mBox^{10} submittal

Job_____ Designer_____ Contact_____

The mBox10 is a high-performance HVAC controller in the Messana Controls BLACK SERIES, our simple **one-box solution** for controlling hydronic systems with a focus on radiant cooling and heating applications. It serves up to **10 zones** and is typically installed in the mechanical room, acting as both the main controller and zoning module.

The mBox10 is assembled with industrial-grade components, and it is designed for high-end residential and light commercial applications.

It is capable of controlling a variety of hydronic distribution terminals, either individually or in combination. These include ceiling panels, radiant floors, and hydronic fan coils. It also features advanced proprietary logic to optimize Indoor Air Quality (IAQ), control humidity, and provide natural enthalpy ventilation.

The mBox10 is designed for 2-pipe hydronic 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. Serving as the core of the Messana mControl platform, it functions as the web server, gateway, and communication module. It is seamlessly integrated with the Messana web and mobile app (iOS and Android), providing a superior climate control platform (mControl) built on over 20 years of experience in hydronic radiant cooling and heating technology.

The mBox10 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

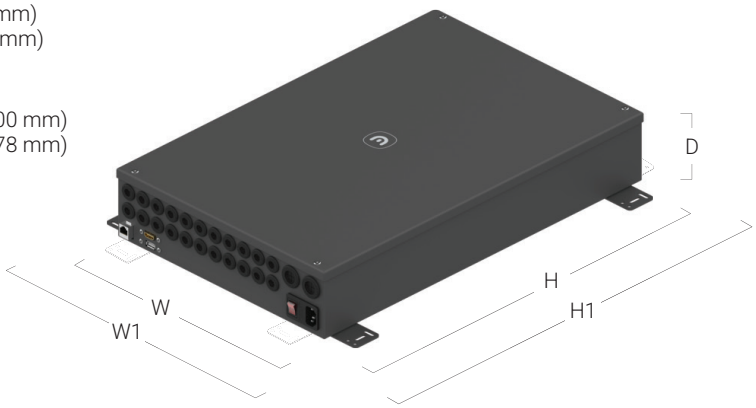
- One-box solution to controls hydronic systems with up to 10 zones
- Controls hydronic systems with a focus on radiant cooling and heating applications
- Capable of controlling a variety of hydronic distribution terminals, and DHW
- Assembled with industrial-grade components
- Features industrial PC x86-based architecture and runs on Linux OS (Debian)
- Push-in CAGE CLAMP® terminal blocks for quick and secure connections
- 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 ½ inches (89 mm)

With brackets
W1: 15 ¾ inches (400 mm)
H1: 22 ¾ inches (578 mm)



Weight
5.1 lb (6.85 kg)

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

Notes

1. Size, weights, and technical characteristics may vary without prior notice.
2. 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 10kΩ@25°C Beta 3435	10 (AI NTC S1/R1/S2/R2/5/6/7/8/9/10)
	Digital Inputs (DI) [3] Presence or window sensors, H/C changeover, alarms, On/Off	
	Dry contact	10 (DI1-DI10)
	Additional [2] dry contact	10 (DI11-DI20)
Outputs [2]	**Digital Outputs (DO)** Thermal actuators, zone valves, pumps, actuators, air units	
	24VDC DO (1 Amp maximum amperage)	10 (ZN1-ZN10*) [4]
	Maximum number of thermal actuators [5]	18
	Maximum number of thermal actuators per DO [5]	3 each
	Dry contacts (with shared commons)	DO11-DO12 (ON/OFF & H/C for HP COMMAND)
	Dry contacts (with miniature plug-in relays) [6 7]	2 (DO10* & DO13) [4]
	120/240VAC 50-60Hz wet contacts for pumps (max 6 A) (with miniature/plug-in relays) [6 8]	2 (DO14-DO15 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 (AO5 MIX / 24V / A06 MIX)
	Programmable AO (0-10V default)	4 (AO1-AO4 / 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)
Communications	Room sensors (mSense)	RS485 Zone Bus (Modbus RTU)
	Outdoor sensors (Belimo), Messana 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 Messana App (10ft range)	
Internal Power Supply	Equipped with dual power supply modules: 24VDC (rated 127.4W / 5.31A) 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)	4 A (96W)

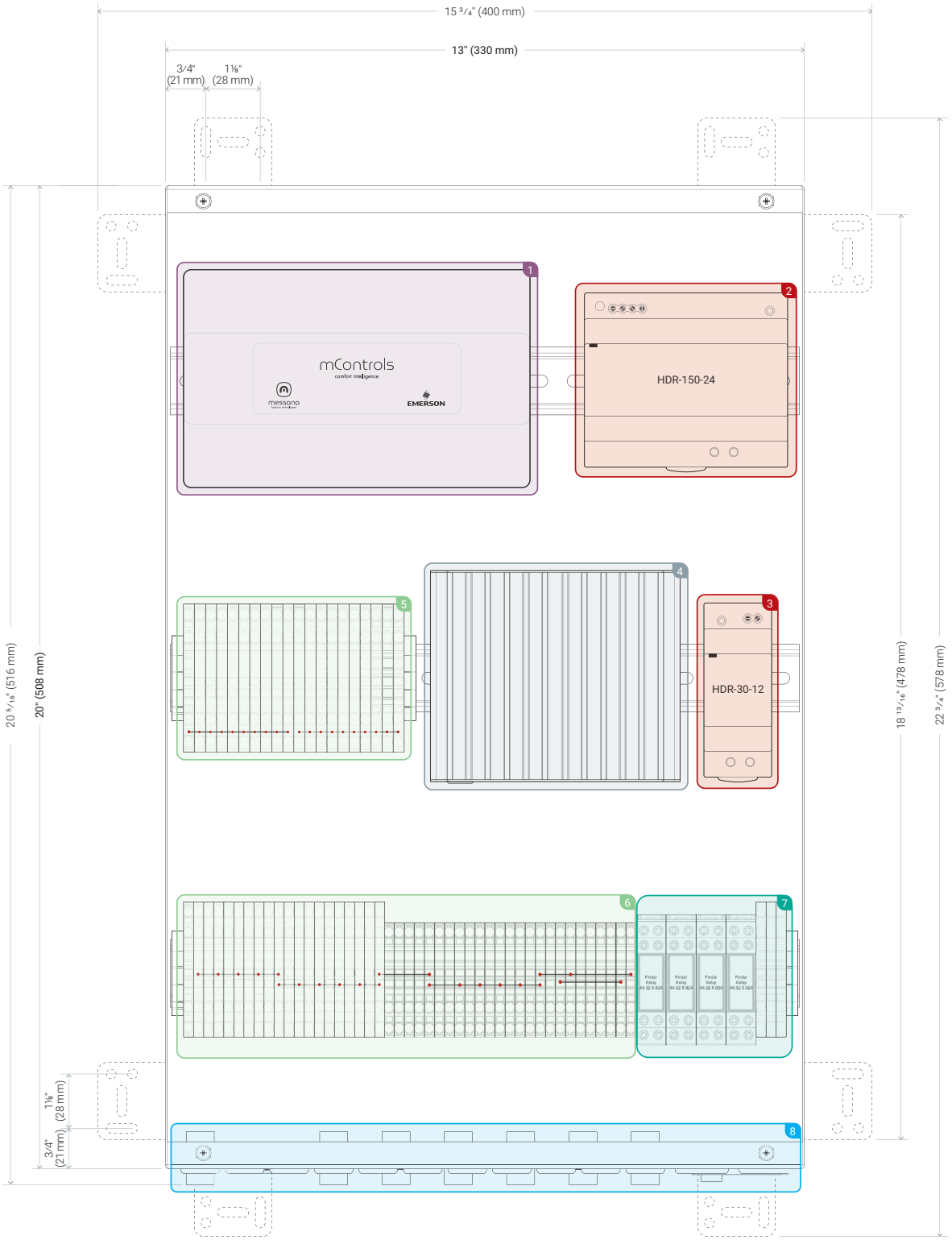
Notes

1. Size, weights, and technical characteristics may vary without prior notice.
2. All I/O connections are rail-mounted terminal blocks with Push-in CAGE CLAMP® (with exception of the 4 power relays DO10* & DO13-DO15 and the additional DI11 located on the embedded mControl I/O device that needs to be wired directly on the controller).
3. Digital Inputs are opto-insulated and are dry contacts.
4. Digital output 10 can be used either as 24VDC contact, ZN10* for zone control, or as a power relay DO10* (PWR) 120/240VAC.
5. The DO terminal blocks are 3-wire connector allowing to connect up to 3 thermal actuators per DO. However, do not exceed 16 actuators in total.
6. Finder 44.52.9.024 miniature plug-in industrial relays (included) rated 250VAC/6A (max 400VAC/10A).
7. Can be reconfigured as 24VDC or 120/240VAC wet contacts.
8. 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.
9. Analog Outputs are opto-insulated and can be programmed as 0-10V or 2-10V.
10. 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.

Components and 2D footprint

Legend

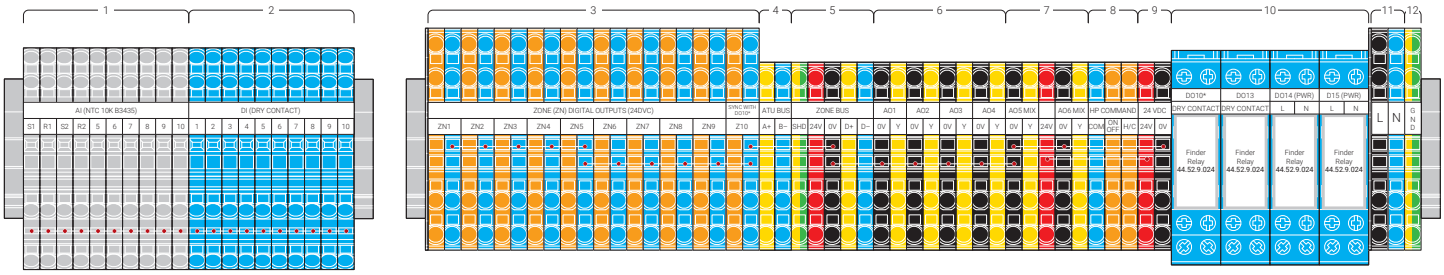
1. Messana mControl I/O device (Emerson iProGENIUS code:IPG215D)
2. A/C Power Supply 24VDC HDR-150-24 (96W for external devices)
3. A/C Power Supply 12VDC HDR-30-12 (dedicated to mini PC)
4. Fanless industrial mini PC x86 Linux
5. Input contacts (DIN rail-mount terminal blocks with Push-in CAGE CLAMP®)
6. Output contacts (DIN rail-mount terminal blocks with Push-in CAGE CLAMP®)
7. 4 power relays (DIN rail-mount sockets) with L, N, and GND terminals
8. Front connection ports and cable pass through rubber grommets



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

Legend

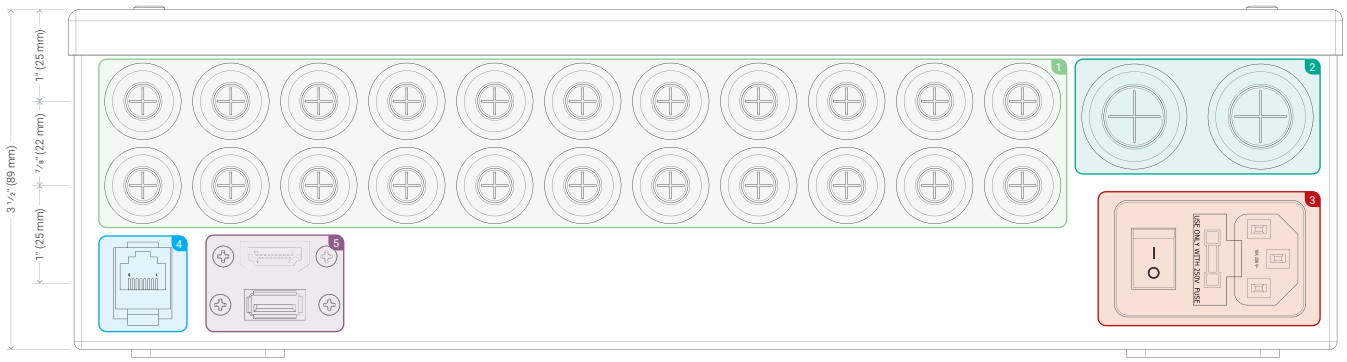
1. 10 Analog Inputs (AI) for NTC temperature probes
2. 10 Digital Inputs (DI)
3. 10 Zone Digital Outputs (DO) 24VDC
4. RS485 ATU bus for air units and other Modbus devices
5. RS485 Zone bus with 24VDC power terminals for mSense and shield
6. 4 Analog Outputs (AO) for 0-10V (or 2-10V) modulation
7. 2 Analog Outputs (AO) with 24VDC power terminals for mix valves actuators
8. 2 Digital Outputs (DO) Dry Contact with shared commons for HP control
9. 24VDC service power terminals (96W max)
10. 4 Power Relays, 2 dry contacts and 2 120/240VAC wet contacts
11. Line and Neutral terminals to use with Power Relays
12. Ground terminals to use with Power Relays



Front connections

Legend

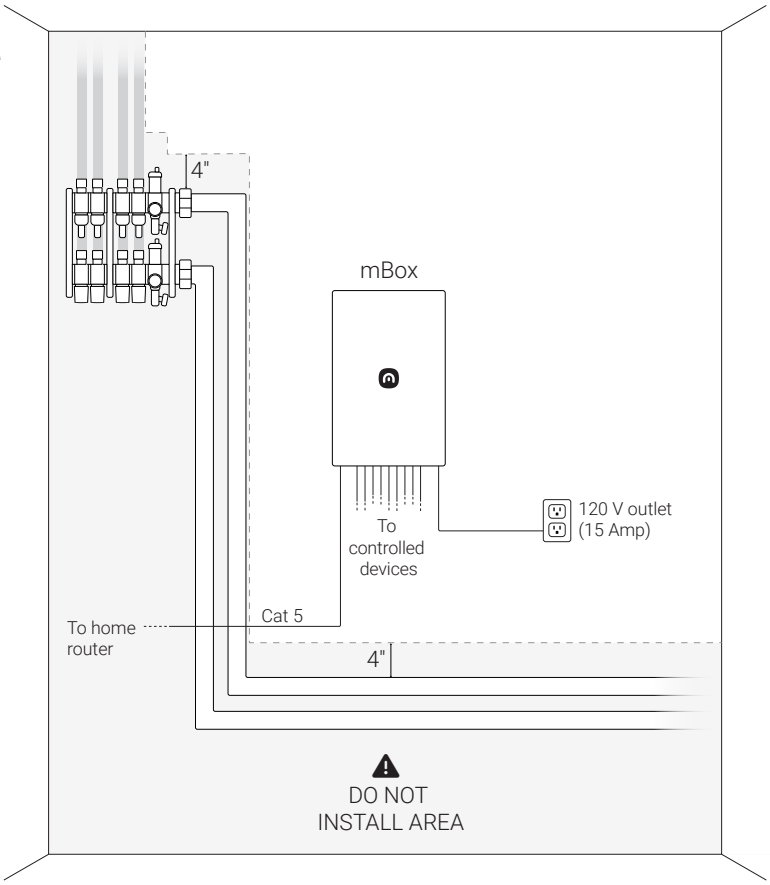
1. 22 Cable pass through rubber grommets for low voltage connections (9mm)
2. 2 Cable pass through rubber grommets for high voltage connections (16mm)
3. Inlet male power socket with switch and fuse holder (IEC320 C14)
4. Wan Internet connection
5. HDMI and USB ports



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 100°F (38°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 115 V (15 Amp) electrical outlet for power supply.
7. Always install the mBox vertically for proper internal ventilation.



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.

August 2023