



GRIDSCAN 6200

High-Precision Monitoring for Transformers with Continuous Measurement of Hydrogen, Humidity, Pressure, and Temperature

Manual

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INTRODUCTION

The **GRIDSCAN 6200**, is a state-of-the-art monitor that **integrates multiple sensors** into a single device, enabling **advanced predictive diagnostics, continuous monitoring** and real-time evaluation of the condition of electrical transformers and other liquid-insulated equipment.

With its patented solid-state technology, the GRIDSCAN 6200 continuously monitors **hydrogen (H₂), humidity, temperature, and insulating liquid pressure**, and is compatible with different classes of transformers and other fluid-filled devices. This information provides a comprehensive view of the condition of the equipment, contributing to the **early detection of failures** and more assertive decision-making by maintenance teams.

Hydrogen is usually the first gas produced under abnormal operating conditions of a transformer and also one of the first gases to escape from the equipment. In this way, the early detection of H₂ generation allows the identification of possible failure conditions before they evolve into more serious events, enabling maintenance teams to act preventively. Once the presence of hydrogen is identified, operators can confirm and deepen the diagnosis through DGA (**Dissolved Gas Analysis**).

Through a **digital interface**, the GRIDSCAN 6200 makes monitoring data available continuously, allowing you to follow the evolution of the main parameters of the insulating liquid and determine the **health of the transformer in real time**. This capability transforms the data collected into essential information for **predictive maintenance** strategies, risk reduction, and increased asset availability.

Another differentiator is **H2scan's patented self-calibration technology**, developed to maintain the accuracy of hydrogen measurements during years of continuous operation, **eliminating the need for periodic sensor calibrations** and contributing to a significant reduction in operating costs (**OPEX**) and maintenance interventions.

The **GRIDSCAN 6200** can also be integrated into **the MONITRAFO ecosystem** via the **EHMI** equipment, allowing the data collected by the monitor to be continuously sent to the platform. This integration enables **24/7 remote monitoring** of parameters such as hydrogen, humidity, temperature, and pressure, centralizing information in a single environment and allowing real-time monitoring of transformer condition. The solution also makes it possible to **configure alerts and notifications**, allowing operation and maintenance teams to be quickly informed of changes or abnormal conditions, contributing to a more preventive action and reducing the risks of unexpected failures.

In this way, the **GRIDSCAN 6200 + Monitrafo** offers a complete solution for **continuous monitoring, early fault detection and predictive diagnosis**, helping operation and maintenance teams to increase the reliability, safety and service life of transformers.

TECHNICAL DATA OPERATING CONDITIONS

Parameter	Minimum	Nominal	Maximum	Units
Environment – Insulating Liquid				
Temperature (operating)	-40		105	°C
Temperature (Survival)	-40		135	°C
Pressure (operating)	0.7 (10.2)	1.0 (14.7)	2.0 (29.0)	Absolute bar (psia)
Pressure (Survival)	0.1 (1.5)		3.0 (43.5)	Absolute bar (psia)
Insulating Liquid Supported	Mineral oil, silicone, natural ester, synthetic ester			
Environment – Environment				
Operating Temperature	-40	25	70	°C
Storage Temperature	-40		85	°C
Ingress Protection	IP68; 25’ water for 14 days (IEC 60529)			
Corrosion resistance	Maritime classification; salt water condensation (IEC 60068-2-11 & DIN EN ISO 12944)			
Operating altitude	Up to 3000 m above sea level			
Mechanical				
Vibration	Three-axis sinusoidal, wideband, and random (IEC 60068-2-6 table C.2, IEC 60068-2-64 paragraph A.2, category No. 2, IEC 61373:2010 Cat 1B section 9)			
Shock	30 g, shock duration 18 ms (IEC 60068-2-27)			
Weight	2.1 lb (0.95 kg) (0.95 kg)			
Electric				
Voltage input	12		24	VDC
Power Consumption (for GS6K without pump)	2,5		10	W

Table 1 – Operating Conditions

TECHNICAL DATA HYDROGEN MEASUREMENT

PARAMETER	VALUE
Measuring range	25–5000 ppm
*Response Time, T90	<60 minutes
Accuracy	±20% of reading or ±25 ppm, whichever is greater
Repeatability	±10% of reading or ±15 ppm, whichever is greater
Cross-sensitivity	Less than 2% cross-sensitivity to other gases (CO, CO ₂ , hydrocarbons)

Note: Once hydrogen reaches the sensor, the sensor will respond in 60 minutes or less.

Table 2 – Hydrogen measurement specification

TECHNICAL DATA HUMIDITY AND TEMPERATURE MEASUREMENT

ATTRIBUTE	SPECIFICATION
Measuring range (water activity)	0–95 %RS
Temperature accuracy at 20°C (68°F)	±2.5 °C (0.9 °F)
Long-term drift	0.2% SR per typical year
Lower limit of detection	2 ppm
Accuracy	±2% RS to <20% RS ±8% RS to 20–50% RS

NOTE: % of relative water saturation is the activity of water multiplied by 100.

Table 3 – Humidity and Temperature measurement specification

TECHNICAL DATA PRESSURE MEASUREMENT

ATTRIBUTE	SPECIFICATION
Measuring range	0.014-2 bar absolute (0.2-30 psia)
Overpressure	4 bar absolute (60 psia)
Burst Pressure	6 bar absolute (90 psia)
Temperature compensated range	0–70 °C (32–158 °F)
Static Accuracy (In Compensated Range)	±2%FSO
Repeatability	0.1 %FSO typical

Table 4 – Pressure measurement specification

ROBUSTNESS AND OPERATION IN EXTREME ENVIRONMENTS

- **Operating temperature:** -40°C to 70°C
- **Submersion resistance:** IP68 (immersion in water up to **7.6 meters for 14 days**)
- **Compatible with insulating oils:** mineral, silicone, natural ester and synthetic
- **Marine resistance:** IEC 60068-2-11 compliant (salt spray)
- **Operating pressure at sensor:** 0.9 to 2 bar absolute (1.45 to 30 psi)
- **Operating altitude:** up to 3000 meters above sea level

COMMUNICATION AND INTEGRATION

- **Output Protocol:** RS-485, Modbus RTU, DNP3
- **EHMI and SCADA compatible**
- **Dynamic data storage**
- **Flexible connectivity:** choice of wired or wireless communication

MECHANICAL AND ELECTRICAL SPECIFICATIONS

- **Dimensions:** 7.6" x 3.5" x 3.2" (19.4 x 8.8 x 8.0 cm)
- **Weight:** 0.95 kg (2.1 lb)
- **Supply voltage:** 12 to 30 VDC
- **Maximum consumption:** 12W

GETTING TO KNOW THE GDSCAN 6200

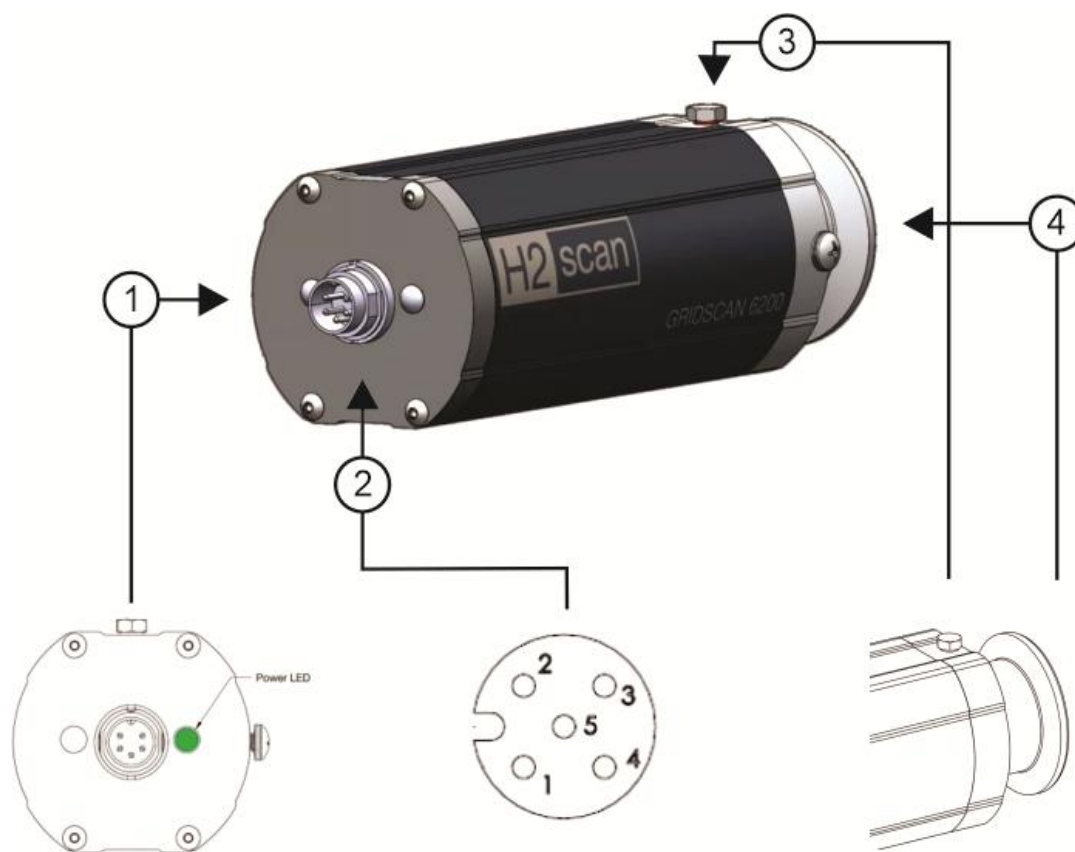


Figure 1 – Getting to know the GDSCAN 6200

1. LED for power on status indication
2. Electrical Connections
3. Bleed Valve
4. Oil Flow

DIMENSIONS

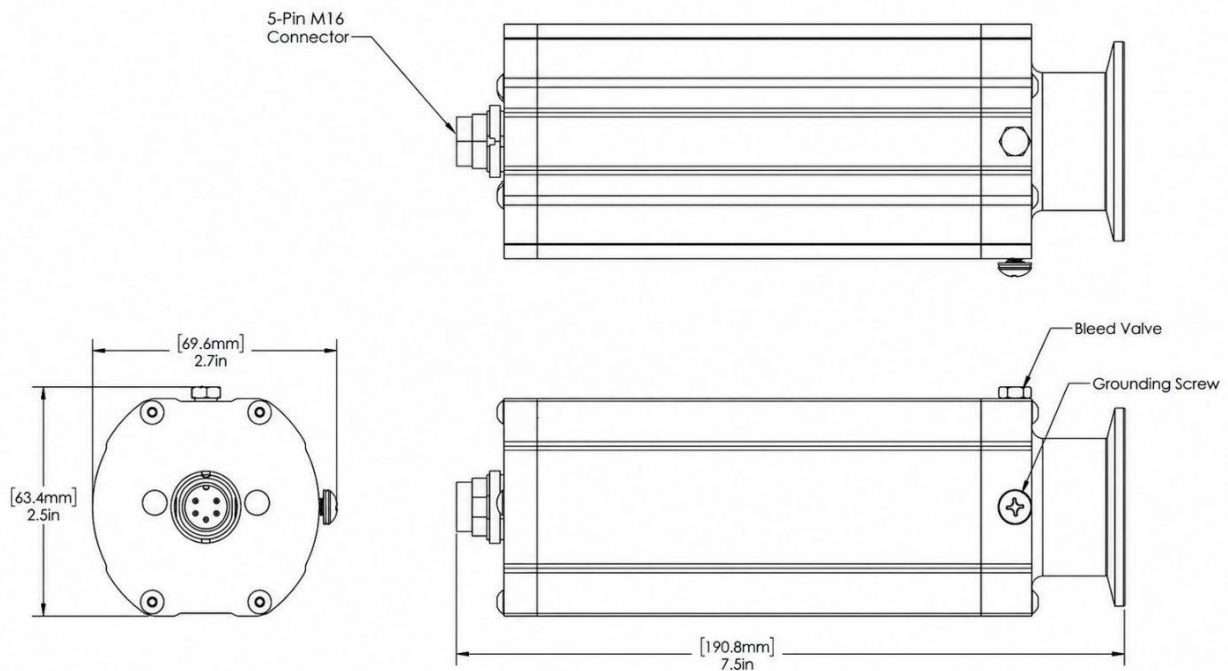


Figure 2 – Dimensions

INSTALLATION RECOMMENDATION

The most convenient location on the transformer may not be conducive to optimal monitor performance. Avoid areas of stagnant oil flow if possible. Install oil-calibrated monitors horizontally. Install horizontally or vertically gas-calibrated monitors.

Do not install the GRIDSCAN® 6200 in a location with turbulent liquid flow.

When selecting a site, consider how the following variables affect the time it takes for hydrogen to reach the GRIDSCAN® 6200:

- **Tube length (recommended no more than 6" from valve)**
- **Valve/Tube Diameter**
- **Valve type (gate or ball valve recommended)**
- **Liquid flow near the installation site**
- **Liquid temperature (the hotter liquid will absorb higher concentrations of hydrogen)**

TYPICAL INSTALLATION LOCATIONS

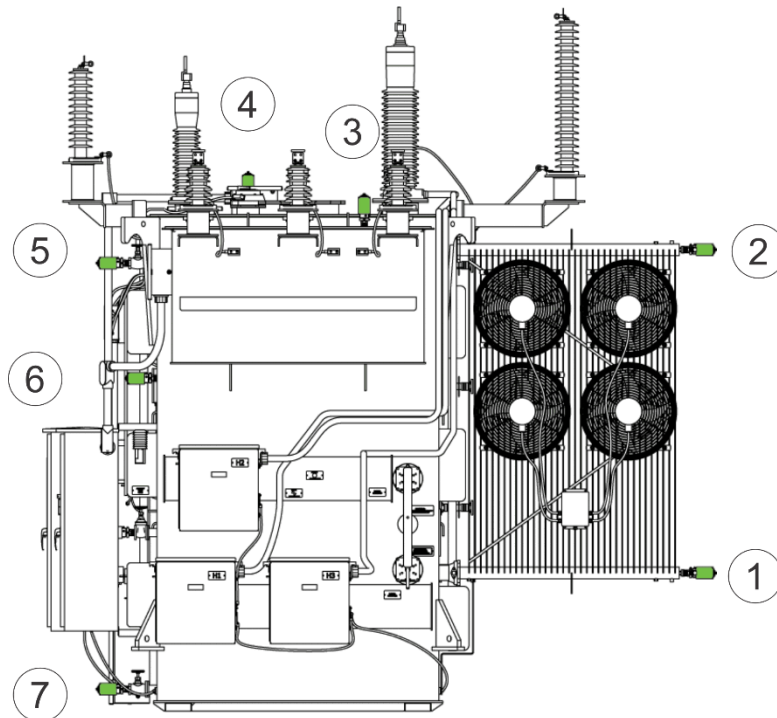


Figure 3 – Typical Installation Locations

Note: When installed in liquid, the monitor should be mounted horizontally, as illustrated in Figure 3. Vertical or horizontal mounting is acceptable in a gas-only location.

TYPICAL VALVE INSTALLATION IN LIQUID

1. Make sure the valve in the chosen location is fully closed.
2. Remove any plugs that may be installed and make sure the threads are clean.
3. Apply Teflon tape or a suitable thread sealant to the threads of the flange adapter.

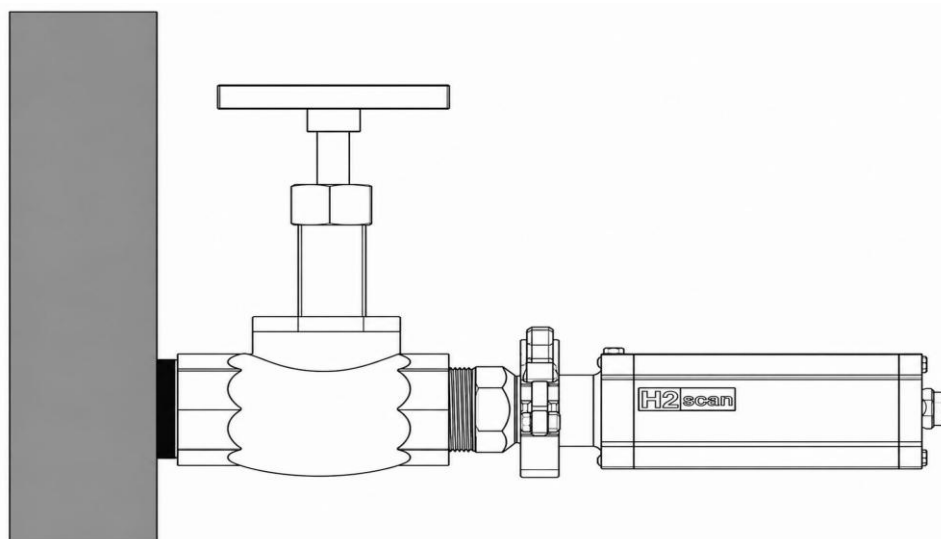


Figure 4 – Typical Installation Locations

4. Firmly insert and tighten the adapter to the transformer valve.
5. Remove the protective cover from the GRIDSCAN 6200.
6. Insert the gasket between the flange adapter and the monitor.
7. Place the KF-40 clamp over the adapter and monitor flanges.
8. Align the unit vertically before tightening the clamp with the included wrench. The clamp screw should slope upwards from below and be secured in the groove above the clamp. Make sure the washer is secured under the nut at the top of the clamp and that the nut is fully tightened.

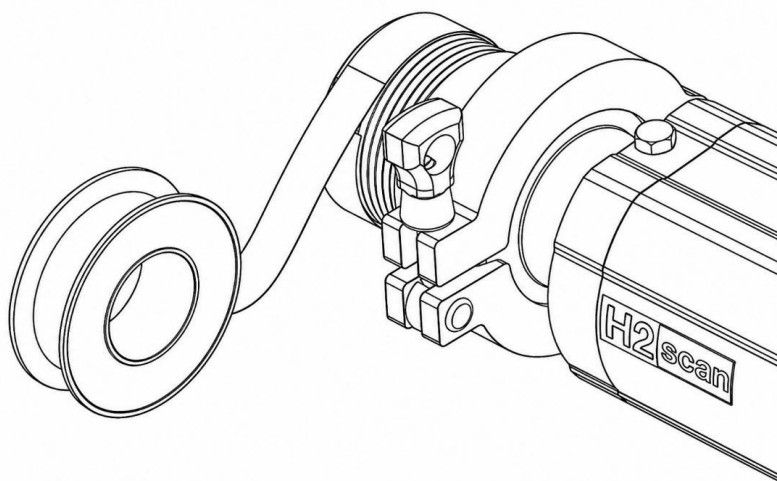


Figure 5. Flange Adapter

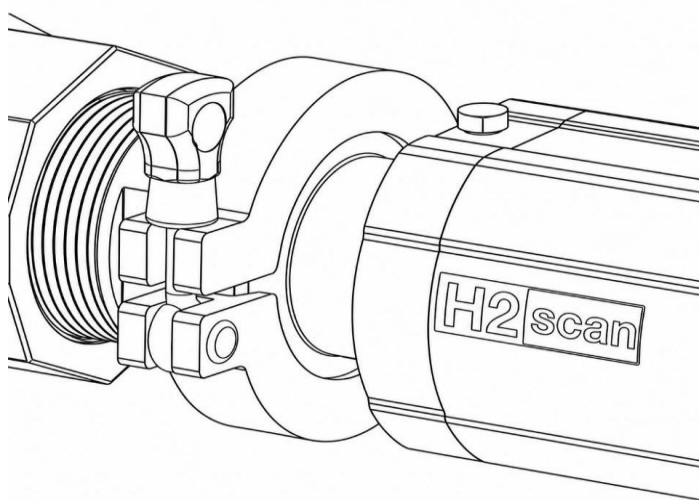


Figure 6. Flange Adapter

AIR BLEEDING AFTER INSTALLATION

The GRIDSCAN 6200 has an integrated bleed valve. Once the GRIDSCAN is installed on the valve, any air trapped in the assembly should be removed by following the steps below.

1. Make sure all connections are tightly closed and all threads are sealed, either with Teflon tape or with a sealant suitable for pipe threading.
2. Make sure all valves and plugs are initially closed.
3. Place a suitable container under the GRIDSCAN 6200 to capture any liquid.
4. Remove the screw from the bleed valve by turning it counterclockwise to expose the hole.
5. Slowly open the transformer valve just enough to see a small stream of liquid coming out of the hole in the bleed valve.

WARNING

Fluid can quickly come out of the bleeding hole. Be prepared to close the transformer valve immediately.

6. When there is no air in the stream, close the transformer valve and reinstall the screw.
7. Fully open the transformer valve and check for leaks.

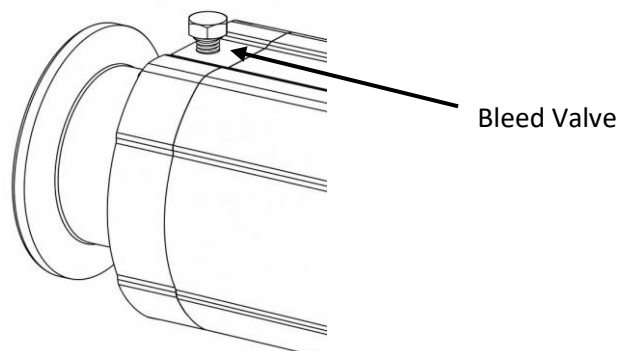


Figure 7. Bleed Valve

 WARNING

Do not completely remove the bleed screw or a geyser will happen.

CONNECTION DIAGRAM

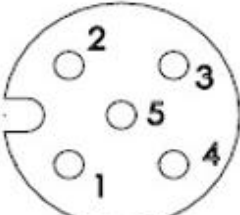
	INPUT	SIGNAL NAME	WIRE COLOR.
	1	DC Power 12-48 Vdc	Brown
	2	Grounding DC 12-48 Vdc	White
	3	RS-485 Terra	Gray
	4	RS-485 Data+	Blue
	5	RS-485 Data-	Black

Table 5 – Connection Diagram

All electrical connections to the GRIDSCAN® 6200 are supplied via a single five-pin M16 connector. The key location (notch) and pin numbers are shown in the table below:

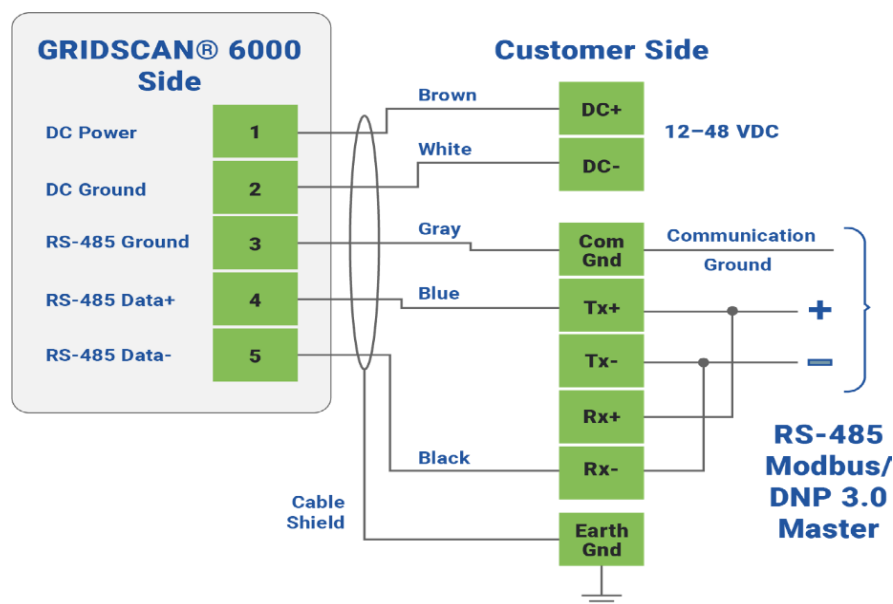


Figure 8 – Connection Diagram

COMMISSIONING

After the cable is connected and the power is supplied, the monitor takes up to 16 hours to perform a power-up sequence consisting of four operations.

- Power-on system self-test.
- Restoring configuration settings from non-volatile memory
- Initial liquid and hydrogen temperature measurement
- Self-calibration sequence to stabilize the monitor as needed (the monitor may show the initial value before self-calibration is completed)

Before putting the monitor into operation, perform the following steps:

1. Connect the monitor to power for at least five minutes to recharge the supercapacitor, which may have discharged if the monitor has been without power for several months.

2. Reset the date/time.
3. Turn the power back to erase any mistakes.

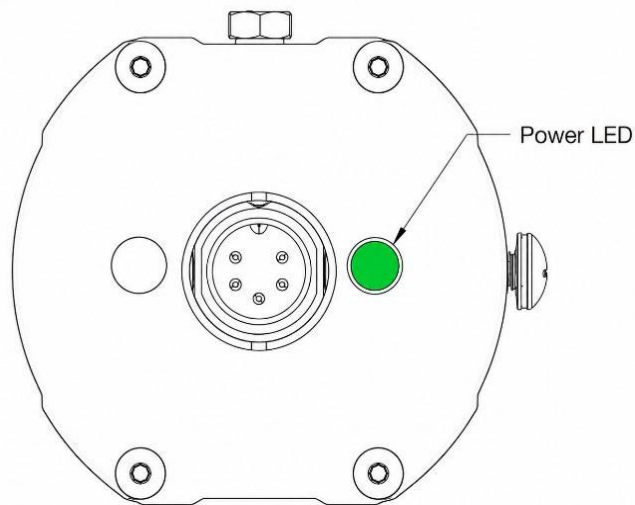


Figure 9 – Power Led

After a brief power outage, the monitor reports approximate hydrogen readings within 30 minutes of power being restored. In new installations and after long power outages, the monitor can take up to 16 hours to stabilize and report accurate hydrogen readings.

Power connected to the GRIDSCAN 6200. The power status is confirmed by the green LED.

BENEFITS FOR ENGINEERING AND MAINTENANCE

1. Real-Time Monitoring

- Provides **continuous data** on key transformer operating parameters
- **Predictive analytics** enable failure anticipation and strategic maintenance planning

2. Maintenance-free technology

- **Hydrogen sensor with 10-year warranty** – free of consumables and calibration
- **Rapid deployment and simplified integration**

3. Dielectric and Operational Fault Detection

- **Early indication of** failures associated with leaks, overheating and dielectric degradation
- **Reduced OPEX** with optimized maintenance

4. Advanced Connectivity

- **EHMI and SCADA compatible** for remote management
- **Robust industrial protocols** ensure reliable integration

EXAMPLE APPLICATION WITH EHMI

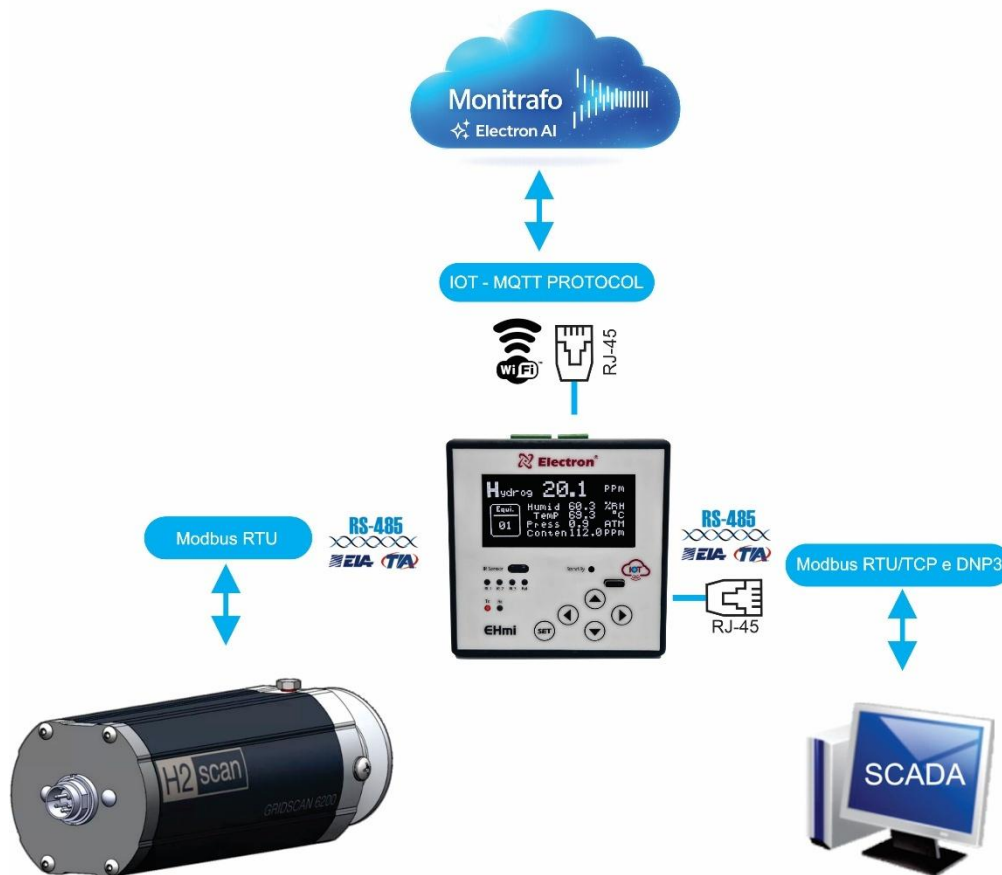


Figure 10 – Application Example

BENEFITS OF INTEGRATING WITH EHMI AND MONITRAFO

The **GRIDSCAN 6200**, combined with **EHMI - IoT** and the **MONITRAFO** platform, offers the most complete solution for **monitoring transformers and critical assets**. The integration of the systems allows for **greater predictability, operational efficiency, and cost reduction**, ensuring safety and performance in real time.

The **GRIDSCAN 6200** and **EHMI - IoT** form a robust and efficient ecosystem for **monitoring transformers and electrical assets**. With the integration of the **MONITRAFO** platform, users have access to a complete solution for **acquisition, processing, and analysis of operational data**, ensuring greater reliability and efficiency in asset management.

Monitored Parameters:

- **Hydrogen (H₂):** First dielectric fault gas, essential for internal overheating monitoring.
- **Humidity:** Critical monitoring of insulating oil degradation and prevention of internal shorts.
- **Pressure:** Indicates operational variations and can detect structural leaks.
- **Temperature:** Allows you to predict thermal failures and overloads.

EHMI uses **MQTT protocol** and integrates advanced tools such as **Artificial Intelligence, Machine Learning, Database, Programmable Functions, Automatic Calculations and Notifications**. In the event of a loss of connection, the data is stored locally and later sent to the server.

With the MONITRAFO platform, users can set up custom designs, track measurements in real-time, and access detailed reports of monitored quantities, triggers, alarms, and predictive maintenance. Monitoring can be done via **internet browser or MONITRAFO app**, available for Android and iOS.

When integrated with the **MONITRAFO** platform, EHMI - IOT offers a complete ecosystem for monitoring and managing electrical assets, significantly expanding its functionalities:

- **Efficient Monitoring:** Access to advanced monitoring, diagnosis, and fault prevention tools directly from the cloud, allowing flexibility and operation from anywhere with internet access.
- **Real-Time Alerts:** Immediate notifications of faults and alarms via SMS, WhatsApp, and email, ensuring quick responses to critical events.
- **Reports with Artificial Intelligence:** Generation of detailed reports with accurate diagnoses, assisting in preventive maintenance and identifying potential problems before they become critical.
- **Interactive Dashboards:** Personalized visualization of projects through modes such as Dashboard, Overview and Map, facilitating the identification of active events and the efficient management of monitored assets.
- **Event Announcer:** Real-time notification to the entire team of substation incidents, promoting effective collaboration and ongoing equipment maintenance.
- **Maintenance Schedule:** Periodic maintenance recommendations generated by IEDs and artificial intelligence, ensuring the best performance and extending the useful life of sensors and electrical assets.
- **Team Communication:** Integration and facilitated communication between team members through notifications and chat on the platform, optimizing maintenance management and maintaining a history of actions.
- **API and Integrations:** Support for various programming languages and integration with ERP systems and IoT platforms, such as SAP, Oracle, Totvs, AWS, Google Cloud, Azure and IBM Watson, providing flexibility and versatility in meeting the specific needs of users.

COMMISSIONING

Once the cable is plugged in and power is supplied, the monitor requires up to 16 hours to perform a power-up sequence consisting of four operations.

- Boot system self-test
- Restoring non-volatile memory configuration settings
- Initial measurement of liquid and hydrogen temperature
- Auto calibration sequence to stabilize the monitor as needed (the monitor may show the initial value before the auto calibration is completed)

Before putting the monitor into operation, perform the following steps:

- Connect the monitor to power for at least five minutes to recharge the supercapacitor, which may have discharged if the monitor has been without power for several months.
- Reset the date/time.
- Turn the power off and on to eliminate any errors.

After a short power outage, the monitor reports approximate hydrogen readings within 30 minutes of restoring power. In new installations and after long power outages, the monitor can take up to 16 hours to stabilize and report accurate hydrogen readings.

Turn on the GRIDSCAN® 6200. The power status is confirmed with the green LED.

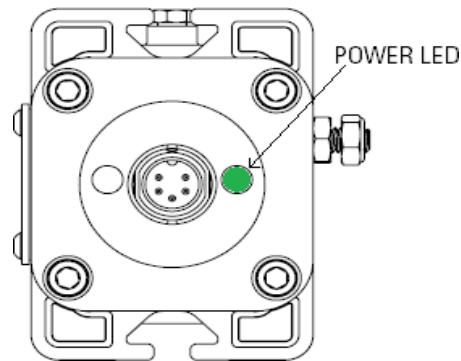


Figure 11 – GDSCAN 6200 LED

CONFIGURATION

The GRIDSCAN® 6200 only provides data to SCADA. No alarm setpoints can be implemented on the GRIDSCAN® 6200.

Configure the GRIDSCAN® 6200 with the ScanH2 Configuration Utility or similar Modbus application.

The GRIDSCAN® 6200 is a multi-sensor device capable of measuring fluid dissolved hydrogen, fluid dissolved moisture, fluid temperature, and fluid pressure. Digital communications on an RS-485 bus provide real-time measurement data. Configuring communication **settings** and initializing the **the monitor** are the only actions required. Optional actions include setting customer identification data, fluid type, and device operating mode.

When connected to a GSAO-2 control hub from the H2scan, the GRIDSCAN® 6200 is automatically detected and its real-time information is displayed on the GSAO-2 and can be configured from the HMI. See the GSAO-2 documentation for more information.

Default Communication Settings:

- RS-485, half duplex, 19200 baud, 8 data bits, 1 or 2 stop bits, no parity.
- The default Modbus ID is 1.

CERTIFICATIONS AND COMPLIANCE

The **GRIDSCAN 6200** meets stringent international standards for electrical safety and electromagnetic compatibility, among others, according to the following standards:

- ✓ IEC 60068-2, IEC60529
- ✓ AT 55011, EN61000-4, AT 61326-1
- ✓ FCC Part 15, IEC 61010
- ✓ IEC 60068-2-2 & EN 50155 Clause 13.4.4
- ✓ IEC 60068-2-11 & DIN EN ISO 12944
- ✓ IEC 60529 Clauses 13.4 & 13.6
- ✓ IEC 60529 Table 3 and Clause 14.2.8
- ✓ IEC 60068-2-6 Table C.2
- ✓ IEC 60068-2-64 Spectrum A.2, Category No. 2
- ✓ IEC 60068-2-27
- ✓ EN 61326-1:2013 (IEC 61326-1:2012)
- ✓ EN 55011 Emission Class A (2009)A1(2010) Group 1 Radiated Emissions
- ✓ CISPR Emission Class A 11 (2008)A1(2009)
- ✓ FCC Part 15/18 Emissions
- ✓ ICES-001/ICES-003 Emissions

- ✓ EN 61000-4-2:2009 (IEC 61000-4-2:2008)
- ✓ EN 61000-4-3:2007+A1:2008+A2:2011 (IEC 61000-4-3:2006+A1:2007+A2:2010)
- ✓ EN 61000-4-4:2013 (IEC 61000-4-4:2012)
- ✓ EN 61000-4-5:2014 (IEC 61000-4-5:2013)
- ✓ EN 61000-4-6:2014 (IEC 61000-4-6:2013)
- ✓ EN 61000-4-8:2010 (IEC 61000-4-8:2009)
- ✓ EN 61000-4-11:2010 (IEC 61000-4-11:2009)
- ✓ IEC 61010-1:2010, +A1:2016
- ✓ EN 61010-1:2010, +A1:2019
- ✓ IEC60028-2-30

SPECIFICATION FOR ORDER

Name: GRIDSCAN 6200 MONITORING KIT

Items Included in the Kit: 1 GRIDSCAN 6200 Sensor (Hydrogen, Temperature, Humidity & Pressure)
1 KF40 Adapter (clamp + threaded connection + O' ring)
10 meters of RS485 4-wire connection cable with circular connector (external use).

Optional:

Code: PA-1161

Name: EHMI – HUMAN-MACHINE INTERFACE with IoT and Gateway for Protocol Conversion

WARRANTY TERM

The **GDSCAN 6200** Electron has a warranty period of two years from the date of sale stated on the invoice, with coverage for any manufacturing defects that make it unsuitable or unsuitable for the applications it is intended for.

Disclaimer of Warranty

The warranty does not cover transportation expenses for technical assistance, freight and insurance for shipment of a product with evidence of defect or malfunction. The following events are also not covered: Natural wear and tear of parts due to continuous and frequent use, damage to the outside caused by falls or improper packaging; attempt to repair/break a seal with damage caused by persons not authorized by Electron and in disagreement with the instructions that are part of the technical description.

Loss of Warranty

The product will automatically lose its warranty when:

- The instructions for use and assembly contained in this manual and the installation procedures contained in the NBR 5410 Standard are not observed;
- Subjected to conditions outside the limits specified in the respective technical descriptions;
- Violated or repaired by a person other than Electron's technical team;
- The damage is caused by a fall or impact;
- Infiltration of water or any other liquid occurs;
- Overload occurs that causes degradation of the components and parts of the product.

Use of the warranty

To enjoy this warranty, the customer must send the product to Electron along with a copy of the purchase invoice properly packaged so that there is no damage in transport. For an emergency service, it is recommended to send as much information as possible, regarding the defect detected. This will be analyzed and subjected to full functional tests.

The analysis of the product and its eventual maintenance will only be carried out by the technical team at the headquarters of Electron do Brasil.