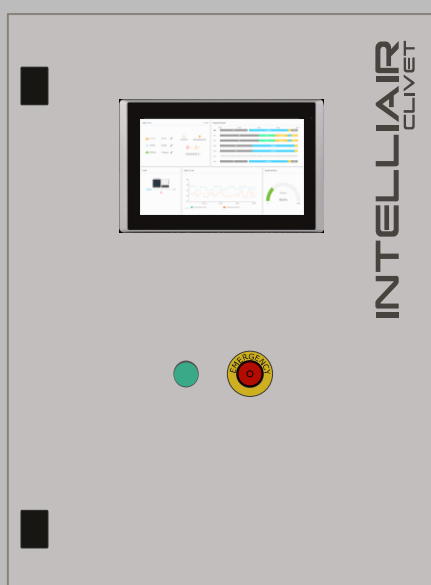


INTELLIAIR



INTELLIAIR CONTROL SYSTEM MANUAL (COMPONENT INSTALLATION)

Contents

1.0.	Introduction	3
2.0.	System structure	4
2.1.	Electrical panel	4
2.1.1	<i>Dimensions.....</i>	5
2.1.2	<i>Installation specifications</i>	6
2.1.3	<i>IP degree of protection / IK mechanical protection</i>	7
2.1.4	<i>Prescriptions regarding accessibility for inspection and similar operations</i>	8
2.2.	Unit connection	9
2.2.1.	<i>Unit connection</i>	10
2.2.2.	<i>Connecting a VRF system</i>	11
2.3	Schematic diagram	12
3.0.	Field components	13
3.1.	Clivet supplied components.....	13
3.1.1.	<i>PEDA00001 – Air quality probe Z-IAQ.....</i>	13
3.1.2	<i>PE8A0039 - I/O Module BMZRX</i>	16
3.1.3	<i>PEIP00014 - Electricity consumption meter EEM.....</i>	18
3.2.	Components not supplied by Clivet	19
3.3.	System architecture	19
4.0	General instructions for laying the cables	20
5.0	RS485 serial line	21
5.1	Serial line features	21
5.2	Laying the serial line	22
5.3	What to do if a device on a serial line is not communicating	24
6.0.	Type of cables	25
7.0.	Configuration of the system	26
7.1	Connecting the units via an Ethernet cable	26
7.2	Connessione unità tramite linea seriale RS-485	26
7.3	Interfacing with BMS	26
7.4	Interfacing with ELFOControl or Control4 NRG system.	27

1.0. Introduction

This manual contains information on the installation of the supervision panel and field components and laying of the serial line used for configuration.

Clivet S.p.A. shall not be held liable for malfunctions caused by incorrect setting of the operating parameters of equipment not supplied by it, incorrect laying of the data transmission cables or, in general, improper use of the supervision instrument.

2.0. System structure

The supervision system comprises an electrical panel (**QEIR**) and field components.

It can interface with third party devices via:

- Modbus RS-485 (on request);
- Modbus TCP/IP;
- BACnet/IP;
- 4-20mA analog signals;
- Dry contacts (Voltage-free contacts);
- 0-10V analog signals

2.1. Electrical panel

The supervision panel is equipped with:

1. Industrial PC for control and supervision of the system;
2. **RS-485 Modbus** serial communication ports (**ER1 - ER2 - ER3**);
3. Ethernet ports for communication in **Modbus TCP/IP (SW1)**;
4. Ethernet ports for communication in **Modbus TCP/IP** and/or **BACnet IP (SW2)**;
5. I/O module for handling **IN** (input) and **OUT** (output) signals:
 - a. 0-10V - **IN** and **OUT**;
 - b. 4-20mA - **OUT**;
 - c. 0-24V - **OUT**;
 - d. Potential-free contact - **IN** and **OUT**.
6. Wiring diagram.

The number of TCP/IP ports depends on the option chosen when configuring the QEIR.



Figure 1: Electrical panel of the QEIR supervisor

There are also 3 nominal **voltage** circuits (U_e):

1. $U_e = 24 \text{ Vdc}$ for users in the field.
2. $U_e = 230 \text{ Vac}$ for P1 service socket.

Note: The service socket can only be used by Clivet service personnel.

3. $U_e = 230 \text{ Vac}$ for LED1 and LED2 service lights

As for the rated **current** (I_{nc}), there are also 3 circuits in this case:

1. $I_{nc} = 6 \text{ A}$ for field users.
2. $I_{nc} = 6 \text{ A}$ for P1 service socket.

Note: The service socket can only be used by Clivet service personnel.

3. $I_{nc} = 0.5 \text{ A}$ for LED1 and LED2 service lights.

Note: In the event of a short circuit, the protection used for the service lights is the 0.5A 500V gG type FUL fuse

Other information:

- Nominal voltage of the switchgear $U_n = 230 \text{ Vac}$
- Rated insulation voltage $U_i = 230 \text{ Vac}$
- Rated impulse withstand voltage $U_{imp} = 4 \text{ kV}$
- Rated current of the panel $I_n = 6 \text{ A}$
- Nominal frequency $f_n = 50 \text{ Hz}$
- Nature of short-circuit protection devices:
 - QF1 circuit breaker for auxiliary A1 power supply 230Vac/24Vdc (6 A, curve C, 6 kA)
 - QF2 circuit breaker for P1 service socket (6 A, curve C, 6 kA)
 - FUL fuse for LED1 and LED2 service lights (0.5 A type gG)
- The protective measure taken against electric shock is the connection of all earths to the protective earth (PE). This measure brings the switchboard to insulation class "I".

2.1.1 Dimensions

The "**Panel Type**" is specified on the **serial number label** (rating plate) located inside the electrical panel.

PANEL TYPE	WEIGHT [kg]	HEIGHT [mm]	WIDTH [mm]	DEPTH [mm]
Size 1	43,71	800	600	300
Expansion Unit	52,70	800	600	300

2.1.2 Installation specifications

- Fixed installation panel (non-movable)
- Install in any covered and possibly easily accessible room, no special installations are allowed on ships, railways, etc.
- **DO NOT** install walls or objects outdoors near high heat sources that may impair air circulation through ventilation grilles.
- The air temperature of the installation environment must not exceed +40°C and its average value over a period of 24 hours must not exceed 35°C.
- The lower limit is -5°C.
- The relative humidity of the installation environment must not exceed 50% at a maximum temperature of +40°C.

Higher relative humidity can be allowed at lower temperatures, e.g. 90% at +20°C.

Moderate condensation must be taken into account, which may occasionally occur due to temperature variations.

- Maximum installation altitude = 2000 m
- It can be installed in **environments** with a **maximum pollution degree** of **3**, i.e. "Presence of conductive pollution or non-conductive dry pollution that becomes a conductor following condensation".
- The pollution degree **inside the panel** is **2**, defined as: "Only non-conductive pollution occurs"; however, a temporary conductivity caused by condensation must occasionally be expected.
- Installation can be carried out at a point in the system where the presumed short-circuit current must be $\leq$ to 6 kA
- Panel can **only** be installed in **TN** and **TT** distribution systems:
 - If you plan to install in a **TN system**, make sure that the protection device upstream of the panel can trip in less than **5s** in the event of a ground fault inside the panel.
 - If the installation is planned in a **TT system**, it may be necessary, in addition to the overload protection device, to install an **RCD** (residual current circuit breaker) upstream of the electrical panel so that the contact voltage, in the event of a fault to the ground, does not exceed **50V**.

If you prefer this installation, you can adopt one of the two proposed solutions, as an alternative to each other:

1. Create the power supply circuit of the electrical panel with double or reinforced insulation of the incoming connections.
2. Protect the power supply circuit of the electrical panel with a residual current circuit breaker.

If you choose the second option, the RCD **must be type A**.

The differential tripping current **$I\Delta n$ must be evaluated by the customer** on the basis of the value of the earth resistance at the point of installation of the INTELLIPLANT/ INTELLIPLANT CORE electrical panel so that in the event of a fault the QE grounds do not rise to a voltage higher than 50V.

1. Installation is only permitted in a Class A electromagnetic environment, i.e. in an industrial environment (a context that can tolerate a certain amount of electromagnetic interference without compromising performance or safety).

WARNING!

This product has been designed for **a Class A** environment. Use of this product in a Class B environment (residential/commercial environments) may generate unwanted electromagnetic disturbances; In this case, the user must implement appropriate mitigation measures.

CLIVET SPA will not respond to any type of malfunction if the recommendations contained in this paragraph have not been respected.

2.1.3 IP degree of protection / IK mechanical protection

Complete electrical panel	IP54
Enclosure	IK10
Cabinet	IK10
Touch screen panel	IK03
Bottone di emergenza	IK07
Emergency button	IK07
Ventilation grilles	IK07

2.1.4 Prescriptions regarding accessibility for inspection and similar operations

- The electrical panel **may only be opened under voltage by authorized personnel**, using the designated key provided.
- The circuit breakers QF1 and QF2, as well as the fuse holder FUL, can be operated under load, for example, to reset a circuit breaker or replace a fuse.
- The output voltage of the power supply unit A1 can be adjusted with the panel open and under voltage.
- The service socket P1, protected by the 6 A circuit breaker QF2, **must be used exclusively** for connecting the programming PC of the system by a qualified technician.

Note: The manufacturer disclaims any responsibility for damages or malfunctions resulting from the connection of loads to the outlet, performed by the customer.

CLIVET SPA will not be liable for any malfunctioning due to failure to comply with the recommendations contained in this paragraph.

2.2. Unit connection

The air conditioning units are equipped with control electronics located within their own electrical panels. The **QEIR** interfaces with the units via the ERMAN NG Modbus RS-485 communication module (refer to the unit's wiring diagram for connection details).

The Clivet units managed by the supervisor are:

- Rooftop;
- Zephir³;
- AHU;
- VRF.

For communication with the **QEIR**, it is essential that each unit be equipped with a **Modbus RTU RS-485** communication port or an Ethernet network port used for **Modbus TCP/IP** communication.

The **RS-485 Modbus** port **configuration** of the units is as follows:

- Parity: NONE;
- Baud Rate: 9600;
- Stop Bits: 1;
- Word Length: 8;
- Slave ID: 1-255.

Configuration of the **Modbus TCP/IP** port is as follows:

- IP address of the units: 192.168.0.20 to 192.168.0.50;
- Subnet Mask: 255.255.255.0;
- Gateway: 192.168.0.1;
- Slave ID: 1;
- Service Port: 502.

2.2.1. Unit connection

The serial line of the units must be connected to the terminals of **ER1**: 1 (GND), 2 (+) and 3 (-).

See the wiring diagram of the panel:

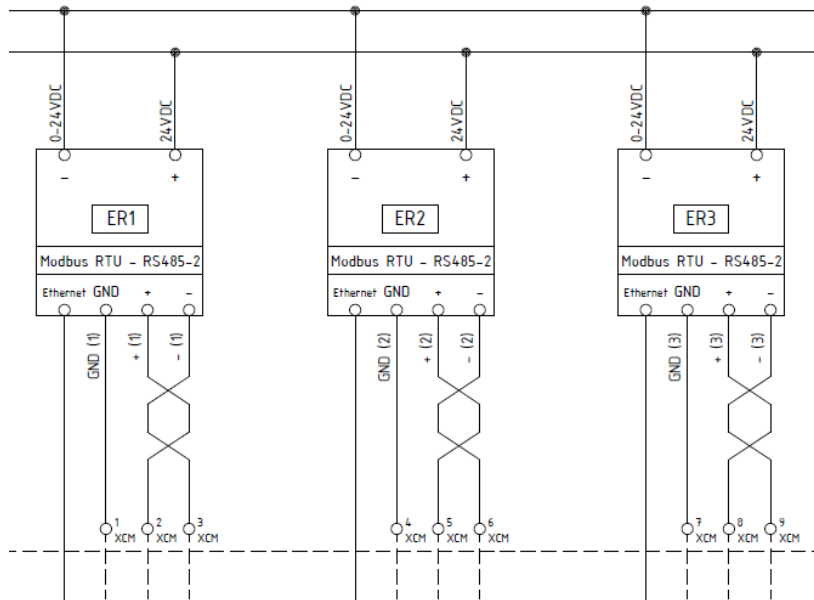


Figure 3: Modbus RS-485 Gateway – Wiring diagram, page 2

Figure 2: Serial connection terminals – Wiring diagram, page 3

If the system is equipped with the **ER3 component**, the serial line must be wired using **terminals 7 (GND), 8 (+), and 9 (-)** of the **XC terminal block** located inside the **INTELLIAIR** unit.

2.2.2. Connecting a VRF system

Interfacing with VRF systems is only possible through connection with the **GW-MOD accessory (A)**.

Communication can take place through:

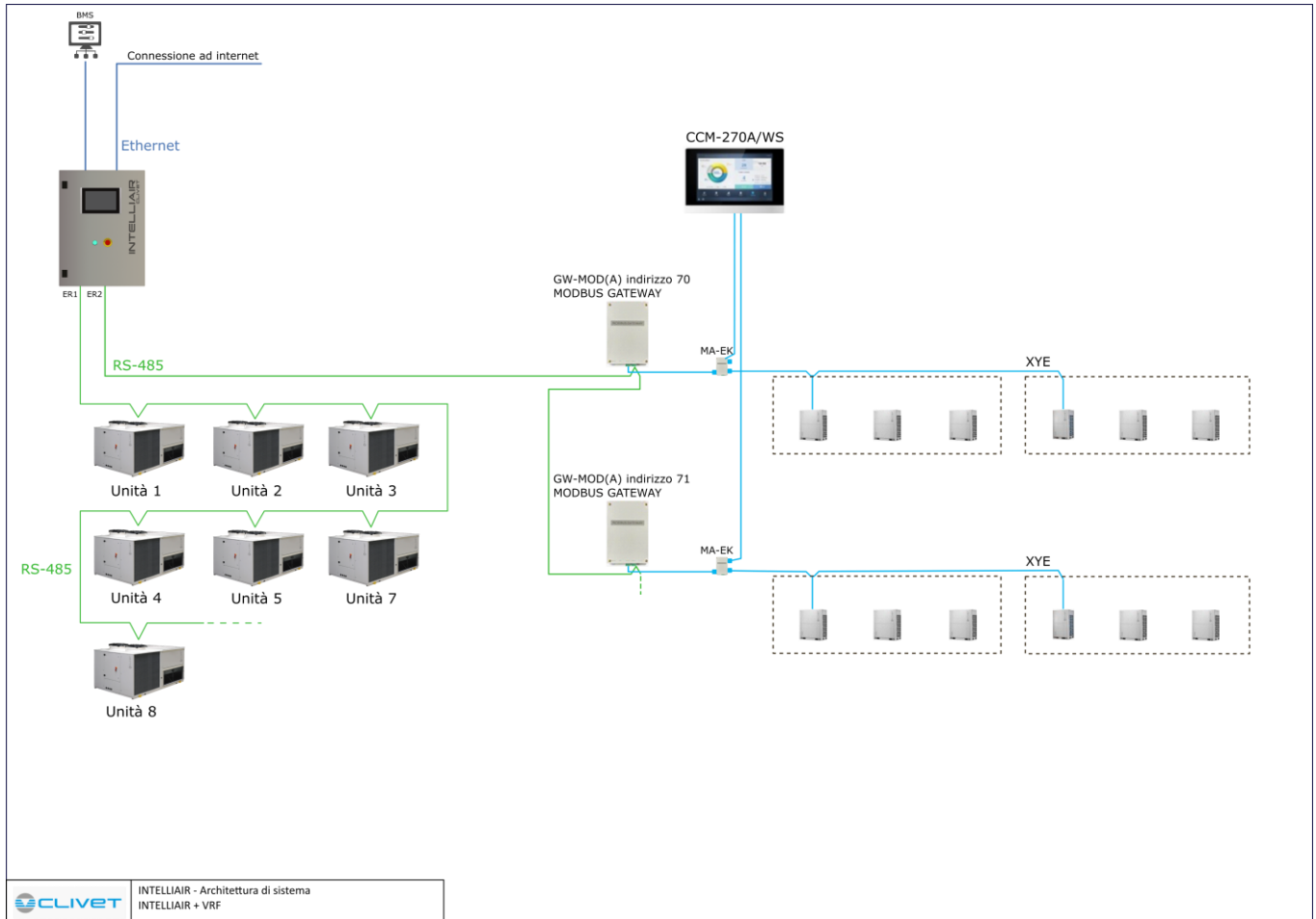
- Communication via **Modbus RTU RS-485**:
 - The serial communication line with the units must be connected to terminals ER2: 4 (GND), 5 (+), and 6 (-) and to terminals A1 (+), B1 (-), and E (GND).
 - The Modbus slave ID parameter values allocated to the VRFs range from 100 to 110.
- Comunicazione tramite **Modbus TCP/IP**:
 - Or the Ethernet cable must be connected directly to switch SW1;
 - or the IP addresses allocated for this device are from 192.168.0.80 to 192.168.0.90.

Refer to the component installation and user manual for more details on installing and configuring the device.



2.3 Schematic diagram

The following is a representation of a **VRF system** and **Rooftop units** connected to INTELLIAIR:



CAUTION: This is an architectural schematic for illustrative purposes only.

3.0. Field components

The components that the supervisor can control are as follows:

- **PEDA00001 – Air quality probe;**
- **PE8A0039 – I/O Module;**
- **PEIP00014 – Electricity consumption meters.**

Clivet spa is **not responsible** for the electrical connection and installation of these devices.

The devices must be installed in accordance with their individual specifications. Clivet spa is not responsible for any errors made during wiring and installation.

3.1. Clivet supplied components

3.1.1. PEDA00001 – Air quality probe Z-IAQ

The Z-IAQ sensor BUS line must comply with the specifications provided in paragraph of this manual.

It is recommended to perform the sensor configuration (described below) before proceeding with the final installation.



Modbus communication configuration

Requirements:

- PC with generic software for reading and writing Modbus registers (ModScan recommended);
- USB/RS-485 converter (e.g., Carel USB/RS-485 converter).

Set the following parameters in the Modbus tool interface (ModScan):

- **Length:** 7
- **Address:** 1
- **Point Type:** 03 HOLDING REGISTER
- **Device ID:** probe Modbus address:
 - Default Modbus address -> address = 110
 - If the address is not 110, the address will consist of the 3 middle digits of the serial module 247:
 - Ex. AP220ZAX -> address = 220

Once communication has been established, registers 1 to 7 will all be set to 0 and must be configured according to the table, following the specified order.

	Registers	Value to set
RS485 Settings	3	2 (Command type = RS485 settings)
	4	960 (Baudrate setting)
	5	0 (Parity none)
	6	1 – 247 (Modbus Slave ID)
	7	1 (to save)
	1	1
	2	0

CAUTION: Once the values listed above have been entered into the various registers, **Register 1** will be automatically reset to **0**. Simultaneously, **Register 2** will switch to value 1 if the configuration is approved, or value **2** if an error occurs.

Upon completion of the procedure, please disconnect the power supply to the probe.

The Modbus Slave ID must be unique on the serial line; no two devices can share the same address on the same serial segment.

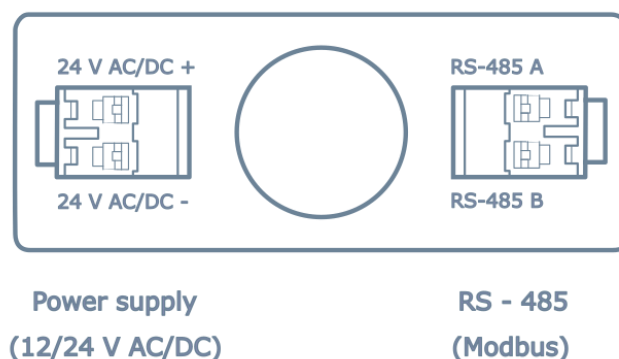
Notes:

To reset the device to factory settings, connect a micro USB cable to the dedicated port (**located on the back of the probe**) to power it. Then, using a pin or similar tool, press and hold the reset button (also on the back of the probe) for 5 seconds; the reset is confirmed by a "beep" from the buzzer.

The configuration after the reset is:

- Modbus = abilitato
- Velocità di trasmissione = 38400 bps
- Parità = nessuna
- Indirizzo Modbus di default -> Indirizzo = 110
- Se viene effettuato un reset di fabbrica:
 - Indirizzo: 3 numeri centrali nel numero seriale mod 247
 - Es. AP220ZAX -> Indirizzo = 220
 - Es. AP290ZAX -> Indirizzo = 043

Connection details



The power supply must be connected to the relevant terminals: + 24V AC/DC, - 24V AC/DC.

The serial line must be connected to terminals RS-485 A (+) and RS-485 B (-) on the probe and to terminals **ER2**: 4 = GND, 5 = + and 6 = - on the QEIR electrical panel.

See the wiring diagram of the panel:

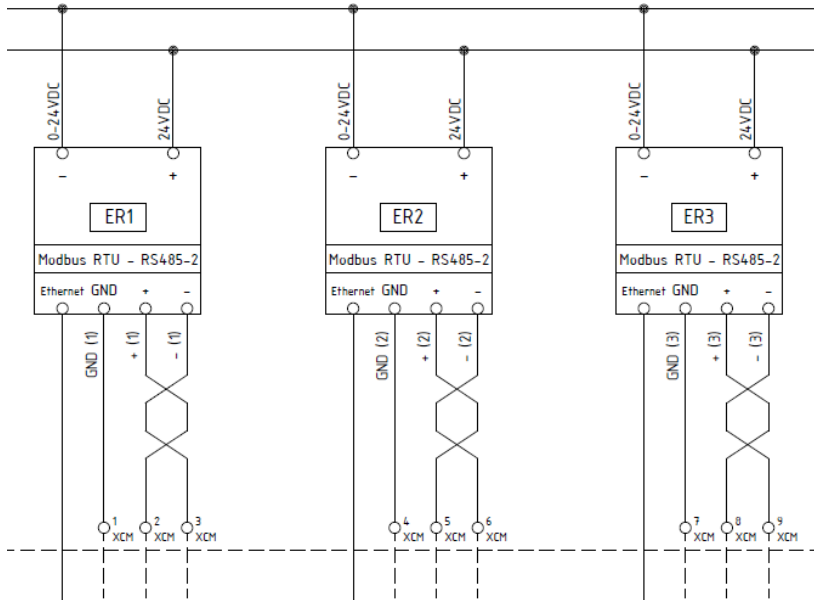


Figure 3: Modbus RS-485 Gateway – Wiring diagram, page 2

Figure 2: Serial connection terminals – Wiring diagram, page 3

Installation guidelines

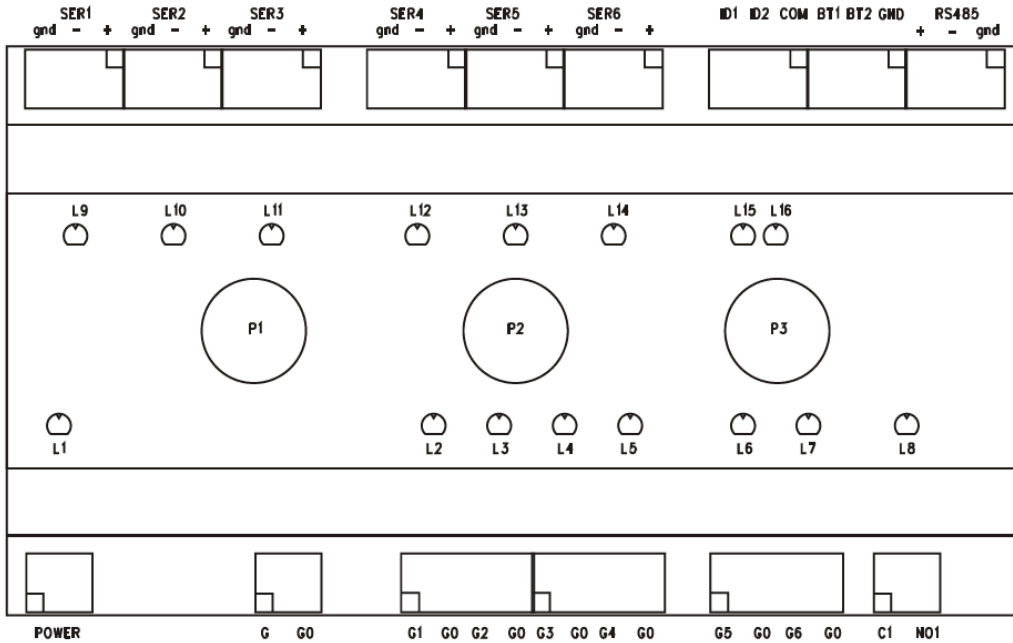
- Indoor installation in the room/area concerned;
- Do not install near sources of heat;
- Do not install near sources of flows of air (diffusers).

Cable to be used to connect the control panel

RS-485 serial cable (see relevant section).

3.1.2 PE8A0039 - I/O Module BMZRX

Layout



Potentiometers

ID	Function	Type
P2	Potentiometer Modbus ID (tens)	PT15 Potentiometer, 10Kohm, 10 detent
P3	Potenziometro Indirizzo Modbus (units)	PT15 Potentiometer, 10Kohm, 10 detent

These potentiometers are used to identify the Modbus address of the module itself.

P2 and P3 define the module's Modbus address, where P2 indicates the tens and P3 indicates the units. Therefore, addresses from 1 to 99 can be set using these two potentiometers.

Example: P2=3 and P3=4 -> module address = 34.

CAUTION: Ensure that the arrow on potentiometer P2 or P3 is aligned precisely with the number.

Modbus Configuration

Requirements:

- PC with generic software for reading and writing Modbus registers (ModScan recommended);
- USB/RS-485 converter (Carel USB/RS-485 converter recommended).

Procedure:

- Address the BMZRX using the potentiometers dedicated to addressing (P2 and P3);
- Set the following parameters in the Modbus tool interface (ModScan):

Length: 6

Address: 1002

Point Type: 03: HOLDING REGISTER

Device ID: BMZRX Address (as assigned via potentiometers)

Once communication has been established, registers 1002 to 1007 must be configured according to the steps indicated below.

Step 1:

Parameter	Register	Value
enChannel1	1002	0
enChannel2	1003	0
enChannel3	1004	0
enChannel4	1005	0
enChannel5	1006	0
enChannel6	1007	0

Step 2: Restart module

Step 3:

Parameter	Register	Value
enChannel1	1002	3
enChannel2	1003	3
enChannel3	1004	3
enChannel4	1005	3
enChannel5	1006	3
enChannel6	1007	3

Step 4: Restart module

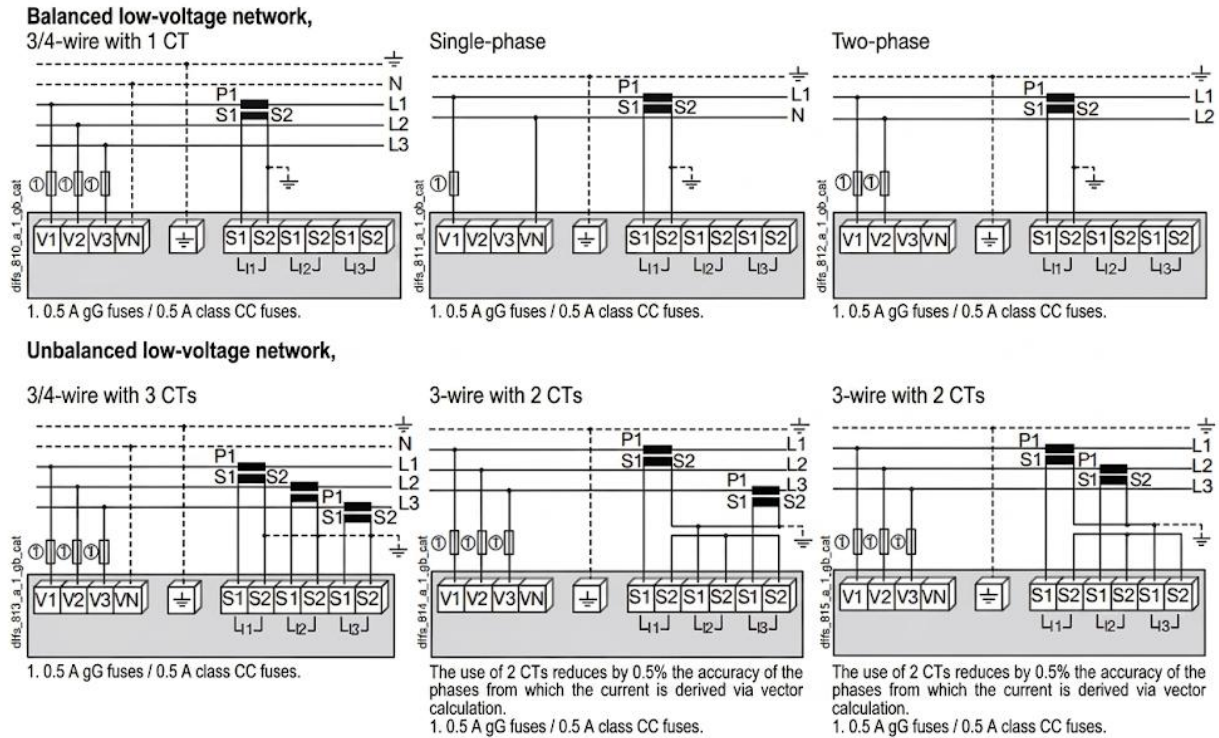
Slave ID address for each serial: from 50 to 69 for each serial.

3.1.3 PEIP00014 - Electricity consumption meter EEM

Installation of the electricity consumption meter is at the installer's discretion.

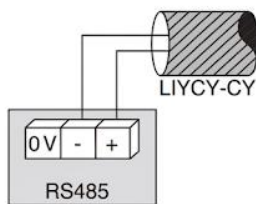
The CTs (current transformers) must be connected to the power supply cables and away from potential sources of interference.

Connection of CTs

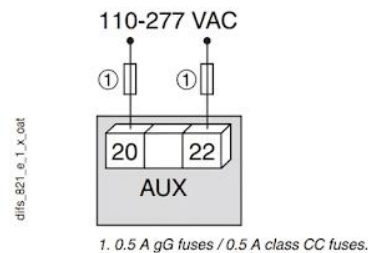


RS-485 Wiring

Communication via RS485 link



AC auxiliary power supply



The required serial lines are as follows:

- An RS-485 serial network cable dedicated to the units connected to the serial communication modules on board the units and to terminals: 1 (GND), 2 (+), 3(-) on XCM terminal block;
- An RS-485 serial network cable dedicated to Z-IAQ probes or other components connected to terminals: 4 (GND), 5 (+), 6 (-) on XCM terminal block;
- one signal cable for each air heater;
- An Ethernet cable for connecting to the customer's internet connection (optional);
- an Ethernet cable for communication with the BMS (optional).

NOTE: This diagram represents a hypothetical connection architecture. Any specific cases must be agreed upon during system installation.

4.0 General instructions for laying the cables

The length of the cables must be less than the maximum lengths given in the table below and kept as short as possible:

Type of connection	Maximum length
Modbus TCP/IP line (Ethernet)	The maximum length for a single Ethernet cable segment without intermediate devices is 100 meters. For distances exceeding 100 meters, it is necessary to use switches, routers, or fiber optic converters to regenerate the signal.
IP BACnet Line (Ethernet)	The maximum length for a single Ethernet cable segment without intermediate devices is 100 meters. For distances exceeding 100 meters, it is necessary to use switches, routers, or fiber optic converters to regenerate the signal.
Modbus RS-485 line	1000 m (max 30 devices, and a repeater is required)

5.0 RS485 serial line

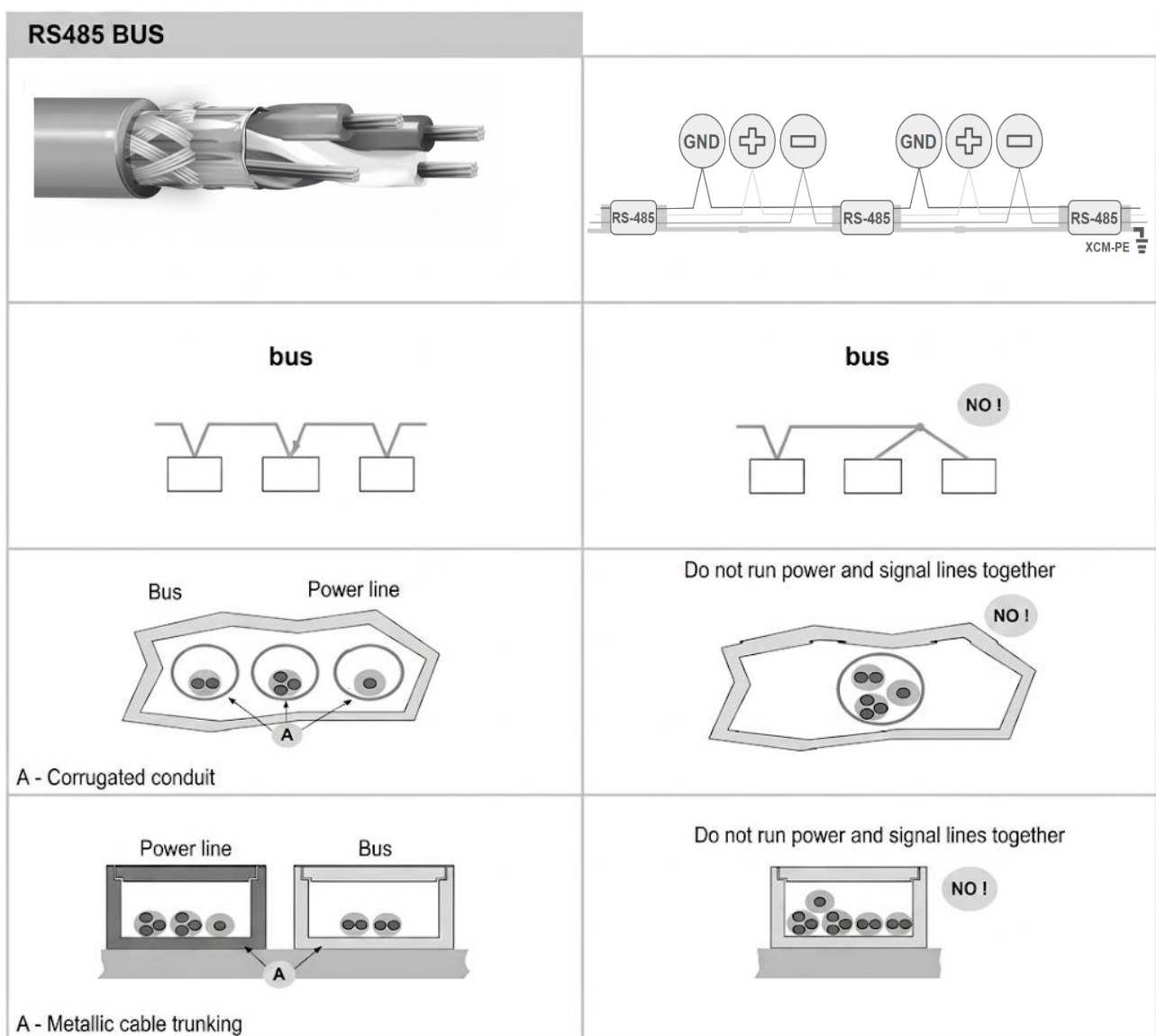
5.1 Serial line features

- Recommended cable: Belden 34S7YGR: 3 twisted conductors with shielding;
- Minimum cable requirements: 3 twisted conductors and shielding;
- Minimum conductor section 0.50 mm²;
- Typical impedance 120 Ω .
- Use a cable suitable for RS485 networks with insulation and voltage characteristics must be in accordance with the electrical regulations in force;
- Insulation of the cable with flame or fire retarding characteristics, commensurate with the electrical standards of reference for the type of system used;
- Maximum number of elements: 30;
- Total length of every single serial line 1000 m;
- Provide guards to protect against electrostatic discharges of atmospheric origin;
- Insert a **termination resistor** (120 Ω) into the last device of the serial line, if required;

5.2 Laying the serial line

- The serial line must be laid by personnel trained and qualified in data communication networks;
- The signal cable must be kept separate from the other cables (be careful if the cable is a power cable or if the cables are powered at different voltages);
- The cable must be laid far from cables or devices that can cause electromagnetic interference;
- Serial lines must be connected using a bus topology (daisy-chain); star or multi-point configurations are not permitted.

The serial line must be made as shown in the figure below:



The above information is provided for guidance only. It is essential to check the actual length of each individual serial line in order to determine the correct cable cross-section.

CLIVET SPA shall not be liable for any malfunctioning due to failure to comply with the recommendations contained in this chapter and reserves the right not to commission the system (or to void the warranty conditions) until all the conditions set out have been verified as active.

5.3 What to do if a device on a serial line is not communicating

The cases that may occur are:

- **All devices on a serial line are not communicating**

In this case, the serial line may not be correctly connected to the converter, or there may be interference in the data transmission:

- Try turning the serial converter off and on again.
- Check that there are no sources of interference on the line by disconnecting all units and connecting one unit at a time to the serial line. Then check again that the device is communicating correctly.
- Verify the requirement for a termination resistor based on the network topology; then, check for its presence and ensure it is correctly installed.

- **One or more devices are not communicating**

Investigate the cause directly in the device:

The problem may arise if there are identical addresses on the same line, causing a communication conflict:

- Check the addresses assigned to the various units (when assigning addresses, it is recommended to restart the device by disconnecting the power supply; however, refer to the specific documentation for the unit).

In units with **Siemens** electronics, the Modbus register mapping may have been set incorrectly:

- verify that the Modbus mapping set is “BMS” (parameter: “P0444: Modbus mapping” in the “Modbus” section of the machine HMI) and that the device is correctly connected to the serial line.
- Finally, restart the unit.

6.0. Type of cables

Cable for 4-20mA inputs

Shielded cable with aluminium tape and drain wire, with one or two 18 AWG (minimum cross-section: $2 \times 0.75 \text{ mm}^2$) twisted pairs of copper conductors, polyethylene insulation and PVC sheath.

Cable for 0-10V outputs

Shielded cable with aluminium tape and drain wire, with one or two 18 AWG (minimum cross-section: $2 \times 0.75 \text{ mm}^2$) twisted pairs of copper conductors, polyethylene insulation and PVC sheath with a cross-section suitable for the type of equipment and its electrical power.

Cable for digital inputs

Shielded cable with aluminium tape and drain wire, with one or two 20 AWG (minimum cross-section: $2 \times 0.50 \text{ mm}^2$) twisted pairs of copper conductors, polyethylene insulation and PVC sheath.

Cable for digital outputs

Cable with conductors of a number, cross-section and insulation suitable for the type of equipment and its electrical power.

7.0. Configuration of the system

The following chapters are reserved exclusively for the Clivet specialist service centre.

7.1 Connecting the units via an Ethernet cable

If the units are connected to INTELLIAIR via an Ethernet cable, they must be addressed as follows:

Component	IP Address
Unit 1	192.168.0.20
Unit 2	192.168.0.21
Unit 3	192.168.0.22
Unit 4	192.168.0.23
Unit 5	192.168.0.24
Unit 6	192.168.0.25
Unit 7	192.168.0.2...

7.2 Connessione unità tramite linea seriale RS-485

The address of the units must be recorded in the checklist available on Clivet World, and subsequently shared with Clivet.

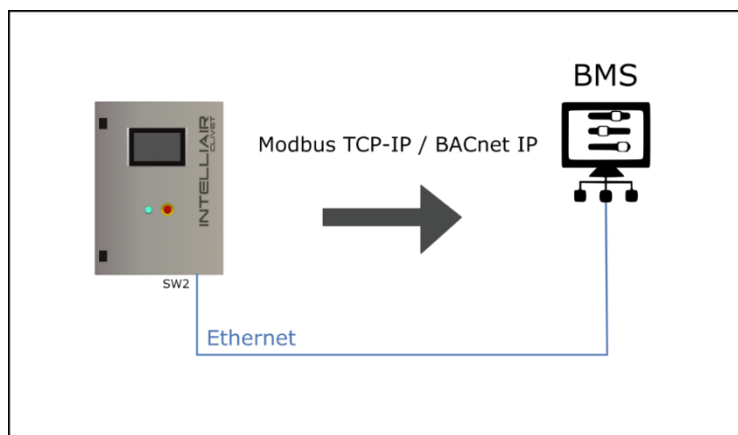
7.3 Interfacing with BMS

Supported protocols are Modbus TCP-IP (MASTER) and BACnet IP.

The ethernet line must be connected to the **SW2** switch within the INTELLIAIR control panel.

It is necessary to define, during the high surveillance phase or during the programming phase of the BMS:

1. Modbus TCP-IP: network configuration (BMS IP address and network details) and log mapping;
2. BACnet IP: BACnet network configuration and list of variables to be integrated.



7.4 Interfacing with ELFOControl or Control4 NRG system.

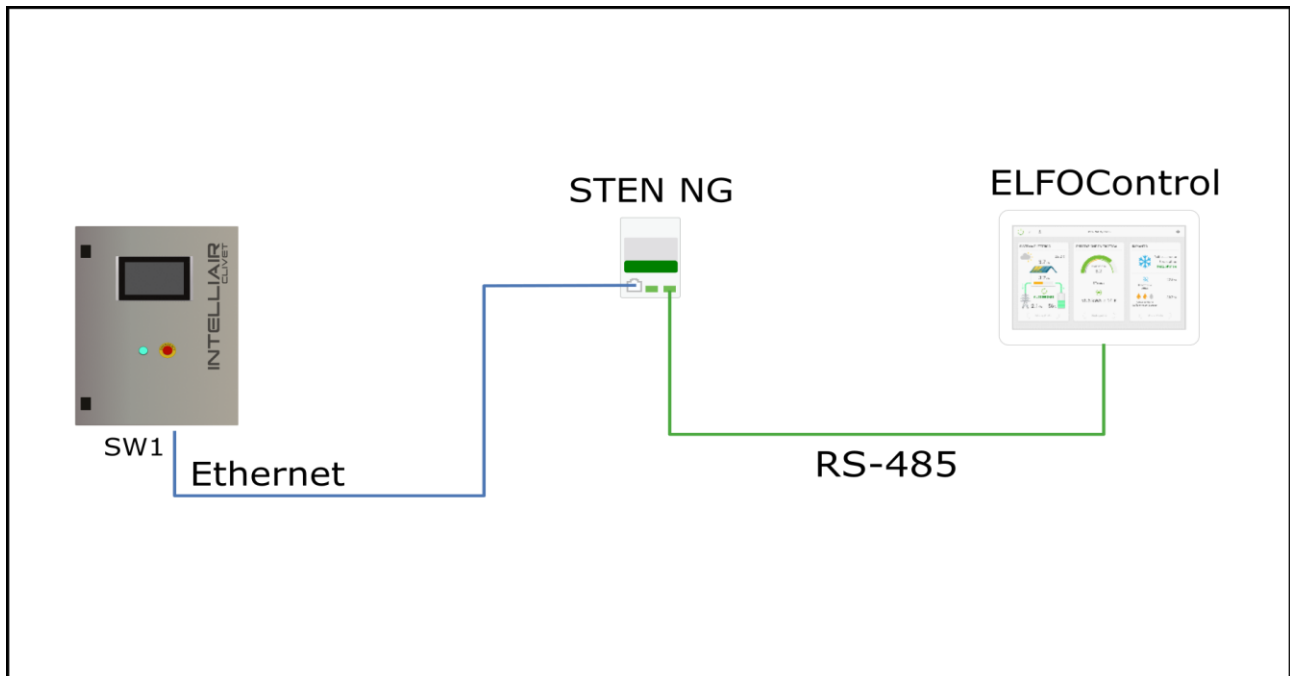
The connection between INTELLIAIR and ELFOControl involves connecting the two systems via a Modbus TCP-IP Ethernet network cable.

The cable must be connected to the **SW1** switch inside the INTELLIAIR control panel and in the **STEN NG** home automation connection module by ELFOControl.

Note: In the ELFOControl system, the following parameter must be set: 52 "Enable / time-out" enter as a value: **20** minutes.

See ELFOControl installation and user manual.

Principal wiring schematic between QEIR and ELFOControl:



FOR OVER 35 YEARS, WE HAVE BEEN OFFERING
SOLUTIONS TO ENSURE
SUSTAINABLE COMFORT AND THE
WELL-BEING OF PEOPLE AND THE ENVIRONMENT

www.clivet.com



CLIVET S.p.A.

Via Camp Lonc 25, Z.I. Villapaiera
32032 Feltre (BL) - Italy
Tel. +39 0439 3131 - Fax +39 0439 313300

info@clivet.it