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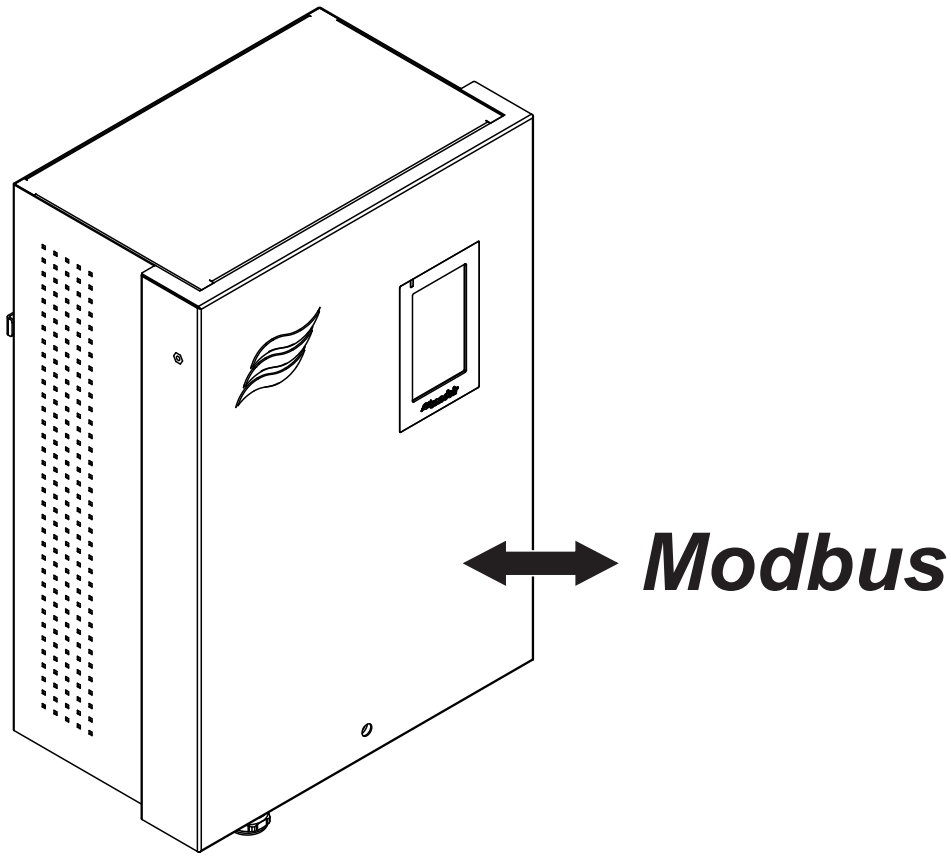

MODBUS

Addendum manual for installation and operation
for use with DL II, ME II, RS II and RO-E

Humidification, Dehumidification
and Evaporative Cooling

condair

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

CAUTION!

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

WARNING!

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**.

DANGER!

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. 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 units 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
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)***
Broadcast address	0
Parity	None, ***Even***, Odd
Baud rate	4800, 9600, ***19200***, 38400, 57600, 115200
Register sequence	***MSR first***, LSR first
Control signal timeout	0-300s ***(300s)***
Max. number of devices	32 (according to RS485 specification)
Supporting Modbus functions	3 Read Holding Registers 6 Write Single Registers 4 Read Input Registers 16 Write Multiple Registers
Register format	16-Bit UInt Register 32-Bit Float Register
Max. cable lengths/ type	600 m Balanced twisted pair with shield, 100-120 Ohm impedance
Topology	Line (Daisy Chain)

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
Bit rate	10 / 100 Mbits/s (according to Ethernet specification)
Control signal timeout	0-300s ***(300s)***
Supporting Modbus functions	3 Read Holding Registers 6 Write Single Registers 4 Read Input Registers 16 Write Multiple Registers
Register sequence	***MSR first***, LSR first
Register format	16-Bit UInt Register 32-Bit Float Register
Max. cable lengths/ type	100 m, CAT5 / 6
Topology	Bus (according to Ethernet specification)
Max. number of clients	3

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

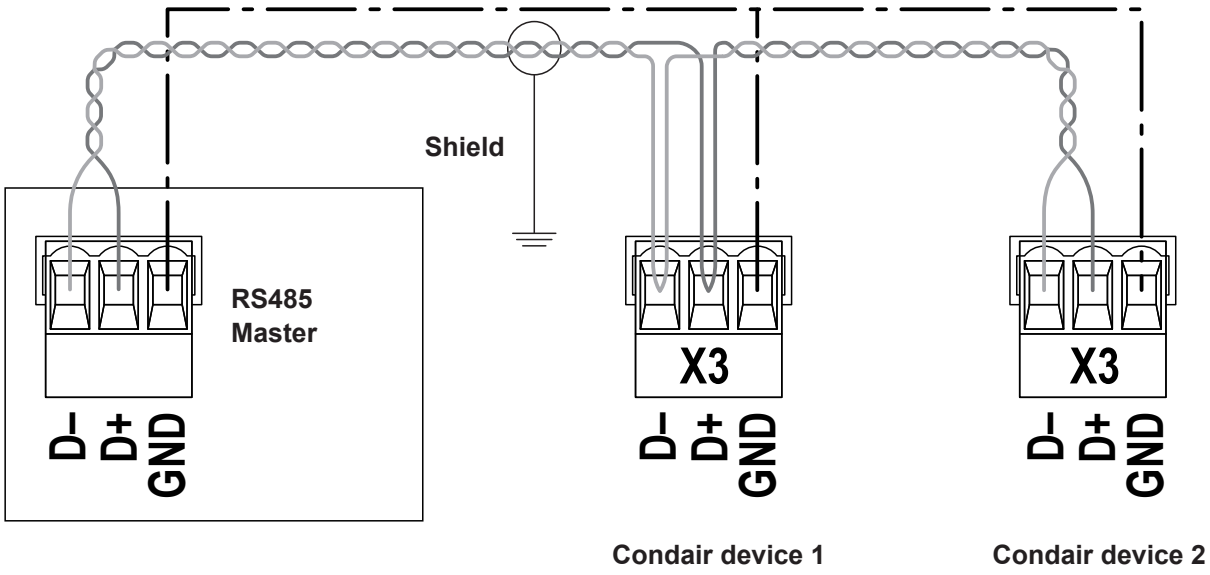
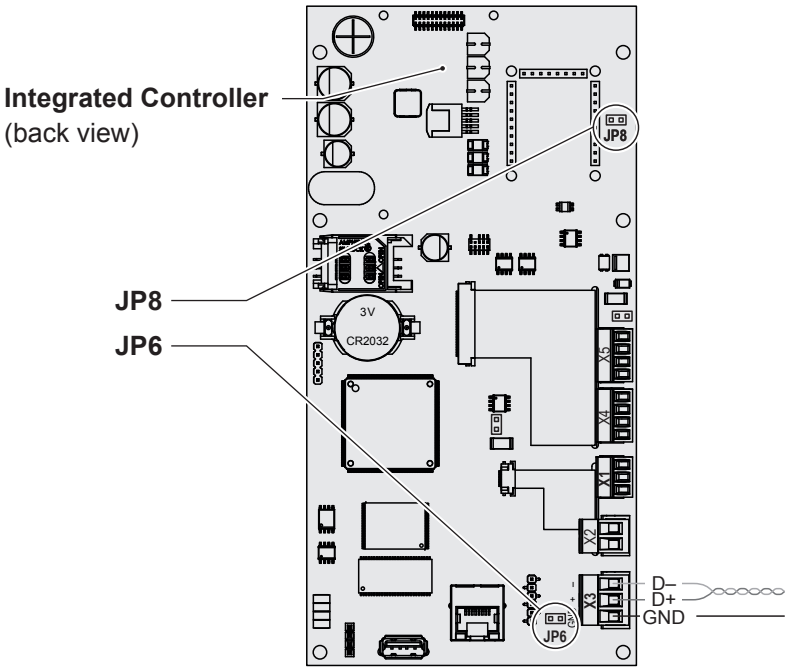


Fig. 1: Example Modbus RTU Network

- 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 X3 "BMS"
– Jumper "JP6" 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 "JP6" set = end of line termination resistor activated.
– Jumper "JP8" has to be removed for Modbus communication via the RS485 interface.
– All devices have to connected via GND.

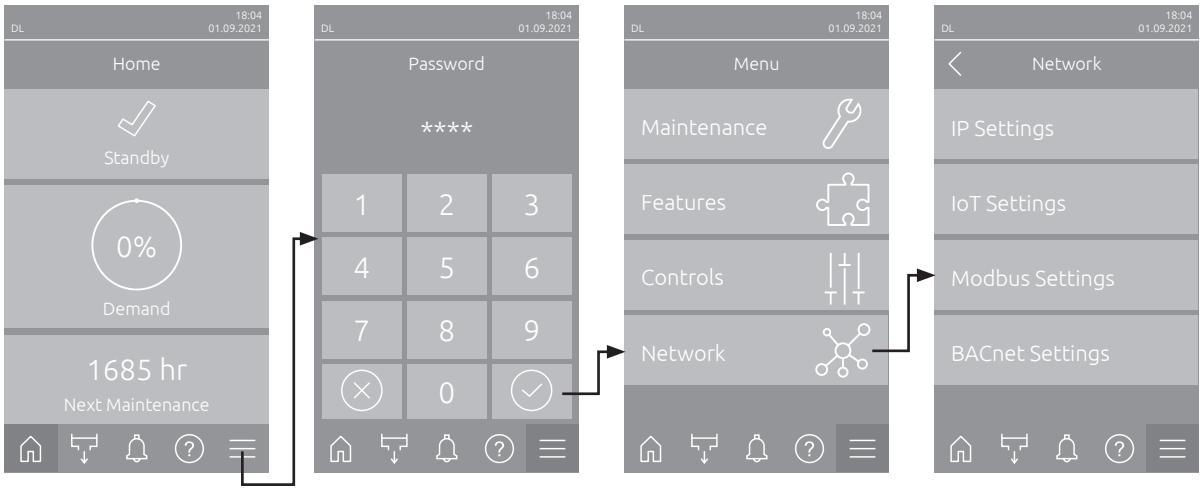
4.4 Determining the Modbus RTU interface parameters

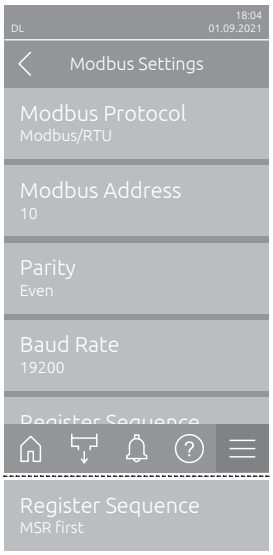
The following interface parameters are fixed and can not be modified:

– 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 "**Modbus Settings**" (Path: "***Menu > Password: 8808 > Network > Modbus Settings***"). The Modbus setting parameters appear.





– **Modbus Protocol**: Set "Modbus Protocol" parameter to "**Modbus/RTU**" in order to activate Modbus/RTU communication. After changing this setting, the control automatically carries out a restart.
  Factory setting: **Modbus/RTU**
  Options: **Off**, **Modbus/RTU**, **Modbus/TCP**
– **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 Options.

  Factory setting: **19200**

  Options: **4800**, **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])

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 date 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

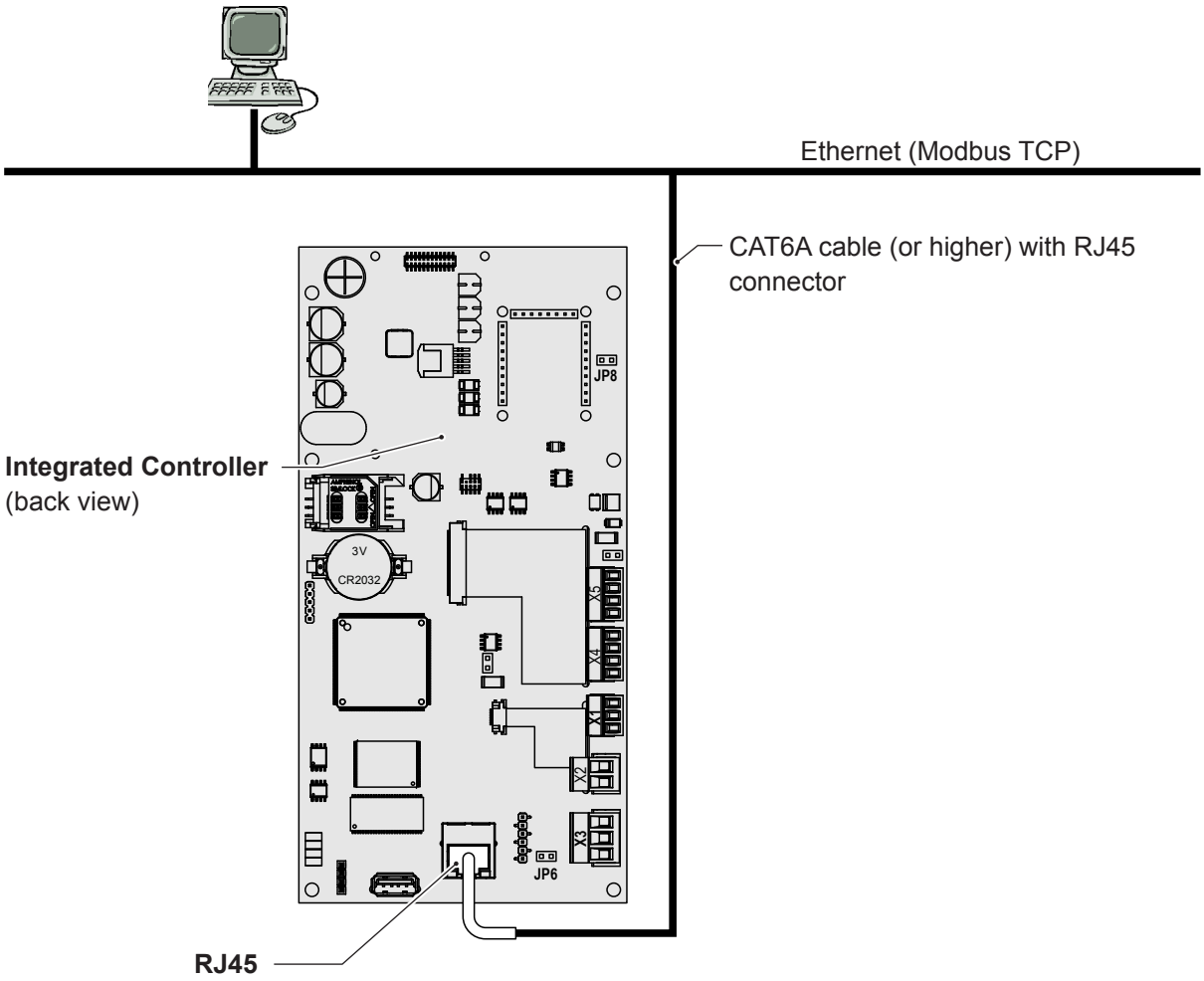


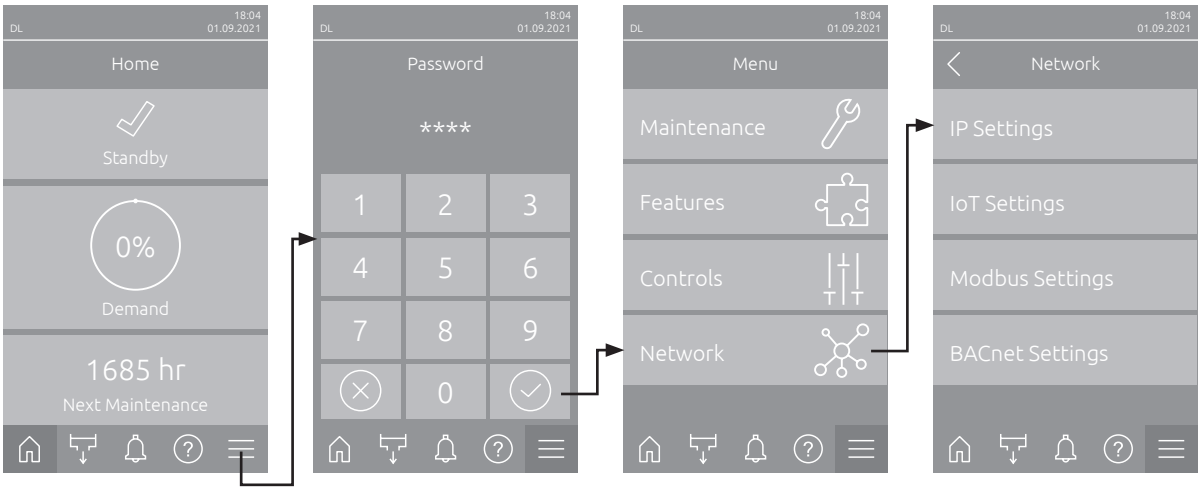
Fig. 3: Example Modbus TCP Network

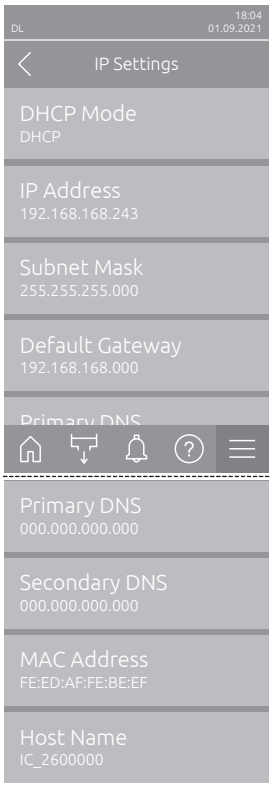
5.3 Determining the Modbus TCP interface parameters

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 "**IP Settings**" (Path: "***Menu > Password: 8808 > Network > IP Settings***"). The IP setting parameters appear.





– **DHCP Mode**: With this setting you determine whether the IP Address, the Subnet Mask, the Standard Gateway as well as the Primary and Secondary DNS address should be assigned as fixed values or dynamically assigned via a DHCP server.
Note: If no address can be assigned via a DHCP server when "DHCP Mode" is set to "DHCP", an APIPA (Automatic Private IP Addressing) is automatically assigned. This is in the range from 169.254.1.0 to 169.254.254.255. The subnet mask is set to 255.255.0.0 and the standard gateway remains 0.0.0.0.

  Factory setting: **DHCP**
  Options: **DHCP** (dynamic assignment)
  Fixed (fixed assignment)

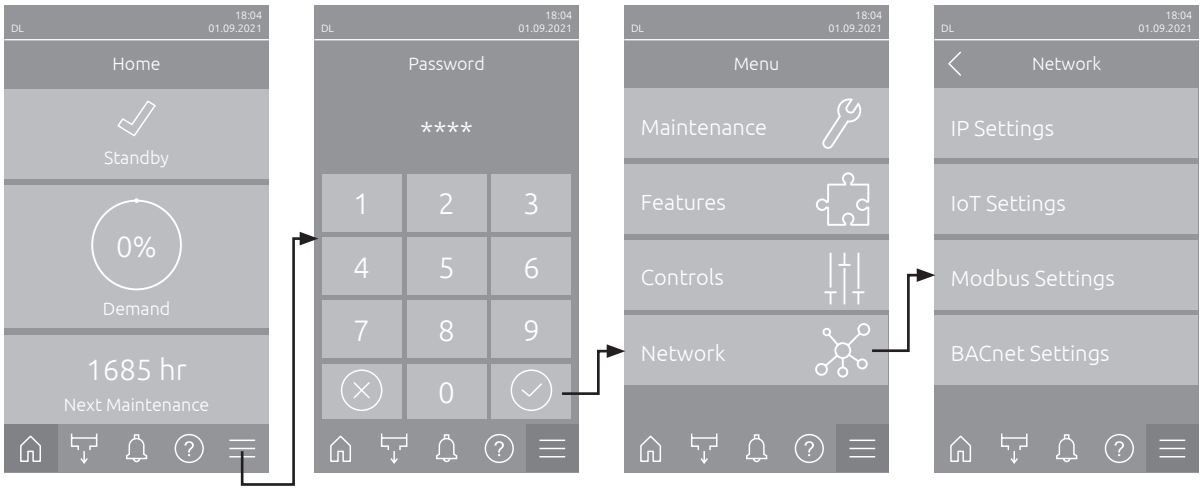
– **IP Address**: This field shows the actual IP address of the device assigned manually or assigned by a DHCP server.
If the parameter "DHCP Mode" is set to "Fixed", the IP address of the device can be set via this field. If the parameter "DHCP Mode" is set to "DHCP", the IP address of the device is assigned by a DHCP server.

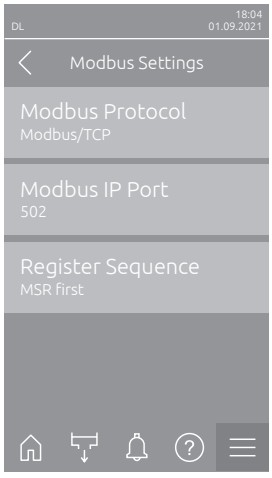
– **Subnet Mask**: This field shows the actual subnet mask of the IP network assigned manually or assigned by a DHCP server.
If the parameter "DHCP Mode" is set to "Fixed", the subnet mask can be set via this field. If the parameter "DHCP Mode" is set to "DHCP", the subnet mask is assigned by a DHCP 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 "DHCP Mode" is set to "Fixed", the IP address of the default gateway can be set via this field. If the parameter "DHCP Mode" 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 "DHCP Mode" is set to "Fixed", the IP address of the primary domain name server can be set via this field. If the parameter "DHCP Mode" 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 "DHCP Mode" is set to "Fixed", the IP address of the secondary domain name server can be set via this field. If the parameter "DHCP Mode" 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 "**Modbus Settings**" (Path: "***Menu > Passworteingabe 8808 > Network > Modbus Settings***"). The Modbus setting parameters appear.





– **Modbus Protocol**: Set "Modbus Protocol" parameter to "**Modbus/TCP**" in order to activate Modbus/TCP communication. After changing this setting, the control automatically carries out a restart.

  Factory setting: **Modbus/RTU**
  Options: **Off**, **Modbus/RTU**, **Modbus/TCP**

– **Modbus 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**

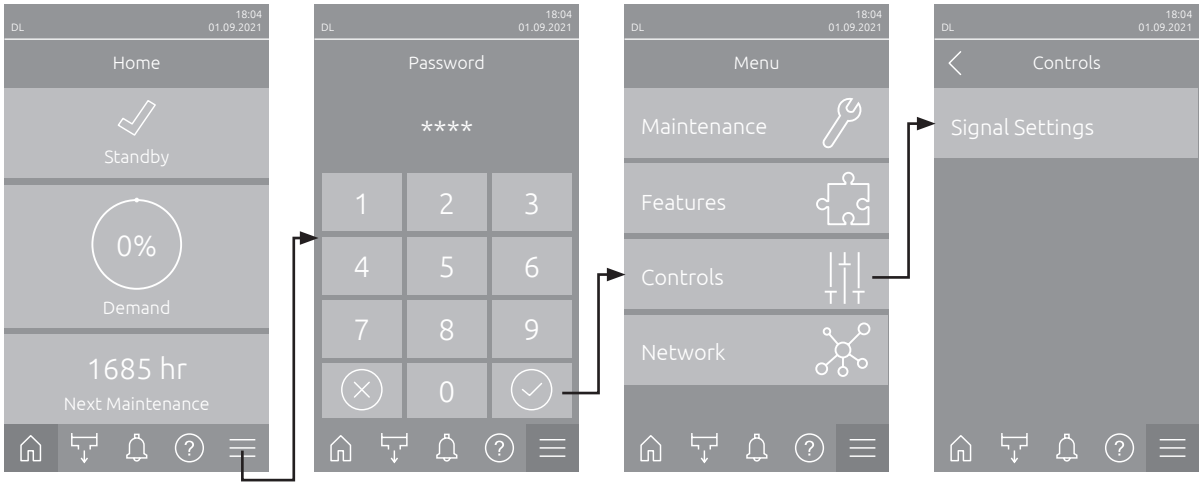
– **Register Sequence**: With this setting you determine the register sequence for the transmission of floating-point numbers.
  Note: With Modbus communication 32 Bit floating-point numbers are transmitted in two registers of 16 Bit each. In order that sender and receiver understand each other (that 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.

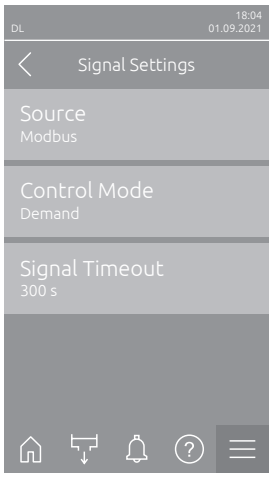
  Factory setting: **MSR first**
  Options: **LSR first** (low-order register is transmitted first)
  Edianness: Little Edian Byte Swapped
  (Format 32 Bit Float [CD] [AB])
  MSR first (high-order register is transmitted first)
  Edianness: Big Endian
  (Format 32 Bit Float [AB] [CD])

6 Signal settings

If the demand or control signal is also to be sent via Modbus, the signal settings must be set as described below.

Select "**Signal Settings**" (Path: "***Menu > Passwod: 8808 > Controls > Signal Settings***"). The signal setting parameters appear.





– **Source**: Set "Source" parameter to "**Modbus**".
  Factory setting: **Analog**
  Options: **Analog**, **Modbus**, **BACnet** or **IoT**
– **Control Mode**: Set the "Control mode" parameter to "**Demand**" (demand signal from an external controller) or to "**RH P**" or "**RH PI**" (humidity signal from an external humidity sensor).
  Factory setting: **Demand**
  Options: **On/Off**, **Demand**, **RH P** or **RH PI**
– **Signal Timeout**: With this setting you determine the timeout period for the signal transmission. If communication with the Modbus master fails for longer than the set time, warning "W35 - Signal Timeout" is triggered and the Condair DL is stopped.
  Factory setting: **300 s**
  Setting range: **1 ... 300 s**

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 via Register 43005

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 "Signal Timeout".
If the control signal is not updated within the set time, warning "W35 - Signal Timeout" will be triggered and the humidification will be stopped until the Modbus Master receives a valid signal into writable holding register 43005.

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

7 Data register tables

7.1 Data register DL

Name	Range	Input Register 1-based	Address	Format
	Read with function 04			
DL Type	0 = Humidifier 1 = Humidifier + FC 2 = Humidifier + FC - Off	32001	2000	UInt16
Device Status	0 = Initializing 1 = Diagnostic 2 = Stopped 3 = Flushing 4 = Standby 5 = Humidifying 6 = Ready 7 = Air Cleaning 8 = Filling 9 = Conductivity Flush 10 = Switched Off 11 = Remote Off 12 = Temperature Flush 13 = Ceramic Wash Over	32002	2001	
Maintenance and Error Status	0 = No Info 1 = Warning 2 = Activation Code 3 = Out of Commissioning 4 = Refill Disinfection 5 = Maintenance 6 = Error 7 = Replace Ag Cartridge 8 = Disinfection	32003	2002	
Error or Warning Code [3]	0 = No Error	32004	2003	
Safety Loop	0 = Open 1 = Closed (=ok)	32005	2004	
Y1 Inlet Valve	0 = Closed 1 = Open	32006	2005	
Y2 Reserve	0 1	32007	2006	
Y3 Valve Air Cleaning [1]	0 = Closed 1 = Open	32008	2007	
Y4 Valve External Pipe Flush [1]	0 = Closed 1 = Open	32009	2008	
Y5 Spray Valve	0 = Closed 1 = Open	32010	2009	
Y6 Spray Valve	0 = Closed 1 = Open	32011	2010	
Y7 Spray Valve	0 = Closed 1 = Open	32012	2011	
Y8 Spray Valve	0 = Closed 1 = Open	32013	2012	
Y9 Spray Valve	0 = Closed 1 = Open	32014	2013	

Name	Range	Input Register 1-based	Address	Format
Y10 Drain Valve (NO)	0 = Open 1 = Closed	32015	2014	UInt16
Y11 Auxiliary Outlet Valve [1]	0 = Open 1 = Closed	32016	2015	
Frequency Converter Enable	0 = Disable 1 = Enable	32017	2016	
Frequency Converter Status	0 = Off 1 = Power On	32018	2017	
Fan [1]	0 = On 1 = Off	32019	2018	
Disinfection Pump (Relay Dosing Pump) [1]	0 = Off 1 = On	32020	2019	
Max. Humidification Capacity [2]	2 - 1000 kg/h 4 - 2573 lb/hr	32026	2025	32-Bit Float
Actual Humidification Capacity [2]	0 - 1000 kg/h 0 - 2573 lb/hr	32028	2027	
Actual Humidity or Demand	0 - 100 %	32030	2029	
Operating Hours	0 - 1200000 h	32032	2031	
Next Maintenance	0 - 10000 h	32034	2033	
Remaining Ag-Ion Capacity	0 - 58.4 Ah	32036	2035	
Target Ag-Ion Current	0 - 29.2 mA	32038	2037	
PS4 Inlet Pressure [2]	0 - 10.0 bar 0 - 145.0 psi	32040	2039	
PS5 Nozzle Pressure [2]	0 - 10.0 bar 0 - 145.0 psi	32042	2041	
Water Temperature [1] [2]	°C or °F	32044	2043	
Water Conductivity	0 - x µS/cm	32046	2045	
Pump Current	0 - 6.0 A	32048	2047	
Ag-Ion Current	0 - x mA	32050	2049	

[1] optional
[2] According to the settings <Imperial> or <Metric> in the DL controller software
[3] Refer to malfunction list in the Condair DL operation manual for a description of the malfunction codes

Name	Range	Holding Register 1-based	Address	Format
Read with function 03 / Write with function 06				
Setpoint	0 - 95 %	43001	3000	UInt16
P-Band	6 - 65 %	43002	3001	
I-Time	1 - 60 min	43003	3002	
Capacity Limitation	20 - 100 %	43004	3003	
Actual Humidity or Demand via Modbus	0 - 100 %	43005	3004	
Remote Flushing	Read: 100 = Off 0-100 = Progress flushing in % Write: 0 = Stop flushing 1 = Start flushing	45002	5001	
Remote Ceramic Wash Over	Read: 100 = Off 0-100 = Progress ceramic wash over in % Write: 0 = Stop ceramic wash over 1 = Start ceramic wash over	45003	5002	

7.2 Data register ME

Name	Range	Input Register 1-based	Address	Format
Read with function 04				
System Mode	0 = Humidifying 1 = Cooling	32001	2000	UInt16
Device Status	0 = Initializing 1 = Diagnostic 2 = Stopped 3 = Humidifying 4 = Cooling 5 = Holding 6 = Draining 7 = Refreshing 8 = Filling 9 = Standby 10 = Diluting 11 = Assisted Draining 12 = Bleeding 13 = Softstart 14 = Switched Off 15 = Remote Off 16 = Purging 17 = Drain Check	32002	2001	
Maintenance and Error Status	0 = No Info 1 = Warning 2 = Maintenance 3 = WET Tank empty 4 = Replace PureFlo Cartridge 5 = Replace UV Lamp 6 = Matrix Wash Over 7 = Out of Comissioning 8 = Activation Code 9 = Error 10 = Disinfection Tank empty	32003	2002	
Error or Warning Code [1)]	0 = No error	32004	2003	
Safety Loop	0 = Open 1 = Closed (=ok)	32005	2004	
Number of Running Stages	0 – 7 stages	32006	2005	
Fault Pump 1	0 = Fault 1 = Ok	32007	2006	
Fault Pump 2	0 = Fault 1 = Ok	32008	2007	
Fault Pump 3	0 = Fault 1 = Ok	32009	2008	
Fault Pump 4	0 = Fault 1 = Ok	32010	2009	
Fault Pump 5	0 = Fault 1 = Ok	32011	2010	
Fault Pump 6	0 = Fault 1 = Ok	32012	2011	
Fault Pump 7	0 = Fault 1 = Ok	32013	2012	
Fault Water Inlet	0 = Fault 1 = Ok	32014	2013	
Fault Water Temperatur	0 = Fault 1 = Ok	32015	2014	
Fault Water Outlet	0 = Fault 1 = Ok	32016	2015	

Name	Range	Input Register 1-based	Address	Format
Fault Level Sensor	0 = Fault 1 = Ok	32017	2016	UInt16
Fault Water Conductivity	0 = Fault 1 = Ok	32018	2017	
Speed Pump 1	0 - 100 %	32019	2018	
Speed Pump 2	0 - 100 %	32020	2019	
Speed Pump 3	0 - 100 %	32021	2020	
Speed Pump 4	0 - 100 %	32022	2021	
Speed Pump 5	0 - 100 %	32023	2022	
Speed Pump 6	0 - 100 %	32024	2023	
Speed Pump 7	0 - 100 %	32025	2024	
Water Level Tank	0 - 7	32026	2025	
WET Tank Level	0 = Empty 1 = Ok	32027	2026	
Disinfection Tank Level	0 = Empty 1 = Ok	32028	2027	
Leakage Sensor	0 = Leak 1 = Ok	32029	2028	
Inlet Valve	0 = Closed 1 = Open	32030	2029	
Drain Valve	0 = Open 1 = Closed	32031	2030	
Drain Pump	0 = Off 1 = On	32032	2031	

[1] See Error code description in the malfunction list of the ME operation manual.

Name	Range	Input Register 1-based	Address	Format
Read with function 04				
Actual Humidity or Demand	0 - 100 %	32038	2037	32-Bit Float
Actual Air Temperature [2)]	°C or °F	32040	2039	
Incoming Air Temperature [2)]	°C or °F	32042	2041	
Actual Water Temperature [2)]	°C or °F	32044	2043	
Water Conductivity	0 - x uS/cm	32046	2045	
UV Current	0 - 4.0 A	32048	2047	
Water Capacity Stage 1 [2)]	1.0 - 360.0 kg/h 2.2 - 793.7 lb/hr	32050	2049	
Water Capacity Stage 2 [2)]	1.0 - 360.0 kg/h 2.2 - 793.7 lb/hr	32052	2051	
Water Capacity Stage 3 [2)]	1.0 - 360.0 kg/h 2.2 - 793.7 lb/hr	32054	2053	
Water Capacity Stage 4 [2)]	1.0 - 360.0 kg/h 2.2 - 793.7 lb/hr	32056	2055	
Water Capacity Stage 5 [2)]	1.0 - 360.0 kg/h 2.2 - 793.7 lb/hr	32058	2057	
Water Capacity Stage 6 [2)]	1.0 - 360.0 kg/h 2.2 - 793.7 lb/hr	32060	2059	
Water Capacity Stage 7 [2)]	1.0 - 360.0 kg/h 2.2 - 793.7 lb/hr	32062	2061	
Operating Hours	0 - 1200000 h	32064	2063	
Next Maintenance	0 - 10000 h	32066	2065	
Next UV Lamp Exchange	0 - 450 d	32068	2067	
Next PureFlo Exchange	0 - 365 d	32070	2069	

[2)] According to the settings <Metric> or <Imperial> in the ME controller software.

Name	Range	Holding Register 1-based	Address	Format
Read with function 03 Write with function 06				
Setpoint Humidity Control	0 - 95 %	43001	3000	UInt16
P-Band Humidity Control	6 - 65 %	43002	3001	
I-Time Humidity Control	1 - 60 min	43003	3002	
Actual Humidity or Demand via Modbus	0 - 100 %	43004	3003	
I-Time Temperature Control	1 - 60 min	43005	3004	
Setpoint Temperature Control [2)]	0 - 40 °C 32 - 104 °F	43011	3010	32-Bit Float
P-Band Temperature Control [2)]	1 - 50 °C 1.8 - 89.9 °F	43013	3012	
Actual Temperature via Modbus [2)]	-25 - 100 °C -12.9 - 211.9 °F	43015	3014	
Remote Draining	Read: 100 = Off 0-100 = Progress draining in % Write: 0 = Stop draining 1 = Start draining	45002	5001	UInt16
Remote Matrix Wash Over	Read: 100 = Off 0-100 = Progress matrix wash over in % Write: 0 = Stop matrix wash over 1 = Start matrix wash over	45003	5002	
Remote Error/Warning Reset	0 = Off 1 = On	45004	5003	

[2)] According to the settings <Metric> or <Imperial> in the ME controller software.

7.3 Data register RS

Name	Range	Input Register 1-based	Address	Format
Read with function 04				
Device Status Cyl. 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	32001	2000	UInt16
Device Status Cyl. 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	32002	2001	
Maintenance and Error Status	0 = Service Info 1 = Warning 2 = RO Service 3 = Extended Maintenance 4 = Small Maintenance 5 = Activation Code 6 = Error	32003	2002	
ErrorWarning Code [3]	0 = No error	32004	2003	
Overheat Switch Cyl. A	0 = Open 1 = Closed (=ok)	32005	2004	
Overheat Switch Cyl. B	0 = Open 1 = Closed (=ok)	32006	2005	
External Safety Loop Cyl. A	0 = Open 1 = Closed (=ok)	32007	2006	
External Safety Loop Cyl. B	0 = Open 1 = Closed (=ok)	32008	2007	
Security Floater Cyl. A	0 = Open 1 = Closed (=ok)	32009	2008	
Security Floater Cyl. B	0 = Open 1 = Closed (=ok)	32010	2009	
Heating Voltage Cyl. A	0 = Off 1 = On	32011	2010	
Heating Voltage Cyl. B	0 = Off 1 = On	32012	2011	
Blower Pack Cyl. A	0 = Off 1 = On (ready)	32013	2012	
Blower Pack Cyl. B	0 = Off 1 = On (ready)	32014	2013	
Main Contactor Cyl. A	0 = Off 1 = On	32015	2014	
Main Contactor Cyl. B	0 = Off 1 = On	32016	2015	

Name	Range	Input Register 1-based	Address	Format
Relay Pump Cyl. A	0 = Off 1 = On	32017	2016	UInt16
Relay Pump Cyl. B	0 = Off 1 = On	32018	2017	
Inlet Valve 1 Cyl. A	0 = Closed 1 = Open	32019	2018	
Inlet Valve 1 Cyl. B	0 = Closed 1 = Open	32020	2019	
Inlet Valve 2 Cyl. A	0 = Closed 1 = Open	32021	2020	
Inlet Valve 2 Cyl. B	0 = Closed 1 = Open	32022	2021	
Drain Cooling Valve Cyl. A	0 = Closed 1 = Open	32023	2022	
Drain Cooling Valve Cyl. B	0 = Closed 1 = Open	32024	2023	
Complete Drain Valve Cyl. A [1)]	0 = Closed 1 = Open	32025	2024	
Complete Drain Valve Cyl. B [1)]	0 = Closed 1 = Open	32026	2025	
Leakage Sensor [1)]	0 = Off (leak) 1 = On	32027	2026	
Furnace Fan [1)]	Condair UL: Remote Furnace/Fan 0 = Off 1 = On	32028	2027	
Ext. Pipe Flush [1)]	Condair CE: Ext.Pipe Flush 0 = Closed 1 = Open			
Level Cyl. A	0 = no level 1 = low 2 = low-mid 3 = mid 4 = mid-high 5 = high	32029	2028	
Level Cyl. B	0 = no level 1 = low 2 = low-mid 3 = mid 4 = mid-high 5 = high	32030	2029	
Nominal Voltage	0 = 200V 1 = 208V 2 = 230 V 3 = 240 V 4 = 380 V 5 = 400 V 6 = 415 V 7 = 440 V 8 = 460 V 9 = 480 V 10 = 500 V 11 = 550V 12 = 600 V	32031	2030	

Name	Range	Input Register 1-based	Address	Format
Max Hum. Capacity [2)]	5 - 160 kg/h 10 - 360 lb/hr	32042	2041	32-Bit Float
Max Hum. Capacity Cyl. A [2)]	5 - 40 kg/h 10 - 90 lb/hr	32044	2043	
Max Hum. Capacity Cyl. B [2)]	5 - 40 kg/h 10 - 90 lb/hr	32046	2045	
Actual Hum. Capacity [2)]	0 - 160 kg/h 0 - 360 lb/hr	32048	2047	
Actual Hum. Capacity Cyl. A [2)]	0 - 40 kg/h 0 - 90 lb/hr	32050	2049	
Actual Hum. Capacity Cyl. B [2)]	0 - 40 kg/h 0 - 90 lb/hr	32052	2051	
Control CH1	0 - 100%	32054	2053	
Control CH2	0 - 100%	32056	2055	
System Demand	0 - 100%	32058	2057	
Operating Hours	0 - 1'200'000 h	32060	2059	
Operating Hours Cyl. A	0 - 1'200'000 h	32062	2061	
Operating Hours Cyl. B	0 - 1'200'000 h	32064	2063	
Next Small Maintenance Cyl. A	0 - 6000 h	32066	2065	
Next Small Maintenance Cyl. B	0 - 6000 h	32068	2067	
Next Extended Maintenance Cyl. A	0 - 6000 h	32070	2069	
Next Extended Maintenance Cyl. B	0 - 6000 h	32072	2071	

Name	Range	Holding Register 1-based	Address	Format
Read with function 03 / Write with function 06				
Setpoint CH1	5 - 95 %	43001	3000	UInt16
Setpoint CH2	5 - 95 %	43002	3001	
P-Band CH1	6 - 65 %	43003	3002	
P-Band CH2	6 - 65 %	43004	3003	
I-Time CH1	1 - 60 min	43005	3004	
I-Time CH2	1 - 60 min	43006	3005	
Capacity Limitation	20 - 100 %	43007	3006	
Actual humidity or demand via Modbus CH1	0 - 100 %	43008	3007	
Actual humidity or demand via Modbus CH2	0 - 100 %	43009	3008	
Remote RS Drain	Read: 0-99 = Progress draining in % 100 = Off Write: 0 = Stop draining 1 = Start draining Cyl. A+ B	45002	5001	
Remote RS Drain Cyl. A	Read: 0-99 = Progress draining in % 100 = Off Write: 0 = Stop draining 1 = Start draining Cyl. A	45003	5002	
Remote RS Drain Cyl. B	Read: 0-99 = Progress draining in % 100 = Off Write: 0 = Stop draining 1 = Start draining Cyl. B	45004	5003	

[1] optional

[2] According to the settings <Imperial> or <Metric> in the RS controller software

[3] Refer to malfunction list in the Condair RS operation manual for a description of the malfunction codes

7.4 Data register RO-E

Name	Range	Input Register 1-based	Address	Format
Read with function 04				
Error or Warning Code [2)]	0 = No Error	32004	2003	UInt16
Fault Status	0 = No Error 1 = Warning 2 = Error	32501	2500	
Y11 Inlet valve	0 = Closed 1 = Open	32502	2501	
Y12 Drain valve	0 = Open 1 = Closed	32503	2502	
Y13 Outlet valve	0 = Open 1 = Closed	32504	2503	
Y15 Permeate valve	0 = Drain 1 = Tank	32505	2504	
Y16 Concentrate valve	0 = Closed 1 = Open	32506	2505	
UO Type	0 = RO-E 1 = RO-E+	32507	2506	
RO Status	0 = Initializing 1 = Diagnostic 2 = Stopped 3 = Hold 4 = Filling 5 = Standby 6 = Flushing 7 = Refreshing 8 = Draining	32508	2507	
UO Capacity [1)]	0 = 20 l/h / 5.3 gal/hr 1 = 40 l/h / 10.6 gal/hr 2 = 100 l/h / 26.4 gal/hr 3 = 200 l/h / 52.8 gal/hr 4 = 300 l/h / 79.3 gal/hr	32509	2508	
UO Maintenance status	0 = No Info 1 = Warning 2 = Warning Sys 3 = Warning Commissioning 4 = Warning Activation 5 = Error 6 = Warning Disinfection	32511	2510	
Inlet pressure [1)]	0 - 6 bar 0 - 87.0 psi	32514	2513	32-Bit Float
Tank pressure [1)]	0 - 6 bar 0 - 87.0 psi	32516	2515	
Membrane pressure [1)]	0 - 20 bar 0 - 290.0 psi	32518	2517	
Permeate conductivity	0 - 100 µS/cm	32520	2519	
Permeate temperature [1)]	0 - 60 °C 32 - 140 °F	32522	2521	
Permeat flow [1)]	0 - 400 l/h 0 - 106 gal/hr	32524	2523	
Next maintenance	0 - 4000 h	32526	2525	
Next Disinfection	0 - 365 [Days]	32528	2527	UInt16
Operating hours	0 - 1200000 h	32529	2528	32-Bit Float

Name	Range	Input Register 1-based	Address	Format
Read with function 03 / Write with function 06				
Minimum tank pressure	0 - 5 bar 0 - 72.5 psi	43501	13500	32-Bit Float
Maximum tank pressure	0 - 5 bar 0 - 72.5 psi	43503	13502	

[1] According to the settings <Imperial> or <Metric> in the RO-E controller software
[2] Refer to malfunction list in the Condair RO-E operation manual for a description of the malfunction codes

8 Test of the Modbus communication

Best is to check the Modbus communication in advance with a "Modbus 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.

8.1 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 = 19200 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.

– **Modus 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 modus 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.

8.2 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 *Section 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.

8.3 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).

  That means, register 43004 has the address 3003 and the number 3004.

  – Example Register 43004

    4 = Register type (4 = Holding Register)

    3004 = Number (or Address 1-based)

    3003 = Address

  – Example Register 32003

    3 = Register type (3 = Input Register)

    2003 = Number (or Address 1-based)

    2002 = 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.

8.4 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 3004 = **4**3004

  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. 43003 and a negative offset

  Register 43003 + Offset of -40001 results in address 3002
  Register 43004 + Offset of -40000 results in address 3004
  Register 32003 + Offset of -30001 results in address 2002
  Register 32003 + Offset of -30000 results in address 2003

- **Version 2b:**

  Selection of the register type 4 and a positive offset

  Register type 4 + Offset of +3004 results in the register 43004.

8.5 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 43004 is entered and under number of registers 3, the data will be read from the registers 43004, 43005, 43006.

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 43006 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.

8.6 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 32032 and 32033 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.

8.7 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".

Notes

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