NG-W169

Gateway Radio device

NG-TH169

Temperature and Humidity Sensor Radio device

USER'S MANUAL FOR NG-W169 AND
NG-TH169 DEVICES

P/N:

HW1800

NG-W169 Gateway Radio device

NG-TH169
Temperature and Humidity sensor Radio device

Requests for any specific information on the product and/or on relating options not contained in the synthetic manual, may be sent to our web site: www.energyteam.it, section "CONTACTS", sending an @mail to the "TECHNICAL AREA" indicating the specific request.

Energy Team reserves the right to make the modifications it deems necessary without having to give any prior notice.

Contents

INTRODUCTION

Ideal equipment to receive and acquire measurement concerning environmental parameters from various measuring instruments as: Temperature, Humidity, etc. The data acquired can be processed and sent via RS-485 to one or more server set for energetic measurement publication.
Small size, easy to install and configure quick in RF connectivity to the sensors at 169MHz. In addition, the high number of channels and the communication mode to other devices, make it a unique product in the international scene.
Next to the new generation analyzers manufactured by Energy-Team, it becomes the essential solution for all the operators active in the energy efficiency world, with Companies involved in certification and energy consulting (ESCO, diagnosis, audit, ISO 500001).

COMPLIANCE

NG-W169 complies with the following standards:

- **EN 61010-1:2010**
- **EN 62311:2008**
- **ETSI EN 301 489-1 V2.2.0**
- **ETSI EN 301 489-3 V2.1.1**
- **ETSI EN 300 220-1 V3.1.1**
- **ETSI EN 300 220-4 V1.1.1**

and subsequent updates. To avoid personal injury, carry out the installation according to regulations in force and the instructions in this manual, taking into account the insulation value specified for the instrument.

The instrument shows the following symbols:

	Pay attention - consult the manual
	Note
	Waste disposal according to law
	CE Marking.
	IEC 60417-5031 Direct Current

GENERAL SAFETY WARNING

Non-adherence to the following points can lead to serious injury or death.

- Use the suitable personal protection devices and adhere to the current regulations governing electrical safety.

According to actual Standards on the safety of civil electrical systems, this product can only be installed by operators having requirements according to law.

- Check that the voltage supply and measurement are compatible with the range permitted by the device. Do not power on the instrument if its appearance is not intact.

- Ensure that all current and voltage supplies are disconnected prior to carrying out any control, visual inspections and test on the device.

- Always assume that all circuits are under voltage until they are completely disconnected, subjected to tests and labelled.

- Disconnect all the power supplies prior to work on the device.

- Always use a suitable voltage detection device to check that the supply is interrupted.

- Pay attention to any dangers and carefully check the work area ensuring that no instruments or foreign objects have been left inside the compartment in which the device is housed.

- The correct use of this device depends on a correct manipulation, installation and use.

- Failure to adhere to the basic installation information can lead to injuries as well as damage to the electric instruments or to any other product. if the product is used in a manner not specified by the manufacturer, the anticipated safety could be compromised.

- NEVER connect an external fuse in by-pass.

- Disconnect all the Input and Output wires before carrying out a dielectric rigidity test or an insulation test on the panel in which the device is installed. The tests carried out at a high voltage can damage the device's electronic components.

- Don't expose the module to temperature ranges outside those reported on the data-sheet. Don't install it in sites with strong vibrations, corrosive gases, excessive dirt or high humidity. Use it only in the operating limits.

- Don't modify the feature of the module, as: removing the covers; making holes on the case; replacing its accessories with other coming from unknown manufacturers not described on the manual's list, because this operation may cause a malfunction and a damage of the instrument. In addition, don't modify the layout of the internal components.

The manufacturer declines any responsibility in case of use of the instrument out of manual's specifications.

ATTENTION !
It is strictly forbidden to install and use the device to anyone who does not possess the characteristics listed.

The device is made in compliance with the directives in force in the European Union and with the technical standards that incorporate the requirements, as evidenced by the CE mark on the device itself and in this publication.

NOTE:
For cleaning the front part of the instrument, use only a damp cloth.

NOTE:
During normal operation, the product must not be subjected to impacts of any kind.

NOTE:
For any calibration and maintenance contact the Energy Team. In case of malfunction or failure, send the device back by attaching a precise description of the fault.

NOTE:
This manual is an integral part of the product and must therefore be kept with care.

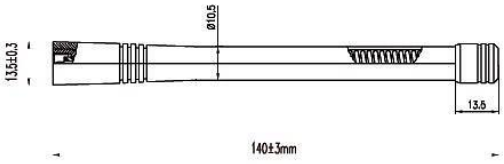
ATTENTION!
The installation and the cabling of the device must be carried out only by qualified personnel. Danger of electrocution, burning and electric arc. Use the personal protection devices suitable to adhere to the current regulations governing electrical safety. Prior to carry out any connections check the sectioning of the electric supply with the voltage detection device.

NG-W169 ModBus 169MHz RADIO GATEWAY

OPTIONS (Antenna Not included)

HELICAL ANTENNA

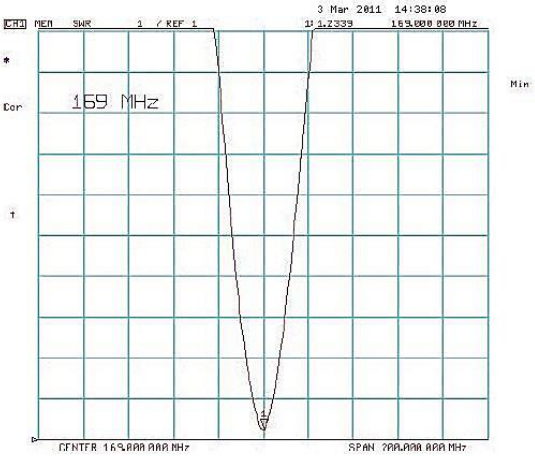
VHF Helical antenna ground-plane dependent, suitable for metering applications.



Dimensions

Specifications	
Frequency range	169 MHz
Polarisation	Linear
VSWR	<1.5:1
Power rating	10W
Connector	SMA-Male
Dimensions	140 x 13.5mm (hxd)

Popular Ordering Options	
H169-SMA	H169-SMA antena with SMA-Male connector



VSWR Diagram

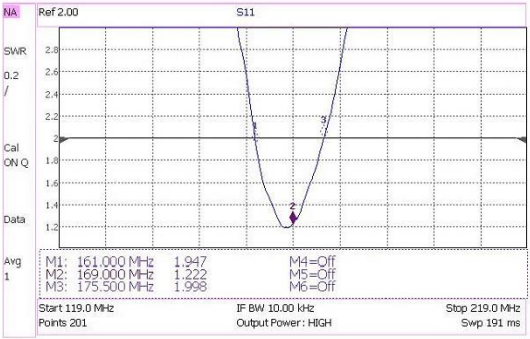
HARMATTAN ANTENNA

Antenna 169 MHz ½ wave omnidirectional, for external mounting with bracket or on wall/pole. Dipole antenna ½ wave guarantees the highest irradiating omnidirectionality.

ELECTRICAL FEATURES

Frequency range (with V.S.W.R. < 2 : 1)	162 / 174 MHz
Impedance:	50 Ω
V.S.W.R. at 169MHz:	< 2 : 1
Max power:	15 W
Polarisation:	Linear
Irradiation:	Omnidirectional
Gain at 169 MHz:	2.1 dBi

Protection against oxidation: ANT has designed this antenna so that it can withstand the worst climatic conditions; the plastic parts are made of raw materials resistant to external environmental agents.
Protection against accidental hits: ANT has designed this antenna so that people are protected from accidental hits against its projecting parts, which are smoothed out and covered with proper protections.
RoHS directive (2002-95-CE): The antenna is RoHS compliant.



VSWR Diagram

169 MHz H-plane

169 MHz E-plane

Irradiation Pattern

WMO ANTENNA

Ideal for AMR Concentrator Applications, 169 MHz VHF Frequency Band.

Specifications	
Frequency range	169 MHz
Gain	2 dBi
Polarisation	Linear - Vertical
VSWR	<1.2:1
Impedance	50 Ohm
Power rating	10W
Cable/Connector	N-Female Connector
Colour Finish	White
Sheath Material	Fibreglass
Operating Temperature	-30 to + 80 degrees C
Dimensions	480mm length + bracket

Popular Ordering Options	
WMO-169-WMB	169 MHz Omni antenna with wall-mount bracket

YAGI ANTENNA

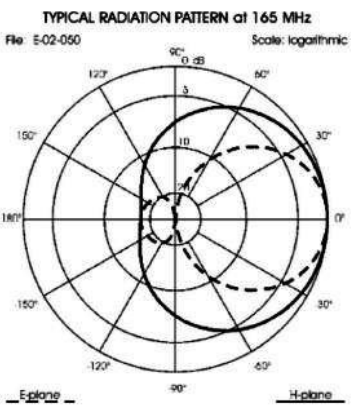
Base station antenna conceived by using an innovative feed system studied and applied to have highly symmetrical radiation pattern in both planes (E and H). It's completely computer designed to get high performances of gain and front-to-back in the working band. All aluminium parts are protected by anodized treatment, hardware are of Stainless steel or zinc plated steel, mounting bracket is of extruded aluminium for the best strength and the connector is placed in rear position for an easily access. To increase the antenna gain please install it in vertical stacked array. Patent pending applied.

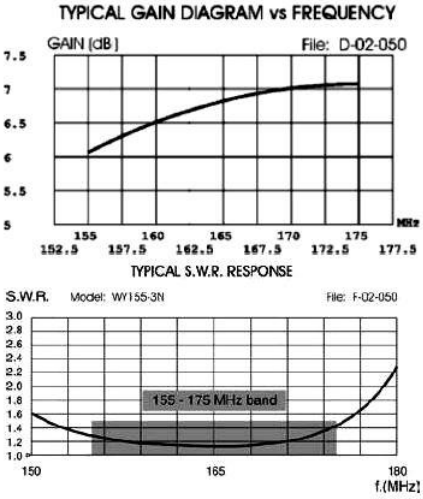
Mechanical Data

Materials	Anodized 6063-T5 Aluminium, Thermoplastic UV stabilized, Chromed Brass
Wind load / resistance	110 N at 150 Km/h / 160 Km/h
Wind surface	0.088 m²
Dimensions (approx.)	990 x 985 mm
Weigth (approx.)	1680 gr
Turning radius	950 mm
Operating temperature	-40° C to +60° C
Mounting Mast	∅ 35-52 mm

Electrical Data

Type	3 elements Yagi
Frequency range	155 - 175 MHz
Impedance	50 Ω Unbalanced
Polarization	Linear Vertical or Horizontal
Radiation (H-plane)	beamwidth at -3 dB= 130° at 165 MHz
Radiation (E-plane)	beamwidth at -3 dB= 70° at 165 MHz
Max Gain	7 dBi
Front to Back ratio	≥ 16 dB
S.W.R. in bandwidth	≤ 1.5:1
Max Power	200 Watts (CW) at 30°C
Feed system / Position	RG303 PTFE coax with balun / inside boom
Lightning protection	DC-ground
Connector	N-female with rubber protection cap





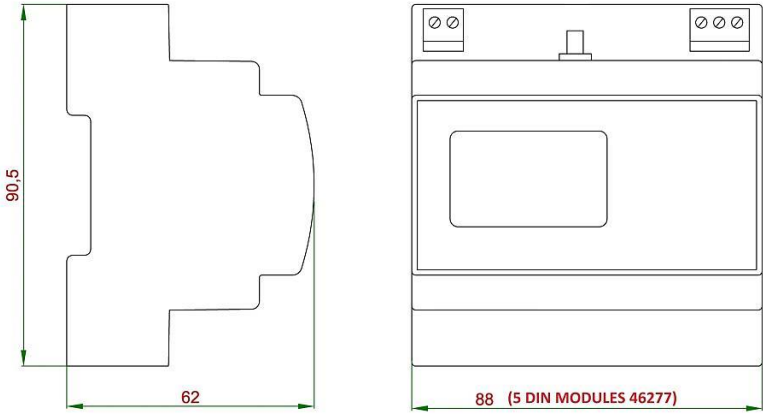
SPECIFICATIONS

- 32 channels to process all measurements received via radio by RF-169MHz sensors.
- All measurements received are transmitted via RS-485 RTU-Modbus.
- The module can receive via radio and manage the "low battery" warning sent by the sensors 30 days before.
- The data displayed can be read and set through the Joystick button.
- Graphic display with LED background allows local visualization of all acquired measures, diagnosis and configuration of the 32 channels.
- Thanks to 169MHz radio frequency band it's possible to cover distances up to 1 Km outdoors. The distance isn't definable for indoors, depending by the building structure.
- Housing for DIN rail 46277 (5 Modules).

Advantages:

This module costs like any other average multi-function device, but it has higher initial features: its small size allows an easy installation within an electrical panel; color display with different font sizes for faster consultation.

DIMENSIONS

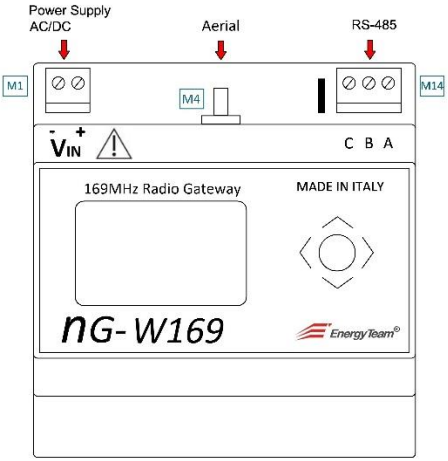


TECHNICAL FEATURES

General	References
Use of the product	INTERNAL – Altitude up to 2000 m
Box type	PC + ABS
Weight	95 g
Maximun dimensions LxHxW	5 DIN modules (approx. 88x90.5x62 mm)
Working temperature	-10 ÷ +65 °C
Pollution degree	2
Relative humidity	95% without condensation.
Display	Graphic 128x64 pixel, with RGB LED background.
Keypad	5 functions joystick
Cables minimum temperature	70°C
Maximum Front Impact Energy	1 Joule (*)
Power supply	
Input Voltage	100÷240 Vac ±10% 50÷60 Hz; +24 ÷ +120 Vdc ± 10%
Overvoltage Category	II
Insulation	6 kV between Aux power supply and RS-485.
Consumption	1.5 W max (dc)
Interfaces	
RS-485 (galvanically insulated)	Modbus protocol, selectable speed up to 115200 bps; programmable parity.
Radio	
Range extension	1 km (depending on installation environment)
Frequency band	169.4 ÷ 169.475 MHz
Power	+17.3 dBm (Max Power admitted: +27 dBm)
Aerial connector	SMA female

(*) Impact test with a 500g steel sphere, dropping from a 200mm height.

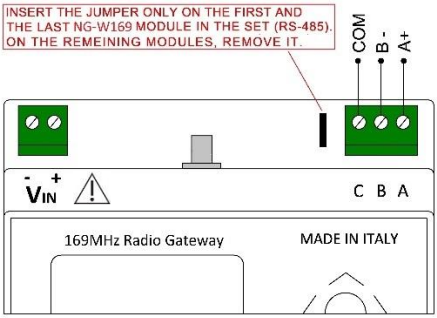
INTERFACES AND RELATIVE CABLE SECTIONS



M1: **Power Supply** – Cable section: Min 0,5 mm^2 (20 AWG); Max 1,5 mm^2 (15 AWG)

M4: **169 MHz interface** (outlet for remotable antenna) SMA female

M14: **RS-485** – Cable section: Min 0.25 mm^2 (24 AWG); Max 0.50 mm^2 (20 AWG); *Belden 9841*

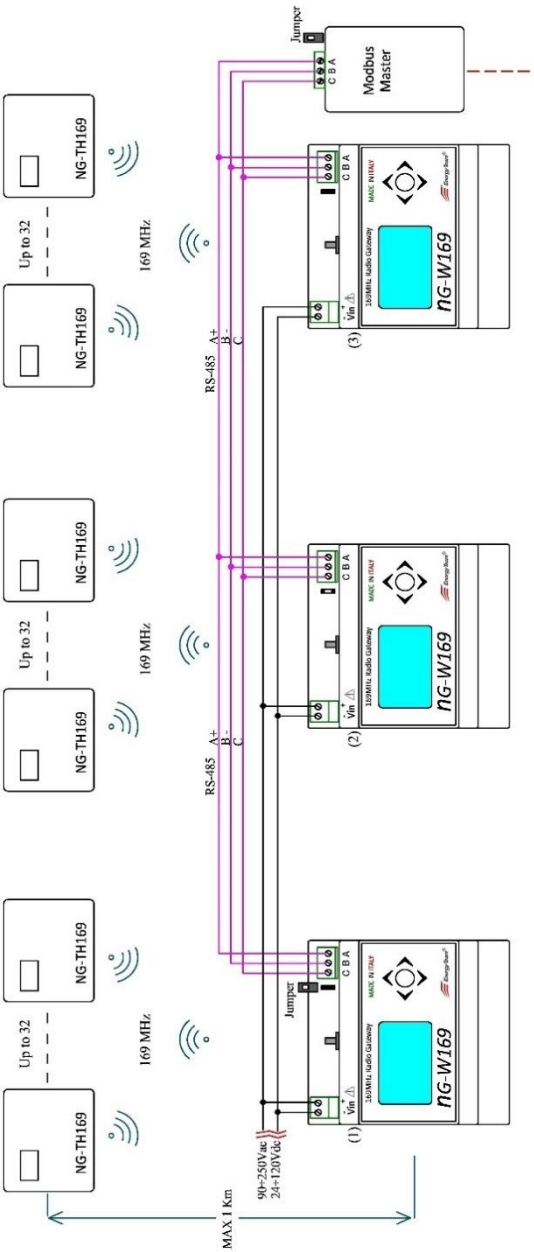


IMPORTANT NOTE

Energy Team declares that, on each product sample, the dielectric strength test at 1400 Vac is carried out between:

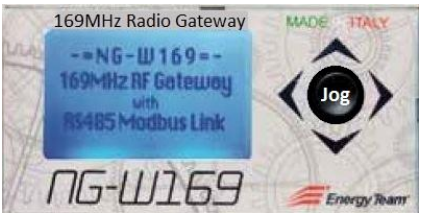
- Power Supply and Antenna Connector.

- Power Supply and RS-485.

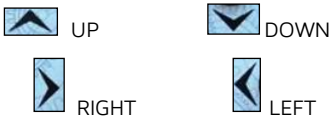


Example about the connection of Nr. 3 NG-W169 through RS-485 serial port, interfaced to external servers by a Modbus Master device. The Jumpers are inserted into modules placed at the ends of the line: in this case NG-W169 (1) and Modbus-Master. Each NG-W169 module can join a maximum of 32 NG-TH169 sensors.

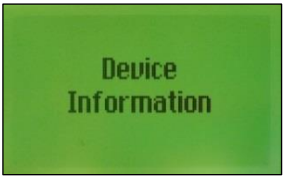
MANUAL TO PROGRAM NG-W169 THROUGH KEYBOARD



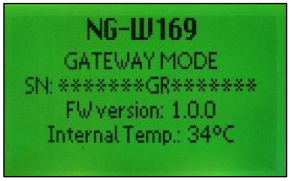
Jog Positions:



When the device is turned on, regardless of the screen displayed, click the Jog button to UP or DOWN position for scrolling the menu, until to display the main screen about device information:



Click the Jog to RIGHT position to display the main page showing: Serial Number; Firmware version; Internal Temperature:

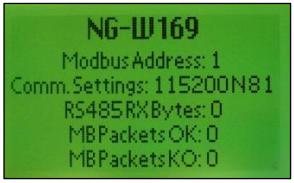


Then, by clicking DOWN, will be displayed the following screen showing the communication parameters such as:

Modbus Address assigned to the device;
Signal speed in bit/s (ex: 115200);
Signal partiy (ex: N as none);
Length of each byte (8 bit); Stop bit (1).
RS485 RX Bytes: Number of bytes received by the serial port.

MBPacketsOK: Number of packets correctly received (each packet is constituted by a set group of bits).

MBPacketsKO: Number of packets damaged.



Click again DOWN to display the next screen, which parameters are explained below:

Modules Joined: Number of sensors joined.
Total Measures: Number of measures enabled.
Total RF Valid RX: Number of radio packet received from joined sensor.
RSSI: Signal strength in dBm, of the received signal.
LQI: Index of signal quality, from 0 to 3
(*0 Poor; 3 Excellent).*

RF channel: number of radio frequency channel set; through which all the devices communicate.

Click the Jog to LEFT position to return to main screen "Device Information".

SETUP

In order to set all system parameters, click the Jog button on UP or DOWN until the screen of Setup is displayed:

Click the RIGHT position to display the menu about PIN entry:

In order to enter PIN code, press the Jog button: the first digit flashes. Then, click Jog to UP or DOWN for inserting the desired number. In the next step: click RIGHT to set the second digit and repeat the procedure already explained. So even for the remaining digits. Once the procedure is finished, press the Jog button to get the access to setting menu. **(the default PIN is 0000).**

The first screen displayed is the following:

This screen is also displayed when the Join sequence is successfully concluded.

Then, by clicking Jog (ENTER), two screens (modalities) may be displayed:
The First

This screen showing the flashing indication "Wait for join" is displayed if the instrument is turned on when it's in the first default mode; or if the results produced by eventual cancellation sequences are exhausted; or when the "Compacting Modules" operation was carried out.

The Second

If the sequence of Delete module or if Delete Last module were carried out, a submenu is shown; from which it's possible to select two functions by Clicking UP or DOWN:

First function

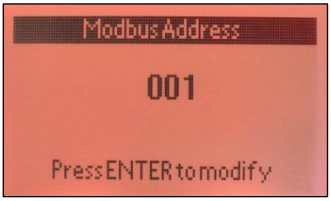
Click Jog (ENTER) to insert the sensor automatically in the first free position. This screen is displayed:

Second function

Click Jog (ENTER) to insert the sensor into last position cleared. This screen is displayed:

NETWORK PARAMETERS

Click UP or DOWN to scroll the menu, until to display the screen about the Modbus Address to assign to device:

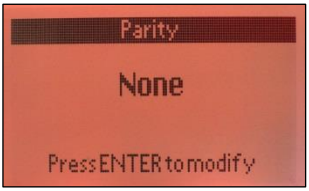


(default is 001).
In order to change it, press the Jog button, the screen changes color (as seen previously) and the cursor flashes. Click RIGHT to bring the cursor on the first digit, then click UP or DOWN to enter a number from 0 to 9. In the next step, click RIGHT to bring the cursor on the second digit and repeat the procedure described, so for all digits.
At the end, press Jog to save the setting.
Insert a number from **001** to **247**.

Click DOWN to display the next screen about the **communication speed** (in bit per second):

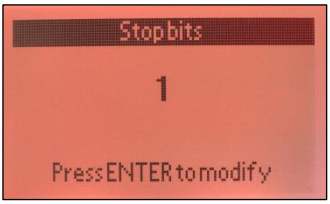
In order to change it, press Jog and click UP or DOWN to select one of the following values: 115200; 57600; 38400; 19200; 9600. Then, press Jog to confirm.
All the instruments connected must have the same speed **(default is 115200).**

Click DOWN to display the next menu about the **Parity** code:



In the "packet" of bits in which the signal is divided, the desired parity code can be set by using the same procedure described in the above paragraph, about the communication speed. Select "Even", "Odd" or "None".
(default is None).

Click DOWN to display the next menu about the **stop bit**:



By using the same procedure described, select the stop bit between 1 or 2. **(default is 1).**

PIN CHANGE

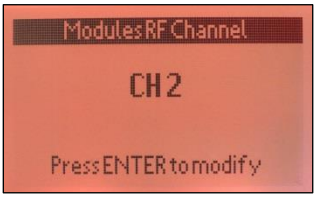
Click UP or DOWN to scroll the menu, until to display the screen about the change of **PIN code**:

By using the same procedure above described (see "node address"), insert the digits of the new PIN code if You don't want to keep the default value.

CHANGE RADIO CHANNEL

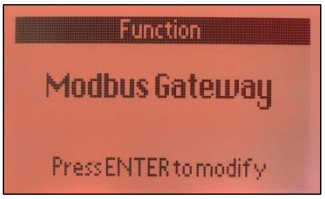
As Default is set the channel CH2.
*It is **NOT** recommended to change the RF Channel by the user. If the user wants to change the channel, contact Energy Team support.*

Click UP or DOWN to scroll the menu, until to display the screen about the radio-frequency channel, through which all the joined sensor must communicate:



In order to change it, by using the same procedure already explained, press the Jog button, the channel indication flashes. Then click UP or DOWN to select a channel from **0** to **6**.
Press Jog (ENTER) to confirm.

Then, click DOWN to display the screen about the settable functions:



We remember that, some functions, are to be developed.

Press Jog (ENTER) to modify; the indication flashes. Then click UP or DOWN to select the interested function. At the end, click Join to confirm.

It's possible to use the instrument as Gateway (main function, described in this manual) or as Repeater for future development.

Click UP or DOWN until to display the screen about the "Miscellaneous" menu:

Press Jog (ENTER), the screen changes as follows:

From this menu, click UP or DOWN to select the interested function among these explained:

Set default setup:
The default parameters are set, included the Radio-channel and the Modbus address configurations.

Reboot:
To restart the device.

Delete Last module:
To delete the last sensor module Joined. In this case it isn't the last sensor module joined in order of time, but in positional sequence from the major to zero.

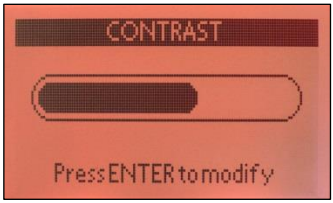
Delete module:
To delete a selected sensor module; in order to select it, press the Jog, then click UP or DOWN until to reach the number concerning the interested sensor module, then press Jog.

Compacting Modules:
To rearrange the numbering sequence for the selected sensor modules, shifting the module position to fill the vacant location; the final result is a set of sensor positioned from 0 to the max number of sensors joined.

CONTRAST

When selected the interested function among these, press Jog (ENTER) to confirm, or click LEFT to exit.

Click UP of DOWN to display the contrast menu:

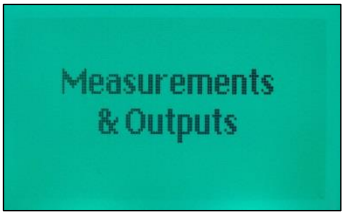


In order to set the contrast of the display, press Jog (ENTER). Then click RIGHT or LEFT respectively to increase or decrease the contrast. The image of the cursor moves accordingly.
Press Jog to confirm.

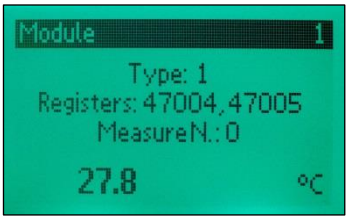
Click LEFT to return to main menu.

MEASUREMENTS

From the main menu, click UP or DOWN to display the screen about the measurements and outputs:



Then click RIGHT to get the access into next screen, by which it's possible to read all the values and the parameters below described:



Module: Number of the sensor joined, in sequence.

Type: It indicates the type of sensor. (see the sensor specific manual for codification).

MeasureN: It's a sequential index indicating the number of the interested measure provided by the sensor.

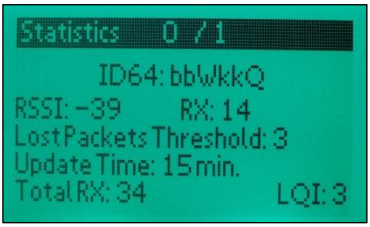
(eg: if a sensor detecting only Temperature and Humidity is connected, 0 indicated the first measure which is the temperature, 1 the second measure which is Humidity).

Registers: The number of the Modbus Register in which the measure is stored; (*eg: in this example is the temperature is an Modbus holding register*).

On the bottom side, you can see the value of the interested measure, with the respective unity.

By clicking UP or DOWN, it's possible to scroll all the Module pages of the joined modules.

Click again RIGHT to display the screen (always concerning this measure), called "Statistics":



In the item "Statistics" highlighted, the first digit (eg: 0) indicates the sensor module; the second digit (eg: 1) indicates the measure.

ID64: Univocal identification code of the sensor module; each Sensor must have only one identification code, different from one to another.

RSSI: Signal strength in dBm, of the received signal.

LQI: Index of signal quality, from 0 to 3 (*0 Poor; 3 Excellent).*

RX: Number of radio packets correctly received.

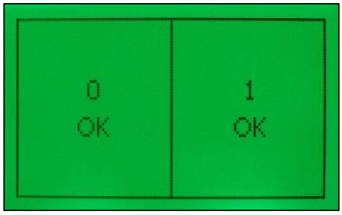
Lost Packets Threshold: it displays the threshold set, precisely: the number of lost packets above which the alarm advertisement starts.

Update Time: the time interval between two different radio communications.

Total RX: Total Number of radio packets correctly received, from all sensors.

By clicking UP or DOWN, it's possible to scroll all the statistics pages of the joined modules.

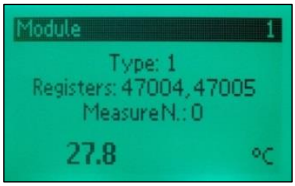
From the statistics page, click again RIGHT, the following screen is displayed:



This example shows 2 fields (box) because only 2 sensor modules are joined. The number of "fields" increases according with the number of modules joined.

If alarms don't occur and all the devices works regularly, the color of the background is Green.

Click twice LEFT to return to main screen displaying the measurement:



Now, by clicking UP or DOWN, it's possible to scroll all the screens about the other sensor modules joined.
For each of these, in order to see the values and all the specific parameters, repeat the procedure above described.

At the end, click repeatedly LEFT to return to main menu.

ALARM PROCESSING

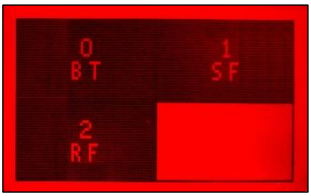
If an alarm signal starts or a sensor module doesn't work regularly, in the screen displaying the "fields", the color of the background changes in RED and the box corresponding to wrong module flashes, according to error codes reported below:

RF: Module RF Link Lost.
(Communication packet lost, impossible to receive the signal)

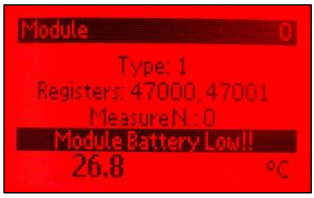
BT: Module Battery Low.

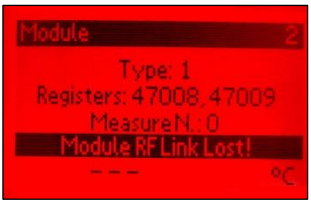
SF: Sensor Fault.

The screen below shows this example:



Then, click LEFT to return to main screen displaying the measurement about the module in alarm; the backgroud color has changed in RED and the specific error message is shown in evidence.
By clicking UP or DOWN it's possible to scroll all the screen and view the modules in alarm status.
The examples below show all the typologies of alarm which may occur:





At the end, click repeatedly LEFT to return on main menu.

NOTE:
If the three typologies of alarms occur simultaneously on the same module, they are shown according to the following Priority: RF (high); BT; SF.

MODBUS REGISTERS MAPPING

Writing / Reading the ModBus Registers

Supported Functions: 03 - read holding registers; 06 - write single register; 16 - write multiple registers.

The "floating point" measures at 32 Bit (4 bytes) and 32 Bit "full", use together two consecutive ModBus registers; therefore it's necessary to read at the same time two ModBus registers, in order to read the value of a measurement.
The reading in this interval of an odd number of registers or an odd initial register will generate a response with error code ILLEGAL ADDRESS.

For the write operation of the registers, is supported the function 16 (write multiple registers).

The "ID" registers shown on the table is equivalent to DATA ADDRESS, 7000 corresponds to Holding Register 47001.

For the write operation of the registers, is supported the function 16 (write multiple registers).

Registers map

The table on the next page shows all the registers map, with ID Register; Format; Contents.

CONFIGURATIONS			
ID	**Format**	**Contents**	**Note**
1123	U16 RW	Modbus Address from 1 to 247 **Default value: 1**	2,3
1124	U16 RW	Serial line speed 0= 9600 bps 1= 19200 bps 2= 38400 bps 3= 57600 bps **4= 115200 bps**	2,3
1125	U16 RW	RS485 Serial line Parity 0= none **1= even** 2= odd	2,3
1126	U16 RW	Stop bit serial line **0= 1 stop bit** 1= 2 stop bit	2,3
1127	U16 RW	Protection PIN against accidental writing 1..65535 settable value **Default value: 0**	2
1128	U16 RW	RF W-MBUS Channel 0..6 settable value **Default value: 2**	2
1344	CHAR[2] RO	Serial number, character 1 and 2 LSB character is on the left	5
1345	CHAR[2] RO	Serial number, character 3 and 4	5
1346	CHAR[2] RO	Serial number, character 5 and 6	5
1347	CHAR[2] RO	Serial number, character 7 and 8	5
1348	CHAR[2] RO	Serial number, character 9 and 10	5
1349	CHAR[2] RO	Serial number, character 11 and 12	5
1350	CHAR[2] RO	Serial number, character 13 and 14	5
1351	CHAR[2] RO	Serial number, character 15 and 16	5
1352	U16 R	FW (hex) Revision	

Special Registers, set only through WRITE SINGLE REGISTER (F06)			
ID	**Formato**	**Contenuto**	**Note**
0999	U16 WO	PIN protection setup (0000-9999) **Initial value 0000**	4
9735	U16 WO	Special registers enable **value 4202** Write (it answers "Success" also if wrong)	5
9739	U16 WO	Remote restart	2
9740	U16 WO	Clear PIN	5

Structure of the sensors

This structure gives the necessary information to interpret how many and which sensors were joined on the gateway (N from 0 to 31).
They are shared in 4 areas:

1) Sensor Indexing Table
2) Measurements Table, reached by the "indexing table".
3) RSSI measurements Table, valid for the sensors active in the receiver
4) Status Table, valid for the sensors active in the receiver.

The Joined sensor modules are normally added with sequential numbering (the first joined is 0, the second 1, etc).

It's possible to "delete" a sensor module and add one in its place (even the same just deleted), provided that the new sensor has the same number of measures of which deleted. It will be also possible to group sensor modules, in case there are erased same module, so as to read the active measures contiguously by the Modbus master.

Table for Sensors indexing

The index table is organized in blocks of five registers, one block for each possible joinable sensor module on the gateway.

The first location of each block (register 5000 + N * 5), has this meaning:

- equal to 0: No sensor module joined; it is possible to stop the scanning of the index table.

- different from 0; The sensor module is present and is identified by "ID TYPE" code read (see the sensor specific manual for codification); it's necessary to continue the reading of the locations in the entire block, in order to interpret the information for the joined sensor. See the following table.

- It is 0xFFFF: Data of a valid sensor module aren't present (deleted module); then, ignore the current block and proceed to the next one.

The second and third location of each block (register 5001 and 2002 + N * 5), contains the unique ID Serial Number of the joined sensor.

The fourth location of each block (register 5003 + N * 5), contains the bits field of the 16 possible measure of a sensor; where the LSB corresponds to the first measure of the sensor.

The fifth location of each block (register 5004 + N*5), contains the 1st Measurement Register; Start of measurement registers; all the next measure register are stored in sequence.

16 bit Sensor descriptor			
ID	**Format**	**Content**	**Note**
Sensor 0			
5000	U16 RO	ID TYPE	7
5001	U16 RO	4 Byte ID Serial Number 1	
5002	U16 RO	4 Byte ID Serial Number 2	
5003	U16 RO	Active Measurement	6
5004	U16 RO	1° Measurement Register; Begin measurement registers.	
Sensor 1			
5005	U16 RO	ID TYPE	7
5006	U16 RO	4 Byte ID Serial Number 1	
5007	U16 RO	4 Byte ID Serial Number 2	
5008	U16 RO	Active Measurement Sensor 1	6
5009	U16 RO	1° Measurement Register; Begin measurement registers.	
Sensor N			
5000+N*5	U16 RO	ID TYPE	7
5000+N*6	U16 RO	4 Byte ID Serial Number 1	
5000+N*7	U16 RO	4 Byte ID Serial Number 2	
5000+N*8	U16 RO	Active Measurement Sensor N	6
5000+N*9	U16 RO	1° Measurement Register; Begin measurement registers.	
Sensor 31			
5155	U16 RO	ID TYPE	7
5156	U16 RO	4 Byte ID Serial Number 1	
5157	U16 RO	4 Byte ID Serial Number 2	
5158	U16 RO	Active Measurement Sensor 1	6
5159	U16 RO	1° Measurement Register; Begin measurement registers.	

32 bit Sensors instant Measures (depending by the joined sensor; (see the sensor specific manual for codification) *Example of Measures register with two Temperature and Humidity sensors joined.*			
ID	**Format**	**Content**	**Note**
7000	FP32 RO	Module 0 Measure 0 = Temperature 0	°C
7002	FP32 RO	Module 0 Measure 1 = Humidity 0	%Rh
7004	FP32 RO	Module 1 Measure 0 = Temperature 1	°C
7006	FP32 RO	Module 1 Measure 1 = Humidity 1	%Rh
…….			
Additional N Sensors (N from 0 to 31)			
7000+**N***4	FP32 RO	Module N Measure 0 = Temperature 0	°C
7000+**N***4+2	FP32 RO	Module N Measure 1 = Humidity 0	%Rh

16 bit RSSI Measures			
ID	**Format**	**Content**	**Note**
6000	S16 RO	Module 0: RSSI value	dBm
6001	S16 RO	Module 1: RSSI value	dBm
……			
Additional N Sensors (N from 0 to 31)			
6000+**N**	S16 RO	Module **N**: RSSI value	dBm

16 bit Sensors Status			
ID	**Format**	**Content**	**Note**

6500	U16 RO	Module 0
		bit 0 = 1 RF Link Lost (over 45' with no signal)
		bit 1 = 1 Low Battery
		bit 2 = 1 Sensor Fault;
		bit 3 = 1 RF Module Anomaly;
		0x00 all FINE	

6506	U16 RO	Module 1	
……			
Additional N Sensors (N from 0 to 31)			
6500+**N***6	U16 RO	Module **N**	

NOTE:

1 - The registers of the calendar must be read or written simultaneously.

2 - Writing is protected if the PIN register (1127) is set to a value different from zero; in this case, before writing into the protected records, you must write the PIN value into the 999 register with the function 06, write single register.
Note: the PIN register cannot be read twice, once read, it goes back to zero.

3 - After modifying the registers, it is necessary to restart the instrument (see register 9739).

4 - See point 2.

5 - Writing allowed only after Special PIN writing in 9735.

6 - In N° OF ACTIVE MEASURES ON N SENSOR, the 16 bit represent the 16 available measures: if the corresponding bit is 1, the measure is active while, if it's 0, the measure it's inactive.

7 - Users and interrogation Software both must know the Measures Registers available see the specific manual sensors. Any attempt at writing a reading only register would give back 07 error.

Data Format

32 BIT FLOAT

The lower register contains the most significant part of the float number.

Format for Float IEEE number:

B3	B2	B1	B0
SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM

Encoding of Modbus registers:

Register A		Register A+1	
B3 (MSB)	B2	B1	B0 (LSB)

Example
The number 5000.0 is encoded into single-precision IEEE format as: 459C4000H

B3	B2	B1	B0
45H	9CH	40H	00H

The encoding in Modbus registers will then be

Register A		Register A+1	
45H	9CH	40H	00H
459CH (17820 decimal)		4000H (16384 decimal)	

INTEGER 32 BIT WITHOUT SIGN

Integer 32 bit number

12345678H will be encoded in the Modbus registers as follows:

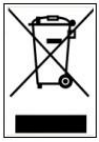
Register A		Register A+1	
12 (MSB)	34	56	78 (LSB)

GENERAL SAFETY REGULATIONS

- The NG-W169 device must be used by specialized and qualified personnel only.
- Disconnect device from mains and all terminals before opening the container.
- Caution: device powered at 240Vac and 120 Vdc.
- Do not use in presence of water.
- Strictly comply with the indications and diagrams in this manual when connecting the device.

WARRANTY

Energy Team guarantees that the supplied products are free from defects and suitable for use. If any malfunction occurs and these are due to manufacturing defects, E.T. will respond within the terms and modalities foreseen by General Conditions of Supply, with particular reference to articles **5B** (terms and duration), **1C** (limits), **5D** (other warranties). Whatever operation or manumission made by third parties not expressly authorized determines in each case the immediate termination of the warranty.



DISPOSAL

WASTE OF ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)
Don't dispose among generic waste but collect separately for recycling and disposal operations according by law.

NOTE:
If you have any doubts about the installation procedure or the use of the product, contact the technical assistance or the local distributor

Energy Team S.p.A.
Via della Repubblica, 9, 20090 Trezzano sul Naviglio (MI)
P +39 02 40405033 – F. +39 02 48405035 - E info@energyteam.it - PEC pec@pec.energyteam.it - W www.energyteam.it

NG-TH169 ROOM TEMPERATURE AND HUMIDITY 169MHz RADIO SENSOR

Front view

Rear view

INTRODUCTION

NG-TH169 radio sensor is a small and useful module able to detect and transmit the values of Temperature and Humidity to NG-W169 Gateway once Joined. the advantages are very high when a wireless application is request.
Being extremely precise, reliable and convenient, NG-TH169 is specifically designed to be used in many different situations (i.e. Offices, CED, warehouses, retail centers, residential buildings, etc.).The sensor is set for wall fitting.

COMPLIANCE

NG-W169 complies with the following standards:

- **EN 61010-1:2010**
- **EN 62311:2008**
- **ETSI EN 301 489-1 V2.2.0**
- **ETSI EN 301 489-3 V2.1.1**
- **ETSI EN 300 220-1 V3.1.1**
- **ETSI EN 300 220-4 V1.1.1**

and subsequent updates. To avoid personal injury, carry out the installation according to regulations in force and the instructions in this manual, taking into account the insulation value specified for the instrument.

The instrument shows the following symbols

	Pay attention - consult the manual
	Note
	Waste disposal according to law
CE	CE Marking.

GENERAL SAFETY WARNING

Non-adherence to the following points can lead to serious injury or death.

- Use the suitable personal protection devices and adhere to the current regulations governing electrical safety.

- According to actual Standards on the safety of civil electrical systems, this product can only be installed by operators having requirements according to law.

- Ensure that the internal power supply battery is disconnected prior to carrying out any control, visual inspections and test on the device.

- The correct use of this device depends on a correct manipulation, installation and use.

- Failure to adhere to the basic installation information can lead to injuries as well as damage to the electric instruments or to any other product.

- The tests carried out at a high voltage can damage the device's electronic components.

- Don't expose the module to temperature ranges outside those reported on the data-sheet. Don't install it in sites with strong vibrations, corrosive gases, excessive dirt or high humidity. Use it only in the operating limits.

- Don't modify the feature and the module, as: removing the covers; making holes on the case; replacing its accessories with other coming from unknown manufacturers not described on the manual's list, because this operation may cause a malfunction and a damage of the instrument. In addition, don't modify the layout of the internal components.

The manufacturer declines any responsibility in case of use of the instrument out of manual's specifications.

ATTENTION !

It is strictly forbidden to install and use the device to anyone who does not possess the characteristics listed.

The device is made in compliance with the directives in force in the European Union and with the technical standards that incorporate the requirements, as evidenced by the CE mark on the device itself and in this publication.

NOTE:
For cleaning the front part of the instrument, use only a damp cloth.

NOTE:
During normal operation, the product must not be subjected to impacts of any kind.

NOTE:
For any calibration and maintenance contact the Energy Team. In case of malfunction or failure, send the device back by attaching a precise description of the fault.

NOTE:
This manual is an integral part of the product and must therefore be kept with care.

SPECIFICATIONS

- NG-TH169 uses radio communications to transmit measurements to NG-W169 receivers, which are equipped with RS485 RTU Modbus.
- 2 Alkaline or Lithium Batteries, 1.5V AA **(NOT RECHARGEABLE)**
- In order to have a battery life-span more than 5 years, It's possible to use 1.5V 3000 mAh Lithium Batteries.
  It transmits every 1 minute if the temperature variation exceeds the threshold of +/- 0,5 [°C] than the measured value; otherwise the transmission occurs every 15 minutes, in this case the duration time of the battery is more long.
- LCD display allows viewing of measurements (Temperature and Humidity). The Temperature is also indicated on the display (in this example: ), the Humidity is recognizable because it is preceded by the letter "H" (example: ). These visualizations are updated every 7 seconds.
- The new 169MHz radio frequency band allows covering distances up to 1 km outdoor.
- Low battery warning shown on the display and transmitted via radio, 30 days in advance.
- To measure room Temperature it is advisable to place the device, away from heating sources.

TECHNICAL FEATURES

General	**References**
Power supply	3 Vdc, 2x1.5 Vdc, Size AA, Alkaline 2850 mAh. Optional: Lithium, 3000 mAh (for 5 years life-span).
Consumption	100 uW / 30 uA
Temperature measuring range	-10°C ÷ +65 °C
Temperature measuring accuracy	+/- 0,2 °C
Humidity measuring range	0% to 100%
Humidity measuring accuracy	+/- 2%
Weight	60 gr
Size (wide)	110 mm
Size (high)	76 mm
Size (deep)	29 mm
Protection degree	IP 20
Box type	ABS
Radio	
Range extension	1 km
Frequency band	169.4 ÷ 169.475 MHz
Max RF Power emitted	15 dBm

ASSOCIATIVE TABLE NG-TH169 SENSOR TO NG-W169 GATEWAY

ID TYPE	1; is for NG-TH169
Measurement size	Float (32bit), 2 ModBus registers
Periodicity	15'; 1' changes in +/- 0.5°C occur, respect the last value of the temperature sent.
Alarm for lost packets	3 attempts (eg. is Equivalent to 45')
Measurement 0	Temeperature range: -10 +65 [°C]
Measurement 1	Humidity range: 0 +100 [%Rh]

In order to map the ModBus Registers, refer to **MODBUS REGISTER MAPPING** in the NG-TH169 manual, the section about sensor installing.

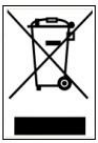
GENERAL SAFETY REGULATIONS

- The NG-TH169 device must be used by specialized and qualified personnel only.
- Disconnect device from mains and all terminals before opening the container.
- Do not use in presence of water.
- Strictly comply with the indications and diagrams in this manual when connecting the device.

WARRANTY

Energy Team guarantees that the supplied products are free from defects and suitable for use. If any malfunction occurs and these are due to manufacturing defects, E.T. will respond within the terms and modalities foreseen by General Conditions of Supply, with particular reference to articles **5B** (terms and duration), **1C** (limits), **5D** (other warranties). Whatever operation or manumission made by third parties not expressly authorized determines in each case the immediate termination of the warranty.

DISPOSAL



WASTE OF ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)
Don't dispose among generic waste but collect separately for recycling and disposal operations according by law.

NOTE:
If you have any doubts about the installation procedure or the use of the product, contact the technical assistance or the local distributor

Energy Team S.p.A.
Via della Repubblica, 9, 20090 Trezzano sul Naviglio (MI)
P +39 02 40405033 – F. +39 02 48405035 - E info@energyteam.it - PEC pec@pec.energyteam.it - W www.energyteam.it

INSTALLATION SEQUENCE
NG-TH169

In this section, we describe the schematic sequence about the steps to carry out for system setup, indicating also the number of the specific chapters.

- Installation sequence leads the user to set the receiver in join mode, then end the Join procedure by acting on the sensor (Chapters: 1, 2, 3).
- After joined the sensor, it's useful to check the RF signal range, therefore install the receiver in the final position and check if the position for the sensor allows a correct radio coverage. By using the RSSI values test (Chapter 6) it's possible to read directly on the sensor display the input signal power value on the module. You could use the Table mentioned to Chapter 7 to report: sensor name; position identification; power strength (RSSI) shown on the sensor display (Chapters: 4, 5, 6, 7).
- After joined all the sensors, it's possible to acquire the sensors measurement by reading them from the receiver NG-W169 by using RS485 ModBus Protocol. For using the ModBus register mapping, refer to Chapter 9.
- After these steps, if the receiver is switched for a long time, waiting the final installation, it's recommended to switch off the sensor by following the procedure on the Chapter 8.

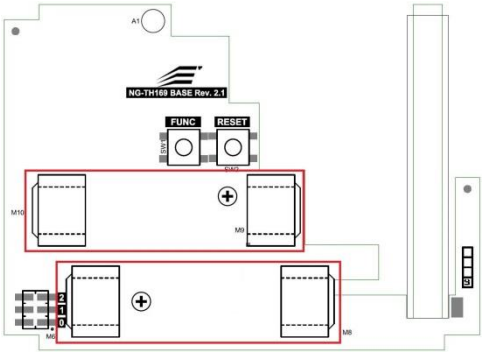
1. SWITCH ON THE SENSOR

NOTE: Not necessary if the sensor has the factory setting.

IMPORTANT NOTE:

When pressing the buttons (Func /Reset) DO NOT use sticks made of conductor materials.

- Switch on the sensor by inserting the batteries, respecting the polarity as indicated on the PCB scheme below.



2. JOIN MENU SELECTION ON THE GATEWAY

When accessed into Setup menu the first screen displayed is the following:

This screen is also displayed when the Join sequence is successfully concluded.

Then, by clicking Jog (ENTER), two screens (modalities) may be displayed:

The First

This screen showing the flashing indication "Wait for join" is displayed if the instrument is turned on when it's in the first default mode; or if the results produced by eventual cancellation sequences are exhausted; or when the "Compacting Modules" operation was carried out.

The Second

If the sequence of Delete module or if Delete Last module were carried out, a submenu is shown; from which it's possible to select two **functions** by Clicking UP or DOWN:

First function

Click Jog (ENTER) to insert automatically the first free sensor position. This screen is displayed:

Second function

Click Jog (ENTER) to insert the sensor into last position cleared. This screen is displayed:

3. JOIN COMPLETATION

- NG-TH169 Sensor: press and release RESET, the display shows the indication 888

- NG-TH169 Sensor: wait until the display shows the indication 169; then within a time interval of 5 seconds, press and hold FUNC until the display shows the indication End, then release.

IF THE JOIN PROCEDURE SUCCESSFULLY ENDS:

- NG-TH169 Sensor: the LCD display shows the cycling temperature and humidity values.

- NG-W169 Gateway: the display shows the first **join menu** (after displaying quickly two transitory screens).

IF THE JOIN PROCEDURE FAILS:

- NG-TH169 Sensor: the LCD display lights off. It's possible to make a RESET operation for restarting a normal working without Radio-Frequency transmission, because the Join procedure failed.

- NG-W169 Gateway: the display continues to show the "waiting for join" menu:

NG-W169 GATEWAY

If an alarm signal starts or a sensor module doesn't work regularly, in the screen displaying the "fields", the color of the background changes in RED and the box corresponding to wrong module flashes, according to error codes reported below:

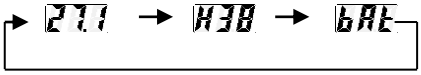
RF: Module RF Link Lost. *(Communication packet lost, impossible to receive the signal)*

BT: Module Battery Low.

SF: Sensor Fault.

NG-TH169 SENSOR

BT: Module Battery Low displayed in the sensor.
During the cycling visualization of the Temperature and Humidity values:



4. NG-TH169 SENSOR POSITION, FOR CORRECT MEASUREMENT AND RF COVERAGE

For a correct evaluation about the average Temperature and Humidity in the room, unless different needs from the user occur, follow the rules mentioned below.

Avoid positioning:

1. Near heating and cooling sources or heat (eg. sunlight).
2. Near openable windows.
3. Vertically, see the image.

Correct

Wrong

⚠ **ATTENTION!: continuous variations in temperature decrease the standard lifetime of the batteries.**

For a correct propagation of the radio signal, follow the rules mentioned below.

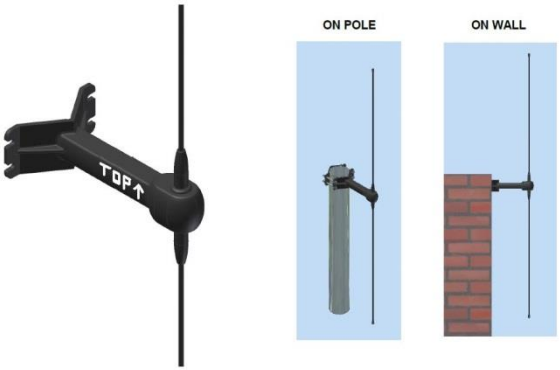
Avoid to position the sensor:

1. Inside metal containers.

⚠ **ATTENTION!: An improper installation degrades the radio signal and may decrease the standard lifetime of the batteries.**

5. NG-W169 GATEWAY POSITION, FOR CORRECT RF COVERAGE

For a correct propagation of the radio signal, follow the rules mentioned below. The presence of obstacles may cause a change in the antenna's nominal performance.



Dipole antenna MOUNTING INSTRUCTIONS

IMPORTANT NOTE:

As shown in the picture, locate the indication "TOP" with the arrow pointing upwards, for the correct direction of antenna installation.

Wall mounting: please use the dedicated seats for screws and fischer plugs for O5 mm holes.

Pole mounting: please use the provided dedicated bracket for a for a pole of O from
min. 40 mm (1.1/4 inch) to max. 60 mm (2 inch)

Avoid to position the antenna:

1. Inside metal containers.
2. Away from obstacles interfering with radio wave propagation.

ATTENTION! An improper installation degrades the radio signal and may decrease the standard lifetime battery.

6. RSSI VALUES (SIGNAL POWER vs POSITION)

- This test can be performed only after Joined the NG-W169 Gateway and NG-TH169 Sensor.

UTILITY

Through this test it's possible to display on LCD display of the NG-TH169 Sensor the RSSI value (Receive Signal Strength Indicator), precisely: the Input Power detected during the communication between the device NG-TH169 and the Gateway NG-W169 to which it's coupled (Joined).

HOW TO INTERPRET IT

The numeric value on the LCD Sensor display indicates the RSSI value without the sign " **–** " .

Values less than 70: it typically indicates a good level of signal.
Between 70 and 85: signal acceptable.
Near 95: signal poor.
Lo: absence of signal.

During the test, the communication is sent every 2 seconds; During each communication, the RSSI value is hold 1 second.

NG-TH169 SENSOR, HOW TO ENABLE IT

- In the NG-TH169 Sensor, insert the batteries if they are missing, then close the cover.

- Press and release the RESET button  : the display shows the indication  .

- Wait until the display shows the indication  ; then within a time interval of 5 seconds, press and release the FUNC button 

- The sensor begins the Test, by sending a communication every 2 seconds.

OPTION A): STOP THE TEST AND SWITCH OFF THE DEVICE

- On the NG-TH169 Sensor, Press and hold FUNC  until the display shows the indication  , then release.

OPTION B): STOP THE TEST AND KEEP THE DEVICE NORMALLY WORKING

- On the NG-TH169 Sensor, Press and release the RESET button 

NOTE:
Make use of the enclosed Table at Pag. 39 to annotate: Number of the sensor module for which the test was carried out; the RSSI value read; the indicator of the position at which the device was installed.

7. SIGNAL POWER vs POSITION TABLE

Insert here Gateway name			
N° Module	RSSI [dBm]	Luogo	Note

8. NG-TH169 SENSOR: SWITCHING OFF PROCEDURE

NG-TH169 SENSOR JOINED

If the NG-TH169 Sensor is Joined and the NG-W169 Gateway is Off; switch Off the NG-TH169 sensor to avoid eventual communications retries, with the advantage to avoid the battery consumption.

- Insert the batteries if it's necessary.
- Press and release the RESET button : the display shows the indication .
- Wait until the display shows the indication ; then within a time interval of 5 seconds, press and release the FUNC button
- The **Link Budget** test begins, a communication is sent every 2 seconds.
- To stop the test and switch Off the device: Press and hold FUNC until the display shows the indication , then release.

NG-TH169 SENSOR **NOT** JOINED

- First, make sure that NG-W169 Gateway IS NOT in Join modality.
- Insert the batteries if it's necessary.
- Press and release the RESET button : the display shows the indication .
- Wait until the display shows the indication ; then within a time interval of 5 seconds, press and hold FUNC button until the indication is displayed. Wait that the sensor switches Off.

9. NG-W169 MODBUS REGISTERS MAPPING

10.1 – Writing / Reading the ModBus Registers

Supported Functions: 03 - read holding registers; 06 - write single register; 16 - write multiple registers.

The "floating point" measures at 32 Bit (4 bytes) and 32 Bit "full", use together two consecutive ModBus registers; therefore it's necessary to read at the same time two ModBus registers, in order to read the value of a measurement.
The reading in this interval of an odd number of registers or an odd initial register will generate a response with error code ILLEGAL ADDRESS.

For the write operation of the registers, is supported the function 16 (write multiple registers).

The "ID" registers shown on the table is equivalent to DATA ADDRESS, 7000 corresponds to Holding Register 47001.

For the write operation of the registers, is supported the function 16 (write multiple registers).

10.2 – Registers map

The table on the next page shows all the registers map, with ID Register; Format; Contents.

CONFIGURATIONS			
ID	**Format**	**Contents**	**Note**
1123	U16 RW	Modbus Address from 1 to 247 **Default value: 1**	2,3
1124	U16 RW	Serial line speed 0= 9600 bps 1= 19200 bps 2= 38400 bps 3= 57600 bps **4= 115200 bps**	2,3
1125	U16 RW	RS485 Serial line Parity 0= none **1= even** 2= odd	2,3
1126	U16 RW	Stop bit serial line **0= 1 stop bit** 1= 2 stop bit	2,3
1127	U16 RW	Protection PIN against accidental writing 1..65535 settable value **Default value: 0**	2
1128	U16 RW	RF W-MBUS Channel 0..6 settable value **Default value: 2**	2
1344	CHAR[2] RO	Serial number, character 1 and 2 LSB character is on the left	5
1345	CHAR[2] RO	Serial number, character 3 and 4	5
1346	CHAR[2] RO	Serial number, character 5 and 6	5
1347	CHAR[2] RO	Serial number, character 7 and 8	5
1348	CHAR[2] RO	Serial number, character 9 and 10	5
1349	CHAR[2] RO	Serial number, character 11 and 12	5
1350	CHAR[2] RO	Serial number, character 13 and 14	5
1351	CHAR[2] RO	Serial number, character 15 and 16	5
1352	U16 R	FW (hex) Revision	

Special Registers, set only through WRITE SINGLE REGISTER (F06)			
ID	**Formato**	**Contenuto**	**Note**
0999	U16 WO	PIN protection setup (0000-9999) **Initial value 0000**	4
9735	U16 WO	Special registers enable **Value 4202** Write (it answers "Success" also if wrong)	5
9739	U16 WO	Remote restart	2
9740	U16 WO	Clear PIN	5

Structure of the sensors

This structure gives the necessary information to interpret how many and which sensors were joined on the gateway (N from 0 to 31).
They are shared in 4 areas:

1) Sensor Indexing Table
2) Measurements Table, reached by the "indexing table".
3) RSSI measurements Table, valid for the sensors active in the receiver
4) Status Table, valid for the sensors active in the receiver.

The Joined sensor modules are normally added with sequential numbering (the first joined is 0, the second 1, etc).

It's possible to "delete" a sensor module and add one in its place (even the same just deleted), provided that the new sensor has the same number of measures of which deleted. It will be also possible to group sensor modules, in case there are erased same module, so as to read the active measures contiguously by the Modbus master.

Table for Sensors indexing

The index table is organized in blocks of five registers, one block for each possible joinable sensor module on the gateway.

The first location of each block (register 5000 + N * 5), has this meaning:

- equal to 0: No sensor module joined; it is possible to stop the scanning of the index table.

- different from 0; The sensor module is present and is identified by "ID TYPE" code read (see the sensor specific manual for codification); it's necessary to continue the reading of the locations in the entire block, in order to interpret the information for the joined sensor. See the following table.

- It is 0xFFFF: Data of a valid sensor module aren't present (deleted module); then, ignore the current block and proceed to the next one.

The second and third location of each block (register 5001 and 2002 + N * 5), contains the unique ID Serial Number of the joined sensor.

The fourth location of each block (register 5003 + N * 5), contains the bits field of the 16 possible measure of a sensor; where the LSB corresponds to the first measure of the sensor.

The fifth location of each block (register 5004 + N*5), contains the 1st Measurement Register; Start of measurement registers; all the next measure register are stored in sequence.

16 bit Sensor descriptor			
ID	**Format**	**Content**	**Note**
Sensor 0			
5000	U16 RO	ID TYPE	7
5001	U16 RO	4 Byte ID Serial Number 1	
5002	U16 RO	4 Byte ID Serial Number 2	
5003	U16 RO	Active Measurement	6
5004	U16 RO	1° Measurement Register; Begin measurement registers.	
Sensor 1			
5005	U16 RO	ID TYPE	7
5006	U16 RO	4 Byte ID Serial Number 1	
5007	U16 RO	4 Byte ID Serial Number 2	
5008	U16 RO	Active Measurement Sensor 1	6
5009	U16 RO	1° Measurement Register; Begin measurement registers.	
Sensor N			
5000+N*5	U16 RO	ID TYPE	7
5000+N*6	U16 RO	4 Byte ID Serial Number 1	
5000+N*7	U16 RO	4 Byte ID Serial Number 2	
5000+N*8	U16 RO	Active Measurement Sensor N	6
5000+N*9	U16 RO	1° Measurement Register; Begin measurement registers.	
Sensor 31			
5155	U16 RO	ID TYPE	7
5156	U16 RO	4 Byte ID Serial Number 1	
5157	U16 RO	4 Byte ID Serial Number 2	
5158	U16 RO	Active Measurement Sensor 1	6
5159	U16 RO	1° Measurement Register; Begin measurement registers.	

32 bit Sensors instant Measures (depending by the joined sensor) *Example of Measures register with two Temperature and Humidity sensors joined.*			
ID	**Format**	**Content**	**Note**
7000	FP32 RO	Module 0 Measure 0 = Temperature 0	°C
7002	FP32 RO	Module 0 Measure 1 = Humidity 0	%Rh
7004	FP32 RO	Module 1 Measure 0 = Temperature 1	°C
7006	FP32 RO	Module 1 Measure 1 = Humidity 1	%Rh
…….			
Additional N Sensors (N from 0 to 31)			
7000+**N***4	FP32 RO	Module N Measure 0 = Temperature 0	°C
7000+**N***4+2	FP32 RO	Module N Measure 1 = Humidity 0	%Rh

16 bit RSSI Measures			
ID	**Format**	**Content**	**Note**
6000	S16 RO	Module 0: RSSI value	dBm
6001	S16 RO	Module 1: RSSI value	dBm
……..			
Additional N Sensors (N from 0 to 31)			
6000+**N**	S16 RO	Module **N**: RSSI value	dBm

16 bit Sensors Status			
ID	**Format**	**Content**	**Note**

6500	U16 RO	Module 0
		bit 0 = 1 RF Link Lost (over 45' with no signal)
		bit 1 = 1 Low Battery
		bit 2 = 1 Sensor Fault;
		bit 3 = 1 RF Module Anomaly;
		0x00 all FINE	

6506	U16 RO	Module 1	
……			
Additional N Sensors (N from 0 to 31)			
6500+**N***6	U16 RO	Module **N**	

NOTE:

1 - The registers of the calendar must be read or written simultaneously.

2 - Writing is protected if the PIN register (1127) is set to a value different from zero; in this case, before writing into the protected records, you must write the PIN value into the 999 register with the function 06, write single register.
Note: the PIN register cannot be read twice, once read, it goes back to zero.

3 - After modifying the registers, it is necessary to restart the instrument (see register 9739).

4 - See point 2.

5 - Writing allowed only after Special PIN writing in 9735.

6 - In N° OF ACTIVE MEASURES ON N SENSOR, the 16 bit represent the 16 available measures: if the corresponding bit is 1, the measure is active while, if it's 0, the measure it's inactive.

7 - Users and interrogation Software both must know the Measures Registers available see the specific manual sensors. Any attempt at writing a reading only register would give back 07 error.

Data Format

32 BIT FLOAT

The lower register contains the most significant part of the float number.

Format for Float IEEE number:

B3	B2	B1	B0
SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM

Encoding of Modbus registers:

Register A		Register A+1	
B3 (MSB)	B2	B1	B0 (LSB)

Example
The number 5000.0 is encoded into single-precision IEEE format as: 459C4000H

B3	B2	B1	B0
45H	9CH	40H	00H

The encoding in Modbus registers will then be

Register A		Register A+1	
45H	9CH	40H	00H
459CH (17820 decimal)		4000H (16384 decimal)	

INTEGER 32 BIT WITHOUT SIGN

Integer 32 bit number

12345678H will be encoded in the Modbus registers as follows:

Register A		Register A+1	
12 (MSB)	34	56	78 (LSB)

Energy Team S.p.A.
Via della Repubblica, 9, 20090 Trezzano sul Naviglio (MI)
P +39 02 40405033 – F. +39 02 48405035 - E info@energyteam.it - PEC
pec@pec.energyteam.it - W www.energyteam.it