



IntesisBox Modbus Server

Samsung NASA compatible Outdoor Units

User's Manual

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Intesis 

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Gateway for the integration of Samsung NASA compatible systems into Modbus (RTU and TCP) control and monitoring systems.

Five models are available for this gateway, with the following **Order Codes**:

SM-ACN-MBS-4

Model supporting up to 4 indoor units.

SM-ACN-MBS-8

Model supporting up to 8 indoor units.

SM-ACN-MBS-32

Model supporting up to 32 indoor units.

SM-ACN-MBS-64

Model supporting up to 64 indoor units.

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1. Description

1.1 Introduction

IntesisBox Modbus Server – Samsung NASA AC is a communication gateway for Samsung NASA compatible outdoor units.

This gateway allows integrating a Samsung AC system inside a Modbus supervision/control/automation system through PLC, SCADA, and in general through any device or system with Modbus mastering (TCP or RTU) interface.

A complete Samsung's AC system supports up to 16 outdoor units – all of them (and their respective indoor units) can be integrated with IntesisBox, allowing a maximum of 4 indoor units (SM-ACN-MBS-4), 8 indoor units (SM-ACN-MBS-8), 32 indoor units (SM-ACN-MBS-32) or 64 indoor units (SM-ACN-MBS-64).

This integration requires the Samsung AC system being equipped with a Samsung MIM-N10 only for ERV systems. Otherwise, direct connection to the R1/R2 connector of the outdoor unit will be enough.

MIM-N10 is supplied by Samsung. Contact your nearest Samsung AC Systems distributor for details.

1.2 Integration signals

Following is the list of parameters that can be monitored/controlled on the indoor and outdoor units using IntesisBox:

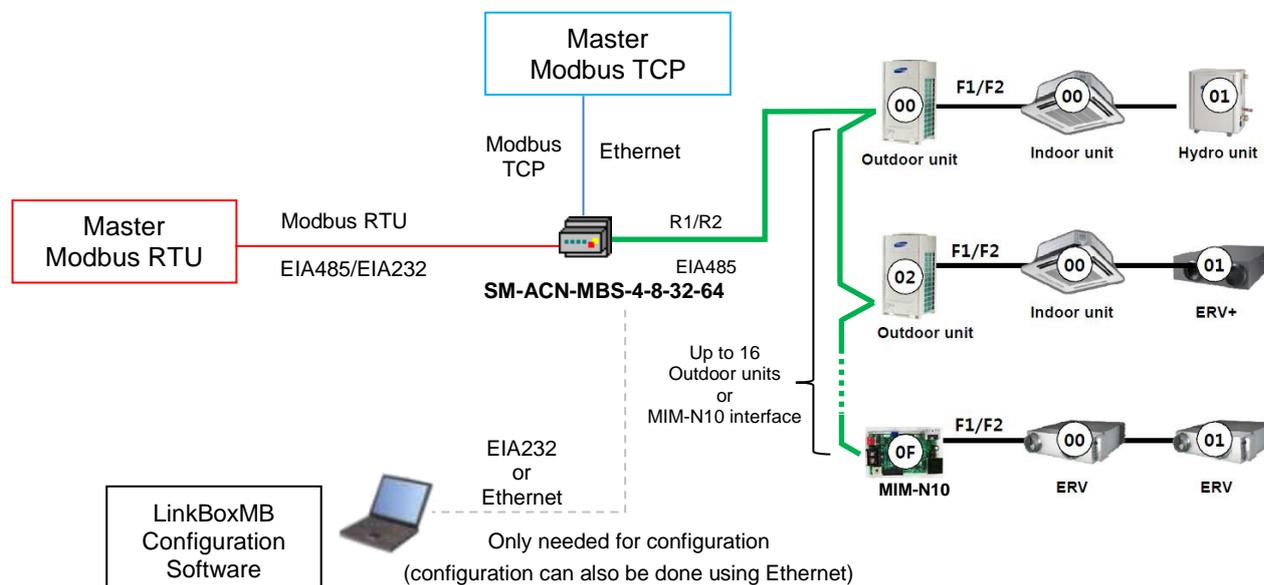
- For each **indoor unit** in the system*:
 - Communication Status (read-only)
 - Unit Type (read-only)
 - On/Off (R/W)
 - Operating Mode (R/W)
 - Fan Speed (R/W)
 - Up/Down Swing (R/W)
 - Filter Alarm (read-only)
 - Filter Reset (write-only)
 - Setpoint Temperature (R/W)
 - Ambient Temperature (read-only)
 - Error Code (read-only)
 - Remote Controller Restriction (R/W), (read-only) *
 - Buzzer Sound (write-only)
 - Water In Temperature (read-only)
 - Water Out Temperature (read-only)
 - Water Out Setpoint Temperature (R/W)
 - Ventilation On/Off (R/W)
 - Ventilation Operation Mode (R/W)
 - Ventilation FanSpeed (R/W)
 - Discharge Temperature Cool (R/W)
 - Discharge Temperature Heat (R/W)

- For each **outdoor unit** in the system:
 - Error Code (read-only)

* Note: Depending on the indoor unit type of signals may not be present. Check section 2.4.2 for more information.

1.3 Functionality

Every one of the mentioned signals is associated to a predefined fixed Modbus address, with this, all the system is seen as a single Modbus slave unit with a fixed Modbus address map.



It can only be one Modbus Mode active simultaneously in IntesisBox, Modbus RTU or Modbus TCP.

IntesisBox continuously polls all signals provided by each Outdoor Unit and maintains the updated values to be served in Modbus.

When a write is done from Modbus in a gateway's write-enabled Modbus address, the corresponding order is sent to the associated Samsung signal.

In the continuous polling of each Outdoor Unit, if no response of a certain Outdoor Unit is detected, the corresponding virtual signal inside the gateway will be activated indicating communication error with the Outdoor Unit.

Each Outdoor Unit in the Samsung AC system has a unique address (0 to 15), and each indoor unit connected to a single Outdoor Unit too (0 to 63). Both addresses (Outdoor Unit address and indoor unit main address) need to be configured in IntesisBox using LinkBoxMB tool, explained in this document.

1.4 Capacity of IntesisBox

Element	Max.	Notes
Number of Outdoor Units or MIM interfaces	16	Maximum number of MIM interfaces or Outdoor Units that a Samsung AC system supports.
Number of indoor units	64*	Maximum number AC indoor units that can be controlled
Number of variables per indoor unit	21	Modbus addresses
Number of variables per outdoor unit	1	Modbus addresses
Maximum number of variables	1360*	Modbus addresses

*There are four different models of *IntesisBox Modbus Server – SAMSUNG AC* each with different capacity. The table above shows the capacity for the top model (with maximum capacity).

Their order codes are:

- Model supporting up to 4 Samsung indoor units. *Ref.: SM-ACN-MBS-4*
- Model supporting up to 8 Samsung indoor units. *Ref.: SM-ACN-MBS-8*
- Model supporting up to 32 Samsung indoor units. *Ref.: SM-ACN-MBS-32*
- Model supporting up to 64 Samsung indoor units. *Ref.: SM-ACN-MBS-64*

2. Modbus interface of IntesisBox

2.1 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 function 06 (*Single Holding Registers*) and 16 (*Write Multiple Holding Registers*) must be used to write Modbus registers.

As per Modbus standard specification, register contents are always expressed in MSB..LSB.

Modbus error codes are fully supported, they will be sent whenever a non-valid Modbus action or address is required.

2.2 Modbus RTU

Baud rate can be selected from 1200, 2400, 4800, 9600, 19200, 38400 and 56700.

Data Bits: 8

Parity can be selected from none, even and odd.

Stop Bits can be selected from 1 and 2.

Modbus slave number can be configured. Physical connection (EIA232 or EIA485) can also be selected.

Only the lines RX, TX and GND of the EIA232 connector are used (TX and RX for EIA485).

2.3 Modbus TCP

The TCP port to use can be configured (by default 502 is used).

The IP address, subnet mask and default gateway address to use by IntesisBox can be also configured.

2.4 Address Map

2.4.1 Modbus addresses related to IntesisBox

Modbus address* (base addr is 1)	Modbus register type (R/W)					Signal description and values
	IU	HE/HT	AHU	ERV	ERV+	
OU_Add[0..15] + 1	R	R	R	R	R	R1/R2 bus communication error <ul style="list-style-type: none"> ▪ 0: No Communication Error on R1/R2 ▪ 1: Communication Error on R1/R2

2.4.2 Modbus addresses related to Indoor Units 1...64

Modbus address* (base addr is 1)	Modbus register type (R/W)					Signal description and values
	IU	HE/HT	AHU	ERV	ERV+	
(IU[1..64]*25) + 1	R	R	R	R	R	Communication status <ul style="list-style-type: none"> ▪ b0: Exist ▪ b1: Ready ▪ b2: Data Updated ▪ b3: Type OK
(IU[1..64]*25) + 2	R	R	R	R	R	Unit type: <ul style="list-style-type: none"> ▪ 0: Not defined ▪ 1: IU ▪ 2: HE ▪ 3: HT ▪ 4: AHU ▪ 5: ERV ▪ 6: ERV+
(IU[1..64]*25) + 3	R/W	R/W	R/W	-	R/W	Indoor Unit On/Off <ul style="list-style-type: none"> ▪ 0: Off ▪ 1: On
(IU[1..64]*25) + 4	R/W	R/W	R/W	-	R/W	Operation Mode <ul style="list-style-type: none"> ▪ 0: Cool ▪ 1: Heat ▪ 2: Dry ▪ 3: Fan ▪ 4: Auto
(IU[1..64]*25) + 5	R/W	-	-	-	-	Fan Speed <ul style="list-style-type: none"> ▪ 0: Auto ▪ 1: Low ▪ 2: Middle ▪ 3: High
(IU[1..64]*25) + 6	R/W	-	-	-	-	Swing <ul style="list-style-type: none"> ▪ 0: Off ▪ 1: On
(IU[1..64]*25) + 7	R	-	R	R	R	Filter Alarm <ul style="list-style-type: none"> ▪ 0: Filter Alarm Not Present ▪ 1: Filter Alarm Present
(IU[1..64]*25) + 8	W	-	-	W	W	Filter Reset <ul style="list-style-type: none"> ▪ 0: No Clear Filter Alarm ▪ 1: Clear Filter Alarm
(IU[1..64]*25) + 9	R/W	-	R/W	-	-	Setpoint temperature (Celsius value x 10) <ul style="list-style-type: none"> ▪ In Heat Mode: 18°C to 30°C ▪ Other Modes: 16°C to 30°C
(IU[1..64]*25) + 10	R	-	R	-	-	Ambient temperature <ul style="list-style-type: none"> ▪ Celsius value x10 (-41°C to 100°C)
(IU[1..64]*25) + 11	R	R	R	R	R	Indoor Unit Error Code <ul style="list-style-type: none"> ▪ 0: No Error ▪ 100-999: Error Code
(IU[1..64]*25) + 12	R/W	R	R/W	R/W	R/W	Remote Controller Restriction <ul style="list-style-type: none"> ▪ 0: Remote Controller Enabled ▪ 1: Remote Controller Disabled
(IU[1..64]*25) + 13	W	-	-	-	-	Buzzer Off <ul style="list-style-type: none"> ▪ 0: Turns the buzzer on ▪ 1: Turns the buzzer off
(IU[1..64]*25) + 14	-	R	-	-	-	Water Inlet Temperature <ul style="list-style-type: none"> ▪ Celsius value x 10
(IU[1..64]*25) + 15	-	R	-	-	-	Water Outlet Temperature <ul style="list-style-type: none"> ▪ Celsius value x 10
(IU[1..64]*25) + 16	-	R/W	-	-	-	Water Outlet Setpoint Temp (Celsius value x 10) <ul style="list-style-type: none"> ▪ HE Cool: 5°C to 25°C ▪ HE Heat: 15°C to 50°C ▪ HT: 25°C to 80°C
(IU[1..64]*25) + 17	-	-	-	R/W	R/W	Ventilation On/Off <ul style="list-style-type: none"> ▪ 0: Off ▪ 1: On
(IU[1..64]*25) + 18	-	-	-	R/W	R/W	Ventilation Operation Mode <ul style="list-style-type: none"> ▪ 0: Bypass ▪ 1: HeatEx ▪ 2: Sleep ▪ 3: Auto
(IU[1..64]*25) + 19	-	-	-	R/W	R/W	Ventilation Fan Speed <ul style="list-style-type: none"> ▪ 0: Low ▪ 1: High ▪ 2: Turbo
(IU[1..64]*25) + 20	-	-	R/W	-	-	Discharge Temp on Cool (Celsius value x 10) <ul style="list-style-type: none"> ▪ 8°C to 18°C
(IU[1..64]*25) + 21	-	-	R/W	-	-	Discharge Temp on Heat (Celsius value x 10) <ul style="list-style-type: none"> ▪ 30°C to 43°C

*IU is the indoor unit index value. In LinkBoxMB configuration it must be entered to which Outdoor Unit (0..15) is this indoor unit connected and what is its indoor unit Main Address (0..63). OU is the Outdoor Unit address index value. This information must be provided by Samsung's installer before configuration is done.

3. LinkBoxMB. Configuration & monitoring tool.

4.1 Introduction

LinkBoxMB is a Windows® compatible software developed specifically to monitor and configure IntesisBox Modbus Server series.

The installation procedure and main functions are explained in the *LinkBoxMB 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 IntesisBox device.

In this section, only the specific case of Samsung indoor unit's integration to Modbus networks will be covered.

4.2 Connections configuration

To configure the IntesisBox connection parameters and to see the points list, press on the **Config** button in the *menu bar* (see Figure 3.1). The *Samsung Configuration* window will open (see **Figure 3.2**). For integrations with large number of points, there is available an alternative CSV installation procedure explained in the LinkBoxMB User Manual.

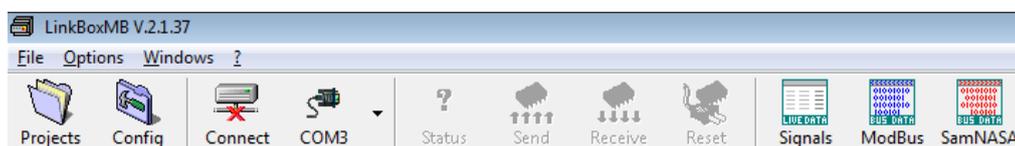


Figure 3.1 LinkBoxMB menu bar

4.2.1 Configuration tab

Select the **Connection** tab to configure the connection parameters. Two subsets of information are shown in this window: Modbus RTU, Modbus TCP and Samsung interfaces parameters (see **Figure 3.2**).

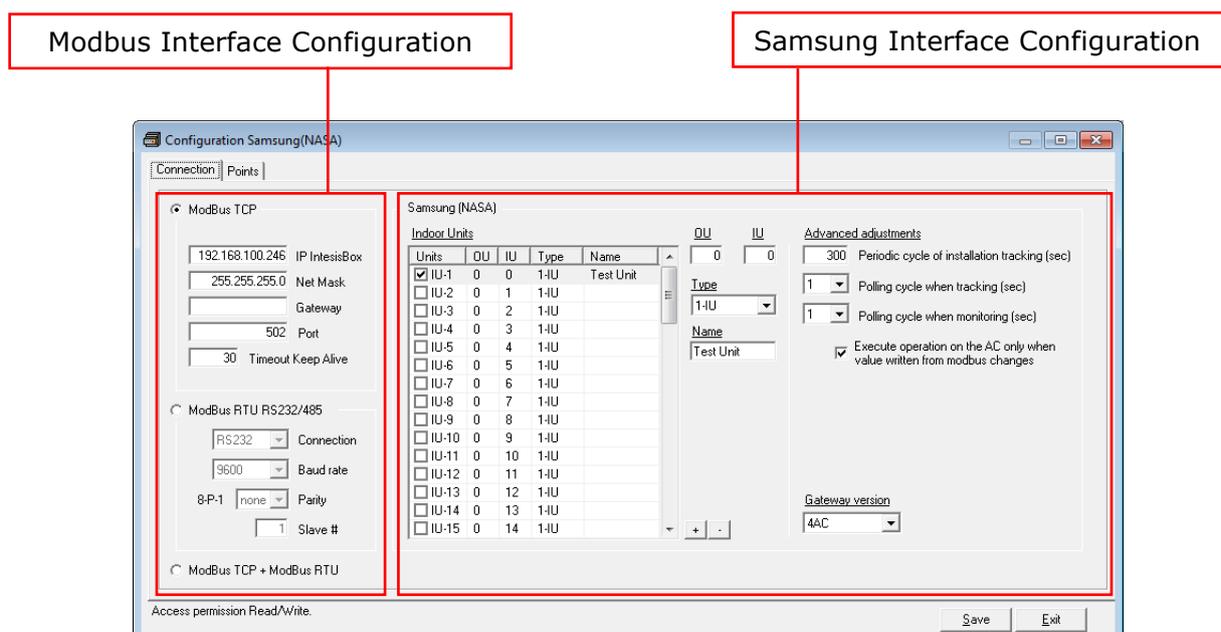


Figure 3.2 LinkBoxMB configuration tab

- Modbus interface configuration parameters:

Figure 3.3 Modbus Interface Configuration

1. Select the type of Modbus communication to use (TCP, RTU or both).

If Modbus TCP is selected, then:

2. IP IntesisBox: Enter the IP address for IntesisBox.

3. Net Mask: Enter the IP net mask for IntesisBox.

4. Gateway: Enter the default gateway address for IntesisBox; leave it blank if no router is needed.

5. Port: Enter the TCP port to use (default for Modbus TCP is 502).

6. Timeout Keep Alive: Enter the time (expressed in seconds) that IntesisBox will wait, upon no TCP activity, to send a Keep Alive packet. Enter 0 if you don't want IntesisBox to send any Keep Alive packet (default 30 seconds).

If Modbus RTU is selected, then:

7. Connection: Select the physical media (EIA232 or EIA485)¹.

8. Baud rate: Enter the baud rate of the serial communication.

9. Parity: Enter the byte parity of the serial communication.

10. Slave: Introduce the Slave number for the Modbus interface.

¹ In the LinkBoxMB this connection is labeled as EIA232 and EIA485 respectively.

- Samsung (NASA) interface configuration parameters:

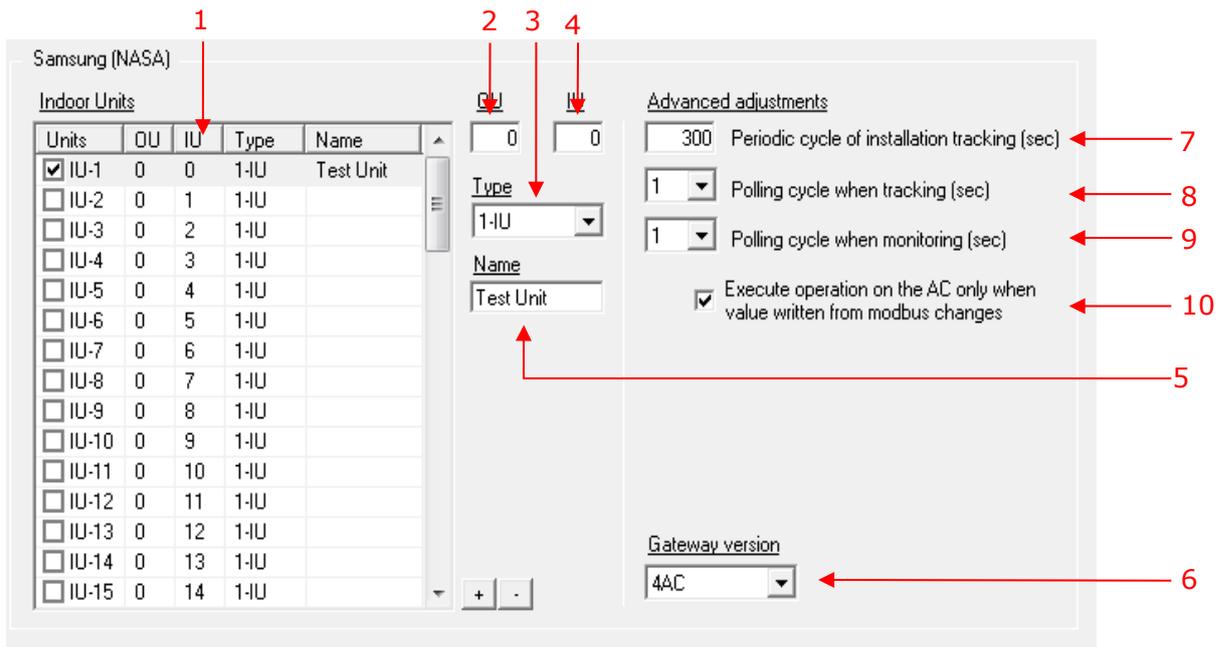


Figure 3.4 Samsung AC Configuration

- 1. Indoor Units list.** In this list, you can individually enable each of the 64 indoor units available on the system. The index in the column "Indoor unit" (i.e. the number x in "IU-xxx") is the reference that will be used later on (in tab "Signals") to refer to this AC indoor unit. Values for columns "OU", "IU", "Type" and "Name" in each indoor unit (IU) can be changed by selecting the IU in the list, by means of textboxes 2, 3, 4 and 5.
- 2. Outdoor Unit address.** Address of the Outdoor Unit to which the selected IU is connected to. Its value range is 0..15.
- 3. Indoor Unit Type.** You need to select the type of indoor unit so the right signals can be applied. By default is IU type.
- 4. Indoor Unit address.** Main Address of the selected IU in the Samsung system. Its value range is 0..63.
- 5. Name.** Optionally you can enter a name, which will appear on the list (2), for each IU.
- 6. Gateway version.** In the right lower part of the IntesisBox configuration window, select which version of the *IntesisBox Modbus Server – Samsung* gateway you are to set up. (64AC for *SM-ACN-MBS-64*, 32AC for *SM-ACN-MBS-32*, 8AC for *SM-ACN-MBS-8* or 4AC for *SM-ACN-MBS-4*).

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...)

- 7. Periodic cycle of installation.** This parameter indicates the cadence for the periodic tracking of the system looking for outdoor units. This is how often the tracking cycle is executed. If there is no outdoor unit connected, a communication error is shown.

Value ranges vary from 60 to 3000 seconds. Default and recommended value is 300s. If you want to disable this function, set the value to 0 seconds.

- 8. Polling cycle when tracking.** This parameter indicates the minimum time between two consecutive TX frames sent by the IntesisBox for the periodic scan of the system when tracking. Default and recommended value is 1s.
- 9. Polling cycle when monitoring.** This parameter indicates the minimum time between two consecutive TX frames sent by the IntesisBox for the periodic scan of the system when monitoring. Default and recommended value is 1s.
- 10. Execute operation on the AC only when value written from Modbus changes.** If this check box is selected, commands to the AC system will only be sent if they have a different value from the current one. This is used to avoid overflow of the communication between the AC system and the IntesisBox.

On the contrary, if this parameter is unchecked, then the commands will be sent to the AC system every time they are received from the Modbus side, independently from its value. Default and recommended value is checked.

4.2.2 Modbus map tab

In order to know the Modbus map that is going to be used by the interface, the *Modbus map* tab can be consulted.

Content in this tab is just informative: no information has to be set up.

Address/Formula	IU	HE/HT	AHU	ERV	ERV+	Signal	Values
OU_Addr[0..15] + 1	R	R	R	R	R	Communication Error OU	0-No error, 1-Error
(IU[1..64] * 25) + 1	R	R	R	R	R	Communication Status	b0-Exist, b1-Ready, b2-Data updated, b3-Type OK
(IU[1..64] * 25) + 2	R	R	R	R	R	Unit Type	0-Not Defined, 1-IU, 2-HE, 3-HT, 4-AHU, 5-ERV, 6-ERV+
(IU[1..64] * 25) + 3	RW	RW	RW	-	RW	On/Off	0-Off, 1-On
(IU[1..64] * 25) + 4	RW	RW	RW	-	RW	Op. Mode	0-Cool, 1-Heat, 2-Dry, 3-Fan, 4-Auto
(IU[1..64] * 25) + 5	RW	-	-	-	-	Fan Speed	0-Auto, 1-Low, 2-Mid, 3-High
(IU[1..64] * 25) + 6	RW	-	-	-	-	Up/Down Swing	0-Swing Off, 1-Swing On
(IU[1..64] * 25) + 7	R	-	R	R	R	Filter Alarm	0-Normal, 1-Alarm
(IU[1..64] * 25) + 8	W	-	-	W	W	Filter Alarm Reset	0-No reset, 1-Reset
(IU[1..64] * 25) + 9	RW	-	RW	-	-	Setpoint Temperature	°C x 10, Cool(18 to 30 °C) Heat(16 to 30 °C)
(IU[1..64] * 25) + 10	R	-	R	-	-	Ambient Temperature	°C x 10, -41 to 100 °C
(IU[1..64] * 25) + 11	R	R	R	R	R	Error Code	0-No error, X-Error (100 to 999)
(IU[1..64] * 25) + 12	RW	R	RW	RW	RW	RC Restriction	0-No restriction, 1-Restriction
(IU[1..64] * 25) + 13	W	-	-	-	-	Buzzer Sound	0-Buzzer On, 1-Buzzer Off
(IU[1..64] * 25) + 14	-	R	-	-	-	Water In Temp.	°C x 10
(IU[1..64] * 25) + 15	-	R	-	-	-	Water Out Temp.	°C x 10
(IU[1..64] * 25) + 16	-	RW	-	-	-	Water Out Setpoint Temp.	°C x 10, HE-Cool(5 to 25 °C) HE-Heat(15 to 50 °C) HT(25 to 80 °C)
(IU[1..64] * 25) + 17	-	-	-	RW	RW	Vent. On/Off	0-Off, 1-On
(IU[1..64] * 25) + 18	-	-	-	RW	RW	Vent. Op. Mode	0-Bypass, 1-HeatEx, 2-Sleep, 3-Auto
(IU[1..64] * 25) + 19	-	-	-	RW	RW	Vent. Fan Speed	0-Low, 1-High, 2-Turbo
(IU[1..64] * 25) + 20	-	-	RW	-	-	Discharge Temp. Cool	°C x 10, 8 to 18 °C
(IU[1..64] * 25) + 21	-	-	RW	-	-	Discharge Temp. Heat	°C x 10, 30 to 43 °C

Figure 3.5 Signals list

- 1. Address Formula:** Formula used by IntesisBox to define the Modbus address for the point. Use this address (obtained with this formula) to access the point from your Modbus master device.
- 2. R/W:** Indicates if the signal is read-only, write-only or if it can be read and written (from the Modbus system point of view). Depending on the different indoor unit type some of them will be available and some others will not.

3. **Signal:** Signal description.
4. **Values:** Possible values for the signal. See section 2.4 for further detail on address map and the possible values on each signal.

4.3 Sending the configuration to IntesisBox

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 LinkBoxMB 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 (SamNASA.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 IntesisBox starts to work as expected.
- 3.- Once in the configuration window again, click on **exit**. Configuration file is ready to be sent to the IntesisBox device.
- 4.- Press the **Send File** button to send the binary file to the IntesisBox device. The process of file transmission can be monitored in the IntesisBox Communication Console window. IntesisBox will reboot automatically once the new configuration is loaded.

After any configuration change, do not forget to send the configuration file to the IntesisBox 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 3.1). The Signals Viewer window will open (see Figure 3.6).

This window shows all signals active within the gateway with its main configuration parameters and its real time value¹ in the **Value** column.

¹ In case you connect to the IntesisBox 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.

#	ID	Signal	R/W	AddMB	Value	Values description
1	OU 00	Communication Error OU-0	R	1		0:No error, 1:Error
2	OU 01	Communication Error OU-1	R	2		0:No error, 1:Error
3	OU 02	Communication Error OU-2	R	3		0:No error, 1:Error
4	OU 03	Communication Error OU-3	R	4		0:No error, 1:Error
5	OU 04	Communication Error OU-4	R	5		0:No error, 1:Error
6	OU 05	Communication Error OU-5	R	6		0:No error, 1:Error
7	OU 06	Communication Error OU-6	R	7		0:No error, 1:Error
8	OU 07	Communication Error OU-7	R	8		0:No error, 1:Error
9	OU 08	Communication Error OU-8	R	9		0:No error, 1:Error
10	OU 09	Communication Error OU-9	R	10		0:No error, 1:Error
11	OU 10	Communication Error OU-10	R	11		0:No error, 1:Error
12	OU 11	Communication Error OU-11	R	12		0:No error, 1:Error
13	OU 12	Communication Error OU-12	R	13		0:No error, 1:Error
14	OU 13	Communication Error OU-13	R	14		0:No error, 1:Error
15	OU 14	Communication Error OU-14	R	15		0:No error, 1:Error
16	OU 15	Communication Error OU-15	R	16		0:No error, 1:Error
17	IU 01 / Add 00-00 / IU / Test Unit	Communication Status	R	25		0:No error, 1:Error, 2:Data updated, 3:Types OK
18	IU 01 / Add 00-00 / IU / Test Unit	Unit Type	R	27		0:Not Defined, 1:U, 2:HE, 3:HT, 4:AHU, 5:ERV, 6:ERV+
19	IU 01 / Add 00-00 / IU / Test Unit	Driv/Off	R/W	28		0:Off, 1:On
20	IU 01 / Add 00-00 / IU / Test Unit	Op. Mode	R/W	29		0:Cool, 1:Heat, 2:Dry, 3:Fan, 4:Auto
21	IU 01 / Add 00-00 / IU / Test Unit	Fan Speed	R/W	30		0:Auto, 1:Low, 2:Mid, 3:High
22	IU 01 / Add 00-00 / IU / Test Unit	Up/Down Swing	R/W	31		0:Swing Off, 1:Swing On
23	IU 01 / Add 00-00 / IU / Test Unit	Filter Alarm	R	32		0:Normal, 1:Alarm
24	IU 01 / Add 00-00 / IU / Test Unit	Filter Alarm Reset	W	33		0:No reset, 1:Reset
25	IU 01 / Add 00-00 / IU / Test Unit	Setpoint Temperature	R/W	34		°C x 10, Cool(18 to 30 °C) Heat(16 to 30 °C)
26	IU 01 / Add 00-00 / IU / Test Unit	Ambient Temperature	R	35		°C x 10, -41 to 100 °C
27	IU 01 / Add 00-00 / IU / Test Unit	Error Code	R	36		0:No error, X:Error (100 to 999)
28	IU 01 / Add 00-00 / IU / Test Unit	RC Restriction	R/W	37		0:No restriction, 1:Restriction
29	IU 01 / Add 00-00 / IU / Test Unit	Buzzer Sound	W	38		0:Buzzer On, 1:Buzzer Off

Figure 3.6 LinkBoxMB Signals Viewer

The signals viewer can be used even though only one system is connected to the IntesisBox, Modbus or Samsung 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 3.7). Changing its value in this way, will make:

- The content of the corresponding Modbus address will be changed to this value.
- If the signal is write-enabled, it will trigger a suitable command to Samsung AC system.

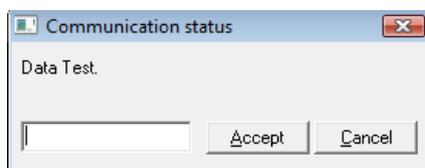


Figure 3.7 Signal value change window

4.5 Files

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

PROJECT.INI	INI file containing general information related to the project
SamNASA.INI	INI file containing information related with the values configured through the "Connection" tab in IntesisBox configuration
SamNASA.LBOX	Binary file created from the information in the files described above. This is the file downloaded to the IntesisBox.

Table 3.1 LinkBoxMB 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 LinkBoxMB due, for example, to a failure of the hard disk in the PC where LinkBoxMB was installed.

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

5. Setup process and troubleshooting

5.1 Pre-requisites

It is necessary to have the Modbus master device operative and well connected to the Modbus port of IntesisBox, remember to respect the maximum of 15 meters cable distance if using EIA232 communication.

It is necessary to have suitable EIA485 bus network connection near IntesisBox with all Samsung Outdoor Units connected to this network. If you own an ERV system, keep in mind that you will require the additional MIM-N10 interface from Samsung.

Connectors, connection cables, PC for LinkBoxMB, and other auxiliary material, if needed, are not supplied by Intesis Software for this standard integration. The items supplied by Intesis Software for this integration are:

- IntesisBox Modbus Server device Samsung AC external protocol firmware loaded.
- LinkBoxMB software to configure IntesisBox.
- Console cable needed to download the configuration to IntesisBox.
- Product documentation.

If requested, Intesis Software can also supply:

- Standard plug-in power supply 220Vac 50Hz to power IntesisBox (European plug type).

5.2 Setup procedure

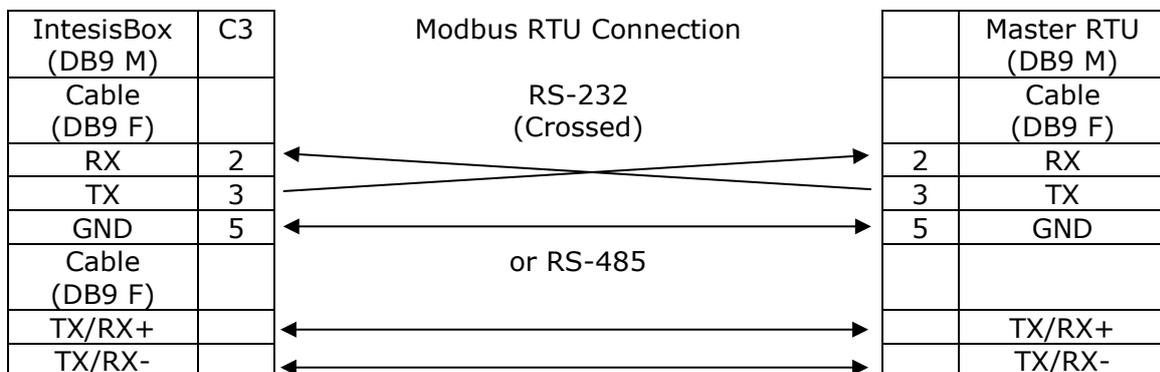
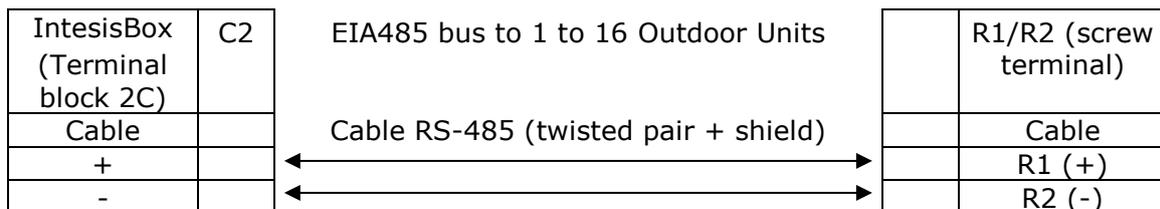
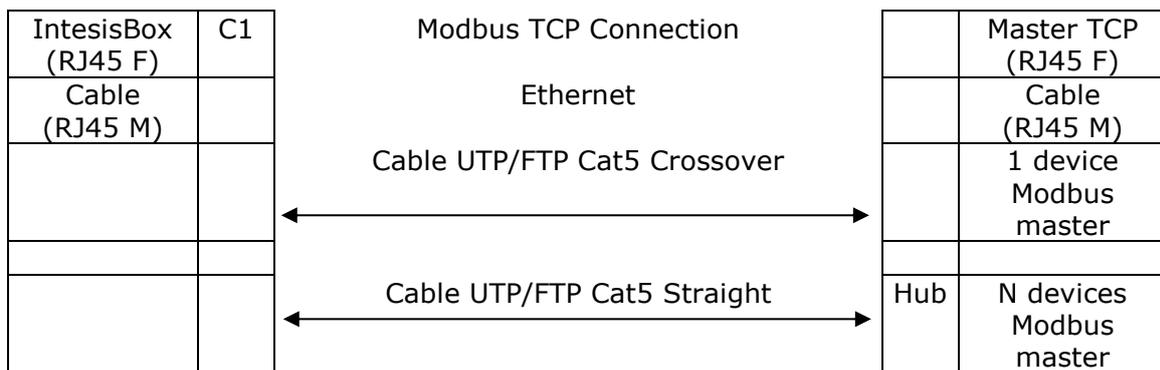
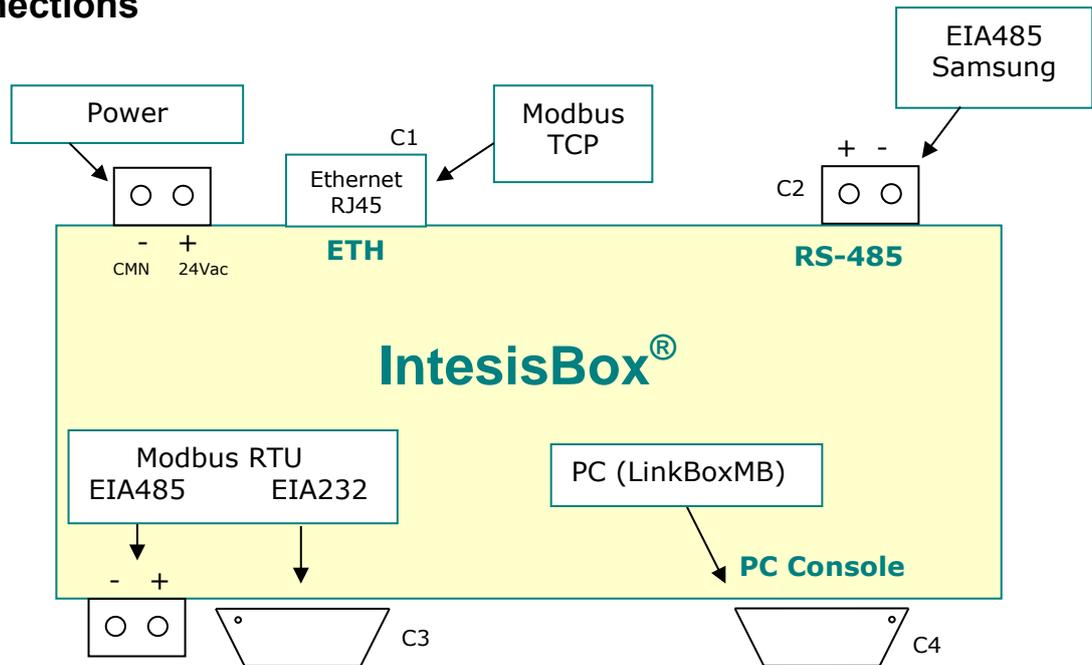
1. Install LinkBoxMB on your laptop. Use the setup program supplied for this purpose and follow instructions given by the Installation wizard.
2. Install IntesisBox in the desired installation site. The mounting can be on DIN rail or on a stable not vibrating surface (DIN rail mounted inside a metallic industrial cabinet connected to ground and with restricted access is recommended). For your convenience, check external enclosure measures (see section 9) before deciding where to place the IntesisBox device.
3. Connect the communication cable coming from the Modbus master device to the port marked as **Modbus** of IntesisBox. Use EIA232, EIA485 or Ethernet port depending on the type of Modbus communication to use (See details for this communication cable in section 6).
4. Connect the EIA485 cable attached to Samsung's AC Outdoor unit to the port marked as **Samsung** of IntesisBox (See details for this communication cable in section 6).
5. Power up IntesisBox. The supply voltage can be 9 to 30 Vdc or just 24 Vac. You can use also the standard plug-in power supply 220/125VAC-12VDC/300mA supplied with the device (if requested). Take care of the polarity of the supply voltage applied.

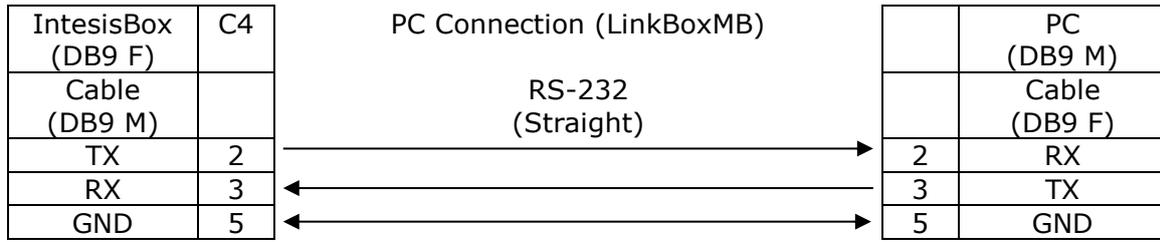
WARNING! In order to avoid earth loops that can damage IntesisBox and/or any other equipment connected to it, we strongly recommend:

- 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.
6. Connect the communication cable coming from the serial port of your laptop PC to the port marked as **PC Console** of IntesisBox or to the **Ethernet** port in case you want to communicate through IP connection (See details for this communication cable in section 6).
 7. Open LinkBoxMB and proceed as explained in section 0.
 8. You can check proper communication between the elements of the integration using LinkBoxMB bus viewers and signal viewers. Check the LinkBoxMB manual for more information.

6. Connections





7. Functional characteristics

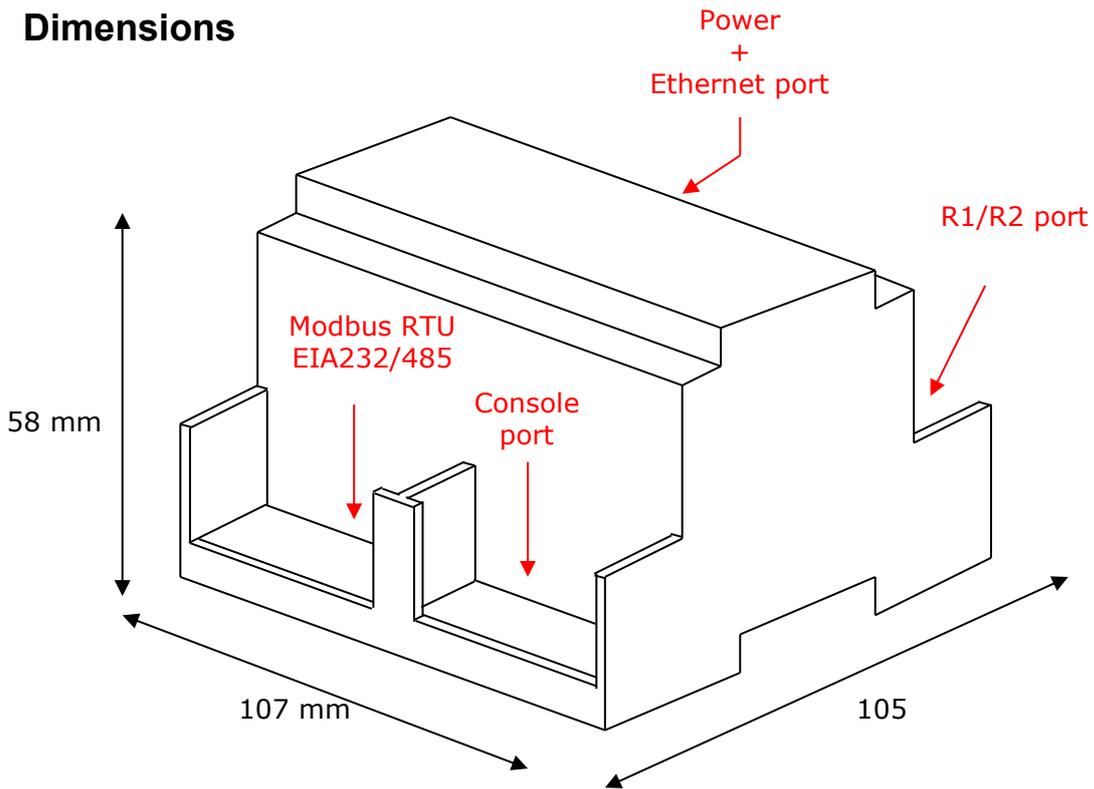
General	
Max. Number of Samsung interfaces	Up to 16 R1/R2 connections can be supported. There 4 different versions of IntesisBox, supporting a maximum 64, 32, 8 or 4 indoor units respectively.
Virtual signals	<ul style="list-style-type: none"> • One communication error virtual signal per every single Outdoor Unit in the system • One communication error virtual signal per every indoor unit. All these virtual signals are available from Modbus.
Modbus interface	
Device type	Slave.
Modbus modes supported	TCP, RTU EIA232 or EIA485.
Modbus TCP configuration parameters	<ul style="list-style-type: none"> • IP address. • Subnet mask. • Default gateway address. • TCP port.
Modbus RTU configuration parameters	<ul style="list-style-type: none"> • EIA232/EIA485. • Baud rate. • Parity. • Slave number.
Points	
Configuration	AC system related fields. <ul style="list-style-type: none"> • MIM interface or Outdoor Unit address: Address of the MIM interface or the Outdoor Unit each AC indoor unit Modbus memory block relates to. • Indoor unit main address: Main Address of the indoor each AC indoor unit Modbus memory block relates to.
Supported Modbus function codes	Read functions: <ul style="list-style-type: none"> • 3- Read holding registers. • 4- Read input registers. Write functions: <ul style="list-style-type: none"> • 6- Write single register. • 16-Write multiple holding register <p><i>If poll records are used to read/write multiple records, the range of addresses requested must contain valid addresses, otherwise the corresponding Modbus error code will be responded.</i></p>
Modbus data coding	All the point's values are coded in 2 byte registers (even if their possible values are 0 and 1). They are expressed in MSB..LSB format (big endian)

8. Mechanical & Electrical characteristics

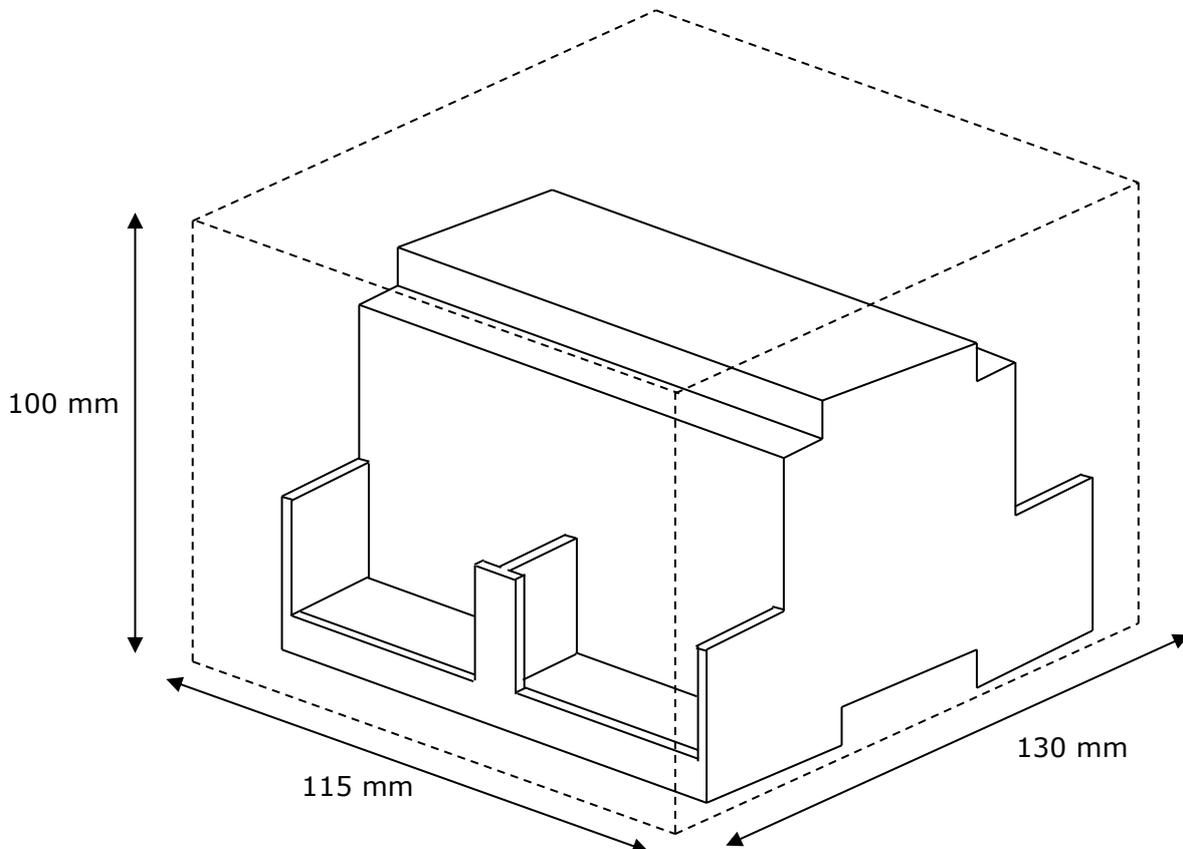
Enclosure	Plastic, type PC (UL 94 V-0). Dimensions: 107mm x 105mm x 58mm.
Color	Light Grey. RAL 7035.
Power	9 to 30Vdc +/-10%, Max.: 125mA. 24Vac +/-10% 50-60Hz, Max.: 127mA Must use a NEC Class 2 or Limited Power Source (LPS) and SELV rated power supply. Plug-in terminal block for power connection (2 poles).
Terminal wiring (for power supply and low-voltage signals)	Per terminal: solid wires or stranded wires (twisted or with ferrule) 1 core: 0.5mm ² ... 2.5mm ² 2 cores: 0.5mm ² ... 1.5mm ² 3 cores: not permitted
Mounting	Wall. DIN rail EN60715 TH35.
Modbus TCP port	1 x Ethernet 100Base-T (RJ45).
Modbus RTU ports	1 x Serial EIA232 (DB9 male DTE). SELV 1 x Serial EIA485 (Plug-in screw terminal block 2 poles). SELV
Samsung AC port	1 x EIA485. Plug-in screw terminal block (2 poles). SELV
LED indicators	1 x Power. 2 x Serial port Modbus RTU activity (Tx, Rx). 2 x Serial port Samsung AC activity (Tx, Rx). 2 x Ethernet port Modbus TCP link and activity (LNK, ACT).
Console port	EIA232. DB9 female connector (DCE). SELV
Configuration	Via console port. ¹
Firmware	Allows upgrades via console port.
Operational temperature	0°C to +70°C
Operational humidity	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

¹ Along with the device it is also supplied a standard DB9 male - DB9 female 1.8 m. cable for configuring and monitoring the device using a PC via serial COM port. The configuration software LinkBoxMB, compatible with MS Windows® operating systems, is also supplied with the device.

9. Dimensions



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



10. AC Unit Types compatibility

A list of Samsung unit model references compatible with SM-ACN-MBS-4/8/32/64 and their available features can be found in:

http://intesis.com/pdf/IntesisBox_SM-ACN-xxx-MIU_AC_Compatibility.pdf

11. Error codes for Indoor and Outdoor Units

This list contains all possible values shown in Modbus registers 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.

Error Code	Description
101	Indoor unit communication error. Indoor unit can not receive any data from outdoor unit.
102	Communication error between indoor unit and outdoor unit. Displayed in indoor unit.
108	Error due to repeated address setting (When 2 or more devices has same address within the
110	Communication error between Hydro unit HT(Main PBA) and Control kit PBA(Detection from the Control kit)
121	Error on indoor temperature sensor of indoor unit (Short or Open)
122	Error on EVA IN sensor of indoor unit (Short or Open)
123	Error on EVA OUT sensor of indoor unit (Short or Open)
128	EVA IN temperature sensor of indoor unit is detached from EVA IN pipe
129	EVA OUT temperature sensor of indoor unit is detached from EVA OUT pipe
130	Heat exchanger in/out sensors of indoor unit are detached
135	RPM feedback error of indoor unit's cleaning fan
151	Error due to opened EEV of indoor unit (2nd detection)
152	Error due to closed EEV of indoor unit (2nd detection)
153	Error on floating switch of indoor unit (2nd detection)
154	RPM feedback error of indoor unit
161	Mixed operation mode error of indoor unit; When outdoor unit is getting ready to operate in cooling (or heating) and some of the indoor unit is trying to operate in heating (or cooling) mode
162	EEPROM error of MICOM (Physical problem of parts/circuit)
163	Indoor unit's remote controller option input is Incorrect or missing. Outdoor unit EEPROM data error
180	Simultaneous opening of cooling/heating MCU SOL V/V (1st detection)
181	Simultaneous opening of cooling/heating MCU SOL V/V (2nd detection)
185	Cross wiring error between communication and power cable of indoor unit
186	Connection error or problem on SPi
190	No temperature changes in EVA IN during pipe inspection or changes in temperature indoor unit with wrong address
191	No temperature changes in EVA OUT during pipe inspection or changes in temperature is seen in indoor unit with wrong address
198	Error due to disconnected thermal fuse of indoor unit
201	Communication error between indoor and outdoor units (installation number setting error, repeated indoor unit address, indoor unit communication cable error)
202	Communication error between indoor and outdoor units (Communication error on all indoor unit, outdoor unit communication cable error)
203	Communication error between main and sub outdoor units
205	Communication error on all PBA within the outdoor unit C-Box, communication cable error
206	E206-C001: HUB PBA communication error / E206-C002: FAN PBA communication errorE206-

	C003:INV1 PBA communication error / E206-C004: INV2 PBA communication error
211	When single indoor unit uses 2 MCU ports that are not in series.
212	If the rotary switch (on the MCU) for address setting of the indoor unit has 3 or more of the same address
213	When total number of indoor units assigned to MCU is same as actual number of installed indoor units but there is indoor unit that is not installed even though it is assigned on MCU
214	When number of MCU is not set correctly on the outdoor unit or when two or more MCU was installed some of them have the same address
215	When two different MCU's have same address value on the rotary switch
216	When indoor unit is not installed to a MCU port but the switch on the port is set to On.
217	When indoor unit is connected to a MCU port but indoor unit is assigned to a MCU and the switch on the port is set to Off
218	When there's at least one or more actual number of indoor unit connection compared to number of indoor units assigned to MCU
219	Error on temperature sensor located on MCU intercooler inlet (Short or Open)
220	Error on temperature sensor located on MCU intercooler outlet (Short or Open)
221	Error on outdoor temperature sensor of outdoor unit (Short or open)
231	Error on COND OUT temperature sensor of main outdoor unit (Short or Open)
241	COND OUT sensor is detached
251	Error on discharge temperature sensor of compressor 1 (Short or Open)
257	Error on discharge temperature sensor of compressor 2 (Short or Open)
262	Discharge temperature sensor of compressor 1 is detached from the sensor holder on the pipe
263	Discharge temperature sensor of compressor 2 is detached from the sensor holder on the pipe
266	Top sensor of compressor 1 is detached
267	Top sensor of compressor 2 is detached
269	Suction temperature sensor is detached from the sensor holder on the pipe
276	Error on top sensor of compressor 1 (Short or Open)
277	Error on top sensor of compressor 2 (Short or Open)
291	Refrigerant leakage or error on high pressure sensor (Short or Open)
296	Refrigerant leakage or error on low pressure sensor (Short or Open)
308	Error on suction temperature sensor (Short or Open)
311	Error on temperature sensor of double layer pipe/liquid pipe(sub heat exchanger) (Short or Open)
321	Error on EVI (ESC) IN temperature sensor (Short or Open)
322	Error on EVI (ESC) OUT temperature sensor (Short or Open)
323	Error on suction sensor 2 (Short or Open)
346	Error due to operation failure of Fan2
347	Motor wire of Fan2 is not connected
348	Lock error on Fan2 of outdoor unit
353	Error due to overheated motor of outdoor unit's Fan2
355	Error due to overheated IPM of Fan2
361	Error due to operation failure of inverter compressor 2
364	Error due to over-current of inverter compressor 2
365	V-limit error of inverter compressor 2
366	Error due to over voltage /low voltage of inverter PBA2
367	Error due to unconnected wire of compressor 2
368	Output current sensor error of inverter PBA2
369	DC voltage sensor error of inverter PBA2

374	Heat sink temperature sensor error of inverter PBA2
378	Error due to overcurrent of Fan2
385	Error due to input current of inverter 2
386	Over-voltage/low-voltage error of Fan2
387	Hall IC connection error of Fan2
389	V-limit error on Fan2 of compressor
393	Output current sensor error of Fan2
396	DC voltage sensor error of Fan2
399	Heat sink temperature sensor error of Fan2
400	Error due to overheat caused by contact failure on IPM of Inverter PBA2
407	Compressor operation stop due to high pressure protection control
410	Compressor operation stop due to low pressure protection control or refrigerant leakage
416	Compressor operation stop due to discharge temperature protection control
425	Phase reversal or phase failure (3Ø outdoor unit wiring, R-S-T-N), connection error on 3 phase input
428	Compressor operation stop due abnormal compression ratio
438	EVI (ESC) EEV leakage or internal leakage of intercooler or incorrect connector insertion of EVI (ESC) EEV
439	Error due to refrigerant leakage
440	Heating mode restriction due to high air temperature
441	Cooling mode restriction due to low air temperature
442	Refrigerant charging restriction in heating mode when air temperature is over 15 °C
443	Operation prohibited due to the pressure drop
445	CCH is deatched
446	Error due to operation failure of Fan1
447	Motor wire of Fan1 is not connected
448	Lock error on Fan1
452	Error due to ZPC detection circuit problem or power failure
453	Error due to overheated motor of outdoor unit's Fan1
455	Error due to overheated IPM of Fan1
461	Error due to operation failure of inverter compressor 1
462	Compressor stop due to full current control or error due to low current on CT2
464	Error due to over-current of inverter compressor 1
465	V-limit error of inverter compressor 1
466	Error due to over voltage /low voltage of inveter PBA1
467	Error due to unconnected wire of compressor 1
468	Output current sensor error of inverter PBA1
469	DC voltage sensor error of inver PBA1
474	Heat sink temperature sensor error of inverter PBA1
478	Error due to overcurrent of Fan1
485	Error due to input current of inverter 1
486	Error due to over voltage/low voltage of Fan
487	Hall IC error of Fan1
489	V-limit error on Fan1 of compressor
493	Output current sensor error of Fan1
496	DC voltage sensor error of Fan1
499	Heat sink temperature sensor error of Fan1
500	Error due to overheat caused by contact failure on IPM of Inverter PBA1
503	Error due to alert the user to check if the service valve is closed

504	Error due to self diagnosis of compressor operation
505	Error due to self diagnosis of high pressure sensor
506	Error due to self diagnosis of low pressure sensor
560	Outdoor unit's option switch setting error (when inappropriate option switch is on)
563	Error due to module installation of indoor unit with old version (Micom version needs to be checked)
573	Error due to using single type outdoor unit in a module installation
601	Communication error between remote controller and the DVM Hydro unit / Hydro unit HT
602	Communication error between master and slave remote controller
604	Tracking error between remote controller and the DVM Hydro unit / Hydro unit HT
618	Error due to exceeding maximum numbers of Hydro unit installation (16 units)
627	Error due to exceeding maximum numbers of wired remote controller installation (2 units)
633	Error caused by installing mixed models
653	Remote controller's temperature sensor is disconnected or has problem
654	Data error on remote controller (Memory read/write error)
702	Error due to closed EEV of indoor unit (1st detection)
703	Error due to opened EEV of indoor unit (1st detection)
901	Error on the sensor of water inlet pipe (Short or Open)
902	Error on the sensor of water outlet pipe (Short or Open)
904	Error on water tank (Short or open)
907	Error due to pipe rupture protection
908	Error due to freeze prevention(Re-operation is possible)
909	Error due to freeze prevention(Re-operation is impossible)
910	Water temperature sensor on water outlet pipe is detached
911	Flow switch off error, When the switch is turned off within 10 seconds after a pump starts its operation(Re-operation is possible)
913	Six times detection for Flow Switch Error(Re-operation is not possible)
914	Error due to incorrect thermostat connection
915	Error on DC fan(Non-operating)
573	Error due to using single type outdoor unit in a module installation
601	Communication error between remote controller and the DVM Hydro unit / Hydro unit HT
602	Communication error between master and slave remote controller
604	Tracking error between remote controller and the DVM Hydro unit / Hydro unit HT
618	Error due to exceeding maximum numbers of Hydro unit installation (16 units)
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901	Error on the sensor of water inlet pipe (Short or Open)
902	Error on the sensor of water outlet pipe (Short or Open)
904	Error on water tank (Short or open)
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911	Flow switch off error, When the switch is turned off within 10 seconds after a pump starts its operation(Re-operation is possible)

913	Six times detection for Flow Switch Error(Re-operation is not possible)
914	Error due to incorrect thermostat connection
915	Error on DC fan(Non-operating)