

Environmental Monitoring Sensor WEG

EMSW

User Manual





User Manual

EMSW

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1 SAFETY INSTRUCTIONS

This manual contains the information required for the installation, configuration, operation, and maintenance of the EMSW gas sensor. It is intended for personnel who are properly trained and/or qualified to work with industrial automation, instrumentation, and monitoring equipment.

It is the user's responsibility to observe and comply with all safety standards, regulations, and procedures applicable to the installation and operating environment. Failure to follow these safety instructions may result in serious injury, risks to personal safety, property damage, and improper system operation.

The guidelines and procedures described in this manual must be followed in their entirety to ensure correct installation, safe operation, and proper product performance. Failure to comply with the instructions contained in this document may result in operational failures, damage to the equipment, associated systems, and the environment, and may also void the product warranty.

1.1 SAFETY NOTICES IN THIS MANUAL

The following safety notices are used throughout this manual:

**DANGER!**

The procedures recommended in this notice are intended to protect the user against the risk of death, serious injury, and significant property damage.

**ATTENTION!**

The procedures recommended in this notice are intended to prevent damage to the equipment and installation.

**NOTE!**

This text provides important information for the proper understanding and correct operation of the product.

1.2 SAFETY LABELS ON THE PRODUCT

The following symbols are present on the product and serve as safety warnings:



High voltages are present.



Components sensitive to electrostatic discharge. Do not touch them.

1.3 PRELIMINARY RECOMMENDATIONS

**DANGER!**

Only properly authorized and qualified personnel are permitted to design, install, commission, and maintain this equipment.

These professionals must comply with all safety instructions contained in this manual as well as all applicable local standards and regulations.

Failure to comply with these instructions and applicable regulations compromises the safety of the product and the installation and may result in death, serious injury, and/or damage to the equipment.

SAFETY INSTRUCTIONS



NOTE!

For the purposes of this manual, qualified personnel are those who have received appropriate training and are capable of:

1. Installing, energizing, calibrating, and operating the EMSW in accordance with this manual and applicable safety regulations.
2. Using personal protective equipment (PPE) and collective protective equipment in accordance with applicable standards.
3. Providing basic first aid.



DANGER!

Always disconnect the equipment power supply before touching any electrical component associated with the EMSW.

Always operate the EMSW within its specified operating conditions. Improper applications compromise the safety of the product and the installation and may result in property damage, serious personal injury, or death.



ATTENTION!

The electronic boards contain components that are sensitive to electrostatic discharge (ESD). Do not touch components, terminals, or connectors directly.

Do not use the EMSW to monitor gas concentrations above the product's specified detection limit. If necessary or in case of doubt, contact the manufacturer.



NOTE!

- The EMSW must be strategically installed to ensure proper environmental monitoring performance. Follow the recommendations provided in section 3 of this manual to avoid installation errors.
- Carefully read this entire user manual before installing, operating, or performing any intervention on this sensor. Failure to follow the instructions may result in improper operation, equipment damage, and safety hazards.
- Observe the regulations applicable in each country regarding the transportation, installation, operation, and disposal of the equipment. All applicable safety standards and regulations must be strictly followed.
- The EMSW must be fully compatible with its intended application and the environmental conditions of the installation site.
- The product must be used in accordance with the guidelines established in the following chapters of this manual. WEG assumes no responsibility for unauthorized modifications to the product or for any improper use by the operator.

1.4 CALIBRATION



DANGER!

The electrochemical cell has an estimated service life of approximately 2 years. Whenever necessary, perform response tests and periodic calibrations in accordance with applicable standards to verify the proper operation of the electrochemical cell and ensure the accuracy of EMSW measurements.

If any problems are identified during calibration or response testing, do not use the equipment. Replace the electrochemical cell immediately in accordance with the manufacturer's recommendations.

2 GENERAL INFORMATION

2.1 RECOMMENDED USE

The WEG Environmental Monitoring Sensor (EMSW) models equipped with relay output and analog output feature integrated visual and audible alarms, allowing them to operate either as standalone gas monitoring devices or integrated with external sirens, beacons, and alarm systems. Integration with additional equipment enables alarm and event retransmission to remote locations, increasing the coverage and effectiveness of the monitoring system.

Models equipped with IO-Link or Modbus RTU digital communication also provide local visual and audible signaling and have been designed for integration with automation, supervision, and control systems. Through these communication interfaces, it is possible to configure the device, remotely monitor the measured variables, and provide gas concentration, temperature, humidity, diagnostic, and alarm information to higher-level systems, enabling the implementation of monitoring, control, and safety strategies appropriate for the application.

All EMSW models feature an integrated NFC interface, allowing complete device parameterization and monitoring of the measured variables using compatible smartphones. By using the WPS Mobile application, users can access operating information, configure parameters, adjust alarm thresholds, execute maintenance commands, and perform device diagnostics quickly and securely, without requiring a physical connection to the device.

The EMSW can be used in both temporary and permanent installations for continuous monitoring of gas concentration in industrial, commercial, and agricultural environments. To ensure measurement accuracy and long-term system reliability, periodic inspections and calibrations must be performed in accordance with the recommendations provided in this manual, the application requirements, and the applicable technical standards.

2.2 FEATURES

Environmental monitoring sensor for measuring gas concentration in parts per million (ppm), temperature (°C), and relative humidity (%), with integrated visual and audible alarms.

2.3 FUNCTIONS

Continuous monitoring of gas concentration, temperature, and relative humidity.

Device parameterization, diagnostics, and monitoring of measured variables through the IO-Link and Modbus RTU communication protocols.

Automatic activation of integrated visual and audible alarms according to the configured gas concentration alarm thresholds.

Activation of external devices or systems through the relay or analog outputs, enabling the implementation of alarm, signaling, and process control functions.

Wireless local parameterization through the NFC interface, including alarm configuration, operational adjustments, execution of maintenance commands, and access to device diagnostic information.

2.4 APPLICATIONS

Gas leak detection in industrial and commercial environments.

Gas concentration monitoring in industrial processes.

Gas concentration monitoring in livestock facilities, poultry houses, and other animal farming environments.

3 INSTALLATION

The EMSW sensor can be installed using one of two mounting methods: surface mounting with the supplied screw kit or suspended mounting using support cables. The selection of the mounting method should consider the characteristics of the environment, the application requirements, and the recommended positioning guidelines to ensure proper monitoring performance. The subsection 3.1 and subsection 3.2 provide recommendations for each installation method. However, it is recommended to perform a gas dispersion study to determine the most appropriate installation location according to the characteristics of the environment and the application.

Figure 3.1 shows the available mounting points as well as the main mechanical dimensions of the device, which should be considered during installation planning and execution.

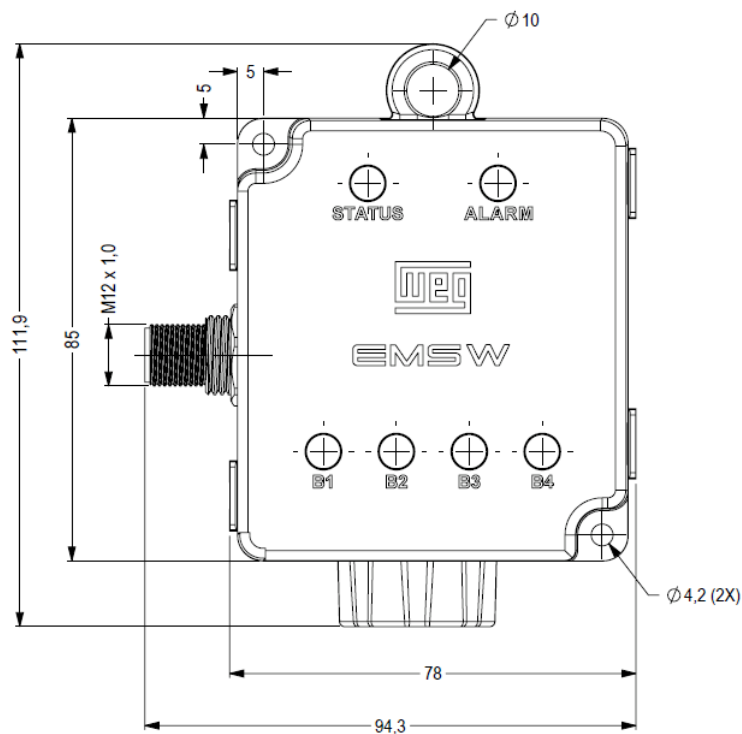


Figure 3.1: EMSW sensor dimensions.



DANGER!

The installation must not be carried out near or above sources of clean air, such as windows, air ducts, fans, or equipment that may influence the quality of the monitored air. The EMSW sensor must be protected from direct sunlight and from environments with relative humidity above 90% or below 15%.

The EMSW sensor must not be used in hazardous or potentially explosive atmospheres. Response tests and calibrations must be performed periodically. Therefore, the EMSW sensor must not be installed in inaccessible locations.



ATTENTION!

The EMSW sensor must not be installed near sources that release vapors containing inhibiting gases, hydrocarbons, solvents, or gas concentrations above the measurement range of the electrochemical sensor, as these conditions may cause irreversible damage to the electrochemical cell.

3.1 SUSPENDED INSTALLATION

The suspended installation of the EMSW sensor can be used for any application. However, it is strongly recommended for gas monitoring applications in livestock facilities. In such applications, the EMSW should be positioned approximately 20 cm from the primary source of the target gas vapors, such as poultry litter, as illustrated in Figure 3.2.

For suspended installation, the use of a suitable support cable is recommended. No mechanical load should be applied to the EMSW power cable, and the sensor must be protected against mechanical impacts and contact with animals.



DANGER!

The EMSW sensor must not be suspended by its power or output cable. Failure of the cables may result in property damage and pose a risk to personal safety.



Figure 3.2: Recommended suspended installation.

For monitoring pipelines and equipment, the suspended installation should follow the recommendations shown in Figure 3.3, positioning the sensor at a maximum distance of 20 cm from the equipment or pipeline sections most susceptible to leaks, such as valves and fittings.

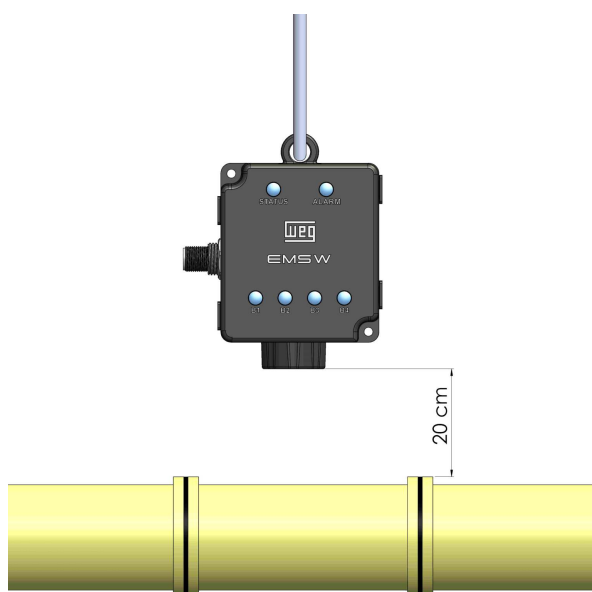


Figure 3.3: Recommended suspended installation.

For gas monitoring applications intended to assess human exposure to target gases, the installation should follow the recommendation shown in Figure 3.4. The objective of this arrangement is to position the EMSW sensor as close as possible to the breathing zone, allowing the measured gas concentration to accurately represent the concentration to which people are actually exposed.



Figure 3.4: Recommended suspended installation.

3.2 SURFACE MOUNTING

For surface mounting, it is recommended to use the mounting kit supplied with the product, allowing the sensor to be installed on any surface previously drilled with the appropriate spacing for the EMSW enclosure mounting screws. The EMSW surface installation should follow the example shown in Figure 3.5, observing the same recommended distances from the gas source described in subsection 3.1 for suspended installations.



DANGER!

The sensor must not be installed on surfaces that obstruct or restrict the flow of gas into the electrochemical cell compartment.



Figure 3.5: Recommended surface mounting.

4 ELECTRICAL CONNECTION

The electrical installation of the EMSW sensor must be carried out exclusively by qualified and authorized personnel, in accordance with applicable technical standards, safety regulations, and installation site procedures. Before making any electrical connections, ensure that the power supply is disconnected and that all necessary safety measures have been taken. Incorrect wiring may impair the proper operation of the equipment, damage the device and associated systems, and pose risks to personnel and installations.

The DC-powered versions, EMSW-MOD and EMSW-ANG, use an A-coded M12 male connector, as shown in Figure 4.1. subsection 4.1 and subsection 4.2 present the connector pin assignments and their respective functions for the electrical connection of each model. The EMSW-RLY version uses terminal blocks for the electrical connections, whose terminal identification and respective functions are presented in subsection 4.3.



DANGER!

The installation shall be performed in such a way as to avoid excessive mechanical stress on the power and communication cables, preventing damage to the connectors, terminals, and the equipment itself.

All EMSW technical specifications presented in Table 8.1 must be strictly observed to ensure safe operation and proper device performance.

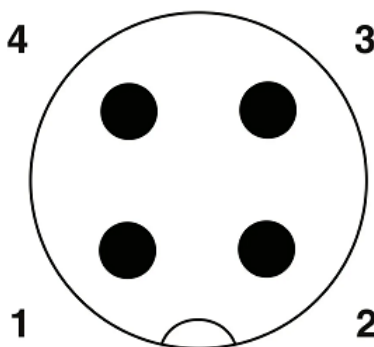


Figure 4.1: 4-pin A-coded male M12 connector.

4.1 EMSW-MOD

Pin	Wire Color	Function
1	Brown	Vcc (+)
2	White	RS-485 B (D-)
3	Blue	Vcc (-)
4	Black	RS-485 A (D+)

Table 4.1: Pin assignment of the 4-pin A-coded male M12 connector for the EMSW-MOD.

4.2 EMSW-ANG

Pin	Wire Color	Function
1	Brown	Vcc (+)
2	White	Analog Output
3	Blue	Vcc (-)
4	Black	IO-Link C/Q

Table 4.2: Pin assignment of the 4-pin A-coded male M12 connector for the EMSW-ANG.

4.3 EMSW-RLY

Terminal	Function
1	AC Supply (L/N)
2	AC Supply (L/N)
3	Relay Common (COM)
4	Relay Contact (NO/NC)

Table 4.3: Terminal identification of the EMSW-RLY terminal block.

5 CALIBRATION

Gas sensor calibration is essential to ensure the accuracy and reliability of the measurements performed by the EMSW. This procedure adjusts the sensor response to ensure that the monitored gas concentrations are indicated correctly throughout the equipment's service life. Calibration also compensates for deviations resulting from the natural aging of the sensing element, exposure to adverse environmental conditions, and possible contamination, maintaining the metrological performance and ensuring that the measurements remain compliant with the application requirements.

**ATTENTION!**

The sensor shall be calibrated according to the interval established by the standards and regulations applicable to the installation. In the absence of specific requirements, calibration is recommended at intervals not exceeding 6 months or whenever deviations are identified during response tests, functional checks, or sensor performance evaluations.

The calibration procedure shall begin with zero calibration, which consists of adjusting the sensor reference in an atmosphere free of the target gas. For this purpose, the sensor shall be exposed to clean air or to a cylinder containing a certified reference gas (synthetic air or equivalent). When a reference gas cylinder is used, follow the procedure described in subsection 5.1. If calibration is performed directly in a clean atmosphere proven to be free of the monitored gas, follow the steps described in subsection 5.2 or use one of the calibration methods available through the communication interfaces, as described in Sections subsection 5.3, subsection 5.4, and subsection 5.5.

After completing zero calibration, span calibration shall be performed to adjust the sensor sensitivity. This procedure requires a cylinder containing the target gas at a known and traceable concentration, balanced in air and corresponding to the calibration concentration configured in the EMSW. First, perform the preparation procedure described in subsection 5.1. Then perform the calibration using one of the available methods, as described in subsection 5.2, subsection 5.3, subsection 5.4, or subsection 5.5.

5.1 CALIBRATION PREPARATION

To prepare the EMSW sensor for the calibration procedure, perform the following steps:

1. Verify, through the Modbus RTU, IO-Link, or NFC interfaces, that the calibration concentration parameter is configured with the same concentration value as the reference gas that will be used during the procedure.
2. Remove the protective cover from the electrochemical sensor by turning it counterclockwise until it is completely removed.
3. Install the calibration cover onto the electrochemical sensor and turn it clockwise until it is fully locked and the assembly is properly sealed.
4. Connect one end of the calibration tubing to the outlet of the flow regulator mounted on the reference gas cylinder.
5. Connect the other end of the tubing to the inlet of the calibration cover, ensuring that all connections are secure, properly installed, and free from leaks.

After completing these steps, the calibration system shall be assembled as shown in Figure 5.1. Once the preparation is complete, proceed with the calibration procedure using one of the methods described in subsection 5.2, subsection 5.3, subsection 5.4, or subsection 5.5.



Figure 5.1: Reference gas cylinder connection for EMSW sensor calibration.

5.2 CALIBRATION USING THE BUTTONS

Calibration can be performed locally using the EMSW buttons through the functions assigned to buttons B2, B3, and B4, as described in subsection 6.5. The procedure shall be performed as follows:

1. Enter Calibration Mode by pressing and holding Button 2 (B2) for approximately 1 second until two audible beeps are emitted. Entering Calibration Mode will be indicated by the STATUS indication, as described in subsection 6.2.
2. With the device in Calibration Mode, perform the desired adjustment:
 - Press and hold Button 3 (B3) for approximately 1 second until two audible beeps are emitted to start zero calibration.
 - Press and hold Button 4 (B4) for approximately 1 second until two audible beeps are emitted to start span calibration.
3. After completing the required calibrations, permanently save the new values by returning to Operation Mode. To do this, press Button 2 (B2) for approximately 0.3 seconds, or until one audible beep is emitted. Then press Buttons 3 and 4 (B3 and B4) simultaneously for approximately 1 second until two audible beeps are emitted, indicating that the calibration parameters have been successfully stored in the equipment's non-volatile memory.

5.3 CALIBRATION VIA MODBUS

Calibration through the Modbus RTU interface is performed using registers 70 and 71, while confirmation and permanent storage of the calibration values are performed through register 100, as described in Table 7.1. The procedure shall be performed as follows:

1. To start calibration, write the value 1 to register 70 to perform zero calibration or to register 71 to perform span calibration. Successful completion of the calibration will be indicated by an audible alert.

2. After completing the required calibrations, permanently store the new values by writing the value 1 to register 100. In addition to the calibration parameters, all parameters currently configured in the device will also be stored in the EMSW non-volatile memory.

5.4 CALIBRATION VIA IO-LINK

Calibration through the IO-Link interface is performed using the commands described in subsection 7.2.4. To perform zero calibration, send command 160. To perform span calibration, send command 161. After the device processes the command, successful completion of the calibration will be indicated by an audible alert.

5.5 CALIBRATION USING WPS MOBILE

Calibration using the WPS Mobile application is performed according to the procedure described in subsection 7.3.3. To perform zero calibration, enable the Zero Calibration (P0070) parameter and send the configuration to the EMSW as described in subsection 7.3.3. To perform span calibration, enable the Span Calibration (P0071) parameter and send the configuration to the device following the same procedure. After the EMSW processes the command, successful completion of the calibration will be indicated by an audible alert.

6 OPERATION

The operation of the EMSW sensor shall be performed and supervised by properly qualified and trained personnel responsible for interpreting the monitoring information, assessing the installation conditions, and carrying out the necessary actions in response to the alarms, events, and diagnostics provided by the equipment. During device parameterization and operation, all applicable standards, regulations, and safety procedures related to the presence and monitoring of gases shall be strictly observed, ensuring the protection of personnel, facilities, and processes.

6.1 ELECTROCHEMICAL SENSOR CONNECTION

Before starting operation, the electrochemical sensor shall be connected to the EMSW. To do so, remove the *shorting spring* installed between terminals 1 and 2 of the sensor, as shown in Figure 6.1. This component is intended only to maintain sensor stability during storage and transportation and must be removed before the first use.

This procedure shall be performed whenever the electrochemical sensor is installed for the first time or replaced.

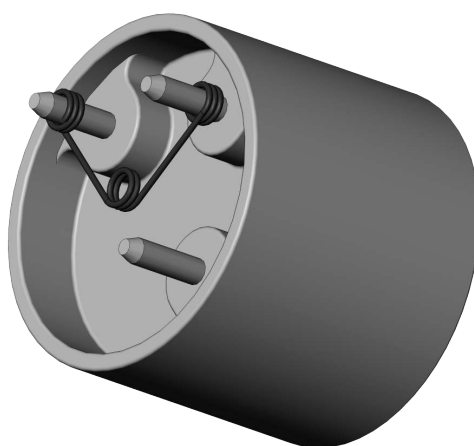


Figure 6.1: Electrochemical sensor with the shorting spring installed between terminals 1 and 2.

6.2 STATUS LED INDICATION

The EMSW sensor features two indicator LEDs with distinct functions: **Status** and **Alarm**. The **Status** LED indicates the device operating status, active operating modes, and any fault or diagnostic conditions related to the sensor and the measurement system.

The indication patterns of the **Status** LED vary according to the EMSW model. The operating states, diagnostic conditions, and their corresponding LED indications are presented in the following tables: for the EMSW-MOD model, see Table 6.1; for the EMSW-ANG model, see Table 6.2; and for the EMSW-RLY model, see Table 6.3.

6.2.1 EMSW-MOD

LED Color	State	Frequency	Diagnostic
Blue	Blinking	1 Hz	Normal operation
Blue	Blinking	5 Hz	Calibration mode
Blue	Steady	-	Communication failure
Red	Steady	-	Sensor failure

Table 6.1: Status LED diagnostic states for the EMSW-MOD model.

6.2.2 EMSW-ANG

LED Color	State	Frequency	Diagnostic	Analog Output
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Blue	Blinking	1 Hz	Normal operation	Current (4 to 20 mA)
Red	Blinking	1 Hz	Normal operation	Voltage (0 to 10 V)
Blue	Blinking	5 Hz	Calibration mode	Current (4 to 20 mA)
Red	Blinking	5 Hz	Calibration mode	Voltage (0 to 10 V)
Blue	Steady	-	Communication failure	-
Red	Steady	-	Sensor failure	-

Table 6.2: Status LED diagnostic states for the EMSW-ANG model.

6.2.3 EMSW-RLY

LED Color	State	Frequency	Diagnostic	Relay Output
Blue	Blinking	1 Hz	Normal operation	NO output
Red	Blinking	1 Hz	Normal operation	NC output
Blue	Blinking	5 Hz	Calibration mode	NO output
Red	Blinking	5 Hz	Calibration mode	NC output
Blue	Steady	-	Power supply failure	-
Red	Steady	-	Sensor failure	-

Table 6.3: Status LED diagnostic states for the EMSW-RLY model.

6.3 ALARM LED INDICATION

The **Alarm** LED indicates alarm conditions related to the monitored gas concentration. The EMSW provides three independent alarm levels, allowing monitoring and safety strategies to be implemented according to the application requirements.

STEL Alarm (Short-Term Exposure Limit): Indicates that the average concentration of the monitored gas has exceeded the configured short-term exposure limit over a continuous period of 15 minutes.

TWA Alarm (Time-Weighted Average): Indicates that the time-weighted average concentration of the monitored gas has exceeded the configured exposure limit over a continuous period of 8 hours.

Instantaneous Alarm: Indicates that the instantaneous concentration of the monitored gas has reached or exceeded the configured alarm threshold.

The alarm activation thresholds are supplied with factory default settings and may be modified at any time by the user through the Modbus RTU, IO-Link, or NFC interfaces, according to the application requirements and applicable standards. Table 6.4 shows the indication patterns of the **Alarm** LED for each alarm condition.

LED Color	Frequency	Active Alarm
Blue	1 Hz	None
Blue	5 Hz	TWA Alarm
Red	1 Hz	STEL Alarm
Red	5 Hz	Instantaneous Alarm

Table 6.4: Alarm LED indication states.

The indication patterns presented in Table 6.4 apply to all EMSW models. When multiple alarms are active simultaneously, the **Alarm** LED indicates only the highest-priority alarm condition. The priority order adopted by the device is: Instantaneous Alarm, STEL Alarm, and finally TWA Alarm. Once the highest-priority condition returns to a safe level, the LED indication automatically switches to the next highest-priority active alarm.

6.4 AUDIBLE INDICATION

The EMSW sensor features an integrated buzzer intended to provide audible indication of alarms related to the monitored gas concentration. The audible alarm is activated simultaneously with the visual indications, allowing

rapid identification of conditions requiring operator attention or intervention. The sound pressure level may reach up to 100 dB.

The audible alarm volume can be configured locally using the device buttons or remotely through the available communication interfaces. The EMSW allows selection of 10 sound intensity levels, in addition to the option of disabling the buzzer. The procedures for adjusting the volume using the buttons are presented in subsection 6.5, according to the device model.

6.5 BUTTONS

The buttons located on the EMSW enclosure provide the physical user interface for device configuration. They allow parameterization, output adjustment, enabling and disabling of audible alarms, buzzer volume adjustment, operating mode selection, and execution of calibration procedures.

The device features four buttons identified as Button 1 (B1), Button 2 (B2), Button 3 (B3), and Button 4 (B4). Each button supports two types of actuation: short press and long press. A short press occurs when the button is pressed for a period between 0.2 s and 1 s, while a long press occurs when the button remains pressed for more than 1 s. When the audible indication is enabled, a short press is confirmed by one beep, while a long press is confirmed by two beeps.

The EMSW provides two operating modes: **Operation Mode** and **Calibration Mode**. The functions assigned to buttons B3 and B4 vary according to the active mode and the device model.

The tables presented in the following subsections describe the functions available for each button according to the operating mode and EMSW model. As an example, Table 6.5 presents the button functions for the EMSW-MOD model in Operation Mode, while Table 6.6 describes the functions available in Calibration Mode for the same model.

6.5.1 EMSW-MOD

Operation Mode		
Button	Short Press	Long Press
Button 1 (B1)	Test audible alarm	Test visual alarm
Button 2 (B2)	Operation mode	Calibration mode
Button 3 (B3)	Decrease volume	Disable audible alarm
Button 4 (B4)	Increase volume	Enable audible alarm

Table 6.5: Button functions in Operation Mode.

Calibration Mode		
Button	Short Press	Long Press
Button 1 (B1)	Reset Modbus ID	Reset Modbus baud rate
Button 2 (B2)	Operation mode	Calibration mode
Button 3 (B3)	Test audible alarm	Zero calibration
Button 4 (B4)	Test visual alarm	Span calibration

Table 6.6: Button functions in Calibration Mode.

6.5.2 EMSW-ANG

Operation Mode		
Button	Short Press	Long Press
Button 1 (B1)	Voltage output (0 to 10 V)	Current output (4 to 20 mA)
Button 2 (B2)	Operation mode	Calibration mode
Button 3 (B3)	Decrease volume	Disable audible alarm
Button 4 (B4)	Increase volume	Enable audible alarm

Table 6.7: Button functions in Operation Mode.

Calibration Mode		
Button	Short Press	Long Press
Button 1 (B1)	Voltage Output (0 to 10 V)	Current Output (4 to 20 mA)
Button 2 (B2)	Operation Mode	Calibration Mode
Button 3 (B3)	Test Audible Alarm	Zero Calibration
Button 4 (B4)	Test Visual Alarm	Span Calibration

Table 6.8: Button functions during Calibration Mode.

6.5.3 EMSW-RLY

Operation Mode		
Button	Short Press	Long Press
Button 1 (B1)	Normally Open Relay Output	Normally Closed Relay Output
Button 2 (B2)	Operation Mode	Calibration Mode
Button 3 (B3)	Decrease Volume	Disable Audible Alarm
Button 4 (B4)	Increase Volume	Enable Audible Alarm

Table 6.9: Button functions during Operation Mode.

Calibration Mode		
Button	Short Press	Long Press
Button 1 (B1)	Normally Open Relay Output	Normally Closed Relay Output
Button 2 (B2)	Operation Mode	Calibration Mode
Button 3 (B3)	Test Audible Alarm	Zero Calibration
Button 4 (B4)	Test Visual Alarm	Span Calibration

Table 6.10: Button functions during Calibration Mode.

6.5.4 SPECIAL FUNCTIONS

In addition to the button functions described in the previous tables, all EMSW models provide two special functions: electrochemical sensor testing and permanent storage of the current configuration.

To perform the electrochemical sensor test, press Buttons 1 (B1) and 2 (B2) simultaneously for more than 1 second until two beeps are emitted. The device will simulate the presence of the target gas by increasing the monitored concentration for approximately 5 seconds. At the end of the test, the displayed concentration should quickly return to its initial value, confirming the proper operation of the electrochemical sensor.

Changes made through the communication protocols or by using the buttons are stored only in volatile memory and will be lost if the sensor is restarted. To permanently save these changes in non-volatile memory, use the communication protocols or press Buttons 3 (B3) and 4 (B4) simultaneously for more than 1 second until two beeps are emitted. The current configuration will then be permanently stored in the device.

6.6 ANALOG OUTPUT

The EMSW-ANG model features an analog output proportional to the monitored gas concentration, enabling its integration with automation, control, and supervisory systems. The device can be configured to operate with a voltage output of 0 to 10 V or a current output of 4 to 20 mA, according to the application requirements. The analog output exhibits a linear response with respect to the measured concentration. Therefore, the lower limit of the measuring range corresponds to the minimum configured output value, while the upper limit corresponds to the maximum configured output value. Intermediate values are represented proportionally across the entire measuring range.

As an example, for the ammonia sensor with a measuring range of 0 to 100 ppm, the relationship between the measured concentration and the 0 to 10 V analog voltage output is shown in Figure 6.2. Likewise,

the relationship between the measured concentration and the 4 to 20 mA analog current output is shown in Figure 6.3.

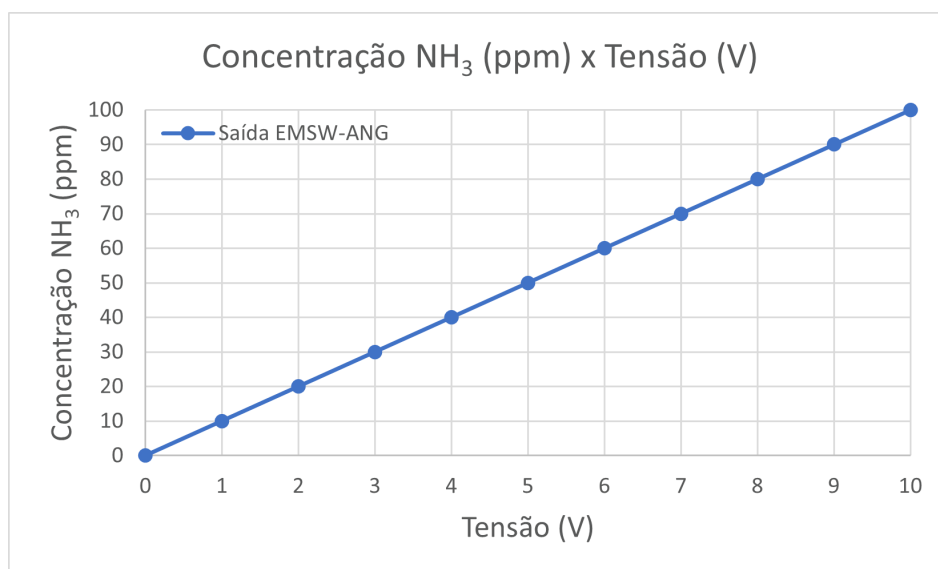


Figure 6.2: Relationship between voltage output and ammonia concentration.

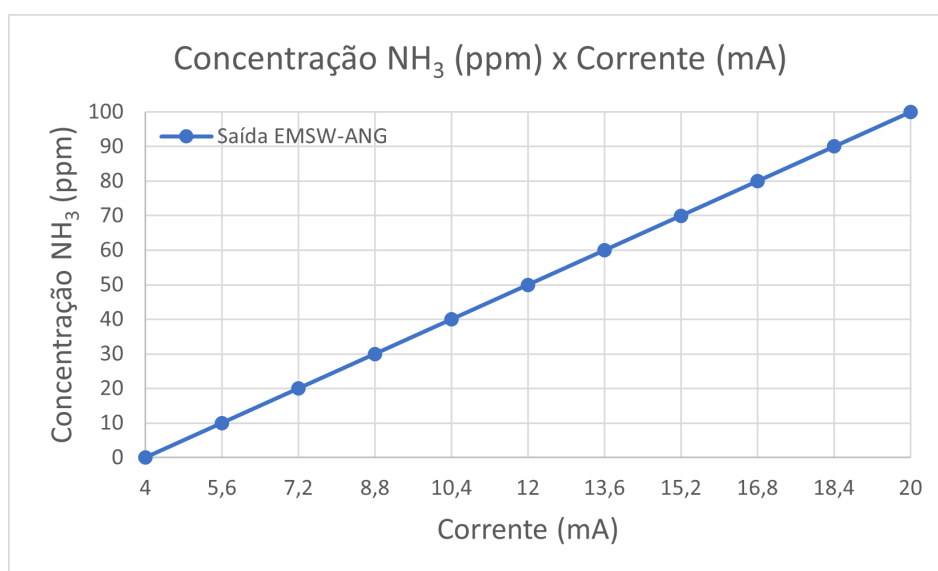


Figure 6.3: Relationship between current output and ammonia concentration.

6.7 RELAY OUTPUT

The EMSW-RLY model is equipped with a relay output intended for controlling external devices such as sirens, visual signaling devices, monitoring systems, and control equipment. The output can be configured to operate as Normally Open (NO) or Normally Closed (NC), according to the application requirements. The relay activation threshold can be configured through the NFC interface and operates independently of the device's visual and audible indications.

The relay output is capable of switching both AC and DC loads, provided that the specified electrical limits are observed. The output characteristics and operating limits are detailed in Table 8.4.



ATTENTION!

The electrical limits specified for the relay output in Table 8.4 shall be strictly observed. Operating the relay output outside the specified conditions may result in damage to the relay, the EMSW, the connected loads, and the associated installation.

7 COMMUNICATION PROTOCOLS

The EMSW sensor provides different communication interfaces for parameterization, monitoring, and integration with automation systems. Depending on the model, the device may operate through the Modbus RTU, IO-Link, or NFC protocols. The Modbus RTU interface is available on the EMSW-MOD model, the IO-Link interface on the EMSW-ANG model, and the NFC interface on all EMSW product family models.

The communication interfaces provide access to monitoring variables, configuration parameters, diagnostics, alarms, and device commands, enabling the integration of the EMSW into supervision, control, and maintenance systems.

7.1 MODBUS PROTOCOL

The Modbus RTU protocol uses a master-slave architecture for data exchange between devices, based on register read and write operations. In the EMSW-MOD, the sensor operates as a slave device, requiring a master device to access the available parameters, monitoring variables, diagnostics, and commands.

Modbus RTU communication is performed through the RS-485 physical interface, using a two-wire differential bus for data transmission. For proper identification of the communication terminals and electrical connections, refer to the instructions provided in section 4.

The Modbus RTU protocol allows multiple devices to be connected to the same communication bus, enabling the implementation of different network topologies. The EMSW-MOD allows configuration of the device address (Modbus ID), baud rate, and communication parameters, providing flexibility for integration into different automation and supervisory systems.



NOTE!

The use of 120 Ω termination resistors at both ends of the RS-485 bus is recommended to ensure communication signal integrity. The absence of proper termination may result in signal reflections, increased susceptibility to electrical noise, and intermittent Modbus RTU communication failures.

Access to EMSW-MOD data is provided through Holding Registers. The Read Holding Registers function shall be used for reading data. The Write Single Register and Write Multiple Registers functions may be used to write parameters and commands.

Table 7.1 presents the complete list of registers available in the EMSW-MOD, including their addresses, descriptions, access permissions, and scaling factors.

The **Access Type** column indicates the access permissions available for each register:

- **RO (Read Only):** read operations only.
- **WO (Write Only):** write operations only.
- **RW (Read/Write):** read and write operations.

Register	Function	Access	Scale	Unit
0	Current Gas Concentration	RO	1	ppm
1	Average Gas Concentration	RO	0.01	ppm
2	STEL Gas Concentration	RO	0.01	ppm
3	TWA Gas Concentration	RO	0.01	ppm
4	Temperature	RO	0.01	°C
5	Humidity	RO	0.01	%
6	Operating Time	RO	1	min
10	NFC Password	RO	1	a.u.
11	Configure NFC Password	WO	1	a.u.

12	Firmware Version	RO	0.01	a.u.
20	Enable Audible Alarm	RW	1	a.u.
21	Audible Alarm Volume	RW	1	a.u.
22	Enable Instantaneous Alarm	RW	1	a.u.
23	Instantaneous Alarm Setpoint	RW	1	ppm
24	Enable STEL Alarm	RW	1	a.u.
25	STEL Alarm Setpoint	RW	1	ppm
26	Enable TWA Alarm	RW	1	a.u.
27	TWA Alarm Setpoint	RW	1	ppm
28	Enable Temperature Alarm	RW	1	a.u.
29	Low Temperature Alarm Setpoint	RW	1	°C
30	High Temperature Alarm Setpoint	RW	1	°C
31	Enable Humidity Alarm	RW	1	a.u.
32	Low Humidity Alarm Setpoint	RW	1	%
33	High Humidity Alarm Setpoint	RW	1	%
40	Instantaneous Alarm Flag	RO	1	a.u.
41	STEL Alarm Flag	RO	1	a.u.
42	TWA Alarm Flag	RO	1	a.u.
43	Temperature Alarm Flag	RO	1	a.u.
44	Humidity Alarm Flag	RO	1	a.u.
50	Modbus RTU Address (ID)	RW	1	a.u.
51	Modbus RTU Baud Rate	RW	100	bps
52	Modbus RTU Parity	RW	1	a.u.
69	Calibration Concentration	RW	1	ppm
70	Zero Calibration	WO	1	a.u.
71	Span Calibration	WO	1	a.u.
72	Test Audible Alarm	WO	1	a.u.
73	Test Visual Alarm	WO	1	a.u.
74	Sensor Test	WO	1	a.u.
99	Save Parameters	WO	1	a.u.
1000-2439	Average Instantaneous Concentration History	RO	1	ppm
3000-4439	STEL Concentration History	RO	1	ppm
5000-6439	TWA Concentration History	RO	1	ppm

Table 7.1: Modbus register table.



NOTE!

The values stored in the registers may use scaling factors to increase the resolution of the monitored variables. To convert the stored value into its corresponding engineering unit, indicated in the **Unit** column, the scaling factor specified in the **Scale** column of Table 7.1 must be applied. For example, a temperature of 25.78 °C is stored in the register as the value 2578. By applying the scaling factor of 0.01, the actual value of 25.78 °C is obtained.

Registers 0, 1, 2 and 3 provide the monitored gas concentration values in parts per million (ppm). Register 0 corresponds to the instantaneous concentration, register 1 to the average concentration over the last minute, register 2 to the STEL concentration, and register 3 to the TWA concentration. The instantaneous concentration is updated every 0.5 s, while the average, STEL, and TWA concentration values are updated every minute. These values represent weighted averages of the monitored gas concentration, calculated over the last minute

for the average concentration, the last 15 minutes for the STEL concentration, and the last 8 hours for the TWA concentration.

Register 4 provides the current temperature measured by the EMSW, while register 5 provides the current relative humidity value. To convert the values stored in the registers into their corresponding engineering units, the scaling factor indicated in the **Scale** column of Table 7.1 must be applied.

Registers 6 and 7 store the continuous operating time of the device. This value is counted in minutes and is reset whenever the equipment is powered off. Therefore, the recorded time corresponds to the uninterrupted operating period since the last power-up of the EMSW.

Registers 10 and 11 are used to read and configure the NFC access password. Register 10 provides the password currently configured in the device, while register 11 allows a new password to be defined. The NFC password must be a numeric value between 1001 and 9999.

Register 12 provides the firmware version currently installed on the EMSW.

Registers 20 and 21 are intended for configuring the EMSW audible alarm. Register 20 enables or disables the buzzer, while register 21 sets the sound intensity level. The volume can be adjusted from 1 to 10, where 1 is the lowest level and 10 is the highest available volume level.

Gas concentration alarms are configured through registers 22 to 27. Register 22 enables or disables the instantaneous alarm, while register 23 defines its activation threshold. Register 24 controls the STEL alarm enable function, and register 25 sets its corresponding threshold. For the TWA alarm, register 26 enables the alarm, while register 27 configures its corresponding threshold.

Temperature alarm configuration is performed through registers 28, 29, and 30. Register 28 enables or disables the alarm function, register 29 defines the low-temperature alarm threshold, and register 30 defines the high-temperature alarm threshold.

Relative humidity alarms are configured through registers 31, 32, and 33. Register 31 enables or disables the alarm function, register 32 defines the minimum humidity threshold for alarm activation, and register 33 defines the maximum humidity threshold for alarm activation.

Registers 40, 41, 42, 43, and 44 provide the status of the EMSW alarms. When the value of one of these registers is equal to 1, the corresponding alarm condition is active.

Register 40 indicates the status of the instantaneous gas concentration alarm. When its value is equal to 1, the instantaneous concentration of the monitored gas is above the configured alarm threshold. Similarly, register 41 indicates the STEL alarm status and register 42 indicates the TWA alarm status, where a value of 1 indicates that the corresponding calculated concentration has exceeded the configured alarm threshold.

Register 43 indicates the temperature alarm status. When its value is equal to 1, the measured temperature is below the configured minimum limit or above the configured maximum limit. Register 44 indicates the relative humidity alarm status. When its value is equal to 1, the measured humidity is outside the range defined by the configured minimum and maximum alarm limits.

The main Modbus RTU communication parameters can be read and configured through registers 50, 51, and 52. Register 50 defines the device address on the network (Modbus ID), register 51 defines the baud rate, and register 52 defines the communication parity setting.

During read and write operations involving the baud rate register, the scaling factor specified in Table 7.1 shall be considered. The factory default values are Modbus address 1 and baud rate 1152, which, after applying the corresponding scaling factor, represents a communication speed of 115200 bps.

Register 52 accepts the following values for communication parity configuration: 0 for no parity (*None*), 1 for odd parity (*Odd*), and 2 for even parity (*Even*). The factory default value is 2, corresponding to the even parity (*Even*) configuration.

Registers 69, 70, and 71 are used during gas sensor calibration procedures. Register 69 defines the calibration gas concentration used for span calibration. The factory default value is 50 ppm and shall be adjusted whenever a calibration gas with a different concentration is used.

Register 70 is intended for sensor zero calibration. This procedure shall be performed in an atmosphere free

of the target gas, using clean air or an appropriate reference gas. To start the zero calibration, simply write the value 1 to this register. Register 71 is intended for sensor span calibration. This procedure requires the application of a reference gas with a known concentration compatible with the value configured in register 69. To start the span calibration, simply write the value 1 to this register. Additional information regarding calibration requirements and procedures is provided in section 5.

Registers 72, 73, and 74 are intended for executing EMSW diagnostic tests, allowing verification of the proper operation of the audible alarm, visual indicators, and electrochemical sensor.

Register 72 performs the audible alarm test. Upon receiving a write command, the buzzer is activated for approximately 2 seconds, allowing verification of its operation and the configured volume level. Register 73 performs the visual indication test. Upon receiving a write command, the Status and Alarm LEDs are activated for approximately 5 seconds, allowing verification of the visual indicators. Register 74 performs the electrochemical sensor test. For approximately 5 seconds, the device simulates a signal equivalent to a gas concentration close to 50 ppm, allowing verification of the sensor operation and diagnostic functions.

Registers 1000 to 2439 store the history of the average gas concentration per minute for the last 24 hours. Each register contains the average concentration measured over a 1-minute interval. Register 1000 stores the most recent value, corresponding to the last minute of monitoring, while register 2439 stores the value recorded 24 hours earlier. All values are expressed in ppm.

Similarly, registers 3000 to 4439 store the STEL concentration history, while registers 5000 to 6439 store the TWA concentration history. In both cases, each register represents the average corresponding to a 1-minute interval, allowing access to the historical data for the last 24 hours.

7.2 IO-LINK PROTOCOL

IO-Link is a point-to-point digital communication protocol standardized by IEC 61131-9 for the integration of sensors and actuators into industrial automation systems. Communication is established between an IO-Link Master and an IO-Link Device, enabling bidirectional exchange of process data, configuration parameters, diagnostic information, and identification data.

The use of the IO-Link protocol provides greater flexibility for EMSW integration and management, enabling real-time monitoring of measured variables, remote sensor parameterization, execution of maintenance and calibration commands, as well as access to diagnostic information and operational status.

To establish communication with the EMSW, an IO-Link Master is required. The master manages communication with the sensor and provides access to process data, configuration parameters, diagnostic information, and available commands.

EMSW integration is performed using the IODD (*IO Device Description*) file, which contains the complete device description, including parameters, process data, events, diagnostics, and supported functions. Importing the IODD file into the IO-Link master's configuration software enables automatic sensor identification and provides an appropriate interface for parameterization, monitoring, and maintenance of the device.

The IO-Link protocol uses three main mechanisms for information exchange: process data, parameters, and diagnostic events. Process data are transmitted cyclically between the device and the IO-Link Master, providing the sensor operating variables in real time. Parameters and diagnostic events, on the other hand, are accessed acyclically upon request from the master.

Through the process data channel, the EMSW cyclically transmits instantaneous gas concentration, STEL concentration, TWA concentration, temperature, and relative humidity values. Process data are updated with a minimum cycle time of 10 ms. The parameter channel allows reading and configuration of all sensor parameters, while the diagnostic channel provides information about faults, alarms, warnings, and other events related to device operation.

7.2.1 PROCESS DATA

The EMSW-ANG provides 11 bytes of process data cyclically transmitted via IO-Link. Each monitored variable is represented by 2 bytes of data, totaling 10 bytes, while the remaining byte is used to indicate alarm status, as shown in Table 7.2.

Subindex	Description	Size	Scale	Unit
1	Instantaneous gas concentration	16 bits	1	ppm
2	STEL concentration	16 bits	0.01	ppm
3	TWA concentration	16 bits	0.01	ppm
4	Temperature	16 bits	0.01	°C
5	Humidity	16 bits	0.01	%
6	Instantaneous alarm flag	1 bit	1	a.u.
7	STEL alarm flag	1 bit	1	a.u.
8	TWA alarm flag	1 bit	1	a.u.
9	Temperature alarm flag	1 bit	1	a.u.
10	Humidity alarm flag	1 bit	1	a.u.

Table 7.2: IO-Link process data for the EMSW-ANG model.

7.2.2 IDENTIFICATION PARAMETERS

The identification parameters provide information related to the manufacturer, product, and device. In addition, parameters 24, 25, and 26 allow the configuration of custom tags of up to 30 characters for identifying the sensor application, function, and location. This information simplifies device identification and management in the field. The main identification parameters are presented in Table 7.3.

Parameter	Description	Access
16	Vendor name	RO
17	Vendor text	RO
18	Product name	RO
19	Product ID	RO
20	Product text	RO
21	Serial number	RO
22	Hardware revision	RO
23	Firmware revision	RO
24	Application specific tag	RW
25	Function tag of the sensor	RW
26	Location tag of the sensor	RW

Table 7.3: IO-Link identification parameters for the EMSW-ANG model.

7.2.3 CONFIGURATION PARAMETERS

The configuration parameters allow the operational behavior and functionalities of the EMSW-ANG to be adjusted. Through these parameters, it is possible to configure the reference concentration for calibration, alarm thresholds for gas concentration, temperature, and humidity, enable or disable specific device functions, modify the behavior of the analog output, and define the NFC communication access password. As a result, the EMSW-ANG can be adapted to the specific requirements of each application, providing greater flexibility for use and integration into monitoring systems. The complete list of available parameters, including their descriptions, functions, and access permissions, is presented in Table 7.4.

Index	Description	Subindex	Function	Access
65	Operating time	-	Operating time counter	RO
66	TWA alarm	1	Configure TWA alarm setpoint	RW
		2	Enable TWA alarm	RW
		1	Configure STEL alarm setpoint	RW

67	STEL alarm	2	Enable STEL alarm	RW
68	Instantaneous alarm	1	Configure instantaneous alarm setpoint	RW
		2	Enable instantaneous alarm	RW
69	Temperature alarm	1	Configure low-temperature alarm setpoint	RW
		2	Configure high-temperature alarm setpoint	RW
		3	Enable temperature alarm	RW
70	Audible alarm	1	Configure alarm volume	RW
		2	Enable audible alarm	RW
71	Humidity alarm	1	Configure low-humidity alarm setpoint	RW
		2	Configure high-humidity alarm setpoint	RW
		3	Enable humidity alarm	RW
72	Analog output	-	Configure analog output	RW
73	Current NFC password	-	Read current NFC password	RO
74	New NFC password	-	Change NFC password	WO
75	Calibration concentration	-	Configure calibration concentration	WO

Table 7.4: IO-Link configuration parameters for the EMSW-ANG model.

7.2.4 COMMANDS

The EMSW-ANG supports the execution of acyclic commands through the IO-Link protocol, allowing calibration procedures and functional tests to be performed without requiring physical intervention on the device. These commands make it possible to perform zero-point and span calibration of the gas sensor, as well as functional tests of the audible alarm, visual indicators, and electrochemical sensor. These features allow verification of the correct operation of the device, validation of alarm indications, and execution of calibration procedures. The complete list of available commands, together with their descriptions and execution codes, is presented in Table 7.5.

Command	Description	Access
160	Zero calibration	WO
161	Span calibration	WO
162	Test audible alarm	WO
163	Test visual alarm	WO
164	Test sensor	WO

Table 7.5: IO-Link commands of the EMSW-ANG model.

7.2.5 EVENTS

The EMSW-ANG provides diagnostic events through the IO-Link protocol, enabling continuous monitoring of alarm conditions, warnings, and faults related to device operation. These events are automatically transmitted to the IO-Link Master whenever a specific condition is detected or cleared, allowing rapid identification of anomalies and implementation of corrective actions by the control system.

The diagnostic events include information related to gas concentration, temperature, and humidity alarms, as well as faults associated with the electrochemical sensor and device operation. Table 7.6 presents the event codes supported by the EMSW-ANG together with their respective descriptions.

Code	Description	Action
6202	Instantaneous alarm	Evaluate the installation environment
6203	STEL alarm	Evaluate the installation environment
6204	TWA alarm	Evaluate the installation environment
6205	Low temperature alarm	Evaluate the installation environment
6206	High temperature alarm	Evaluate the installation environment

6207	Low humidity alarm	Evaluate the installation environment
6208	High humidity alarm	Evaluate the installation environment
16912	High operating temperature	Eliminate the heat source
16928	Low operating temperature	Evaluate the installation environment
20496	Device malfunction	Repair or replace the device

Table 7.6: IO-Link events of the EMSW-ANG model.

7.2.6 FACTORY RESET

The EMSW-ANG allows configuration restoration through specific IO-Link protocol parameters. The *Application Reset* command restores all parameters to their factory default values, except for the application, function, and location tags, while automatically performing a *Data Storage Upload* operation to update the data stored in the IO-Link Master.

The *Factory Reset* command performs the same parameter restoration but without executing the *Data Storage Upload*. In this case, a *Data Storage Download* operation must be performed to synchronize the parameters between the master and the device.

The *Back to Box* command restores all parameters to their original factory values, including the application, function, and location tags. After execution, the device must be restarted by cycling its power supply in order to re-establish communication with the IO-Link Master.

Table 7.7 presents the parameters available for executing the reset procedures together with their respective functions.

Command	Description	Access
129	Application Reset	WO
130	Factory Reset	WO
131	Back to Box	WO

Table 7.7: IO-Link reset commands of the EMSW-ANG model.

7.3 NEAR FIELD COMMUNICATION (NFC)

The *Near Field Communication* (NFC) protocol is a short-range wireless communication technology based on electromagnetic induction. This technology enables fast and secure data exchange between compatible devices without requiring a physical connection, making it particularly suitable for industrial parameterization and configuration applications.

The EMSW NFC interface enables practical and secure device parameterization and diagnostics without requiring a direct electrical connection. Unlike conventional serial communication protocols based on metallic conductors, NFC technology uses wireless electromagnetic coupling, allowing both data exchange and tag powering through the magnetic field generated by the transmitting device, such as a smartphone or a compatible NFC reader. Its operation is based on the electromagnetic induction principle described by the Faraday–Neumann–Lenz law, in which the transmitter coil generates a varying magnetic field that induces an electric current in the EMSW receiver coil. During communication, the transmitter modulates this magnetic field to transmit commands and parameters, while the EMSW responds by modulating the same magnetic field, ensuring reliable bidirectional communication for device configuration, identification, and information access.

The EMSW uses the NFC *Data Exchange Format* (NDEF) standard to structure and exchange data through NFC communication, ensuring interoperability, reliability, and compatibility with devices and applications that support this standard. NDEF is a lightweight, standardized binary format designed to encapsulate information efficiently and securely between NFC devices and smart tags. In the EMSW, this technology enables the structured transmission of parameters, diagnostic information, and device data, simplifying configuration, identification, and maintenance procedures through compatible smartphones or NFC readers.

7.3.1 INTEGRATION WITH WPS MOBILE

NFC communication with the EMSW is performed through the WPS Mobile application. Using this application, users can monitor device variables, access diagnostic information, execute commands, and perform complete parameterization of the gas detector. Although other applications compatible with the NDEF standard may also be used, WPS Mobile provides an interface specifically optimized for the EMSW, facilitating device identification, information visualization, and access to configuration parameters.

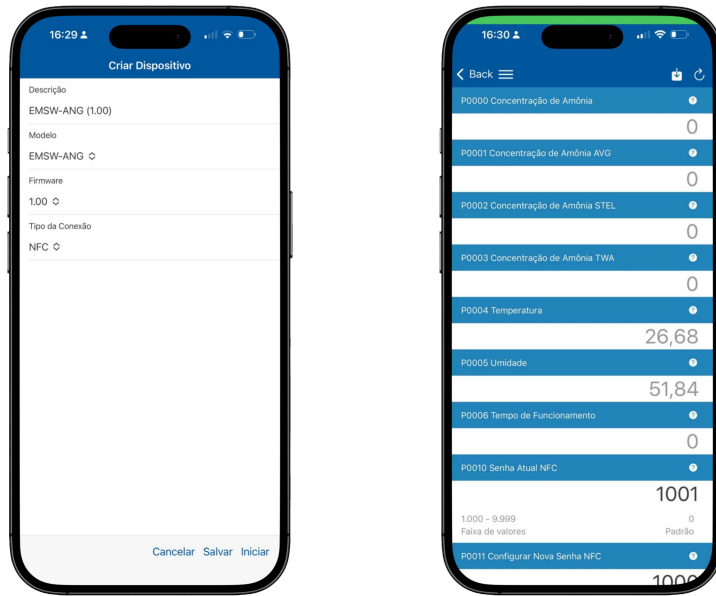
To establish communication between WPS Mobile and the EMSW, follow the procedure illustrated in Figure 7.1. First, select the “+” button on the application’s home screen, as shown in Figure 7.1a, to add a new device. Next, select the NFC interface as the communication method, as illustrated in Figure 7.1b. After confirmation, the application will enable NFC reading mode and display the scanning screen shown in Figure 7.1c. When the message “Ready to Scan” is displayed, position the smartphone close to the EMSW NFC tag, identified by the QR Code on the device. Communication will be established automatically, providing access to the information and functions available in the device.



Figure 7.1: Steps for connecting WPS Mobile to the EMSW using NFC.

After bringing the smartphone close to the EMSW and successfully reading the NFC tag, the device registration screen shown in Figure 7.2a will be displayed. At this stage, the user may choose to save the device in the application for future access or immediately start communication with the EMSW to access its monitoring and configuration functions.

Once communication has been established, the main device parameter screen, shown in Figure 7.2b, will be displayed. Through this interface, users can monitor process variables, access diagnostic information, configure operational parameters, and execute the commands available on the device. Available functions include configuring alarm thresholds, adjusting device parameters, performing calibration procedures, and executing diagnostic and maintenance tests, providing complete device management and real-time visualization of the variables monitored by the EMSW through the NFC interface.



(a) Device registration screen.

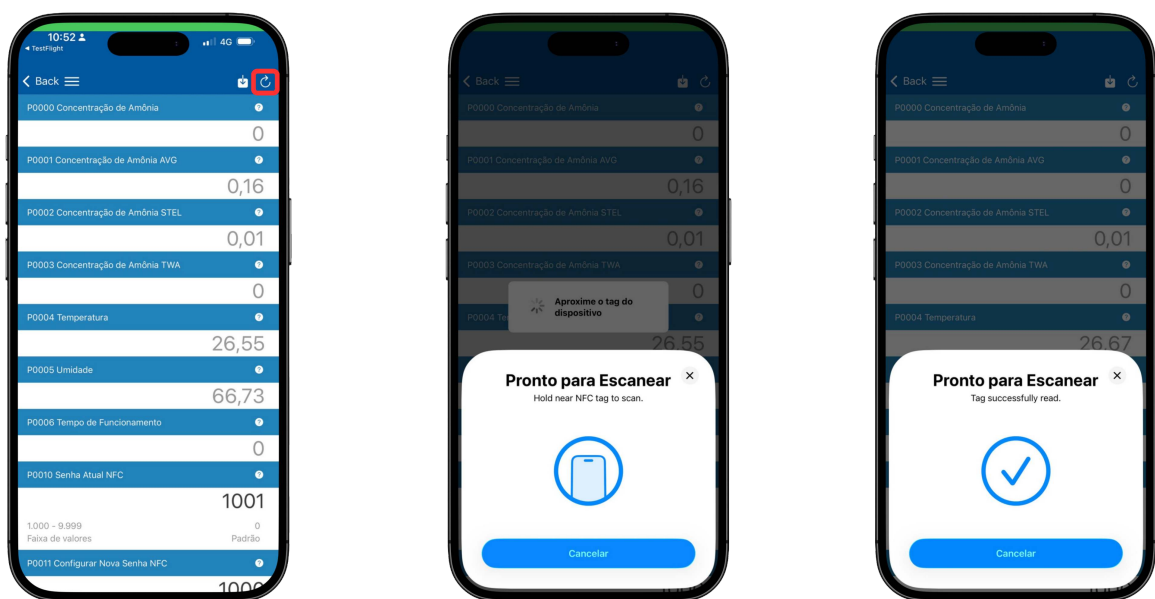
(b) Parameterization screen.

Figure 7.2: Establishing communication between WPS Mobile and the EMSW.

7.3.2 READING PARAMETERS USING WPS MOBILE

The reading of configuration parameters, diagnostic information, and monitored variables from the EMSW is performed according to the procedure shown in Figure 7.3. To begin the operation, select the *Reload* button located in the upper-right corner of the screen, highlighted in red in Figure 7.3a.

After pressing the button, the screen shown in Figure 7.3b will be displayed, prompting the user to bring the smartphone close to the EMSW NFC tag. Position the mobile device near the area identified by the QR Code on the equipment and wait approximately 2 seconds for communication to be established and the data to be transferred to the application. Once the operation is completed, the screen shown in Figure 7.3c will be displayed, indicating that the reading procedure has been successfully completed. If any error occurs during the process, the application will display an error message and the procedure must be repeated.



(a) NFC tag reading button.

(b) Waiting for the NFC tag.

(c) Reading completed successfully.

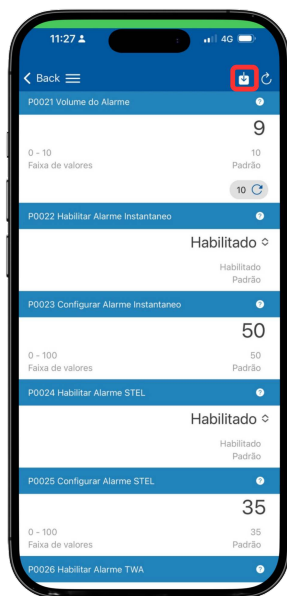
Figure 7.3: Procedure for reading EMSW parameters using WPS Mobile.

7.3.3 WRITING PARAMETERS USING WPS MOBILE

To write parameters or send commands to the EMSW, the procedure shown in Figure 7.4 must be followed. Unlike the reading process, the write operation requires authentication through the Current NFC Password (P0010) parameter. The entered value must match the password currently configured in the device or the factory default password 1001 if it has not been changed.

To begin the operation, configure the desired parameters, enter the password in parameter P0010, and select the send button located in the upper-right corner of the screen, highlighted in red in Figure 7.4a. After pressing the button, the confirmation message shown in Figure 7.4b will be displayed, requesting confirmation before writing the new values to the device. After confirmation, the application will prompt the user to bring the mobile device close to the EMSW NFC tag, as illustrated in Figure 7.3b. Position the smartphone near the area identified by the QR Code on the equipment and wait approximately 2 seconds for communication to be established and the data to be transferred to the EMSW.

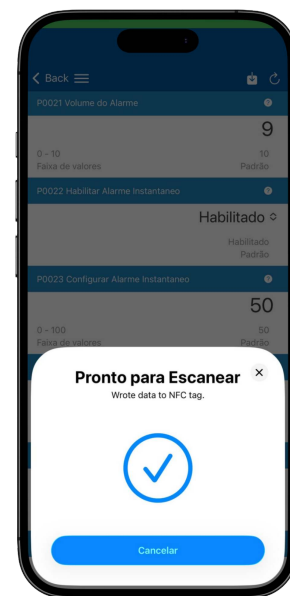
Once the operation has been completed, the screen shown in Figure 7.4c will be displayed, indicating that the writing procedure has been successfully completed. If any communication or data transfer error occurs, the application will display an error message and the procedure must be repeated.



(a) NFC tag reading button.



(b) Waiting for the NFC tag.



(c) Writing completed successfully.

Figure 7.4: Procedure for writing parameters or sending commands to the EMSW using WPS Mobile.

8 TECHNICAL SPECIFICATIONS

The technical specifications common to all EMSW models are presented in Table 8.1. These specifications define the electrical, mechanical, and environmental characteristics of the product, as well as its operating conditions and limits. To ensure proper performance and equipment integrity, all specified values shall be observed during the installation, operation, and maintenance of the device.

Operating Conditions	
Temperature	0 °C to +50 °C
Relative Humidity	15 % to 90 %
Pressure	800 to 1200 mbar
Mechanical Characteristics	
Enclosure Material	Polyamide (PA)
Dimensions (H × W × D)	112 × 94 × 41 mm
Degree of Protection	IP66
Electrical Characteristics	
Rated Current	7 mA
Power Supply Interface	Male M12 A-coded connector
Number of Pins	4 pins
Temperature Monitoring	
Resolution	0.01 °C
Accuracy	±0.2 °C
Humidity Monitoring	
Resolution	0.01 % RH
Accuracy	±2 % RH
Wireless Monitoring and Parameterization	
Communication Protocol	NFC
Configuration Parameters	Calibration Visual Alarms Audible Alarms Alarm Volume Alarm Levels
Physical Interfaces	
Buttons	Button 1 (B1) Button 2 (B2) Button 3 (B3) Button 4 (B4)
Visual Indication	
Status LED	Operation and diagnostic indication
Alarm LED	Alarm indication
Audible Indication	
Internal Buzzer	100 dB
General Characteristics and Installation	
Mounting	Cable-suspended mounting 2 × M4 screws
Sensor Covers	Protective Cover Calibration Cover
Certification	CE

TECHNICAL SPECIFICATIONS

Table 8.1: General technical specifications of the EMSW.

The technical specifications specific to each model, as well as the characteristics associated with each target gas, are presented in the following subsections.

8.1 EMSW-MOD

Electrical Characteristics	
Supply Voltage	13 to 32 VDC
Communication Protocol	
Communication Protocol	Modbus RTU
Baud Rate	115200 (configurable)
Data Bits	8
Stop Bits	1
Parity	Even (configurable)
Internal Data Logging	
Logging Interval	1 minute
Stored Data	Average Concentration STEL Concentration TWA Concentration
Data Log Capacity	24 hours

Table 8.2: EMSW-MOD technical specifications.

8.2 EMSW-ANG

Electrical Characteristics	
Supply Voltage	13 to 32 VDC
Communication Protocol	
Communication Protocol	IO-Link
Transmission Rate	COM3 (230.4 kbit/s)
Analog Output	
Voltage Output	0 to 10 VDC
Current Output	4 to 20 mA

Table 8.3: EMSW-ANG technical specifications.

8.3 EMSW-RLY

Electrical Characteristics	
Supply Voltage	127/220 VAC
Relay Output	
Contact Type	Normally Open (NO) or Normally Closed (NC) (configurable)
Load Capacity	127 VAC / 4 A 220 VAC / 4 A 30 VDC / 4 A

Table 8.4: EMSW-RLY technical specifications.

8.4 TARGET GAS SPECIFICATIONS

8.4.1 EMSW-XXX-ENH3-P1T-X-XXX

Electrochemical Sensor Characteristics	
Target Gas	Ammonia (NH ₃)
Measuring Range	0 to 100 ppm
Resolution	1 ppm
Repeatability	±10 %
Response Time (T90)	< 75 seconds
Measuring Principle	Electrochemical Sensor
Service Life	> 24 months

Table 8.5: Electrochemical sensor technical specifications.



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