Link IO – Manual

Introduction

Overview

I/O Modules are such a key component in any building automation system, that we wanted to see how we can perfect every aspect of its operation looking at the hardware, software, and overall usability.

Together with Carel, an Italian controls manufacturer trusted all over the world in critical control applications for more than 40 years, we have created **Link IO -** a scalable and fully integrated BMS product that will last you for many years to come! Now available World-Wide.

Available models

LNK-IO20-IP-MOD Modbus TCP/IP (Hardware part number **LNK-IO20-IP)**
LNK-IO20-RS-MOD Modbus RS485 (Hardware part number **LNK-IO20-RS)**
LNK-IO20-IP-BAC BACnet & Modbus TCP/IP (Hardware part number **LNK-IO20-IP)**
LNK-IO20-RS-BAC BACnet & Modbus RS485 (Hardware part number **LNK-IO20-RS)**

Options

LNK-IO16-EXP Expansion 6 x DO, 10 x UIO
LNK-ADD-BAC BACnet upgrade for models LNK-IO20-RS-MOD or LNK-IO20-IP-MOD

System layout
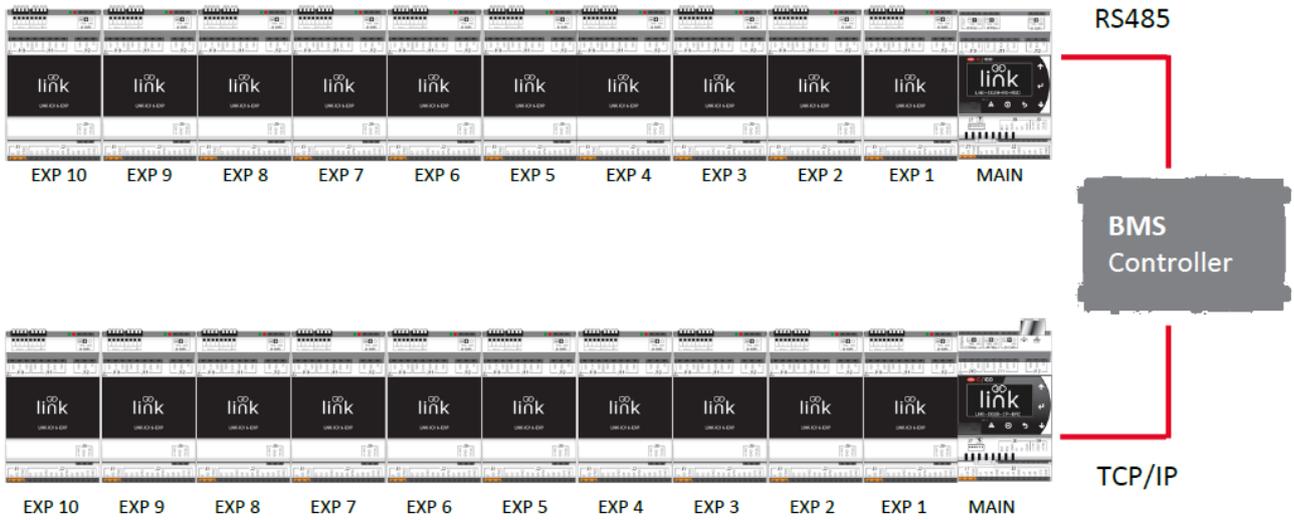
Hardware

Overview

Module	Part Number	Type	RS485	IP	BMS	Display	UIO	DO	DI	AO
	LNK-IO20-IP-MOD HW: LNK-IO20-IP	Link IO Main Module	-	Yes	Modbus	Yes	10	6	2	2
	LNK-IO20-RS-MOD HW: LNK-IO20-RS	Link IO Main Module	Yes	-	Modbus	Yes	10	6	2	2
	LNK-IO20-IP-BAC HW: LNK-IO20-IP + SW: LNK-ADD-BAC	Link IO Main Module	-	Yes	Modbus + BACnet	Yes	10	6	2	2
	LNK-IO20-RS-BAC HW: LNK-IO20-RS + SW: LNK-ADD-BAC	Link IO Main Module	Yes	-	Modbus + BACnet	Yes	10	6	2	2
	LNK-IO16-EXP	Link IO Expansion Module	Yes	-	-	-	10	6	-	-

Wiring power supply

24 Vac +10%/-15% 50/60 Hz, 28 to 36 Vdc +10% to -15%

Consumption main unit (max): 30VA / 12W

Consumption expansion unit (max): 15VA / 6W
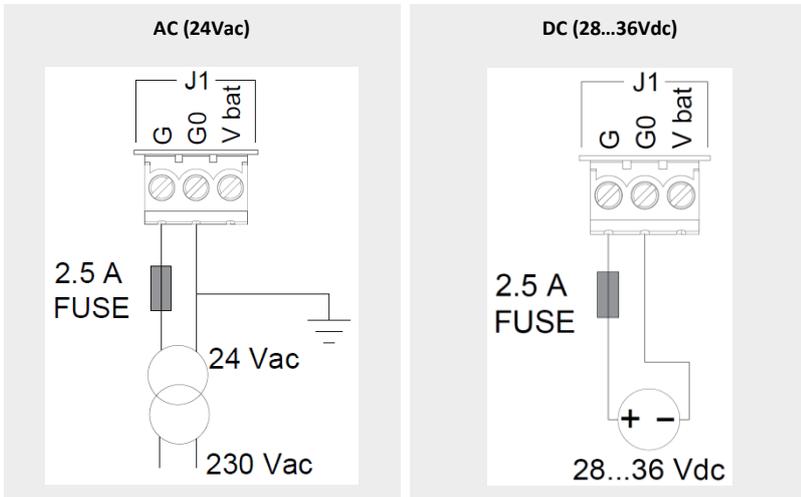
Wiring Universal Channels

Maximum current output: 2 mA

Maximum connection cable length: less than 10 m
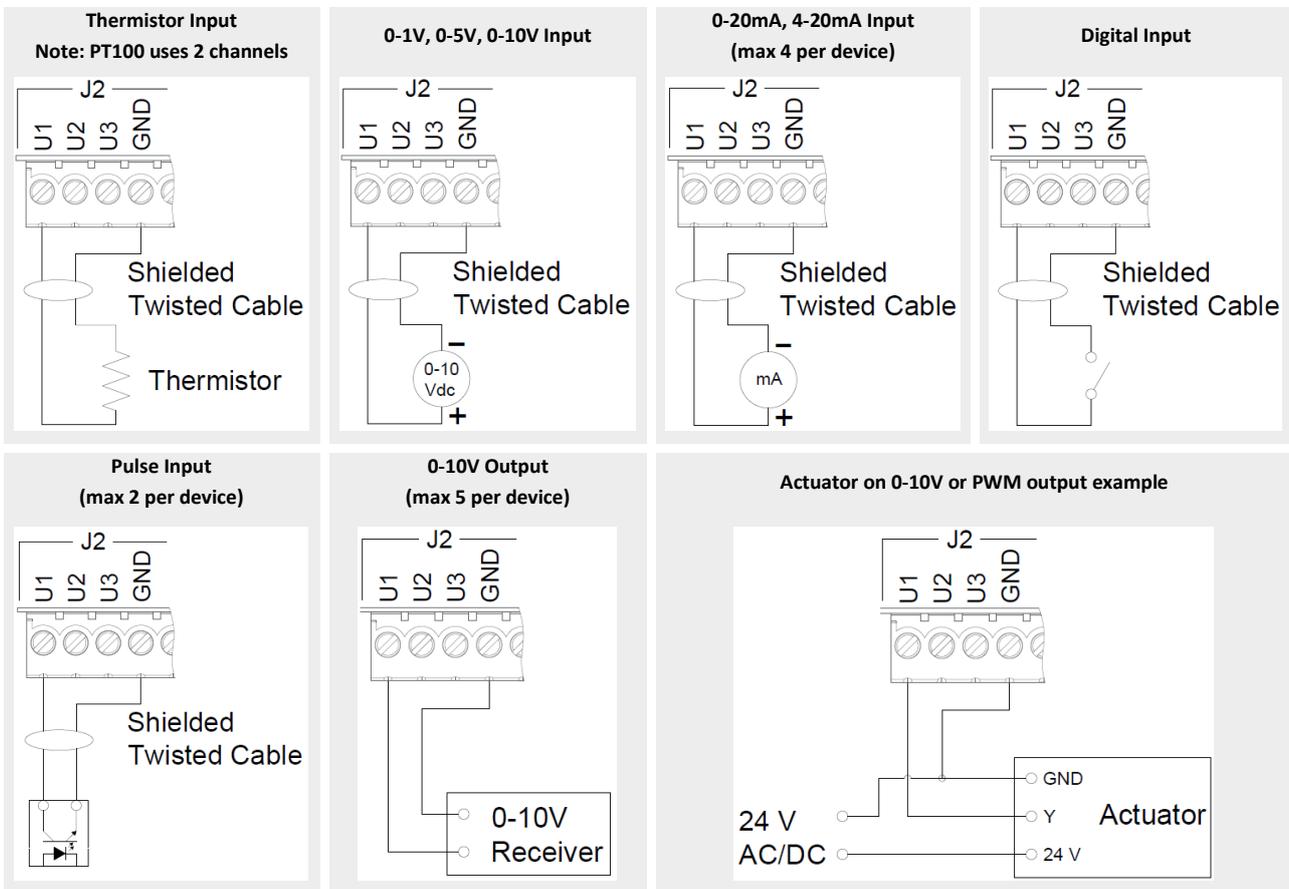
Wiring Digital Outputs

Output 1 to 5 Relay max 5A, 250Vac only with NO contacts

Output 6 Relay max 1A, 250Vac with NO/NC contacts
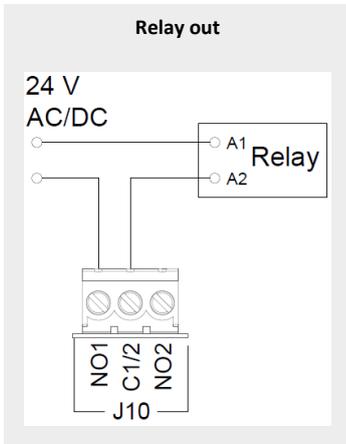
Wiring Digital Inputs (main unit only)

Maximum current output: 5 mA

Maximum voltage with the contact open: 12 Vdc

Maximum connection cable length: less than 10 m
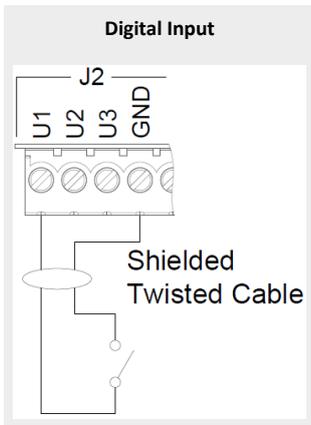
Wiring Analog Outputs (main unit only)

Maximum current output: 10 mA

Maximum connection cable length: less than 10 m
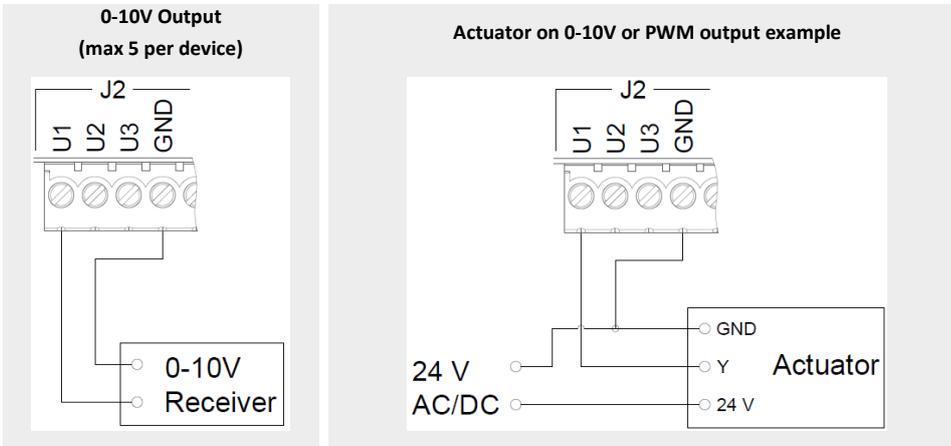
Wiring the RS485 networks

Some useful links to our knowledge base website:

How to wire an RS485 network https://know.innon.com/howtowire-non-optoisolated

How to terminate and bias an RS485 network https://know.innon.com/bias-termination-rs485-network

Note: the RS485 ports are not opto-isolated. Carefully check the orientation of the G and G0 terminals on all devices to be the same and the shield to be connected correctly to avoid damaging the units.
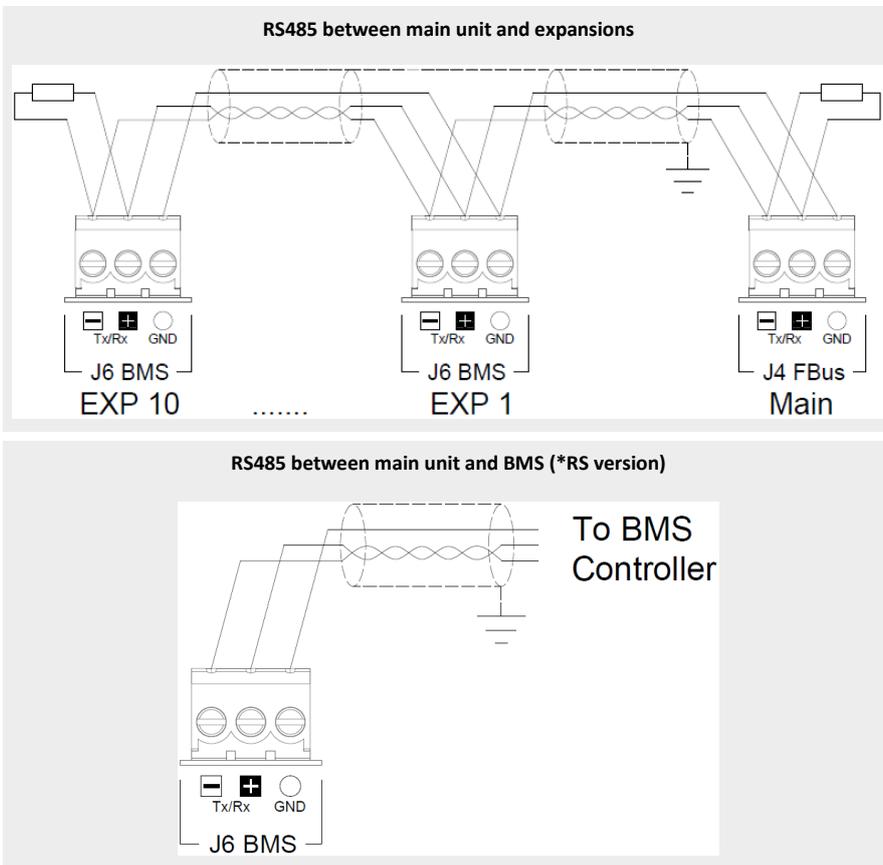
Setting the expansion

The expansion (part number LNK-IO16-EXP) setup is done using the dipswitches on the top side, near the RS485 connector (J6 BMS). Remember to power cycle the device when the setting is changed.
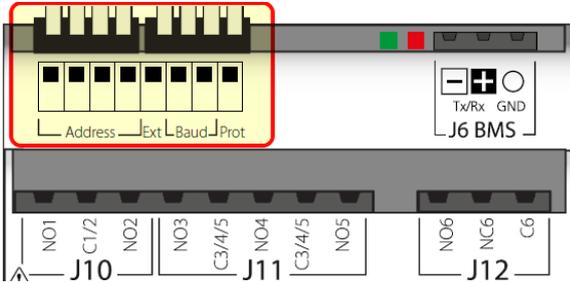
The dipswitches corresponding to "Ext", "Baud" and "Prot" must be configured to a fixed position.

The dip-switched are numbered in the front from 1 to 4 and the position is as follow:
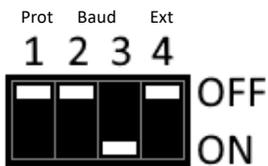
The "Address" dipswitches will need to be configured according to the expansion number, from "1" to"10".

Expansion addresses will be always consecutive, so if you have 2 expansions, you will use addresses "1" and "2", if you have 3 expansions you will use addresses "1", "2" and "3" and so on

Address 4 dip-switches configuration is shown for all 10 expansions as follow:

Example of configuration for expansion 1, view from the top-down:

Display navigation

Display and keys

The display in Link IO is a graphical B/W display with backlight with 132x64 pixels.

All the settings are accessible using the display and the navigation keys
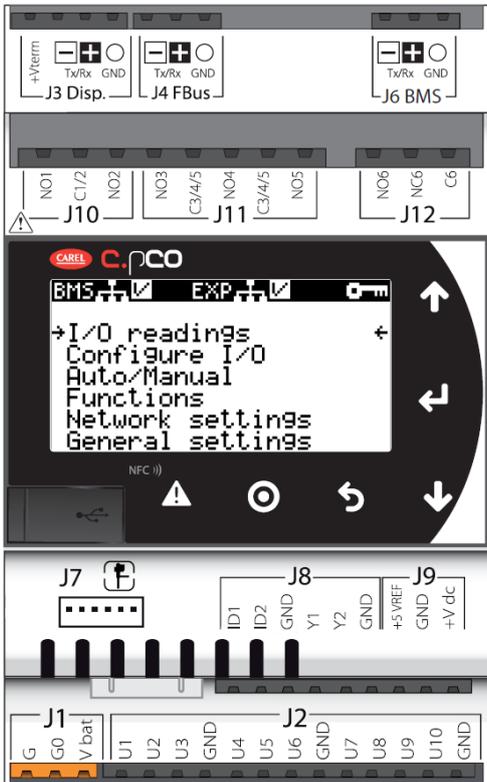
⬆	Cursor on top-left of the screen or no cursor: **go to previous page**. Cursor on top of setting: **increase value**. Within a menu: **scroll menu up**.
↵	**Move cursor to next position and confirm setting**. Within a menu: **enter menu selection**.
⬇	Cursor on top-left of the screen or no cursor: **go to next page**. Cursor on top of setting: **decrease value**. Within a menu: **scroll menu down**.
↩	Cursor on top-left of the screen or no cursor: **go back one menu level**. Cursor on top of setting: **send cursor to the top-left of the screen.** If on "warnings and alarms", **return to the last page visited.**
⊙	**Go to the main settings menu**.
⚠	**Go to "configuration warnings and alarms" screens**

Settings are password protected and users will have to login to view and edit. The password screen is displayed when trying to enter any configuration menu to allow the user to login (see in the next chapter how). "I/O readings" is the only part always accessible without logging in.

Settings of all expansions are configured from the main device. The expansions will not work in isolation.

The display backlight is automatically turned OFF if no button is pressed for more than 5 minutes. This function makes sure also that the user is automatically logged out and the screen goes back to the main Link IO page.

The ⊙ menu button has an independent backlight. If ON, it indicates the user is currently logged in.

The ⚠ button has independent red backlight. If ON, it indicates there is a problem that needs to be fixed, such as a configured expansion being offline or a wrong configuration on the Universal Channels.

Main menu

The main Link screen is shown when the unit boots up.

Pressing the ⊙ menu button you can view the main device menu
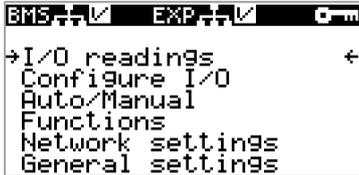
Use the ⬆⬇ up and down buttons to scroll the options and enter them by pressing ↵.

On the top line of the main menu some quick access information is displayed:

BMS 📶 ✓	A BMS supervisor is polling the Link IO (online with BMS)
BMS 📶 !	No BMS supervisor is polling the Link IO (offline with BMS)
EXP 📶 ✓	If expansions are configured, they are all online
EXP 📶 !	If expansions are configured, at least one is offline (not communicating with the main Link IO device)
🔑	When shown. It indicated you are not currently logged in. You can only access the "I/O readings" section

Individual functionalities accessible on each menu selection on the screen are going to be discussed individually in detail later in this manual.

The options from the main menu are

I/O readings	Shows all the live input/output values and statuses. Does not require to log in.
Configure I/O	Allows the configuration of all Universal Channels and Analog output (main unit only). It also allows the configuration of the output positions in case of an offline (if watchdog is enabled). Requires to be logged in.
Auto/Manual	Allows to configure each output as AUTO (controlled by the BMS or any internal function on the Link IO) or MANUAL (fixed output to a desired state). Requires to be logged in.
Functions	Allows to control selected outputs depending on selected input values/statuses. Functions available include Thermostat, Digital in to Digital out, Analog in to Analog out and configurable Pulse Counter. Required to be logged in.
Network settings	Allows the configuration of the RS485 BMS port (for models equipped with the RS485 port) or the IP BMS port (for models equipped with the Ethernet port). It also allows to enable the watchdog to preset the outputs in case of an offline. Requires to be logged in.
General settings	Allows to access the general settings of the device, such as number of I/O expansions connected, temperatures in degC or degF, login password change, settings backup/restore function, factory default install and software version

When expansions are configured, a menu is presented when entering the devices configuration allowing to select which device you want to configure.

Configuration password, log in/log out

When trying to access any configuration setting without being logged in, the password screen is displayed automatically as follow

Use the up and down buttons to increase/decrease each digit value and press enter to move to the next digit and confirm the value.

The default password is 1234.

The password can be changed from the "General settings" menu.

If the wrong password is inserted, the setting is blanked, and you can try again.

You can exit this screen by pressing back.

If the correct password is inserted, you will be logged in and you will be able to enter any configuration menu.

You can log out at any time by holding the button back for 5 seconds, until the display goes back to the main screen.

If you do not press any button for more than 5 minutes, the system will automatically log you out and switch off the screen backlight (away mode). The screen backlight switches back on by pressing any button.

Warnings and alarms

The system is self-checking runtime.

You can check if there is any warning by pressing the ⚠ alarm button.

Warning and alarm screens:

Screen	Description	⚠ button backlight (warning severity)
Device is ok The device is online and working as expected	All is ok with the device: a supervisor is polling on the BMS port, the Universal Channels are configured correctly and if expansions are configured, they are all online	OFF
Expansions offline One or more expansions are not connected 1 2 3 4 5	Expansions are configured and at least 1 of them is not responding. In this example, 5 expansions are configured and expansions 4 and 5 are not responding	ON
Alarm Local Univ.channels config. error 0-10V out (max 5) 0/4-20mA in (max 4) Pulse/Freq.in (max 2) 0-5V Link in (max 2) PT100 2nd in used	Wrong Universal Channel configurations on the local device or an expansion module. In this example, the reported wrong configuration is in the local (main) device and specifically there are too many channels configured as 0-10V output and one channel configured as PT100 3 wires with the second channel being used	ON
BMS warning Link IO is not communicating with a BMS master	No supervisor is communicating with the Link IO device on the BMS port. The timeout for this warning is configurable. This is a low severity warning, as the Link IO can be used in isolation with no BMS	OFF

You can exit these warning screens by pressing ↩ back and automatically return to the latest screen visited when the ⚠ alarm button was pressed.

Screens diagram

Intro

link
LNK-I020-RS-MOD

Main menu

```
BMS        EXP
→I/O readings              ←
 Configure I/O
 Auto/Manual
 Functions
 Network settings
 General settings
```

- *Configure I/O*
- *Auto/Manual*
- *Function*
- *Network settings*
- *General settings*

(Logged in)

(Not logged in)

Login

```
                    Login
Insert password to
access the device
settings:
                    0000
```

no expansion / with expansion

```
            Read I/O menu
                       1/2
→Local                   ←
 Expansion 1
 Expansion 2
 Expansion 3
 Expansion 4
 Expansion 5
```

```
            Read I/O Local
U 1:(in)             3.6%
U 2:(in)             3.6%
U 3:(in)             3.6%
U 4:(in)             3.6%
U 5:(in)             3.6%
```

```
            Read I/O Local
DO 1:               OFF
DO 2:               OFF
DO 3:               OFF
DO 4:               OFF
DO 5:               OFF
DO 6:               OFF
```

I/O readings

```
          Configure I/O menu
                       1/2
→Local                   ←
 Expansion 1
 Expansion 2
 Expansion 3
 Expansion 4
 Expansion 5
```

```
          Configure I/O Local
Universal channel 1
Direction:         INPUT
Type:         NTC 10K3A1
Filter                 5
```

```
          Configure I/O Local
Outputs when offline
DO 1: OFF      DO 2: OFF
DO 3: OFF      DO 4: OFF
DO 5: OFF      DO 6: OFF

Y 1:    0%     Y 2:    0%
```

Configure I/O

```
          Auto/Manual menu
                       1/2
→Local                   ←
 Expansion 1
 Expansion 2
 Expansion 3
 Expansion 4
 Expansion 5
```

```
            A/M I/O Local
      A/M    M.Val    Out.
U 6:MAN       0%       0%
U 7:AUTO      0%     ---%
U 8:----    ---%     ---%
U 9:AUTO      0%       4%
U 5:----    ---%     ---%
```

```
            A/M I/O Local
       A/M    M.Val   Out.
DO 1:AUTO     OFF     OFF
DO 2:AUTO     OFF     OFF
DO 3:AUTO     OFF     OFF
DO 4:AUTO     OFF     OFF
DO 5:AUTO     OFF     OFF
DO 6:AUTO     OFF     OFF
```

Auto/Manual

```
            Functions menu
                       1/2
→Local                   ←
 Expansion 1
 Expansion 2
 Expansion 3
 Expansion 4
 Expansion 5
```

```
          Pulse counter 1 local
Current value:     000000

Input select:        ---
Scaling:         001.000
Preset value:     000000
Preset run:           No
Reset to 0 run:       No
```

```
            Tstat 1 local
Input select:        ---
En input:       DIRECT ---
Set-point:          25.0
Hysteresis:          2.0
Act.direction:    DIRECT
Output select
1:---     2:---    3:---
```

Functions

```
                  Watchdog
Enable BMS
offline watchdog:   NO

BMS timeout:       30s

Enable expansion
offline watchdog:   NO
```

```
            Modbus settings
Modbus ID:            1

Baudrate:         19200
Parity:            NONE
Stop bits:            1
```

Network settings

```
                Expansions
Set the number
of connected
expansions:         7
```

```
            Backup/restore
Function: RESTORE DATA
Memory:          LOCAL
File name:    EXPORT_00

Confirm operation:  NO
```

```
                  Default
Reset the device to
the manufacturer
settings?
                    NO
```

General settings

Intro

link
LNK-I020-RS-MOD

No alerts / Alerts

```
              Device is ok
The device is online
and working as
expected
```

```
              Alarm Local
Univ.channels config.
error
■0-10V out (max 5)
■0/4-20mA in (max 4)
■Pulse/Frq.in (max 2)
■0-5V Link in (max 2)
■PT100 2nd in used
```

Alerts

The external display (optional part no. LNK-IO-DISP)

What it is

Link IO comes with an on-board display, but it is possible to connect an external display (part number **LNK-IO-DISP**).

The external display has got a slightly larger screen and the same 6 buttons with membrane keys instead of capacitive sensors.

The external display can be used as a commissioning tool, to facilitate the operation of an engineer on site, having a hand-held display available to use.

But it is also a useful feature when Link IO is enclosed within a panel: the external display can be panel mounted and be accessible from outside of the panel door, providing all the useful I/O live readings and all the capabilities of the on-board display.

The external display does not require any configuration: it comes pre-configured and ready to be connected. Once connected to Link IO, the external display and the on-board display will show the same screens.

How to connect the external display to the main Link IO unit

The Link IO external display comes with an RJ12 6 pin connector on the back.

You will need to provide a cable to connect the RJ12 to the J3 Display port on Link IO, following the schematics below.

The maximum cable length allowed between Link IO and the external display is 10 meters.

RJ12 pinout	RJ12 to Link IO	Example
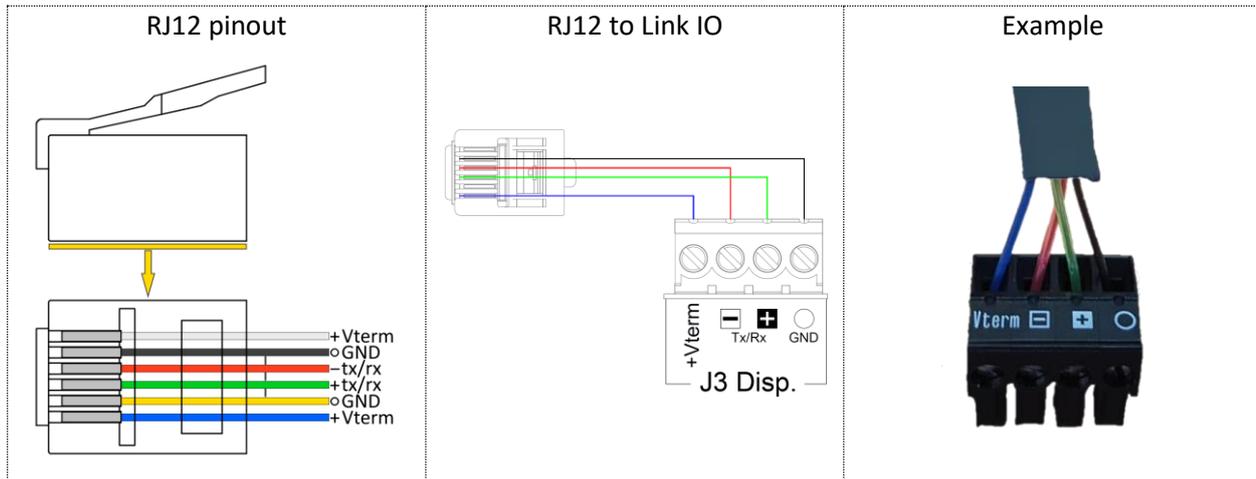
(The colour scheme is based on a standard RJ12 cable. Check your cable, single wires colour might be different!)

I/O readings

How the I/O work with Link IO

The Link IO system is designed with a main unit communicating with the BMS, configuring the system through the display, managing Auto/Manual modes for the outputs, functions between inputs and outputs and establishing safe watchdog statuses in case of the BMS being offline, and optional expansion modules, which can only manage an internal watchdog in case of loss of connection with the main unit.

The inputs are read and converted as specified on the main unit configuration.

The outputs are controlled with a priority level described here below:

- The BMS supervisor can control the outputs to a desired status/value
- If the BMS watchdog has been enabled and the BMS goes offline, the outputs that are controlled by the BMS will be configured to their watchdog status/value until the BMS goes back online.
  The ⬚ icon will be shown next to the outputs to know they are in the watchdog state
- If a function is enabled and using an output, the function will bypass any command from the BMS (and BMS watchdog) and the Link IO main unit will be in full control of the output autonomously.
  The ⬚ icon will be shown next to such output to know it is being controlled by a function
- If an output has been configured in "Manual" mode from the "Auto/Manual" menu, the manual setting will bypass any command from the BMS or any assigned function.
  The ⬚ icon will be shown next to such output to know it is in manual mode

When visualizing the Inputs and Outputs of an expansion, an additional icon ⬚ is displayed on both inputs and outputs in case the expansion is offline with the main unit. The input values are not reliable as the last valid value is shown, and the outputs can no longer be controlled.

If the expansion watchdog has been enabled, the expansion will also self-position all its outputs to their safe watchdog status/value until the main unit comes back online.

Universal Channels

Universal Channels are visualised with (in) if they are inputs or (out) if they are outputs.

Temperature inputs show the unit of measure (degC or degF based on the setting, the temperature is also converted accordingly).

Active analog inputs, digital inputs and pulse/frequency counters do not show any unit of measure.

Outputs show the % value, 0% being the analog value at minimum and 100% at maximum value.

On the example below, see that Universal Channel 4 is used as an output and configured in Manual mode (⬚) and that Universal Channel 5 is configured to be controlled by a function (⬚).

Digital inputs are still shown with the decimal point. Value 1.0 is shown with the digital input closed, value 0.0 is shown with the digital input opened.

Note below how both inputs and outputs are displayed with the icon EXP⏻ when an expansion is offline

```
 ██████ Read I/O Exp 2 ██████
 U 1:(in)  EXP⏻      3.6°C
 U 2:(in)  EXP⏻      3.6°C
 U 3:(in)  EXP⏻      3.6°C
 U 4:(in)  EXP⏻      3.6°C
 U 5:(in)  EXP⏻      3.6°C
```

Digital Outputs

Digital Outputs are all displayed in one screen.

In the example below DO2 and DO3 are in manual mode ⊟MAN and DO5 is associated to a function IN➔OUT

```
 ██████ Read I/O Local ██████
 DO 1:               OFF
 DO 2:     ⊟MAN      OFF
 DO 3:     ⊟MAN      OFF
 DO 4:               OFF
 DO 5:    IN➔OUT     OFF
 DO 6:               OFF
```

The Digital Outputs of an expansion that is momentarily offline are going to display the EXP⏻ icon

```
 ██████ Read I/O Exp 2 ██████
 DO 1:     EXP⏻      OFF
 DO 2:     EXP⏻      OFF
 DO 3:     EXP⏻      OFF
 DO 4:     EXP⏻      OFF
 DO 5:     EXP⏻      OFF
 DO 6:     EXP⏻      OFF
```

Digital Inputs and Analog Outputs (main unit only)

The main units are equipped with 4 extra points compared to the expansions: 2 digital inputs and 2 analog outputs.

On the main unit (local) it is possible to visualise such extra points together in one screen

```
 ██████ Read I/O Local ██████
 ID1:                 0
 ID2:                 0

 Y1:                 0.0%
 Y2:      ⊟MAN      25.0%
```

The digital input shows value 1 when the input is closed, value 0 when the input is opened.

Configure I/O

Universal Channels

Universal Channels are flexible connections that can be configured either as Inputs or Outputs with many different types of signals available to be configured.

Check the following table to have an overview of all the possible configurations.

Please refer to the column "Max per device" to know the configuration limits of each device.

I/O	Group	Type	Max per device	Filter/Speed /Current
Input	Temperature sensors (passive inputs)	NTC 10K3A1	10	Filter: 0-9 0= fast reading, no interpolation 9= slow reading, 9 readings interpolation
		NTC 10K4A1	10	
		NTC CAREL	10	
		PT1000	10	
		PT500	10	
		PT100 (3 wires, 2 inputs, requires the next input to be configured as "NOT USED")	5	
		PTC_R	10	
		NTC 0-150 CAREL	10	
		NTC -50T90 CAREL	10	
		NTC -10T170 CAREL	10	
	Active analog inputs	0-1V	10	
		0-10V	10	
		0-5V (power from Link)	2	
		0-5V (external power supply)	10	
		0-20mA	4	
		4-20mA		
	Digital inputs (clean contact)	DIGITAL INPUT	10	Speed: FAST-NORMAL
	Pulse/Frequency counter input	PULSE COUNT	2	Current: 50uA 500uA TTL level For transistor out reading
		FREQUENCY MEASURE		
Output	0-10V	0-10V	5	Not applicable
	PWM	PWM 100Hz	10	
		PWM 2kHz	10	

For every Universal Channel configured as "Output" it is possible to configure the desired output in case the Watchdog function is used and enabled

In the example below, Universal Channels 4, 5, 8 and 10 are configured as outputs. In case of the watchdog function driving the outputs, Universal channel 4 would go to 0%, channel 5 to 50% and channels 8 and 10 would go to 100% full output

```
  Configure I/O Local
Outputs when offline

U 1: ---%    U 2: ---%
U 3: ---%    U 4:   0%
U 5:  50%    U 6: ---%
U 7: ---%    U 8: 100%
U 9: ---%    U10: 100%
```

Digital Outputs

The digital outputs are driven by relays.

For every Digital Output it is possible to configure the desired status in case the Watchdog function is used and enabled.

In the example below all the Digital Outputs are going to an "OFF" status in case of the Watchdog function driving the outputs.

Note that output 6 provides a relay with both NO and NC contacts.

```
  Configure I/O Exp 1
Outputs when offline

DO 1: OFF    DO 2: OFF
DO 3: OFF    DO 4: OFF
DO 5: OFF    DO 6: OFF
```

Analog Outputs (only main unit)

The main unit has 2 Digital Inputs and 2 Analog Outputs more compared to the expansion devices. The Analog Outputs can be configured as 0-10V, PWM 100Hz or PWM 2kHz

```
  Configure I/O Local
Analog outputs

Y1 type:        0-10V

Y2 type:        0-10V
```

For each Analog Output it is possible to configure the desired value in case the Watchdog function is used and enabled. The settings are in the same screen of the Digital Output

In the example both analog output would go to 0% in case of the Watchdog function driving the outputs.

```
  Configure I/O Local
Outputs when offline

DO 1: OFF    DO 2: OFF
DO 3: OFF    DO 4: OFF
DO 5: OFF    DO 6: OFF

Y 1:   0%    Y 2:   0%
```

Auto/Manual

The "Auto/Manual" section allows to configure outputs to a fixed status or value.

When an output is configured in "Manual", any demand from the BMS, the BMS watchdog active or any function applied to the output will be bypassed and the output maintained at the desired Manual configuration.

For the expansion, the status of the expansion outputs is dictated by the main unit. So, if the expansion is disconnected from the main unit and the expansion watchdog is enabled, the expansions output will be driven safely to their watchdog position, even if the output was in Manual mode. If the watchdog is not enabled, the expansion will maintain the outputs to their last demand status until the expansion is restarted.

Universal Channels

Any Universal Channel configured as Output (0-10V or PWM) will be available here to be configured in either AUTO (controlled by BMS, watchdog or functions) or in MANUAL mode, where a fixed value is set.

In the example below, Universal Channels 1, 2 and 4 are configured as Outputs and Universal Channel 2 is fixed to a manual position of 5V (50%)

```
       A/M I/O Local
        A/M   M.Val    Out.
U 1:AUTO       0%        4%
U 2:MAN.      50%       50%
U 3:----      --%       --%
U 4:AUTO       0%        4%
U 5:----      --%       --%
```

Digital Outputs

All Digital Outputs are available to be configured in either AUTO (controlled by BMS, watchdog or functions) or in MANUAL mode, where a fixed position is set.

In the example below, Digital Outputs 2 and 3 are fixed to a manual state, with Digital Output 2 being OFF and Digital Output 3 being ON

```
        A/M I/O Local
        A/M   M.Val   Out.
DO 1:AUTO     OFF     OFF
DO 2:MAN.     OFF     OFF
DO 3:MAN.     ON      ON
DO 4:AUTO     OFF     OFF
DO 5:AUTO     OFF     OFF
DO 6:AUTO     OFF     OFF
```

Analog Outputs (main unit only)

On the main unit 2 extra Analog Outputs are available to be configured in either AUTO (controlled by BMS, watchdog or functions) or in MANUAL mode, where a fixed value is set.

In the example below, Analog Output 2 is fixed to a manual position of 7.5V (75%)

```
        A/M I/O Local
        A/M   M.Val    Out.
Y 1:AUTO       0%        0%
Y 2:MAN.      75%       75%
```

Functions

The main unit allows to create some basic logic between inputs and outputs. A flexible setup allows to select any input and output (of a compatible type) within the function so some essential controls strategy is managed directly at the "edge" level, with a BMS monitoring the I/O and controlling some other outputs on the same module.

When a function is controlling an output, any demand from the BMS or a BMS watchdog being active is disregarded. It is still possible to manually set the output to a fixed status by placing it in Manual mode from the "Auto/Manual" menu.

For the expansion, the status of the expansion outputs is dictated by the main unit. So, if the expansion is disconnected from the main unit and the expansion watchdog is enabled, the expansions output will be driven safely to their watchdog position, even if the output was controlled by a function. If the watchdog is not enabled, the expansion will maintain the outputs to their last demand status until the expansion is restarted.

Functions also include pulse counters, which store the counted value locally with an embedded scaling function to adapt to the meter pulse strategy.

Pulse counter

2 pulse counters are available on each main device and expansion.

The total counter is shown on the top row with "Current value".

Note: the display can only visualise 6 digits, but the value is a full 32-bit float, so the BMS can access higher values than 999999.

"Input select" allows to configure the desired Universal Channel used for the pulse counting function.

Note: this Universal Channel MUST be configured as "PULSE COUNTER" type for the function to work properly.

"Scaling" allows to configure a scaling factor to the raw pulses. The function will do the following:

Current Value = Universal Channel raw pulses * Scaling

"Preset value" is used together with the command "Preset run" and it allows to override the "Current value" with a desired preset. Set the "Preset value" and then configure "Preset run" to "yes" to override.

"Reset to 0 run" is a command that allows to set the "Current value" to "000000". Configure the "Reset to 0 run" to "yes" to override

```
┌─────────────────────────┐
│ Pulse counter 1 local   │
│ Current value:   000004 │
│                         │
│ Input select:        U1 │
│ Scaling:        001.000 │
│ Preset value:    000000 │
│ Preset run:          No │
│ Reset to 0 run:      No │
└─────────────────────────┘
```

Analog input re-scale to analog output

Any Universal Channel configured as Analog Input (that being a passive Temperature sensor or an active input such as 4-20mA or 0-10V) can be re-scaled to a 0-100% analog output signal, which can be sent to either a Universal Channel configured as Analog Output, or to one of the 2 dedicated Analog Outputs available on the main unit.

2 analog input re-scale to analog output functions are available on each main device and each expansion.

On the first row it is possible to select the Universal Channel used as analog input to be rescaled.
Note: the Universal Channel MUST be configured as Analog Input

On the second row it is possible to select a Universal Channel used as enable signal. On the main unit it is possible to select also one of the 2 dedicated digital inputs. It is also possible to select whether the enable signal is direct (contact open = enable) or reverse (contact close = enable). Leaving the "En input" to "—" will keep the function always enabled.
Note: if selecting a Universal Channel, it MUST be configured as Digital Input

On the fourth and fifth row we can find the Analog input value associated to 0% analog output and the value associated to 100% analog output.
Example 1: out 0% > in 20.0, out 100% > in 25.0. This will keep the analog output at 0% below 20.0 analog input, then modulate the output to 100% proportionally with the analog input increasing from 20.0 to 25.0, maintaining the output at 100% for any higher value of analog input.
Example 2: out 0% > in 55.0, out 100% > in 50.0. This will keep the analog output at 0% above 55.0 analog input, then modulate the output to 100% proportionally with the analog input decreasing from 55.0 to 50.0, maintaining the output at 100% for any lower value of analog input.

On the last row it is possible to select up to 3 Universal Channels configured as analog output or dedicated analog outputs in case of the main unit (local) to send the output signal out of the device.
Note: if selecting a Universal Channel, it MUST be configured as Analog Output

```
 ▀▀▀▀Aim rescale 1 local
Input select:          U1
En input:    DIRECT   U3

Out 0%   > in:        0.0
Out 100% > in:      100.0
Output select
1: U6     2:---    3:---
```

Digital input to digital output

Any Universal channel configured as Digital Input or, in case of the main unit (local), any of the 2 dedicated digital inputs can be ported back to a digital output, either direct or inverted.

2 digital input to digital output functions are available on each main device and each expansion.

On the first row it is possible to select the Universal Channel used as digital input, or a dedicated digital input on the main unit (local), to be rescaled.

Note: the Universal Channel MUST be configured as Digital Input

On the second row it is possible to configure whether the signal received should be used "direct" or "reverse". Direct will activate the selected output when the input is open (1), while Reverse will activate the selected output when the input is closed (0).

On the last row it is possible to select up to 3 digital outputs to send the output signal out of the device.

```
 Din to Dout 1 local
Input select:        U2
Input mode:      DIRECT

Output select
1:DO1    2:---    3:---
```

Thermostat

Any Universal Channel configured as Analog Input (that being a passive Temperature sensor or an active input such as 4-20mA or 0-10V) can be used as input of a thermostat function that creates an ON/OFF signal that can be then sent to a digital output.

The thermostat can have an enable signal and can be used direct or reverse.

2 Thermostat functions are available on each main device and each expansion.

On the first row it is possible to select the Universal Channel used as input for the thermostat.

Note: the Universal Channel MUST be configured as Analog Input

On the second row it is possible to select a Universal Channel used as enable signal. On the main unit it is possible to select also one of the 2 dedicated digital inputs. It is also possible to select whether the enable signal is direct (contact open = enable) or reverse (contact close = enable). Leaving the "En input" to "—" will keep the function always enabled.

Note: if selecting a Universal Channel, it MUST be configured as Digital Input

Note2: you can use the same enable function on 2 separate thermostat one "direct" and one "reverse" to create a "summer/winter" signal, for example.

On the third and fourth row we can configure the set point and hysteresis of the thermostat, and on the fifth row whether we want the thermostat to work "direct" (cooling) or "reverse" (heating).

In a **DIRECT** control operation, the output will be triggered ON when the analog input value is equal or above set-point + hysteresis. It would be then maintained ON until the analog input value goes below set-point.
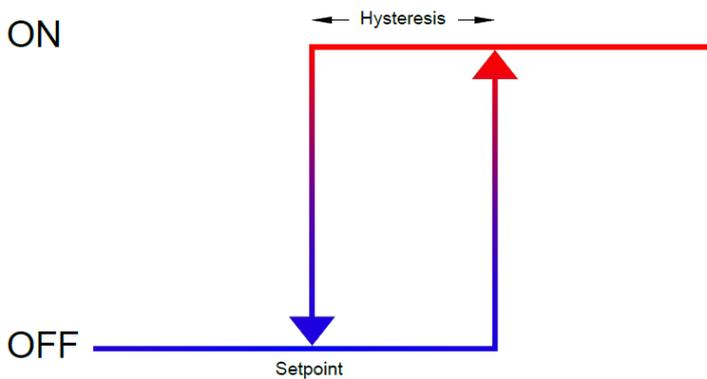
In a **REVERSE** control operation, the output will be triggered ON when the analog input value is equal or below set-point - hysteresis. It would be then maintained ON until the analog input value goes above set-point.
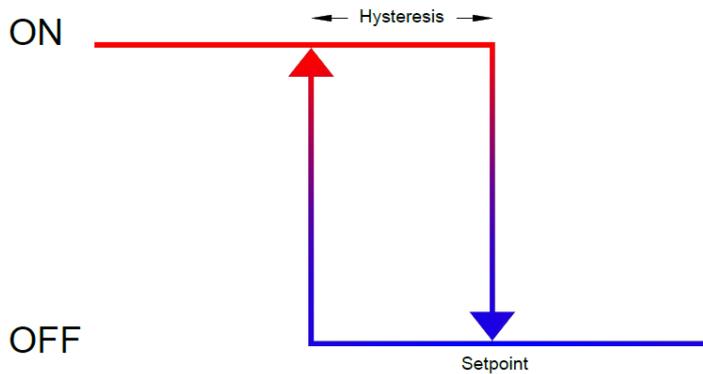
On the last row it is possible to select up to 3 digital outputs to send the output signal out of the device.

Network settings

General note

After changing any setting on the "Network settings" menu, a device reboot is required.

You will find a useful display at the end of this menu (press "UP" or "DOWN" ⬆️⬇️ to scroll to this display) that will allow you to reboot without having to power the device OFF and back ON

```
                    Reboot
Select "YES" to
reboot the
device:            NO

```
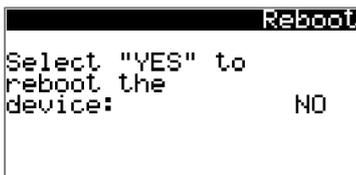
On the "IP configuration" of the Link IO IP device model you will also find a dedicated reboot function, needed to save the IP settings.

Watchdog

Watchdog is an internal function of Link IO which checks if a master is online to control the I/O, and if it is not it can position the outputs to a pre-configured pattern.

Link IO comes with 2 watchdogs: the first one is with the BMS. If outputs are controlled by the BMS and are not in Manual mode or used by a function, enabling the BMS watchdog will get Link IO to verify the BMS commands. If the BMS stops polling Link IO for any reason, after the configured BMS Timeout, the outputs of Link IO and the connected expansions will all be configured to the "output when offline" position, which can be found on the "Configure I/O" section on the local display or the "I/O" section on the web tool

A second watchdog is also available for the expansions only. If enabled, each expansion will constantly check for the presence of the main Link IO device. If an expansion loses connection for any reason, its outputs will automatically be configured to the "output when offline" position

```
                   Watchdog
Enable BMS
offline watchdog:   NO

BMS timeout:        30s

Enable expansion
offline watchdog:   NO
```
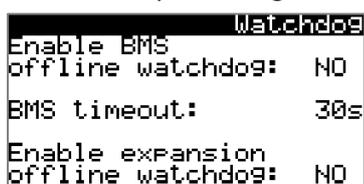
Using an RS485 main unit (part number LNK-IO20-RS-MOD and LNK-IO20-RS-BAC)

When using an RS485 main unit, the RS485 can only work with either Modbus or BACnet. Both protocols cannot be used at the same time on an RS485 network.

If your device is licensed for BACnet, the display below will be available so you can choose which protocol to use

```
     BMS protocol
Select the BMS port
Protocol:
            MODBUS
```

If Modbus is selected (or is the only protocol available), the Modbus RTU settings will be displayed on the next screen

```
     Modbus settings
Modbus ID:          1

Baudrate:       19200
Parity:          NONE
Stop bits:          1
```

Otherwise the BACnet MSTP settings will be displayed instead. You can select a desired "BACnet ID" and a separate "MAC address". Note that not all variables are enabled to be used with COV. All variables can be used in "polled" mode, COV is not mandatory.

```
     Bacnet settings
Bacnet dev ID:   2532
Bacnet MAC addr:    1

Baudrate:       19200

COV setting:      0.1
```

Using an IP main unit (part number LNK-IO20-IP-MOD and LNK-IO20-IP-BAC)

When using an IP enabled unit (the one with the ethernet port), both Modbus and BACnet are enabled at the same time, you do not need to choose. Just configure the BMS master to use one protocol or the other according to your needs.

The Modbus TCP configuration will just need the ID and IP port to be configured. Note that because Modbus TCP uses also the IP address to identify the slave unit, all slaves in this case could be configured with Modbus ID = 1 without a problem

```
        Modbus settings
Modbus ID:            1
IP port:           502
```

For BACnet IP, the address, IP port and COV increment are available. Note that not all variables are enabled to be used with COV. All variables can be used in "polled" mode, COV is not mandatory.

```
        Bacnet settings
Bacnet dev ID:       1
IP port:         47808
COV setting:       0.1
```

It is possible then to get into the IP port settings by pressing ENTER on the next screen. Configure your IP settings, then move to the next screen down (place cursor on the top left of the screen and press the key DOWN) and select "Yes" to save the IP settings and reboot the Link IO main device.

```
              IP port
Press "Enter" to
access the IP port
settings
```

```
              IP settings
Enable: Static

IP:    192.168. 80. 91
MASK:  255.255.255.  0
GW:    192.168. 80.  1
DNS:     8.  8.  8.  1
```

```
              IP settings
Save your IP
settings?          No


(device will reboot)
```

General settings

Configuring number of expansions

The main unit can work independently with its on board 20 I/O points or can be extended with the use of expansion modules (**LNK-IO16-EXP**).

Up to 10 expansion modules can be configured.

When at least 1 expansion is configured, the menu option for "I/O readings", "Configure I/O", "Auto/Manual" and functions will show an extra menu to allow to set the main device and each expansion individually. The main unit manages all the strategies and controls, but the settings are conveniently separated per physical device.

Temperatures in Celsius or Fahrenheit

All Universal Channels configured to read "passive analog inputs" (any NTC, PT1000, PT500, PT100, PTC) will display a temperature, and by default they are shown in ˚C (Celsius).

It is possible to convert the temperatures to ˚F (Fahrenheit) within the Link IO module, so no conversion is required on the BMS.

Permanent memory use

Link IO saves permanent data within its flash memory.

As with any permanent memory, there is a limited amount of writings you can do before the memory cells could fail. With the Link IO the permanent memory is guaranteed for 1 million writings per cell.

Configuration settings are not going to change much. There are 2 data sets that is worth checking:

- The total value of the pulse counter functions
- The set-point and hysteresis of the thermostat functions

```
 Permanent memory
Save counters
every:          15min

Check the manual
for more information
about the flash memory
```

The setting in this menu takes care of the periodic saving of the pulse counters in case of a power failure. So if for example the counter was saved every 10 minutes, the memory cell would be guaranteed for the next 20 years. Saving less frequently will extend the time proportionally (15 minutes = 30 years, 20 minutes = 40 years and so on).

As for the thermostat functions, set point could be changed from the BMS. Changing it regularly will be fine (as per pulse counter). The issue would come if you were to do ambient tracking on the BMS or similar functions, where the set-point would constantly change damaging the flash memory in the long run. If you plan on using ambient tracking, a solution would be to filter the required set-point changes within the BMS and send them to Link IO only every 15 minutes for example.

Buzzer "beeping" mode

By default, the on-board buzzer gives a feedback "beeping" on every key pressed.

This can be disabled here selecting "NO" and effectively muting the buzzer.

(the buzzer will still beep only once when the cursor is on top or a parameter and cycling from the maximum value to its minimum or viceversa)

```
    Buzzer mode
Display buzzer
"feedback" beeping
at every button
press:          YES
```

Setting log in password

It is possible to customise the settings password. Default is "1234", but you can use any number between 0000 and 9999.

```
  Change password
Change here the
"settings"
password:
              1234
```

Please save and remember your password.

Backup/Restore settings

Link IO has a USB micro port available just below the display.

You can either connect directly with a PC using a USB A (male) to USB micro (male) cable, or connect a USB memory stick using a USB A (female) to USB micro (male) cable, also referred to as "OTG cable".

When connecting with a PC, the Link IO main device is found as an external USB drive.

The USB memory stick would need to be formatted as FAT32 and it is recommended to use a USB2.0 dongle with max 500mA current requirement. USB3.0 might not work because of higher current required to run.

All the settings (except the IP port settings) can be exported (**BACKUP DATA**) to a .txt file. The file can be saved to:

- **LOCAL.** Saves the file on the root directory of the Link IO internal memory. **NOTE:** make sure there is nothing (ie PC) connected over USB when backing up or restoring data. A "memory error" message is provided when trying to access the "LOCAL" memory with a PC connected
- **USB.** Saves the file on the root directory of a connected USB memory stick (USB 2.0 max).

This operation is very useful as the same file can be used on other Link IO main devices and restore (**RESTORE DATA**) all the settings contained in the txt file within the Link IO, effectively reducing massively configuration time for extended repeatable configurations.

The exported file can also be edited with the Web Configurator on our website! The Web configurator can then save a new version of the txt file that can be used on the Link IO devices where needed.

Once the whole configuration has been made on this page, you will just need to get the cursor on top of the "Confirm operation" setting displaying "NO", and using the buttons changing it to "YES" and press to run the function.

Note: the name of the file is particularly important. The file is always named as "EXPORT_xx.txt" where xx is a configuration number between 0 and 99. The file name should always be formatted as required, with 1 digit between 0 and 9, and 2 digits between 10 and 99, so it can be found by the device when restoring a configuration.

Examples of file name: EXPORT_0.txt, EXPORT_5.txt, EXPORT_67.txt

Using a wrong file name when restoring a configuration or backing up from/restoring to a USB memory stick that is not recognized will fail the operation showing "Cannot access file".

Remember to always remove any PC USB connection when restoring from the local memory. While the PC is connected the local flash memory will not be accessible by Link IO and the error "Cannot access file" will also appear.

Restore factory defaults

From the general settings menu it is possible to restore the Link IO device to the factory settings, by changing the setting from "NO" to "YES" and press Enter

```
        Default
Reset the device to
the manufacturer
settings?
              NO
```

There are special cases where the device might not be accessible ("setting log in password" lost is probably the main example).

In this case, it is possible to access a "system hidden menu", by holding both the buttons and pressed until the menu appears (about 4 seconds)

```
  INFORMATION
  SETTINGS
> APPLICATION
  UPGRADE
  LOGGER
  DIAGNOSTICS
```

Move to the option "Application" using the buttons and press .
The "Application" sub menu appears

```
  STOP APPLICATION
  START APPLICATION
  RESTART APPLICATION
> WIPE RETAIN
  WIPE NVRAM
  UI MANAGMENT
  BUILT IN SETTINGS
```

From there, move to the option "Wipe Retain" using the buttons.

Once you press , the factory default settings will be applied, also resetting the forgotten setting log in password to "1234".

Here is a quick overview of the default configuration

Parameter main group	Parameter group	Parameter	Factory default setting
Configure I/O	Universal Channels (all)	Direction	INPUT
		Type	10K3A1
		Filter	5
	Analog outputs (main unit, Y1 and Y2)	Type	0-10V
	Output when offline (watchdog) for Universal Channels (visible when configured as output)	Value	0%
	Output when offline (watchdog) for Digital Outputs	Value	OFF (relay disengaged)
	Output when offline (watchdog) for Analog Outputs (main unit)	Value	0%
Auto/Manual	Auto/Manual for Universal Channels (visible when configured as output)	Auto/Manual	AUTO
		Manual value	0%
	Auto/Manual for Digital Outputs	Auto/Manual	AUTO
		Manual value	OFF
	Auto/Manual for Analog Outputs (main unit)	Auto/Manual	AUTO
		Manual value	0%
Functions	Functions (in general)	All inputs	NOT SELECTED (disabled)
		All outputs	NOT SELECTED (disabled)
Network settings	Watchdog BMS	Enable	DISABLED
		Timeout	30s
	Watchdog expansions	Enable	DISABLED
	RS485 device only	Protocol	MODBUS
	RS485 device, Modbus	Modbus ID	1
		Baudrate	19200
		Parity	NONE
		Stop bits	1
	RS485 device, BACnet	BACnet ID	1
		BACnet MAC address	1
		Baudrate	19200
		COV setting	0.1
	IP device, Modbus	Modbus ID	1
		Modbus port	502
	IP device, BACnet	BACnet ID	1
		BACnet port	47808
		COV setting	0.1
	IP device, IP port settings	IP address	192.168.80.91
		Subnet	255.255.255.0
		Gateway	192.168.80.1
		DNS	0.0.0.0
General settings	Expansions	Number of expansions	0
	Temperature readings	Celsius of Fahrenheit	CELSIUS
	Pulse counter function	Flash saving frequency	Every 15min
	Display user access password change	Password	1234

Software version and software information

This section is providing general information about the software.

```
                 Version
Link IO

Model: LNK-IO20-RS-MOD

Sw version:        1.0b1
Sw date:      21/07/2020
```

```
               Information
Link IO
U.ID:0000K21000007AC0

Sw cycle time:       191ms
Supply volts:        24.0V
Supply type:            AC
Var writes:            234
```

When asking for support, you will be asked to provide the information displayed here, to have a first view on the software release, how the processor is doing, the power supply voltage value and how the permanent memory has been used.

It is an easy way to simplify support.

In the Information screen you can also find the Unique ID (U.ID), which is necessary to bind a BACnet license to the device (see chapter "Licensing BACnet").

The SW cycle time shows the duration of a software full program cycle. During that time the software would have read the inputs, run all the functions, auto manual etc and finally write the outputs.

Link IO power supply type can be showing "AC" (alternating current), "DC" (direct current), "PSU" (when a dedicated super capacitor module is connected and the mains power supply is missing) or "N.A." (when there is a problem with the voltage reading internal module).

The voltage reading in AC is the RMS voltage (same as you would read using an external multimeter).

Note: the voltage reading should be considered as an "indicative" value, expecting an error on the range of ±0.5 V. It is useful though to get an indication on fluctuation or considerably wrong voltage value on the power supply.

Var writes is used for debug, and it shows the total number of times any permanent memory variable has been changed. This number is expected to increase in time, but sudden continuous increases might indicate an excess of permanent memory writings, for example the Set-point of the thermostats from the BMS supervisor (see chapter "Permanent memory use").

The Web Configurator

Introduction

Visiting the website https://link.innon.com/ you can access a web tool that allows you to:

- Load an exported configuration file and visualise it on the web (see chapter "Backup/Restore settings" to know more about this function)
- Create a new configuration from scratch
- Save a configuration file that can be restored into a Link controller using the "Backup/Restore" function, placing the file on a USB memory stick or directly on the Link memory using a USB cable and PC (see chapter "Backup/Restore settings" to know more about this function)

Note1: the name of the file is particularly important. The file is always named as "EXPORT_xx.txt" where xx is a configuration number between 0 and 99. The file name should always be formatted as required, with 1 digit between 0 and 9, and 2 digits between 10 and 99, so it can be found by the device when restoring a configuration.

Examples of file name: EXPORT_0.txt, EXPORT_5.txt, EXPORT_67.txt

Note2: the file saved from the configuration tool is compatible with both the IP and RS version of Link IO. Settings that are not applicable for the destination unit will be simply disregarded.

The website and how to use it

The web tool presents 3 levels of configuration which are like the layout found on the onboard display

On the top bar of the web tool, looking on the left, you can navigate between these section

- General – Where you can configure the Network and General settings
- I/O – Where you can configure the I/O type, direction, watchdog position and the Auto/Manual settings for the outputs
- Functions – Where you can set up all the functions of each device

On the right-hand side, you can

- Reset – Clear all the web tool settings to default
- Load – Select a .txt setting file from your PC and load it to the web tool
- Download – Save the web tool settings to a new .txt configuration file to be used on Link IO

Also, if a wrong configuration is made while setting up the system, like selecting too many 0-10V outputs on a expansion for example, a notification will appear on this top bar with the warning description and a link to the setting to correct.

Web tool sections – General

This configuration section starts with common settings applicable to both the IP and RS version of Link IO

General settings

Expansions connected to the Link IO device	0
Display password	1234
Enable BMS offline watchdog	⬜
BMS offline timeous (s)	120
Enable expansions offline watchdog	⬜
Use temperature sensors in Fahrenheit	⬜

Common BMS Settings

Modbus address	1
Bacnet ID	1

You will be presented then with specific settings for the RS and IP version of Link IO. Configure them both if you want to use the same file for both type of devices: the file will be compatible

RS485 (*RS) only BMS settings

BMS protocol	Modbus
Baud Rate	19200
Modbus Parity	NONE
Modbus Stop bits	1

Ethernet (*IP) only BMS settings

Modbus IP Port	502
Bacnet IP Port	47808

Note: you will notice that the only missing configuration is the ethernet port IP, subnet, DNS. The configuration of the ethernet port must be done on each device and is currently not available on the web tool.

Web tool sections – I/O

This section provides all the available settings for the inputs and outputs. The settings are separated with a "tab" available for the main device and up to 10 other "tabs" available for the available 10 expansions

NAME	DIRECTION	TYPE	FILTER/SPEED/CURRENT	MIN	MAX	OUTPUT WHEN OFFLINE	OVERRIDE EN	OVERRIDE VALUE
Universal Channel 1	Input	NTC 10K3A1	5	—	—	—	—	—
Universal Channel 2	Input	0-10V	5	0.0	100.0	—	—	—
Universal Channel 3	Input	PT1000	5	—	—	—	—	—
Universal Channel 4	Input	DIG.INPUT	FAST	—	—	—	—	—
Universal Channel 5	Input	PULSE COUNT	50uA	—	—	—	—	—
Universal Channel 6	Input	PULSE COUNT	50uA	—	—	—	—	—
Universal Channel 7	Output	0-10V	—	—	—	75.0	⬜	0.0
Universal Channel 8	Output	0-10V	—	—	—	50.0	🔴	50.0
Universal Channel 9	Output	0-10V	—	—	—	0.0	⬜	0.0
Universal Channel 10	Output	0-10V	—	—	—	0.0	⬜	0.0
Digital Output 1						⬜	⬜	⬜
Digital Output 2						🔴	🔴	🔴
Digital Output 3						🔴	⬜	⬜
Digital Output 4						🔴	⬜	⬜
Digital Output 5						⬜	⬜	⬜
Digital Output 6						⬜	⬜	⬜
Analog Output 1		0-10V				0.0	⬜	0.0
Analog Output 2		0-10V				0.0	🔴	25.0

You will notice that all the input and output settings are available, including the watchdog output positions and the auto/manual settings

Web tool sections – Functions

This section allows to configure all the functions available for each device. Like for the I/O section, "tabs" are available to access the functions of the main unit and each expansion individually.

Functions setup

Local | Expansion 1 | Expansion 2 | Expansion 3 | Expansion 4 | Expansion 5 | Expansion 6 | Expansion 7 | Expansion 8 | Expansion 9 | Expansion 10

Counter 1

Input selection	N.U.
Counter preset value	0.0
Counter scaling	1.000

Counter 2

Input selection	N.U.
Counter preset value	0.0
Counter scaling	1.000

Digital Input Copy 1

Input selection	N.U.
Input reverse	
Output 1 selection	N.U.
Output 2 selection	N.U.
Output 3 selection	N.U.

Digital Input Copy 2

Input selection	N.U.
Input reverse	
Output 1 selection	N.U.
Output 2 selection	N.U.
Output 3 selection	N.U.

Analog Value Rescale 1

Input selection	N.U.
Enable input selection	N.U.
Enable input reverse	
Scale X min	0.0
Scale X max	100.0
Output 1 selection	N.U.
Output 2 selection	N.U.
Output 3 selection	N.U.

Analog Value Rescale 2

Input selection	N.U.
Enable input selection	N.U.
Enable input reverse	
Scale X min	0.0
Scale X max	100.0
Output 1 selection	N.U.
Output 2 selection	N.U.
Output 3 selection	N.U.

Thermostat 1

Input selection	N.U.
Enable input selection	N.U.
Enable input reverse	
Set–point	25.0
Hysteresis	2.0
Direction reverse	
Output 1 selection	N.U.
Output 2 selection	N.U.
Output 3 selection	N.U.

Thermostat 2

Input selection	N.U.
Enable input selection	N.U.
Enable input reverse	
Set–point	25.0
Hysteresis	2.0
Direction reverse	
Output 1 selection	N.U.
Output 2 selection	N.U.
Output 3 selection	N.U.

Licensing BACnet

When buying the BACnet version of Link IO (part numbers LNK-IO20-IP-BAC and LNK-IO20-RS-BAC) or when adding the BACnet license later (add on part number LNK-ADD-BAC), you will receive a BACnet license file to install on the device so the additional driver can be enabled.

The license is linked to the individual device using a Unique ID.

The process of licensing is quite simple (if you purchased a LNK-IO20-IP-BAC or LNK-IO20-RS-BAC you can skip to step 5) directly):

1) Turn on Link IO

2) Access the main menu and enter the "General Settings"

3) Scroll all the way down (or just 1 step up) using the arrow keys until you get to the system information screens

4) On the information screen you will find the Unique ID of the device. Note that down and provide the code to Innon (do this for each device you need the Bacnet license for)

5) Innon will process the licenses for you and provide back a file named "**AUTORUN_*uniqueID*.ap1**" for each device required

6) Option 1: **COPYING THE FILE DIRECTLY ON THE DEVICE**
   a. Connect your Link IO to your PC using a USB A to USB micro cable (you can find the USB micro port on Link IO lifting the rubber flap just below the screen)
   b. The Link IO will appear as an external drive. Find the folder UPGRADE there
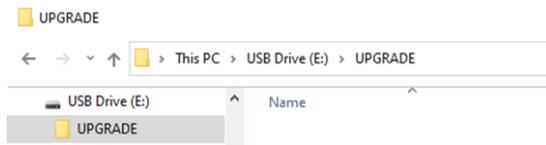
   c. Copy and paste each license file in this folder
   d. Safely remove the USB drive (Link IO) on Windows and disconnect the USB cable. Link IO will then recognize the file

7) Option 2: **USING A USB MEMORY.** Get a USB memory stick, USB2.0 (USB3 might not work) and format it in FAT32 using a dedicated. I use SD Card Formatter, a free software available here: https://www.sdcard.org/downloads/formatter/
   a. Create a folder UPGRADE on the USB memory stick
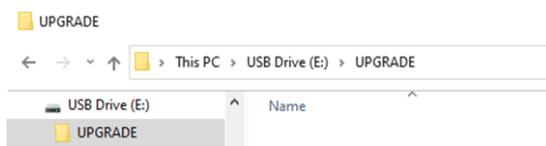
   b. Copy and paste each license file in this folder
   c. Connect the USB memory stick to the Link IO you need to license, using a USB A to USB micro cable (also called "OTG" cable)

8) Now follow the instructions on the screen to license the device

Updating the software

The software running on the Link IO can be upgraded.

This is a rare operation, but it might be required if extra functionalities have been introduced on future releases and you would like to use it on existing devices running an older software.

The software is provided as a single file with name "Autorun.ap1".

Note 1: when updating the software, you might lose all your settings and the device will default back to factory configuration. We would recommend running a BACKUP of your settings so you can RESTORE them once the update is finished (check the "Backup/Restore Settings" chapter to know more about this function)

Note 2: the upgrade process can take up to 10 minutes! Do not unplug the USB cable/dongle or the power supply during the process.

Note 3: the upgrade process takes over the 5 minutes backlight timer. This means the display backlight will switch off while the upgrade is working. Check the screen after 10 minutes, you should find the "press ENTER to restart the device" message. Press ENTER and the device should be updated and ready to be used again.

Connecting directly to the device

Connect your Link IO to your PC using a USB A to USB micro cable (you can find the USB micro port on Link IO lifting the rubber flap just below the screen)

The Link IO will appear as an external drive. Find the folder UPGRADE there
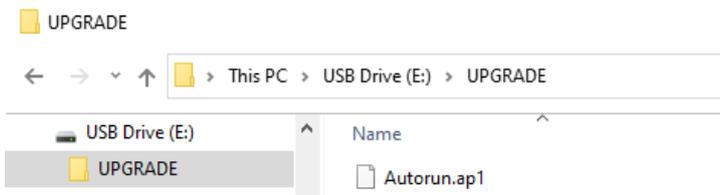
Once you have copied the file, make sure you disconnect the drive (Link IO) on the Windows taskbar and disconnect the USB cable. The screen will access then the file and prompt you to upgrade the software.

Follow the instruction on the screen pressing ↵ to confirm.

Using a USB memory stick

Make sure the USB stick is USB2.0 (USB3.0 might not work) and formatted in FAT32.

Using a dedicated software to format external devices is usually ensuring the correct format. I use SD Card Formatter, a free software available here: https://www.sdcard.org/downloads/formatter/

We are also going to use a USB A (female) to USB micro (male) cable, called also "OTG". This allows to use standard USB memory sticks and connect them to the USB micro port of the Link IO unit.

On the USB memory stick, we need to create a folder called "UPGRADE" and place the "Autorun.ap1" file within that folder
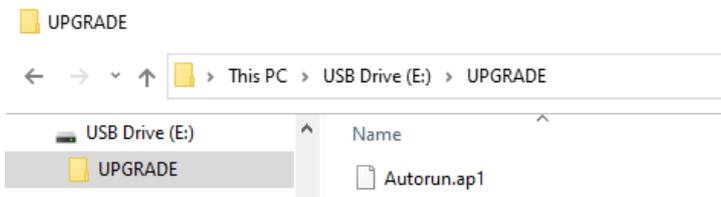
With the USB stick ready, we are going to plug it to the USB port of Link IO.

Once the USB memory stick has been recognised, the screen will automatically prompt for confirming the upgrade. Pressing will confirm.

BMS Point lists

Modbus

Use this point list to configure your BMS Modbus master (RTU or TCP depending on the used device/connection)

Floating point data type uses 2 registers (32 bit) and the byte order is 3210

Bit-field data type uses individual bits from the 16 bits available on the Modbus register to provide multiple Boolean information.

Bit 0 refers to Universal channel 1, Digital output 1 or Analog output 1 (based on the point), Bit 1 refers to Universal channel 2, Digital output 2 or Analog output 2 and so on.

Local									
Modbus Data	**Index (dec)**	**Index (modbus)**	**Bit**	**Variable Description**	**DataType**	**Default**	**--**	**--**	**Dir**
Coil	11	12	1	Command Digital Output 1	Bool	0	0	1	RW
Coil	12	13	1	Command Digital Output 2	Bool	0	0	1	RW
Coil	13	14	1	Command Digital Output 3	Bool	0	0	1	RW
Coil	14	15	1	Command Digital Output 4	Bool	0	0	1	RW
Coil	15	16	1	Command Digital Output 5	Bool	0	0	1	RW
Coil	16	17	1	Command Digital Output 6	Bool	0	0	1	RW
Coil	21	22	1	Reset Pulse Counter 1	Bool	0	0	1	RW
Coil	22	23	1	Reset Pulse Counter 2	Bool	0	0	1	RW
Coil	23	24	1	Preset Pulse Counter 1	Bool	0	0	1	RW
Coil	24	25	1	Preset Pulse Counter 2	Bool	0	0	1	RW
Modbus Data	**Index (dec)**	**Index (modbus)**	**Bit**	**Variable Description**	**DataType**	**Default**	**--**	**--**	**Dir**
DiscreteIn	1	10002	1	Digital Input Universal Channel 1	Bool				R
DiscreteIn	2	10003	1	Digital Input Universal Channel 2	Bool				R
DiscreteIn	3	10004	1	Digital Input Universal Channel 3	Bool				R
DiscreteIn	4	10005	1	Digital Input Universal Channel 4	Bool				R
DiscreteIn	5	10006	1	Digital Input Universal Channel 5	Bool				R
DiscreteIn	6	10007	1	Digital Input Universal Channel 6	Bool				R
DiscreteIn	7	10008	1	Digital Input Universal Channel 7	Bool				R
DiscreteIn	8	10009	1	Digital Input Universal Channel 8	Bool				R
DiscreteIn	9	10010	1	Digital Input Universal Channel 9	Bool				R
DiscreteIn	10	10011	1	Digital Input Universal Channel 10	Bool				R
DiscreteIn	11	10012	1	Current value Digital Output 1	Bool				R
DiscreteIn	12	10013	1	Current value Digital Output 2	Bool				R
DiscreteIn	13	10014	1	Current value Digital Output 3	Bool				R
DiscreteIn	14	10015	1	Current value Digital Output 4	Bool				R
DiscreteIn	15	10016	1	Current value Digital Output 5	Bool				R
DiscreteIn	16	10017	1	Current value Digital Output 6	Bool				R
DiscreteIn	17	10018	1	Digital Input ID 1	Bool				R
DiscreteIn	18	10019	1	Digital Input ID 2	Bool				R

Modbus Data	Index (dec)	Index (modbus)	Bit	Variable Description	DataType	Default	Min	Max	Dir
HoldingR	1	40002	32	Command Output Universal Channel 1	Float	0	0.0	100.0	RW
HoldingR	3	40004	32	Command Output Universal Channel 2	Float	0	0.0	100.0	RW
HoldingR	5	40006	32	Command Output Universal Channel 3	Float	0	0.0	100.0	RW
HoldingR	7	40008	32	Command Output Universal Channel 4	Float	0	0.0	100.0	RW
HoldingR	9	40010	32	Command Output Universal Channel 5	Float	0	0.0	100.0	RW
HoldingR	11	40012	32	Command Output Universal Channel 6	Float	0	0.0	100.0	RW
HoldingR	13	40014	32	Command Output Universal Channel 7	Float	0	0.0	100.0	RW
HoldingR	15	40016	32	Command Output Universal Channel 8	Float	0	0.0	100.0	RW
HoldingR	17	40018	32	Command Output Universal Channel 9	Float	0	0.0	100.0	RW
HoldingR	19	40020	32	Command Output Universal Channel 10	Float	0	0.0	100.0	RW
HoldingR	21	40022	32	Command Output Y1	Float	0	0.0	100.0	RW
HoldingR	23	40024	32	Command Output Y2	Float	0	0.0	100.0	RW
HoldingR	31	40032	32	Preset Value Counter 1	Float	0	0.0	999999	RW
HoldingR	33	40034	32	Preset Value Counter 2	Float	0	0.0	999999	RW
HoldingR	35	40036	32	Scaling Counter 1	Float	1.0	-999.9	999.9	RW
HoldingR	37	40038	32	Scaling Counter 2	Float	1.0	-999.9	999.9	RW
HoldingR	39	40040	32	Setpoint Thermostat 1	Float	25.0	-999.9	999.9	RW
HoldingR	41	40042	32	Hysteresis Thermostat 1	Float	2.0	-999.9	999.9	RW
HoldingR	43	40044	32	Setpoint Thermostat 2	Float	25.0	-999.9	999.9	RW
HoldingR	45	40046	32	Hysteresis Thermostat 2	Float	2.0	-999.9	999.9	RW
Modbus Data	Index (dec)	Index (modbus)	Bit	Variable Description	DataType	Default	Min	Max	Dir
InputR	1	30002	32	Current Value Universal Channel 1	Float				R
InputR	3	30004	32	Current Value Universal Channel 2	Float				R
InputR	5	30006	32	Current Value Universal Channel 3	Float				R
InputR	7	30008	32	Current Value Universal Channel 4	Float				R
InputR	9	30010	32	Current Value Universal Channel 5	Float				R
InputR	11	30012	32	Current Value Universal Channel 6	Float				R
InputR	13	30014	32	Current Value Universal Channel 7	Float				R
InputR	15	30016	32	Current Value Universal Channel 8	Float				R
InputR	17	30018	32	Current Value Universal Channel 9	Float				R
InputR	19	30020	32	Current Value Universal Channel 10	Float				R
InputR	21	30022	32	Current Value Output Y1	Float				R
InputR	23	30024	32	Current Value Output Y2	Float				R
InputR	25	30026	16	Auto/Manual status Universal Ch Outputs	Bit-Field				R
InputR	26	30027	16	Function status Universal Ch Outputs	Bit-Field				R
InputR	27	30028	16	Auto/Manual status Digital Outputs	Bit-Field				R
InputR	28	30029	16	Function status Digital Outputs	Bit-Field				R
InputR	29	30030	16	Auto/Manual status Analog Outputs	Bit-Field				R
InputR	30	30031	16	Function status Analog Outputs	Bit-Field				R
InputR	31	30032	32	Current Value of Counter 1	Float				R
InputR	33	30034	32	Current Value of Counter 2	Float				R

Expansion "nn" — Replace "nn" on "Index" with the expansion number ("01", "02", "03" up to "10") to read/write the correct expansion data (i.e.: with index "modbus" 4nn02, use 40302 for expansion 3, 41002 for expansion 10 etc)										
Modbus Data	**Index (dec)**	**Index (modbus)**	**Bit**	**Variable Description**	**DataType**	**Default**	**--**	**--**	**Dir**
Coil	nn11	nn12	1	Command Digital Output 1	Bool	0	0	1	RW
Coil	nn12	nn13	1	Command Digital Output 2	Bool	0	0	1	RW
Coil	nn13	nn14	1	Command Digital Output 3	Bool	0	0	1	RW
Coil	nn14	nn15	1	Command Digital Output 4	Bool	0	0	1	RW
Coil	nn15	nn16	1	Command Digital Output 5	Bool	0	0	1	RW
Coil	nn16	nn17	1	Command Digital Output 6	Bool	0	0	1	RW
Coil	nn21	nn22	1	Reset Pulse Counter 1	Bool	0	0	1	RW
Coil	nn22	nn23	1	Reset Pulse Counter 2	Bool	0	0	1	RW
Coil	nn23	nn24	1	Preset Pulse Counter 1	Bool	0	0	1	RW
Coil	nn24	nn25	1	Preset Pulse Counter 2	Bool	0	0	1	RW
Modbus Data	**Index (dec)**	**Index (modbus)**	**Bit**	**Variable Description**	**DataType**	**Default**	**--**	**--**	**Dir**
DiscreteIn	nn01	1nn02	1	Digital Input Universal Channel 1	Bool				R
DiscreteIn	nn02	1nn03	1	Digital Input Universal Channel 2	Bool				R
DiscreteIn	nn03	1nn04	1	Digital Input Universal Channel 3	Bool				R
DiscreteIn	nn04	1nn05	1	Digital Input Universal Channel 4	Bool				R
DiscreteIn	nn05	1nn06	1	Digital Input Universal Channel 5	Bool				R
DiscreteIn	nn06	1nn07	1	Digital Input Universal Channel 6	Bool				R
DiscreteIn	nn07	1nn08	1	Digital Input Universal Channel 7	Bool				R
DiscreteIn	nn08	1nn09	1	Digital Input Universal Channel 8	Bool				R
DiscreteIn	nn09	1nn10	1	Digital Input Universal Channel 9	Bool				R
DiscreteIn	nn10	1nn11	1	Digital Input Universal Channel 10	Bool				R
DiscreteIn	nn11	1nn12	1	Current value Digital Output 1	Bool				R
DiscreteIn	nn12	1nn13	1	Current value Digital Output 2	Bool				R
DiscreteIn	nn13	1nn14	1	Current value Digital Output 3	Bool				R
DiscreteIn	nn14	1nn15	1	Current value Digital Output 4	Bool				R
DiscreteIn	nn15	1nn16	1	Current value Digital Output 5	Bool				R
DiscreteIn	nn16	1nn17	1	Current value Digital Output 6	Bool				R
Modbus Data	**Index (dec)**	**Index (modbus)**	**Bit**	**Variable Description**	**DataType**	**Default**	**Min**	**Max**	**Dir**
HoldingR	nn01	4nn02	32	Command Output Universal Channel 1	Float	0	0.0	100.0	RW
HoldingR	nn03	4nn04	32	Command Output Universal Channel 2	Float	0	0.0	100.0	RW
HoldingR	nn05	4nn06	32	Command Output Universal Channel 3	Float	0	0.0	100.0	RW
HoldingR	nn07	4nn08	32	Command Output Universal Channel 4	Float	0	0.0	100.0	RW
HoldingR	nn09	4nn10	32	Command Output Universal Channel 5	Float	0	0.0	100.0	RW
HoldingR	nn11	4nn12	32	Command Output Universal Channel 6	Float	0	0.0	100.0	RW
HoldingR	nn13	4nn14	32	Command Output Universal Channel 7	Float	0	0.0	100.0	RW
HoldingR	nn15	4nn16	32	Command Output Universal Channel 8	Float	0	0.0	100.0	RW
HoldingR	nn17	4nn18	32	Command Output Universal Channel 9	Float	0	0.0	100.0	RW
HoldingR	nn19	4nn20	32	Command Output Universal Channel 10	Float	0	0.0	100.0	RW
HoldingR	nn31	4nn32	32	Preset Value Counter 1	Float	0	0.0	999999	RW
HoldingR	nn33	4nn34	32	Preset Value Counter 2	Float	0	0.0	999999	RW
HoldingR	nn35	4nn36	32	Scaling Counter 1	Float	1.0	-999.9	999.9	RW
HoldingR	nn37	4nn38	32	Scaling Counter 2	Float	1.0	-999.9	999.9	RW

Modbus Data	Index (dec)	Index (modbus)	Bit	Variable Description	DataType	Default	Min	Max	Dir
HoldingR	nn39	4nn40	32	Setpoint Thermostat 1	Float	25.0	-999.9	999.9	RW
HoldingR	nn41	4nn42	32	Hysteresis Thermostat 1	Float	2.0	-999.9	999.9	RW
HoldingR	nn43	4nn44	32	Setpoint Thermostat 2	Float	25.0	-999.9	999.9	RW
HoldingR	nn45	4nn46	32	Hysteresis Thermostat 2	Float	2.0	-999.9	999.9	RW
Modbus Data	**Index (dec)**	**Index (modbus)**	**Bit**	**Variable Description**	**DataType**	**Default**	**Min**	**Max**	**Dir**
InputR	nn01	3nn02	32	Current Value Universal Channel 1	Float				R
InputR	nn03	3nn04	32	Current Value Universal Channel 2	Float				R
InputR	nn05	3nn06	32	Current Value Universal Channel 3	Float				R
InputR	nn07	3nn08	32	Current Value Universal Channel 4	Float				R
InputR	nn09	3nn10	32	Current Value Universal Channel 5	Float				R
InputR	nn11	3nn12	32	Current Value Universal Channel 6	Float				R
InputR	nn13	3nn14	32	Current Value Universal Channel 7	Float				R
InputR	nn15	3nn16	32	Current Value Universal Channel 8	Float				R
InputR	nn17	3nn18	32	Current Value Universal Channel 9	Float				R
InputR	nn19	3nn20	32	Current Value Universal Channel 10	Float				R
InputR	nn25	3nn26	16	Auto/Manual status Universal Ch Outputs	Bit-Field				R
InputR	nn26	3nn27	16	Function status Universal Ch Outputs	Bit-Field				R
InputR	nn27	3nn28	16	Auto/Manual status Digital Outputs	Bit-Field				R
InputR	nn28	3nn29	16	Function status Digital Outputs	Bit-Field				R
InputR	nn31	3nn32	32	Current Value of Counter 1	Float				R
InputR	nn33	3nn34	32	Current Value of Counter 2	Float				R

BACnet

Use this point list to configure your BMS BACnet supervisor (MSTP or IP depending on the used device/connection)

Bit-field data type (Positive Integer Value BACnet Data) uses individual bits from the 16 bits available on the point to provide multiple Boolean information.

Bit 0 refers to Universal channel 1, Digital output 1 or Analog output 1 (based on the point), Bit 1 refers to Universal channel 2, Digital output 2 or Analog output 2 and so on.

			Local					
BACnet Data	**ID**	**COV**	**Variable Description**	**DataType**	**Default**	**--**	**--**	**Direction**
Binary Value	11	No	Command Digital Output 1	Bool	0	0	1	ReadWrite
Binary Value	12	No	Command Digital Output 2	Bool	0	0	1	ReadWrite
Binary Value	13	No	Command Digital Output 3	Bool	0	0	1	ReadWrite
Binary Value	14	No	Command Digital Output 4	Bool	0	0	1	ReadWrite
Binary Value	15	No	Command Digital Output 5	Bool	0	0	1	ReadWrite
Binary Value	16	No	Command Digital Output 6	Bool	0	0	1	ReadWrite
Binary Value	21	No	Reset Pulse Counter 1	Bool	0	0	1	ReadWrite
Binary Value	22	No	Reset Pulse Counter 2	Bool	0	0	1	ReadWrite
Binary Value	23	No	Preset Pulse Counter 1	Bool	0	0	1	ReadWrite
Binary Value	24	No	Preset Pulse Counter 2	Bool	0	0	1	ReadWrite
BACnet Data	**ID**	**COV**	**Variable Description**	**DataType**	**Default**	**--**	**--**	**Direction**
Binary Input	1	Yes	Digital Input Universal Channel 1	Bool				Read
Binary Input	2	Yes	Digital Input Universal Channel 2	Bool				Read
Binary Input	3	Yes	Digital Input Universal Channel 3	Bool				Read
Binary Input	4	Yes	Digital Input Universal Channel 4	Bool				Read
Binary Input	5	Yes	Digital Input Universal Channel 5	Bool				Read
Binary Input	6	Yes	Digital Input Universal Channel 6	Bool				Read
Binary Input	7	Yes	Digital Input Universal Channel 7	Bool				Read
Binary Input	8	Yes	Digital Input Universal Channel 8	Bool				Read
Binary Input	9	Yes	Digital Input Universal Channel 9	Bool				Read
Binary Input	10	Yes	Digital Input Universal Channel 10	Bool				Read
Binary Input	11	Yes	Current value Digital Output 1	Bool				Read
Binary Input	12	Yes	Current value Digital Output 2	Bool				Read
Binary Input	13	Yes	Current value Digital Output 3	Bool				Read
Binary Input	14	Yes	Current value Digital Output 4	Bool				Read
Binary Input	15	Yes	Current value Digital Output 5	Bool				Read
Binary Input	16	Yes	Current value Digital Output 6	Bool				Read
Binary Input	17	Yes	Digital Input ID 1	Bool				Read
Binary Input	18	Yes	Digital Input ID 2	Bool				Read
BACnet Data	**ID**	**COV**	**Variable Description**	**DataType**	**Default**	**Min**	**Max**	**Direction**
Analog Value	1	No	Command Output Universal Channel 1	Float	0	0.0	100.0	ReadWrite
Analog Value	2	No	Command Output Universal Channel 2	Float	0	0.0	100.0	ReadWrite
Analog Value	3	No	Command Output Universal Channel 3	Float	0	0.0	100.0	ReadWrite

| BACnet Data	ID	COV	Variable Description	DataType	Default	Min	Max	Direction
Analog Value	4	No	Command Output Universal Channel 4	Float	0	0.0	100.0	ReadWrite
Analog Value	5	No	Command Output Universal Channel 5	Float	0	0.0	100.0	ReadWrite
Analog Value	6	No	Command Output Universal Channel 6	Float	0	0.0	100.0	ReadWrite
Analog Value	7	No	Command Output Universal Channel 7	Float	0	0.0	100.0	ReadWrite
Analog Value	8	No	Command Output Universal Channel 8	Float	0	0.0	100.0	ReadWrite
Analog Value	9	No	Command Output Universal Channel 9	Float	0	0.0	100.0	ReadWrite
Analog Value	10	No	Command Output Universal Channel 10	Float	0	0.0	100.0	ReadWrite
Analog Value	11	No	Command Output Y1	Float	0	0.0	100.0	ReadWrite
Analog Value	12	No	Command Output Y2	Float	0	0.0	100.0	ReadWrite
Analog Value	21	No	Preset Value Counter 1	Float	0	0.0	999999	ReadWrite
Analog Value	22	No	Preset Value Counter 2	Float	0	0.0	999999	ReadWrite
Analog Value	23	No	Scaling Counter 1	Float	1.0	-999.9	999.9	ReadWrite
Analog Value	24	No	Scaling Counter 2	Float	1.0	-999.9	999.9	ReadWrite
Analog Value	25	No	Setpoint Thermostat 1	Float	25.0	-999.9	999.9	ReadWrite
Analog Value	26	No	Hysteresis Thermostat 1	Float	2.0	-999.9	999.9	ReadWrite
Analog Value	27	No	Setpoint Thermostat 2	Float	25.0	-999.9	999.9	ReadWrite
Analog Value	28	No	Hysteresis Thermostat 2	Float	2.0	-999.9	999.9	ReadWrite
BACnet Data	**ID**	**COV**	**Variable Description**	**DataType**	**Default**	**Min**	**Max**	**Direction**
Analog Input	1	Yes	Current Value Universal Channel 1	Float				Read
Analog Input	2	Yes	Current Value Universal Channel 2	Float				Read
Analog Input	3	Yes	Current Value Universal Channel 3	Float				Read
Analog Input	4	Yes	Current Value Universal Channel 4	Float				Read
Analog Input	5	Yes	Current Value Universal Channel 5	Float				Read
Analog Input	6	Yes	Current Value Universal Channel 6	Float				Read
Analog Input	7	Yes	Current Value Universal Channel 7	Float				Read
Analog Input	8	Yes	Current Value Universal Channel 8	Float				Read
Analog Input	9	Yes	Current Value Universal Channel 9	Float				Read
Analog Input	10	Yes	Current Value Universal Channel 10	Float				Read
Analog Input	11	Yes	Current Value Output Y1	Float				Read
Analog Input	12	Yes	Current Value Output Y2	Float				Read
Analog Input	13	Yes	Current Value of Counter 1	Float				Read
Analog Input	14	Yes	Current Value of Counter 2	Float				Read
BACnet Data	**ID**	**COV**	**Variable Description**	**DataType**	**Default**	**Min**	**Max**	**Direction**
Positive Integer Value	1	Yes	Auto/Manual status Universal Ch Outputs	Bit-Field				Read
Positive Integer Value	2	Yes	Function status Universal Ch Outputs	Bit-Field				Read
Positive Integer Value	3	Yes	Auto/Manual status Digital Outputs	Bit-Field				Read
Positive Integer Value	4	Yes	Function status Digital Outputs	Bit-Field				Read
Positive Integer Value	5	Yes	Auto/Manual status Analog Outputs	Bit-Field				Read
Positive Integer Value	6	Yes	Function status Analog Outputs	Bit-Field				Read

			Expansion "nn" Replace "nn" on "ID" with the expansion number ("01", "02", "03" up to "10") to read/write the correct expansion data (i.e.: with ID nn01, use 301 for expansion 3, 1001 for expansion 10 etc)					
BACnet Data	**ID**	**COV**	**Variable Description**	**DataType**	**Default**	**--**	**--**	**Direction**
Binary Value	nn11	No	Command Digital Output 1	Bool	0	0	1	ReadWrite
Binary Value	nn12	No	Command Digital Output 2	Bool	0	0	1	ReadWrite
Binary Value	nn13	No	Command Digital Output 3	Bool	0	0	1	ReadWrite
Binary Value	nn14	No	Command Digital Output 4	Bool	0	0	1	ReadWrite
Binary Value	nn15	No	Command Digital Output 5	Bool	0	0	1	ReadWrite
Binary Value	nn16	No	Command Digital Output 6	Bool	0	0	1	ReadWrite
Binary Value	nn21	No	Reset Pulse Counter 1	Bool	0	0	1	ReadWrite
Binary Value	nn22	No	Reset Pulse Counter 2	Bool	0	0	1	ReadWrite
Binary Value	nn23	No	Preset Pulse Counter 1	Bool	0	0	1	ReadWrite
Binary Value	nn24	No	Preset Pulse Counter 2	Bool	0	0	1	ReadWrite
BACnet Data	**ID**	**COV**	**Variable Description**	**DataType**	**Default**	**--**	**--**	**Direction**
Binary Input	nn01	Yes	Digital Input Universal Channel 1	Bool				Read
Binary Input	nn02	Yes	Digital Input Universal Channel 2	Bool				Read
Binary Input	nn03	Yes	Digital Input Universal Channel 3	Bool				Read
Binary Input	nn04	Yes	Digital Input Universal Channel 4	Bool				Read
Binary Input	nn05	Yes	Digital Input Universal Channel 5	Bool				Read
Binary Input	nn06	Yes	Digital Input Universal Channel 6	Bool				Read
Binary Input	nn07	Yes	Digital Input Universal Channel 7	Bool				Read
Binary Input	nn08	Yes	Digital Input Universal Channel 8	Bool				Read
Binary Input	nn09	Yes	Digital Input Universal Channel 9	Bool				Read
Binary Input	nn10	Yes	Digital Input Universal Channel 10	Bool				Read
Binary Input	nn11	Yes	Current value Digital Output 1	Bool				Read
Binary Input	nn12	Yes	Current value Digital Output 2	Bool				Read
Binary Input	nn13	Yes	Current value Digital Output 3	Bool				Read
Binary Input	nn14	Yes	Current value Digital Output 4	Bool				Read
Binary Input	nn15	Yes	Current value Digital Output 5	Bool				Read
Binary Input	nn16	Yes	Current value Digital Output 6	Bool				Read
BACnet Data	**ID**	**COV**	**Variable Description**	**DataType**	**Default**	**Min**	**Max**	**Direction**
Analog Value	nn01	No	Command Output Universal Channel 1	Float	0	0.0	100.0	ReadWrite
Analog Value	nn02	No	Command Output Universal Channel 2	Float	0	0.0	100.0	ReadWrite
Analog Value	nn03	No	Command Output Universal Channel 3	Float	0	0.0	100.0	ReadWrite
Analog Value	nn04	No	Command Output Universal Channel 4	Float	0	0.0	100.0	ReadWrite
Analog Value	nn05	No	Command Output Universal Channel 5	Float	0	0.0	100.0	ReadWrite
Analog Value	nn06	No	Command Output Universal Channel 6	Float	0	0.0	100.0	ReadWrite
Analog Value	nn07	No	Command Output Universal Channel 7	Float	0	0.0	100.0	ReadWrite
Analog Value	nn08	No	Command Output Universal Channel 8	Float	0	0.0	100.0	ReadWrite
Analog Value	nn09	No	Command Output Universal Channel 9	Float	0	0.0	100.0	ReadWrite
Analog Value	nn10	No	Command Output Universal Channel 10	Float	0	0.0	100.0	ReadWrite
Analog Value	nn21	No	Preset Value Counter 1	Float	0	0.0	999999	ReadWrite
Analog Value	nn22	No	Preset Value Counter 2	Float	0	0.0	999999	ReadWrite
Analog Value	nn23	No	Scaling Counter 1	Float	1.0	-999.9	999.9	ReadWrite
Analog Value	nn24	No	Scaling Counter 2	Float	1.0	-999.9	999.9	ReadWrite
Analog Value	nn25	No	Setpoint Thermostat 1	Float	25.0	-999.9	999.9	ReadWrite

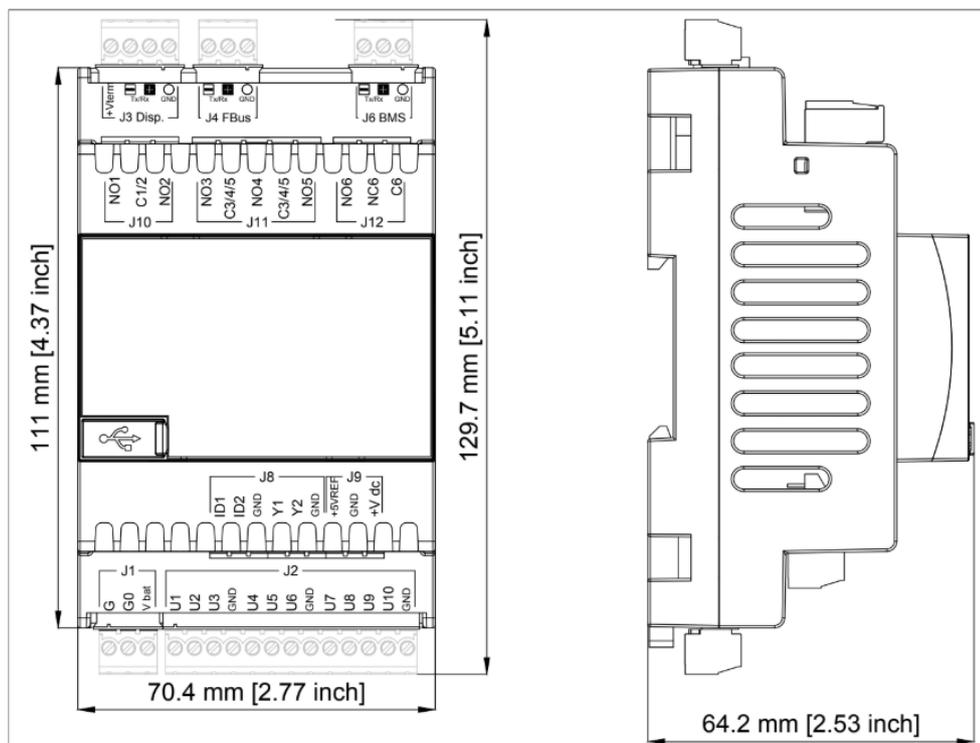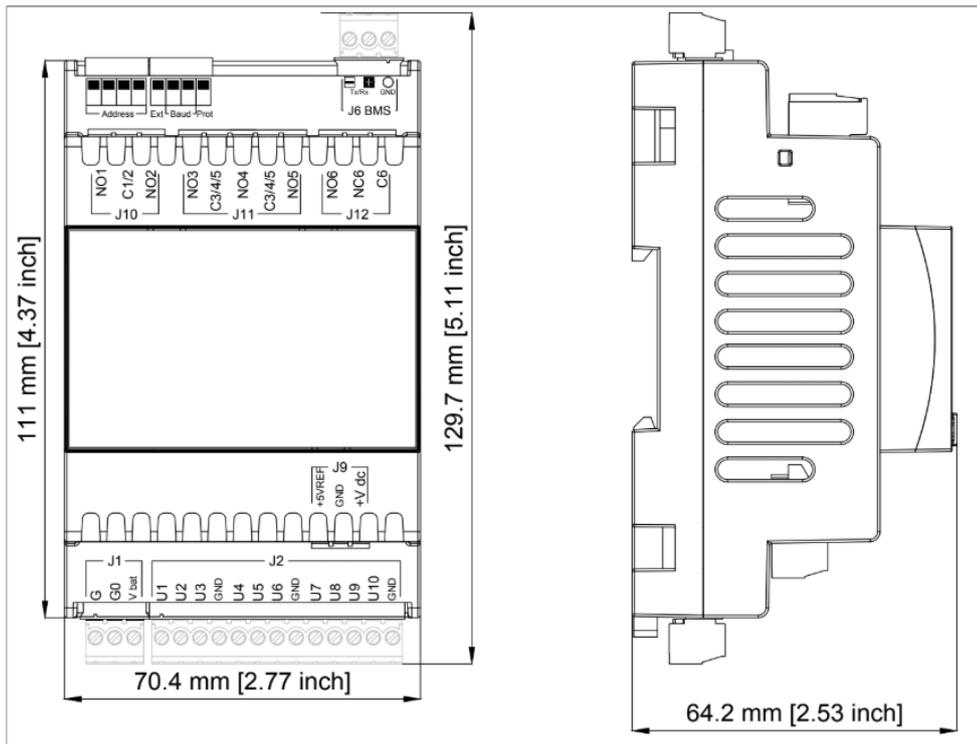| BACnet Data	ID	COV	Variable Description	DataType	Default	Min	Max	Direction
Analog Value	nn26	No	Hysteresis Thermostat 1	Float	2.0	-999.9	999.9	ReadWrite
Analog Value	nn27	No	Setpoint Thermostat 2	Float	25.0	-999.9	999.9	ReadWrite
Analog Value	nn28	No	Hysteresis Thermostat 2	Float	2.0	-999.9	999.9	ReadWrite
BACnet Data	**ID**	**COV**	**Variable Description**	**DataType**	**Default**	**Min**	**Max**	**Direction**
Analog Input	nn01	Yes	Current Value Universal Channel 1	Float				Read
Analog Input	nn02	Yes	Current Value Universal Channel 2	Float				Read
Analog Input	nn03	Yes	Current Value Universal Channel 3	Float				Read
Analog Input	nn04	Yes	Current Value Universal Channel 4	Float				Read
Analog Input	nn05	Yes	Current Value Universal Channel 5	Float				Read
Analog Input	nn06	Yes	Current Value Universal Channel 6	Float				Read
Analog Input	nn07	Yes	Current Value Universal Channel 7	Float				Read
Analog Input	nn08	Yes	Current Value Universal Channel 8	Float				Read
Analog Input	nn09	Yes	Current Value Universal Channel 9	Float				Read
Analog Input	nn10	Yes	Current Value Universal Channel 10	Float				Read
Analog Input	nn13	Yes	Current Value of Counter 1	Float				Read
Analog Input	nn14	Yes	Current Value of Counter 2	Float				Read
BACnet Data	**ID**	**COV**	**Variable Description**	**DataType**	**Default**	**Min**	**Max**	**Direction**
Positive Integer Value	nn01	Yes	Auto/Manual status Universal Ch Outputs	Bit-Field				Read
Positive Integer Value	nn02	Yes	Function status Universal Ch Outputs	Bit-Field				Read
Positive Integer Value	nn03	Yes	Auto/Manual status Digital Outputs	Bit-Field				Read
Positive Integer Value	nn04	Yes	Function status Digital Outputs	Bit-Field				Read

Technical data

Drawings

Part numbers: **LNK-IO20-IP-MOD** and **LNK-IO20-IP-BAC**
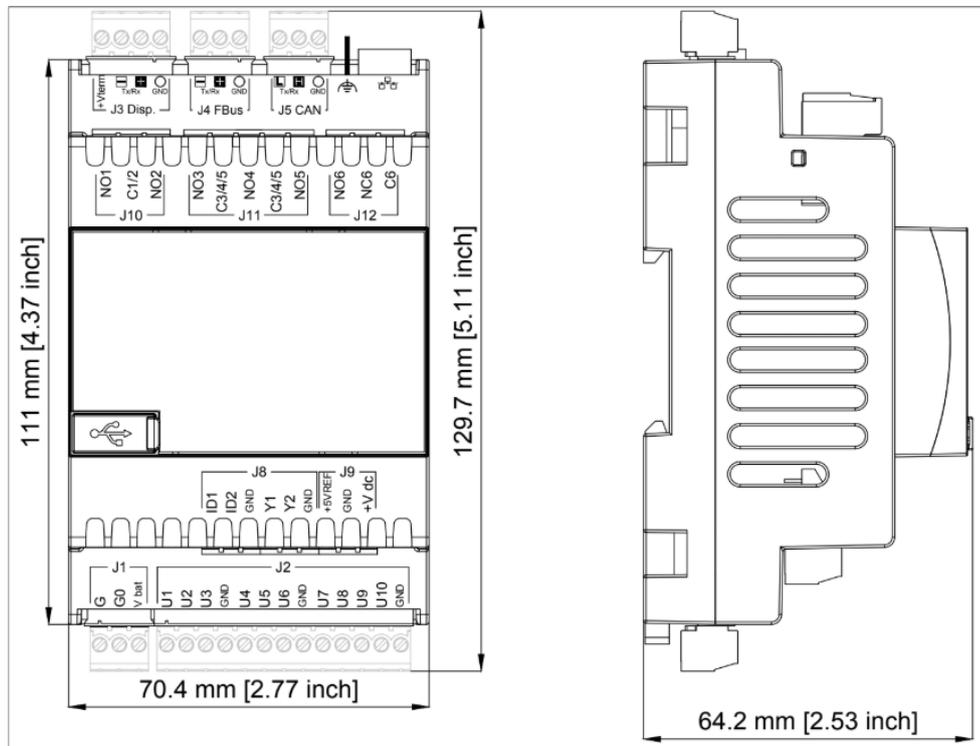
Part numbers: **LNK-IO20-RS-MOD** and **LNK-IO20-RS-BAC**

Part number: **LNK-IO16-EXP**

Specifications

Main unit

Power supply	24 Vac +10%/-15% 50/60 Hz, 28 to 36 Vdc +10% to -15% Consumption 30 VA / 12W
+Vdc	Voltage output: 12 Vdc +8%/-8%, max current: 50 mA, protected against short circuits
+5Vref	Voltage output: 5 Vdc +3%/-3%, max current: 50 mA, protected against short circuits
Digital Outputs	Output 1 to 5 Relay max 5 A, 250 Vac only with NO contacts NO EN 60730-1: 2(1) A (100,000 cycles); UL60730: 5 A resistive, 1FLA, 6LRA, 250 Vac, C300 pilot duty, 30,000 cycles
	Output 6 Relay max 1 A, 250 Vac with NO/NC contacts NO EN 60730-1: 1(1) A (100,000 cycles); UL 60730-1: 1 A resistive, 1 A FLA, 6 A LRA, 250 Vac, D300 pilot duty, 30,000 cycles
Digital Inputs	2x Volt free contact Maximum current output: 5 mA Maximum voltage with the contact open: 12 Vdc Maximum connection cable length: less than 10 m
Analog outputs	2x 0-10 V 0-10 V, PWM 3.3 V 100Hz, PWM 3.3 V 2KHz Precision of analogue outputs: ± 3% of full scale Maximum current output: 10 mA Maximum connection cable length: less than 10 m
Universal Inputs/Outputs	10x selectable input/output Precision of analogue input reading: ± 0.3% of full scale Precision of analogue output signal: ± 2% of full scale Analogue/digital conversion: 14-bit Maximum current output 2 mA Maximum connection cable length: less than 10 m
	Passive Inputs NTC 10K3A1, NTC 10K4A1, Carel NTC 10K, PT1000, PT500, PT100 (3 wires), PTC_R, Carel NTC 0-150, Carel -50T90, Carel -10T170
	Active Inputs 0-1 V, 0-10 V, 0-5 V, 0-20 mA, 4-20 mA
	Digital Inputs Volt free contact
	Digital Pulse Counter (up to 2KHz), digital Frequency Measure (up to 2KHz, res +-1Hz)
	Analogue Outputs 0-10 V, PWM 3.3 V 100Hz, PWM 3.3 V 2KHz
Interface to BMS	Connector J6 (BMS), RS485, Modbus RTU or BACnet MSTP, up to 128 devices on the bus, not opto-isolated
	Ethernet, Modbus TCP/IP or BACnet IP
Interface to expansions	Connector J4 (Field Bus), RS485, not opto-isolated
Baud-rate BMS	Range from 2400 to 115200 bps
Baud-rate expansions	Fixed 38400 bps
Ingress Protection Rating	IP40 - for indoor installation
Temperature and humidity	Operating: -20°C to +60°C (-4°F to 140°F), max 90% RH (without condensation)
	Storage: -30°C to +70°C (-22°F to 158°F), max 90% RH (without condensation)
Connectors	Separable, max 2.5 mm2 (18 – 12 AWG)
Mounting	DIN rail mounting (DIN EN 50022 norm)
Housing Material	Plastic, self-extinguishing PC/ABS
PTI of insulating materials	PCB: PTI 250 V; insulating material: PTI 175
Cable cross-section	min 0.5 mm2 - max 2.5 mm2

Expansion unit

Power supply	24 Vac +10%/-15% 50/60 Hz, 28 to 36 Vdc +10% to -15% Consumption 15 VA / 6W
+Vdc	Voltage output: 12 Vdc +8%/-8%, max current: 50 mA, protected against short circuits
+5Vref	Voltage output: 5 Vdc +3%/-3%, max current: 50 mA, protected against short circuits
Digital Outputs	Output 1 to 5 Relay max 5A, 250Vac only with NO contacts NO EN 60730-1: 2(1) A (100,000 cycles); UL60730: 5 A resistive, 1FLA, 6LRA, 250 Vac, C300 pilot duty, 30,000 cycles
	Output 6 Relay max 1 A, 250Vac with NO/NC contacts NO EN 60730-1: 1(1) A (100,000 cycles); UL 60730-1: 1 A resistive, 1 A FLA, 6 A LRA, 250 Vac, D300 pilot duty, 30,000 cycles
Universal Inputs/Outputs	10x selectable input/output
	Precision of analogue input reading: ± 0.3% of full scale Precision of analogue output signal: ± 2% of full scale
	Analogue/digital conversion: 14-bit
	Maximum current output 2 mA Maximum connection cable length: less than 10 m
	Passive Inputs NTC 10K3A1, NTC 10K4A1, Carel NTC 10K, PT1000, PT500, PT100 (3 wires), PTC_R, Carel NTC 0-150, Carel -50T90, Carel -10T170
	Active Inputs 0-1 V, 0-10 V, 0-5 V, 0-20 mA, 4-20 mA
	Digital Inputs Volt free contact
	Digital Pulse Counter (up to 2KHz), digital Frequency Measure (up to 2KHz, res +-1Hz)
	Analogue Outputs 0-10V, PWM 3.3 V 100Hz, PWM 3.3 V 2KHz
Interface to main unit	Connector J6 (BMS), RS485, not opto-isolated
Baud-rate	Fixed 38400 bps
Ingress Protection Rating	IP40 - for indoor installation
Temperature and humidity	Operating: -40°C to +70°C (-40°F to 158°F), max 90% RH (without condensation)
	Storage: -40°C to +70°C (-40°F to 158°F), max 90% RH (without condensation)
Connectors	Separable, max 2.5 mm2 (18 – 12 AWG)
Mounting	DIN rail mounting (DIN EN 50022 norm)
Housing Material	Plastic, self-extinguishing PC/ABS
PTI of insulating materials	PCB: PTI 250 V; insulating material: PTI 175
Cable cross-section	min 0.5 mm2 - max 2.5 mm2

Guidelines for Disposal

- The appliance (or the product) must be disposed of separately in accordance with the local waste disposal legislation in force.
- Do not dispose of the product as municipal waste; it must be disposed of through specialist waste disposal centres.
- The product contains a battery that must be removed and separated from the rest of the product according to the instructions provided, before disposing of the product.
- Improper use or incorrect disposal of the product may negative effects on human health and on the environment.
- In the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation.