Intesis™

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Mitsubishi Heavy Industries Air Conditioning

Gateway for integration of Mitsubishi Heavy Industries air conditioning systems into KNX TP-1 (EIB) control systems

Application's Program Version: 2.1

USER MANUAL

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HMS Connecting Devices™

Important User Information

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Gateway for integration of Mitsubishi Heavy Industries air conditioning systems into KNX TP-1 (EIB) control systems.

ORDER CODE	LEGACY ORDER CODE
INKNXMHI048O000	MH-AC-KNX-48
INKNXMHI128O000	MH-AC-KNX-128

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URL | https://www.intesis.com

1. Description

1.1 Introduction

Intesis™ KNX – Mitsubishi Heavy Industries AC is a communication gateway for the integration of Mitsubishi Heavy Industries air conditioning (AC) systems into KNX TP-1 (EIB).

This gateway allows integrating a Mitsubishi Heavy Industries AC system inside a supervision/control/automation system through PLC, SCADA and, in general, through any device or system with a KNX TP-1 (EIB) interface.

The aim of this integration is to make accessible several Mitsubishi Heavy Industries air conditioning indoor units communicating with the Superlink protocol as if they were part of a KNX TP-1 (EIB) system. Therefore, the *Intesis™ KNX* acts as a KNX device in the KNX TP-1 (EIB) interface, allowing the KNX system read and write in the communication objects. Moreover, Intesis™ includes all hardware required to manage/control Mitsubishi Heavy Industries indoor units without extra components needed.

1.2 Integration signals

Following is the list of parameters that can be monitored/controlled on the indoor units using Intesis™:

- For **each indoor unit** in the system:
  - Communication Status (read-only)
  - On/Off (R/W)
  - Operation Mode (R/W)
  - SetPoint Temperature (R/W)
  - Fan Speed (R/W)
  - Remocon Lock/Unlock (R/W)
  - Louver Control (R/W)
  - Room Temperature (read-only)
  - Filter Sign Status (read-only)
  - Error Code (read-only)
  - Compressor Status (read-only)
  - Filter Sign Reset (write-only)
  - Remocon Error Reset (write-only)
  - Thermo On/Off Status (read-only)

Apart from these, the Intesis™ also implements some extra signals (functions):

- For **all indoor units[1]** in the system:
  - HW Communication Status (read-only)
  - On/Off (write-only)
  - Operation Mode (write-only)
  - SetPoint Temperature (write-only)
  - Fan Speed (write-only)
  - Remocon Lock/Unlock (write-only)

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[1] These signals work as master signals controlling all connected units at the same time

1.3 Functionality

Intesis^{TM} continuously polls (reads) the Superlink network for all configured signals and keeps the updated status of all of them in its memory ready to be served when requested from KNX.

When a change of status is detected in a MHI's AC signal, a write telegram is sent to the KNX bus, of the associated *KNX Group*.

When it is received a telegram from the KNX bus, and if its *KNX Group address* is associated to an MHI's AC signal, a message is sent immediately to the Superlink network to perform the corresponding action in the MHI's AC system.

In the continuous polling if no response is detected, the corresponding virtual signal inside the gateway will be activated indicating communication error. There is a virtual signal for each AC indoor unit indicating communication error with the indoor unit – this signal will be normally activated if the indoor unit is not properly setup.

Each of the mentioned signals in section 1.2 has to be associated to a KNX group address, with this, all the system is seen as *another* KNX device, with the same configuration and functioning characteristics. These addresses are not fixed and can be configured using the LinkBoxEIB tool (see 4.2.2)

Intesis^{TM} includes all hardware needed to connect directly with the Mitsubishi Heavy Industries indoor units connecting with Superlink network.
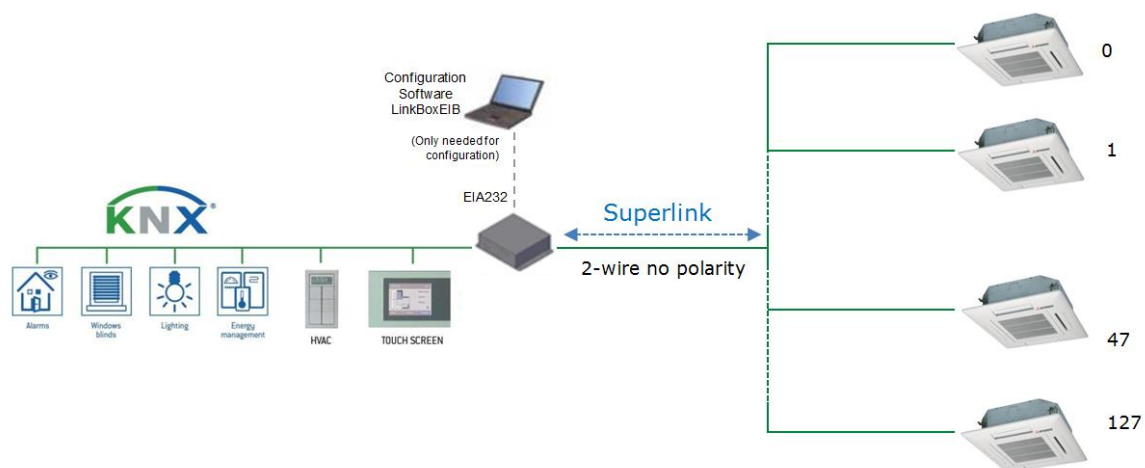

Figure 1.1 Integration of Mitsubishi Heavy Industries AC into KNX TP-1 (EIB) system

1.4 Capacity of Intesis^{TM}

Element	Max.	Notes
Number of indoor units	128 *	Maximum number of AC indoor units that can be controlled
Main Group Address	3000	Maximum number of communication objects
Total number of listening group addresses	1000	Number of KNX groups that can be used as listening addresses
Num. of listening addresses per communication object	255	Number of listening addresses that can be associated to an KNX group address

Table 1.1 Intesis^{TM} capacity

* There are two different models of *Intesis^{TM} KNX – Mitsubishi Heavy Industries AC* each one with different capacity. The table above shows the capacity for the top model (with maximum capacity).

Their order codes are:
▪ INKNXMHI048O000:
    ▪ Model supporting up to 48 indoor units
    ▪ For Superlink-I (Previous Superlink) or Superlink-II (New Superlink).
    ▪ Indoor Unit actual address range is 00 to 47

▪ INKNXMHI128O000:
    ▪ Model supporting up to 128 indoor units
    ▪ For Superlink-II (New Superlink)
    ▪ Indoor Unit actual address range is 000 to 127

Check available combination of Mitsubishi Heavy Industries Central Control and BMS interface units in the next tables.

In the case of SL2NA or SL3NA, it is necessary to erase registration of non-connected indoor unit. For SL2NA and SL3NA, change is required for the setup deprived of the rights of instruction of Remocon control Lock/Unlock.

New Superlink connections:

MH-AC-MBS-128 INKNXMHI128O000	SC-LGWNA-A SC-BGWNA-A/B etc.	SC-SL3NA-AE/BE etc.	SC-SL2NA-E etc.	SC-SL1N-E etc.	Max Indoor Units	Address No.
1	Non connect	2	0	0-8	128	000-127
		1	0-2			
		0	0-4			

MH-AC-MBS-48 INKNXMHI048O000	SC-LGWNA-A SC-BGWNA-A/B etc.	SC-SL3NA-AE/BE etc.	SC-SL2NA-E etc.	SC-SL1N-E etc.	Max Indoor Units	Address No.
1	Non connect	2	0	0-8	48	00-47
		1	0-2			
		0	0-4			

Previous Superlink connections:

MH-AC-MBS-48/128 INKNXMHI048O000/128	SC-LGWNA-A SC-BGWNA-A/B etc.	SC-SL3NA-AE/BE etc.	SC-SL2NA-E etc.	SC-SL1N-E etc.	Max Indoor Units	Address No.
1	Non connect	Non connect	1	0	32	00-47
			0	1,2		
			0	0	48	

2. KNX interface of Intesis^{TM}

2.1 Description

Intesis^{TM} KNX - Mitsubishi Heavy Industries supports the KNX TP-1 (EIB) physical layer, as defined in the KNX standard. It behaves as *another* device of the KNX system, with the same configuration and functional characteristics as other KNX devices.

KNX TP-1 (EIB) bus provides a 30V DC current, which can even directly power certain low-consumption KNX devices. Intesis^{TM} does not drain any significant current from the KNX bus - it has a separate own power supply. Another important electrical aspect is that the KNX TP-1 (EIB) port of Intesis^{TM} is optically isolated (~2500Vrms AC) from all its other ports (EIA232, EIA485, Ethernet) and power supply.

At a logical level, all KNX devices feature an interface of communication objects, by which their functionality is abstracted. As a basic example, a KNX interface of an AC indoor unit would typically consist of an interface of datapoints such as "On/Off", "Setpoint temperature", "Operating mode", etc.

Associations between communication objects from different KNX devices are actually done by means of so-called group addresses.

KNX telegrams within a working KNX installation are always addressed to a certain KNX group address. Typically, whenever a communication object on a KNX device changes its value, the new value is updated to the bus, by sending a "write" telegram addressed to its associated group address. The rest of KNX devices in the installation that have a communication object associated to this group address will act accordingly on reception of the new value.

Other operations are possible. KNX devices can also decide to read the current value of the communication objects, by sending a "read" telegram to a certain group address (previously known to be associated to the targeted comm. object). This operation is performed by many devices on bus start-up or recovery – in this way, the device gets the latest value of the group addresses it has associated right from its start-up.

Each datapoint defined in Intesis^{TM} KNX configuration needs at least a single KNX group address associated with it. This group address will be used either for sending updates *to* KNX of the datapoint value (that have been generated on the other MHI interface of the Intesis^{TM}), or receiving updates *from* KNX of the datapoint value (that will be propagated to the MHI side in this case)

From the point of view of KNX functionality, each datapoint of Intesis^{TM} can hold following group address associations:

- A single KNX group address with which update/write telegrams will be sent, whenever the datapoint changes (as a result of a change coming from the other interface of Intesis^{TM}, MHI in this case).

- One or more KNX group addresses from which this datapoint of Intesis^{TM} will be updated/written from the KNX installation (resulting in a change to the other side of Intesis^{TM}, MHI in this case).

A single KNX group address from which Intesis^{TM} will read the object value on KNX bus recovery / Intesis^{TM} start-up.

Behavior of Intesis^{TM} datapoints with regard to their associated group addresses is defined by means of flags (R, W, T, U and U2), explained in section 4.2.2.

Additional to the binding aspect commented above, it is also important to notice that each KNX communication object has a defined EIS type. The EIS type of a communication object defines the bit length and coding of the data it represents. Communication objects associated by means of a group address need to match the same EIS type, in order to communicate consistently.

So, at configuration time it is required that for each datapoint configured on Intesis^{TM} an EIS type is defined. Datapoints on Intesis^{TM} KNX support the following EIS-types:

- EIS1 - Switching (1bit raw)
- EIS2 - Dimming (4bit raw)
- EIS5 – Value (16bit – floating type)
- EIS6 – Scaling (8bit – scaled 0%-100% in values 0-255)
- EIS7 – Drive Control (1bit raw)
- EIS8 – Priority (2bit raw)
- EIS9 – IEEE 754 float (32bit – floating type)
- EIS10 – 16bit Counter (16bit raw)
- EIS11 – 32bit Counter (32bit raw)
- EIS13 – ASCII char (8bit raw)
- EIS14 – 8bit Counter (8bit raw)

ETS3 or ETS4 software tools are not used to configure Intesis^{TM}. Though, it's typical that the choice of which KNX group addresses to use is restricted or defined by an ETS-based project. If that's the case, the KNX installer/integrator needs to provide the set of group addresses prior to doing the configuration of datapoints in LinkBoxEIB.

Also, a *dummy* ETS application is provided by HMS Networks (section 5), which can be imported into ETS. This application is nor downloadable into Intesis^{TM} KNX neither usable for Intesis^{TM} configuration. Rather, it poses as a means of having a device in the ETS project representing the Intesis^{TM} KNX and its own datapoints/communication objects, and to which group addresses are associated.

2.2 Communication objects available

Address map is configurable for each indoor unit and can be modified through the supplied software LinkBoxEIB. Next, there are two tables showing different datapoints/communication objects available either for each indoor unit control or all indoor units control at a time. Please, remember that in the tables *R/W* stands for *Read* and *Write*, *R* stands for *Read Only* and *W* stands for *Write Only.*

2.2.1 Communication objects per each indoor unit:

Property	EIS type	Signal type (R/W)	Description / Status	
Communication Error	1 – Switching (1bit)	R	**Communication Status** 0 – Communication OK, 1 – Communication ERROR	
OnOff	1 – Switching (1bit)	R/W	**Indoor Unit On/Off** 0 – Off, 1 – On	
Mode	14 – Counter (8bit)	R/W	**Operation Mode** 0 – Auto, 1 – Heat, 2 – Cool, 3 – Fan, 4 – Dry	
	DPT 20.105 (8bit)	R/W	**Operation Mode** 0 – Auto, 1 – Heat, 3 – Cool, 9 – Fan, 14 – Dry	
	DPT 1.100 (1bit)	R/W	**Operation Mode** 0 – Cool, 1 – Heat	
Mode::Cool	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	Only one of these objects will be set / read to "1" at the same time (all objects will be updated on bus upon a Mode change)
Mode::Heat	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	
Mode::Fan	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	
Mode::Auto	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	
Mode::Dry	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	
SetPoint	5 – Float (2byte)	R/W	**Set Point Temperature** (only integer numbers allowed) 16..30 ºC **Read/Write:** If the option of virtual ambient temperature and SetPoint is deactivated (see in section 4.2.1of this document). **Write:** If the option of virtual ambient temperature and SetPoint is activated, to be configured from extern KNX sensor (see in section 4.2.1of this document).	
Fan Speed	14 – Counter (8bit)	R/W	**Fan Speed** 0 – Low, 1 – Medium, 2 – High, 3 – Powerful	
FanSpeed::Low	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	Only one of these objects will be set / read to "1" at the same time (all objects will be updated on bus upon a FanSpeed change)
FanSpeed::Mid	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	
FanSpeed::High	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	
FanSpeed::Powerful	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	
RemoConLock	1 – Switching (1bit)	R/W	**Remote Controller Lock/ Unlock** 0 – Remote Controller Locked, 1 – Remote Controller Unlocked	
Louver	14 – Counter (8bit)	R/W	**Louver Control**[1] 0 – Swing, 1 – Pos1, 2 – Pos2, 3 – Pos3, 4 – Pos4	
Room Temp	5 – Float (2byte)	R/W	**Ambient Temperature (only integer numbers)** Read: 10ºC to 40ºC **Read:** If the option of virtual ambient temperature and SetPoint is deactivated (see in section 4.2.1of this document). **Write:** If the option of virtual ambient temperature and SetPoint is activated, to be measured from extern KNX sensor (see in section 4.2.1of this document).	
Filter Sign	1 – Switching (1bit)	R	**Filter Sign Status** 0 – Off, 1 - On	
ErrorCode	10 – Counter (16bit)	R	**Error Code** 0 – No Error, 1..99 – Error Code[2]	

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[1] During transition between positions, *Swing* signal will turn on indicating the Louver is moving

[2] See list of indoor unit error codes and their meaning in section 9.

URL   https://www.intesis.com

CompressorStatus	1 – Switching (1bit)	R	**Compressor Status** 0 – Off, 1 - On
FilterSignReset	1 – Switching (1bit)	W	**Filter Sign Reset** 1 – Clear Filter Alarm (When reading always 0)
RemoConErrorReset	1 – Switching (1bit)	W	**Remote Controller Error Reset** 1 – Clear Filter Alarm (When reading always 0)
ThermoOnOff	1 – Switching (1bit)	R	**Thermo On/Off Status (Inverter Type Only)** 0 – Off, 1 - On

2.2.2 Controlling all units at a time

Property	EIS type	Signal type (R/W)	Description / Status	
HW Error Com	1 – Switching (1bit)	R	**HW Communication Status** 0 – Communication OK, 1 – Communication ERROR	
OnOff_All	1 – Switching (1bit)	R/W	**Indoor Unit On/Off** 0 – Off, 1 – On	
Mode_All	14 – Counter (8bit)	R/W	**Operation Mode** 0 – Auto, 1 – Heat, 2 – Cool, 3 – Fan, 4 – Dry	
	DPT 20.105 (8bit)	R/W	**Operation Mode** 0 – Auto, 1 – Heat, 3 – Cool, 9 – Fan, 14 – Dry	
	DPT 1.100 (1bit)	R/W	**Operation Mode** 0 – Cool, 1 – Heat	
Mode_All::Cool	1 – Switching (1bit)	R/W	0–Inactive, 1–Active	Only one of these objects will be set / read to "1" at the same time (all objects will be updated on bus upon a Mode change)
Mode_All::Heat	1 – Switching (1bit)	R/W	0–Inactive, 1–Active	
Mode_All::Fan	1 – Switching (1bit)	R/W	0–Inactive, 1–Active	
Mode_All::Auto	1 – Switching (1bit)	R/W	0–Inactive, 1–Active	
SetPoint_All	5 – Float (2byte)	R/W	**Set Point Temperature** (only integer numbers allowed) 16..30 ºC	
Fan Speed_All	14 – Counter (8bit)	R/W	**Fan Speed** 0 – Low, 1 – Medium, 2 – High, 3 – Powerful	
FanSpeed_All::Low	1 – Switching (1bit)	R/W	0–Inactive, 1–Active	Only one of these objects will be set / read to "1" at the same time (all objects will be updated on bus upon a FanSpeed change)
FanSpeed_All::Mid	1 – Switching (1bit)	R/W	0–Inactive, 1–Active	
FanSpeed_All::High	1 – Switching (1bit)	R/W	0–Inactive, 1–Active	
FanSpeed_All::Powerful	1 – Switching (1bit)	R/W	0–Inactive, 1–Active	
RemoconLock_All	1 – Switching (1bit)	W	**Remote Controller Lock/Unlock** 0 – Unlock, 1 - Lock	

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3. Intesis^{TM} KNX Device Connections
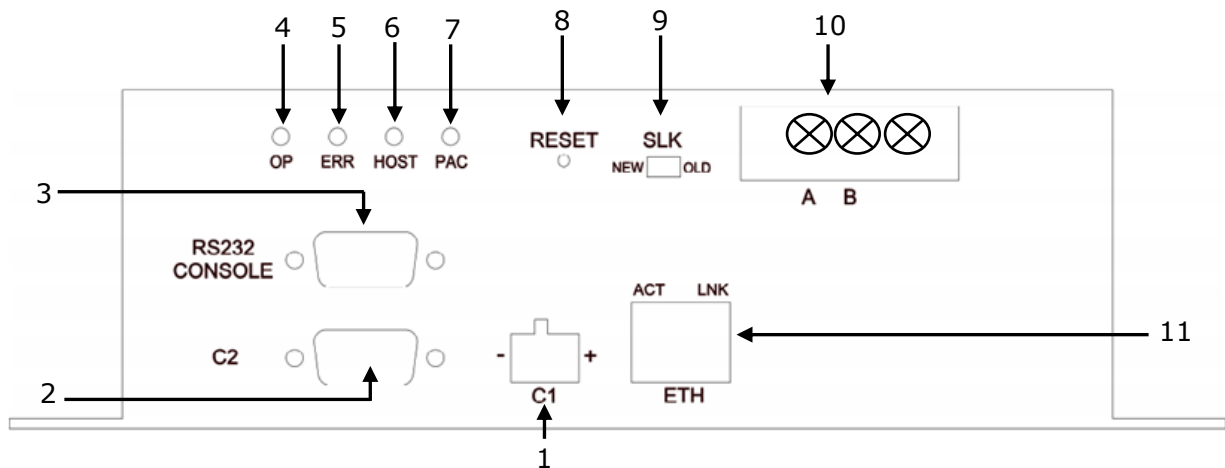
Figure 3.1 Intesis^{TM} KNX device front view
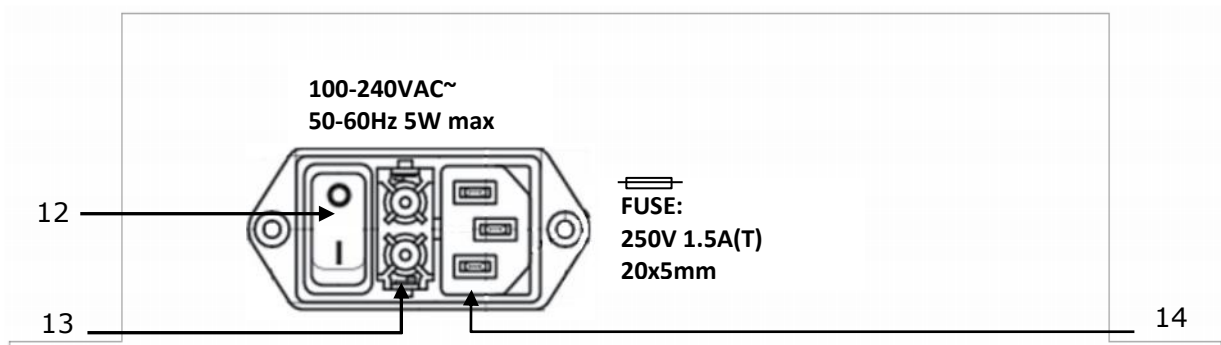
Figure 3.2 Intesis^{TM} KNX device back view

Next, there is the list with the device physical interface connector's description

1.- KNX configuration Port (C1)

2.- Non supported (C2)

3.- Console serial port EIA232

4.- Operation LED

5.- Error LED

6.- Host LED

7.- Pac LED

8.- Reset button (Non supported)

9.- Superlink selector (SLK)
   New: Superlink-II
   Old: Superlink-I

10.- A-B connector (for Superlink, no polarity)

11.- IP configuration Ethernet (ETH)

12.- Power supply On/Off button

13.- Power supply fuse (250V, 1.5A)

14.- Power supply connector

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3.1 Connect to Mitsubishi Heavy Industries Interface

Use the A-B connector in the right top corner of the front side of the Intesis™ device in order to connect the Mitsubishi Heavy Industries network (Superlink) to the Intesis™. Recommended specifications of the cable for the Superlink are shown as follows:

- Size of cable : 0.75 to 1.25 square mm
- Max length of wiring : total 1000m (loop wiring is not allowed)
- Cable materials :

Twisted Vinyl Cabtyre Cable	VCTF 2 core 0.75 to 1.25 square mm
Twisted Vinyl Cabtyre Cable	VCT 2 core 0.75 to 1.25 square mm
Twisted Vinyl Cable for Control	CVV 2 core 0.75 to 1.25 square mm

Table 3.1 Cable types recommended for Superlink connection

- For prevention of electromagnetic noise malfunctions, parallel wiring with the power line should be avoided

Select the appropriate Superlink mode in the SLK selector. If you are using latest Air Conditioner of the Mitsubishi Heavy Industries network (New Superlink) select NEW, if not select OLD.

LEDs placed in the top left corner will show connection status as follows:

LED	Status	Intesis™ behavior
OP	Blinking	Power supply OK
ERR	Off	No error
HOST	Blinking	Internal communication OK
PAC	Blinking	Communication with the Superlink network OK

Table 3.2 Intesis™ LED status information

OP LED behavior must defer depending on the Superlink version, as shown in **Figure 3.3**
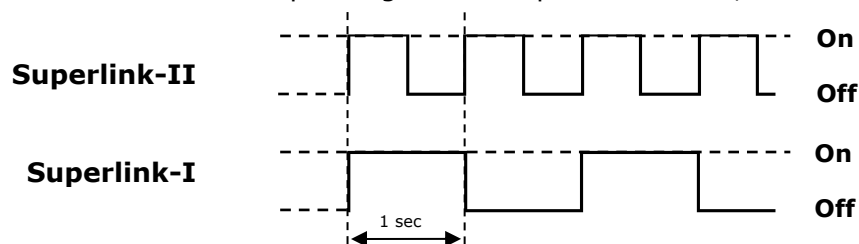
Figure 3.3 OP LED blinking behavior depending on Superlink version

If LEDs (except ERR) are not in the states described above, check section 6.3.

For further information about the Superlink network, look up the Mitsubishi Heavy Industries Manual or contact your nearest Mitsubishi Heavy Industries supplier.

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3.2 Connect to KNX Interface

Connect + and – terminals of the KNX bus to the Intesis™ KNX connector (C1). The polarity is important.

How to check if there is communication with the KNX bus is explained in the LinkBoxEIB Manual (section 6.3).

To check connectivity and correct functioning, use LinkBoxEIB software (see LinkBoxEIB User Manual).

3.3 Connect to PC (LinkBoxEIB)

This action allows the user to have access to configuration and monitoring of the device (more information can be found in the LinkBoxEIB User Manual).Two methods to connect to the PC can be used:

- Ethernet: Using the ETH port (**Figure 3.1**) of Intesis™. How to check connectivity is explained in section 6.3.

- Serial cable: Connect the Intesis™ device to the PC serial port using the serial cable provided. One end should be connected to the Console EIA232 port of the Intesis™ device (**Figure 3.1**) and the other end to the PC serial port.

Intesis™ (DB9 F)	EIA232 Serial Console	PC Connection (LinkBoxEIB)		PC (DB9 M)
Cable (DB9 M)		EIA232 (Straight)		Cable (DB9 F)
TX	2	→	2	RX
RX	3	←	3	TX
GND	5	↔	5	GND
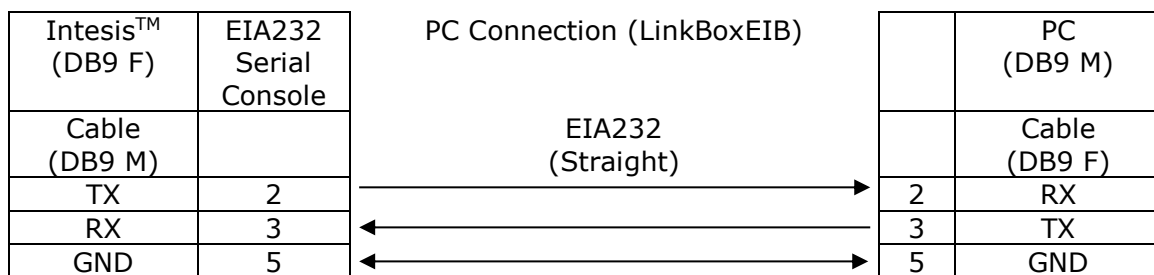
Table 3.3 EIA232 serial connection pin assign

3.4 Power Device

To power up the device, what you need is to plug properly the Power Supply connector to the Intesis™ device using a proper cable and connecting one end to the power supply connector (see Figure 3.2) and the other end to the power line. After that, just press the power supply On/Off button to turn it on.

4. **LinkBoxEIB**. Configuration & monitoring tool for Intesis^{TM} KNX series

4.1 Introduction

LinkBoxEIB is a Windows® compatible software developed specifically to monitor and configure Intesis^{TM} KNX series.

The installation procedure and main functions are explained in the *LinkBoxEIB User Manual*. This document can be found in the Doc folder or can be downloaded from the link indicated in the installation sheet supplied with the Intesis^{TM} device.

In this section, only the specific case of Mitsubishi Heavy Industries indoor unit's integration to KNX networks will be covered.

4.2 Connections configuration

To configure the Intesis^{TM} connection parameters and to see the points list, press on the **Config** button in the *menu bar* (see Figure 4.1). The *Mitsubishi Heavy Industries Configuration* window will open (see Figure 4.2). For integrations with large number of points, there is available an alternative CSV installation procedure explained in the LinkBoxEIB User Manual.
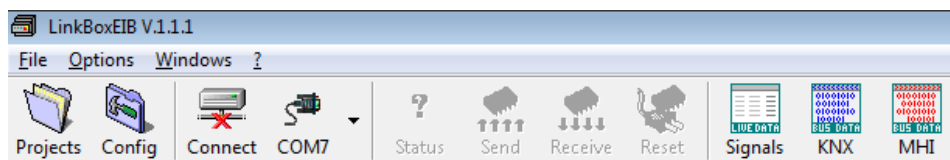
Figure 4.1 LinkBoxEIB *menu bar*

4.2.1   Configuration tab

Select the **Connection** tab to configure the connection parameters. Three subsets of information are shown in this window: EIB (KNX interface), Intesis IP (IP interface for configuration) and Mitsubishi Heavy Industries interface parameters (see Figure 4.2).
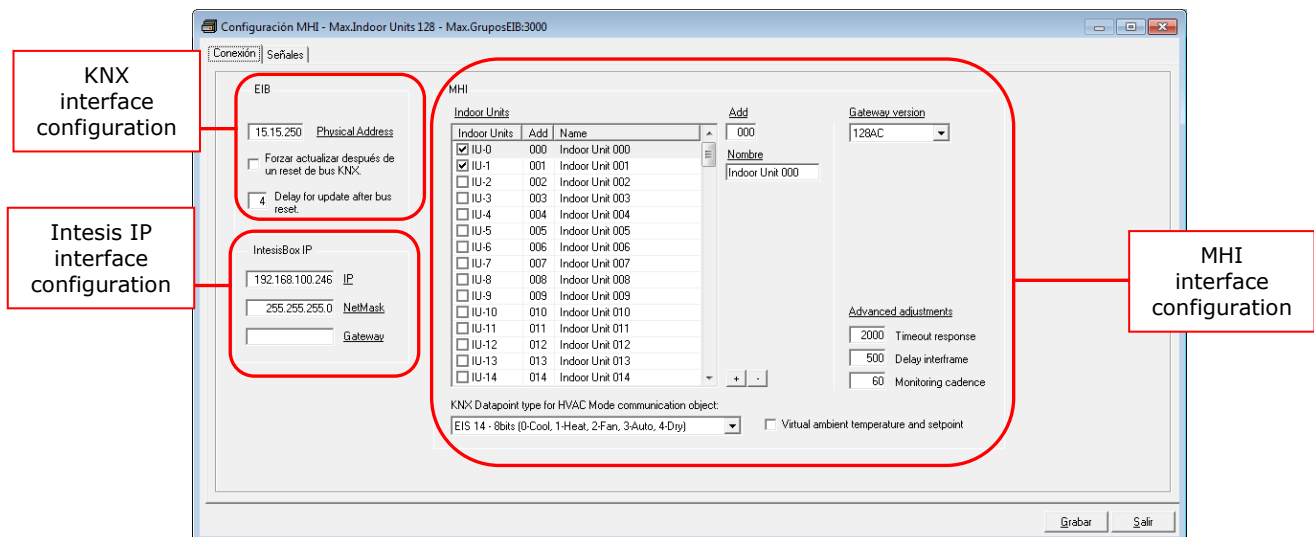
Figure 4.2 LinkBoxEIB configuration tab

Next, there is an explanation for each of the configuration parameters in each mode.

• KNX interface configuration parameters:
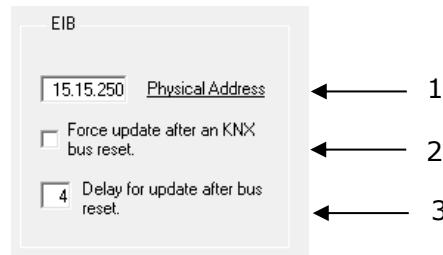
Figure 4.3 KNX interface configuration

1. **Physical Address:** Enter the KNX physical address for the gateway.

2. **Force update after a KNX bus reset:** Affects to the KNX groups with the Update feature activated (U).

3. **Delay for update after bus reset:** Enter the desired delay after a bus reset. It is expressed in seconds.

- IntesisIP interface configuration parameters:
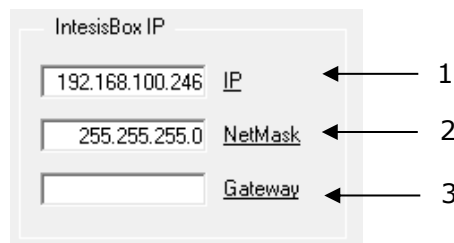
Figure 4.4 IntesisIP interface configuration

1. **IP:** Enter the KNX physical address for the gateway.

2. **NetMask:** Enter the Intesis™ net mask address.

3. **Gateway:** Enter the router or default gateway address if needed. In case you don't want to use it, left blank.

- Mitsubishi Heavy Industries interface configuration parameters:
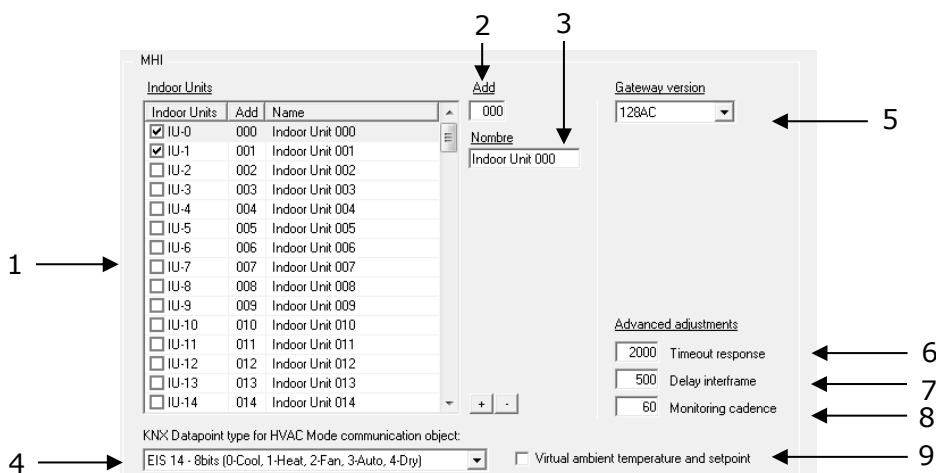
Figure 4.5 Mitsubishi Heavy Industries interface configuration

1. **Indoor Units:** In this list, you can individually enable each of the 128 indoor units available on the system. The index in the column "Indoor Units" (i.e. the number

x in "Indoor Unit xxx") is the reference that will be used later on (in tab "Signals") to refer to this AC indoor unit. You can also change the description name of the Indoor Unit and its address to facilitate integration tasks using **Add** and **Name** text boxes.

2. **Add:** Enter here the desired Indoor Unit address.

3. **Name:** Enter here the desired descriptive Indoor Unit name (optional).

4. **KNX Datapoint type for HVAC Mode communication object:** Select the desired codification so the Mode object matches your integration needs.

5. **Gateway version:** Selection of the *Intesis^{TM} KNX – Mitsubishi Heavy Industries* gateway you are setting up (*128AC* for *INKNXMHI128O000, 48AC* for *INKNXMHI048O000*).

6. **Timeout response:** Maximum amount of time permitted before activating the Communication Error signal. It is expressed in milliseconds (ms) and ranges can vary from 2000 ms to 10000 ms.

7. **Delay interframe:** Maximum amount of time permitted between End Of Transmission (EOT) and a new frame. It is expressed in milliseconds (ms) and ranges can vary from 500 ms to 3000 ms.

8. **Monitoring cadence:** Cadence of monitoring and subscription. It is expressed in seconds (s) and ranges can vary from 60 s to 600 s.

9. **Virtual ambient temperature and setpoint:** Meant to be enabled when you want the temperature provided by a KNX sensor to be the reference ambient temperature for the air conditioner. Then, the following formula applies for calculation of real *Control_ Setpoint Temperature* sent to the AC unit:

"AC Setp. Temp" = "AC Ret. Temp" - ("KNX Amb. Temp." - "KNX Setp. Temp")

- AC Setp. Temp: AC indoor unit setpoint temperature
- AC Ret. Temp: AC indoor unit return temperature
- KNX Amb. Temp.: Ambient temperature provided from KNX
- KNX Setp. Temp: Setpoint temperature provided from KNX

As an example, consider the following situation:

User wants: **19ºC** ("KNX Setp. Temp*.*")
User sensor (a KNX sensor) reads: **21ºC** ("KNX Amb Temp*.*")
Ambient temp. read by MHI system is: **24ºC** ("AC Ret. Temp")

In this example, the final setpoint temperature that INKNXMHI048O000/128 will send out to the indoor unit (shown in "Setp. Temp*.*") will become 24ºC – (21ºC - 19ºC) = **22ºC**. This is the setpoint that will actually be requested to MHI unit.

This formula will be applied as soon as the *Control_ Setpoint Temperature* and *Control_ Ambient Temperature* objects are written at least once from the KNX installation. After that, they are kept always consistent.

Note that this formula will always drive the AC indoor unit demand in the *right* direction, regardless of the operation mode (Heat, Cool or Auto). Due to the use of this functionality, temperature showed in the KNX device and in the MHI remote controller (in case it exist) may differ.

Additional configuration parameters should generally be left to their default value. They only might need to be tuned in some very specific cases (installations with large number of units, scenarios with large bursts of commands sent at once …)

4.2.2 *Signals*

Select the Signals tab to configure the signals list (the IntesisTM internal points).

Figure 4.6 Signal list

1. **IU:** Indoor Unit identifier.

2. ***Property*:** Identifies the different signals available per every MHI group. An identification code is given to every different signal into the MHI group, identifying every signal with an individual code. In section 2.2, an explanation of every signal is given. A contextual menu appears using mouse right button click over the column showing all the possible signal codes.

3. **Signal:** Signal's descriptive name (optional). Useful to identify the signal. The default descriptive name corresponds to the signal's code, but can be edited or modified.

4. **EIS:** KNX data type (Data point) to encode the signal's value. It will depend on the MHI type of signal associated to it in every case. Edit using the mouse right-button-click pop-up menu available on the column. Only the EIS defined in values are allowed.

5. **Group:** Main KNX group address for the signal. Flags *R,W,T,U* explained below will only apply for this main KNX group address, not for listening addresses. Formats supported are P/I/S and P/S.

6. **Listening addresses:** KNX group addresses that will be listened by IntesisTM for this signal. If IntesisTM receives a KNX telegram whose destination is one of these listening addresses, the telegram will be taken into account and the corresponding action will be performed on this signal (if W is active). Formats supported are P/I/S and P/S, comma separated.

7. **Communication object flags:**

   7.1 **R:** Indicates if this signal is allowed to be read from KNX system ("R" flag activated, "blank" flag not activated).

7.2 **W:** Indicates if this signal is allowed to be written from KNX system ("W" flag activated, "blank" flag not activated).

7.3 **T:** Indicates if this signal will generate a telegram sending to the KNX system following a change of the signal's value, that is to say, any change of value of this signal in MHI side will be transmitted to the KNX system if this flag is activated ("T" flag activated, "blank" flag not activated).

7.4 **U:** Indicates if this signal will be updated (sending read requests) whenever Intesis^{TM} starts up or after a KNX bus reset ("U" flag activated for the main group address, "U2" activated for the listening group address, "blank" flag not activated).[1]

8. **Active:** Indicates if the signal is active or not for the current configuration ("1-Yes" signal active, "0-No" signal not active).

See section 2.2 for further detail on available signals and the possible values on each one.

4.3 Sending the configuration to Intesis^{TM}

When the configuration is finished, follow the next steps.

1.- Click on **Save** button to save the project to the project folder on your hard disk (more information in LinkBoxEIB User Manual).

2.- You will be prompted to generate the configuration file to be sent to the gateway.
   a.- If **Yes** is selected, the binary file (MHI.Lbox) containing the configuration for the gateway will be generated and saved also into the project folder.
   b.- If **NO** is selected, remember that the binary file with the project needs to be generated before the Intesis^{TM} starts to work as expected.

3.- Once in the configuration window again, click on **exit**. Configuration file is ready to be sent to the Intesis^{TM} device.

4.- Press the **Send File** button to send the binary file to the Intesis^{TM} device. The process of file transmission can be monitored in the Intesis^{TM} Communication Console window. Intesis^{TM} will reboot automatically once the new configuration is loaded.

After any configuration change, do not forget to send the configuration file to the Intesis^{TM} using button Send File.

4.4 Signals viewer

Once the gateway is running with the correct configuration, to supervise the status of the configured signals, press the **Signals** button on the *menu* bar (see Figure 4.1). The Signals Viewer window will open (see Figure 4.7).

This window shows all signals active within the gateway with its main configuration parameters and its real time value[2] in the **Value** column.

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[1] DO NOT BE CONFUSED: Philosophy of Intesis^{TM} point's U flag is not the same as KNX device's U flag. In KNX devices, U flag means that the point's value will be updated whenever a write telegram for the group address is received by the device.

[2] In case you connect to the Intesis^{TM} when it's been running for a certain time, you should press the *Refresh* button to get updated values. After pressing *Refresh*, all signal values will keep continuously updated until the connection is closed.

Figure 4.7 LinkBoxEIB Signals Viewer

The signals viewer can be used even though only one system is connected to the Intesis™, KNX or Mitsubishi Heavy Industries AC. Therefore, it becomes convenient for supervision and testing the system.

In order to force a specific value to a signal, double-click its row in the table. This will display a dialog in which the desired value can be entered (see Figure 4.8). Changing its value in this way, will make:

- The content of the corresponding KNX group address will be changed to this value.
- If the signal is write-enabled, it will trigger a suitable command to Mitsubishi Heavy Industries AC system.

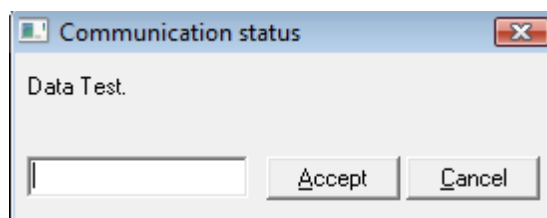
Figure 4.8 Signal value change window

4.5 Files

LinkBoxEIB saves the integration configuration in the following files inside the project folder:

PROJECT.INI	INI file containing general information related to the project.

MHI.INI	INI file containing information related with the values configured through the "Connection" tab in Intesis™ configuration.
MHI.LBOX	Binary file created from the information in the files described above. This is the file downloaded to the Intesis™.
MHI.dat	ASCII file containing the configuration of the project signals. It is the one to be used for bulk point configuration.

Table 4.1 LinkBoxEIB generated files during Project creation

It is strongly recommended to back up the project folder containing these files in external media, once the installation process is finished. This way you will be able to do future configuration changes in case of reinstallation of LinkBoxEIB due, for example, to a failure of the hard disk in the PC where LinkBoxEIB was installed.

The configuration cannot be uploaded from the gateway to LinkBoxEIB, it can only be downloaded.

5. Intesis™ and ETS
5.1 Integration of Intesis™ in ETS

As explained the Intesis™ is configured with the LinkBoxEIB but in some projects it might be needed to integrate the gateway in the ETS project, for example to allow the line couplers have a correct configuration of their filter tables. To do so a Dummy device can be used in ETS to simulate the Intesis™ and associate also to this Dummy device all group addresses used in Intesis™.

The dummy device can be downloaded from: https://intesis.com/docs/software/setupv_linkboxmb

6. Setup process and troubleshooting

6.1 Pre-requisites

It is necessary to have the KNX bus operative and well connected to the KNX port of IntesisTM.

Connectors, connection cables, PC for LinkBoxEIB, and other auxiliary material, if needed, are not supplied by HMS Networks for this standard integration. Items supplied by HMS Networks for this integration are:

- IntesisTM KNX device with full Mitsubishi Heavy Industries AC compatibility without extra components.
- Standard plug-in 220Vac 50Hz power supply to power IntesisTM (European plug type).
- Access to LinkBoxEIB software download site to configure IntesisTM.
- Console cable needed to download the configuration to IntesisTM.
- Product documentation.

6.2 *Setup* procedure

1. Install LinkBoxEIB on your laptop, use the setup program supplied for this and follow the instructions given by the Installation Wizard.

2. Install IntesisTM in the desired installation site. For your convenience, check external enclosure measures (see 7) before deciding where to place the IntesisTM device.

3. Connect the communication cable coming from the KNX bus to the IntesisTM KNX port (See 3 for more information on connection procedure).

4. Connect the Superlink network cable to the IntesisTM port marked as AB (see 3.1).

5. Select the appropriate Superlink mode in the SLK selector. If you are using latest Air Conditioner of the Mitsubishi Heavy Industries network select NEW, if not select OLD. Contact your nearest Mitsubishi Heavy Industries supplier in case of doubt.

6. Connect the IntesisTM device to the power line (see 3.4) and press the On/Off button to turn it on.

7. Connect the communication cable coming from the serial port of your laptop/desktop PC to the IntesisTM port marked as EIA232 Console (see 3.3).

8. Open LinkBoxEIB and proceed as explained in section 4.

6.3 Troubleshooting

If IntesisTM is not working properly or even not working at all, please check the following conditions to be accomplished.

6.3.1 Physical checking

First point to look at to make sure that IntesisTM is not working properly is to check physical connections:

1.- Make sure that the power plug is correctly connected and current is available in the power line.

2.- Check Intesis™ LED status:

LED	Status	Explanation	Solution
OP	Off	No power reaching the internal device	Check power connection Check fuse status (see part 13 in Figure 3.2)
ERR	Blinking once periodically	Superlink communication failure	Check Superlink cables and terminals (connectors, length of cables, etc.)
HOST	Off	Configuration error	Download the binary file again (see 4.3)
PAC	Off	Communication error in the Superlink network	Check the Mitsubishi Heavy Industries Superlink network and its connections

Table 6.1 Intesis™ LED status information

6.3.2 Software checking

Once physical connections have been checked, if functioning problems still remain, please use the LinkBoxEIB tool to monitor the working status of the device.

- To check the KNX communication status, click on the **KNX** button in the *menu bar* (see Figure 4.1).
- To check the MHI communication status, click on the **MHI** button, also in the *menu bar* (see Figure 4.1).
- To check the signal values in the KNX communication objects, click on the **Signals** button, also in the *menu bar* (see Figure 4.1).

Further information regarding the monitoring procedure and the information provided in each window can be consulted in the LinkBoxEIB Manual.
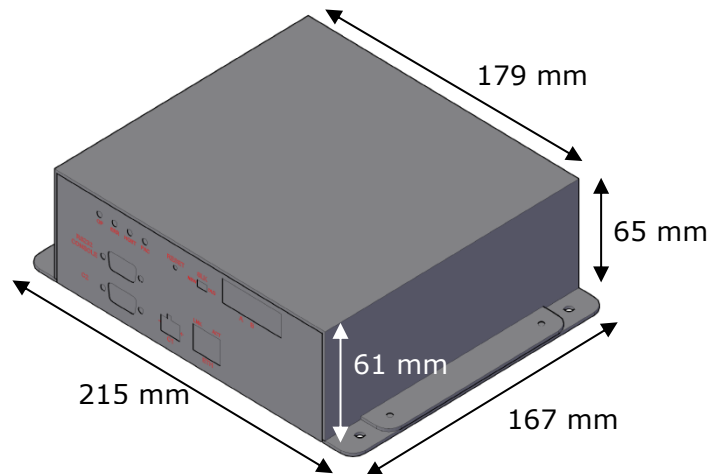
7. Mechanical & Electrical characteristics

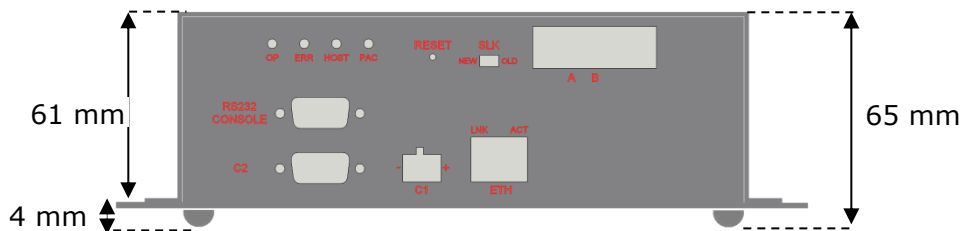**Figure 7.1** External dimensions – Perspective view
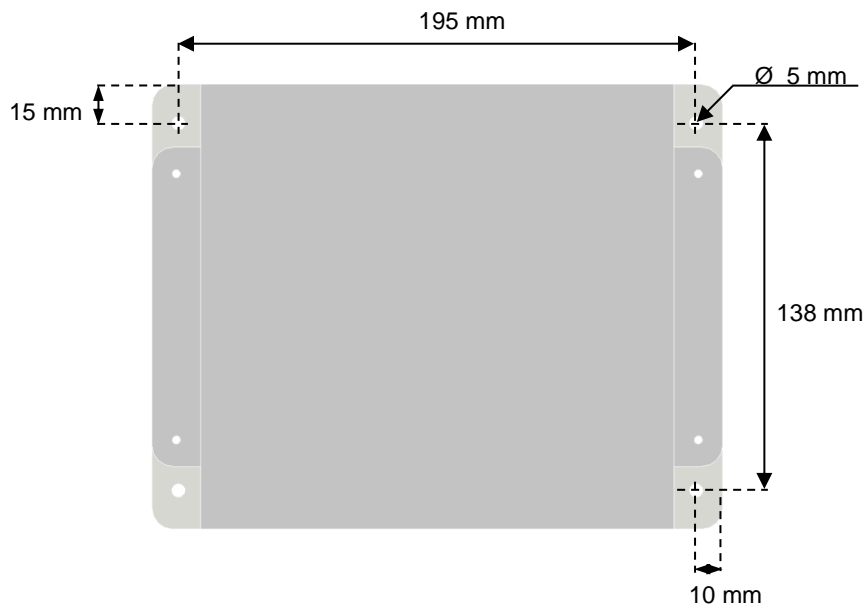

Figure 7.2 External dimensions – Front view

Figure 7.3 Top view[1] (screw holes size)

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[1] Device can be installed in any position.

Enclosure	Industrial sheet metal. Size: 215mm x 167mm x 61mm. Weight: 2.025 Kg
Color	Gray metalized.
Power	100 to 240VAC~ 50 to 60Hz 5W max. Power connector: C14 (male) [1]
Fuse	250V 1.5A Dimensions: 20x5mm
Terminal wiring (for low-voltage signals)	Per terminal: solid wires or stranded wires (twisted or with ferrule) 1 core: 0.75 … 1.25mm^2 2 cores: 0.75 … 1.25mm^2 3 cores: not permitted
Mounting	Wall (see Figure 7.3)
KNX port	1 x KNX TP1 (EIB) opto-isolated (Plug-in screw terminal block 2 poles)
A-B port	1 x Superlink terminals (Plug-in screw terminal block 2 poles "A" "B"). SELV
ETH port	1 x Ethernet 10Base-T (RJ45)
LED indicators	2 x Ethernet port link and activity (LNK, ACT). 4 x MHI Interface (OP, ERR, HOST, PAC)
Push buttons	1 x Reset Device
Selectors	1 x SLK selector
Console port	EIA232. (DB9 female DCE). SELV
Configuration	Via console port. [2]
Firmware	Allows upgrades via console port.
Operational temperature range	0°C to +40°C
Operational humidity range	5% to 95%, non condensing
Protection	IP20 (IEC60529).
RoHS conformity	Compliant with RoHS directive (2002/95/CE).
Norms and standards	CE conformity to EMC directive (2004/108/EC) and Low-voltage directive (2006/95/EC) EN 61000-6-2 EN 61000-6-3 EN 60950-1 EN 50491-3

Table 7.1 Intesis™ Mechanical and Electrical Characteristics

8. AC Unit Types compatibility

Indoor units compatible with the Intesis™ KNX – Mitsubishi Heavy Industries are those included in the Mitsubishi Heavy Industries KX family and so on.

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[1] A power cable with connector C14 male 1.6 meters long is supplied with the device.

[2] Standard cable DB9male-DB9female 1.8 meters long is supplied with the device for connection to a PC COM port for configuring and monitoring the device. The configuration software, compatible with Windows™ operating systems, is also supplied.

Intesis™
BY HMS NETWORKS

URL https://www.intesis.com