Treetech®



GMP

Gas and Moisture Monitor

PRODUCT MANUAL

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1 Preface

1.1 Legal Information

The information contained in this document is subject to change without prior notice.

This document belongs to Treetech Tecnologia Ltda. and may not be copied, transferred to third parties, or used without express authorization, pursuant to Law 9.610/98.

1.1.1 Disclaimer

Treetech Tecnologia reserves the right to make changes without prior notice to all products, circuits, and functionalities described herein in order to improve their reliability, function, or design. Treetech Tecnologia assumes no liability arising from the application or use of any product or circuit described herein, nor does it convey any license or patent rights of its own or of third parties.

Treetech Tecnologia may hold patents or other types of registrations and intellectual property rights described in the content of this document. Possession of this document by any person or entity does not confer upon them any rights regarding these patents or registrations.

1.2 Presentation

This manual presents all recommendations and instructions for the installation, operation, and maintenance of the Gas and Moisture Monitor - GMP

1.3 Typographic Conventions

Throughout this text, the following typographic conventions have been adopted:

Bold: Symbols, terms, and words in bold carry greater contextual importance. Therefore, pay attention to these terms.

Italics: Foreign-language terms, alternatives, or terms used outside of a formal context are italicized.

Underline: References to external documents.

1.4 General and Safety Information

This section presents relevant aspects regarding the safety, installation, and maintenance of the GMP.

1.4.1 Safety symbols

This manual uses three types of risk classification, as shown below:



Caution:
This symbol is used to alert the user to a potentially hazardous operating or maintenance procedure that requires extra care during execution. Minor or moderate injuries may occur, as well as damage to the equipment.



Warning:
This symbol is used to alert the user to a potentially dangerous operating or maintenance procedure requiring extreme caution. Serious injury or death may occur. Potential equipment damage will be irreparable.



Risk of electric shock:
This symbol is used to alert the user to an operating or maintenance procedure that, if not strictly followed, could result in electric shock. Minor, moderate, or severe injury, or death, may occur.

1.4.2 General symbols

This manual uses the following general-purpose symbols:



Important
This symbol is used to highlight information.



Tips
This symbol represents instructions that facilitate the use of or access to functions in GMP.

1.4.3 Minimum recommended profile for the GMP operator and maintainer

The installation, maintenance, and operation of equipment in electrical substations require special care; therefore, all recommendations in this manual, applicable standards, safety procedures, safe work practices, and good judgment must be applied during all stages of handling the Gas and Moisture Monitor - GMP.



Only authorized and trained personnel, operators and maintenance staff, may handle this equipment.

To handle the GMP, the professional must:

1. Be trained and authorized to operate, ground, start, and shut down the GMP, following maintenance procedures in accordance with established safety practices, which are the sole responsibility of the GMP operator and maintainer;
2. Be trained in the use of PPE (Personal Protective Equipment), CPE (Collective Protective Equipment), and first aid;
3. Be trained in the operating principles and configuration of the GMP;
4. Follow regulatory recommendations regarding interventions on any type of equipment within an electric power system.

1.4.4 Environmental and voltage conditions required for installation and operation

The following table lists important information regarding environmental and voltage requirements.

Table 1 - Operating conditions

Condition	Range/description
Supply voltage	85...265 VAC/VDC
Application	Equipment for use in substations, industrial environments, and similar settings
Protection rating (IEC 60529)	IP67
Altitude* (EN IEC 61010-1)	Up to 2000 m
Supply voltage fluctuation (EN IEC 61010-1)	Up to ±10% of nominal voltage
Overvoltage (EN IEC 61010-1)	Category II
Temperature (EN IEC 61010-1)	
Operation	-40...+70 °C
Storage	-50...+85 °C
Relative humidity (EN IEC 61010-1)	
Operation	0...100 % - condensing or non-condensing
Storage	0...100 % - condensing or non-condensing
Pollution rating (EN IEC 61010-1)	Degree 3
Atmospheric pressure**	80...110 kPa

* Altitudes above 2,000 m already have successful applications.
** Pressures below 80 kPa already have successful applications.

1.4.5 Instructions for testing and installation

This manual must be available to those responsible for the installation and maintenance of the Gas and Moisture Monitor – GMP, as well as to its users.

To ensure user safety, equipment protection, and correct operation, the following minimum precautions must be observed during the installation and maintenance of the GMP.

1. Carefully read this manual before installing, operating, or maintaining the GMP. Errors in the installation, maintenance, or adjustment of the GMP can lead to false alarms or the failure to trigger necessary alarms, thereby resulting in a misunderstanding of the transformer's actual health and operating condition.

2. The installation, adjustments, and operation of the GMP must be performed by personnel trained and familiar with mineral or vegetable oil-insulated power transformers, control devices, and substation equipment control circuits.

3. Special attention must be paid to the installation of the GMP, including the cable type and gauge, installation location, and commissioning, including the correct parameterization of the equipment.



Prioritize installing the GMP in locations with high oil flow and the lowest possible temperature. Stagnant oil or poor circulation may compromise the quality of the sensor reading, while high temperatures will reduce its service life.



The GMP can be installed in an unsheltered environment (outdoor use), provided the temperature does not exceed the equipment's specified rating.

1.4.6 Instructions for cleaning and decontamination

Thanks to its IP67 protection rating, the GMP can be cleaned without concern. You can use a cloth with soap, water-diluted detergent, or even ethyl alcohol to clean the entire exterior of the device.



Turn off and unplug the equipment before cleaning any of its parts.

1.4.7 Instructions for inspection and maintenance

For GMP inspection and maintenance, the following points must be observed:

Do not open the equipment. It contains no user-serviceable parts. Servicing must be performed by Treetech technical support or by technicians accredited by the company.

This equipment is completely maintenance-free; however, the user may perform visual and operational inspections, whether periodic or otherwise. These inspections are not mandatory.

All parts for this equipment must be supplied by Treetech, or by one of its authorized suppliers, in accordance with its specifications. Should the user wish to acquire them from another source, they must strictly adhere to Treetech's specifications to ensure that the performance and safety of both the user and the equipment are not compromised. Failure to follow these specifications may expose the user and the equipment to unforeseen risks.

Opening the GMP at any time will void the product warranty. In cases of unauthorized opening, Treetech cannot guarantee proper operation, regardless of whether the warranty period has expired.

1.5 Customer Service

Are you already familiar with our online customer service platform?

CS

On the CS page, you'll find a quick and direct communication channel with our support team. Get your questions answered, resolve problems, and keep your Treetech product application up-to-date.

The Treetech knowledge base is also available, including catalogs, manuals, application notes, FAQs, and more.

In some cases, it will be necessary to send the equipment to Treetech's Technical Support department. Our Customer Service team will provide details on the entire procedure and the necessary contact information.

1.6 Warranty Statement

Treetech warrants the Gas and Moisture Monitor (GMP) for a period of two (2) years from the date of purchase, exclusively against manufacturing defects or quality flaws that render it unfit for regular use.

The warranty does not cover damage to the product resulting from accidents, abuse, improper handling, incorrect installation or application, inadequate testing, or the breaking of the warranty seal.

Any need for technical assistance must be reported to Treetech or its authorized representative, and the equipment must be presented along with the corresponding proof of purchase.

No warranty, express or implied, other than those cited above, is provided by Treetech. Treetech provides no warranty regarding the suitability of the GMP for a particular application.

The seller shall not be liable for any type of property damage or for any losses or damages arising from, connected with, or resulting from the acquisition of the equipment, its performance, or any service potentially provided in conjunction with the GMP.

Under no circumstances shall the Seller be held liable for damages incurred, including, but not limited to: loss of profits or revenue; inability to use the GMP or any associated equipment; costs of capital; costs of purchased energy; costs of substitute equipment, facilities, or services; downtime costs; or claims by the Buyer's customers or employees—regardless of whether such damages, claims, or losses are based on contract, warranty, negligence, tort, or any other legal theory. Under no circumstances shall the Seller be held liable for personal injury of any kind.

2 Introduction

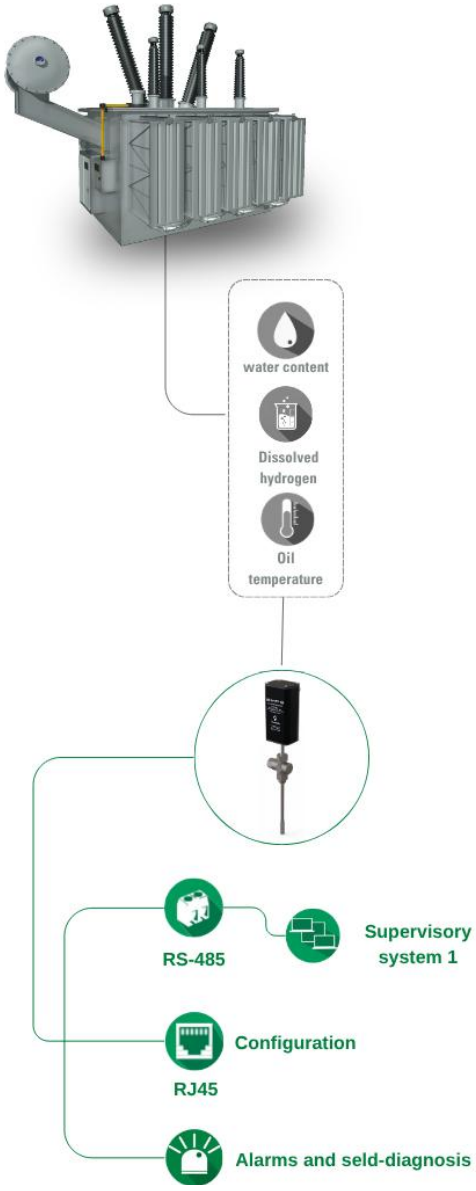


Figure 1 - System topology

The Gas and Moisture Monitor – GMP measures, in real time, the levels of hydrogen (H_2) and water (H_2O) dissolved in the oil of power transformers and reactors. For high- and extra-high-voltage assets, this continuous monitoring serves as a vital predictive diagnostic tool. Detecting anomalies at an early stage prevents serious operational and financial losses, such as severe equipment damage, revenue loss, contractual penalties, and reduced electrical system reliability.

Operational issues such as hot spots, partial discharges, or electric arcs cause the decomposition of oil and solid insulation (cellulose), generating combustible gases: H_2, CO, CO_2 and hydrocarbons (CH_4, C_2H_6, C_2H_4 and C_2H_2). Since hydrogen (H_2) is released across all fault temperature ranges, it serves as a universal indicator of defects. The GMP performs this online measurement with complete selectivity and without cross-interference, ensuring that H_2 readings are not masked by high concentrations of other gases, such as methane (CH_4).

Furthermore, the device monitors oil moisture via water content (absolute concentration) and relative saturation (the percentage of water relative to the fluid's solubility limit at the current temperature). This monitoring is crucial, as water reduces the medium's dielectric strength, can lead to dangerous bubble formation, and accelerates cellulose aging. Thus, the GMP protects the asset's insulation and ensures the immediate detection of thermal and electrical disturbances.

2.1 Features

COMPACT AND VERSATILE

- ✓ The GMP features compact dimensions, resulting in space and installation cost savings. It also utilizes a small-sized valve or threaded connection, increasing sensor installation options and facilitating optimal placement in areas with high oil flow.

ROBUST HARDWARE

- ✓ The GMP design exceeds EMC (Electromagnetic Compatibility) standards to withstand the harsh electromagnetic conditions of substations and an operating temperature range of -40 to 70°C. It also features IP67 protection, enabling it to withstand adverse outdoor installation conditions.

IED (Intelligent Electronic Device)

- ✓ Designed specifically for substation yard conditions (interference, extreme temperatures); capable of integration with supervisory or monitoring systems via the RS485 port (standard Modbus® RTU or DNP3).

NO MECHANICAL PARTS

- ✓ Complete absence of mechanical parts for parameterization and calibration.

2.2 Functions

H_2 AND H_2O MEASUREMENT AND INDICATION

- ✓ Performs real-time measurement and indication of dissolved hydrogen in the oil, its trend of evolution, and the time (in days) until alarm levels are reached. Additionally, the equipment indicates the relative saturation (%) and water content (ppm) in the oil.

H_2 AND H_2O CONCENTRATION INDICATION ALARMS

- ✓ High and very high-level alarms are issued for H_2 and H_2O concentrations. Alarms are also issued for the trends in the evolution of these values.

REAL-TIME OIL TEMPERATURE INDICATION

- ✓ Just like gas and moisture levels, oil temperature is also monitored and displayed in real time.

SELF-DIAGNOSIS

- ✓ The equipment features a system for detecting internal faults. This system enhances the reliability of measurements and associated controls.

OPEN COMMUNICATION

- ✓ An RS-485 port is available for communication with monitoring or supervisory systems. The communication protocols are open—Modbus® RTU and DNP3.

2.3 Basic Operating Philosophy

2.3.1 Periodic analysis of dissolved gas

Dissolved Gas Analysis (DGA) is recognized worldwide as an efficient tool for analyzing and diagnosing incipient faults in oil-immersed transformers and high-voltage equipment. It is also widely used by transformer manufacturers to evaluate product performance and by equipment users within preventive maintenance programs.

Despite this success, DGA is predominantly a laboratory-based method relying on a schedule of manual oil sampling from equipment, with the frequency determined by the equipment's relative importance and any suspected defects. Consequently, a fault involving rapid gas evolution might go undetected during an initial sampling and worsen significantly before the next sample is taken, or, in a worst-case scenario, lead to equipment failure before the subsequent analysis is performed.

In addition to the main drawback mentioned above, periodic DGA also carries the risk of error arising from failures in sample collection, transport to the laboratory, and the operation of analysis equipment, thereby requiring specialized personnel.

2.3.2 Continuous monitoring of dissolved gases in oil

As previously mentioned, Dissolved Gas Analysis (DGA) in oil is an indisputably important tool for diagnosing the condition of equipment immersed in insulating oil; performing it continuously further enhances the tool's value by eliminating the associated drawbacks. Obviously, continuous monitoring via oil sampling is neither practical nor financially viable when dozens or hundreds of pieces of equipment require supervision.

On the other hand, installing equipment to perform online measurement of all combustible gases present in the oil, as is done in the laboratory with periodic samples, is currently not yet financially viable for most applications. At first glance, this might lead one to believe that continuous dissolved gas monitoring is unfeasible, but that is not the case.

Studies conducted by various researchers have demonstrated that hydrogen is present, either alone or alongside other gases, in all processes involving the decomposition of insulating oil, thereby serving as a sort of “universal indicator” of faults. Continuous monitoring of this key gas makes it possible to detect any developing equipment problem at any time, although this measurement alone does not allow for an exact diagnosis of the issue.

Once a suspected equipment problem arises due to an increase in H_2 levels, it can be confirmed (or ruled out) and investigated in depth through laboratory analysis of oil samples. This eliminates the period during which the equipment remains unmonitored, and the timely identification of an incipient fault allows the user to plan the necessary steps to diagnose the issue and take corrective actions when required.

2.3.3 Methodology for online monitoring of dissolved gas in oil

Online monitoring of dissolved hydrogen, the key gas for detecting faults in oil-immersed equipment, fills the gap left by periodic DGA.

Treetech's GMP measures the H_2 concentration in the oil to continuously monitor the gas's evolution and detect increases indicating a possible fault in the high-voltage equipment.

2.3.3.1 Measurement of hydrogen concentration

The sensors used by the GMP to measure gas and humidity concentrations employ technology capable of eliminating cross-sensitivity to other combustible gases. Once powered up, the gas sensor must undergo a learning phase for H_2 measurement. This process takes a few minutes. Afterward, the GMP effectively begins measurement.

2.3.3.2 Representativeness of the measurement

For the entire process described above for measuring dissolved hydrogen to be effective for equipment diagnosis, the oil in contact with the GMP sensor (and consequently the hydrogen dissolved in it) must be representative of the transformer's overall condition.

The natural circulation of oil within the tank—driven by convection currents resulting from temperature differences between heat sources inside the equipment and heat dissipation points, such as radiators and sidewalls—contributes to this condition.

For this reason, the gas monitor should ideally be installed in a location with significant oil flow, such as one of the transformer's sidewalls or the radiator inlet/outlet piping. Scan the QR code below to view the possible installation locations for the GMP, listed in order of priority.

Installation points for the GMP

2.4 Intended use

The Gas and Moisture Monitor - GMP is a device used to monitor the presence of dissolved hydrogen gas and water in the insulating oil of power transformers and reactors, indicating their conservation statuses.

Monitoring these components makes it possible to detect and identify potential failures at an early stage, thereby preventing major damage to high- or extra-high-voltage equipment.

3 Design and Installation

3.1 Mechanical Installation

The Gas and Moisture Monitor (GMP) must be installed in locations such as radiator or heat exchanger piping, using a full-bore valve with a minimum diameter of 1/2” (ball or gate type). This allows the GMP probe to be inserted through the valve, positioning the sensor tip directly in the oil flow and avoiding measurements in stagnant oil. Valves that do not provide a full-bore opening, such as globe valves, must not be used.

If the sensor probe comes into direct contact with a very high-velocity oil flow, this may cause variations in temperature control and significant fluctuations in sensor readings.

The GMP features a 329.5 mm connection stem, with a free insertion length of approximately 261 mm reaching the oil flow. Therefore, the total distance from the valve tip to the interior of the pipe or tank must be less than 261 mm, as shown in the following figure, ensuring that the end of the stem reaches the active oil flow.

The GMP operating temperature limits of -40°C to +70°C must also be observed.

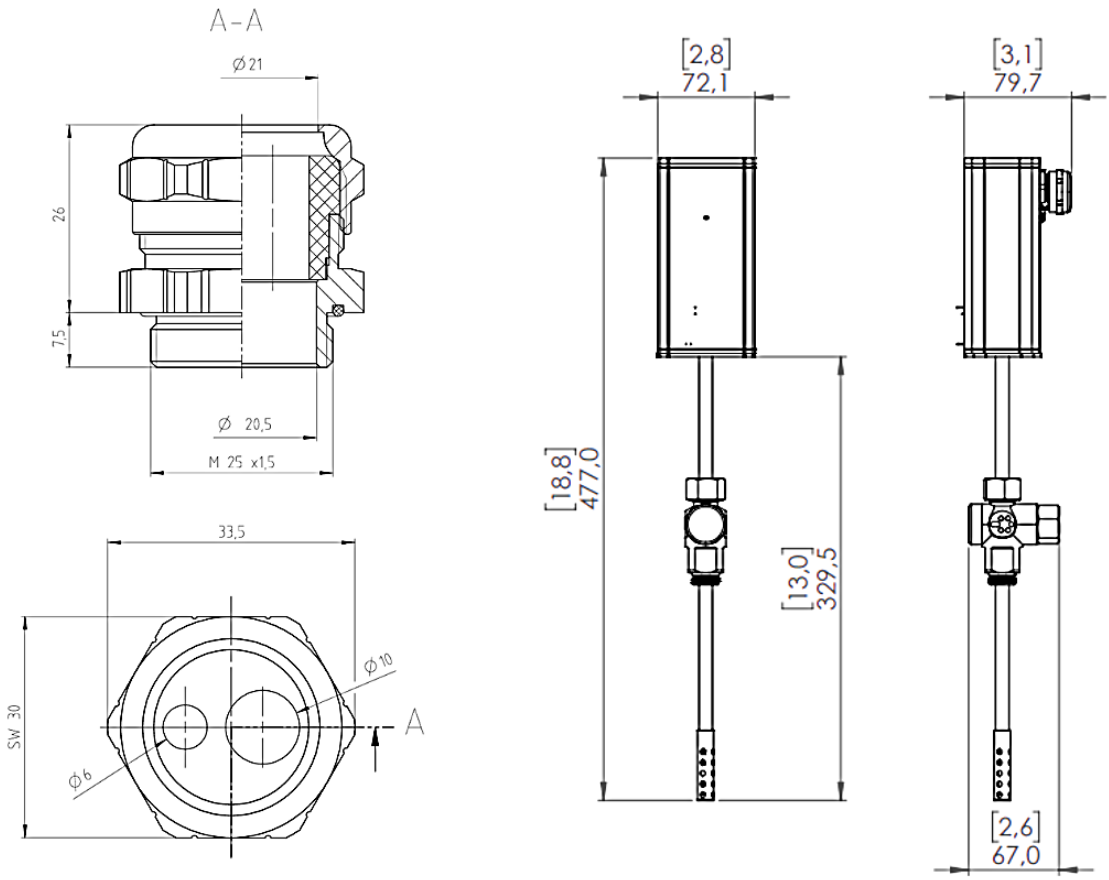


Figure 2 - Cable gland and GMP dimensions

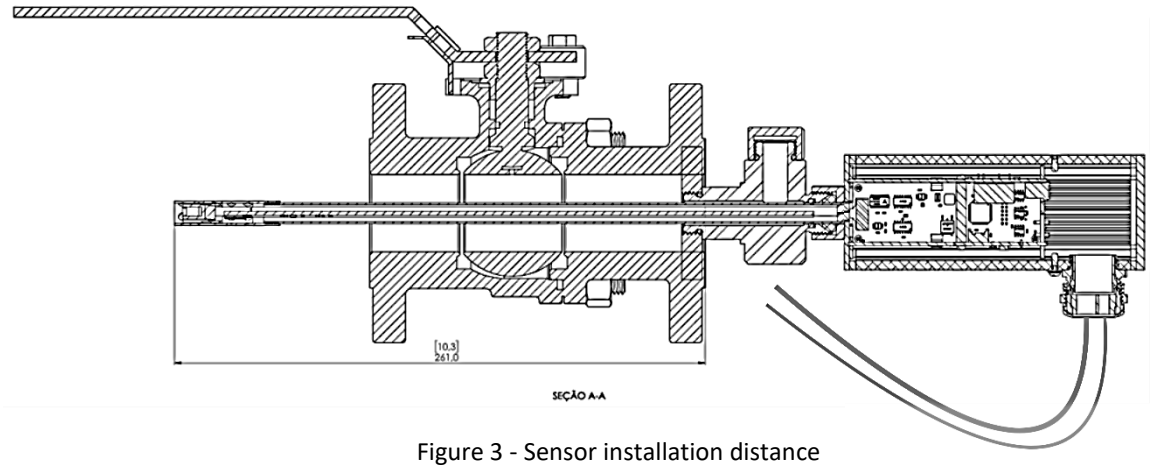


Figure 3 - Sensor installation distance

3.1.1 Mechanical installation procedure

A. The cable gland features an port that allows for the installation of an oil drainage connection. If you choose to use this port, begin the installation by connecting the valve, which must have a G ½" threaded connection, as shown in the drawing below. Otherwise, start the installation at item B.

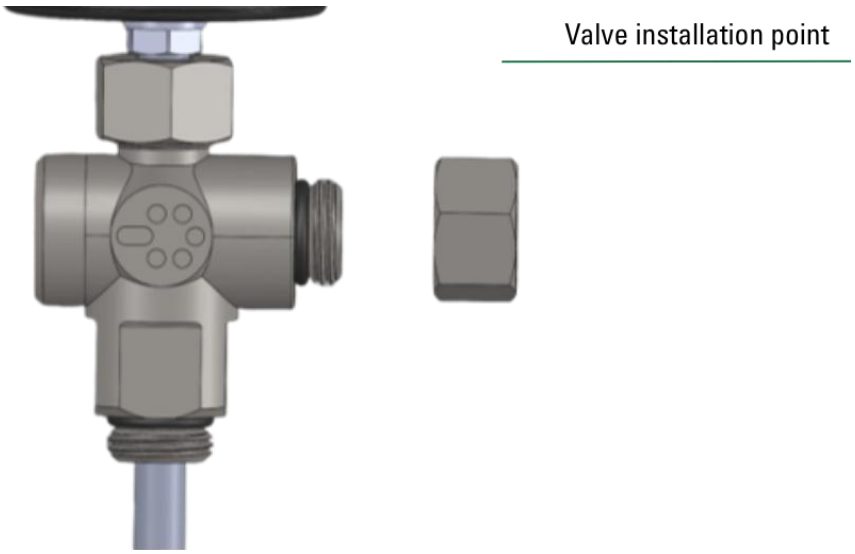


Figure 4 - Optional branch bushing

B. Remove the plastic cap protecting the end of the stem during transport.

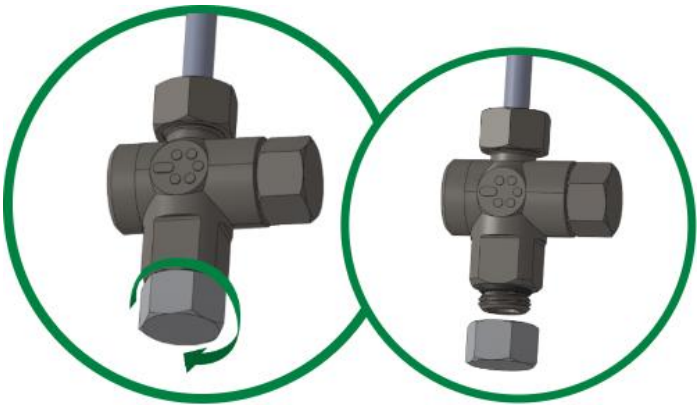


Figure 5 - Remove plastic cap

C. Loosen the nut (1) on the cable gland (2).

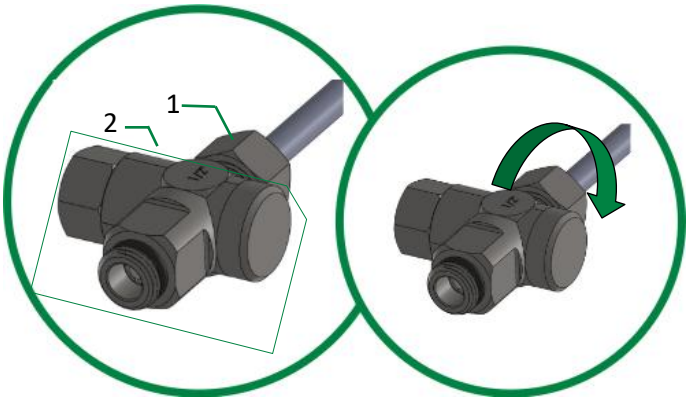


Figure 6 - Loosening the cable gland

D. Slide the mounting element (2) towards the lower end of the stem, as shown below.

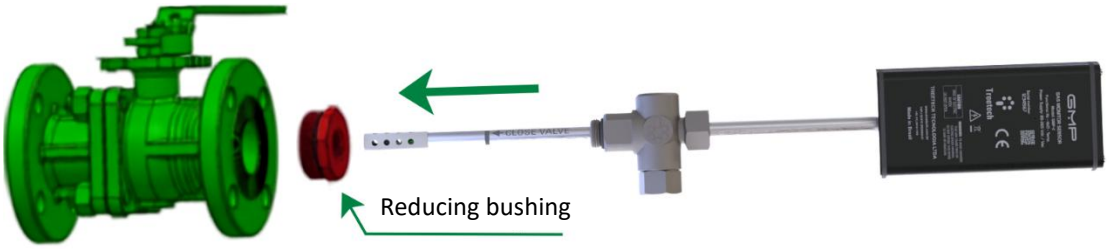


Figure 7 – Reducing bushing

Note: In most cases, it is necessary to use a ½" BSP **reducing bushing**. This item is not supplied with the product.

E. Using an adjustable wrench or a 1-inch open-end wrench, screw and tighten the cable gland (2) onto the transformer valve. The use of Teflon tape is not required, as the seal is provided by the equipment's O-ring.

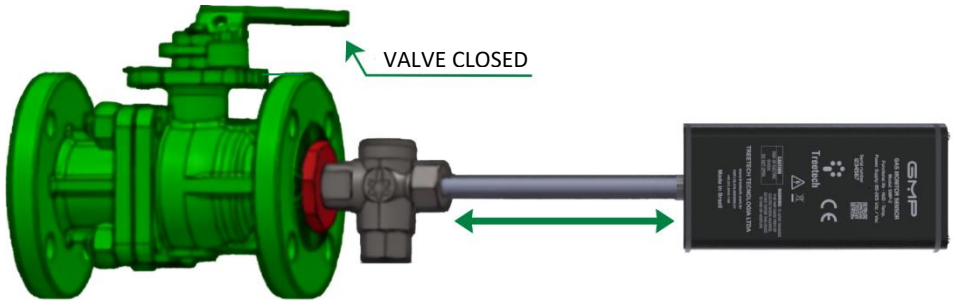


Figure 8 - Valve cable gland

F. Carefully open the valve and insert the stem, adjusting its position until the end of the stem's travel.

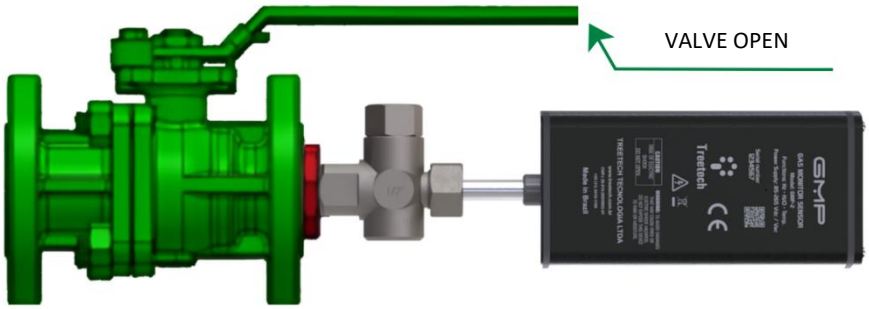


Figure 9 - Stem positioning

G. Using an adjustable wrench or a 1-inch open-end wrench, tighten the nut (1) onto the fastener cable gland (2), preventing the rod from shifting out of position.

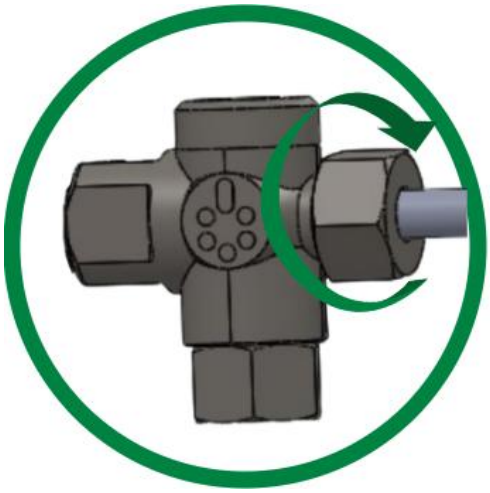


Figure 10 - Tightening the nut on the fastener or mounting element

3.1.2 Installation precautions

To ensure the product functions correctly and to preserve the integrity of the seal, avoid the following practices during the installation of the GMP:

A. Avoid sharp bends in the cable immediately as it exits the cable gland, as this can create gaps and compromise the equipment's seal. Ensure there is at least 15 cm of straight, unbent cable before the first bend.

B. In horizontal installations, do not position the cable gland facing upward. This orientation increases the risk of liquid ingress from dripping, as it allows liquids to run down the cables directly toward the equipment.

C. The distance between the body of the GMP and the locking nut must be at least 1 cm.

3.1.2.1 Correct installations

Examples of correct installations that follow these guidelines, ensuring a perfect seal, durability, and proper system operation.

The cable must exit perpendicular to the equipment body and follow the guidelines in item **A.**

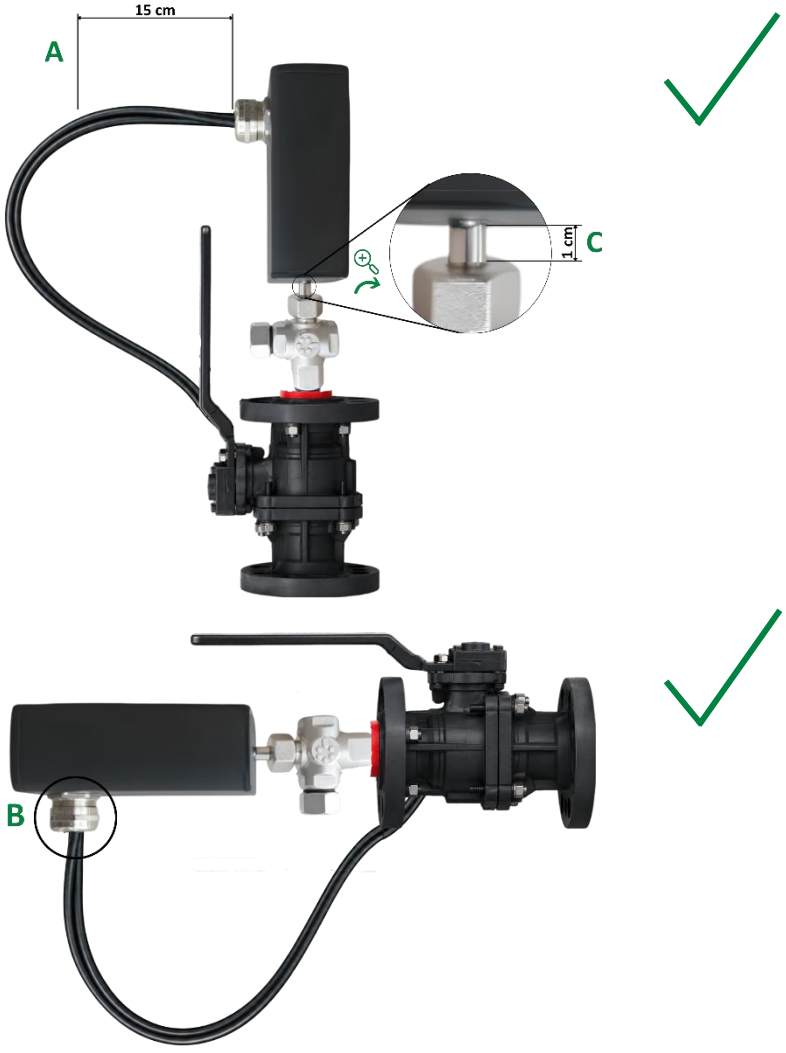
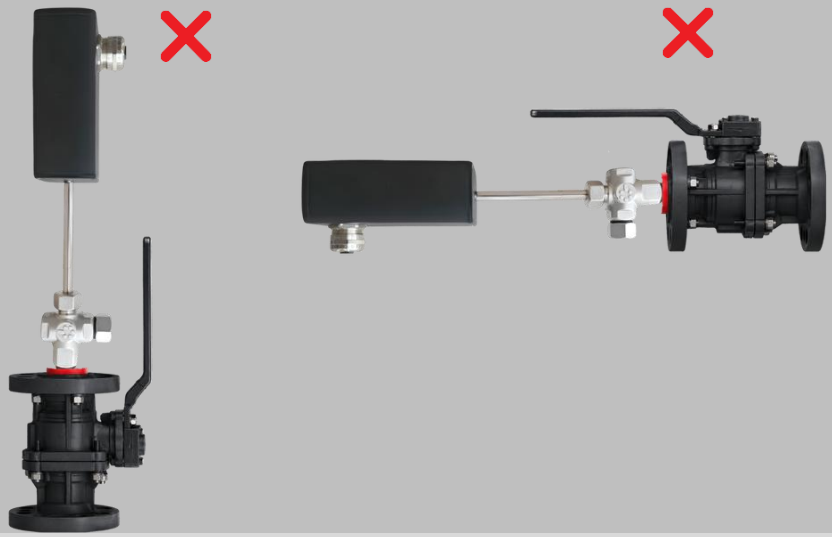


Figure 11 - Correct installations

3.1.2.2 Incorrect installations

Below, you can see some examples of incorrect installations:

Table 2 - Installation errors

Installation error	Examples
Sharp bend at the exit	
Stem not adjusted	
Cable gland orientation	

3.2 Electrical Installation

Certain special precautions must be followed for the design and installation of the GMP, as described below:



Study and understand the application in which you intend to use the GMP. Familiarize yourself with the GMP's functional, electrical, and configuration characteristics. This way, you will be able to make the most of the equipment and minimize safety risks.



This equipment operates at dangerous supply voltage levels, which may result in death or serious injury to the operator or maintenance personnel.



A circuit breaker must be installed immediately upstream of the power input (universal power supply – 85–265 VAC/VDC, ≤15 W, 50/60 Hz), which corresponds to pins 01 and 02 of the GMP.

The circuit breaker must have a number of poles corresponding to the number of phases used in the power supply; the poles must interrupt only the phases—never the neutral or ground—and provide thermal and electrical protection for the conductors supplying the equipment. It must be located near the equipment and be easily maneuverable by the operator.

Additionally, it must bear an indelible identification indicating that it is the GMP electrical disconnection device.



The following circuit breaker specification is recommended when used exclusively for the GMP:

- AC/DC supply, Phase-Neutral: Single-pole circuit breaker, 1 A ≤ In ≤ 2 A, curve B or C, standards NBR/IEC 60947-2, NBR/IEC 60898, or IEEE 1015-2006;
- AC/DC supply, Phase-Phase: Two-pole circuit breaker, 1 A ≤ In ≤ 2 A, curve B or C, standards NBR/IEC 60947-2, NBR/IEC 60898, or IEEE 1015-2006.



The minimum insulation for circuits connected to the GMP is 300 Vrms for auxiliary equipment and transducers, and 50 Vrms for self-powered equipment.

The minimum isolation is 1.7 kVrms for equipment powered at up to 300 Vrms, in accordance with IEC 61010-1.

These values refer to the intrinsic isolation of the devices connected to the GMP. Instances where this value does not apply to equipment or devices connected to the GMP will be explicitly stated in this manual.

3.2.1 Cable specification

Table 3 - Cable specification

Cable specification			
Function	**Cable specification**	**External diameter**	**Notes**
Power supply and grounding	3x2.5mm², HEPR 90°C insulation, 1 kV	10mm	The outer layer of the cable must have a cylindrical finish.
RS485	**Between two pieces of equipment or at the beginning of the network (Daisy chain):** 4x18 AWG, tinned copper (SN) braided shield, AFT, HEPR 90 °C insulation, 300 V. **At the end of the network:** 2x18 AWG, tinned copper (SN) braided shield, AFT, HEPR 90 °C insulation, 300 V.	6mm	The outer layer of the cable must have a cylindrical finish. For further installation information, refer to RS-485 Communication.

ATTENTION:
Using cables with the correct specifications is essential to ensure the integrity of the seal and the protection of the equipment.

To ensure proper sealing of the equipment, the cable gland features a specific hole for each GMP cable, as illustrated in the figure below:

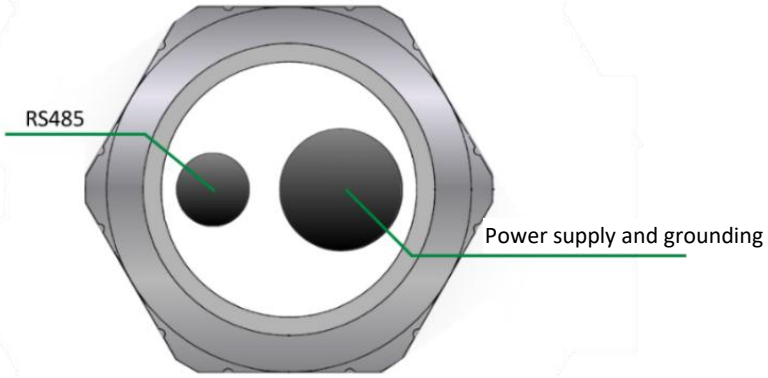


Figure 12 - Cable routing specification

Arrange the cables internally so that they do not block access to the RJ45 port. To do this, it is recommended to bend the cables, as shown in the example below:



Figure 13 - Internal curvature of the cables

3.2.2 Wiring diagram

The standard schematic diagram for the GMP connection shows all possible wiring options, identifying them as shown in the following figure.

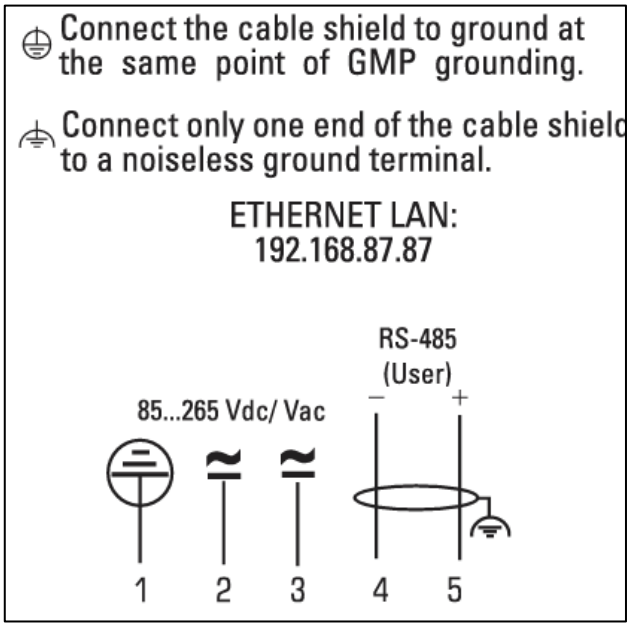


Figure 14 - GMP electrical wiring diagram

Special attention must be paid to the correct connection of components to the GMP at all stages of installation. Errors in connecting the equipment can pose risks or even cause irreversible injury to the operator. Damage resulting from incorrect use is not covered by the warranty.

3.2.3 Input and output terminals

The Gas and Moisture Monitor - GMP has the following inputs and outputs: ® Modbus®

Table 4 - GMP input terminals

Inputs	Terminals
Power Supply and Ground Power supply input 85 to 265 VAC/VDC, 50/60 Hz, ≤15 W.	— Ground 01 — DC/AC 02 — DC/AC
RS-485 Ports — Serial Communication Network with Monitoring or Supervisory System Connection to a monitoring or supervisory system using the Modbus® RTU or DNP3 protocol. Use shielded twisted-pair cable.	**RS-485** 03 — (-) 04 — (+)
RJ45 (Configuration) Configuration via HTTP Used primarily for configuring equipment parameters. This interface also allows for the viewing of measurements, as well as the collection and transmission of operational data.	**1 Ethernet**

3.2.4 Power supply and ground

The GMP features a universal power input (85 to 265 VAC/VDC, 50/60 Hz). Powering the GMP via the substation's auxiliary power supply is advisable, particularly when it is integrated into a communication network for data collection by supervisory or monitoring systems.

3.2.5 Communication ports

3.2.5.1 RS-485 Communication

The GMP can be connected to a data acquisition system (supervisory or monitoring system) or to other IEDs via RS-485 serial communication ports. Up to 31 devices can be interconnected on the same communication network. The communication protocols available for this connection are Modbus® RTU (master/slave) or DNP3 RTU (master/outstation).

The RS-485 serial communication network must be interconnected using a shielded twisted-pair cable, ensuring the shield remains continuous along the entire run. If intermediate terminal blocks are required for the serial communication connection, the cable shield must also be routed through a terminal to avoid breaking continuity. Any unshielded cable section resulting from a splice must be kept as short as possible, and it is recommended that the cable shield be grounded at only one end. The use of a 120 Ω termination resistor at each end of the serial communication network is recommended to attenuate signal reflections.

Along with termination resistors, pull-up and pull-down resistors must be used at only one point in the network. The 5 V DC supply for the pull-up and pull-down resistors can be provided internally by the data acquisition system or the IED. Note that some communication equipment may already have these resistors installed internally, eliminating the need for external resistors. The maximum distance of 1200 m between the ends of the communication network must be observed.

4 Operation

The equipment's operation involves a button to reset communication parameters to default, an LED indicating when the device is powered on, a serial communication port for configuration and monitoring via protocol, and a web interface for accessing all the device's functionalities.

4.1 Button Function

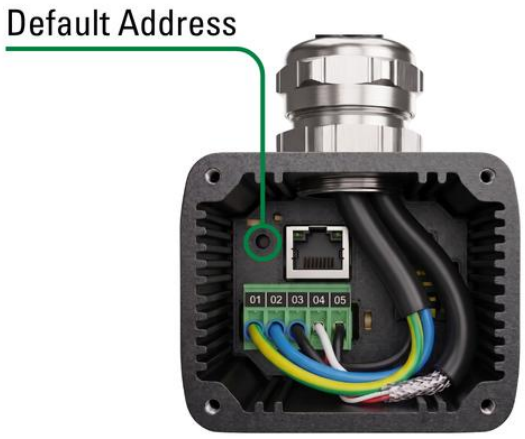


Figure 15 - Default Address button

The button on the front of the GMP performs an essential function by allowing quick access to the equipment's standard communication settings:

- ✓ Address: 247;
- ✓ Baud rate: 9600 bps;
- ✓ Protocol: Modbus® RTU;
- ✓ IP: 192.168.87.87.

4.2 LED

The equipment features an LED indicator that is essential for monitoring its operational status.

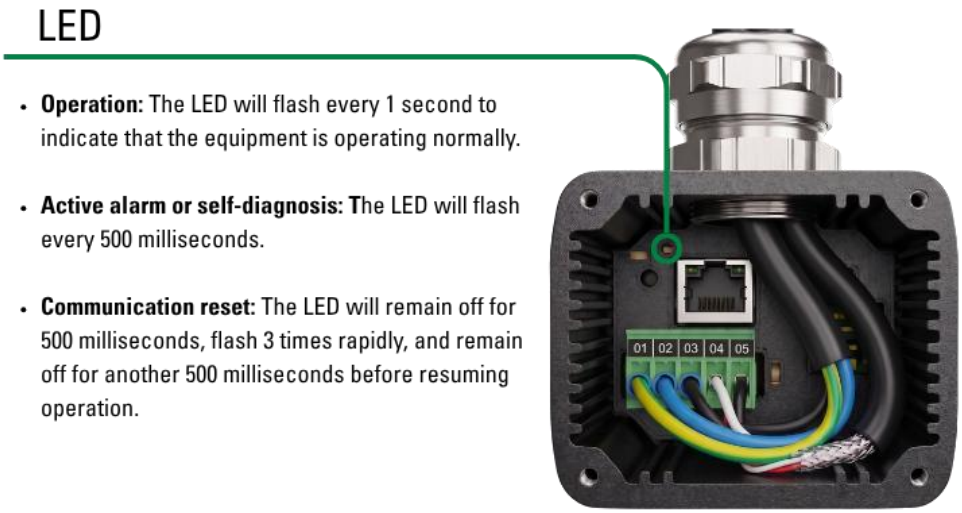


Figure 16 - LED operation

4.3 General Information about the Web Interface

The web interface of the Gas and Moisture Monitor - GMP provides access to all the equipment's features. Through it, users can access the Online, File Transfer, Parameterization, and About tabs, which provide information on measurements and product versioning, log downloads, and more.

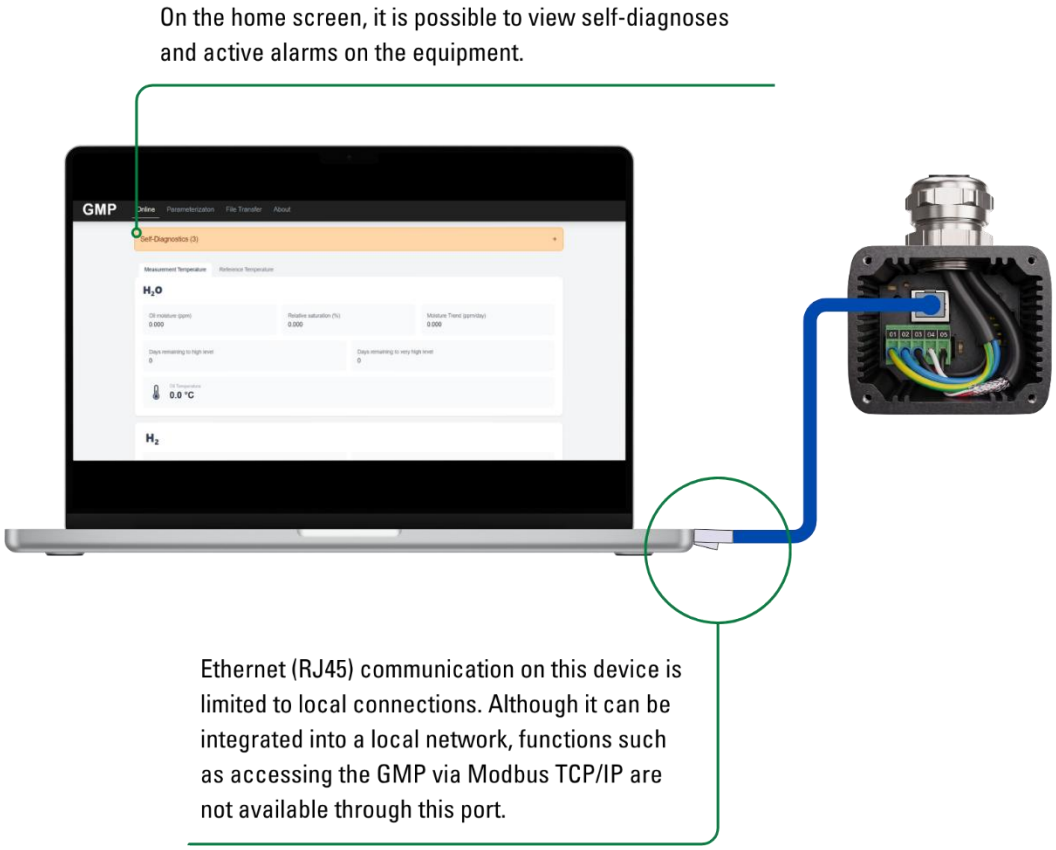


Figure 17 - General information about the web interface

4.3.1 Login

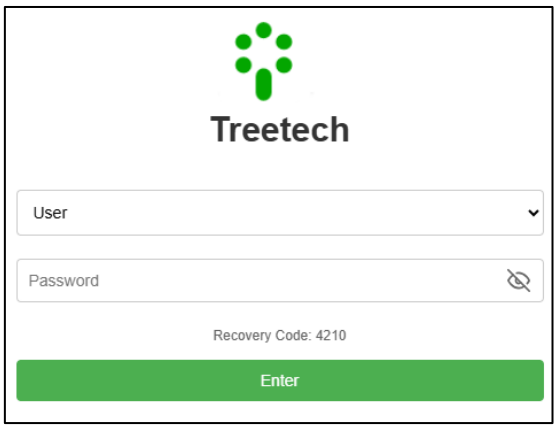


Figure 18 - Login screen

In order to promote greater security, to access the GMP parameterization tab, it is necessary to log in with your username and password.
For first access:

Profile: User
Password: 0

It can subsequently be changed by the user; a counter-password will be displayed above the “Enter” field.

4.3.2 File transfer

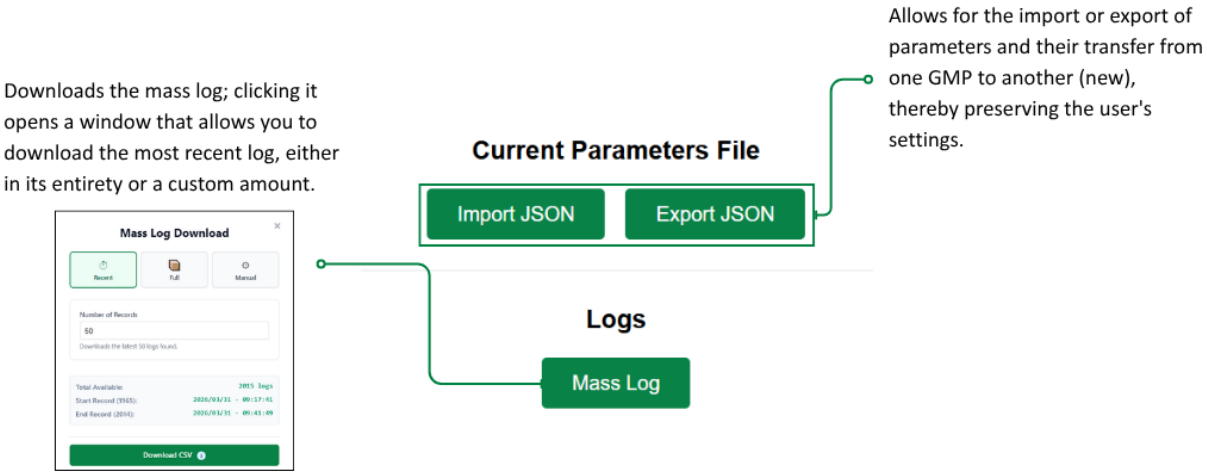
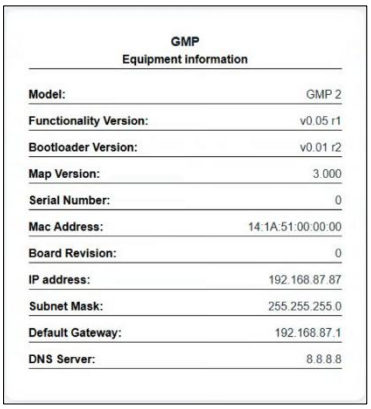


Figure 19 - "File transfer" section

4.3.3 About



GMP
Equipment information

Model:	GMP 2
Functionality Version:	v0.05 r1
Bootloader Version:	v0.01 r2
Map Version:	3.000
Serial Number:	0
Mac Address:	14:1A:51:00:00:00
Board Revision:	0
IP address:	192.168.87.87
Subnet Mask:	255.255.255.0
Default Gateway:	192.168.87.1
DNS Server:	8.8.8.8

Figure 20 - "About" screen

The "about" page contains useful information for the efficient use of the product, such as:

- ✓ IP address;
- ✓ Firmware versions;
- ✓ Protocol map version.

5 Parameterization

To ensure correct system operation, the Gas and Moisture Monitor (GMP) requires parameter adjustments, which provide the information necessary for its proper functioning and continuous monitoring. All adjustments and configurations are performed exclusively via the web interface. To access it, follow the steps below:

- ✓ Connect the GMP to the network via the parameterization port;
- ✓ Enter the device's IP address into any web browser; ensure the device used for access is connected to the same network as the GMP;
- ✓ Log in.

For the first access to the web interface, use the default IP: **192.168.87.87**

5.1 Acquisition and Analysis

5.1.1 "H2O Menu"

Parameter for selection index of the settling time of the cumulative moving average filter
Intensity of the filter applied to the H_2O concentration and oil temperature measurement.
Adjustment range:
0 = Very low
1 = Low
2 = Standard
3 = High
4 = Very high
5 = Filter disabled
Standard: 2

Parameters for solubility:
The following parameters represent the value of constant A for water solubility in oil. Typical values based on the oil type or values obtained from tests may be used. The final solubility value is derived by concatenating the parameters; thus, the "A1" value represents the ones and tenths digits, while the "A2" value represents the hundredths and subsequent decimal places. Example: A1 = 7.0 and A2 = 895 → Solubility = 7.0895.

Parameter for solubility constant A (unit + tenths)
Adjustment range: 10 to 99
Standard: 70

Parameter for complement of solubility constant A (hundredths)
Supplement to the previous parameter for determining the typical value.
Adjustment range: 0 to 999
Standard: 895

Parameter for solubility constant B

The value of B represents the water-in-oil solubility constant B. Like parameters “A1” and “A2,” it can be set to a typical value based on the oil type or to values obtained from tests.
Adjustment range: 0 to 9999
Standard: 1567

Parameter for reference temperature for conversion

This parameter represents the reference temperature used in the calculation of relative saturation converted to the reference temperature.
Adjustment range: -55 to 200°C
Standard: 25°C

Parameter for time constant used in the moving average filters for calculating the H_2O evolution trend

Time constant used in moving average filters for calculating the H_2O evolution trend.
Adjustment range: 1 to 720
Standard: 168

Parameter for hours for filter stabilization

Duration of the filter stabilization process for trend calculations.
Adjustment range: 4 to 48 h
Standard: 6h

5.1.2 “H2 Menu”

Parameter for time constant for calculating the H_2 evolution trend

Time constant used in moving average filters for calculating the H_2 evolution trend.
Adjustment range: 1 to 720
Standard: 168

Parameter for intensity of the H_2 moving average filter

Intensity of the filter applied to the H_2 concentration measurement**.**
Adjustment range:
0 = Very low
1 = Low
2 = Standard
3 = High
4 = Very high
5 = Filter disabled
Standard: 2

5.1.3 Alarms

In this field, the values related to hydrogen and moisture measurements are configured. These values may vary depending on the oil type, the manufacturer, and the application. When data is not provided by the manufacturer, certain standards offer reference values.

Indication of alarm values

Standardization of GMP H_2 and H_2O alarm levels: Treetech Tecnologia

5.1.3.1 "H2O Menu"

Parameter for trigger value of the alarm due to high water content
Adjustment range: 0 to 500 ppm
Standard: 25 ppm

Parameter for trigger value of the alarm due to very high water content
Adjustment range: 0 to 500 ppm
Standard: 35 ppm
Parameter for trigger value of the alarm due to high water content adjusted to 20°C
Adjustment range: 0 to 500 ppm
Standard: 20 ppm

Parameter for trigger value of the alarm due to very high water content adjusted to 20°C
Adjustment range: 0 to 500 ppm
Standard: 25 ppm

Parameter for trigger value of the alarm due to high relative water saturation
Adjustment range: 0 to 100%
Standard: 40%

Parameter for trigger value of the alarm due to very high relative water saturation
Adjustment range: 0 to 100%
Standard: 50%

Parameter for trigger value of the alarm due to trend in water content evolution
Adjustment range: 1 to 90 days
Standard: 14 days

Parameter for trigger value of the alarm due to H_2O evolution trend at 20 °C
Adjustment range: 1 to 90 days
Standard: 14 days

5.1.3.2 "H2 Menu"

Parameter for trigger value of the alarm due to high hydrogen concentration in the oil
Adjustment range: 30 to 5000 ppm
Standard: 200 ppm

Parameter for trigger value of the alarm due to very high hydrogen concentration in the oil
Adjustment range: 30 to 5000 ppm
Standard: 300 ppm

Parameter for trigger value of the alarm due to trend in H_2 levels
Adjustment range: 1 to 90 days
Standard: 14 days

5.1.3.3 "General Menu"

Parameter for hysteresis value to prevent alarms from being affected by small fluctuations in the variables
Adjustment range: 0 to 20%
Standard: 10%

5.2 Commands

5.2.1 "H2 Menu"

Command to reset the H2Sense sensor
Adjustment range: YES or NO
Standard: NO

5.2.2 "General Menu"

Command to reset the alarm memory
Adjustment range: YES or NO
Standard: Não

Command to reset the self-diagnosis memory
Adjustment range: YES or NO
Standard: NO

Command to restore user parameter defaults
Adjustment range: YES or NO
Standard: NO

5.2.3 "Communication Menu"

Command to restore default communication settings
Adjustment range: YES or NO
Standard: NO

Command to reset network settings to default values
Adjustment range: YES or NO
Standard: NO

5.2.4 “Mass Log Menu”

Command to reset the mass memory log
Adjustment range: YES or NO
Standard: NO

5.3 Communication

5.3.1 Serial communication port (RS485)

Parameter for user UART baud rate
Selects the transmission rate (baud rate) for the RS-485 serial communication port.
Adjustment range: 4800 / 9600 / 19200 / 38400 / 57600 / 115200 bps
Standard: 9600 bps

Parameter for protocol associated with the user UART
Selects the standard protocol to be used for communication with data acquisition systems.
Adjustment range: Modbus or DNP3
Standard: Modbus

Parameter for user UART address
Sets the GMP address on the RS-485 communication port for communication with data acquisition systems.
Adjustment range: 1 to 65519
Standard: 247

Note: The maximum limit **depends on the selected protocol**: 247 for Modbus and 65519 for DNP3.

Parameter for user UART end-of-reception detection interval
Parameter responsible for defining the data reception timeout, that is, the waiting time for receiving a data packet.
Adjustment range: 5 to 500 ms
Standard: 5 ms

Parameter for delay interval before user UART transmission
Parameter responsible for defining the data transmission wait time, that is, the waiting period between transmissions.
Adjustment range: 5 to 500 ms
Standard: 25 ms

5.3.2 Network

5.3.2.1 Parameter for IP address

Sets the device's IP address on the network, enabling its identification and communication with other devices.

Parameter for IP address – byte 0
Adjustment range: 0 to 255
Standard: 192

Parameter for IP address – byte 1
Adjustment range: 0 to 255
Standard: 168

Parameter for IP address – byte 2
Adjustment range: 0 to 255
Standard: 87

Parameter for IP address – byte 3
Adjustment range: 0 to 255
Standard: 87

5.3.2.2 Parameter for network mask

Configures the subnet mask, determining the range of IP addresses available for communication.

Parameter for network mask – byte 0
Adjustment range: 0 to 255
Standard: 255

Parameter for network mask – byte 1
Adjustment range: 0 to 255
Standard: 255

Parameter for network mask – byte 2
Adjustment range: 0 to 255
Standard: 255

Parameter for network mask – byte 3
Adjustment range: 0 to 255
Standard: 0

5.3.2.3 Parameter for gateway address

Specifies the address of the default gateway, which is responsible for forwarding packets to external networks.

Parameter for default gateway address – byte 0
Adjustment range: 0 to 255
Standard: 192

Parameter for default gateway address – byte 1
Adjustment range: 0 to 255
Standard: 168

Parameter for default gateway address – byte 2
Adjustment range: 0 to 255
Standard: 87

Parameter for default gateway address – byte 3
Adjustment range: 0 to 255
Standard: 1

5.3.2.4 Parameter for DNS server address

Sets the DNS server address used to translate domain names into IP addresses.

Parameter for DNS server address – byte 0
Adjustment range: 0 to 255
Standard: 8

Parameter for DNS server address – byte 1
Adjustment range: 0 to 255
Standard: 8

Parameter for DNS server address – byte 2
Adjustment range: 0 to 255
Standard: 8

Parameter for DNS server address – byte 3
Adjustment range: 0 toa 255
Standard: 8

5.4 System and Control

Allows configuring the system date and time to the UTC standard.

5.4.1 Manual date and time configuration

UTC Time – Year
Adjusts the year.
Adjustment range: 2000 to 2099
Standard: 2000

UTC Time – Month
Adjusts the month.
Adjustment range: 1 to 12
Standard: 1

UTC Time – Day
Adjusts the day.

Adjustment range: 1 to 31
Standard: 1

UTC Time – Hour
Adjusts the hour.
Adjustment range: 0 to 23 h
Standard: 0 h

UTC Time – Minute
Adjusts the minutes.
Adjustment range: 0 to 59 min
Standard: 0 min

UTC Time – Second
Adjusts the seconds.
Adjustment range: 0 to 59 s
Standard: 0 s

5.4.2 Time zone

Configures the time zone offset relative to UTC.
Time zone – Hours
Adjusts the time zone in hours.
Adjustment range: -12 to 12
Standard: -3

Time zone – Minutes
Adjusts the time zone in minutes.
Adjustment range: -59 to 59
Standard: 0

5.4.3 Mass log interval

Humidity percentage variation to consider a log event
Sets the Humidity percentage variation to consider a log event.
Adjustment range: 1 to 20%
Standard: 10%

H2 percentage variation to consider a log event
Sets the H2 percentage variation to consider a log event.
Adjustment range: 1 to 20%
Standard: 10%

Parameter for time interval for saving the mass log
Sets the interval for periodic saving of the mass log.
Adjustment range: 1 to 9999 min
Standard: 60 min

6 Commissioning for Entry into Service

Once the equipment has been installed in accordance with the instructions in this manual, commissioning must follow the basic steps below:

- ✓ Check the mechanical installations: verify that there are no leaks and that the connections are properly tightened;
- ✓ Using a multimeter, verify that the electrical connections are correct;
- ✓ Power up the equipment and observe whether the LED is flashing, as specified in chapter **4.2**;
- ✓ Using a computer, appropriate communication converters, and software (as applicable), check the operation of the GMP communication port according to the application used, and also verify the operation of the RJ45 port.

7 Troubleshooting

Troubleshooting the Gas and Moisture Monitor - GMP involves identifying and resolving issues related to communication and network configuration.

If, after these checks, the problem persists and cannot be resolved internally, it is recommended to contact Treetech's Customer Service (CS). The Customer Service team is equipped to handle technical issues related to the GMP and provide additional support for resolving more complex problems.

It is important to emphasize the need to follow the manufacturer's guidelines and utilize the available support resources. By relying on Treetech's Customer Service, you can obtain specialized assistance and ensure an efficient troubleshooting process for the GMP, thereby minimizing downtime and maintaining the proper operation of the communication system.

7.1 Viewing Self-diagnosis Memory and Alarm Memory

To view the self-diagnosis and alarm memory, it is necessary to consult the map for the protocol being used. This option provides details on which errors were triggered and whether they are still active.

7.2 Self-diagnosis

Table 5 - Self-diagnosis

Self-diagnosis	Recommended solution
External Flash write error	Contact Treetech technical support
External Flash read error	
Humidity sensor error (HIH8131)	
Internal temperature too high	
Internal temperature sensor failure	
RTC oscillator stopped working	
Communication error with H2Sense	
H2Sense not ready to report data	
Unrecoverable H2Sense error	
H2 measurement error	
H2Sense temperature measurement error	
Heating above expected levels (H2Sense)	
Pressure sensor error (H2Sense)	

8 Technical Data

Table 6 - Technical data

Hardware	Range/description
Supply voltage	85...265 VAC/VDC
Frequency	50/60 Hz
Maximum consumption	<15 W
Operating temperature	-40...70 °C
Protection rating	IP67
Hydrogen measurement	
Measurement range	30...5000 ppm
Maximum error	± 20% of the reading or ±20 ppm, whichever is greater
Water saturation percentage measurement	
Measurement range	0...100% water saturation
Maximum error	± 3% water saturation
Temperature measurement	
Measurement range	-40...125 °C
Maximum error at 20°C	± 0.2 °C of full scale
Communication interface	
Communication protocols	DNP3 Modbus® RTU
Serial communication ports	1 RS-485 (based on the TIA-485-A standard)
Service port (parameterization)	RJ45: 1 Ethernet RJ45 (10/100BASE-T)
Dimensions and weight	
Dimensions	477.0 mm x 79.7 mm x 72.1 mm
Weight	1.0 kg

9 Order Specification

1. Product name

- Gas and Moisture Monitor – GMP.

2. Quantity

- Number of units to be purchased.

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