Error code description in the malfunction list of the operation manual.
- 3) psi is not implemented in software version 4.209.x.x and 1.1.x.x
- 7) 32-Bit Float are only supported in software version 5.x.x.x or higher

Description	Range	Holding Register 1-based	Format
Read with function 03 Write with function 06			
Humidity setpoint	0 - 95 %	41005	UInt16
Proportional band	6 - 65 %	41006	
Integral time	1 - 60 min	41007	
Manual capacity	20 - 100 %	41008	
Actual humidity or demand via Modbus	0 - 100 %	41053	
Manual drain	Read: 0 = Off 2 = Flushing active Write: 0 = Stop flushing 1 = Start flushing	41707	
Ceramic wash over	Read: 0 = Off 2 = Ceramic wash over active Write: 0 = Stop ceramic wash over 1 = Start ceramic wash over	41708	

8.2 Data register ME

Description	Range	Input Register 1-based	Format
<i>Read with function 04</i>			
Actual humidity or demand	0 - 100 %	31300	32-Bit Float ⁷⁾
Actual air temperature ¹⁾	°C or °F	31302	
UV current	0 – 4.0 A	31304	
Water capacity ¹⁾ stage 1	5.0 - 200.0 kg/h 11.0 - 440.9 lb/hr	31306	
Water capacity ¹⁾ stage 2	5.0 - 200.0 kg/h 11.0 - 440.9 lb/hr	31308	
Water capacity ¹⁾ stage 3	5.0 - 200.0 kg/h 11.0 - 440.9 lb/hr	31310	
Water capacity ¹⁾ stage 4	5.0 - 200.0 kg/h 11.0 - 440.9 lb/hr	31312	
Water capacity ¹⁾ stage 5	5.0 - 200.0 kg/h 11.0 - 440.9 lb/hr	31314	
Water capacity ¹⁾ stage 6	5.0 - 200.0 kg/h 11.0 - 440.9 lb/hr	31316	
Water capacity ¹⁾ stage 7	5.0 - 200.0 kg/h 11.0 - 440.9 lb/hr	31318	
Operating hours	0 - 1'200'000 h	31320	
Next service	0 - 10000 h	31322	
Next UV bulb exchange	0 - 450 d ⁶⁾	31324	
Next PureFlow Ag+ exchange	0 - 365 d ⁶⁾	31326	
Conductivity	µS	31328	
Actual water temperature ¹⁾	°C or °F	31330	
Incoming air temperature ¹⁾	°C or °F	31332	
Demand pump 1	0 - 100 %	31341	UInt16
Demand pump 2	0 - 100 %	31342	
Demand pump 3	0 - 100 %	31343	
Demand pump 4	0 - 100 %	31344	
Demand pump 5	0 - 100 %	31345	
Demand pump 6	0 - 100 %	31346	
Demand pump 7	0 - 100 %	31347	
Water lever in tub	0 - 8	31203	

¹⁾ According to the settings <Metric> or <Imperial> in the ME control unit. Metric units via Modbus are not supported in software version 1.1.x.x

⁶⁾ Unit days as of software version 5.7.x.x

⁷⁾ 32-Bit Float are only supported as of software version 5.x.x.x or higher

Description	Range	Input Register 1-based	Format
Read with function 04			
Number of running stages	0 – 7	31002	UInt16
Operating status	0 = Initializing 1 = Diagnostic 2 = Stopped 3 = Humidifying 4 = Cooling 5 = Holding 6 = Draining 7 = Refreshing 8 = Filling 9 = Standby 10 = Diluting 11 = Drain assisting 12 = Bleeding 13 = Ramping Up 14 = Switched Off 15 = Remote Off 16 = Purging 17 = Drain check	31010	
Maintenance and malfunctions status	0 = Service Info 1 = Warning 2 = Service 3 = Refill Liquid 4 = Replace PureFlow Ag+ 5 = Replace UV Bulb 6 = Matrix Wash over 7 = Out of Commissioning 8 = Activation Code 9 = Fault	31013	
Error code ²⁾	0 = No error	31014	
Fault pump 1 ⁴⁾	0 = Fault 1 = Ok	31031	
Fault pump 2 ⁴⁾	0 = Fault 1 = Ok	31032	
Fault pump 3 ⁴⁾	0 = Fault 1 = Ok	31033	
Fault pump 4 ⁴⁾	0 = Fault 1 = Ok	31034	
Fault pump 5 ⁴⁾	0 = Fault 1 = Ok	31035	
Fault pump 6 ⁴⁾	0 = Fault 1 = Ok	31036	
Fault pump 7 ⁴⁾	0 = Fault 1 = Ok	31037	
Fault inlet ⁴⁾	0 = Fault 1 = Ok	31040	
Fault water temperatur ⁴⁾	0 = Fault 1 = Ok	31041	
Fault water outlet ⁴⁾	0 = Fault 1 = Ok	31042	
Fault level sensor ⁴⁾	0 = Fault 1 = Ok	31043	
Fault water conductivity ⁴⁾	0 = Fault 1 = Ok	31044	
Safety loop	0 = Open 1 = Closed (=ok)	31200	

Description	Range	Input Register 1-based	Format
Dosing pump level	0 = Empty 1 = Ok	31201	UInt16
Leakage sensor	0 = Leakage 1 = Ok	31202	
Drain valve	0 = Open 1 = Closed	31017	
Inlet valve	0 = Closed 1 = Open	31018	
Drain pump	0 = Off 1 = On	31019	

- 2) Error Code is not supported in software version 1.1.x.x. See Error code description in the malfunction list of the operation manual
- 4) Software version x.x.1.16 or higher

Description	Range	Holding Register 1-based	Format
<i>Read with function 03 Write with function 06</i>			
Humidity setpoint	0 - 95 %	41005	UInt16
Proportional band humidity control	6 - 65 %	41006	
Integral time humidity control	1 - 60 min	41007	
Integral time temperatur control	1 - 60 min	41017	
Actual humidity or demand via Modbus	20 - 100 %	41053	
Matrix wash over / tank draining	Read: 0 = Off 1 = Initialisation 2 = Process active 3 = Process completed Write: 0 = Stop active process 1 = Start matrix wash over 2 = Start tank draining	41054	
Temperature setpoint ¹⁾	5 - 40 °C 41 - 104 °F	41300	32-Bit Float ⁷⁾
Proportional band temperature control ¹⁾	1 - 50 °C 34 - 122 °F	41302	
Actual temperature via Modbus ¹⁾	-25 - 100 °C -13 - 212 °F	41304	
Remote reset	0 = Off 1 = On	40704	UInt16

- ¹⁾ According to the settings<Metric> or <Imperial> in the ME control unit. Metric units via Modbus are not supported in software version 1.1.x.x
- ⁷⁾ 32-Bit Float are only supported in software version 5.x.x.x or higher

8.3 Data register RS

Description	Range	Input Register 1-based	Format
<i>Read with function 04</i>			
Input signal channel 1 unit A	0 - 100 %	30004	UInt16
Limiter signal channel 2 unit A	0 - 100 %	30005	
System demand	0 - 100 %	30006	
Device type	0 = RS 1 = RS+ RO 2 = RO	31000	
Nominal voltage	0 = 200 V 1 = 208 V 2 = 230 V 3 = 240 V 4 = 400 V 5 = 415 V 6 = 440 V 7 = 460V 8 = 480 V 9 = 500 V 10 = 550 V 11 = 600 V 12 = 380 V	31003	
Max. capacity ¹⁾	5 - 160 kg/h 10 - 360 lb/hr	31016	32-Bit Float ⁷⁾
Max. capacity unit A ¹⁾	5 - 40 kg/h 10 - 90 lb/hr	31018	
Max. capacity unit B ¹⁾	5 - 40 kg/h 10 - 90 lb/hr	31020	
Actual capacity ¹⁾	0 - 160 kg/h 0 - 360 lb/hr	31022	
Actual capacity unit A ¹⁾	0 - 40 kg/h 0 - 90 lb/hr	31024	
Actual capacity unit B ¹⁾	0 - 40 kg/h 0 - 90 lb/hr	31026	

¹⁾ According to the settings <Imperial> or <Metric> in the RS control unit

⁷⁾ 32-Bit Float are only supported in software version 5.x.x.x or higher

Description	Range	Input Register 1-based	Format
Operating status unit A	0= Initializing 1 = Diagnostic 2 = Stopped 3 = Break 4 = Level Test 5 = Standby 6 = Humidifying 7 = Filling 8 = Idle 9 = Draining 10 = Remote Off 11 = Keep Warm	31010	UInt16
Operating status unit B	0= Initializing 1 = Diagnostic 2 = Stopped 3 = Break 4 = Level Test 5 = Standby 6 = Humidifying 7 = Filling 8 = Idle 9 = Draining 10 = Remote Off 11 = Keep Warm	31011	
Maintenance and malfunctions status unit A	0 = Service Info 1 = Warning 2 = RO Service 3 = Extended Maintenance 4 = Small Maintenance 5 = Activation Code 6 = Fault	31012	
Maintenance and malfunctions status unit B	0 = Service Info 1 = Warning 2 = RO Service 3 = Extended Maintenance 4 = Small Maintenance 5 = Activation Code 6 = Fault	31013	
Error code ²⁾	0 = No error	31014	
Operating hours	0 - 1'200'000 h	31100	
Next service unit A	0 - 6000 h	31106	32-Bit Float ⁷⁾
Next service unit B		31108	
Water level unit A	0 = no level 1 = low 2 = low-mid 3 = mid 4 = mid-high 5 = high	31210	UInt16
Water level unit B	0 = no level 1 = low 2 = low-mid 3 = mid 4 = mid-high 5 = high	31211	

²⁾ See Error code description in the malfunction list of the operation manual.

Description	Range	Input Register 1-based	Format
Blower ready unit A	0 = Off 1 = On (ready)	30008	UInt16
Blower ready unit B	0 = Off 1 = On (ready)	30018	
External safety loop unit A	0 = Open 1 = Closed (ok)	31200	
External safety loop unit B	0 = Open 1 = Closed (ok)	31201	
Internal safety loop unit A	0 = Open 1 = Closed (ok)	31202	
Internal safety loop unit B	0 = Open 1 = Closed (ok)	31203	
Heating voltage unit A	0 = Off 1 = On	31204	
Heating voltage unit B	0 = Off 1 = On	31205	
Internal safety loop unit A (security level)	0 = Open 1 = Closed (ok)	31218	
Internal safety loop unit B (security level)	0 = Open 1 = Closed (ok)	31219	
Leakage sensor unit A	0 = Off (leak) 1 = On	31220	
Leakage sensor unit B	0 = Off (leak) 1 = On	31221	
Contactactor unit A	0 = Off 1 = On	31222	
Contactactor unit B	0 = Off 1 = On	31223	
Pump unit A	0 = Off 1 = On	31224	
Pump unit B	0 = Off 1 = On	31225	
Inlet valve 1 unit A	0 = Closed 1 = Open	31226	
Inlet valve 1 unit B	0 = Closed 1 = Open	31227	
Inlet valve 2 unit A	0 = Closed 1 = Open	31228	
Inlet valve 2 unit B	0 = Closed 1 = Open	31229	
Drain cool valve 1 unit A	0 = Closed 1 = Open	31230	
Drain cool valve 1 unit B	0 = Closed 1 = Open	31231	
Complete drain valve 2 unit A	0 = Closed 1 = Open	31232	
Complete drain valve 2 unit B	0 = Closed 1 = Open	31233	
External fan unit A	0 = Off 1 = On	31234	
External fan unit B	0 = Off 1 = On	31235	
Hygiene flush unit A	0 = Closed 1 = Open	31236	
Hygiene flush unit B	0 = Closed 1 = Open	31237	

Description	Range	Holding Register 1-based	Format
<i>Read with function 03 Write with function 06</i>			
Manual capacity unit A	20 - 100 %	40002	UInt16
Setpoint channel 1 unit A	0 - 95 %	40003	
Setpoint channel 2 limiter unit A	10 - 95 %	40004	
Actual humidity or demand via Modbus unit A	0 - 100 %	40005	
Actual humidity or limiter via Modbus unit A	0 - 100 %	40006	
P-Band unit A (Proportional band)	6 - 65 %	40017	
P-Band limiter unit A (Proportional band)	6 - 65 %	40018	
Integral time channel 1 unit A	1 - 60 min	40021	
Damp time channel 2 unit A	0 - 60 s	40022	
Remote Drain	Read: 0 = Off 1 = Initializing 2 = Busy 3 = Done Write: 0 = Off (operation) 1 = RS drain cylinder A 2 = RS drain cylinder B 3 = RS drain cylinder A + B 4 = RO flush 5 = RO fresh water automation	41701	

8.4 Data register RO-A

Description	Range	Input Register 1-based	Format
<i>Read with function 04</i>			
Operating status RO	0 = Initializing 1 = Diagnostic 2 = Stopped 3 = Standby 4 = Refreshing 5 = Flushing 6 = Producing 7 = Regenerating	31305	UInt16
Capacity RO	0 - 500 kg/h	31306	32-Bit Float
Next service RO	0 - 1'2000'000 h	31308	
Operating hours RO	0 – 1'2000'000 h	31310	
Inlet pressure (tap water) RO	0 – 10 bar	31312	
Tank pressure (demineralized water) RO	0 – 10 bar	31314	
Overcurrent pump RO	0 = Fault 1 = Ok	31300	UInt16
Leak sensor RO	0 = Fault 1 = Ok	31301	
Pump RO	1 = On 0 = Off	31302	
Inlet valve RO	0 = Closed 1 = Open	31303	
Drain valve RO	0 = Closed 1 = Open	31304	
Maintenance and malfunctions status RO	0 = Service Info 1 = Warning 2 = RO Service 5 = Activation Code 6 = Fault	31012	
Error code ²⁾	0 = No error	31014	

²⁾ See Error code description in the malfunction list of the operation manual.

9 Options

9.1 Galvanic Isolation Module

If there is a potential difference on the Ground (GND) between the Modbus devices, it's recommend to use a galvanic isolation interface, e.g. the "Isolation Module" option. Beside the galvanic isolation the "Isolation Module" option gives the possibility to activate a Bias Network. A Bias Network is able to provide a defined voltage level to the bus, if no node is active. Per Network segment one Bias Network only may be active.

Order number: 2585445 (RS485 Isolation Module)

9.2 Mounting the "Isolation Module" option

- Install the interface directly on port J6 "BMS"
- Jumper set = end of line termination resistor is activated
- DIP switches: Activate or deactivate the Bias Network (Position shown on the photo = deactivated)
- Remove jumper J4 on the Integrated Controller

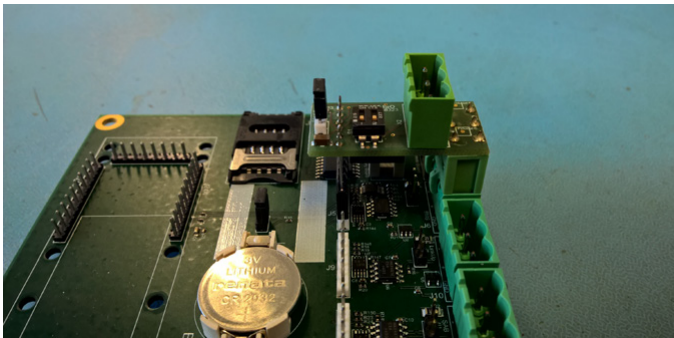


Fig. 4: Mounting the "Isolation Module" option

10 Test of the Modbus communication

Best is to check the Modbus communication in advance with a "Modbus Master Test Tool". For the tests, this software is taking the function of the master station or of a client with Modbus TCP.

Unlike other bus systems, Modbus is having a lot of providers for such test tools. The handling of these test tools is varying from producer to producer and cannot be described generally. However it's possible to sum up some similarities, how test tools are working and what needs to be entered.

10.1 Modbus RTU Test

- **Communication Gateway (Communications Port)**

This Port is used for the serial communication between the device and a notebook or a PC, respectively. At Windows this information is given at the Windows Device Manager. The shown port for the communication has to match with the setting of the test tool.

- **Baud Rate**

The baud rate has to be set to the same value as the baud rate at the integrated controller (default value ex-factory = 9600 baud). It's possible to change the baud rates, however they always have to be equal at the integrated controller of the respective device and at the test tool.

- **Quantity of Data Bits**

The number of data bits at the integrated controller is 8 and cannot be changed. The test tool must be adjusted to the default setting of the respective device.

- **Quantity of Stop Bits**

The number of stop bits at the integrated controller cannot be changed as well. There is always 1 stop bit used. The used stop bits have to be set at the test tool to value 1.

- **Parity**

The the parity of the integrated controller is set ex-factory to "Even". The value can be adjusted. The test tool has to show the same parity like the integrated controller of the respective device.

- **Modbus protocol type**

Most Modbus Master test tools are supporting the Modbus RTU telegram and the Modbus TCP or even Modbus ASCII. Please make sure, that the modbus is set on "RTU".

- **Entry of the Modbus Address**

The Modbus address at the integrated controller is set ex-factory to 10. This address can be adjusted from 1 to 247, however the value at the respective device and the one at the test tool have to be equal.

10.2 Modbus TCP Test

For the Modbus TCP test, less parameters need to be adjusted. However, it is important that the notebook and the corresponding device are in the same IP range. Therefore, assign a fixed IP address to the notebook in the network settings.

For the test, the notebook can be assigned to the same IP address range or you can use the following default settings for notebook and device:

- Notebook:
IP Address: 192.168.168.242
Subnet mask: 255.255.255.0
Subnet mask: 192.168.168.101
- Device:
IP Address: 192.168.168.243
Subnet mask: 255.255.255.0
Standard gateway: 192.168.168.101

Note: The IP settings in the device and in the notebook must be reset to the original values after the test!

For the test of the Modbus TCP communication, the following additional parameters must be set in the test tool:

- **Modbus Protocol type**
The protocol type must be set to Modbus TCP.
- **IP Address of the device**
According to the selected setting in the communication menu (see [chapter 5.3](#))
- **Modbus TCP Port**
According to the Modbus TCP standard the default port is 502.
The port number may be set to a different value. It is important that the port number in the Modbus TCP settings of the device is the same as the one in the test tool.
- **Modbus Address**
Imperatively set the Modbus address to 255 if this input is required in the test tool.
Caution: The Modbus address (alias Node ID, Slave ID, device address) must not be confused with the IP address.

10.3 Read out registers

The entry of the readable or the writable register is often generating problems. Therefore, please observe the following notes

- The first figure from the left shows the type of register. The device is using "Holding Register" 4 and "Input Register" 3 only.
- The remaining figures are showing the number. Particular at the Modbus telegram is, that the numbering of the registers is not matching with the addressing. The listing of the numbering starts with 1 (1-based), the listing of the addressing with 0 (0-based). In the register tables of this manual the registers are always shown 1-based.

That means, register 41008 has the address 1007 and the number 1008.

- Example Register 41008
4 = Register type (4 = Holding Register)
1008 = Number (or Address 1-based)
1007 = Address
- Example Register 31014
3 = Register type (3 = Input Register)
1014 = Number (or Address 1-based)
1013 = Address

It is therefore important to take notice whether the register, the number or the address must be entered in the test tool used.

Note: The format described above describes the register specifications according to the Modicon 5-digit standard. All devices described in this manual use this type of register.

10.4 Function

In order to be able to read out the value from the Modbus register, there are usually two different input variants, which differ depending on the test tool used:

- **Version 1:**

- Entry of the function + entry of the address or number**

- With this type, you first enter the function in a single field and the address or number in a second input field. Which function fits to which register is best taken from the tab tables.

- e.g. Function 03 + number 1008 = 41008

- Please note that holding registers are read with function 03, although for holding registers the first digit from the left is 4!

- The other way round input registers, which start with 3, are read with the function 4.

- **Version 2a:**

- **Entry of the register e.g. 41008 and a negative offset**

- Register 41008 + Offset of -40001 results in address 1007

- Register 41008 + Offset of -40000 results in address 1008

- Register 31014 + Offset of -30001 results in address 1013

- Register 31014 + Offset of -30000 results in address 1014

- **Version 2b:**

- **Selection of the register type 4 and a positive offset**

- Register type 4 + Offset of +1008 results in address 1008 respectively the register 41008.

10.5 Number of registers

For most of the test tools it's possible to enter the number of registers in an additional field after the selection of the first register. If for example for the first register 41008 is entered and under number of registers 3, the data will be read from the registers 41008, 41009, 41010.

This procedure is very comfortable, as it's not necessary to enter each address separately, however it bears the risk of errors.

If for example the register 41009 is missing, or if it's blocked by Condair, the test tool is displaying an error! It's advisable to first check separate registers and afterwards to look for connected register ranges. General rule: Each readable register has to be part of the register table of the respective device.

10.6 32-Bit Float Register

Here it must be considered, that for the transfer of 32-bit float values always two consecutive registers have to be transmitted, as one register has 16 bit only.

In order to transmit a 32-bit float value, for example the operating hours of the DL, the registers 31308 and 31309 are required.

Note: For some test tools the "Number of registers" must be set to 2 in order to read out 32-bit float registers.

10.7 Test tool variety

The variants shown above are not final, but are covering a big amount of test tools, which are available on the market. If you should need any further information regarding test tools, **please read first the operating instructions of the used test tool.**

A detailed description for a test tool is available from Condair Group AG. Unfortunately we're not allowed to publish pictures of all test tool manufacturers. Therefore we concentrate on a commercial test tool, which is available online and which is fulfilling the requirements for the test of the communication with our devices.

If required, ask for the additional operating instructions. These describe in detail the use of the test tool "Modbus Poll".

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