

## Serial communication protocol

Modbus is a client/server protocol for communication between network linked devices.

Modbus devices communicate using a master-slave technique in which a single device (the master) can send messages. All other devices in the network (slaves) respond by returning the data required to the master or executing the action indicated in the message received.

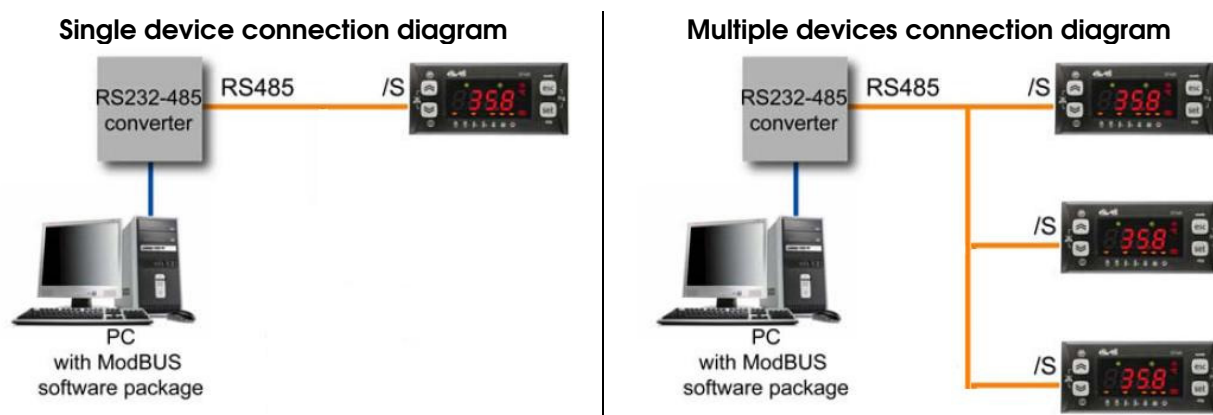
A slave is defined as a device connected to a network that processes information and sends the results to a master using the Modbus protocol.

The master can send messages to individual slaves or to the entire network (broadcast) whilst slaves can only reply to messages received individually from the master.

The Modbus standard used in this controller is RTU coding for data transmission.

### Connection diagram

The connection diagram is shown below



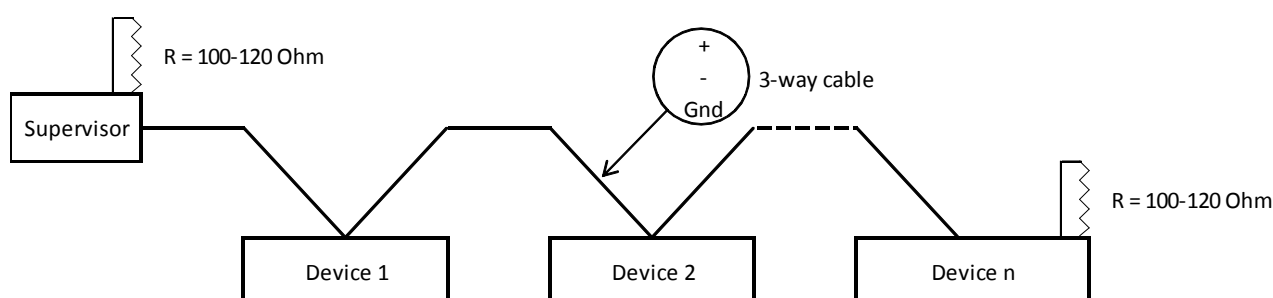
The cable between the converter (RS232-485 in example or USB-485) has to be shielded and twisted (example: Belden model 8762 cable)

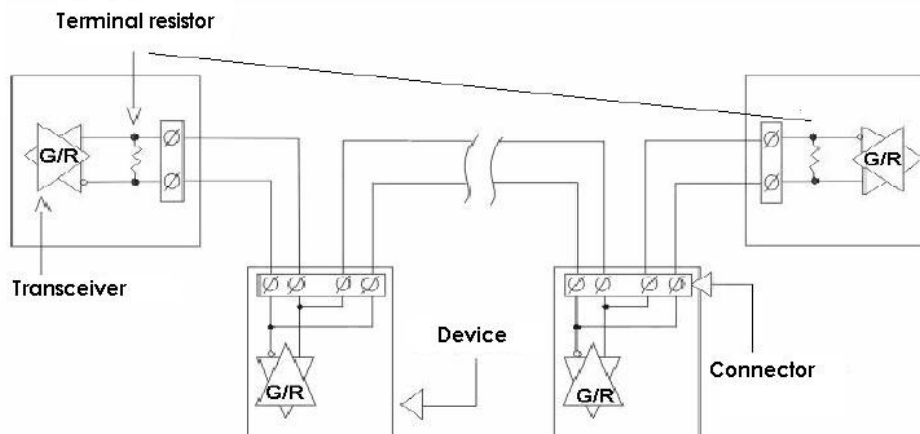
Other cables can be used only if they have equivalent electric and mechanical characteristics. It is however advisable to use RS485 compliant cables with the following characteristics:

- AWG 20/22
- Typical impedance of 120Ω
- Copper braided and twisted leads
- Sheath shielding and protective insulation

RS485 standards admit a maximum length of 1200m and/or 32 devices on each network.

The network must be wired only in accordance with the principle shown below, i.e. daisy-chained:





It is particularly important to take into account the following:

1. DO NOT use different types of cables for the same network and always make sure that the same type of cable is used.
2. The network cable transmits signals at a safe voltage (SELV) and must not be wired using the same ducts employed for cables with a dangerous voltage (for example 230 VAC) or that transmit high currents, especially CA. The network cable should never be installed in parallel with power cables.
3. Perform all connections maintaining the cable as linear as possible, avoid tight bending radiuses and do not wind it unnecessarily.
4. Do not wind the cable around power ducts or intersect the cable at 90° with ducts, when this is unavoidable.
5. Maintain the required safety distance from electromagnetic sources such as large engines, switching boards, neon reactors and all kinds of aerals.
6. Although it is not necessary to insert the cable in a lead, it is generally advisable to avoid conditions that could cause wear or mechanical damage. Said sources may include dangerous heat sources, areas exposed to high humidity and to solvent leakage. Unless otherwise specified, devices are designed to be used in areas with an ordinary and standard level of pollution. For outdoor connections, maintain a safety distance from sources that could release electrostatic discharges such as suction plants used to convey plastic material.
7. Verify that the tension of cables does not exceed 110 N (11.3 Kg) to prevent excessive stretching.
8. Preventively plan the shortest route and record the addresses of all connected devices, verifying that they have been positioned in a logical sequence, as this simplifies maintenance.
9. Do not reverse the polarity "+" and "-" of connection terminals.
10. Avoid using short cable sections for the connection terminations of devices to allow maintenance to be carried out without tearing or stretching the cable.
11. Identify the start and end terminations, and avoid leaving "open" sections.
12. The 100-120Ω resistors of terminations must be placed at the end of the network only and not on each device. It is generally advisable to install the resistor at the beginning of the network, although this is not always required (there are several cases of networks operating without initial resistor).

In order to enable / modify Modbus communication on each controller, follow this procedure.

Access CF folder, in this way:

- press ESC + SET keys together to open PAr menu
- press SET key to enter in Par sub-folders
- scroll the menu with UP / DOWN keys in order to find out CF sub-folder
- press SET key to enter in CF sub-folder
- scroll the menu with UP / DOWN keys in order to find out desired parameter (CF01 in example)
- press SET key to show desired parameter (CF01 in example)
- scroll the menu with UP / DOWN keys in order to adjust desired parameter (CF01 in example)
- press SET key to confirm
- press ESC in order to GO back to the previous level

Check following parameters:

- CF01 → Select COM1 (TTL) protocol → 1 (1 = Modbus, already configured by default)
- CF30 → Modbus protocol controller address → user defined, from 1 to 255
- CF31 → Modbus protocol Baudrate → 3 (3 = 9600, already configured by default → fixed value, not changeable)
- CF32 → Modbus protocol parity → 0 = STX, 1 = EVEN, 2 = NONE, 3 = ODD

### Modbus commands available and data areas

Implemented commands are:

Modbus command	Description of command
3	Read multiple registers on Client side
16	Write multiple registers on Client side
43	Read device ID

Length restriction is 30 Byte both for sent and received messages

### Modbus address

The whole part represents the address of the MODBUS register containing the value of the resource to be read or written in the instrument. The value after the point indicates the position of the most significant data bit in the register; if not indicated it is taken to be zero. This information is always provided when the register contains more than one information item, and it is necessary to distinguish which bits actually represent the data (the working size of the data indicated in the column DATA SIZE is also taken into consideration). Given that the modbus registers have the size of one WORD (16 bit), the index number after the point can vary from 0 (least significant bit -LSb-) to 15 (most significant bit -MSb-).

Please consider that some specific Modbus software (ModScan in example) requires to add 1 to given Modbus address

## SYSCROLL 20-35 VARIABLE LIST

### Commands

	Modbus address	Description
OFF	33532,7	OFF command
COOL	33532,3	Cool mode operation command
HEAT	33532,4	Heat mode operation command
COOL	17062	Read & Write. Cooling setpoint (°C)
HEAT	17074	Read & Write. Heating setpoint (°C)

### Analogue input address list

Analogue input name*	Modbus address	Description
AI1	412	RWT Return water temperature
AI2	414	LWT Leaving water temperature
AI3	416	Dynamic set-point (option)
AI4	418	High pressure transducer
AI5	420	Air Temperature
AIE1	858	Coil Temperature (HP only)
AIE2	860	DHW temperature (option)

\*referring to wiring diagram

### Digital input address list

Digital input name*	Modbus address	Description
DI1	33158	Fan motor protection
DI2	33158,1	Compressor motor protection
DI4	33158,3	Plant side flow switch
DI5	33158,4	Low pressure switch
DI6	33158,5	High pressure switch
DIE1	33702	External interlock / sequence phase control
DIE2	33702,1	Remote double set point
DIE5	33702,4	Pump motor protection

\*referring to wiring diagram

### Digital output address list

Digital output name*	Modbus address	Description
DO1	33159,2	Compressor
DO4	33159	General alarm
DO5	33159,1	DHW integration (option)
DO6	33159,5	Extra heater
DOE1	33703	Plant side pump (if present)
DOE2	33703,1	Reverse Valve
DOE3	33703,2	Integration boiler (option)

\*referring to wiring diagram

### Analogue output address list

Analogue output name*	Modbus address	Description
AO1	33225	Condensing control (option)

\*referring to wiring diagram

## SYSCROLL 40-75 address list

### Commands

	Modbus address	Description
OFF	33532,7	OFF command
COOL	33532,3	Cool mode operation command
HEAT	33532,4	Heat mode operation command
COOL	17062	Read & Write. Cooling setpoint (°C)
HEAT	17074	Read & Write. Heating setpoint (°C)

### Analogue input address list

Analogue input name*	Modbus address	Description
AI1	412	RWT Return water temperature
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AI5	420	Air temperature
AIE1	858	Coil Temperature (HP only)
AIE2	860	DHW temperature (option)

\*referring to wiring diagram

### Digital input address list

Digital input name*	Modbus address	Description
DI1	33158	Fan motor protection
DI2	33158,1	Compressor 1 thermal protection
DI3	33158,2	Compressor 2 thermal protection
DI4	33158,3	Flow switch
DI5	33158,4	Low pressure switch
DI6	33158,5	High pressure switch
DIE1	33702	External interlock / sequence phase control
DIE2	33702,1	Remote double set point
DIE5	33702,4	External interlock circ. pump
DIE6	33702,5	Remote load shedding control

\*referring to wiring diagram

### Digital output address list

Digital output name*	Modbus address	Description
DO1	33159,2	Compressor 1
DO2	33159,3	Compressor 2
DO3	33159,4	Fan
DO4	33159	General alarm
DO5	33159,1	DHW integration (option)
DO6	33159,5	Extra heater
DOE1	33703	Plant side pump (option)
DOE2	33703,1	Reverse Valve
DOE3	33703,2	Integration boiler (option)

\*referring to wiring diagram

**List of alarms address list Syscroll 20-75 Air**

Error code	Modbus address	Description
Er00	33104	General alarm
Er01	33104,1	High pressure circuit
Er05	33104,5	Low pressure circuit
Er10	33105,2	Thermal protection - compressor 1
Er11	33105,3	Thermal protection - compressor 2
Er20	33106,4	Plant side flow switch
Er21	33106,5	Thermal protection - plant side pump
Er25	33107,1	Source side flow switch
Er30	33107,6	antifreeze
Er35	33108,3	Water high temperature
Er45	33109,5	Clock failure
Er46	33109,6	Clock to be set
Er47	33109,7	LAN communication error
Er60	33111,4	RWT probe failure
Er61	33111,5	LWT probe failure
Er67	33112,3	Visualization probe (T/P) failure
Er68	33112,4	Outdoor air temperature probe failure
Er69	33112,5	High pressure transducer failure
Er73	33113,1	Dinamic set-point failure
Er80	33114	Configuration error
Er81	33114,1	Compressor maintenance
Er85	33114,5	Plant side pump maintenance
Er90	33115,2	Alarm hystoric record overcoming