Intesis Modbus Server for Hisense Air Conditioning Gateway integration of VRF Systems User Manual

Hisense Air Conditioning Gateway for the integration of Hisense VRF systems into Modbus (RTU and TCP) systems

USER MANUAL
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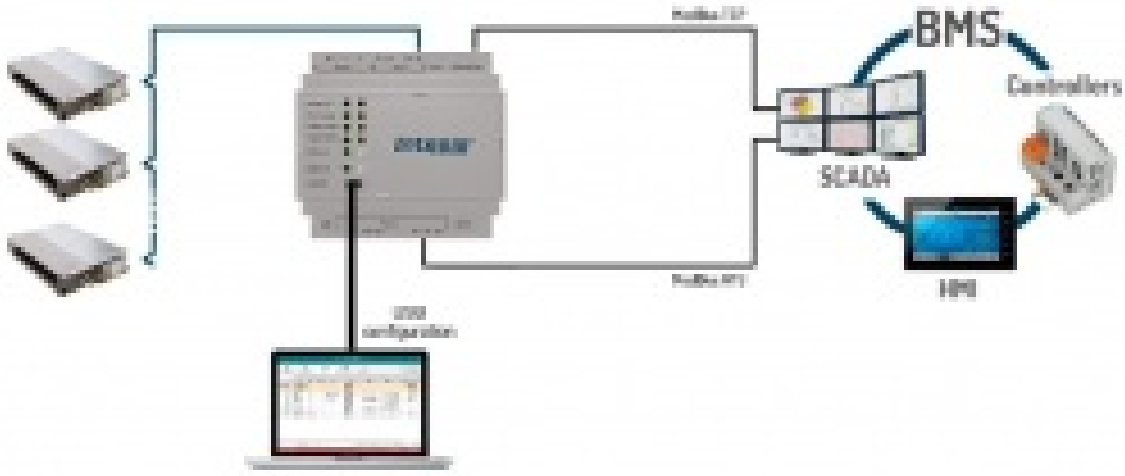
Gateway for the integration of Hisense VRF systems into Modbus (RTU and TCP) systems.

ORDER CODE	LEGACY ORDER CODE
INMBSHIS016O000	HS-AC-MBS-16
INMBSHIS064O000	HS-AC-MBS-64

Contents

1.1Introduction

This document describes the integration of Hisense VRF air conditioning systems into Modbus compatible devices and systems using using gateway the Intesis Modbus Server to Hisense VRF communication gateway.
The aim of this integration is to monitor and control Hisense air conditioning systems, remotely, from a Control Center using any commercial SCADA or monitoring software that includes a Modbus Master driver (RTU and/or TCP). To do it so, Intesis performs as a Modbus Server, allowing poll and write requests from any Modbus master device.
Intesis makes available the Hisense air conditioning system indoor units’ datapoints through independent Modbus registers.
Up to 64 indoor units supported, depending on product version.
This document assumes that the user is familiar with Modbus and Hisense technologies and their technical terms.
Integration of



Integration of Hisense's compatible systems into Modbus systems

1.1 Functionality

IntesisTM continuously monitors Hisense VRF network for all configured signals and keeps the updated status of all of them in its memory, ready to be served when requested from the Modbus master.
Commands toward the indoor units are permitted.
Each indoor unit is offered as a set of MBS objects.

Element	Object supported
Outdoor Unit	• Status
Indoor Unit	• Status • Command • Communication status
General signals (all units)	• Command

1.2 Capacity of Intesis

Element	Max.	Notes
Number of indoor units	64 *	Number of indoor units that can be controlled through Intesis

* There are different models of Intesis MBS – Hisense VRF each one with different capacity. The table above shows the capacity for the top model (with maximum capacity).

Their order codes are:
- INMBSHIS016O000: Model supporting up to 16 indoor units
- INMBSHIS064O000: Model supporting up to 64 indoor units

2. Modbus interface

In this section, a common description for all Intesis Modbus series gateways is given, from the point of view of Modbus system which is called from now on internal system. Connection with the Hisense VRF system is also called from now on external system.

1.3 Functions supported

This part is common for Modbus RTU and TCP.
Modbus functions 03 and 04 (Read Holding Registers and Read Input Registers) can be used to read Modbus registers.
Modbus functions 06 and 16 (Single Multiple Holding Registers and Write Multiple Holding Registers) can be used to write Modbus registers.
Configuration of poll records is possible between Modbus addresses 0 and 20000. Addresses that are not defined in section 2.2 (Modbus map of the device) are read-only and will always report 0.
Modbus error codes are supported, they will be sent whenever a non-valid Modbus address is queried.
All registers are 16-bit signed integer, in standard Modbus Big Endian (MSB/LSB) format.
Intesis supports Modbus RTU and Modbus TCP and both interfaces can be used simultaneously.

1.4 Modbus RTU

Both EIA485 and EIA232 physical layers are supported. Only the lines RX, TX and GND of the EIA232 connector are used (TX and RX for EIA485).
Baud rate can be selected between 1200, 2400, 4800, 9600, 19200, 38400, 56700 and 115200. Parity (none, even or odd) and stop bits (1 or 2) can be selected as well. Modbus slave number must be configured and the physical connection (RS232 or RS485) can also be selected

1.5 Modbus TCP

TCP port to use (default is 502) and keep alive period must be configured.
IP settings of Intesis (DHCP status, own IP, net mask and default gateway) must be configured as well.

1.6 Modbus Address Map

Modbus address from the formula is expressed in link layer format. This is, first register address is 0.

Modbus Address (First Address is 0)	Read (Write)	Register/signal name	Possible values
0	W	On (all the units)	1-Set all the units On
1	W	Off (all the units)	1-Set all the units Off
2	W	Operation Mode Auto (all the units)	1-Set Auto Mode
3	W	Operation Mode Heat (all the units)	1-Set Heat Mode
4	W	Operation Mode Dry (all the units)	1-Set Dry Mode
5	W	Operation Mode Fan (all the units)	1-Set Fan Mode
6	W	Operation Mode Cool (all the units)	1-Set Cool Mode
7	W	Fan Speed Auto (all the units)	1-Set Fan Speed Auto
8	W	Fan Speed Low (all the units)	1-Set Fan Speed Low
9	W	Fan Speed Mid (all the units)	1-Set Fan Speed Mid
10	W	Fan Speed High (all the units)	1-Set Fan Speed High
11	W	Fan Speed High+ (all the units)	1-Set Fan Speed High+
12	W	Vane Position Auto (all the units)	1-Set Vane Position Auto
13	W	Vane Position 1 (all the units)	1-Set Vane Position 1
14	W	Vane Position 2 (all the units)	1-Set Vane Position 2
15	W	Vane Position 3 (all the units)	1-Set Vane Position 3
16	W	Vane Position 4 (all the units)	1-Set Vane Position 4
17	W	Vane Position 5 (all the units)	1-Set Vane Position 5
18	W	Vane Position 6 (all the units)	1-Set Vane Position 6
19	W	Vane Position 7 (all the units)	1-Set Vane Position 7

20	W	Temperature Setpoint (x10ºC) (all units)	Cool: 16..30ºC; Heat: 17..30ºC
(OU*25)+10000+0 [illegible]	R	Communication Error OU	0-No error, 1-Error
(OU*25)+10000+1	R	Outdoor Air Temp.	-50..50 ºC
(OU*25)+10000+2	R	Comp. Top Temp.	0..200 ºC
(OU*25)+10000+3	R	Total Real Comp. Freq.	0..255 Hz
(OU*25)+10000+4	R	Total Comp. Current	0..255 A
(OU*25)+10000+5	R	Out Exp. Valve 1 Open	0..100 %
(OU*25)+10000+6	R	Discharge Pressure (x10ºC)	-0.5..5.0 MPa
(OU*25)+10000+7	R	Suction Pressure (x10ºC)	-0.5..5.0 MPa
(IU*100)+0 [illegible]	R/W	On/Off	0-Off, 1-On
(IU*100)+1	R/W	Operation Mode	0-Auto, 1-Heat, 2-Dry, 3-Fan, 4-Cool
(IU*100)+2	R/W	Fan Speed	0-Auto, 1-Low, 2-Mid, 3-High, 3-High+
(IU*100)+3	R/W	Vane Position	0-Auto, 1-Pos1..7-Pos7
(IU*100)+4	R/W	Temperature Setpoint (x10ºC)	Cool:16..30ºC, Heat:17..30ºC
(IU*100)+5	R	Remote Sensor Temp. (x10ºC)	-63..40ºC
(IU*100)+6	R	Inlet Temp. (x10ºC)	-63..40ºC
(IU*100)+7	R	Outlet Temp. (x10ºC)	-63..40ºC
(IU*100)+8	R	GasPipe Temp. (x10ºC)	-63..40ºC
(IU*100)+9	R	LiquidPipe Temp. (x10ºC)	-63..40ºC
(IU*100)+10	R	Unit Error code	Error code
(IU*100)+11	R	Filter Alarm	0-Normal, 1-Alarm
(IU*100)+12	W	Filter Alarm Reset	1-Reset
(IU*100)+13	R	Communication Status	0-Not Exist, 1-Exist

(U*100)+14	R/W	Allow On/Off from RC	0-Allow, 1-Not allow
(U*100)+15	R/W	Allow Mode from RC	0-Allow, 1-Not allow
(U*100)+16	R/W	Allow Setpoint from RC	0-Allow, 1-Not allow
(U*100)+17	R/W	Allow Fan from RC	0-Allow, 1-Not allow
(U*100)+18	R	Unit Type	0:Not Defined,1-DS,2-FC,3-VRF,4-RU,5-ES
(U*100)+19	R	Unit Address	1..64
(U*100)+20	R	System Address	1..64
(U*100)+21	R	Dehumidification	0-Disabled, 1-Enabled
(U*100)+22	R/W	Dehumidification Correction	0-0, 1-(-1), 2-(-2)
(U*100)+23	R	Compressor Stop Cause	255-Operation Off, Other-See manual
(U*100)+24	R	Expansion Valve Open	0..100%
(U*100)+25	R	Operation Condition	0-Off, 1-Thermo Off, 2-Thermo On, 3-Alarm
(U*100)+26	R	RC SW Temperature (x10°C)	-63..63°C
(U*100)+27	R	RC SW Config	0-Without RCS, 1-With RCS

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3. Connections

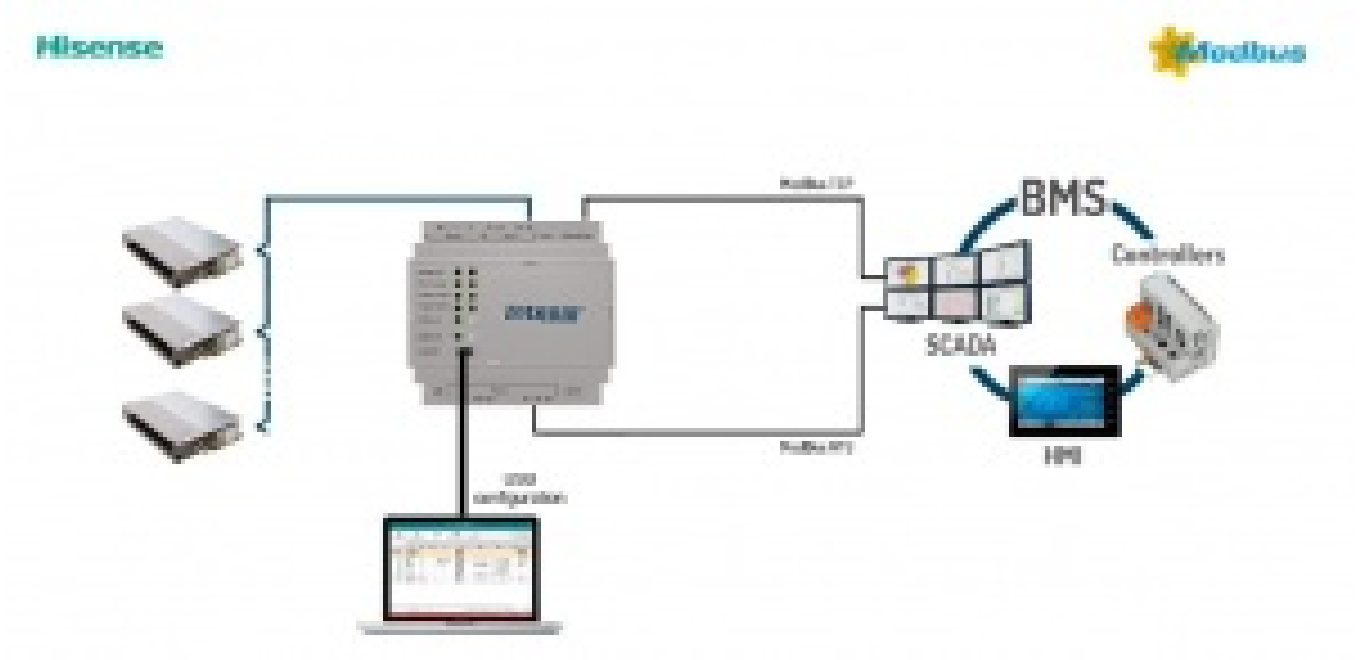
Find below information regarding the Intesis connections available.

Power Supply
Must use NEC Class 2 or Limited Power Source (LPS) and SELV rated power supply.
If using DC power supply:

Respect polarity applied of terminals (+) and (-). Be sure the voltage applied is within the range admitted (check table below). The power supply can be connected to earth but only through the negative terminal, never through the positive terminal.
If using AC power supply:

Make sure the voltage applied is of the value admitted (24 Vac). Do not connect any of the terminals of the AC power supply to earth, and make sure the same power supply is not supplying any other device.
Ethernet / Modbus TCP (TCP) / Console (UDP & TCP)
Connect the cable coming from the IP network to the connector ETH of the gateway. Use an Ethernet CAT5 cable.

If communicating through the LAN of the building, contact the network administrator and make sure traffic on the port used is allowed through all the LAN path (check the gateway user manual for more information). Default IP is 192.168.100.246. DHCP is enabled by default.



PortA / H-Link Hisense
Connect the H-Link terminals (TB2) of Hisense Outdoor Unit to the connectors A3 and A4 of gateway's PortA. There is no polarity to be respected.

PortB / Modbus-RTU RS485
Connect the EIA485 bus to connectors B1 (B+), B2 (A-) and B3 (SNGD) of gateway's PortB. Respect the polarity. Remember the characteristics of the standard EIA485 bus: maximum distance of 1200 meters, maximum 32 devices connected to the bus, and in each end of the bus it must be a termination resistor of 120 Ω. Bus biasing and termination resistor for EIA485 can be enabled for PortB by means of a dedicated DIP:

SW1:
ON: 120 Ω termination active
OFF: 120 Ω termination inactive (Default setting).
SW2+3:
ON: Polarization active
OFF: Polarization inactive (Default setting).

If the gateway is installed in one bus end, make sure that termination is active.

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1.7 Power device

The first step to perform is to power up the device. To do so, a power supply working with any of the voltage range allowed is needed (check section 5). Once connected the ON led will turn on.

WARNING! In order to avoid earth loops that can damage the gateway, and/or any other equipment connected to it, we strongly recommend:

- The use of DC power supplies, floating or with the negative terminal connected to earth. Never use a DC

power supply with the positive terminal connected to earth.

- The use of AC power supplies only if they are floating and not powering any other device.

1.8 Connect to Hisense VRF installation

Use the PortA connector in the top corner of the Intesis device in order to connect H-Link bus to the Intesis. Remember to follow all safety precautions indicated by Hisense.
Connect the Hisense H-Link/TB2 bus to connectors A3 and A4 of gateway's PortA. Bus is not sensitive to polarity.

1.9 Connection to Modbus

1.9.1 Modbus TCP

The gateways Ethernet port connection is used for Modbus TCP communication. Connect the communication cable coming from the network hub or switch to the Ethernet port of Intesis. The cable to be used shall be a straight Ethernet UTP/FTP CAT5 cable.
TCP port to use (default 502) and keep alive period must be configured.
IP settings of the gateway (DHCP status, own IP, netmask and default gateway) must be configured as well.

1.9.2 Modbus RTU

Connect the communication cable coming from the motbus network to the port marked as Port B of the Intesis. Connect the EIA485 bus to connectors B1 (-), B2 (+) and B3 (SNGD) of gateway's PortB. Respect the polarity. Remember the characteristics of the standard EIA485 bus: maximum distance of 1200 meters, maximum 32 devices (without repeaters) connected to the bus, and in each end of the bus it must be a termination resistor of 120 Ω. The gateway has an internal bus biasing circuit that incorporates the termination resistor. Bus biasing and termination resistor for EIA485 can be enabled for PortB by means of a dedicated DIP switch.

1.10 Connection to PC (Configuration tool)

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

- Ethernet: Using the Ethernet port of Intesis.
- USB: Using the console port of Intesis, connect a USB cable from the console port to the PC.

4. Set-up process and troubleshooting

1.11 Pre-requisites

It is necessary to have the Modbus RTU or TCP master/client device (BMS side device) operative and properly connected to the corresponding port of the gateway and the Hisense VRF installation connected to their corresponding ports as well.
Connectors, connection cables, PC for the Configuration Tool usage and other auxiliary material, if needed, are not supplied by Intesis for this standard integration.
Items supplied by HMS Networks for this integration are:

- Intesis gateway.
- Link to download the configuration tool.
- USB Console cable to communicate with Intesis.
- Product documentation.

1.12 Intesis MAPS. Configuration & monitoring tool for Intesis Modbus series

1.12.1 Introduction

Intesis MAPS is a Windows® compatible software developed specifically to monitor and configure Intesis new generation gateways.

The installation procedure and main functions are explained in the Intesis MAPS User Manual. This document can be downloaded from the link indicated in the installation sheet supplied with the Intesis device or in the product website at www.intesis.com

In this section, only the specific case of Hisense VRF to Modbus systems will be covered. Please check the Intesis MAPS User Manual for specific information about the different parameters and how to configure them.

1.12.2 Connection

To configure the Intesis connection parameters press on the Connection button in the menu bar.

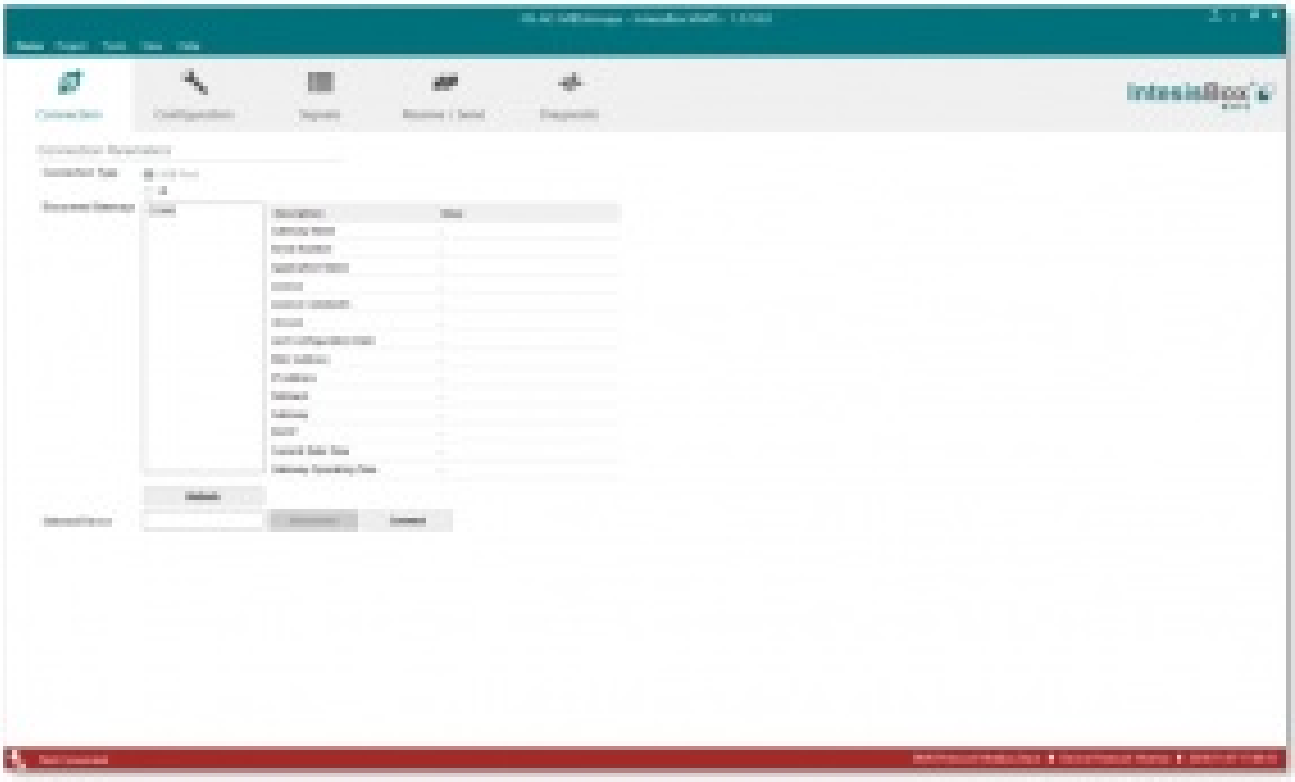

Figure 4.1 MAPS connection

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1.12.3 Configuration tab

Select the Configuration tab to configure the connection parameters. Three subsets of information are shown in this window: General (Gateway general parameters), Modbus Slave (Modbus interface configuration) and Hisense (Hisense interface parameters).

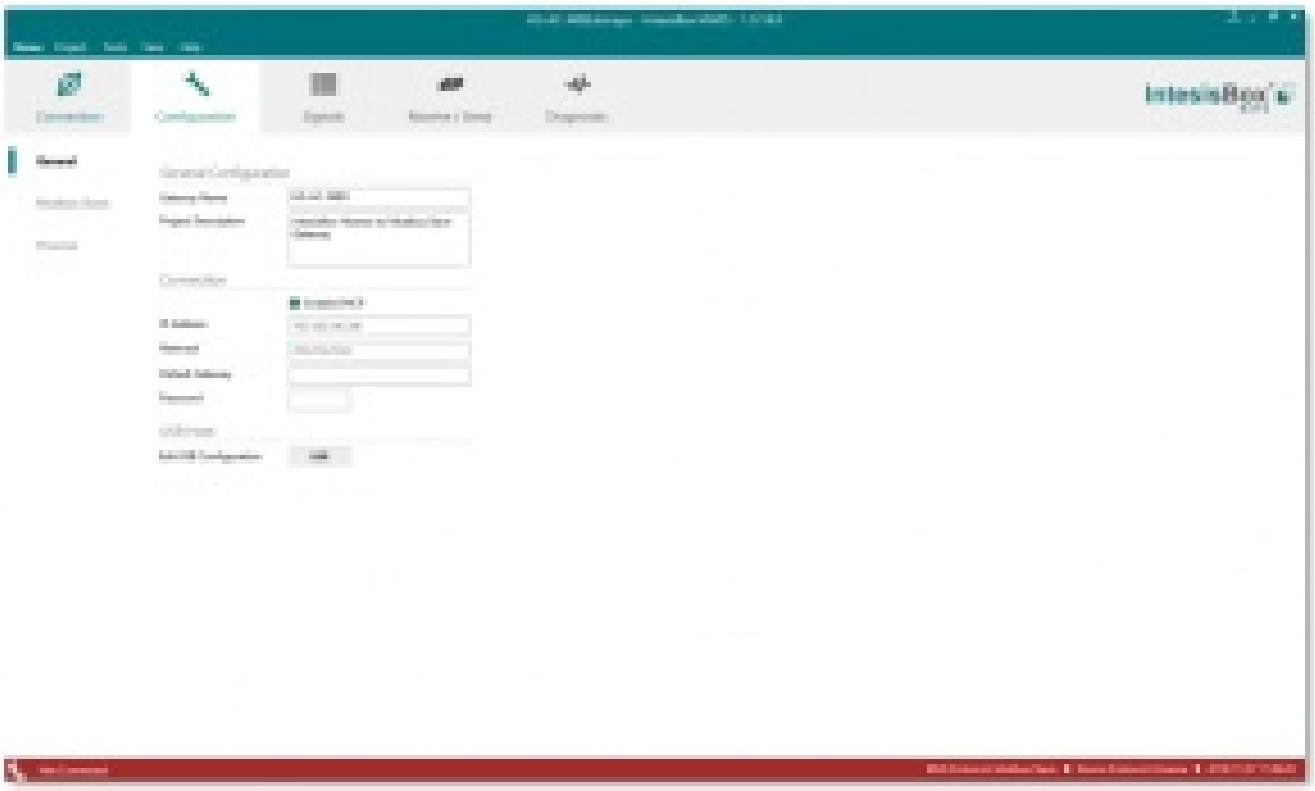

Figure 4.2 Intesis MAPS configuration tab

1.12.4 Modbus Slave configuration
Set parameters of Modbus Slave interface of Intesis.

IntesisTM Modbus Server – HISENSE VRF

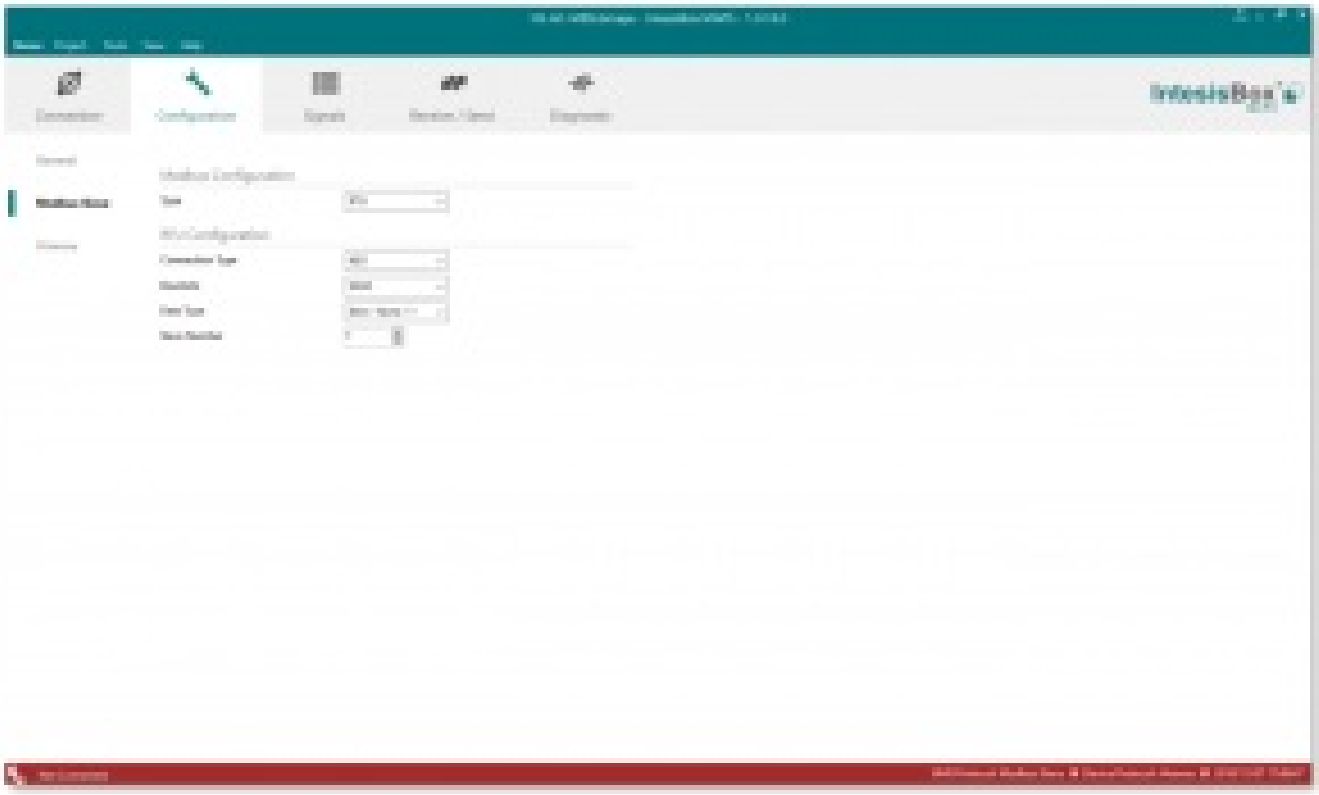

Figure 4.3 Intesis MAPS Modbus configuration tab

1. Modbus Configuration

   1.1. Modbus type selection. Select RTU, TCP or simultaneous RTU and TCP communication.

2. TCP Configuration.

   2.1. Modbus TCP Port: Modbus TCP communication port setting. Default port 502.

   2.2. Keep Alive. Set the time of inactivity to send a keep Alive message. Default 10 minutes.

3. RTU Configuration.

   3.1. RTU bus connection type. Select the RTU connection type serial bus RS485 or 232.

   3.2 Baudrate. Set the RTU bus communication speed. Default: 9600 bps.

   • Available values: 1200, 2400, 4800, 9600,19200, 38400, 57600, 115200 bps.

   3.3 Data Type. Set the Data-bit/parity/stop-bit. Default: 8bit/None/1.

   • Available selection: 8bit/None/1, 8bit/Even/1, 8bit/Odd/1, 8bit/None/2.

   3.4 Slave Number. Set the Modbus Slave address. Default slave address: 1.

   • Valid address: 1..255.

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1.12.5 Hisense configuration
Set parameters for connection with Hisense's installation.

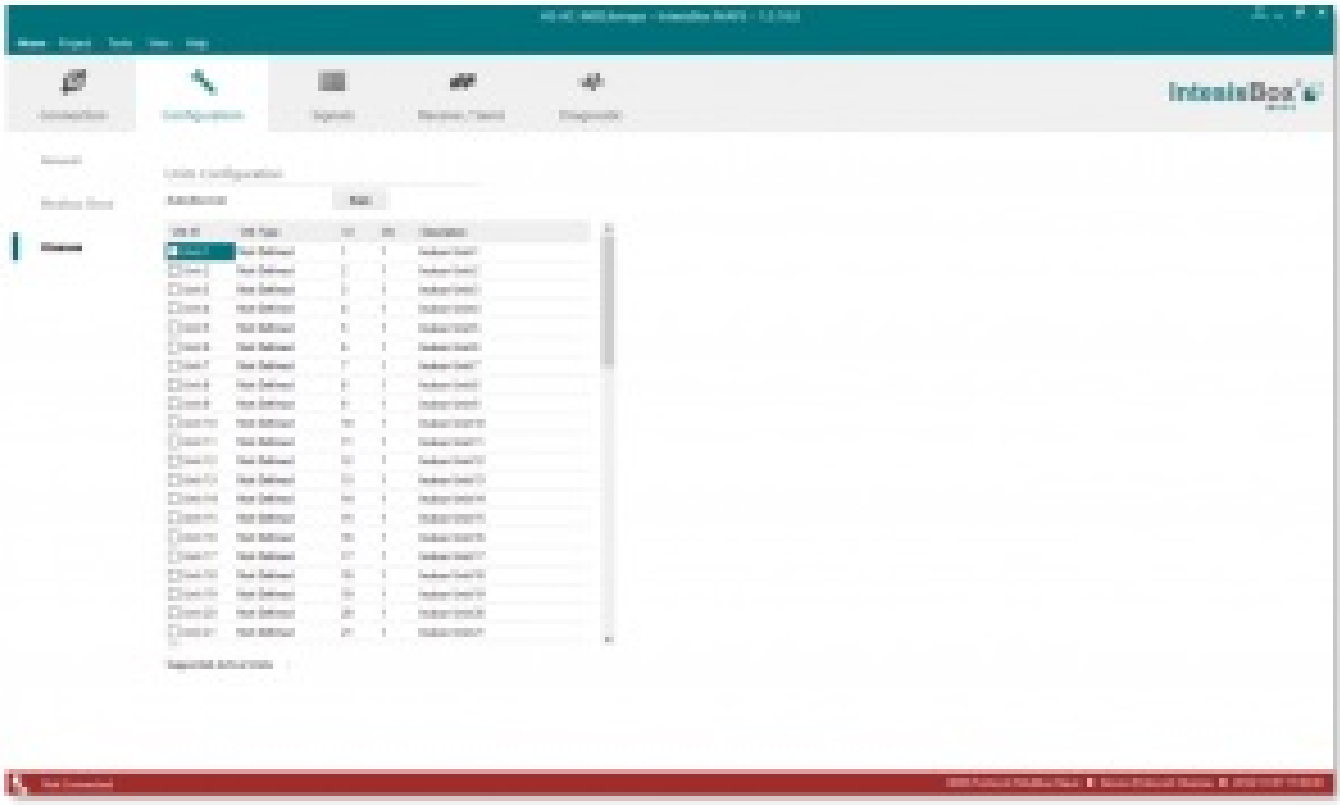

Figure 4.4 Intesis MAPS Hisense configuration tab

In Units Configuration section you need to enter, for each unit:

- Active. If it's active (checkbox at Unit xx), ranging from 1 to 64 indoor units that will be integrated (maximum number of units will depend on Intesis model)
- IU address. Address 1..64 of Unit in Hisense H-Link bus.

- OU address. Address 1..64 of Outdoor Unit in Hisense H-Link bus.
- Description. Descriptive name to easy identification of the unit (for example, ‘living room floor 1 unit’, etc). Additional to manual entry of each unit, autodiscover of present units in an H-Link installation is possible. To do so, click button Scan. Following window will appear:

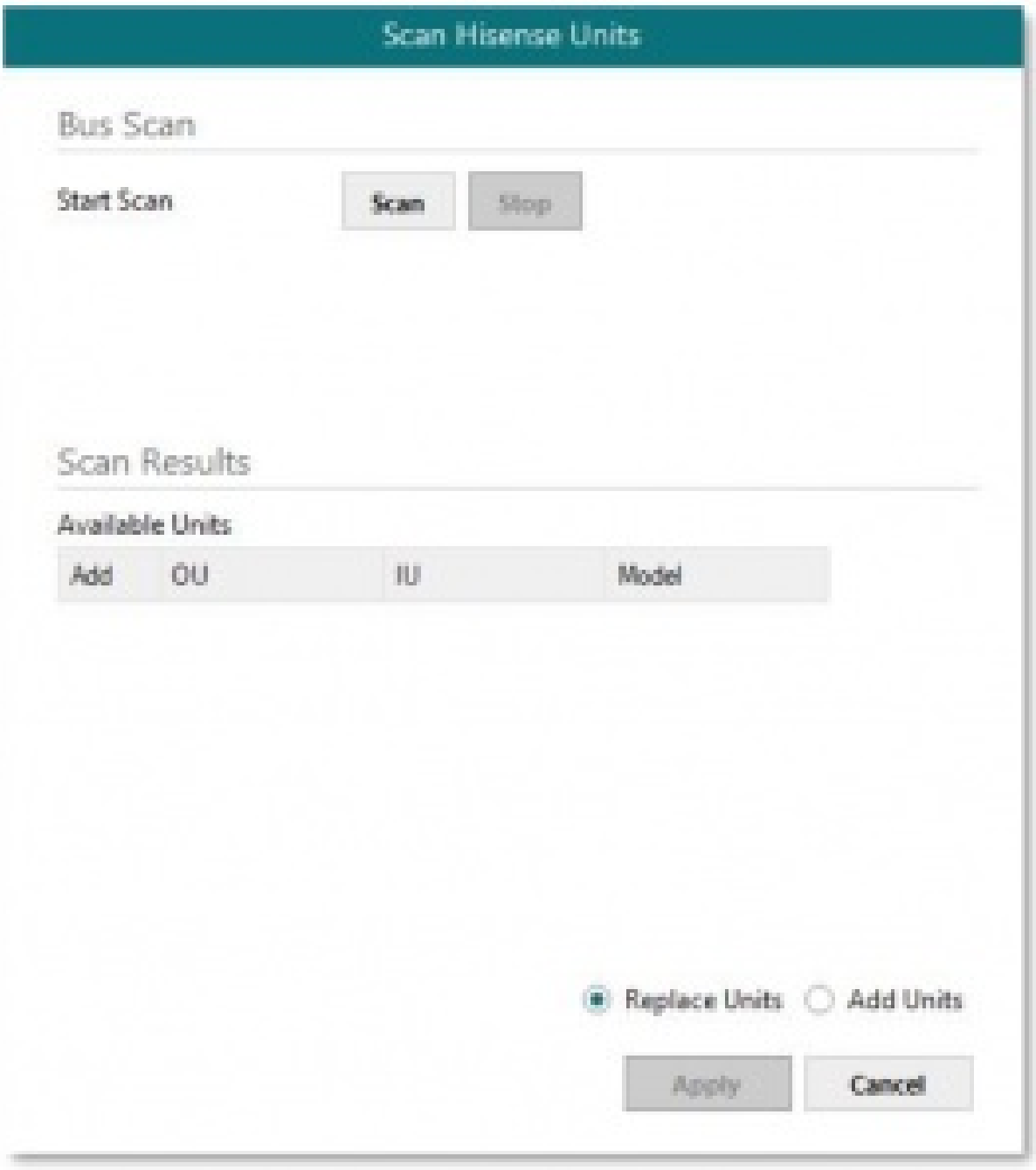

Figure 4.5 Intesis MAPS Scan Hisense Units window

By pressing Scan button, connected Hisense H-Link bus will be scanned for available units. Error window will appear if there is a problem in the connection with H-Link bus (units not powered, bus not connected, …).
A progress bar will appear during the scan, which will take up to a few minutes. After scan is complected, detected units will be shown in available units as follows:

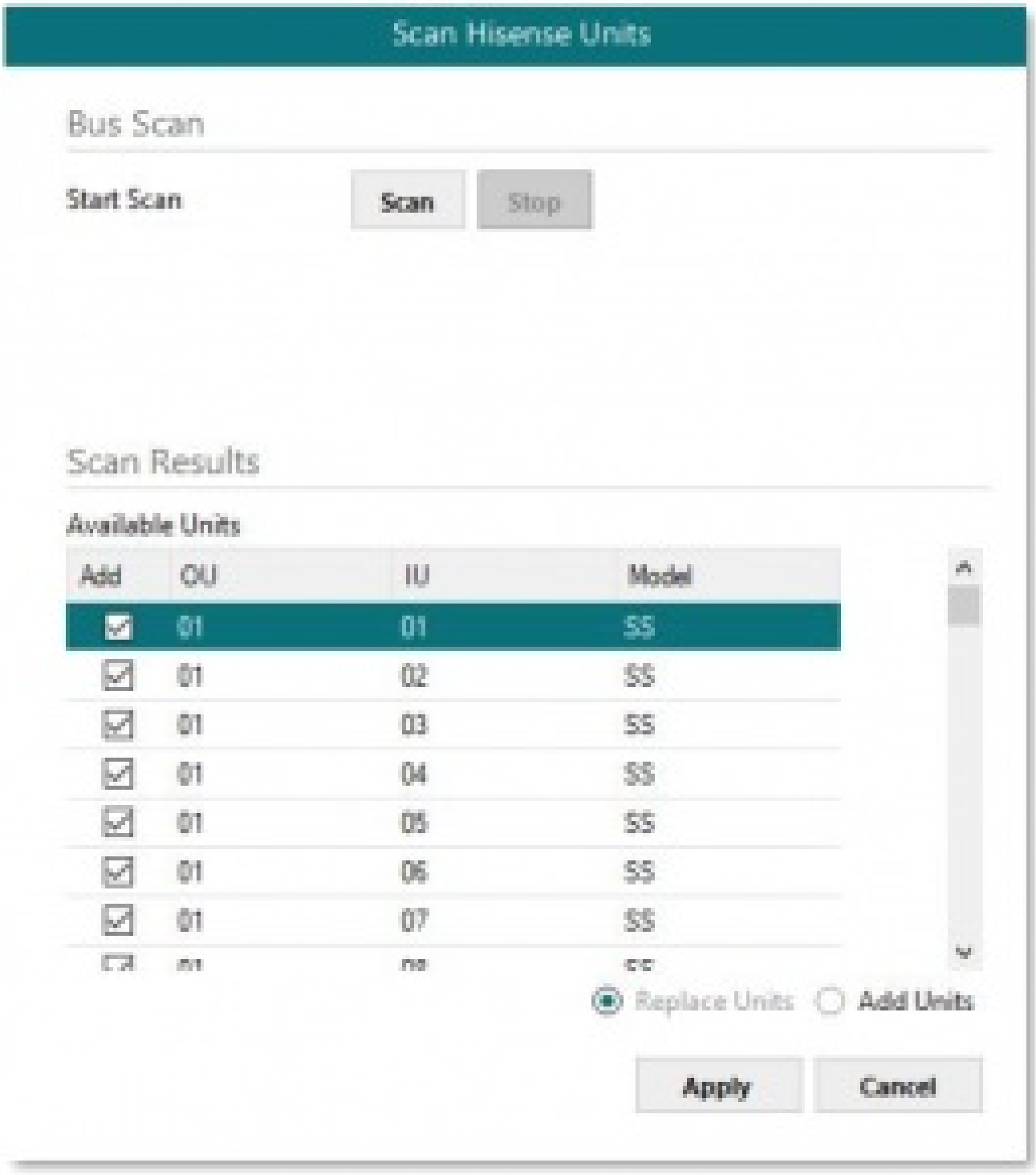

Figure 4.6 Intesis MAPS Scan Hisense Units window with scan results

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Select with its checkbox units to add (or replace) in installation, according to selection Replace Units / Add Units. After units to be integrated are selected, click button Apply, and changes will appear in previous Units Configuration window.

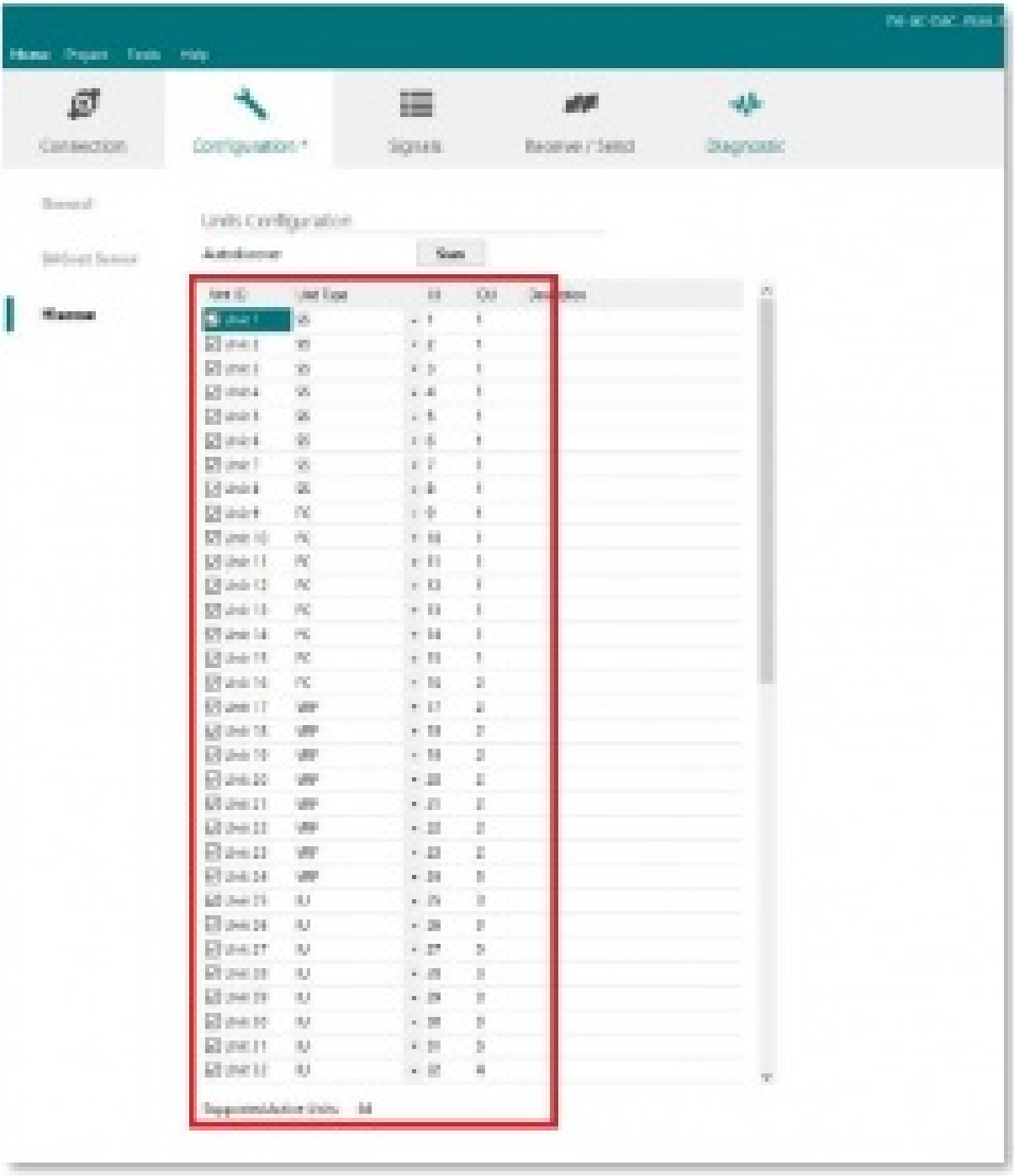

Figure 4.7 Intesis MAPS Hisense configuration tab after importing scan results

1.12.6 Signals

All available Modbus registers, its corresponding description and other main parmaters are listed in the signals tab.

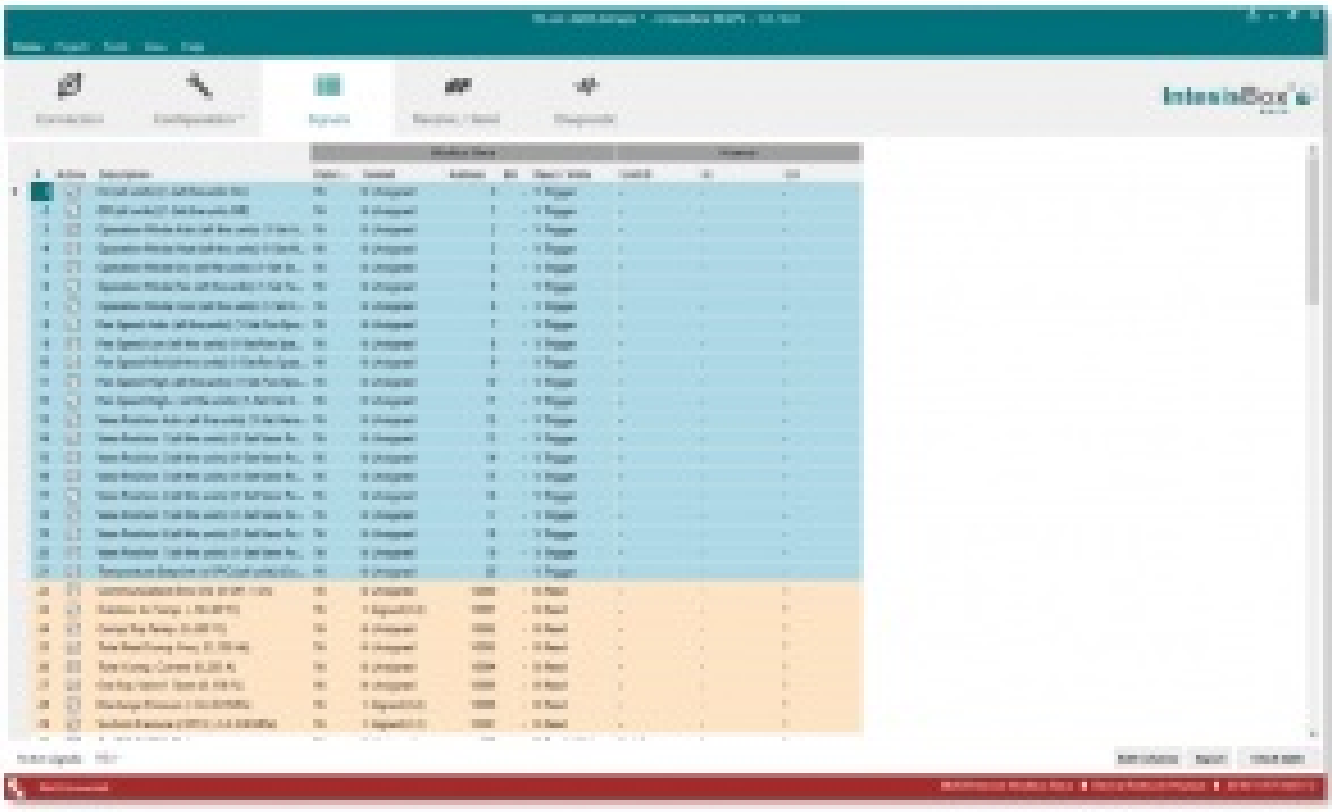

Figure 4.8 Intesis MAPS Signals tab

1.12.7 Sending the configuration to Intesis

When the configuration is finished, follow the next steps.

1. Save the project (Menu option Project->Save) on your hard disk (more information in Intesis MAPS User Manual).
2. Go to tab 'Receive / Send' of MAPS, and in Send section, press Send button. Intesis will reboot automatically once the new configuration is loaded.

Figure 4.9 Intesis MAPS Receive/Send tab

After any configuration change, do not forget to send the configuration file to the Intesis using the Send button in the Receive / Send section.

1.12.8 Diagnostic

To help integrators in the commissioning tasks and troubleshooting, the Configuration Tool offers some specific tools and viewers.

In order to start using the diagnostic tools, connection with the Gateway is required.

The Diagnostic section is composed by two main parts: Tools and Viewers.

- Tools

  Use the tools section to check the current hardware status of the box, log communications into compressed files to be sent to the support, change the Diagnostic panels' view or send commands to the gateway.
- Viewers

  In order to check the current status, viewer for the Internal and External protocols are available. It is also available a generic Console viewer for general information about communications and the gateway status and finally a Signals Viewer to simulate the BMS behavior or to check the current values in the system.

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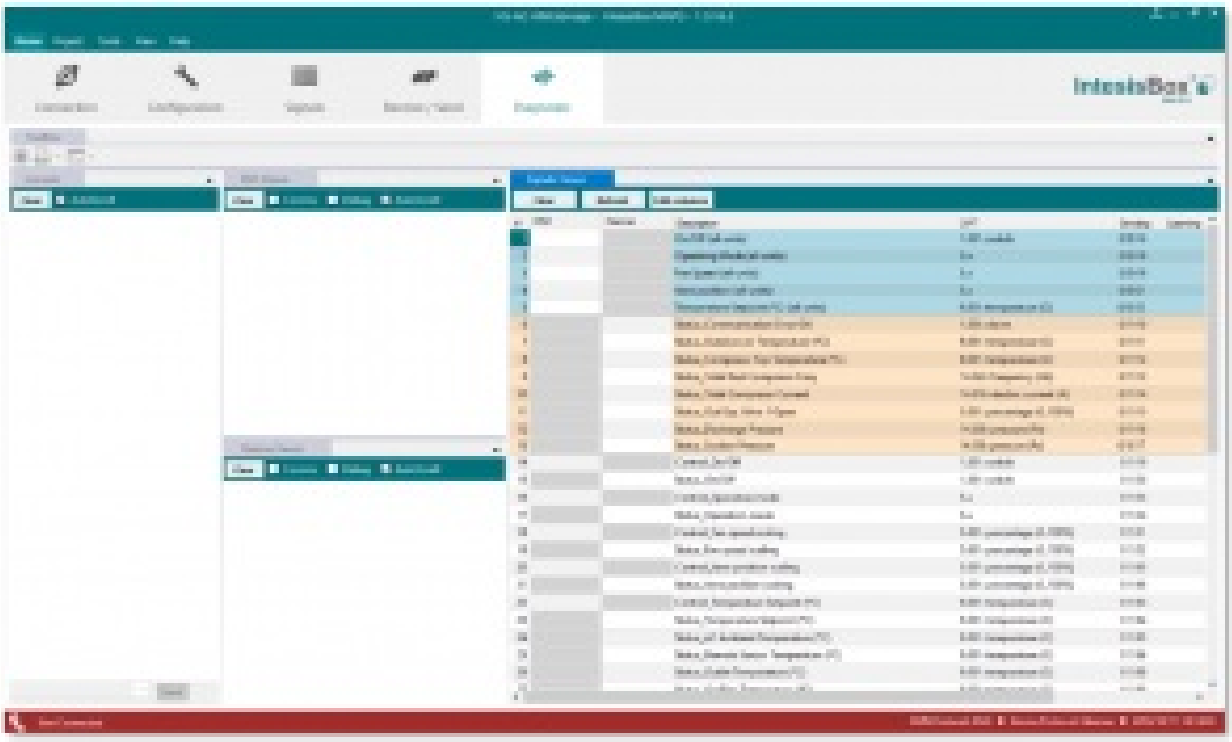

More information about the Diagnostic section can be found in the Configuraion Tool manual.

1.12.9 Set-up procedure

1. Install Intesis MAPS on your laptop, use the setup program supplied for this and follow the instructions given by the Installation wizard.
2. Install Intesis in the desired installation site. Installation can be on DIN rail or on a stable not vibrating surface (DIN rail mounted inside a metallic industrial cabinet connected to ground is recommended).
3. If using Modbus RTU, connect the communication cable coming from the EIA485 port of the Modbus RTU installation to the port marked as Port B of Intesis (More details in section 3).

   If using, Modbus TCP, connect the communication cable coming from the Ethernet port of the Modbus TCP installation to the port marked as Ethernet Port of Intesis (More details in section 3).

4. Connect the communication cable coming from the Hisense VRF installation to the port marked as Port A of Intesis (More details in section 3).
5. Power up Intesis. The supply voltage can be 9 to 36 Vdc or just 24 Vac. Take care of the polarity of the supply voltage applied.

WARNING! In order to avoid earth loops that can damage Intesis and/or any other equipment connected to it, we strongly recommend:

- The use of DC power supplies, floating or with the negative terminal connected to earth. Never use a DC power supply with the positive terminal connected to earth.
- The use of AC power supplies only if they are floating and not powering any other device.

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6. If you want to connect using IP, connect the Ethernet cable from the laptop PC to the port marked as Ethernet of Intesis (More details in section 3).
If you want to connect using USB, connect the USB cable from the laptop PC to the port marked as Console of Intesis (More details in section 3).
7. Open Intesis MAPS, create a new project selecting a copy of the one named INMBSHIS—O000.
8. Modify the configuration as desired, save it and download the configuration file to Intesis as explained in the Intesis MAPS user manual.
9. Visit the Diagnostic section, enable COMMS () and check that there is communication activity, some TX frames and some other RX frames. This means that the communication with the Centralized Controller and Modbus Master devices is OK. In case there is no communication activity between Intesis and the Centralized Controller and/or Modbus devices, check that those are operative: check the baud rate, the communication cable used to connect all devices and any other communication parameter.

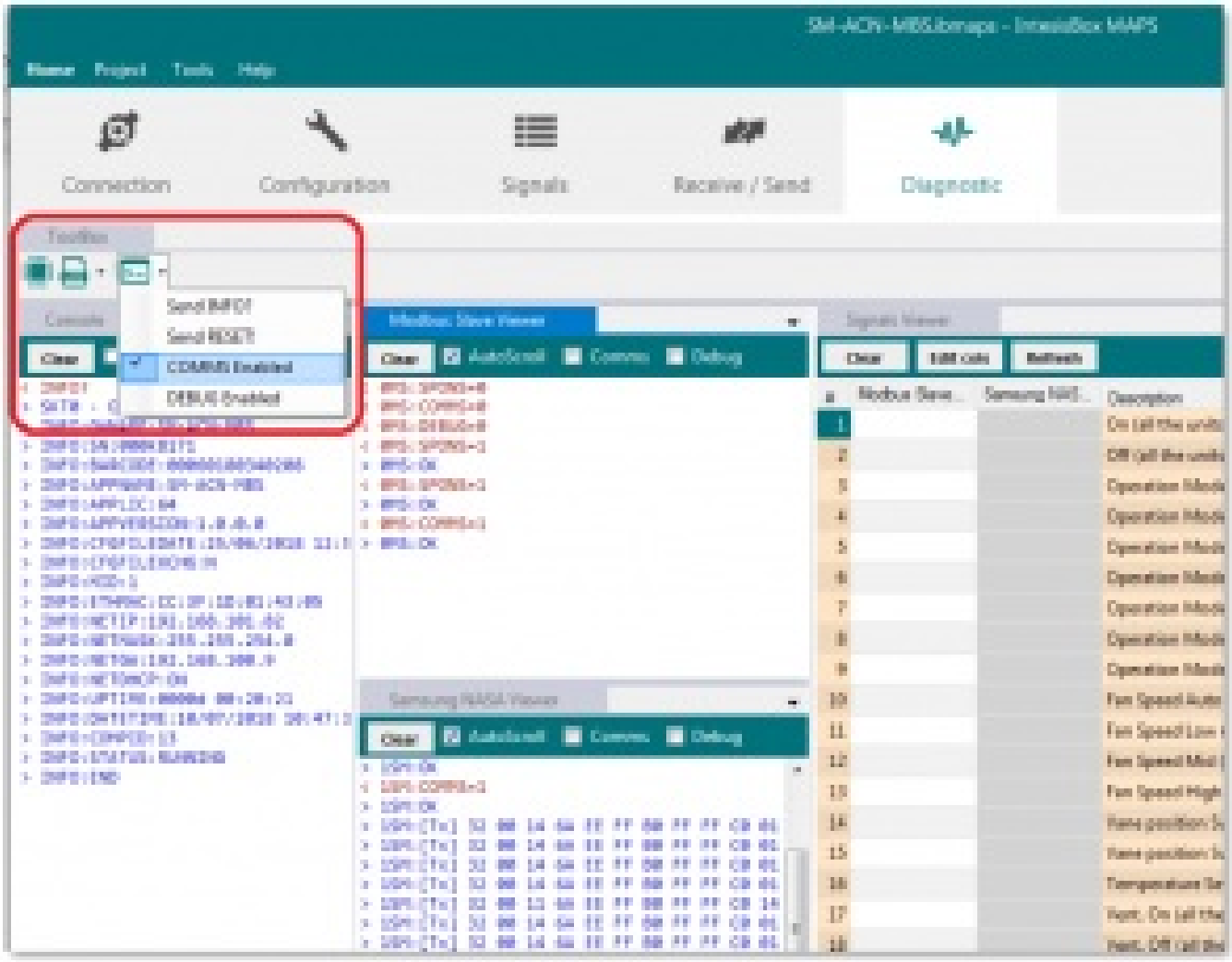


Figure 4.11 Enable COMMS

5. Electrical & Mechanical Features

Enclosure

Plastic, type PC (UL 94 V-0)
Net dimensions (dxwxh): 90x88x56 mm
Recommended space for installation (dxwxh): 130x100x100mm
Color: Light Grey. RAL 7035

Mounting

Wall.
DIN rail EN60715 TH35.

Terminal Wiring (for power supply and low-voltage signals)

Per terminal: solid wires or stranded wires (twisted or with ferrule)

1. core: 0.5mm2… 2.5mm2
2. cores: 0.5mm2… 1.5mm2
3. cores: not permitted

   If cables are more than 3.05 meters long, Class 2 cable is required.

Power

1 x Plug-in screw terminal block (3 poles)
9 to 36VDC +/-10%, Max.: 140mA.
24VAC +/-10% 50-60Hz, Max.: 127mA
Recommended: 24VDC

Ethernet

1 x Ethernet 10/100 Mbps RJ45
2 x Ethernet LED: port link and activity

Port A

1 x H-Link Plug-in screw terminal block orange (2 poles)
1500VDC isolation from other ports
1 x Plug-in screw terminal block green (2 poles)
Reserved for future use

Switch A

x DIP-Switch for PORTA configuration:
Reserved for future use (leave OFF, default)

PORT B

1 x Serial EIA232 (SUB-D9 male connector)
Pinout from a DTE device
1500VDC isolation from other ports
(except PORT B: EIA485)
1 x Serial EIA485 Plug-in screw terminal block (3 poles)
A, B, SGND (Reference ground or shield)
1500VDC isolation from other ports
(except PORT B: EIA232)

Switch B

1 x DIP-Switch for serial EIA485 configuration:
Position 1:
ON: 120 Ω termination active
Off: 120 Ω termination inactive (default)
Position 2-3:
ON: Polarization active
Off: Polarization inactive (default)

Battery

Size: Coin 20mm x 3.2mm
Capacity: 3V / 225mAh
Type: Manganese Dioxide Lithium

Console Port

Mini Type-B USB 2.0 compliant
1500VDC isolation

USB port

Type-A USB 2.0 compliant
Only for USB flash storage device
(USB pen drive)
Power consumption limited to 150mA
(HDD connection not allowed)

Push Button

Type-A USB 2.0 compliant
Only for USB flash storage device
(USB pen drive)
Power consumption limited to 150mA
(HDD connection not allowed)

Push Button

Button A: Not used
Button B: Not used

Operation Temperature

0°C to +60°C

Operational Humidity

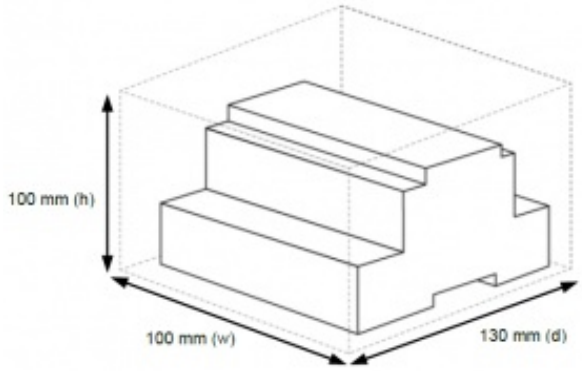
to 95%, no condensation

Protection

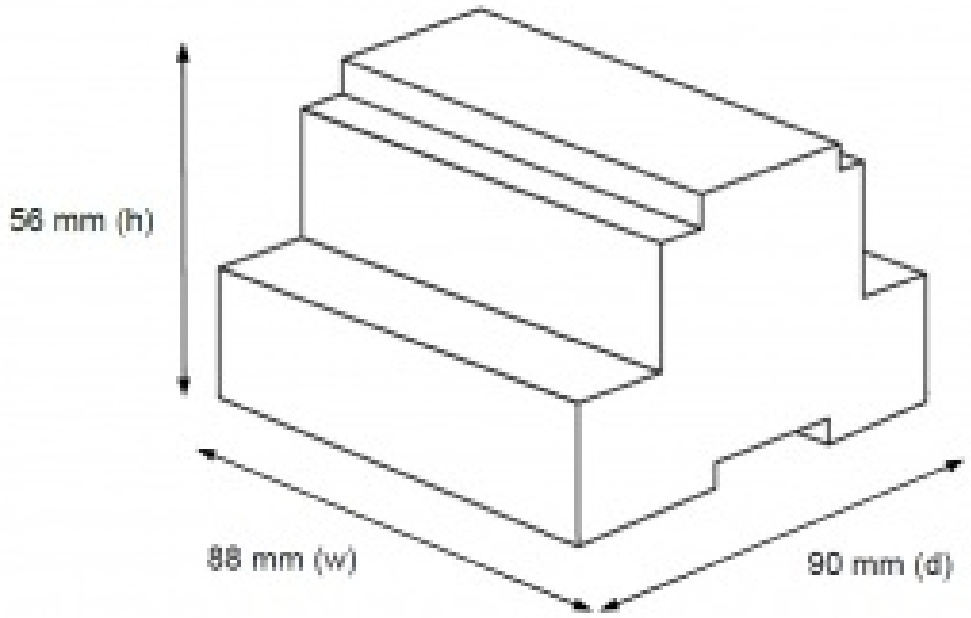
IP20 (IEC60529)

LED Indicators

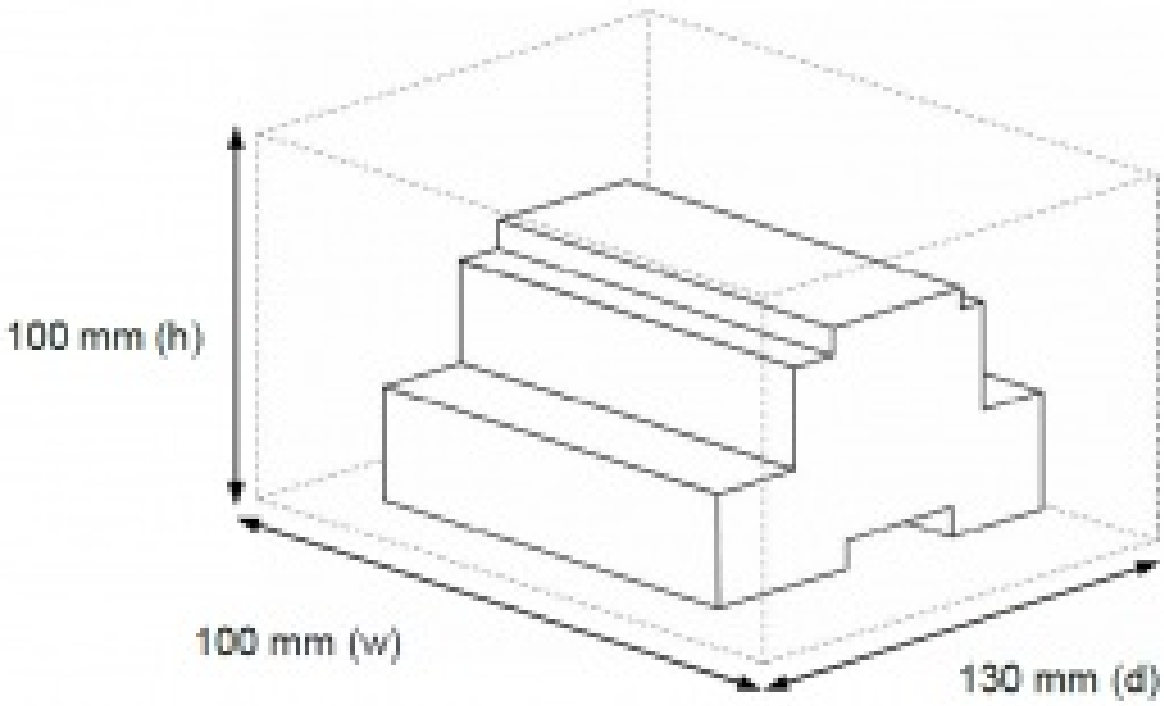
10 x Onboard LED indicators
2 x Run (Power)/Error
2 x Ethernet Link/Speed
2 x Port A TX/RX
2 x Port B TX/RX
1 x Button A indicator
1 x Button B indicator



6. Dimensions



Recommended available space for its installation into a cabinet (wall or DIN rail mounting), with space enough for external connections



7. AC Unit Types compatibility

A list of Hisense unit model references compatible with INMBSHIS—O000 and their available features can be found in:

https://www.intesis.com/docs/compatibilities/inxxxhis001r000_compatibility

8. Error codes for Indoor and Outdoor Units

This list contains all possible values shown in Modbus register for “Error Code” for each indoor unit and outdoor unit.

It must be taken into account that Outdoor Units are only able to reflect a single error for each indoor / outdoor unit in the system. Thus, a unit having two or more active errors from that list will only report a single error code – the one of the first error that has been detected.

42	Protection Device	Activation of Low Compression Ratio Protection Device	Defective Compression (Failure of Compressor or Inverter, Loose Power Supply Connection)
44		Activation of Low Pressure Increase Protection Device	Overload at Cooling, High Temperature at Heating, Expansion Valve Locking (Loose Connector)
45		Activation of High Pressure Increase Protection Device	Overload Operation (Clogging, Short Pass), Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing
47		Activation of Low Pressure Decrease Protection Device (Vacuum Operation Protection)	Insufficient Refrigerant, Refrigerant Piping Clogging, Expansion Valve Locking at Open Position (Loose Connector)
48		Activation of Inverter Overcurrent Protection Device	Overload Operation, Compressor Failure
51	Sensor	Abnormal Inverter Current Sensor	Current Sensor Failure
53	Inverter	Inverter Error Signal Detection	Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, Short Circuit)
54		Abnormality of Inverter Fin Temperature	Abnormal Inverter Fin Thermistor, Heat Exchanger Clogging, Fan Motor Failure
55			
		Inverter Failure	Inverter PCB Failure
57	Fan Controller	Activation of Fan Controller Protection	Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, Short Circuit), Instantaneous Overcurrent
58		Abnormality of Fan Controller Fin Temperature	Fin Thermistor Failure, Heat Exchanger Clogging, Fan Motor Failure
59		Activation of Overcurrent Protection	Fan Motor Failure
5C		Abnormality of Fan Controller Sensor	Failure of Current Sensor (Instantaneous Overcurrent, Increase of Fin Temperature, Low Voltage, Earth Fault, Step-Out)
69	Compressor	Compressor Protection Alarm (It is cannot be reset from remote Controller)	This alarm code appears when the following alarms occurs three times within 6 hours. *53, 57, 58, 59, 43 to 45, 47
61	Outdoor Unit No. Setting	Incorrect Setting of Unit and Refrigerant Cycle No.	Over 64 Number is Set for Address or Refrigerant Cycle.
	Indoor Unit No. Setting		More than 31 Non-Corresponding to Hi-NET Units are Connected to One System.

3d			
43	Protection Device	Activation of Low Compression Ratio Protection Device	Defective Compression (Failure of Compressor of Inverter, Loose Power Supply Connection)
44		Activation of Low Pressure Increase Protection Device	Overload at Cooling, High Temperature at Heating, Expansion Valve Locking (Loose Connector)
45		Activation of High Pressure Increase Protection Device	Overload Operation (Clogging, Short-Pass), Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing
47		Activation of Low Pressure Decrease Protection Device (Vacuum Operation Protection)	Insufficient Refrigerant, Refrigerant Piping, Clogging, Expansion Valve Locking at Open Position (Loose Connector)
48		Activation of Inverter Overcurrent Protection Device	Overload Operation, Compressor Failure
51	Sensor	Abnormal Inverter Current Sensor	Current Sensor Failure
53	Inverter	Inverter Error Signal Detection	Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, Short Circuit)
54 55		Abnormality of Inverter Fin Temperature	Abnormal Inverter Fin Thermistor, Heat Exchanger Clogging, Fan Motor Failure
		Inverter Failure	Inverter PCB Failure
57	Fan Controller	Activation of Fan Controller Protection	Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, Short Circuit), Instantaneous Overcurrent
5A		Abnormality of Fan Controller Fin Temperature	Fin Thermistor Failure, Heat Exchanger Clogging, Fan Motor Failure
5b		Activation of Overcurrent Protection	Fan Motor Failure
5C		Abnormality of Fan Controller Sensor	Failure of Current Sensor (Instantaneous Overcurrent, Increase of Fin Temperature, Low Voltage, Earth Fault, Step-Out)
EE	Compressor	Compressor Protection Alarm (It is cannot be reset from remote Controller)	This alarm code appears when the following alarms* occurs three times within 6 hours. *02, 07, 08, 39, 43 to 45, 47
b1	Outdoor Unit No. Setting	Incorrect Setting of Unit and Refrigerant Cycle No.	Over 64 Number is Set for Address or Refrigerant Cycle.
	Indoor Unit No. Setting		More than 17 Non-Corresponding to H-NET Units are Connected to One System.

b5		Incorrect Indoor Unit Connection Number Setting	
C1	Switch Box Unit	Incorrect Indoor Unit Connection	2 or more Switch Box Units are connected between outdoor unit and indoor unit.
C2		Incorrect Indoor Unit Connection No. Setting	9 or More Indoor Units Connected to Switch Box Unit
C3		Incorrect Indoor Unit Connection	The indoor units of different refrigerant cycle is connected to Switch Box unit.

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