



mBox submittal

Job_____

Designer_____

Contact_____

The mBox is a high-performance HVAC controller assembled with industrial-grade components, it is designed for high-end residential and light commercial applications. It is the main unit of the Massana Controls WHITE SERIES, our **modular control platform** that can be customized to manage the most complex hydronic systems with a focus on radiant cooling and heating applications. It is capable of controlling a variety of hydronic distribution terminals, either individually or in combination. These include ceiling panels, radiant floors, hydronic fan coils, baseboard convectors, radiators, towel warmers, and snow melt systems. It also features advanced proprietary logic to optimize indoor air quality (IAQ), control humidity, and provide natural enthalpy ventilation.

The mBox is designed for 2 or 4 pipe hydronic systems and can interface with third-party VRV/VRF systems (requires Modbus adapters and/or CoolMasterNet, not included), providing an integrated global solution for hydronic and refrigerant combined systems. It efficiently regulates home energy flow by modulating energy sources such as heat pumps, chillers, and boilers, optimizing comfort in multi-zone systems. It also controls buffer tank temperatures, uses smart proprietary technology to perform heating and cooling changeover based on actual conditions, activates circulator pumps, and regulates radiant fluid temperature through a 3-way mixing valve. In addition, it manages Messana Air Treatment Units (ATUs), ERV/HRV units for optimum Indoor Air Quality, and utilizes unique smart technology for optimized control of Domestic Hot Water (DHW) systems.

Based on the x86 architecture (Intel® Apollo Lake Celeron® J3455) and running on the Linux OS (Debian), the mBox integrates a programmable mControl I/O device designed in collaboration with Emerson. As the core of the Messana mControl platform, it serves as the web server, gateway, and communication module. Seamlessly integrated with the Messana web and mobile app (iOS and Android), the mBox provides a superior climate control platform (mControl) built on over 20 years of experience in hydronic radiant cooling and heating technology.

The mBox can also be paired with an optional 10.1" external wall-mounted touch panel (mDisplay) for a reliable wired connection for offline use.





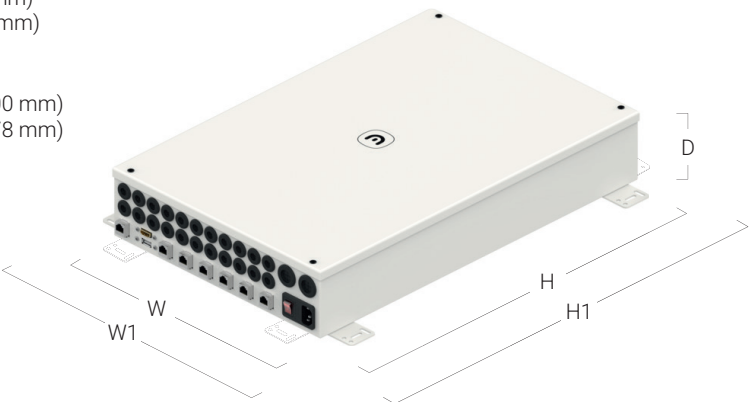
Main features

- Main control unit within the Massana Controls WHITE SERIES modular platform
- Controls hydronic systems with a focus on radiant cooling and heating applications
- Features industrial PC x86-based architecture and runs on Linux OS (Debian)
- Programmable mControl I/O device designed in collaboration with Emerson
- Push-in CAGE CLAMP® terminal blocks for quick and secured connections
- 6 Ethernet ports, 2 RS485 serial interface (Modbus communication)
- Offers Bluetooth® and Wi-Fi connectivity
- Allows remote Internet access through the Messana App and web interface

Technical specifications ¹

Size and weight

- Size
- W: 13 inches (330 mm)
 - H: 20 inches (508 mm)
 - D: 3 1/2 inches (89 mm)
- With brackets
- W1: 15 3/4 inches (400 mm)
 - H1: 22 3/4 inches (578 mm)



- Weight
- 15.2lb (6.9kg)

Casing

Mounting type	Wall mount (vertical only) with 4 brackets ²
Protection grade	NEMA 13 (IP54)
Color and finish	Warm white sablé metal enclosure
Installation	Indoor installation only

Environmental requirements

Operating ambient temperature	36° to 110°F (2° to 43°C)
Relative humidity (indoor use only)	<90%, non-condensing

Optional

External touch monitor (mDisplay)	10.1" WXGA Touch Panel
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Notes

- Size, weights, and technical characteristics may vary without prior notice.
- The 4 brackets can be mounted on each corner either vertically or horizontally.



Technical specifications ¹

Inputs ²

Analog Inputs (AI)

Temperature probes (Supply/Return temp for fluid or air)

Resolution 10-bit A/D converter

NTC 10k Ω @25°C Beta 3435 6 (AI NTC S/R/3/4/5/6)

Digital Inputs (DI) ³

Presence or window sensors, H/C changeover, alarms, On/Off

Dry contact 1 (DI1)

Additional ² dry contact 10 (DI2-DI11)

Outputs ²

Digital Outputs (DO) ⁴

Thermal actuators, zone valves, pumps, actuators, air units

Dry contacts (with shared commons) ⁵ 4 (DO1-DO4)

Dry contacts (with miniature plug-in relays) ^{6,7} 2 (DO5-DO6)

120/240VAC 50-60Hz wet contacts for pumps (max 6 A)
(with miniature/plug-in relays) ^{6,8} 2 (DO7-DO8 PWR)

Analog Outputs (AO) ⁹

Mixing valves, servo motors, actuators, fan-coils

Resolution/Accuracy 8 bit converter (2%)

2-10V with 24VDC power supply for mix valve actuators 2 (AO1-AO2 MIX / 24V/0V/Y)

Programmable AO (0-10V default) 2 (AO3-4 AUX / 0V/Y)

CPU

x86-based architecture (Intel® Apollo Lake Celeron® J3455), 4GB Ram, 64GB Flash

Zone Bus

RS485 master with shield and 24VDC power Up to 12 mSense max 300ft
(Zone Bus SHD/24V/0V/D+/D-)

ATU Bus ¹⁰

RS485 master Up to 15 devices
(ATU Bus A+/B-)

WAN port

Internet connection (connect to home router LAN port) 1 (RJ-45)

LAN ports

Private local network **172.16.0.x** for Messina devices 6 (RJ-45)

Communications

6 LAN ports to connect with mZone modules, mTouch(es),
CoolMasterNet, and additional Ethernet or PoE switches Ethernet (Modbus TCP)

Room sensors (mSense) RS485 Zone Bus (Modbus RTU)

mZone modules, room sensors (mSense), outdoor sensors
(Belimo), Messina ATUs, and other Modbus devices RS485 ATU Bus (Modbus RTU)

Ports and connectivity

USB (for mDisplay connection)

HDMI (for mDisplay connection)

Wi-Fi (802.11ax Wi-Fi 6 wireless networking IEEE 802.11a/b/g/n/ac compatible) (100ft range)

Bluetooth® for initial configuration and nearby device control through the Messina App (10ft range)

Internal Power Supply

Equipped with dual power supply modules:
24VDC (rated 92W / 3.83A) and 12VDC (Rated 24W / 2A) 3 + 0.88 A @115V or 1.6 +0.48 A @230V
(AC current input of the two power supply modules)

Input Voltage Required

Equipped with 10A power socket IEC320 C14 with 10A fuse 120/240VAC 50-60 Hz (10 A)

Max output Available

To 120/240VAC equipment connected to the DO7-DO8 (PWR) 6 A (720W@120V or 1,440W@240V)

To 24VDC external devices (actuators, fan coils, etc) 2.5 A (60W)

Notes

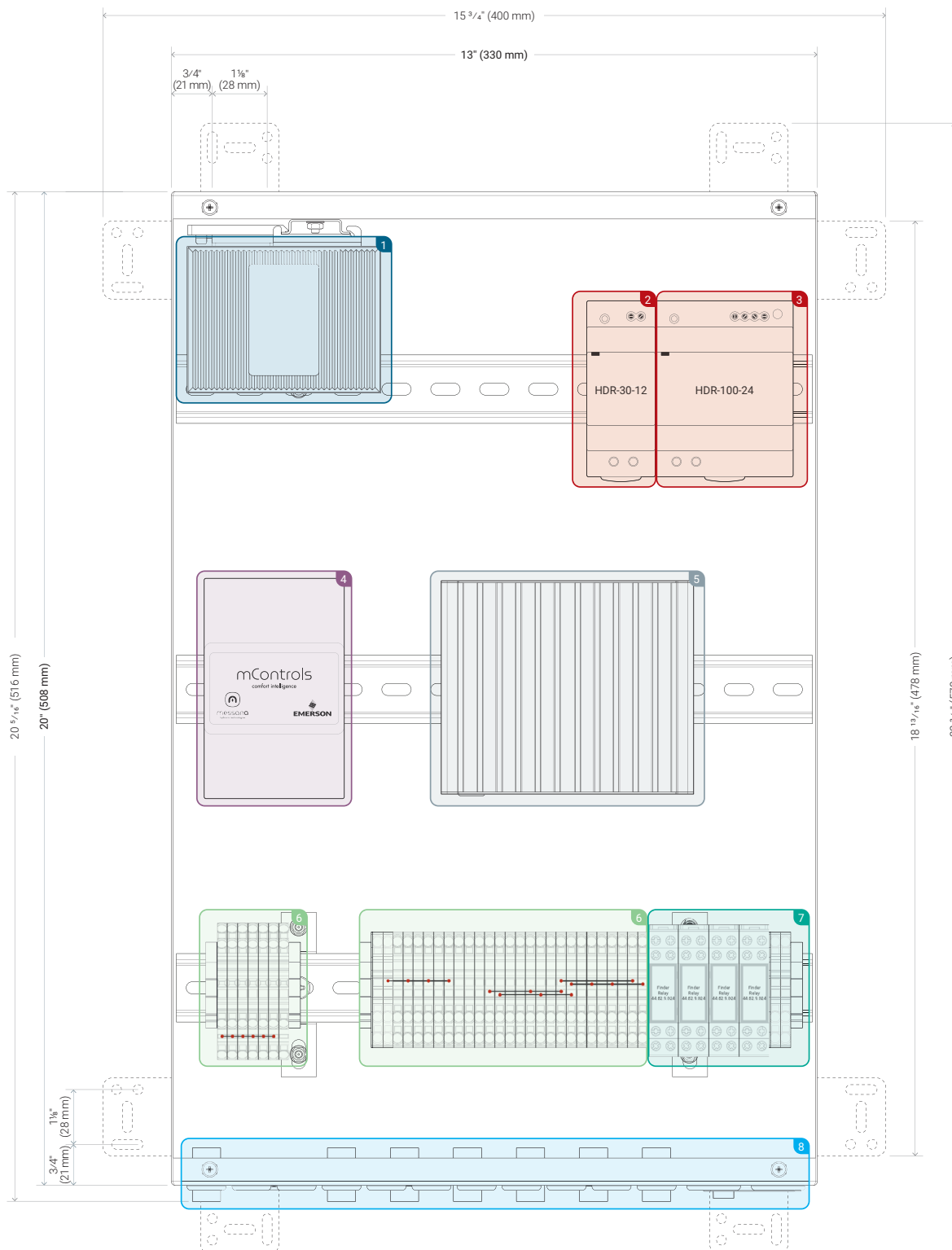
- Size, weights, and technical characteristics may vary without prior notice.
- All I/O connections are rail-mounted terminal blocks with Push-in CAGE CLAMP® (with exception of the 4 power relays DO5-DO8 and the additional DI2-DI11 located on the embedded mControl I/O device that needs to be wired directly on the controller).
- Digital Inputs are opto-insulated and are dry contacts.
- Digital Outputs DO1-DO8 are normally open dry contacts (max 250V/1Amp per DO) of the embedded mControl I/O device. They are grouped by 4 with shared commons: DO1-DO4 and DO5-DO8. DO1-DO4 are general use dry contacts, while DO5-DO8 digital outputs are used to control the 24VDC coils of four miniature relays labeled DO5-DO6 (DRY CONTACT) and DO7-DO8 (PWR).
- If one of the dry contacts is connected to a hot wire (e.g. 24VAC), all 4 contacts will be exposed to the same voltage through the commons.
- Finder 44.52.9.024 miniature plug-in industrial relays (included) rated 250VAC/6A (max 400VAC/10A).
- Can be reconfigured as 24VDC or 120/240VAC wet contacts.
- Relay socket pre-wired with 120/240VAC with both L and N on the commons of a dual pole relay. Voltage depends on the AC power supplied. Max amperage available to DO7-DO8 (PWR) is 6 A total. Relays can also be reconfigured as 24VDC wet contacts or dry contacts.
- Analog Outputs are opto-insulated and can be programmed as 0-10V or 2-10V.
- RS485 polarity labels may vary between manufacturers. According to the RS485 standard, the two terminals are labeled as 'A' for negative and 'B' for positive. However, many manufacturers, including Messina, use 'A+' and 'B-' instead. Some other manufacturers may label the Modbus terminals as 'A' and 'B' but reverse the polarity, intending 'A' as positive.



Components and 2D footprint

Legend

- | | |
|------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| 1 8-port industrial Ethernet switch | 5 Fanless industrial mini PC x86 Linux |
| 2 A/C Power Supply 12VDC HDR-30-12 (dedicated to mini PC) | 6 I/O contacts (DIN rail-mount terminal blocks with Push-in CAGE CLAMP®) |
| 3 A/C Power Supply 24VDC HDR-100-24 (60W for external devices) | 7 4 power relays (DIN rail-mount sockets) with GND terminals |
| 4 Messana mControl I/O device (Emerson iProGENIUS code:IPG208D) | 8 Front connection ports and cable pass through rubber grommets |

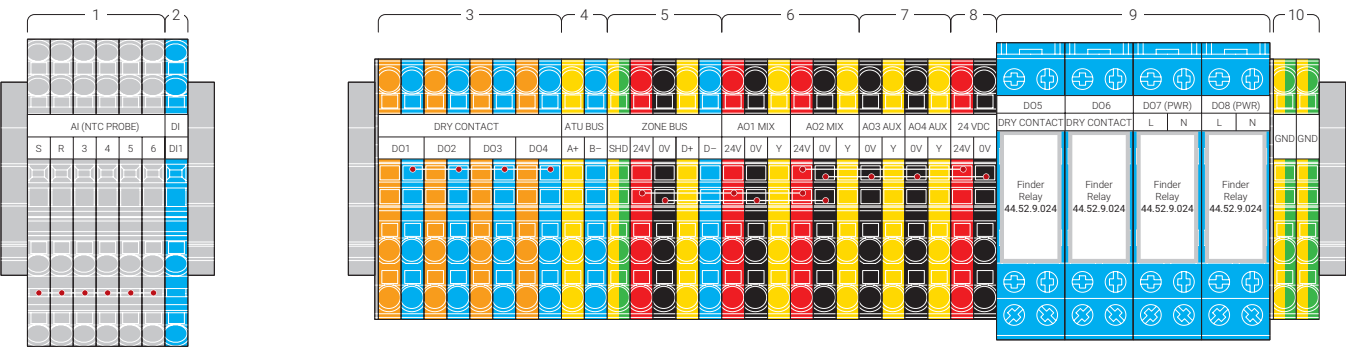




I/O contacts (DIN rail-mount terminal blocks with Push-in CAGE CLAMP®)

Legend

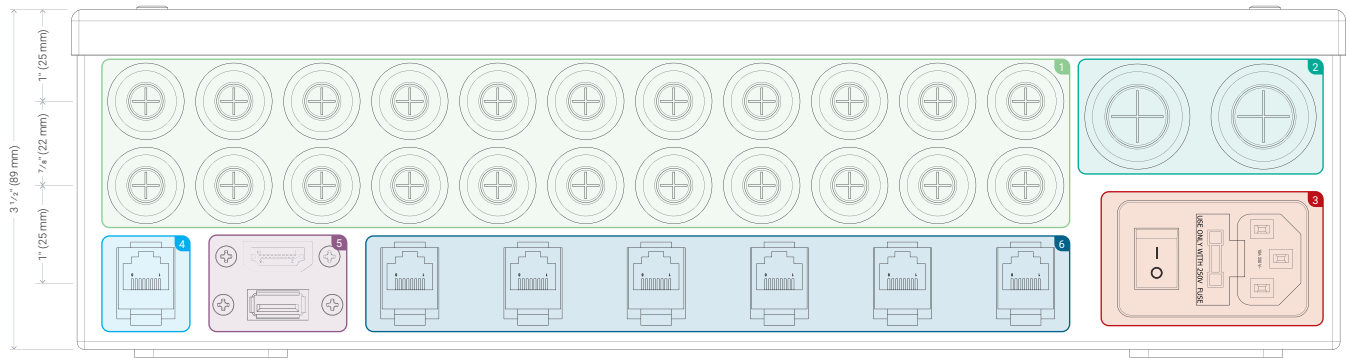
- 1** 6 Analog Inputs (AI) for NTC temperature probes
- 2** 1 Digital Input (DI)
- 3** 4 Digital Outputs (DO) Dry Contact with shared commons
- 4** RS485 ATU bus for air units and other Modbus devices
- 5** RS485 Zone bus with 24VDC power terminals for mSense and shield
- 6** 2 Analog Outputs (AO) with 24VDC power terminals for mix valves actuators
- 7** 2 Analog Outputs (AO) for 0-10V (or 2-10V) modulation
- 8** 24VDC service power terminals (60W max)
- 9** 4 Power Relays, 2 dry contacts and 2 120/240VAC wet contacts
- 10** Ground terminals to use with Power Relays



Front connections

Legend

- 1** 22 Cable pass through rubber grommets for low voltage connections (9mm)
- 2** 2 Cable pass through rubber grommets for high voltage connections (16mm)
- 3** Inlet male power socket with switch and fuse holder (IEC320 C14)
- 4** Wan Internet connection
- 5** HDMI and USB ports
- 6** LAN 1-6 Ethernet ports





Wiring diagram

Legend

AWG16 cables

Green/Yellow	GND
Black ¹	(L) line
White	(N) Neutral
Black ¹	0VDC
Red	24VDC

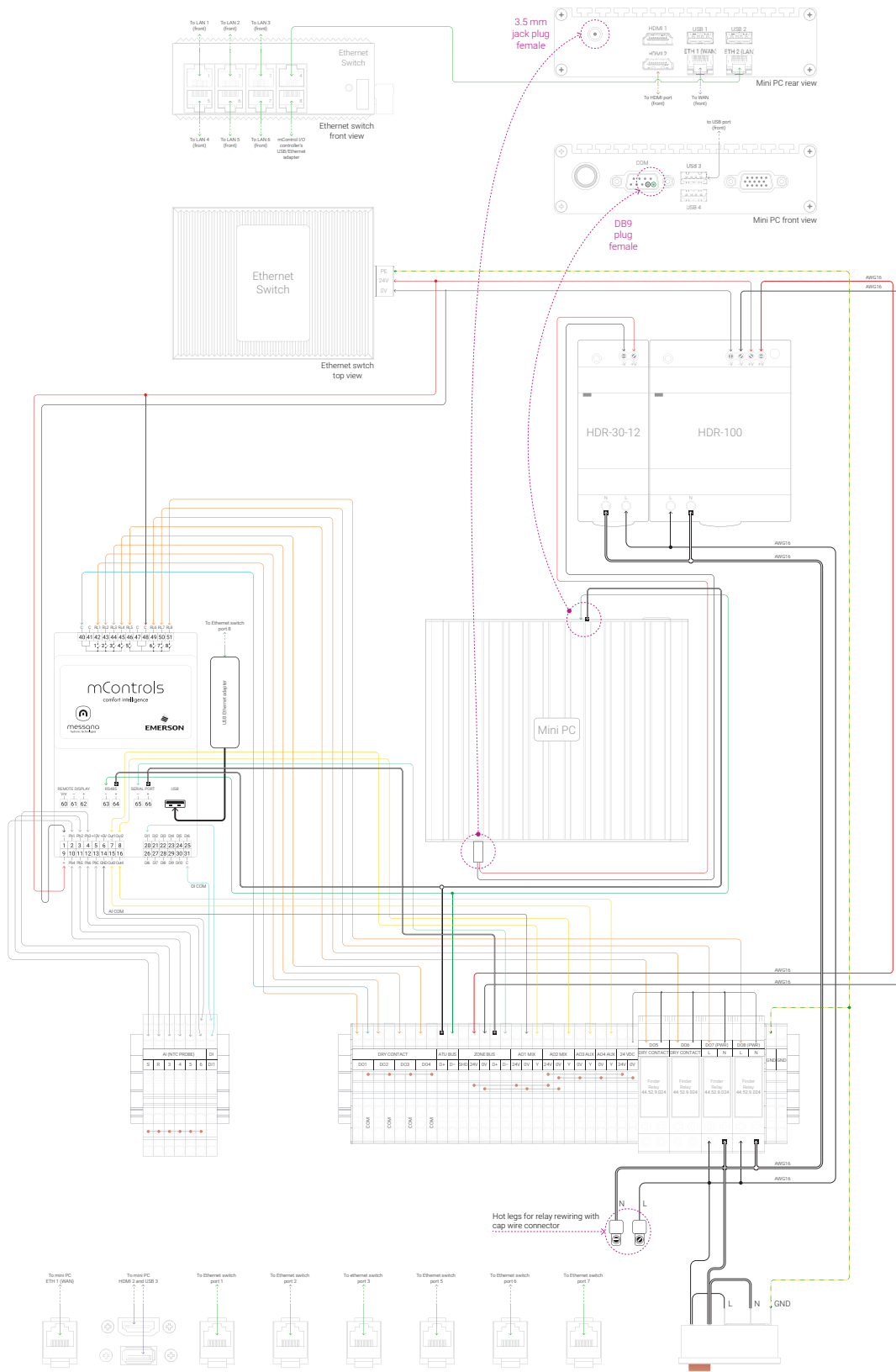
AWG22 cables

Black	0VDC
Red	24VDC
Blue	Digital Input
Blue	Digital Output Com
Orange	Digital Output
Grey	Analog Input
Yellow	Analog Output
Green	RS485 D-
White	RS485 D+

Other cables

Green	Ethernet	CAT 5E UTP
Brown	HDMI	
Violet	USB	

1. Black cable AWG16 is used for both: (L) line (120/240VAC) and 0V for the 24VDC line.





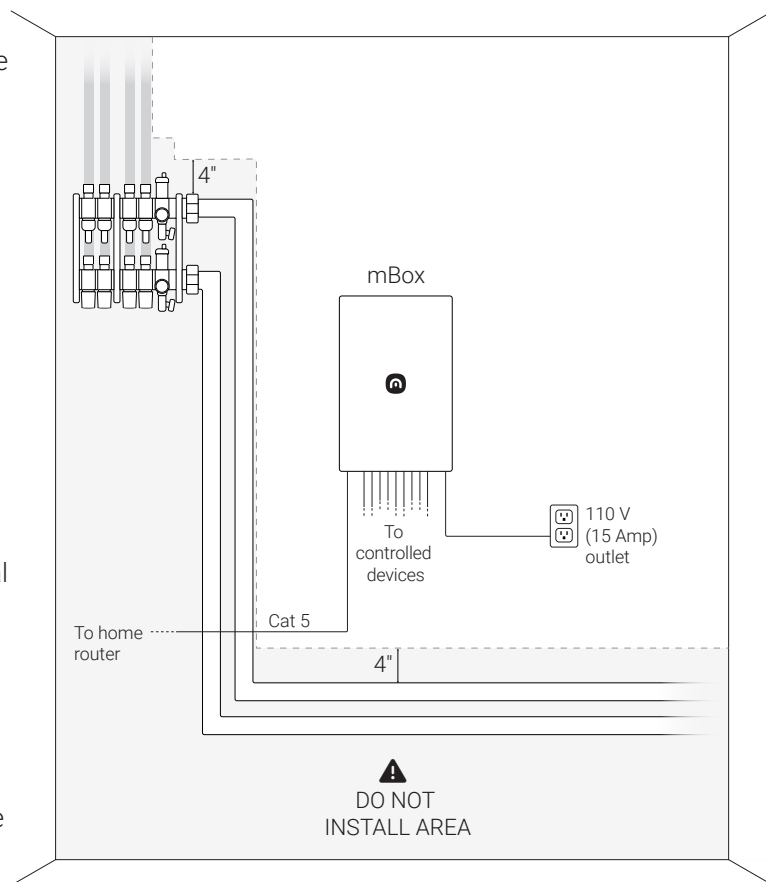
Installation guidelines and clearances

When selecting the location for the mBox module, it is important to consider the following guidelines:

1. Choose an **indoor** location with temperature ranging from 36°F (2°C) to 110°F (43°C) and relative humidity of less than 90% (non-condensing).
2. Maintain a minimum distance of 4 inches above pipes or finished floor to ensure proper ventilation and accessibility for maintenance.
3. Avoid installing the module below manifolds or condensing pipes to prevent potential leakage onto the control unit.
4. Keep the module away from sources of electrical interference.
5. Ensure easy access to the module for wiring and servicing.
6. Provide an independent 120 V (15 Amp) electrical outlet for power supply.
7. Always install the mBox vertically for proper internal ventilation.

i The mBox module requires a wired connection to the home router, using a Cat 5 Ethernet cable.

⚠ We strongly recommend the use of surge protection for the mBox module's connection to the 120V power line. This precaution helps protect the internal miniPC from potential power outages.



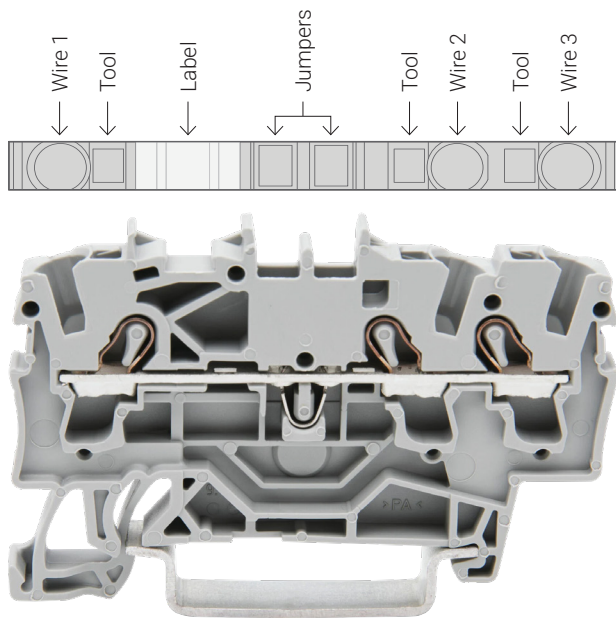
Please note that these guidelines should be followed to ensure proper installation and optimal performance of the mBox module.



WAGO Terminal Block with Push-in CAGE CLAMP® connection technology

The Push-in CAGE CLAMP® connection technology allows for easy end reliable wiring to the mBox terminals. All the terminal blocks on the mBox are 3-wire connectors as shown below (with the exception of the AI and DI terminals).

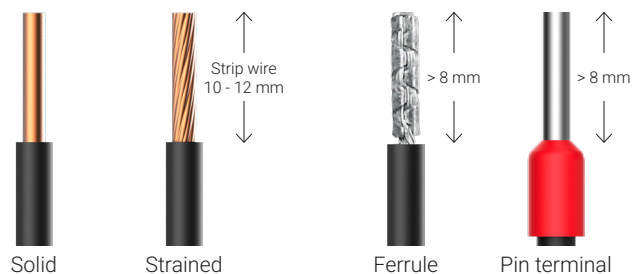
i Bad connections are the source of almost half of all system failures!



The CAGE CLAMP connection is suitable for

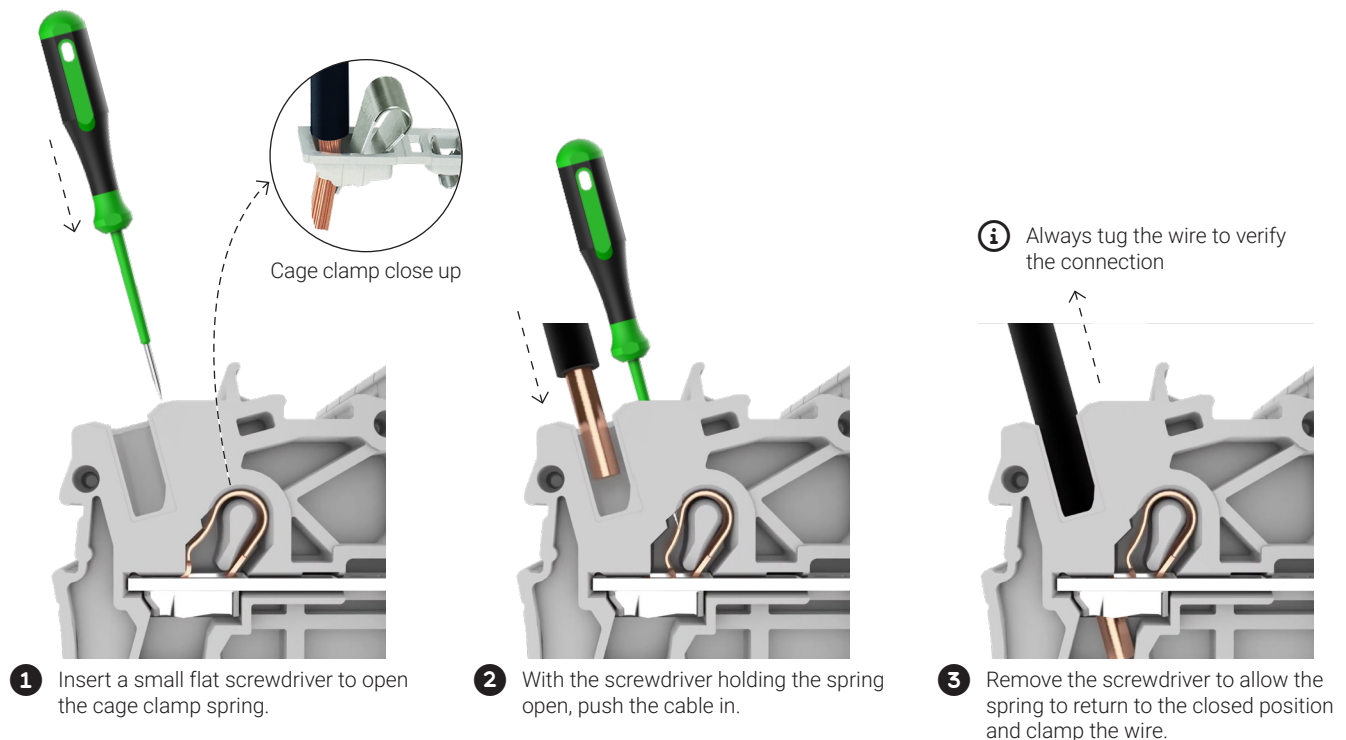
Solid and stranded conductors

Ferrule and pin terminals



Wire size range: AWG 24-12 (0.25 - 4 mm²)
Strip length: 0.39 - 0.47 inches (10 - 12 mm)
Pin terminal length: 0.31 - 0.47 inches (8 - 12 mm)

Wiring as easy as 1 - 2 - 3 even in the most challenging job site conditions

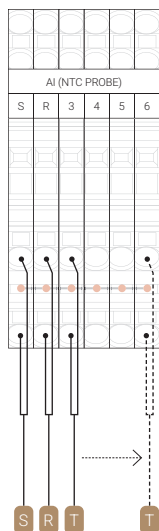




Input / Output contacts

AI (NTC PROBE) (S / R / 3 / 4 / 5 / 6)

Analog Inputs for temperature probes (NTC 10kΩ@25°C Beta 3435).



AI NTC (SUPPLY / RETURN) are dedicated to NTC probes to measure supply and return temperatures of the radiant fluid.

S S terminals are used for **supply** fluid NTC temperature probes.

R R terminals are used for **return** fluid NTC temperature probes.

! The NTC supply thermistors must be installed after the circulator pump.

AI NTC (3, 4, 5 and 6) are general purpose additional analog inputs preprogrammed as NTC to measure other temperatures (buffer tanks, energy sources supply, DHW tank, etc.).

T AI terminals are used for NTC temperature probes.

! Do not use PT1000 temperature probes. Only use 10kΩ@25°C Beta 3435 NTC thermistors provided by Messana.

DI (DI1 + additional DI02-DI11)

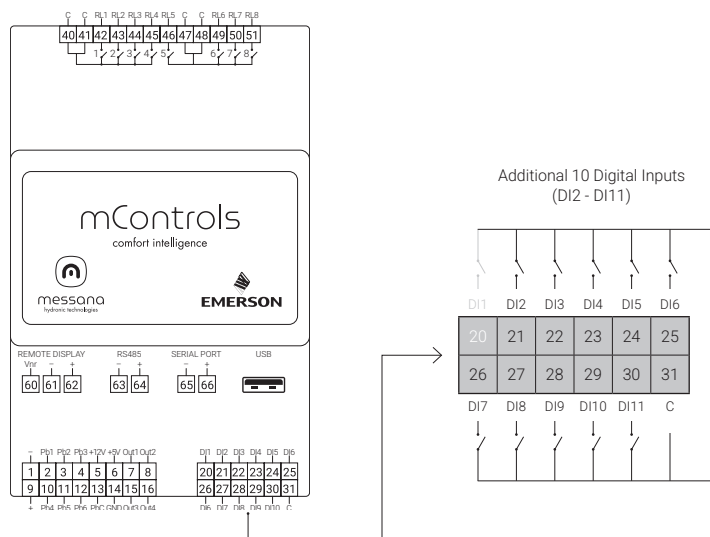
Digital Inputs (DI) are opto-insulated dry contacts. DI are used to communicate the status of external devices to the mBox module.

DI can be programmed to be triggered by normally open (NO) or normally closed (NC) external contacts. By default a DI is preset to work with a NO contact. In case of an event, an external contact is closed and acknowledged by the DI.



DI1 is a dry contact digital input for external devices (alarm system, fire alarm, window sensor, presence sensor, etc.). It can also be used with an external switch to select the system mode between heating and cooling or to force the system ON and OFF.

i mBox offers one digital input, DI1, pre-wired on the terminal blocks on the DIN bar. Additional 10 Digital Inputs (DI2-DI11) are available directly on the embedded mControl I/O device and need to be wired directly to the push-in connectors located on the controller.



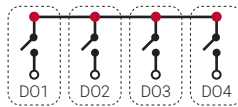
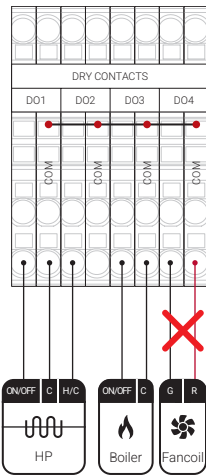
i Pin 31 C is already wired on the terminal block.



Input / Output contacts

DO DRY CONTACTS WITH SHARED COMMONS (D01-D04)

mBox features four Digital Outputs (D01-D04) with voltage-free terminals to activate external devices such as boilers, chillers, heat pumps, circulator pumps (with digital input control), fan coils, actuators, and other devices. D01-D04 are normally open (NO) dry contacts with shared common terminals. Each contact supports max 250V/1Amp.



! D01-D04 are dry contacts with commons connected together (shared commons). If one of the dry contacts is connected to a hot wire (e.g. 24VAC), all four contacts will be exposed to the same voltage through the commons.

i Do not unplug the connection between commons. They are directly connected together in the mControl I/O device.

X Do not connect devices that induce a voltage to the D01-D04 dry contacts. This could damage the control board of other devices that require voltage-free contacts only.

C Common voltage-free
R 24VAC

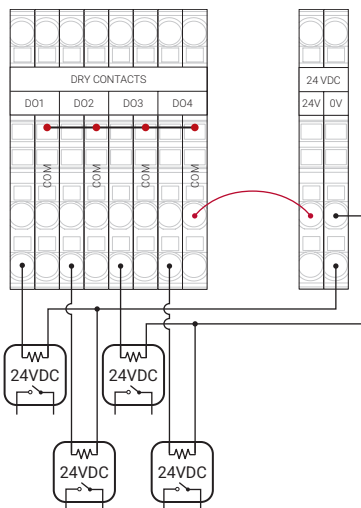
G Fan relay
Y Cooling relay

Use of 24VDC external relays

When controlling different devices it is recommended to use external 24VDC relays directly powered through the 24VDC power terminals.

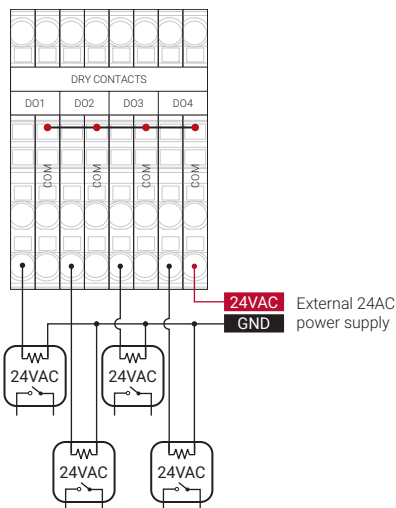


Recommended.



Use of 24VAC external relays

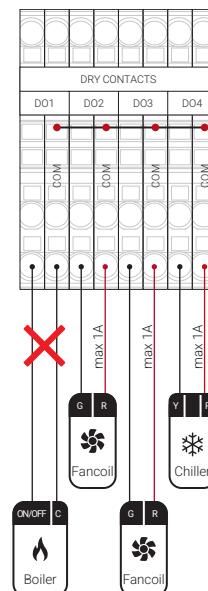
A valid alternative to 24VDC relays is to use external relays with a 24VAC coil. Must be powered by an external 24VAC power supply.



Activation of 24VAC devices

To activate 24VAC devices (e.g. fan coils, chiller), apply the R (24VAC) to the common terminals.

X Do not connect devices that require voltage-free contacts only.

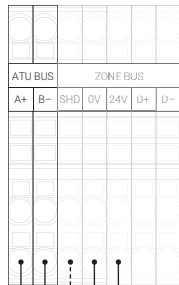




Input / Output contacts

ATU BUS (A+, B-) ¹

ATU Bus is a RS485 bus used to communicate with Messana Air Treatment Units and other third-party Modbus units (up to 15 devices).



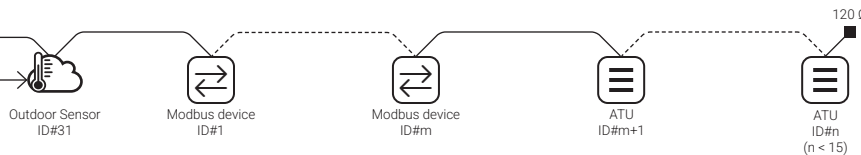
A+ and B- are the signal bus terminals. These two signals, along with a shield SHD (often referred to as GND) for reference, are the serial bus. The mBox act as a master and the other Modbus units are slaves. To achieve bi-directional communications, the bus is shared between transmitting and receiving. Polarity between the D+ and D- signals must be respected.¹

SHD (from the ZONE BUS) terminal must be connected to the shield of the serial bus cable (for foil shielded cable, use the shield drain wire) to provide shielding against induced noise. The shield must be connected at one end only.

⚠ Without the SHD connection, reliability of the protocol might be significantly degraded. Always connect the shield drain wire to the SHD only on the mBox side to avoid ground loops. Do not connect the shield on any other Modbus device to GND (or SHD). Make sure the continuity is maintained on each split connection on the bus by twisting together the shield drain wires of the two shielded cables.

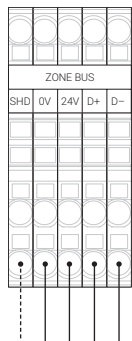
0V 24V (from the ZONE BUS) are 24VDC terminals that can be used to provide power to the outdoor sensor.

i Max 15 Modbus devices including the outdoor temperature and humidity sensor (Modbus ID#31). The last unit(s) on the bus must be terminated with a resistor of 120 Ω (not provided).



ZONE BUS (SHD, 0V, 24V, D+, D-)

Zone Bus is a RS485 bus used to communicate with mSense² room comfort sensors (up to 12 on each Zone Bus) over Modbus RTU protocol. In typical installations the mSense sensors are connected directly to the mZone module.



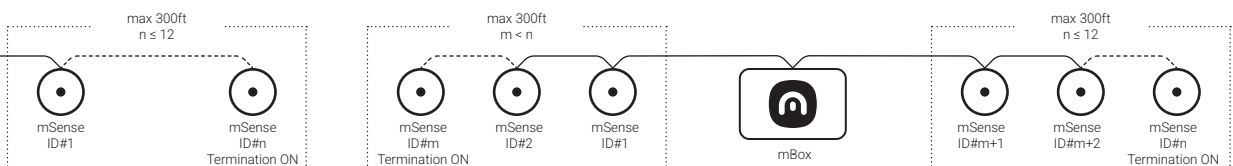
SHD terminal must be connected to the shield of the serial bus cable (for foil shielded cable, use the shield drain wire) to provide shielding from induced noise. The shield must be connected at one end only to avoid ground loops.

⚠ Without SHD connection, reliability of the protocol can be significantly degraded. Always connect the shield drain wire to the mBox SHD terminal and make sure the continuity is maintained on each mSense split connection by twisting together the shield drain wires of the two shielded cables.

0V and 24V terminals are used to supply 24VDC power to the mSense sensors attached on the bus. Up to 12 sensors can be installed with max 300ft of wire.²

D+ and D- are the signal bus terminals. These two signals, along with the shield (SHD), are the mSense serial bus. The mBox acts as a master and the mSense sensors are slaves. To achieve bi-directional communications, the bus is shared between transmitting and receiving. Polarity between the signals D+ and D-, must be respected.¹

i The last sensor(s) on the bus must be terminated by setting the dip-switch ID#9 to ON. The mBox module can also be installed in the middle of the bus with two different terminated branches.



Notes

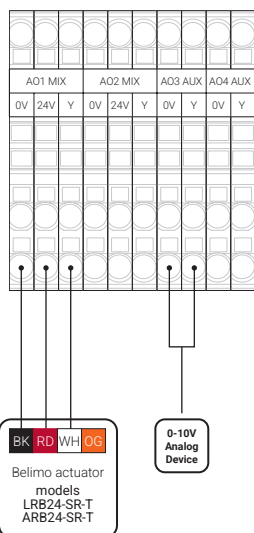
- RS485 polarity labels may vary between manufacturers. According to the RS485 standard, the two terminals are labeled as 'A' for negative and 'B' for positive. However, many manufacturers, including Messana, use 'A+' and 'B-' instead. Some other manufacturers may label the Modbus terminals as 'A' and 'B' but reverse the polarity, intending 'A' as positive.
- For more details on the mSense refer to the submittal on www.messana.tech website.
- Use Messana mWire or equivalent 18 AWG 2 conductors + 22 AWG shielded twisted pair (aluminum foil with drain wire). The shield must be continuous on each split and connect to ground at only one end to avoid ground loops. Always connect it to the SHD terminal on the mBox.



Input / Output contacts

AO1 MIX (0V, 24V, Y), AO2 MIX (0V, 24V, Y), AO3 AUX, AO4 AUX

0-10V or 2-10V programmable opto-insulated analog outputs for controlling motorized mixing valves, servo motors, actuators, fan-coils, and other analog devices.



AO1 MIX and AO2 MIX are typically used to control motorized proportional mixing valves to adjust the radiant fluid temperature.

0V, 24V are the terminals to supply power to the valve actuator.

Y is the 2-10V (or 0-10V) terminal to control the position of the valve.

i Y can be programmed as a 0-10V or 2-10V analog output. AO MIX default value is 2-10V.



Messana suggests the use of the Belimo B3 series 3-Way mixing valves with 2-10V proportional control actuators: **LRB24-SR-T** (B307-B325 valves) and **ARB24-SR-T** (B329-B352 valves).

AO3 AUX and AO4 AUX are two general purpose analog outputs.

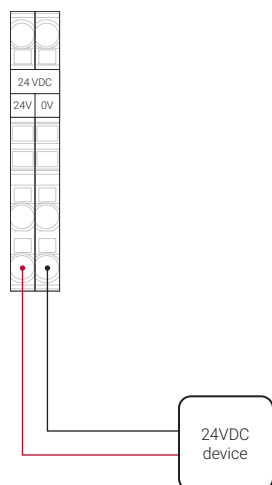
0V, Y are the 0-10V (or 2-10V) signal terminals to control analog devices (servo motors, actuators, fan-coils, etc.).

i Y can be programmed as a 0-10V or 2-10V analog output. AO AUX default value is 0-10V.

Power terminals

24VDC power terminals (max 60W, 2.5 Amps)

To supply 24VDC to other external devices such as thermal actuators, valve actuators (mixing, diverting, pressure independent and On/Off valves), damper actuators, fan-coils (Jaga), relays, etc.



0V/24V 24VDC terminals.

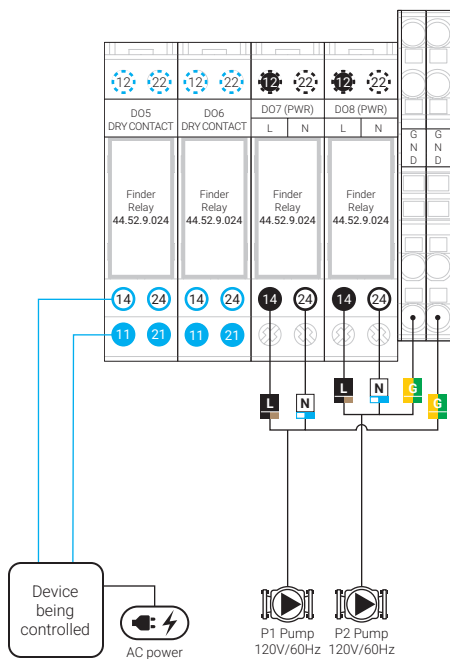
⚠ The maximum power available to external 24VDC devices powered through the mBox 24VDC terminals is **60W (2.5 Amps)**.



Power relays

DO5-DO6 (DRY CONTACTS), DO7-DO8 (PWR)

Reconfigurable digital outputs with power relays.



Digital Outputs DO5-DO8 are normally open dry contacts of the embedded mControl I/O device used to activate the 24VDC coils of four relay sockets installed on the DIN rail labeled DO5-DO6 (DRY CONTACT) and DO7-DO8 (PWR). On each socket is mounted a Finder 44.52.9.024 miniature plug-in industrial relay rated 250VAC/6A (max 400VAC/10A).

DO5 and **DO6** are pre-wired as dry contacts. Use the 11 as common and 14 as normally open contact (or 12 as normally closed). These contacts are voltage-free.

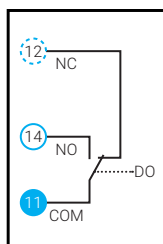
- i** Double pole dry contact relay¹
If a double pole relay is required (in addition to the left pole of the relay, terminals 11 - 14/12), use 21 as common and 24 as normally open terminal (or 22 as normally closed) for an additional pole. The two poles (11 - 14/12 and 21 - 24/22) are electrically isolated but are activated at the same time by the digital outputs DO5 or DO6.

DO7 (PWR) and **DO8 (PWR)** are pre-wired as high voltage (120VAC or 240VAC, depending on the mBox AC power supply) wet contacts with both legs connected to the commons, 11 (L) and 21 (N), of a dual pole relay to directly power circulator pumps or other high voltage devices. Use the 14 (L) and 24 (N) terminals as normally open contacts or 12 (L) and 22 (N) as normally closed contacts.

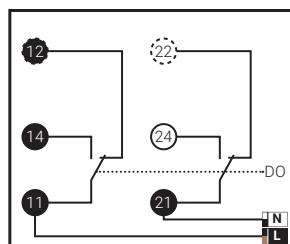
- !** Any high voltage device connected to the power relays DO7-DO8 (PWR) will be supplied directly through the mBox AC main power supply and will be protected by the internal fuse (10 Amps). 4 Amps are dedicated to the mBox internal modules and the 24VDC external devices and the remaining **6 Amps** are available for the power relays DO7-DO8 (PWR). The nominal power available for external devices (pumps etc.) through the power relays DO7-DO8 (PWR) is **720W** at 120VAC (or 1,440W at 240VAC).
- i** If the high voltage external devices (pumps etc.) total absorption is over the 6 Amps limit, we recommend using 24VDC external relays.
- i** Power relays are rated 250VAC/6A.

Relay configurations

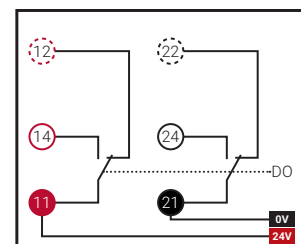
Dry contact



120/240VAC dual pole contact



24VDC dual pole contact



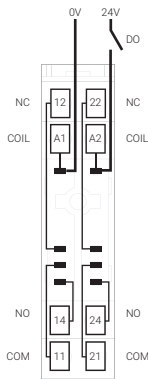
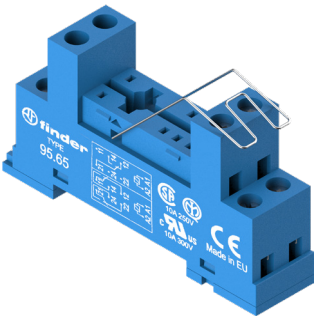
Notes

1. Refer to the section "Double-pole dry contact relay" for more details.



Relay sockets and miniature plug-in relays

Relay socket

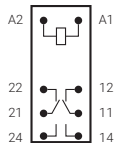
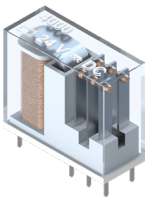


Relay socket pinout
(top view)

The Power Relays D05-D08 of the mBox are wired on 4 relay sockets to favor the replacements of the plug-in industrial miniature relays.

The digital outputs D05-D08 of the mControl I/O device are pre-wired to activate the 24VDC coils (A1 and A2) of the miniature relays installed on the sockets.

Miniature plug-in relay



Relay pinout diagram
(bottom view)

Model: **Finder 44.52.9.024**
Coil voltage: **24VDC**
Rated voltage/max: **250/400 VAC**
Rated current/max: **6A/10A**

Four Finder miniature relay model **44.52.9.024** are pre-installed in the relay sockets. Each miniature relay features two separate poles:

1. COM 11 - NO 14 (or NC 12)
2. COM 21 - NO 24 (or NC 22)

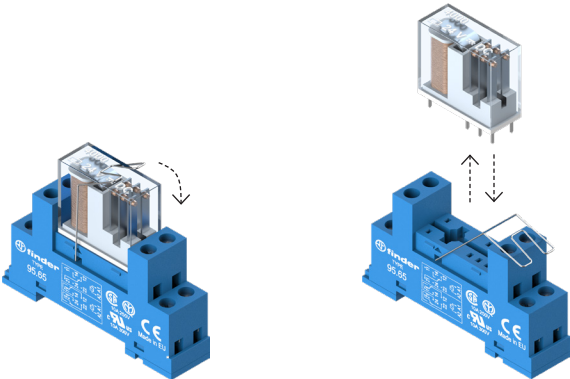
The two poles are electrically insulated and can be used as a double-pole switch. ¹

i To use the digital outputs D05-D08 make sure a miniature relay is inserted in the relay socket and secured by pulling-up the retaining clip.

Replacement of the plug-in miniature relay

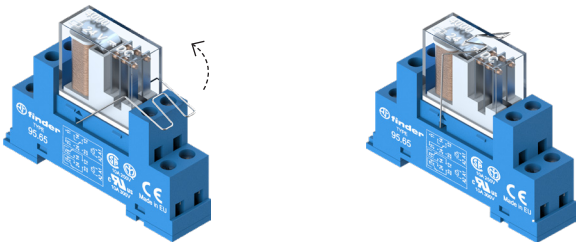
Miniature relays can be easily replaced following these steps.

i Use only Finder miniature plug-in relay model **44.52.9.024**.



1 Rotate the retaining clip to unlock the relay

2 Remove and replace the relay



3 Rotate the retaining clip back to lock the relay

4 Secured relay

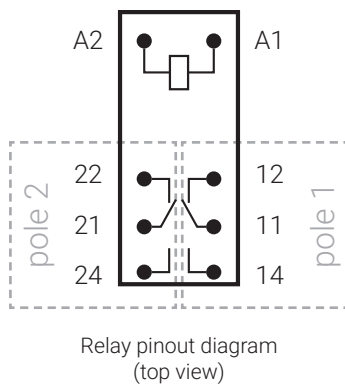
Notes.

1. Refer to the section "Double-pole dry contact relay" for more details.



Double-pole dry contact relay

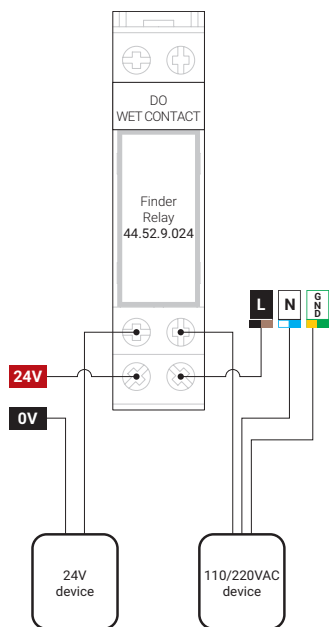
The Finder relay features two columns of terminals, **COM 11, NC 12, NO 14** (pole 1) and **COM 21, NC 22, NO 24** (pole 2) equivalent to two single-pole relays actuated by a single coil 24VDC (**A1, A2**).



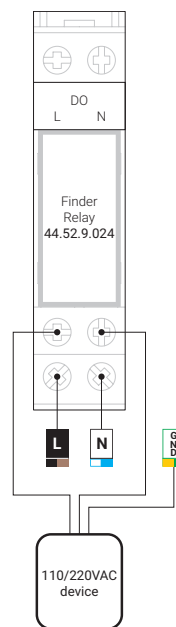
The two poles are electrically insulated and activated by the same digital output.

Examples of usage:

Two different voltages



Line (L) and neutral (N) interruption





Rewiring DO5 and/or DO6 from dry contacts to 24VDC wet contacts

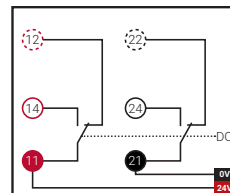
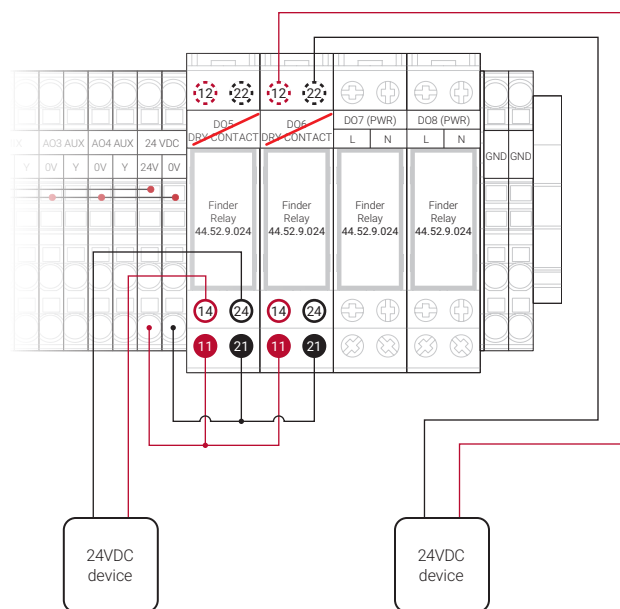
mBox features two digital outputs (DO5 and DO6) for general purpose that are pre-wired to control the coil (24VDC) of two miniature relays to be use as dry contacts (Finder relays model 44.52.9.024 included).

When needed, dry contacts DO5 and/or DO6 can be rewired as 24VDC wet contact(s) by following the instruction below.

⚠ Disconnect power before proceeding. When completed, cross off the “DRY CONTACT” label to avoid future errors.

24VDC wet contacts

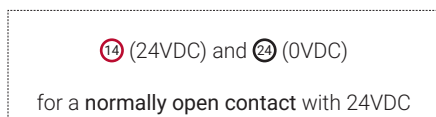
24VDC supplied by the mBox A/C Power Supply 24V (max 60W available).



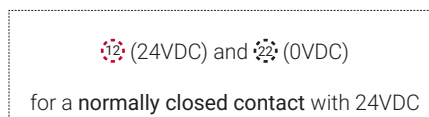
⚠ The maximum power available to all external 24VDC devices powered through the mBox 24VDC terminals is **60W (2.5 Amps)**. This includes thermal actuators, valve actuators (mixing, diverting, pressure independent and On/Off valves), damper actuators, fan-coils (Jaga), relays, etc.

Connect 24VDC from the adjacent terminal blocks (24V and 0) to the COM **11** (24VDC) and COM **21** (0VDC) on the DO5 and/or DO6 relay socket(s).

To control a 24VDC device use the terminals:



or



i To use these contacts, makes sure a Finder miniature relay model 44.52.9.024 is installed into the relay socket.



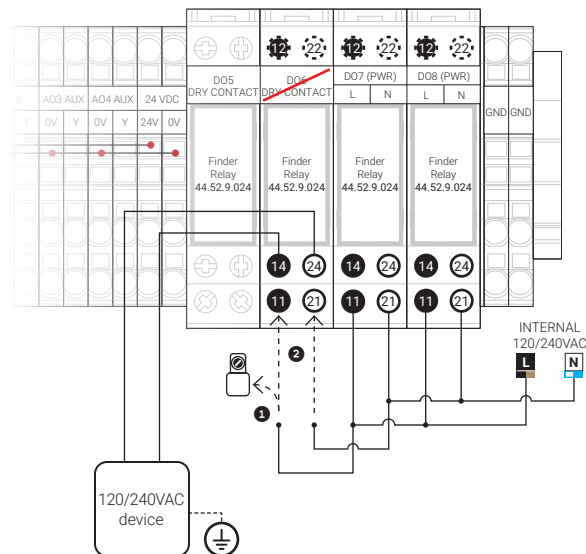
Rewiring DO5 and/or DO6 from dry contacts to 120/240VAC¹ wet contacts

The mBox features two digital outputs (DO5 and DO6) for general purpose that are pre-wired to control the coil (24VDC) of two miniature relays to be use as dry contacts (Finder relays model 44.52.9.024, included).

When needed, dry contacts DO5 and/or DO6 can be rewired as high voltage 120/240VAC¹ wet contact(s) by following the instructions below.

⚠ Disconnect power before proceeding. When completed, cross off the “DRY CONTACT” label to avoid future errors.

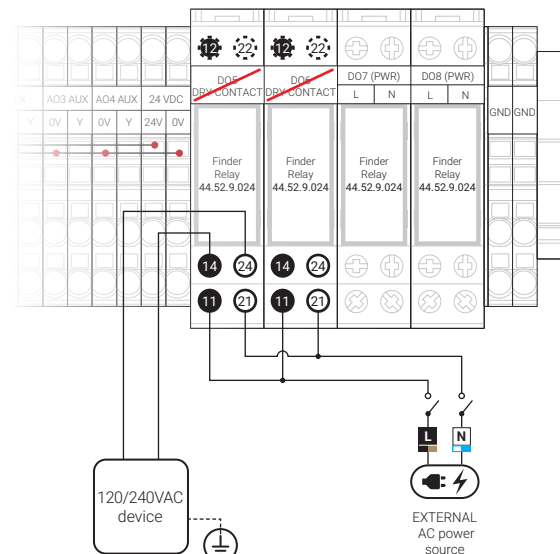
DO6 rewired as 120/240VAC wet contacts INTERNAL 120/240VAC power supply¹ (10A Fuse)



1. Remove the cap wire connectors from the spare (L) and (N) legs
2. Connect them to the COM 11 (L) and the COM 21 (N), as shown on the electric schematic above. These (L) and (N) legs are protected by the internal 10A fuse located in the inlet power socket.

⚠ Max 6 Amps in total for all power relays (DO6, DO7 and DO8).

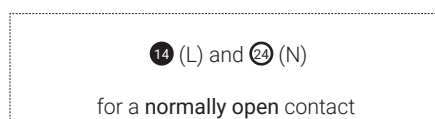
DO5 and DO6 rewired as (120/240VAC) wet contacts EXTERNAL AC power source



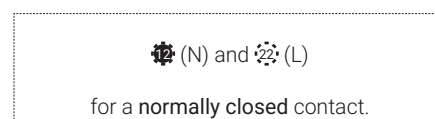
Connect an additional AC power circuit to the COM 11 (L) and COM 21 (N) of both the DO5 and DO6 relay socket(s), as shown on the electric schematic above.

⚠ An additional AC power source with a dedicated circuit breaker must be added. Power relays are rated 250VAC/6A (max 400VAC/10A).

To control a 120/240VAC device use the terminals:



or



i To use these contacts, make sure a Finder miniature relay model 44.52.9.024 is installed into the relay socket.

Notes

1. 120VAC or 240VAC (50 or 60Hz) depending on the mBox AC power supply.



Rewiring D07 and/or D08 from 120/240VAC¹ wet contacts to dry contacts

The mBox features two digital outputs (D07 and D08) that are pre-wired to control the coil (24VDC) of two dual pole miniature relays (Finder relays model 44.52.9.024, included) dedicated to directly power² circulator pumps or other high voltage devices through the contacts 14 (L) and 24 (N).

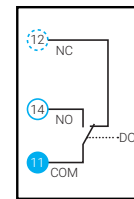
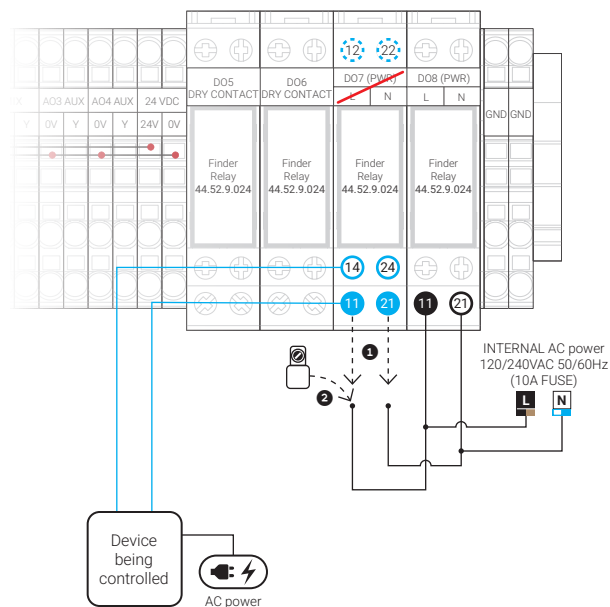
In case the circulator pump or another device needs to be controlled with an On/Off potential-free contact (dry), the Power Relays D07 and/or D08 must be re-wired accordingly.

Follow the instructions below to rewire either both or one of the wet 120/240VAC¹ contacts into dry contacts.

⚠ Disconnect power before proceeding. When completed, cross off the “PWR N | L” label to avoid future errors.

Dry contacts

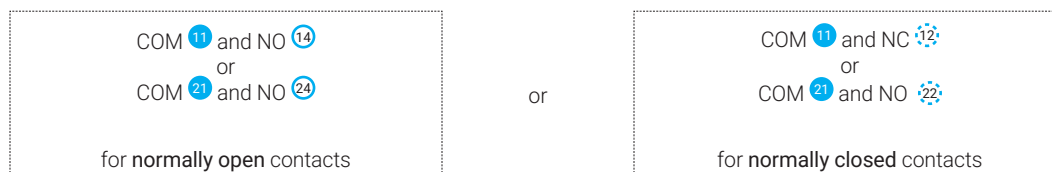
In the example below the D07 is re-wired from 120/240VAC Power Relay to dry contact



1. Disconnect the line (L) and neutral (N) legs connected to the relay's common terminals 11 (L) and 21 (N).
2. Cap them off with cap wire connectors.

⚠ Cover the exposed neutral (N) and line (L) wires with cap wire connectors and tape over for extra assurance.

To control a device with an On/Off potential-free, use the following terminals:



The two dry contacts (11 - 14 / 12 and 21 - 24 / 22) are electrically isolated but activated at the same time by D07.

i To use these contacts, make sure a Finder miniature relay model 44.52.9.024 is installed into the relay socket.

Notes

1. 120VAC or 240VAC (50 or 60Hz) depending on the mBox AC power supply.
2. Max 250V/6Amp per relay. Max 6 Amps are available for all the Power Relays (120/240VAC).



Rewiring DO7 and/or DO8 from 120/240VAC¹ to 24VDC wet contacts

The mBox features two digital outputs (DO7 and DO8) that are pre-wired to control the coil (24VDC) of two dual pole miniature relays (Finder relays model **44.52.9.024**, included) dedicated to directly power² circulator pumps or other high voltage devices through the contacts **14** (L) and **24** (N).

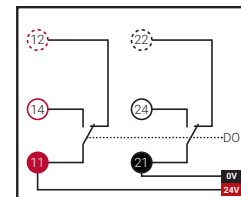
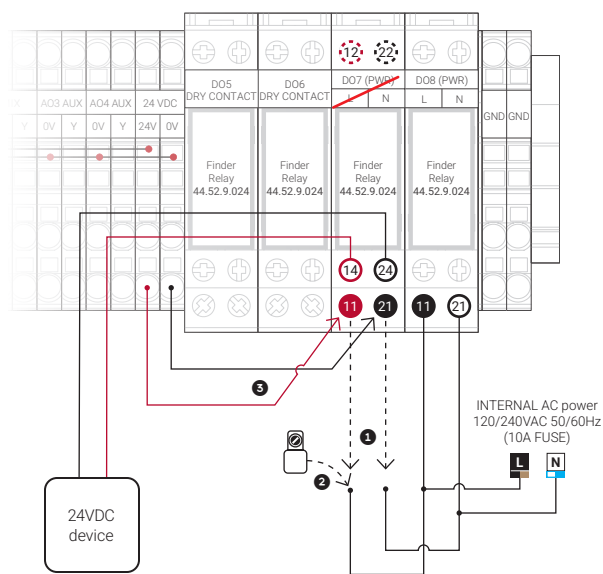
In case another device needs to be controlled with 24VDC wet contacts, the Power Relays DO7 and/or DO8 must be re-wired accordingly.

Follow the instructions below to rewire either both or one wet 120/240VAC¹ contacts into 24VDC.

⚠ Disconnect power before proceeding. When completed, cross off the “PWR N | L” label to avoid future errors.

24VDC wet contacts

In the example below the DO7 is re-wired from 120/240VAC Power Relay to dry contact 24VDC supplied by the mBox A/C Power Supply 24V (max 60W available).



⚠ The maximum power available to all external 24VDC devices powered through the mBox 24VDC terminals is **60W (2.5 Amps)**. This includes thermal actuators, valve actuators (mixing, diverting, pressure independent and On/Off valves), damper actuators, fan-coils (Jaga), relays, etc.

1. Disconnect the line (L) and neutral (N) legs connected to the relay's common terminals COM **11** (L) and the COM **21** (N).
2. Cap them off with cap wire connectors.
- ⚠** Cover the exposed neutral (N) and line (L) wires with cap wire connectors and tape over for extra assurance.
3. Connect 24VDC from the adjacent terminal blocks (0V and 24VDC) to the COM **11** (24VDC) and COM **21** (N) on the DO7 relay socket(s).

To control a 24VDC device, use the following terminals:

NO **14** (24VDC) and NO **24** (0VDC)
for **normally open** 24VDC contacts

or

NC **12** (24VDC) and NC **22** (0VDC)
for **normally closed** 24VDC contacts

i To use these contacts, make sure a Finder miniature relay model **44.52.9.024** is installed into the relay socket.

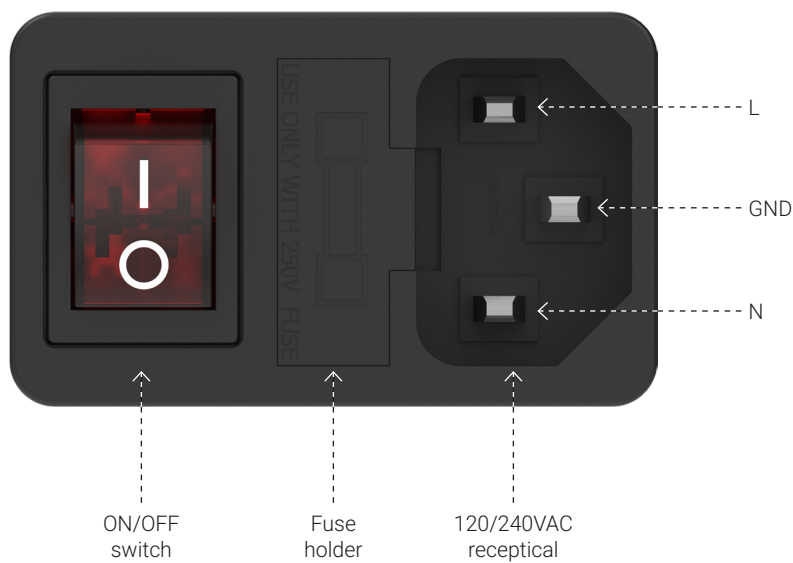
Notes

1. 120VAC or 240VAC (50 or 60Hz) depending on the mBox AC power supply.



Inlet power socket with fuse holder and switch

The power inlet module allows for a safe connection to the power line (120V/240VAC, 50/60Hz, 10A) and incorporate a fuse circuit protection and double pole rocker switch.



L (line), **N** (neutral) and **GND** (ground/earth) are blade terminals to connect a power cord (IEC320-C13, not included) to the mBox.

i Use IEC320-C13 10 Amps power cord.

! The mBox is supplied with a **10A fuse** (one 10A spare fuse located in the fuse holder). **4 Amps** are dedicated to the mBox internal modules and the 24VDC external devices and the remaining **6 Amps** are available for the power relays DO7-DO8 (PWR).

i Use glass fuse cartridge (5x20mm).



Product attributes

Connector style:	IEC320-C14
Connector type:	Receptical with male blades
Current rating:	10 Amps
Voltage rating:	250VAC
Switch:	Rocker double pole illuminated
Fuse holder:	With 10A fuse plus one spare
Material:	Body (Nylon UL94V-0), Switch (Polycarbonate)
EMI filter:	No



mBox Ethernet connections

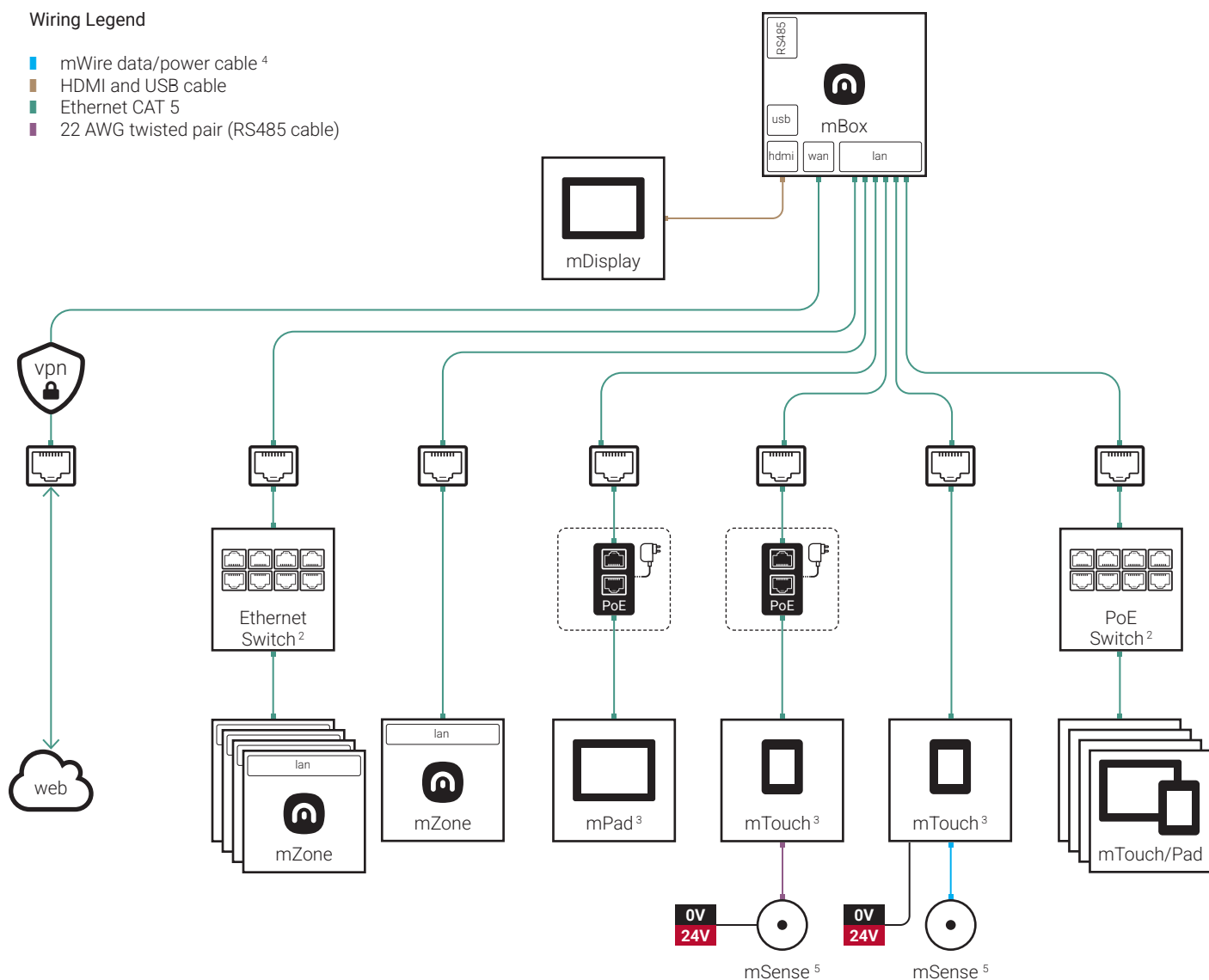
mBox is equipped with six Ethernet LAN¹ ports and one WAN port.

The WAN port must be connected to one of the home router's LAN ports to provide an Internet connection. This allows the mBox to communicate with the Messana server **service.radiantcooling.com** to provide remote access.

mBox can connect to up to six² mZone modules or other Messana devices (mPad, mTouch)³. Each mZone or Messana device must be set with a different IP address in the local private network **172.16.0.x**.

Wiring Legend

- mWire data/power cable⁴
- HDMI and USB cable
- Ethernet CAT 5
- 22 AWG twisted pair (RS485 cable)



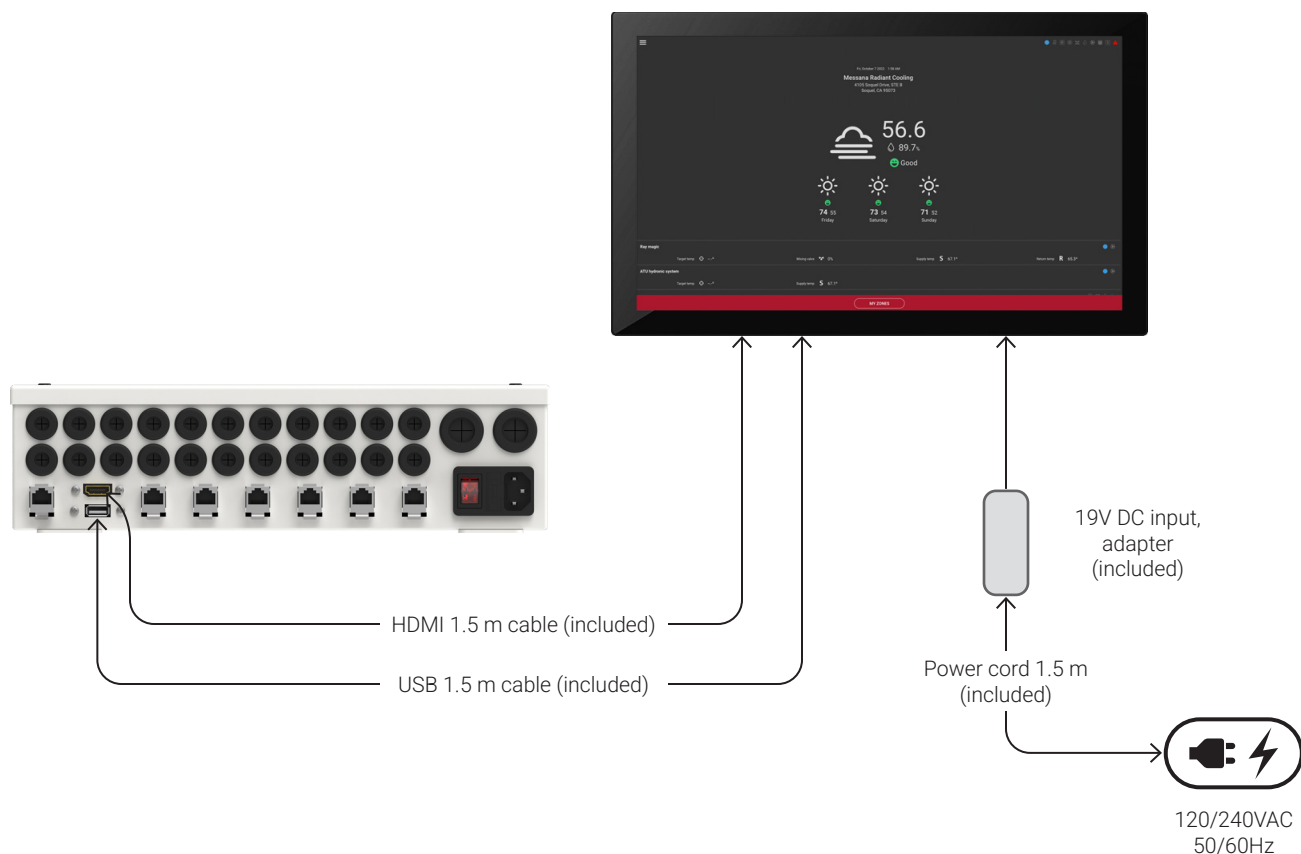
Notes

- mBox is equipped with six Ethernet LAN ports for the private network **172.16.0.x** dedicated to the internal communication with other Messana devices (mTouch, mPad and mZone).
- To expand the mBox's Messana private network connectivity, add one or more industrial grade Ethernet or PoE switches.
- mTouch(s) or mPad(s) connected to an Ethernet port must be powered by a 24VAC/DC PoE injector or by a separate 24VAC/DC power supply.
- Use Messana mWire or equivalent 18 AWG 2 conductors + 22 AWG shielded twisted pair (aluminum foil with drain wire).
- One mSense sensor can be connected to the mTouch serial bus but must be powered separately with 24VAC/DC. The same power supply can be used to power the mTouch as well.



mDisplay

10.1" industrial grade panel mount monitor. The mDisplay is installed next to the mBox to offer a convenient user interface within the mechanical room. It connects directly to the the internal mini PC via HDMI and USB (both connections required, cables are included) to guarantee a reliable user interface for full control of the Messana system in case of an Internet service outage, or any issues related to the home router (or switch). Front IP65 waterproof rating. VESA mount 100x100mm (wall mount brackets not included). 120/240VAC power adapter, HDMI and USB cable (included).



Wi-Fi 6 (802.11ax) connection

The mBox is equipped with a Wi-Fi connection integrated in the mini PC. This connection allows any nearby device running the Messana App to directly connect with the mBox and control the system. The range is limited to about 100ft.

Bluetooth® Low Energy connection¹

The mBox is equipped with a Bluetooth® LE connection integrated in the mini PC. This connection allows any nearby device running the Messana App to directly connect with the mBox and control the system. The range is limited to about 10ft.

Notes

1. Bluetooth is typically used for low speed data transferring (3Mbps). We advised that this connection is only for the initial configuration and as back up in the event of an issue with the home router or phone data service. Only one active device can be paired to the mBox at a time.



There is also one mTouch installed in the guest room and one mSense installed in the mechanical room only for monitoring temperature and humidity (no zoning). A Heat Pump is the primary source to provide heating and cooling with a second stage gas-fired boiler for heating. The boiler is also dedicated to the Domestic Hot Water system that features a recirculation pump. Two Air Treatment Units (one per floor) with HRV are utilized to control indoor air quality (IAQ), including humidity.



mBox sample application drawing (mechanical drawing)

Connection Legend

- Messana mSense bus (data/power)
- Serial bus (RS485)
- Ethernet
- HDMI and USB

- DO Digital Outputs
- DI Digital Inputs
- AO Analog Outputs
- AI Analog Inputs

