

Industrial Managed Switch

8 Ports 1000BASE-T; MAC Security

852-1322



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Every conceivable measure has been taken to ensure the accuracy and completeness of this documentation. However, as errors can never be fully excluded, we always appreciate any information or suggestions for improving the documentation.

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Provisions

This documentation applies to the following product:

852-1322

1.1 Proper Use

The device is designed for the IP30 protection class. It is protected against the insertion of solid items and solid impurities up to 2.5 mm in diameter, but not against water penetration. Unless otherwise specified, the device must not be operated in wet and dusty environments.

Warranty and Liability

The terms set forth in the General Business & Contract Conditions for Delivery and Service of WAGO Kontakttechnik GmbH & Co. KG and the terms for software products and products with integrated software stated in the WAGO Software License Contract – both available at www.wago.com – shall apply. In particular, the warranty is void if:

- The product is improperly used.
- The deficiency (hardware and software configurations) is due to special instructions.
- Modifications to the hardware or software have been made by the user or third parties that are not described in this documentation and that has contributed to the fault.

Individual agreements always have priority.

Obligations of Installers/Operators

The installers and operators bear responsibility for the safety of an installation or a system assembled with the products. The installer/operator is responsible for proper installation and safety of the system. All laws, standards, guidelines, local regulations and accepted technology standards and practices applicable at the time of installation, and the instructions in the the products' Instructions for Use, must be complied with. In addition, the Installation regulations specified by Approvals must be observed. In the event of non-compliance, the products may not be operated within the scope of the approval.

Improper Use

Improper use of the product is not permitted. Improper use occurs especially in the following cases:

- Non-observance of the intended use.
- Use without protective measures in an environment in which moisture, salt water, salt spray mist, dust, corrosive fumes, gases, direct sunlight or ionizing radiation can occur.
- Use of the product in areas with special risk that require continuous fault-free operation and in which failure of or operation of the product can result in an imminent risk to life, limb or health or cause serious damage to property or the environment (such as the operation of nuclear power plants, weapons systems, aircraft and motor vehicles).

1.2 Typographical Conventions





Number Notation

100	Decimals: Normal notation
0x64	Hexadecimals: C-notation
'100'	Binary: In single quotation marks
'0110.0100'	Nibbles separated by a period

Text Formatting

<i>italic</i>	Names of paths or files
bold	Menu items, entry or selection fields, emphasis
Code	Sections of program code
>	Selection of a menu point from a menu
"Value"	Value entries
[F5]	Identification of buttons or keys

Cross References / Links

	Cross references/links to a topic in a document
	Cross references / links to a separate document
	Cross references / links to a website
	Cross references / links to an email address

Action Instructions

- ✓ This symbol identifies a precondition.
- 1. Action step
- 2. Action step
 - ⇒ This symbol identifies an intermediate result.
- ⇒ This symbol identifies the result of an action.

Lists

- Lists, first level
 - Lists, second level

Figures

Figures in this documentation are for better understanding and may differ from the actual product design.

Notes

DANGER

Type and source of hazard

Possible consequences of hazard that also include death or irreversible injury

- Action step to reduce risk

⚠ WARNING**Type and source of hazard**

Possible consequences of hazard that also include severe injury

- Action step to reduce risk

⚠ CAUTION**Type and source of hazard**

Possible consequences of hazard that include at least slight injury

- Action step to reduce risk

! NOTICE**Type and source of malfunction (property damage only)**

Possible malfunctions that may restrict the product's scope of functions or ergonomics, but do not lead to foreseeable risks to persons

- Action step to reduce risk

i Note**Notes and information**

Indicates information, clarifications, recommendations, referrals, etc.

1.3 Legal Information

Intellectual Property

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Subject to Change

The instructions, guidelines, standards, etc., in this manual correspond to state of the art at the time the documentation was created and are not subject to updating service. The installer and operator bear sole responsibility to ensure they are complied with in their currently applicable form. WAGO Kontakttechnik GmbH & Co. KG retains the right to carry out technical changes and improvements of the products and the data, specifica-

tions and illustrations of this manual. All claims for change or improvement of products that have already been delivered – excepting change or improvement performed under guarantee agreement – are excluded.

Licenses

The products may contain open-source software. The requisite license information is saved in the products. This information is also available under [🌐 www.wago.com](https://www.wago.com).

Safety

This section contains safety rules that must be followed for hazard-free use of the product.

This section is aimed at the following target groups:

- Planners and installers
- Operators
- Qualified assembly personnel
- Qualified installation personnel (electrical installation, technician network installation etc.)
- Qualified operating personnel
- Qualified service and maintenance personnel

Obey the following safety rules:

2.1 General Safety Regulations

- This documentation is part of the product. Therefore, retain the documentation during the entire service life of the product. Pass on the documentation to any subsequent user of the product. In addition, ensure that any supplement to this documentation is included, if necessary.
- Any actions related to the use of WAGO software may only be performed by qualified staff with sufficient knowledge to use the respective PC system.
Steps in which files are created or changed on a PC system may only be performed by qualified employees with sufficient knowledge in the administration of the PC system used in addition to file creation or modification.
Steps that change the PC system's behavior within a network may only be performed by qualified employees with sufficient knowledge of administration of the responsible network.
- Changes to switch configurations in the network must always be performed by qualified personnel with sufficient skills.
- Comply with the laws, standards, guidelines, local regulations and accepted technology standards and practices applicable at the time of installation.
- If remote access to control components and control networks is required, use a Virtual Private Network (VPN).

2.2 Electrical Safety

- High voltage can cause electric shock or burns! Disconnect all power sources from the product before performing any installation, repair or maintenance.

Power Supply

- Connecting impermissible current or frequency values may destroy the product.
- Switch off power supply to the device immediately if the product malfunctions or is damaged.

Ground/Protection/Fuses

- Protect the product with an appropriate overcurrent protection device.
- Using the overvoltage and lightning protection designs intended for the building.

- When handling the product, please ensure that environmental factors (personnel, work space and packaging) are properly equalized. Do not touch any conducting parts.

Lines

- Maintain spacing between control, signal and data lines and the power supply lines.
- Observe permissible temperature range of connecting cables.
- Use appropriate strain relief.
- Make sure the pin assignment is correct.
- Avoid reverse polarity of data and power supply lines, as this may damage the devices involved.

Protect

- Observe the applicable standards for EMC-compatible installations.

Radio, etc.

- This is a Class A product. The product can cause radio interference in residential areas; in this case, the operator can be required to take appropriate measures to prevent such interference.
- For industrial use: WAGO's 852 Series ETHERNET Switches are certified to be used in residential and in industrial environments. If the latter, they should be considered as exposed operating components. Therefore, in industrial applications, only install these switches in lockable housings, cabinets or electrical operation rooms. Access must be limited to authorized, qualified staff having the appropriate key or tool.
- Only use devices equipped with ETHERNET or RJ-45 connectors in LANs. Never connect these devices with telecommunication networks.

Components

- Replace defective or damaged device/module (e.g., in the event of deformed contacts).

2.3 Mechanical Safety

- As the installer of the system, you are responsible for ensuring the necessary touch-proof protection. Follow the installation guidelines for the specific application.
- The surrounding air temperature for operation indicated in the technical data applies to the nominal mounting position. Different mounting positions may affect the permissible surrounding air temperature for operation.
- Cooling of the product must not be impaired. Ensure air can flow freely and that the minimum clearances from adjacent products/areas are maintained.
- Do not install the product on or in the vicinity of easily flammable materials.
- When selecting the location for installation, note that the control cabinet must remain accessible for maintenance purposes.
- Before startup, please check the product for any damage that may have occurred during shipping. Do not put the product into operation in the event of mechanical damage.
- Only use this product in a controlled environment.
- Do not open the product housing.
- Avoid conductive contamination.

2.4 Indirect Safety

- Do not use hard objects that could cause scratches for cleaning.
- Do not use any contact spray for cleaning.
- Clean tools and materials are imperative for handling the product.
- The products are not resistant to materials having seeping and insulating properties such as aerosols, silicones and triglycerides (found in some hand creams). If these substances occur in the environment of the products, install the products in an additional housing that is also resistant to these substances.
- Before installation and operation, please read the product documentation thoroughly and carefully. In addition, note the information on the product housing and further information, e.g. at www.wago.com/<item number>.
- Change the password. The factory default setting is widely known and does not provide adequate protection.
- Give all products in a network different IP addresses.
- Use only the current firmware.
- Regularly perform threat analyses. You can check whether the measures taken meet your security requirements.
- Use “defense-in-depth” mechanisms in your system's security configuration to restrict the access to and control of individual products and networks.

Overview

WAGO's 852-1322 industrial managed switch is a switch with 8 Gigabit-Ports 10/100/1000 BASE-T(X) RJ-45, of which two ports support MAC Security encryption.

This industrial managed switch is easy to configure and install; thus, it can be used in numerous applications including residential applications. It is ideal for plug-and-play local area network protection with embedded MACsec key agreement that offers security protection.

MACsec uses GCM-AES to implement point-to-point security for ETHERNET links between switches. In other words, it can secure a network from a whole host of security threats, including intrusion, man-in-the-middle, masquerading, passive wiretapping, and playback attacks. And because MACsec encryption is hardware-based, there is no nameable added latency.

WAGO's 852-1322 is ideal for adding an extra layer of security in residential and industrial applications that require compact solutions while delivering high network performance up to 97 % of throughput guaranteed with no nameable additional latency.

It also supports a wide operating temperature range of -20 °C to 70 °C and is EN/IEC(CB)/UL62368-1, and IEC 60068-2-6, IEC 60068-2-27, IEC 60068-2-32. WAGO's 852-1322 switches is a powerful compact device that can perform under a variety of environmental conditions, such as power input voltage, shock, drop and vibration.

Properties

4.1 Views

4.1.1 Front View

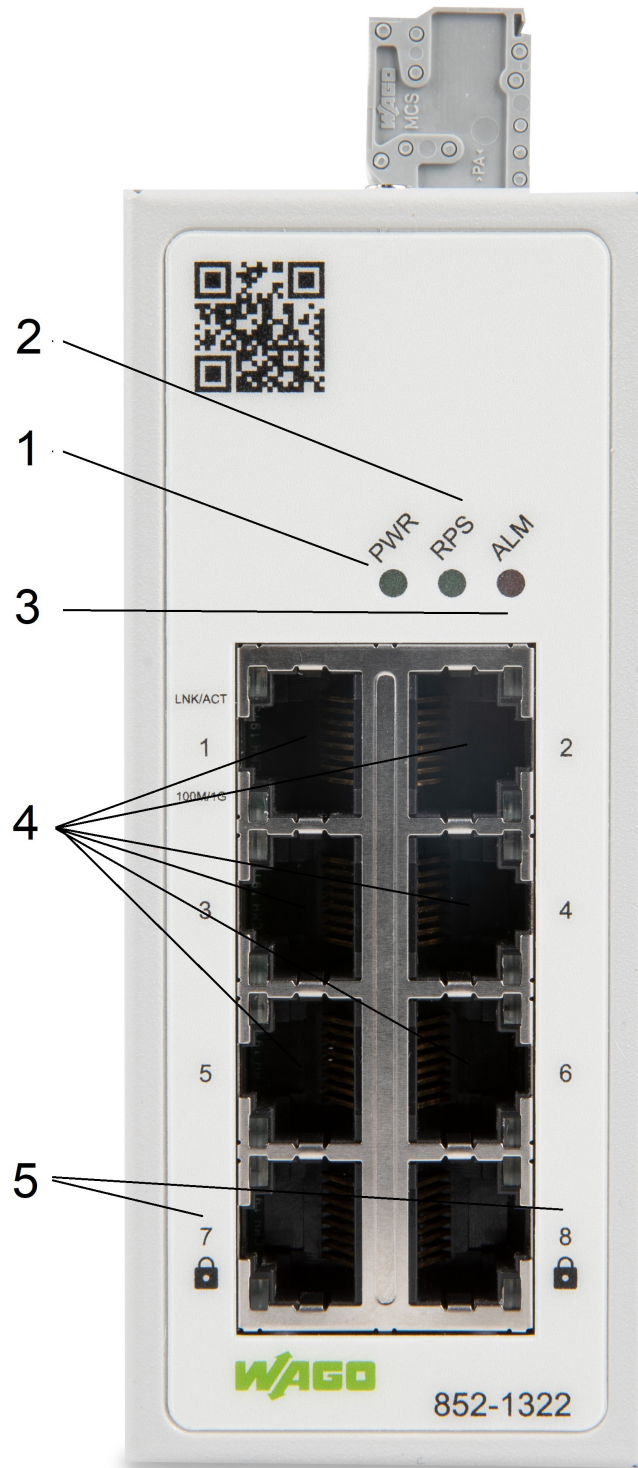


Figure 1: Front View of the Industrial Managed Switch

Table 1: Legend for the Figure "Front View of the Industrial Managed Switch"

Pos.	Custom Name	Explanation	
1	PWR	Status LED Power input	Display Elements [18]
2	RPS	Status LED redundant input	Display Elements [18]
3	ALM	Status LED alarm	Display Elements [18]
4		RJ-45 ports (10/100/1000BASE-T(X)) (6)	Port LEDs [19]
5		RJ-45 ports (10/100/1000BASE-T(X)) (MACsec) (2)	Port LEDs [19]

4.1.2 Top View

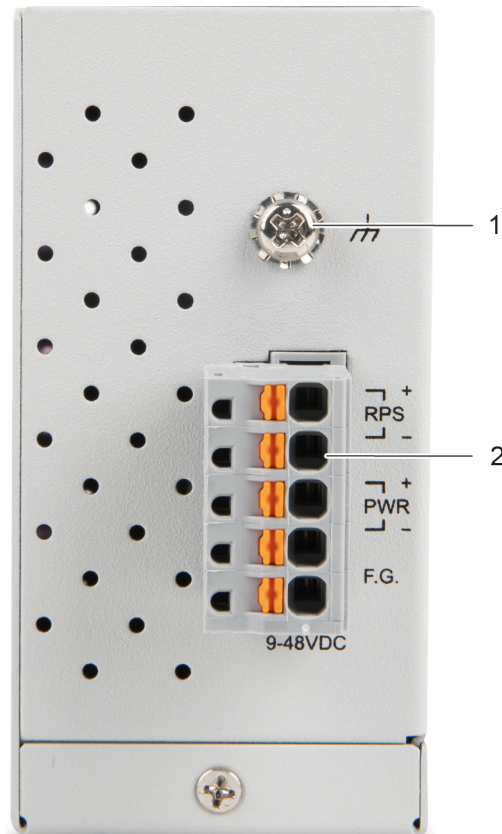


Figure 2: Top View of the Industrial Managed Switch

Table 2: Legend for the Figure "Top View of the Industrial Managed Switch"

Pos.	Custom Name	Explanation	Details
1	-	Grounding screw	Grounding screw [16]
2	-	Connector (male) for power consumption (RPS/PWR/F.G.) (RPS/PWR/F.G.) (Item number 2231-105/026-000)	Power Supply [16]

4.2 Label

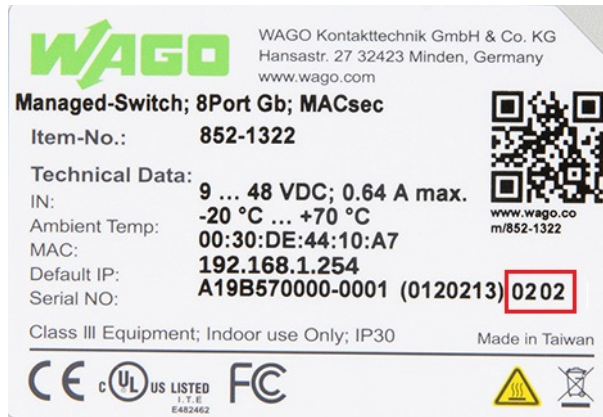


Figure 3: Label

Table 3: Legend for Figure „Label“

Custom Name	Description
Item-No	Item number
IN	Device input and maximum current and voltage
Ambient Temp	Device input and maximum current and voltage
MAC	Device MAC information
Default IP	Device default IP address
Serial NO	Device serial number
	Firmware Version (left digit sequence) (02)
	Hardware Version (right digit sequence) (02)
QR code	Connect to product information by scanning this QR code

4.3 Connectors

4.3.1 Grounding screw

The switch must be grounded. Connect the grounding screw to the ground potential. Do not operate the switch without an appropriately installed protective earth conductor.



Figure 4: Grounding screw

4.3.2 Power Supply

The female connector (Item No. 2231-105/026-000) can easily be connected to the 5-pole male connector (Item No. 231-435/001-000) located on the top of the switch.

Both PWR and RPS support input voltage between 9 and 48 VDC.

The male connector shows the following pin assignment:

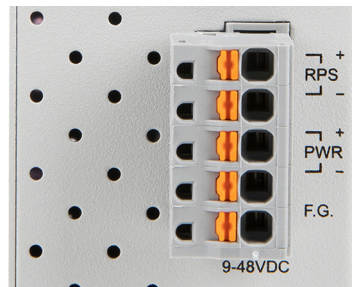


Figure 5: Power Supply Connector

Table 4: Legend for Figure "Power Supply"

Connection	Custom Name	Description
+	RPS	Secondary DC input
-	RPS	Secondary DC input
+	PWR	Primary DC input
-	PWR	Primary DC input
	F.G.	Functional Ground

! NOTICE

Damage to Property Caused by Electrostatic Discharge (ESD)!

DC Powered Switch: Power is supplied through an external DC power source. Since the switch does not include a power switch, plugging its power adapter into a power outlet will immediately power it on.

4.3.3 Network Connections

The industrial managed Switch uses ports with copper connectors and supports ETHERNET, Fast ETHERNET and Gigabit ETHERNET

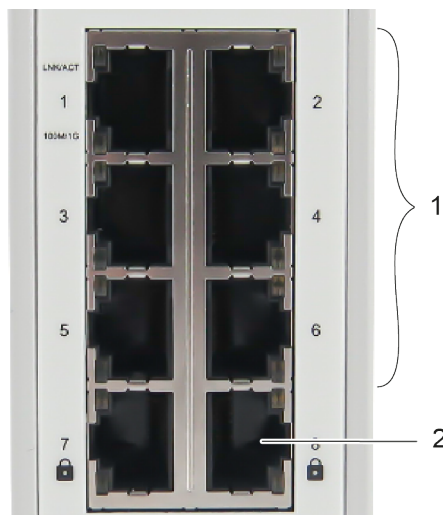


Figure 6: Network Connections

Table 5: Legend for Figure "Network Connections"

Pos.	Description	For Details, see Section:
1	6 x RJ-45 connections (10/100/1000BASE-T(X))	10/100/1000BASE-T(X) ports [18]

Pos.	Description	For Details, see Section:
2	2 x SFP connections (10/100/1000BASE-T(X) (MACsec))	10/100/1000BASE-T(X) (MACsec) ports [▶ 18]

4.3.3.1 10/100/1000BASE-T(X) ports

10/100/1000BASE-T(X) ports support networks speeds of 10 Mbit/s, 100 Mbit/s und 1000 Mbit/s and can be operated in half- and full-duplex transmission modes. These ports also provide automatic crossover detection (Auto-MDI/MDI-X), with plug-and-play capabilities. Simply plug the network cables into the ports; they then adapt to the end node devices.

We recommend the following cable for the RJ-45 ports:

- Cat 5e or better with a max. cable length 100 m.

4.3.3.2 10/100/1000BASE-T(X) (MACsec) ports

The 10/100/1000BASE-T(X) (MACsec) connections offer not only the network speeds of 10 Mbit/s, 100 Mbit/s and 1000 Mbit/s, but also encrypted data traffic using the MAC Security security standard.

4.4 Display Elements

The is equipped with device LEDs and port LEDs. You can see the status quickly with the device LEDs, while the port LEDs provide information about connection actions.

4.4.1 Unit LEDs



Figure 7: Unit LEDs

Table 6: Legend for “Unit LEDs” Figure

LED	Name	Status	Description
PWR	Primary-Power-LED	Green	Use the primary power supply.
		Off	Primary power off or failure.
RPS	Redundant-Power-System-LED	Green	Use the redundant power supply.
		Off	Redundant power off or failure.
ALM	Alarm-LED	Red	No power supply at the primary or secondary (PWR or RPS) power supply.
		Off	No alarm reported

4.4.2 Port LEDs

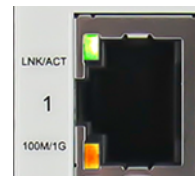


Figure 8: Port LEDs

Table 7: Legend for „Port LEDs“ Figure

LED	Connection	Status	Description
LINK/ACT	10/100/1000 BASE T Ports LED (1 LED for each port)	Green	Port in operation
		Flashes	Data traffic routed via the port
		Off	No proper link established
100M/1G	10/100/1000 BASE T Ports LED (1 LED for each port)	Amber	Port in operation at 100/1000 Mbit/s
		Off	Port in operation at 10 Mbit/s or not linked

4.5 Technical data

4.5.1 Product

Table 8: Technical Data – Device Data

Property	Value
Width	45.3 mm
Height	110 mm
Depth	92 mm (from the top edge of the carrier rail)
Weight	441 g
Degree of protection	IP30

4.5.2 System Data

Table 9: Technical Data – System Data

Property	Value
MAC table	16384 entries
Jumbo Frame Size	10 kB
Maximum lengths	10/100/1000BASE-T(X): 100 m

4.5.3 Power Supply

Table 10: Technical Data – Power Supply

Property	Value
Supply voltage	9 ... 48 VDC
Power consumption, max.	5.8 W

4.5.4 Communication

Table 11: Technical Data – Communication

Property	Value
Ports (copper, RJ-45)	6 x 10/100/1000BASE-T(X)
Ports (copper, RJ-45, MAC Security)	2 x 10/100/1000BASE-T (MAC Security)

Property	Value
Standards	IEEE 802.3 10BASE-T IEEE 802.3u 100BASE-TX IEEE 802.3ab 1000BASE-T IEEE 802.3x Flow Control, back pressure Flow Control IEEE 802.1Q for VLAN Tagging (Prioritization of Profinet Packets) IEEE 802.1p for CoS (Prioritization of Profinet Packets) IEEE 802.1AE for MAC Security

4.5.5 Environment requirements


Table 12: Technical Data – Environmental Conditions


Property	Value	
Surrounding air temperature, operation	-20 ... +70 °C	
Surrounding air temperature, storage	-40 ... +85 °C	
UL 62368-1	Use	Indoor
	Pollution degree	PD 2
Relative humidity	≤ 95 % at ≤ +55 °C, ≤ 50 % at +55 ... +70 °C	
Vibration resistance	IEC 60068-2-6	
Shock resistance	IEC 60068-2-27	
EMC immunity to interference	EN 55024 EN 61000-6-2 EN 61000-6-1	
EMC Emission of interference	FCC Part 15, Subpart B, Class A, Class B EN 55032 Class A and Class B EN 61000-6-4 EN 61000-6-3 EN 55011	

4.6 Guidelines, approvals and standards

4.6.1 Approvals

The following approvals have been granted for the product:

	Conformity Marking
---	--------------------

	Ordinary Locations	UL62368 (E482462)
---	--------------------	-------------------

Note

More information on approvals

You can find detailed information on the approvals online at: www.wago.com/<item number>

4.6.2 Regulations and Standards

Please observe the standards and regulations that are relevant to installation:

- The data and power lines must be connected and installed in compliance with the standards to avoid failures on your installation and eliminate any danger to personnel.
- For installation, startup, maintenance and repair, please observe the accident prevention regulations of your machine (e.g., DGUV Regulation “Electrical Installations and Equipment”).
- Emergency stop functions and equipment must not be deactivated or otherwise made ineffective. See relevant standards (e.g., EN 418).
- Your installation must be equipped in accordance to the EMC guidelines so electromagnetic interferences can be eliminated.
- Please observe the safety measures against electrostatic discharge according to EN 61340-5-1/-3. When handling the modules, ensure that environmental factors (persons, workplace and packing) are well grounded.
- The relevant valid and applicable standards and guidelines regarding the installation of switch cabinets must be observed.

Functions

5.1 Security

5.1.1 IEEE 802.1X

IEEE 802.1X is an IEEE standard for port-based Network-Access Control protocol. It provides an authentication mechanism to devices that need to attach to a LAN. This protocol restricts unauthorized clients from connecting to a LAN through ports that are opened to the Internet. The authentication generally involves three parties (see Figure “RADIUS Authentication Sequence” in Section [RADIUS \[p. 22\]](#)): a supplicant, an authenticator, and an authentication server.

- **Supplicant:** A client device that requests access to the LAN
- **Authentication Server:** This server performs the actual authentication. We utilize RADIUS („Remote Authentication Dial-In User Service“ as the authentication server.
- **Authenticator:** The Authenticator is a network device (i.e. the WAGO Industrial managed switch) that acts as a proxy between the supplicant and the authentication server. It passes around information, verifies information with the server, and relays responses to the supplicant.

The authenticator acts like a security guard to a protected network. The supplicant is not allowed accessing to the protected side of the network through the authenticator until the supplicant’s identity has been validated and authorized. With IEEE802.1X authentication, a supplicant and an authenticator exchange **EAP** („Extensible Authentication Protocol“, an authentication framework widely used by IEEE) aus. Then the authenticator forwards this information to the authentication server for verification. If the authentication server confirms the request, the supplicant (client device) will be allowed to access resources located on the protected side of the network.

5.1.2 RADIUS

The RADIUS is a networking protocol that provides authentication, authorization and accounting (AAA) management for devices to connect and use a network services. Figure “RADIUS Authentication Sequence” shows a diagram of RADIUS authentication sequence.

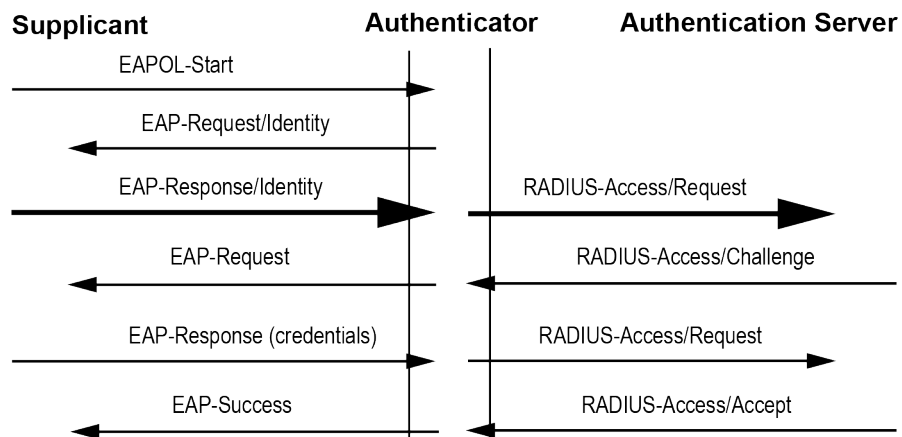


Figure 9: RADIUS Authentication Sequence

5.1.3 MAC Security (MACSec)

WAGO industrial managed switches support advanced security features that allow traffic encryption and high throughput. MACsec or Media Access Control Security is a security standard specified by IEEE also called IEEE 802.1AE. This IEEE MAC security standard provides connectionless user data confidentiality, frame data integrity, and data origin authenticity. MACsec can establish point-to-point security on ETHERNET links between directly connected nodes. WAGO industrial managed switches support this security feature and can be used to transparently secure an IEEE 802 LAN connection to a peer device (such as another switch) that also supports the MACsec.

MACsec defines two terms called secure channel and connectivity association when setting up a secure communication between two switches. A secure channel in MACsec is unidirectional and used for transmitting (outbound traffic) or receiving (inbound traffic) data. A connectivity association when MACsec is enabled consists of two secure channels: one for inbound traffic and one for outbound traffic.

The point-to-point links can be secured by MACsec after matching security keys are exchanged and verified between the ports on two different secure switches.

The static secure association key (SAK) security mode is when the user manually configured the same static secure association key (SAK) on both sides of a connection. There is no key server in this mode and the keys must be matched on the ports of both switches. This can be viewed as setting up two secure channels within a connectivity association. It is suggested to have a periodic manual key update in order to prevent the key to be broken by brute-force attack.

Planning

6.1 Structure Guidelines

6.1.1 Installation Site

The location selected to install the may greatly affect its performance. When selecting a site, we recommend considering the following rules:

- Install the at an appropriate place. See Section [🔗 Environment requirements \[▶ 20\]](#) , for the acceptable temperature and humidity operating ranges.
- Make sure that the heat output from the and ventilation around it is adequate.
- Do not place any heavy objects on the .

Transport and Storage

The original packaging offers optimal protection during transport and storage.

- Store the product in suitable packaging, preferably the original packaging.
- Only transport the product in suitable containers/packaging.
- Make sure the product contacts are not contaminated or damaged during packing or unpacking.
- Observe the specified ambient climatic conditions for transport and storage ([🔗 Environment requirements \[▶ 20\]](#)).

Installation and Removal

8.1 Installation

8.1.1 Installation on a Carrier Rail

The carrier rail must optimally support the EMC measures integrated into the system and the shielding of the internal data bus connections.

Place the onto the DIN rail from the top and snap it into position.

8.2 Removal

8.2.1 Removal from Carrier Rail

To remove the industrial managed switch from the carrier rail, insert a suitable tool into the metal tab under the switch and deflect the metal tab downward.

You can then release the switch down from the carrier rail and remove it upwards.

Connection

9.1 Grounding

Grounding is through the grounding screw on the top of the product.

The switch must be grounded. Connect the grounding screw to the ground potential. Do not operate the switch without an appropriately installed protective earth conductor.

9.2 Connecting the Supply Voltage

The switch uses direct-current power supply of 9 ... 48 VDC .

The primary and secondary power supply pins are connected via a 5-pin plug-in connection located on the top of the industrial managed switch.

The female connector (Item No. 2231-105/026-000) is composed of five connecting terminals and can be inserted and removed easily by hand to connect to the 5-pin plug connector located on the top of the switch.

1. Connect a suitable grounding conductor to the grounding lug on the top of the switch.

Note **Ground for the switch**

The ground for the switch prevents electromagnetic interference from electromagnetic radiation.

Observe the corresponding standards for EMC-compatible installations as well.

2. Plug the female connector into the male connector of the switch if it has not already been plugged in. Check the tight fit of the multipoint connector by gently shaking it.
3. PWR +/-:
To connect or disconnect the conductors, actuate the spring directly in the female connector using a screwdriver or an operating tool and insert or remove the conductor.
4. Check whether the power LED "PWR" on the top of the device lights up when power is supplied to the device. If not, check to ensure that the power cable is plugged in correctly and fits securely.
5. RPS +/-:
To connect or disconnect the conductors, actuate the spring in the female connector directly using a screwdriver or an operating tool and insert or remove the conductor.
6. Check whether the power LED "RPS" on the top of the device lights up when power is supplied to the device. If not, check to ensure that the power cable is plugged in correctly and fits securely.

9.3 Connect 10/100/1000BASE-T ports

The 10/100/1000BASE-T ports (RJ-45 ETHERNET ports) of the support both autosensing and auto-negotiation.

1. Connect one end of the twisted pair cable of the type Category 3/4/5/5e to an available RJ-45 port on the and the other end to the port of the selected network node.
2. Check the respective port LED on the that the connection is established (see Section [Port LEDs \[▶ 19\]](#)).

Configuration in the WBM

An internal file system and integrated Webserver can be used for configuration and administration of the system. Together, they are referred to as the Web-Based Management (WBM) system.

The HTML pages saved internally provide you with information about the configuration and status of the industrial managed switch. In addition, you can also change the configuration of the device here.

Note

Always restart after making changes to the configuration!

The system must always be restarted for the changed configuration settings to take effect.

10.1 Login

1. To open the WBM, launch a Web browser (e.g., Microsoft Edge, Mozilla Firefox or Google Chrome).
2. Enter the IP address of the device.
3. While the device is booting up, it would send the GARP packets to the network. Therefore, if you use the DHCP protocol to assign the device's IP address or you forget the static IP address of the device, you could capture the GARP packets by using Wireshark (a network sniffer software) as shown in Figure "Example of Wireshark software sniffing on IP address of a switch" to find the IP address that is assigned to the device.

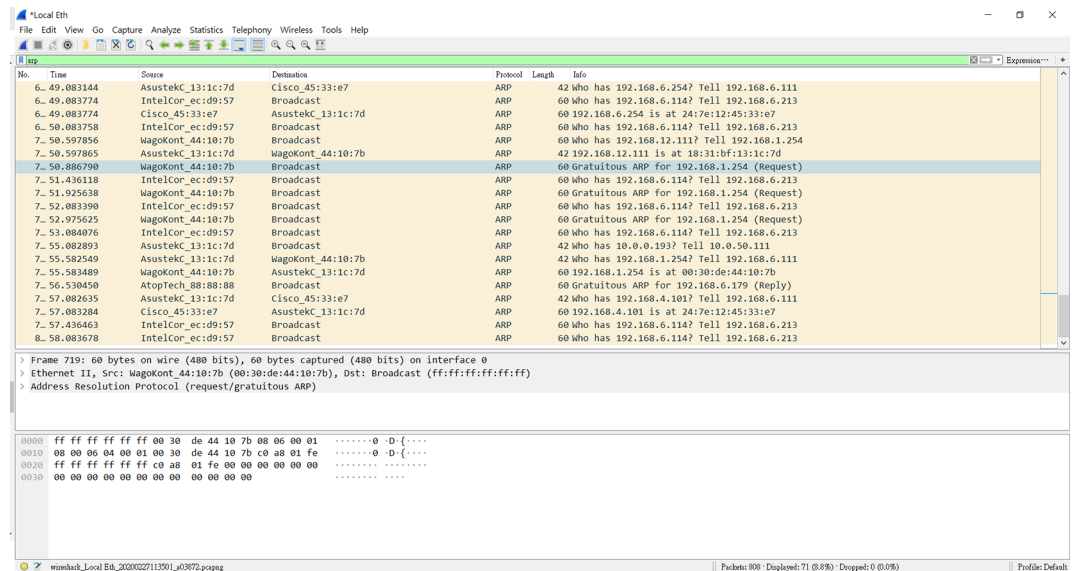


Figure 10: Example of Wireshark software sniffing on IP address of a switch

4. Click **[Enter]** to confirm.

- If this is the first time that your Web browser access the device, you may see a security warning page.
 - Please, click on the red box **[Advanced]** button and click on **[Accept the Risk and Continue]** button.

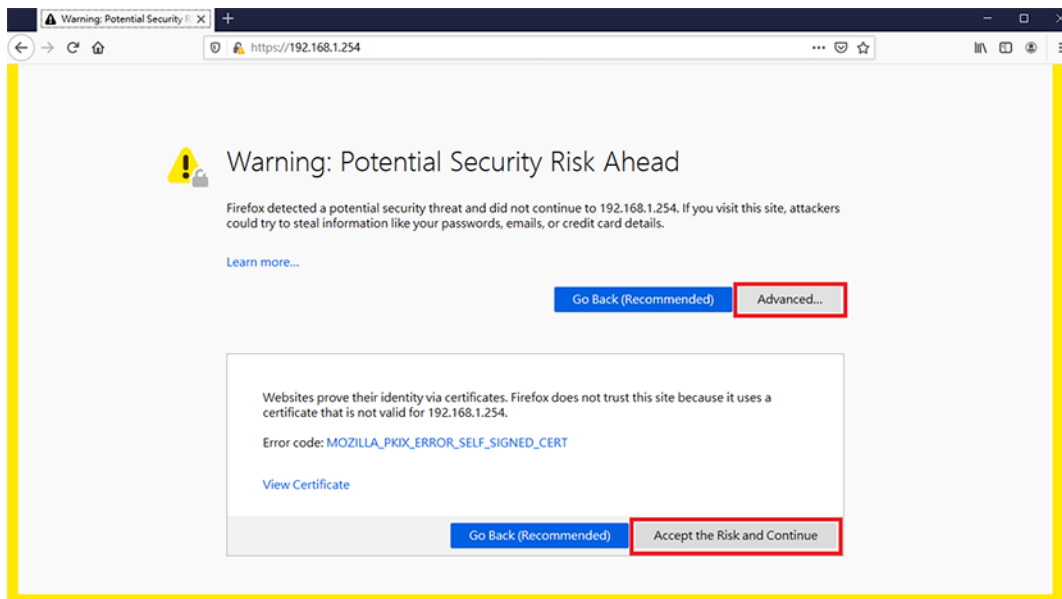


Figure 11: Security Warning Page

- After pressing the **[Enter]** key.

A screenshot of the WAGO login page. It features the WAGO logo at the top left. Below the logo, the model name '852-1322' and MAC address '00:30:DE:44:10:7B' are displayed. There are two input fields: 'Username' and 'Password'. A green 'Login' button is located at the bottom right of the form.

Figure 12: WAGO Login Page

- Enter your user name and password in the query dialog:
 - Username = „admin“
 - Password = „wago“
- The start page of WBM loads.

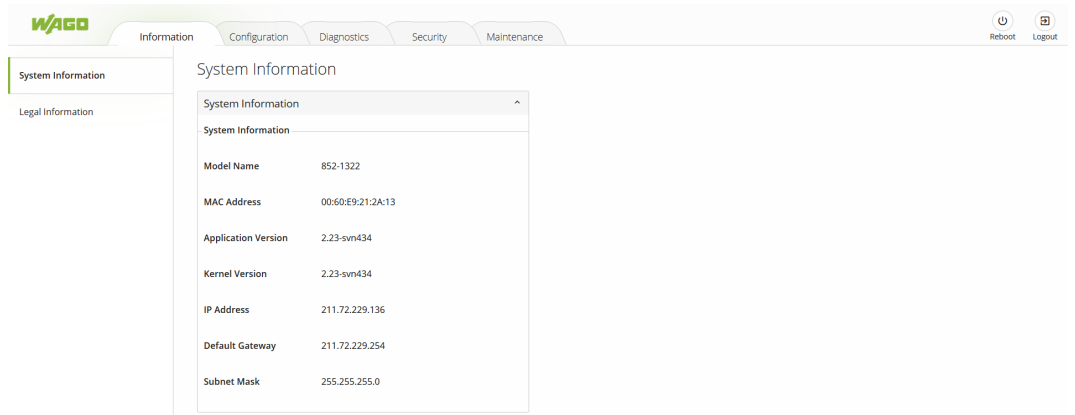


Figure 13: Start Page of WBM

9. Select your desired page on the navigation bar at the top of the screen and clicking on corresponding tab on the left hand side of the screen.
10. Make the desired settings on the desired web page.
11. Click **[Submit]** or **[Change]** or **[Add]** to confirm or update your changes to apply the settings.
12. It is highly recommended to avoid using the factory default password during the actual operation of your device. Therefore, if you logged in with the default password successfully, the device will remind the user to change the password with a warning pop-up dialog and redirect the user to the change password page as shown in Figure “Default Password Warning Pop-up Dialog on Password Web Page”. Please click the **[OK]** button to accept the warning.

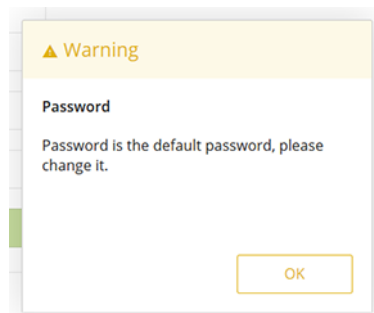


Figure 14: Default Password Warning Pop-up Dialog on Password Web Page

You can access the corresponding WBM pages via the links in the navigation bar.

Table 13: Overview – Navigation Links and WBM Pages

Navigation Links and WBM Pages
[Information]
<ul style="list-style-type: none"> • System Information • Legal Information
[Configuration]
<ul style="list-style-type: none"> • System Settings • Device Discovery - LLDP • System Management - SNMP • Network Settings • Port Settings • Interface - Mirror • Password

Navigation Links and WBM Pages
[Diagnostics]
<ul style="list-style-type: none"> • SNMP • Modbus® TCP • System-Log • Port Monitor
[Security]
<ul style="list-style-type: none"> • Static SAK • Secure Code • 802.1X (IEEE 802.1X) • Port Security • VLAN
[Redundancy]
<ul style="list-style-type: none"> • RSTP
[Maintenance]
<ul style="list-style-type: none"> • Firmware-Upgrade • Reset to Default • Backup/Restore • Reboot • Logout

The settings/configuration of the industrial managed switch can be made on these WBM pages.

The default values are displayed in **bold**.

10.2 Login Failure

If you failed to login, you will encounter an Error dialog as shown in Figure “Login Failure Dialog”. You will have two options or buttons to choose from which are **[Forget it]** or **[Try again]** buttons. If you click the **[Try again]** button, you will be re-directed to the Login page with some waiting time, which is determined by the number of times that the user failed to login. The first and the second tries will have 0 second waiting time. The third try will have a waiting time of 10 seconds. The fourth try will have a waiting time of 100 seconds. The fifth up to tenth tries will have a waiting time of 1000 seconds. If the user tried more than ten times, the user will only be able to click the **[Forget it]** button to log in with the a secure code generated by the security card as shown in Figure “Example of Security Card”.

i Note

Functions of the “Secure code” tab

The use of the security card and the **[Forget it]** option is enabled by default on the device. You can disable this feature in the “Security” – “Secure code” tab page, after logging in for the first time.

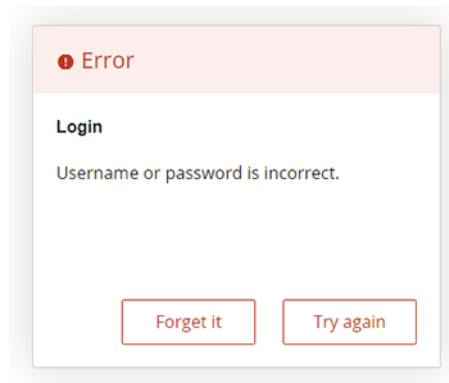


Figure 15: Login Failure Dialog

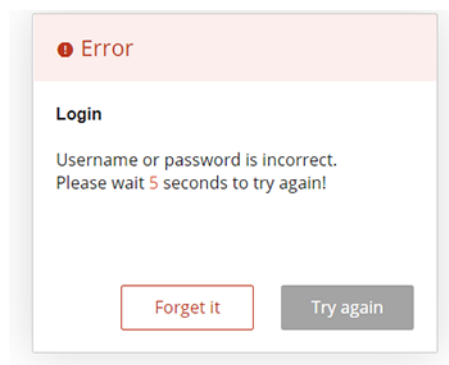


Figure 16: Login Failure Dialog with only [Forget it] button

If you click on the **[Forget it]** button, the device will randomly ask for a secure code of three characters. The three characters are randomly chosen from the security card. You will need to look up the characters in the security card and use them to enter them in the Secure code textbox as shown in Figure “Example of Dialog after Clicking **[Forget it]** Button”. The secure code dialog in Figure “Example of Dialog after Clicking **[Forget it]** Button” provides the hints on the newly composed secure code. Based on the security card given in Figure “Example of Security Card”, the secure code is “NLS”. The dialog has two buttons to choose from: **[OK]** and **[Cancel]** .

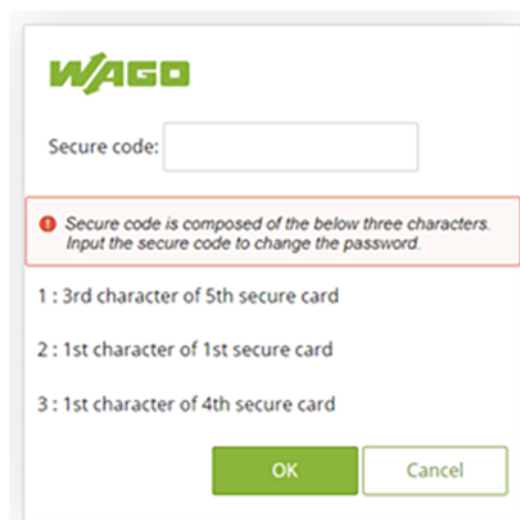


Figure 17: Example of Dialog after Clicking [Forget it] Button

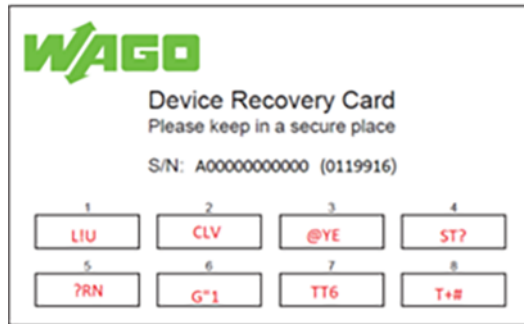


Figure 18: Example of Security Card

After clicking [OK] button with a correct secure code from the security card, you will be re-directed to the change password tab page to immediately update the password as shown in Figure “Re-direction to Change Password Tab Page”. When you finished changing the new password, click on the [Submit] button. The system will prompt you with the WAGO login page to enter the new password as shown in Figure “WAGO Login Dialog after Resetting Password”.

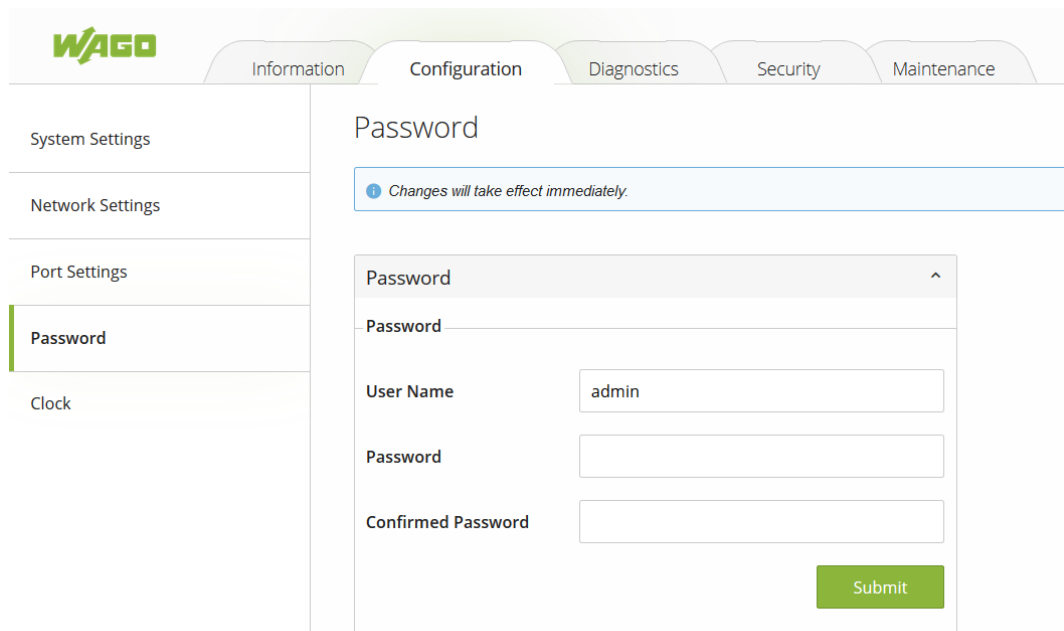


Figure 19: Re-direction to Change Password Tab Page

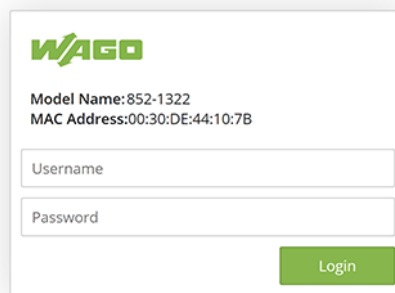
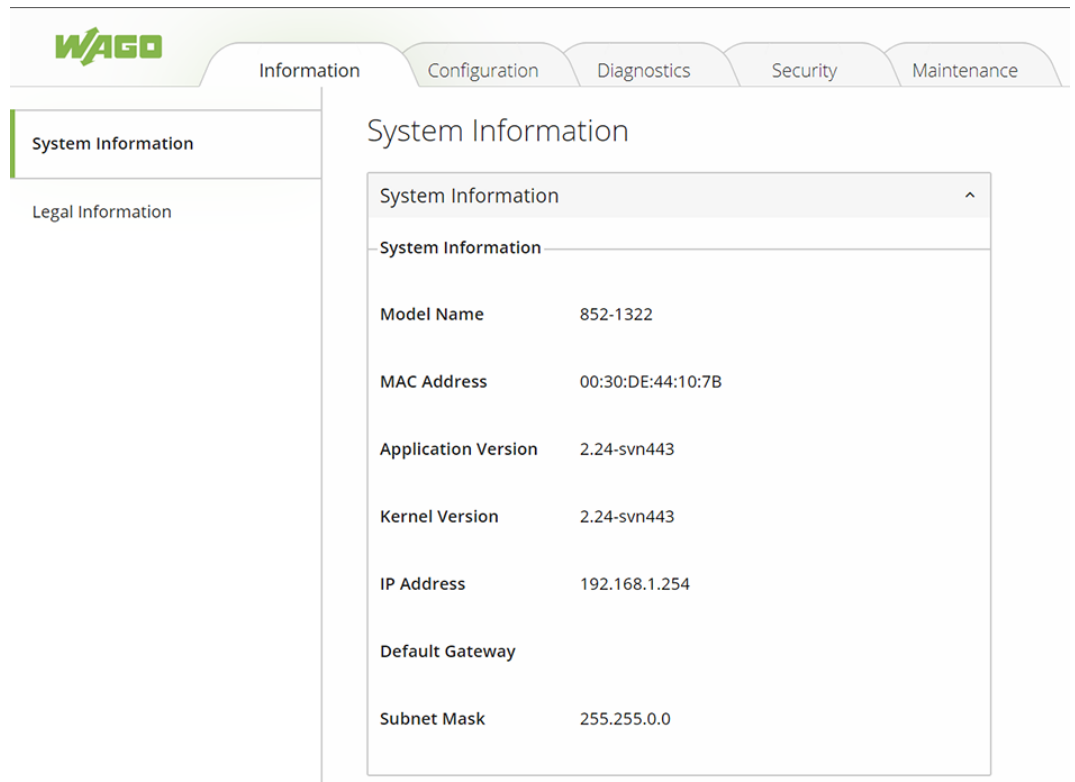


Figure 20: WAGO Login Dialog after Resetting Password

10.3 Information

10.3.1 System Information

To help users become familiar with the device, the System Information tab page provides important details of the WAGO's industrial managed switch. This is also the main welcome screen once the user has logged in. The details make it easier to identify different switches connected to the network. The user can check various information such as the Model Name, MAC Address, Application Version, Kernel Version, IP Address, Default Gateway and Subnet Mask. Figure "WBM "Information" Page – "System Information" Tab" depicts an example of System Information of WAGO 852-1322 switch. Table "WBM "Information" Page – "System Information" Tab" summarizes the description of each field of system information.



The screenshot shows the WAGO WBM interface with the 'Information' tab selected. The 'System Information' sub-tab is active, displaying the following details:

Parameter	Description
Model Name	852-1322
MAC Address	00:30:DE:44:10:7B
Application Version	2.24-svn443
Kernel Version	2.24-svn443
IP Address	192.168.1.254
Default Gateway	
Subnet Mask	255.255.0.0

Figure 21: WBM "Information" Page – "System Information" Tab

Table 14: WBM "Information" Page – "System Information" Tab

Parameter	Description
Model Name	This display field shows the model name of the switch.
MAC Address	This display field shows the MAC (Media Access Control) address of the switch.
Application Version	This display field shows the application version of the firmware inside the switch.
Kernel Version	This display field shows the kernel version of the firmware inside the switch.
IP Address	This display field shows the IP address of the switch. It is also the IP address for logging in to the device.
Default Gateway	This display field shows the default gateway of the switch.
Subnet Mask	This display field shows the subnet mask of the switch.

10.3.2 Legal Information

This page has two tabs that are WAGO Licenses and Open Source Licenses. They list all information and terms about software license agreement.

Wago Licenses

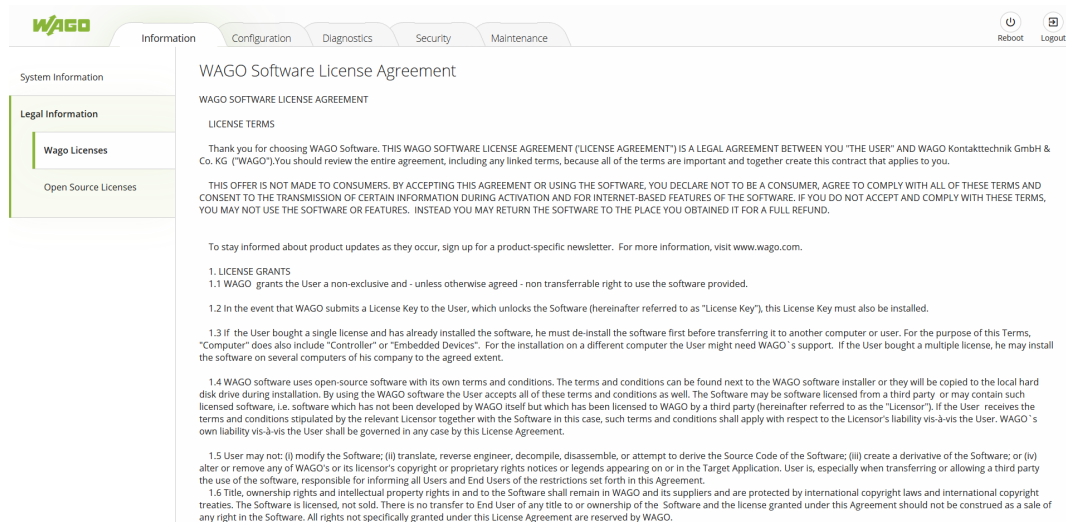


Figure 22: WBM "Information" Page – "Legal Information" – "WAGO Licenses" Tab

Open Source Licenses

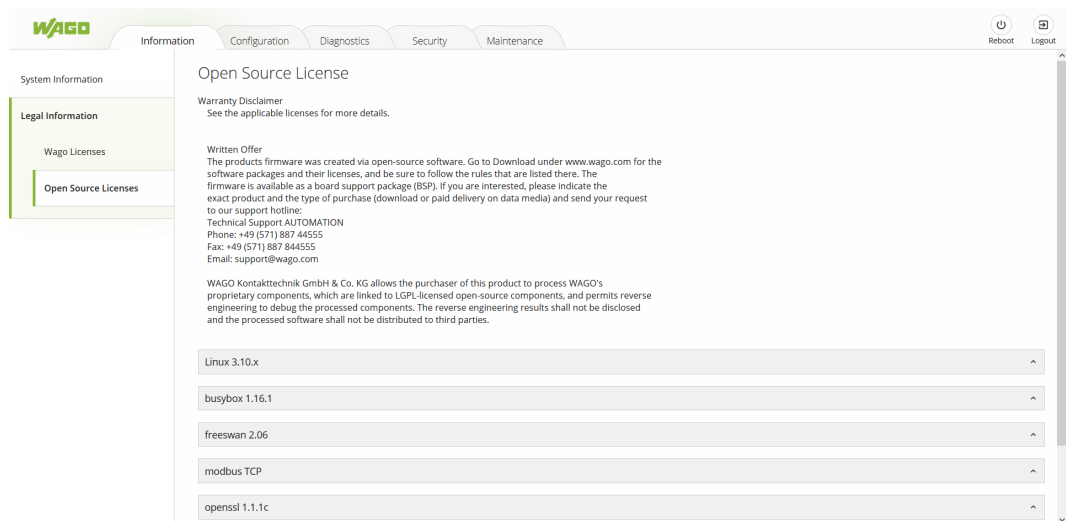


Figure 23: WBM "Information" Page – "Legal Information" – "Open Source License" Tab

10.4 Configuration

10.4.1 System Settings

Users can assign device's details to WAGO's industrial managed switch on this System Settings tab page. By entering unique and relevant system information such as device name, this information can help identifying one specific switch among all other devices in the network. Please click on the **[Submit]** button to update the information on the switch. Figure "WBM "Configuration" Page – "System Settings" Tab" shows System Settings

page of the product. Table “WBM “Configuration” Page – “System Settings” Tab” summarizes the device information setting descriptions and corresponding default factory settings.

Figure 24: WBM “Configuration” Page – “System Settings” Tab

Table 15: WBM “Configuration” Page – “System Settings” Tab

Parameters	Factory Default	Description
Device Name	(None)	This text field can specify a particular role or application of different switches. This text field can support a maximum of 63 characters.

10.4.2 Device Discovery – LLDP

The LLDP (Link Layer Discovery Protocol) allows stations connected to a LAN according to IEEE 802.1ab to send information to other stations connected to the same LAN. The information includes essential system functions, including the management address or addresses of an entity or entities that provide management of these functions, as well as identification of the station’s access point to the IEEE802 LAN required by the management entity or entities.

LLDP information can only be sent to and received from devices; no information is requested, and no state changes are made between nodes. The device can turn the send and receive functions on and off independently.

LLDP is designed to be managed using SNMP. Applications that use this protocol include topology discovery, inventory management, emergency services, VLAN assignment, and inline power.

Note

If enabled, LLDP device information will appear on the topology map of Lean Managed Switches. The switch information will be shared with other devices connected within the same network.

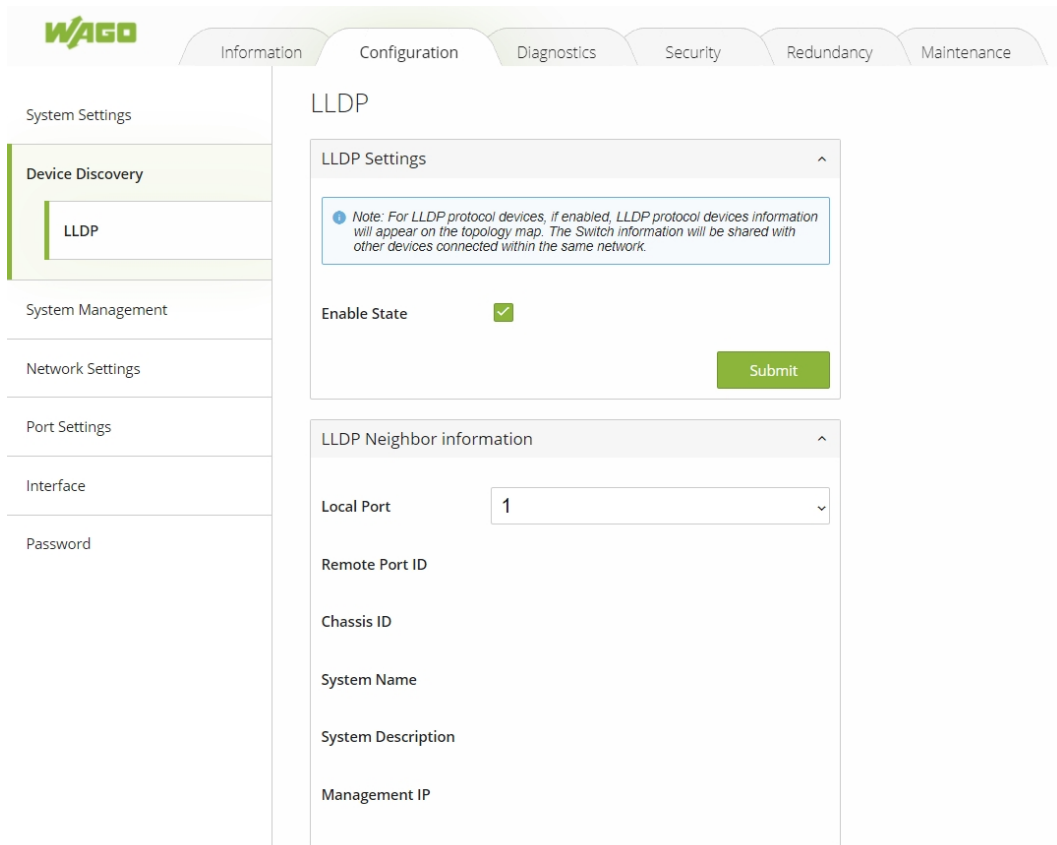


Figure 25: WBM "Configuration" tab – "LLDP Settings" page

Table 16: WBM "Configuration" tab – "LLDP Settings" page

Parameter	Description
Enable State	Select Enable State to enable LLDP on the switch. Deselect Enable State to disable LLDP on the switch. Remember to click on the [Submit] button to confirm your choice.
LLDP Neighbor Information	A status overview of the detected LLDP neighbors is displayed here.
Local Port	Specify the port on the local switch for which LLDP neighbor information will be displayed. Information about LLDP-enabled devices that has been received on this port will then be shown.

10.4.3 System Management – SNTP

10.4.3.1 General Information

The SNTP ("Simple Network Time Protocol") is a protocol for synchronizing clocks in computer systems. It is a less complex implementation of NTP ("Network Time Protocol").

SNTP uses Coordinated Universal Time. No information on time zones or daylight savings time is transmitted. This information falls outside the protocol range and must be obtained separately. The SNTP port is 123.

In addition:

- The SNTP server always replies with the current UTC time.
- If the switch receives the SNTP reply time, it adjusts the time to the time zone configuration and configures the time for the switch accordingly.
- If the time server's IP address is not specified, the switch does not send an SNTP request packet.

- If the switch does not receive an SNTP reply packet, it repeats the challenge every ten seconds.
- If the switch receives an SNTP reply, it repeats the time request from the NTP server every hour.
- If the time zone and NTP server changes, the switch repeats the request process.
- There is no default SNTP server.

10.4.3.2 SNTP Setup

A mode must first be selected from the Mode pull-down list. Manual mode disables SNTP. The time must then be set manually. The Network Time Protocol mode enables SNTP. Both of these modes are described below.

Mode: Manual

Select Manual mode to disable SNTP. The time must then be set manually.

Figure 26: WBM "Configuration" page – "SNTP" tab

Table 17: WBM "Configuration" page – "SNTP" tab

Parameter	Description
Current Time and Date	
Current Time	This field displays the current time when you open or refresh the WBM.
Current Date	This field displays the current date when you open or refresh the WBM.
Time and Date Settings	
Date	Select the date in the format day/month/year that you are manually setting for the system.

Parameter	Description
Time	Select the time in the format hour/minute/second that you are manually setting for the system.
Daylight Saving Settings	
Enable State	Select Enable to enable Daylight Saving Settings or Disable to disable Daylight Saving Settings.
Start Day	Enter the date and time for the start of daylight saving time if you have activated this option. The time is displayed in 24-hour format.
End Day	Enter the date and time for the end of daylight saving time if you have activated this option. The time is displayed in 24-hour format.

Mode: Network Time Protocol

Select Network Time Protocol mode to enable SNTP. An NTP server must then be specified.

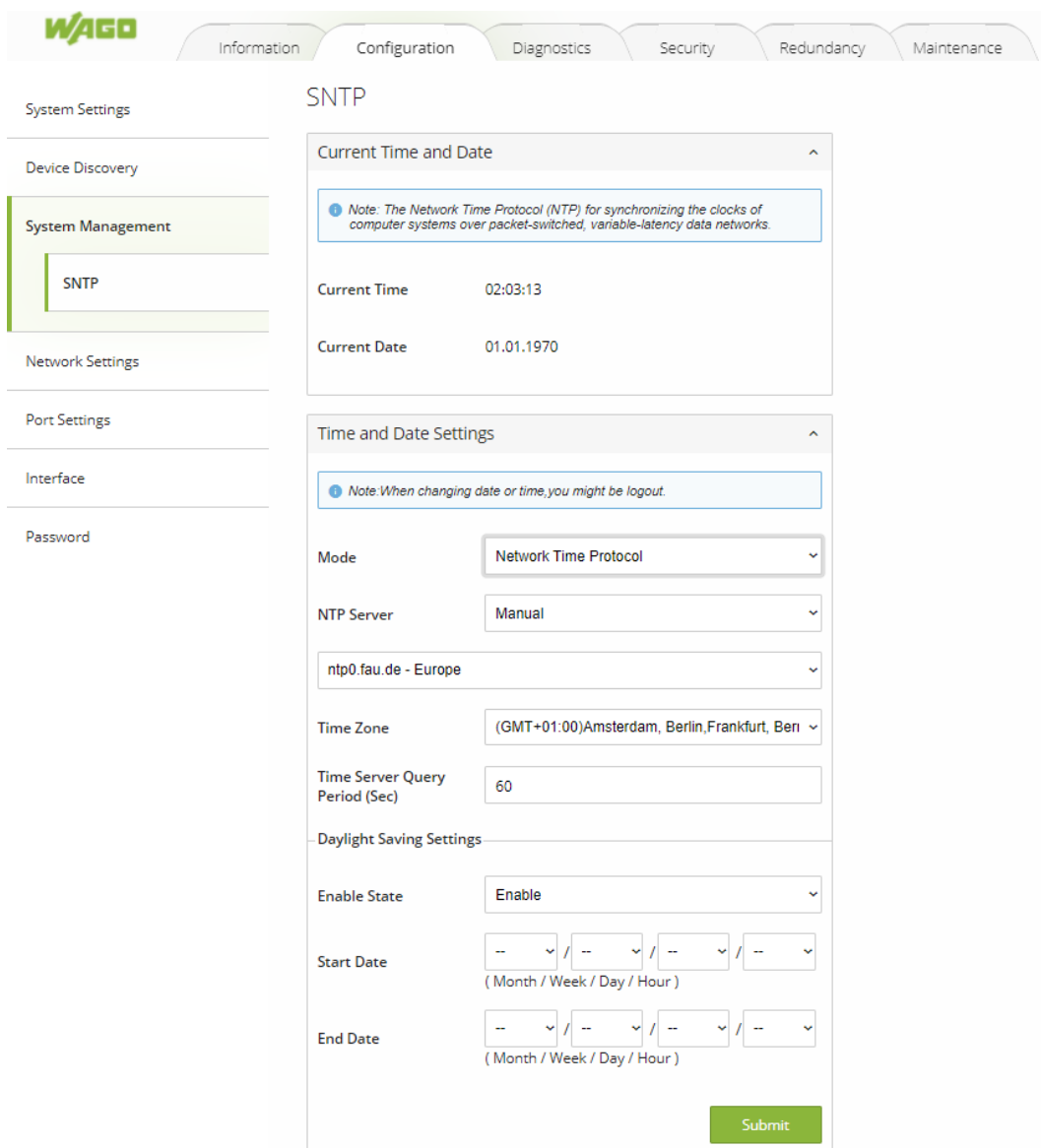


Figure 27: WBM "Configuration" tab – "SNTP" page

Table 18: WBM "Configuration" tab – "SNTP" page

Parameter	Description
Current Time and Date	
Current Time	This field displays the current time when you open or refresh the WBM.
Current Date	This field displays the current date when you open or refresh the WBM.
Time and Date Settings	
NTP Server	Choose a predefined time server (public) or enter the IP address of a time server manually (manual).
<i>Public</i>	Select one of the predefined time servers
<i>Manual</i>	IP/Domain
	Select whether you will specify the IP address or fully qualified domain name for the time server
<i>Manual</i>	In the text field below, enter the IP address or fully qualified domain name for the time server
Time Zone	Select the time zone you are located in.
Daylight Saving Settings	
Enable State	Select Enable to enable Daylight Saving Settings or Disable to disable Daylight Saving Settings.
Start Day	Enter the date and time for the start of daylight saving time if you have activated this option. The time is displayed in 24-hour format.
End Day	Enter the date and time for the end of daylight saving time if you have activated this option. The time is displayed in 24-hour format.

10.4.4 Network Settings

In this tab page, users may modify network settings of Internet Protocol version 4 (IPv4) for the WAGO industrial managed switch.

The Network Settings tab page is depicted in Figure "WBM "Configuration" Page – "Network Settings" Tab". Inside the Network Settings box, the user can enable Dynamic Host Configuration Protocol (DHCP) client inside the switch by checking the DHCP box so that the switch can obtain IP address' setting automatically from a DHCP server available on the user's local network. If the DHCP is enabled, the rest of the fields will be disabled. Note that the user should consult your local network administrator for information about the availability of DHCP server. If the user prefers a static IP setting, then the user can proceed to enter the IP Address, Subnet Mask, Gateway, and the Primary DNS. If the user set gateway or DNS on this page, the industrial managed switch will not use the gateway or the DNS from DHCP server. After entering the desired information, please click **[Submit]** button to change the IP Setting.

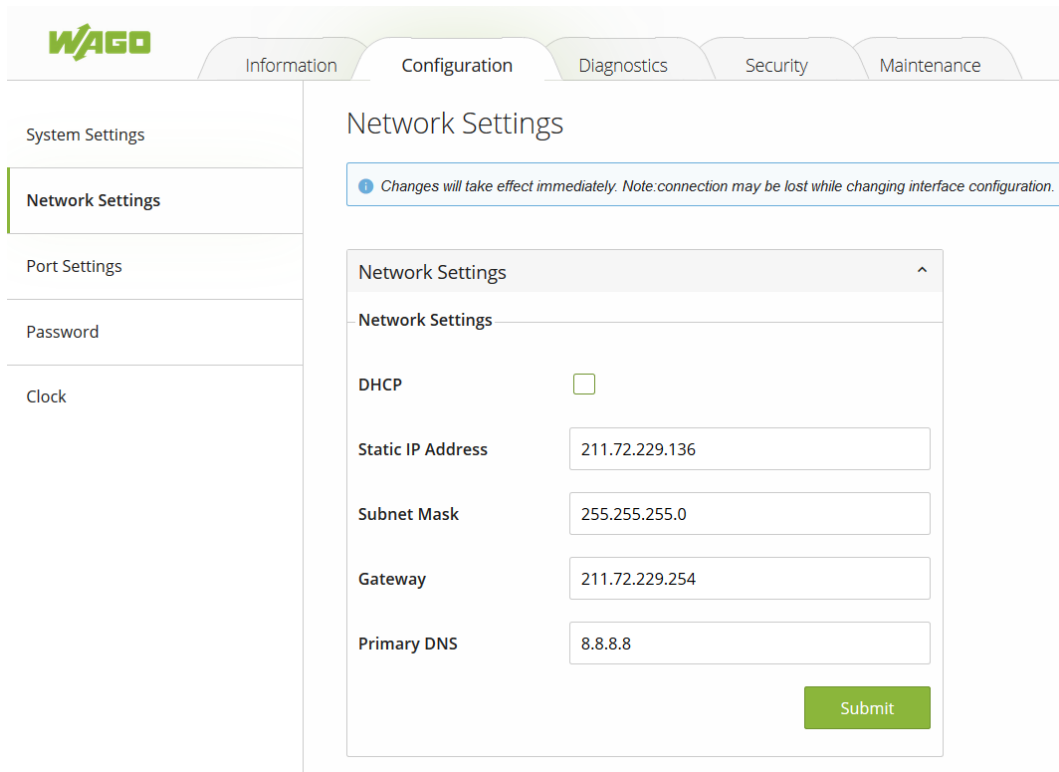


Figure 28: WBM “Configuration” Page – “Network Settings” Tab

The description of each parameter and its default value in Network Settings tab page are summarized in Table “WBM “Configuration” Page – “Network Settings” Tab”.

Table 19: WBM “Configuration” Page – “System Settings” Tab

Parameters	Factory Default	Description
DHCP	Unchecked	By checking this box, an IP address and related parameters will be automatically assigned. Otherwise, user can set up the static IP address and related fields manually.
Static IP Address	192.168.1.254	This field displays current IP address. The user can also set a new static IP address for the device.
Subnet Mask	255.255.255.0	This field displays current subnet mask. The user can set a new subnet mask in this field.
Gateway	0.0.0.0	This field shows current Gateway’s IP address. The user can set a new IP address for the Gateway in this field.
Primary DNS	Null	The user can set the primary DNS’ IP address used by your network in this field.

10.4.5 Port Settings

10.4.5.1 Setting

The user can control the state of each port by either selecting Enable or Disable from the dropdown list as shown in Figure “WBM “Configuration” Page – “Port Settings” Tab”. After finishing any change on the port setting, please click on the **[Submit]** button.

Figure 29: WBM “Configuration” Page – “Port Settings” Tab

The description of each parameter and its default value in Port Settings tab page are summarized in Table “WBM “Configuration” Page – “Port Settings” Tab”.

Table 20: WBM “Configuration” Page – “Port Settings” Tab

Parameters	Factory Default	Description
Port n	Enable	Port number on the industrial managed switch. The user can click on the dropdown list to select either Enable or Disable to change the status of the port. When enabling a port, data will be allowed to transmit and receive through that particular port.

10.4.6 Interface – Port Mirroring

10.4.6.1 General Information

Port-based mirroring is used on a network switch to send a copy of the network packets sent or received by one or a range of ports to a network monitoring system connected to another port (monitor port).

This is often used for network devices that require monitoring of network traffic, such as an intrusion detection system (IDS).

Port mirroring, together with a network traffic analyzer, assists in monitoring network traffic. Users can monitor the selected ports (source ports) for egress and ingress packets.

Source Mode

- Ingress: The incoming data packets are copied and forwarded to the monitor port.

- Egress: The outgoing data packets are copied and forwarded to the monitor port.

Note

The monitor port cannot be a trunk member port.

Firmware version 2.53 for the switch does not permit you to mirror a range of ports to a monitor port.

Firmware version 2.53 for the switch does not permit you to choose between the different source modes. By default, both incoming and outgoing data packets are copied and forwarded to the monitor port.

10.4.6.2 Port Mirroring Setup

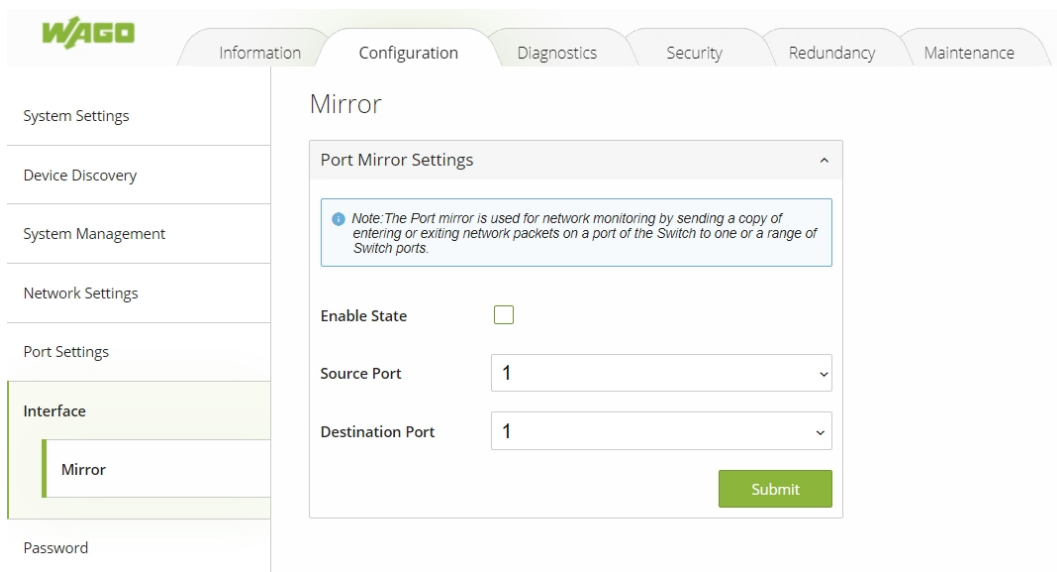


Figure 30: WBM "Configuration" tab – "Mirror" page

Table 21: WBM "Configuration" tab – "Mirror" page

Parameter	Description
Enable State	Select Enable State to enable port mirroring. Deselect Enable State to disable port mirroring. Port mirroring must be enabled before the selected Source Port or Destination Port can be changed
Source Port	Select a port to copy its ingress (incoming) and egress (outgoing) traffic to the Destination Port.
Destination Port	Select the port to which the network traffic of the source port should be copied

10.4.7 Password

User name "admin" and password "wago" are set for the device when it is manufactured. The user can modify the device's user name and password to ensure overall system security. The user name and password can be updated in this tab as shown in Figure "WBM "Configuration" Page – "Password" Tab". The password must be entered twice in Password and Confirmed Password textboxes before a change to confirm its correctness. Please click on the **[Submit]** button to update the user name and password information on the switch.

Figure 31: WBM “Configuration” Page – “Password” Tab

The description of each parameter and its default value in Password tab page are summarized in Table “WBM “Configuration” Page – “Password” Tab”.

Table 22: WBM “Configuration” Page – “Password” Tab

Parameters	Factory Default	Description
User Name	admin	User name to log-in with maximum length of 15 characters.
Password	wago	Password to log-in with maximum length of 15 characters.
Confirmed Password	wago	Re-type the password. This has to be exactly the same as the password entered in the above field with maximum length of 15 characters.

10.5 Diagnostics

10.5.1 SNMP

The SNMP („**S**imple **N**etwork **M**anagement **P**rotocol“) is used in network management systems to monitor the state of attached devices that require the attention of an administrator. SNMP is a component of the “internet protocol suite” defined by the IETF (“Internet Engineering Task Force”). It consists of a set of standards for network management, including an application layer protocol, a database schema and a set of data objects.

SNMP provides management data in the form of variables on the managed systems, which describe the system configuration. These variables can be queried (and sometimes changed) by managing applications.

An “SNMP community string” is a text string that acts as a password. It is used to authenticate messages that are sent between the management station (the SNMP manager) and the device (the SNMP agent). The string is included in every packet transmitted between the SNMP manager and the SNMP agent.

The “SNMP community” acts like a password and is used to define the security parameters of SNMP clients in an SNMP v1 and SNMP v2c environments. The default “SNMP community” is “public” for both SNMPv1 and SNMPv2c before SNMPv3 is enabled. Once SNMPv3 is enabled, the “Communities” of SNMPv1 and v2c have to be unique and cannot be shared.

WAGO’s industrial managed switch support SNMP and can be configured in this tab page as shown in Figure “WBM “Diagnostics” Page – “SNMP” Tab”. The SNMP setting has four parts, which are:

- SNMP Agent
- SNMPv1/v2c Community
- SNMP-Trap
- SNMPv3 Authentication (Auth.)

Note that SNMP V1/V2c Community setting was not shown in Figure “WBM “Diagnostics” Page – “SNMP” Tab” but it will be shown when SNMP V1/V2c version option was selected.

Note

Using SNMPv3

For security reasons, the user cannot use SNMP v1/v2c to reboot the device, change security related settings, and change the device’s password. These changes are possible only by using SNMPv3.

SNMP Setting

SNMP Agent ^

SNMP Agent Setting

SNMP Enabled

SNMP Version V1/V2c V3

[Submit](#)

SNMP V1/V2c Community ^

SNMP V1/V2c Community Setting

String	Permission Type	
public	read-all-only	Remove
private	read-write-all	Remove
String	<input style="width: 100%;" type="text"/>	
Permission Type	<input style="width: 100%;" type="text" value="read-all-only"/>	

[Add](#)

Figure 32: WBM “Diagnostics” Page – “SNMP Setting Part 1” Tab

SNMP Trap

SNMP Trap Mode

Trap Mode

SNMP Trap Setting

Trap server IP	Port	Community String
Empty		
Trap server IP	<input type="text"/>	
Port	<input type="text" value="162"/>	
Community String		<input type="text"/>

Figure 33: WBM "Diagnostics" Page – "SNMP Setting Part 2" Tab

SNMP V3 Auth.
^

SNMP V3 Auth. Setting

Name	Authentication	Data Encryption	
admin	MD5	DES	<div style="border: 1px solid #ccc; padding: 2px 10px; display: inline-block; color: #4CAF50; font-weight: bold;">Remove</div>

Name

Auth. Password

Confirmed Password

Encryption Key

Confirmed Key

Add

Figure 34: WBM “Diagnostics” Page – “SNMP Setting Part 3” Tab

10.5.1.1 SNMP Agent

To enable SNMP agent on the managed switch, please check the SNMP Enabled box and click **[Submit]** button as shown in Figure “SNMP Agent Setting”. The SNMP version 1 (V1), version 2c (V2c) and version 3 are supported by WAGO’s managed switches as summarized in “WBM Page, “Diagnostics” – “SNMP” Tab, SNMP Agent Setting” Fehler! Verweisquelle konnte nicht gefunden werden.. Basically, SNMP V1 and SNMP V2c have simple community string based authentication protocol for their security mechanism, while SNMP V3 is improved with cryptographic security. The default setting of SNMP Version is V3. The user can select SNMP Version by checking either the V1/V2c box and/or the V3 box.

Figure 35: SNMP Agent Setting

Table 23: WBM Page, “Diagnostics” – “SNMP” Tab, SNMP Agent Setting

Parameters	Factory Default	Description
SNMP Enabled	Disable	Check the box to enable SNMP agent.
SNMP Version	V3	Check the desired SNMP Version as either V1/V2c and/or V3.

10.5.1.2 SNMPv1/v2c-Community

SNMP V1 and SNMP V2c use a community string matching for authentication. This authentication will allow network management software to access the information or data objects defined by Management Information Bases (MIBs) on the industrial managed switch. Note that this simple authentication is considered a weak security mechanism. It is recommended to use SNMP V3, if possible. There are two levels of authentications or permission type in WAGO 852-1322, which are read-all-only or read-write-all. For example, in our default setting as shown in Figure “SNMP V1/V2c Community Setting”, an SNMP agent, which is a network management software module residing on the industrial managed switch, can access all objects with read-all-only permissions using the string “public”. Another setting example is that the string “private” has permission of read-write-all.

The SNMP V1/V2c Community Setting as shown in Figure “SNMP V1/V2c Community Setting” allows the user to set a community string with a type of permission for authentication or remove existing community string from the list by clicking on the **[Remove]** button at the end of each community string item. The users can specify a new string names by entering a text in the String field and choose a type of permissions from the dropdown list of Permission Type. Then, click on the **[Add]** button.

Figure 36: SNMP V1/V2c Community Setting

Table “WBM “Diagnostics” Page – “SNMP” Tab, SNMP V1/V2c Community Setting “briefly provides descriptions of SNMP V1/V2c community string setting.

Table 24: WBM “Diagnostics” Page – “SNMP” Tab, SNMP V1/V2c Community Setting

Parameters	Factory Default	Description
(Community) String	Public (read-all-only) Private (read-write-all)	Define name of strings for authentication. The maximum length of the string is 15 characters.
Permission Type	-	Choose a type from the dropdown list: read-all-only and read-write-all. See notes below for a briefed explanation. <ul style="list-style-type: none"> Choose a type from the dropdown list: read-all-only and read-write-all. See notes below for a briefed explanation Read write-all: permission to read/write OID 1 Sub Tree.

10.5.1.3 SNMP Trap

The industrial managed switch provides a trap function that allows the switch to send notification to agents with SNMP traps or inform. The notifications are based on the status changes of the switch such as link up, link down, warm start, and cold start. For inform mode, after sending SNMP inform requests, the switch will resends inform request if it does not receive response within 10 seconds. The switch will try re-send three times. Figure “WBM “Diagnostics” Page – “SNMP” Tab, SNMP Trap” shows the SNMP Trap section.

SNMP Trap
^

SNMP Trap Mode

Trap Mode

SNMP Trap Setting

Trap server IP	Port	Community String
Empty		
Trap server IP		<input style="width: 95%; border: 1px solid #ccc;" type="text"/>
Port	<input style="width: 95%; border: 1px solid #ccc;" type="text" value="162"/>	
Community String		<input style="width: 95%; border: 1px solid #ccc;" type="text"/>

Figure 37: WBM “Diagnostics” Page – “SNMP” Tab, SNMP Trap

The SNMP Trap Mode allows users to configure SNMP Trap mode or Inform mode by selecting the desired mode from the dropdown list as shown in Figure WBM “Diagnostics” Page – “SNMP” Tab, SNMP Trap“. Then, click **[Submit]** button to change the mode. The SNMP Trap Setting shows a list of configured SNMP Trap Server. Example in Figure “WBM “Diagnostics” Page – “SNMP” Tab, SNMP Trap” shows an Empty list. The user can enter an IP address in the Trap server IP field, port number of Trap server in the Port field, and a string used as Community String for an authentication. After filled in all required field for SNMP Trap Setting, please click on the **[Add]**. button. Table “WBM “Diagnostics” Page – “SNMP” Tab, SNMP Trap” summarizes the descriptions of the SNMP Trap parameters.

Table 25: WBM “Diagnostics” Page – “SNMP” Tab, SNMP Trap

Parameters	Factory Default	Description
Trap Mode	Trap	Choose between Trap mode or Inform mode.
Trap server IP	Null	Enter the IP address of your Trap Server.
Port	162	Enter the Trap server’s service port.

Parameters	Factory Default	Description
Community String	Null	Enter the community string for authentication. The maximum length of the string is 15 characters.

10.5.1.4 SNMP-V3-Auth.

As mentioned earlier, SNMP V3 is a more secure SNMP protocol. In this part, the user will be able to set a password and an encryption key to enhance the data security. When SNMP V3 is chosen, the users can configure SNMP V3's authentication and encryption parameters. MD5 (Message-Digest algorithm 5) is used for authentication password and DES (Data Encryption Standard) is used for data encryption algorithm. Figure "WBM "Diagnostics" Page – "SNMP Tab", SNMP V3 Auth." shows the SNMP V3 Authentication (Auth.) Setting options.

Name	Authentication	Data Encryption	
admin	MD5	DES	Remove

Name:

Auth. Password:

Confirmed Password:

Encryption Key:

Confirmed Key:

[Add](#)

Figure 38: WBM "Diagnostics" Page – "SNMP Tab", SNMP V3 Auth.

The users can view existing SNMP V3 users' setting on the list at the upper part of SNMP V3 Auth. Setting as shown in Figure "WBM "Diagnostics" Page – "SNMP Tab", SNMP V3 Auth.". The list provides information about user Name, Authentication type, and Data Encryption. The user have an option to remove existing SNMP V3 user by clicking on the **[Remove]** button in the last column of each entry.

To add a new SNMP V3 user, the user have to select the user Name from the dropdown list which can be either Admin or User. Then, the authentication password with a maximum length of 31 characters must be entered in the Auth. Password field and re-entered again in the Confirmed Password field. Note that if no password is provided, there will be no authentication for SNMP V3. Finally, the encryption key with a maximum length of 31 characters can be entered in the Encryption Key field and re-entered again in Confirmed Key field. After filling all the required fields, please click on **[Add]** button to update the information on the industrial managed switch. Table “WBM “Diagnostics” Page – “SNMP” Tab, SNMP V3 Auth.” lists the descriptions of SNMP V3 settings.

Table 26: WBM “Diagnostics” Page – “SNMP” Tab, SNMP V3 Auth.

Parameters	Factory Default	Description
Name	admin	Choose from one of the following options: Admin: Administration level (Default) User: Normal user level
Auth. (Authentication) Password	wago0852	Set an authentication password for the user name specified above. If the field is left blank, there will be no authentication. Note that the authentication password is based on MD5 and the maximum length of the password is 31 characters.
Confirmed Password	wago0852	Re-entering the Authentication Password to confirm.
Encryption Key	wago0852	Set an encryption key for more secure protection of SNMP communication. Note that the encryption algorithm is based on DES and the maximum length of the key is 31 characters.
Confirmed Key	wago0852	Re-entering the Encryption Key to confirm.

10.5.2 Modbus TCP

WAGO’s industrial managed switch can be connected to a Modbus network using Modbus TCP/IP protocol which is an industrial network protocol for controlling automation equipment. The switch’s status and settings can be read through Modbus TCP/IP protocol which operates similar to the Management Information Base (MIB) browser. The switch will be a Modbus slave which can be remotely configured by a Modbus master. The Modbus slave address must be set to match the setting inside the Modbus master. In order to access the switch, a Modbus Address must be assigned as described in this subsection. A Modbus memory mapping table, which lists all the register’s addresses inside the switch and their descriptions, is provide in “Modbus Memory Map” table in the “Appendix”. Figure “WBM “Diagnostics” Page – “Modbus TCP” Tab” shows the Modbus TCP tab page “.

The screenshot shows the WAGO WBM interface with the 'Diagnostics' tab selected. The left sidebar contains a menu with 'Modbus TCP' highlighted. The main content area is titled 'Modbus Setting' and contains two sections:

- Modbus Address Setting:** A text input field labeled 'Modbus Address (1-247)' contains the value '1'. A green 'Submit' button is located to the right of the field.
- Modbus TCP Setting:** A checkbox labeled 'Modbus Enable' is unchecked. Below it, a text input field labeled 'Modbus Port (1-65535)' contains the value '502'. A green 'Submit' button is located to the right of the field.

A notification banner at the top of the main content area states: 'Changes will take effect immediately.'

Figure 39: WBM “Diagnostics” Page – “Modbus TCP” Tab

To set a Modbus Address for the industrial managed switch, choose a number from 1 to 247 and enter it in the Modbus Address field. Click **[Submit]** button to configure it. To enable the Modbus protocol on the industrial managed switch, check the box behind the Modbus Enable and set a Modbus Port number by choosing a number from 1 to 65535 and enter that number in the Modbus Port field. Click **[Submit]** button to set the Modbus TCP. Table “WBM “Diagnostics” Page – “Modbus TCP” Tab” summarizes the descriptions of the Modbus TCP’s parameters.

Please refer to Appendix for the Modbus Memory mapping (see chapter [Modbus-Register \[▶ 85\]](#)).

Table 27: WBM “Diagnostics” Page – “Modbus TCP” Tab

Parameters	Factory Default	Description
Modbus Address	1	Enter a number from 1 to 247 to set the Modbus Address of the industrial managed switch.
Modbus Enable	Uncheck	Enable the Modbus protocol on the industrial managed switch by checking the Modbus Enable box.
Modbus Port	502	Enter a number from 1 to 65535 to set the Modbus service port number for the industrial managed switch.

10.5.3 System-Log

10.5.3.1 Setting

The user can enable how the system log (syslog) will be saved and/or delivered to other system in the System Log Setting tab page as show in Figure” WBM “Diagnostics” Page – “System Log” – “Setting” Tab”. The syslog can be saved to flash memory inside the in-

dustrial managed switch and/or it can be sent to a remote log server. The user needs to select the log level and provides the IP address of a remote log server and the service port of the log server. Please click on the **[Submit]** button after finishing the setup. Table “WBM “Diagnostics” Page – “System Log” – “Setting” Tab” summarizes the descriptions of the Syslog Settings’ parameters.

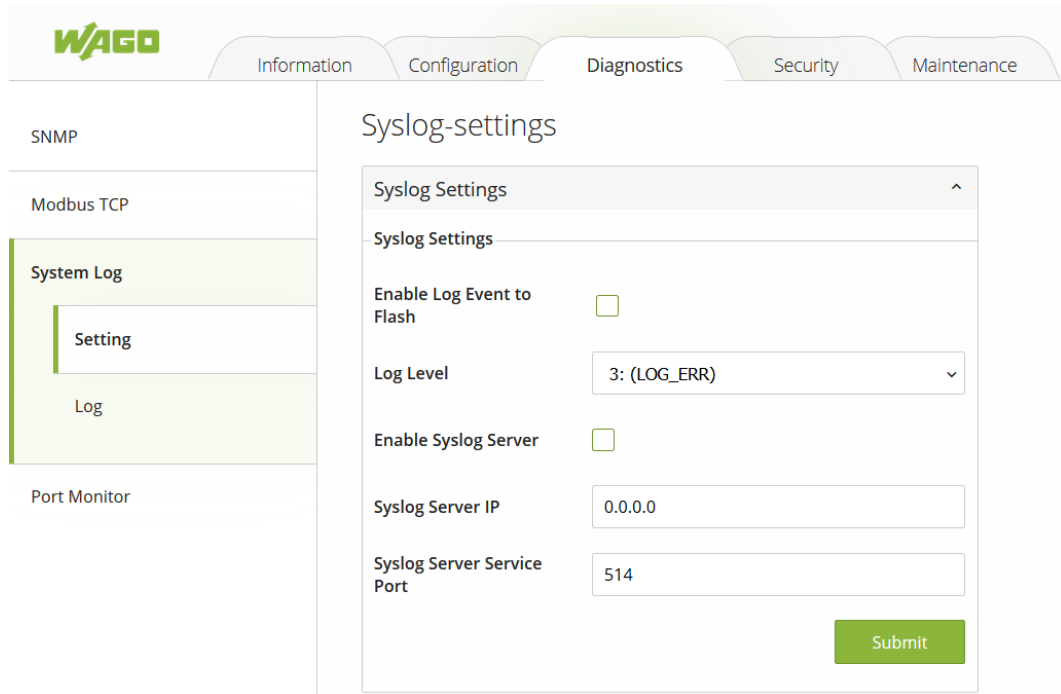


Figure 40: WBM “Diagnostics” Page – “System Log” – “Setting” Tab

Table 28: WBM “Diagnostics” Page – “System Log” – “Setting” Tab

Parameters	Factory Default	Description
Enable Log Event to Flash	Uncheck	Checked: Saving log event into flash memory. The flash memory can keep the log event files even if the switch is rebooted. Unchecked: Saving log event into RAM memory. The RAM memory cannot keep the log event files after each reboot.
Log Level (Protokoll-ebene)	3: (LOG_ERR)	Set the log level to determine what events to be displayed on the next webpage (Log). The level selection is inclusive. For example, if 3: (Log_ERR) is selected, all 0, 1, 2 and 3 log levels will be implied. Range from Log 0 to Log 7.
Enable Syslog Server	Uncheck	Checked: Enable Syslog Server. Uncheck: Disable Syslog Server. If enabled, all recorded log events will be sent to the remote System Log server.
Syslog Server IP	0.0.0.0	Set the IP address of Syslog server.
Syslog Server Service Port	514	Set the service port number of Syslog server. Range from Port 1 to Port 65535.

10.5.3.2 Log

The Log tab page under the System Log as shown in Figure “System Log Page” can display the log information based on the log level configured in the System Log Setting tab page (previous subsection). The user has options to either Read all notifications or Read only the last n records of the log. This can be selected by clicking on the corresponding radio button.

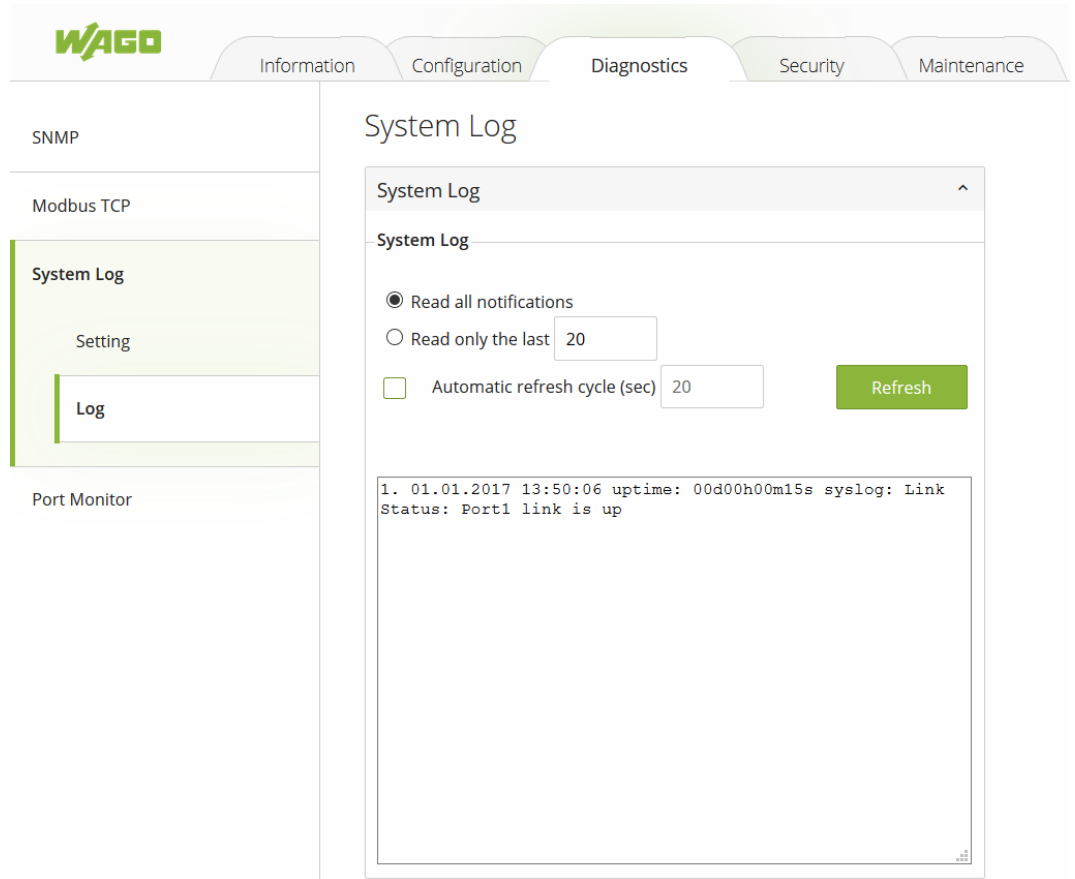


Figure 41: WBM Page, “Diagnostics” – “System Log” Tab – “Log” Section

To refresh the display or to enable cyclic refresh, click the **[Refresh]** button. This **[Refresh]** button is only visible if the Automatic refresh cycle option is not enabled or stopped. To enable cyclic refresh, click the **[Start]** button. The **[Start]** button is only visible if Automatic refresh cycle option is enabled and has not yet started as shown in Figure “**[Start]** button is visible when Automatic refresh cycle is enabled”. To stop cyclic refresh again, click the **[Stop]** button. The **[Stop]** button is only visible if cyclic refresh is enabled. The user can set the duration of automatic refresh cycle in seconds by entering the number in the corresponding field. Note that the log records are sorted by date and time. Table “WBM Page, “Diagnostics” – “System Log” – “Log” Tab” summarizes the descriptions of the parameters in the Log page. Table “Log Event Description” provides descriptions of a log event.

System Log

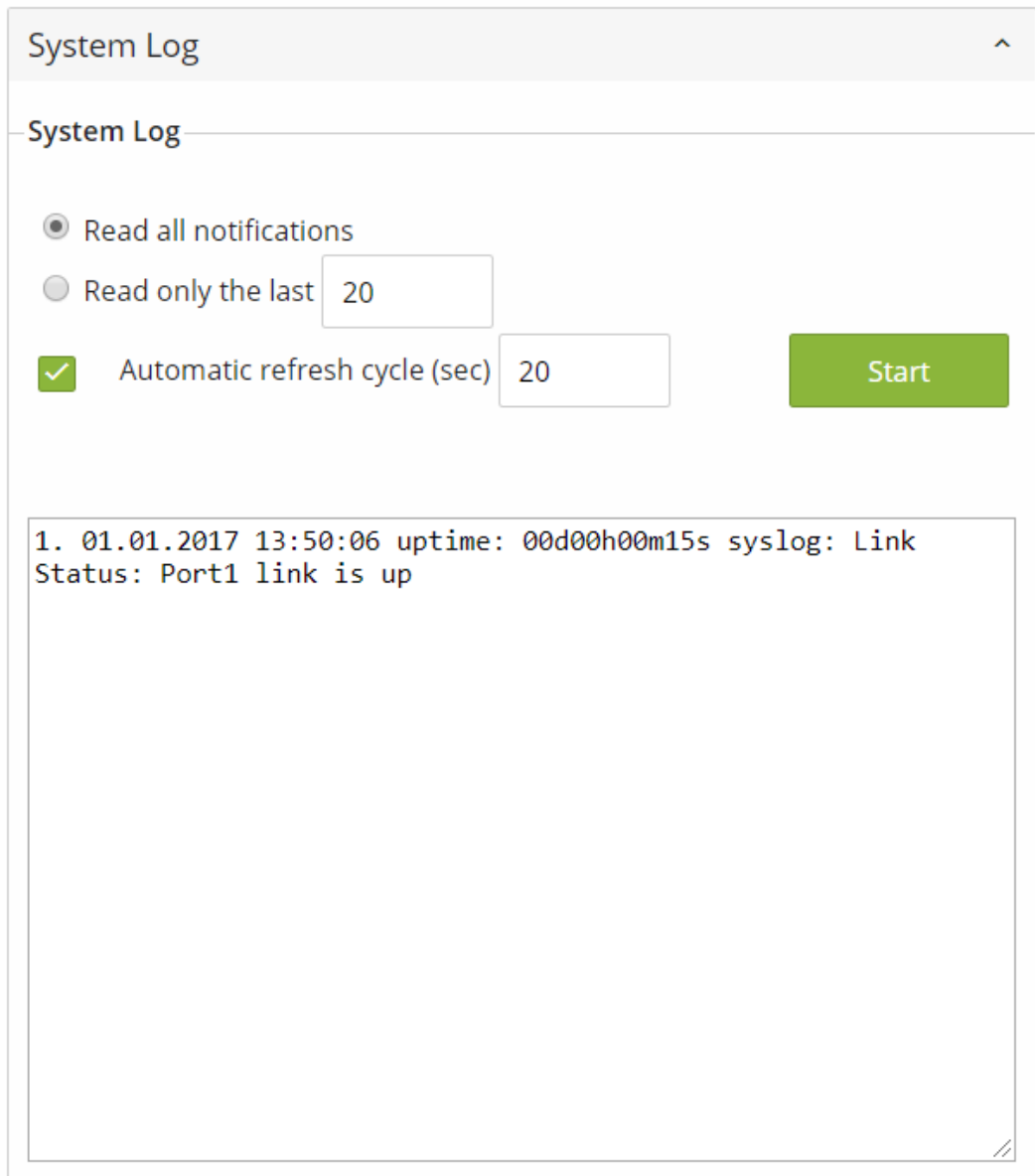


Figure 42: [Start] Button is visible when Automatic refresh cycle is enabled.

Table 29: WBM Page, "Diagnostics" – "System Log" – "Log" Tab

Parameters	Factory Default	Description
Read all notifications	Selected	Activate the display of all log messages.
Read only the last n	20	Activate the display of only the last n messages. The user can also specify the number of messages to be displayed.
Automatic refresh cycle (sec)	Disable, 20	Select the check box to enable cyclic refresh. Enter the cycle time in seconds in which a cyclic refresh is performed. The label of the button ("Refresh"/"Start"/"Stop") changes depending on the selected mode.

Table 30: Log Event Description

Parameters	Description
Index	Indicate the index of a particular log event
Date	Indicate the system date of the occurred log event.

Parameters	Description
Time	Indicate the time stamp that this log event occurred.
Startup Time	Indicate how long the system (industrial managed switch) has been up since this log event occurred.
Event	Details description of this log event.

10.5.4 Port Monitor

Port monitor tab page is shown in Figure “WBM “Diagnostics” Page – “Port Monitor” Tab”. It depicts the actual connecting status for all available ports of the WAGO industrial managed switch in this page. The user can see that status whether a port is connected (Link Up/ Green color) or disconnected (Link Down/ Yellow color) or disabled (Black color). Table “WBM “Diagnostics” Page – “Port Monitor” Tab” summarizes the descriptions of each legend on the port status.

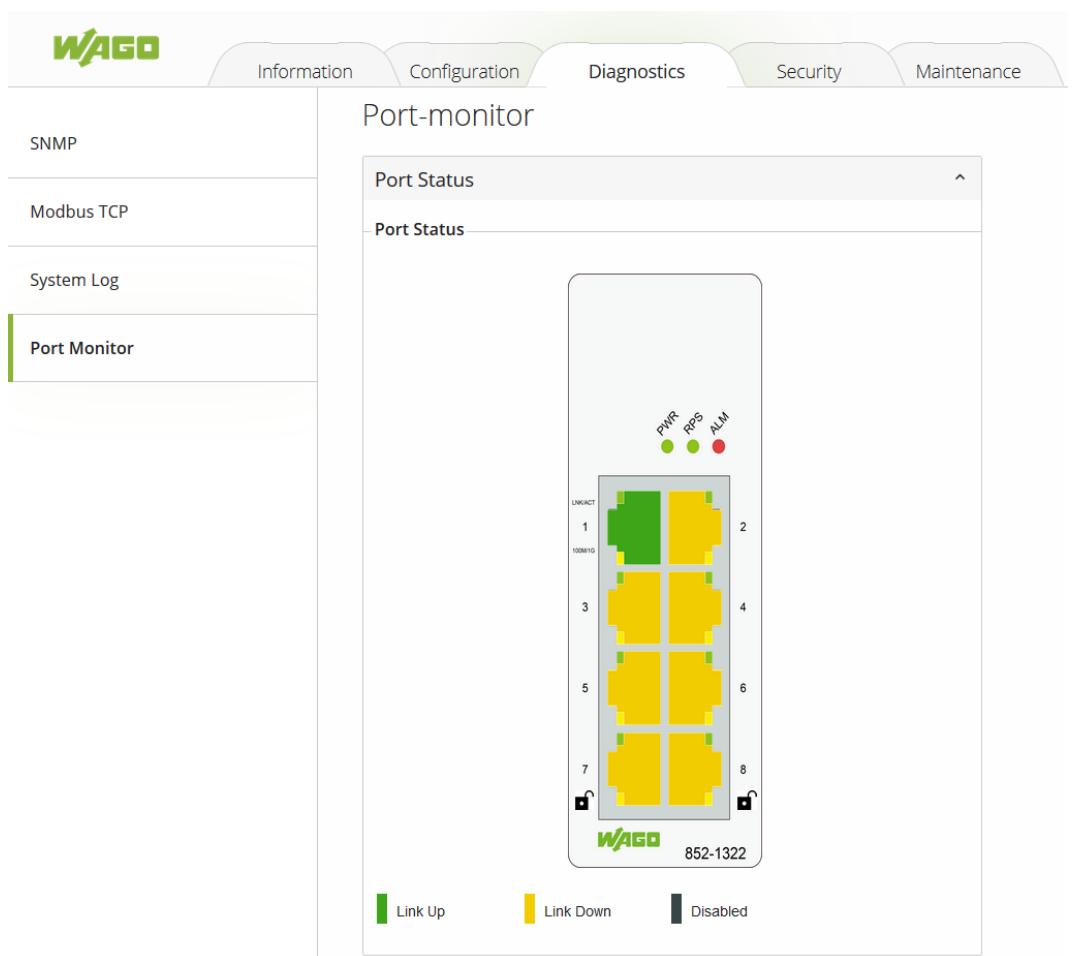


Figure 43: WBM “Diagnostics” Page – “Port Monitor” Tab

Table 31: WBM “Diagnostics” Page – “Port Monitor” Tab

Parameters	Description
Port	The port name: Port 1 to Port 8.
Connected Status	Green: indicates copper link up Yellow: indicates link down Black: indicates disable.
lock	Port is encrypted if the lock is closed.

10.6 Security

10.6.1 Static SAK

Figure WBM Page, “Security” – “Static SAK” Tab shows the “Static Secure Association Key” (SAK) settings tab. Please note that WAGO 852-1322 supports the MACsec protocol on ports 7 and 8. To enable secure association mode on industrial managed switch’s port(s), first select one of the two ports from the dropdown list under the Ports. Then, enter the Secure Channel Identifier (SCI) with a 16-digit hexadecimal number (i.e., 0,1,2, ...,a,b,c,d,e,f) and enter the Secure Association Key (SAK) with a 32-digit hexadecimal number. Finally, click on the **[Submit]** button to update the setting to one of the ports in the Static SAK Status table in the lower part.

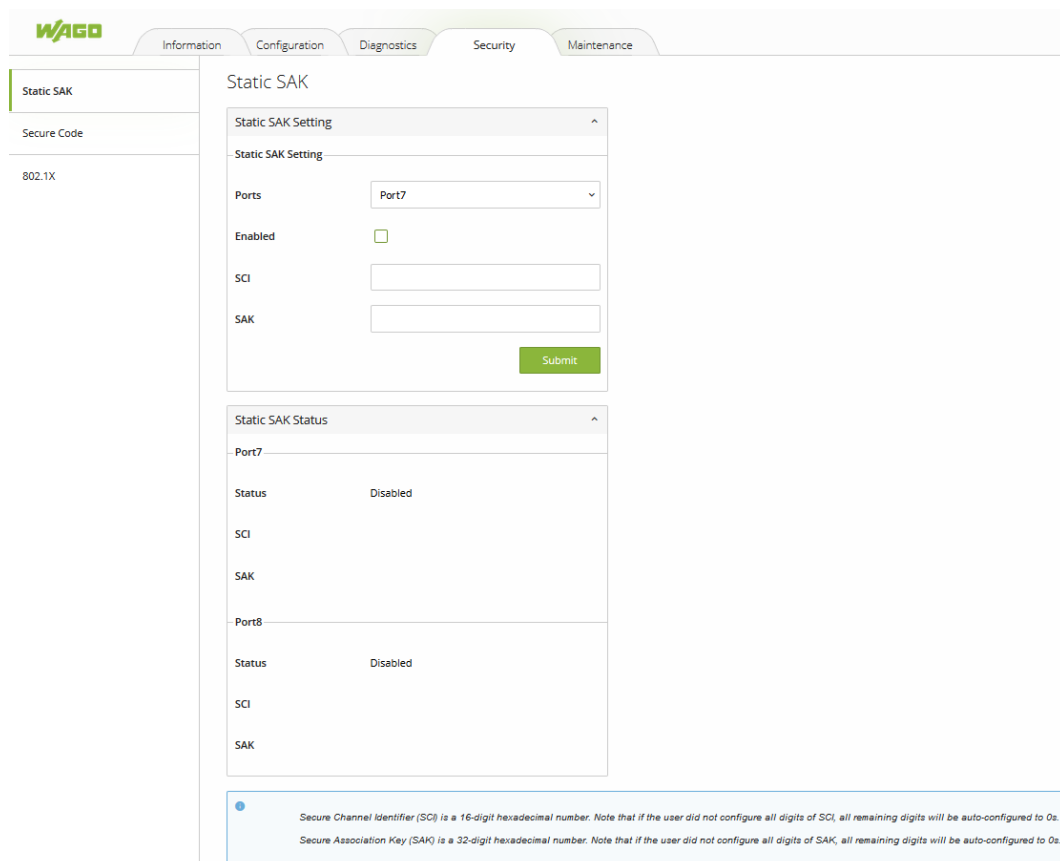


Figure 44: WBM Page, “Security” – “Static SAK” Tab

The selected port(s) will use the given static SAK as the secure key to secure all the traffic. If any two switches have the same SCI and SAK, they can securely communicate. If there is any non-secured traffic that uses incorrect SCI and SAK, the traffic will be dropped by the ingress port of the switch. The description of the static SAK setting fields are summarized in Table “WBM Page, “Security” – “Static SAK” Tab”.

To disable the Static SAK setting for any of the port(s), simply select the desired port(s) from the dropdown list and uncheck the Enabled box. Then click on the **[Submit]** button. This will update the status of the setting in the Static SAK Status table in the lower part of the Figure “WBM Page, “Security” – “Static SAK” Tab”.

Table 32: WBM Page, “Security” – “Static SAK” Tab

Parameters	Factory Default	Description
Ports	Option	Select specific port form the dropdown list to be configured.

Parameters	Factory Default	Description
Enabled	Uncheck	Check the box to enable static secure association key (SAK) mode of MACSec for the selected port(s) on the switch.
SCI	0	Secure Channel Identifier (SCI) is a 16-digit hexadecimal number. Note that if the user did not configure all digits of SCI, all remaining digits will be auto-configured to 0s.
SAK	0	Secure Association Key (SAK) is a 32-digit hexadecimal number. Note that if the user did not configure all digits of SAK, all remaining digits will be auto-configured to 0s.

10.6.2 Secure Code

Every WAGO industrial managed switch will have eight secure codes. Every code has three characters. The security codes of every switch are unique. An example of secure code is illustrated in Figure “Example of Secure Codes”. They can be used to log in to the industrial managed switch when the user forgot the password and selected the **[Forget it]** button at the login dialog.

The use of the device recovery card is enabled by default.

To disable this secure code mechanism, uncheck the Enable box and click **[Submit]** button as shown in Figure “WBM “Security” Page – “Secure Code” Tab”. Please refer the WAGO login in Section „Login Failure“ for more detail.

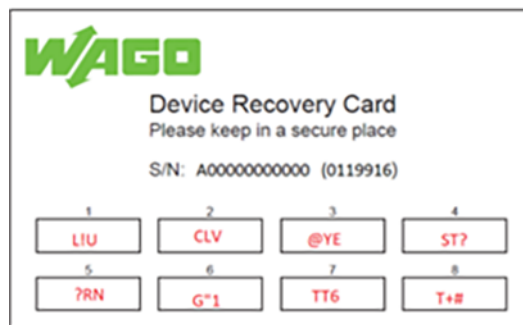


Figure 45: Example of Secure Codes

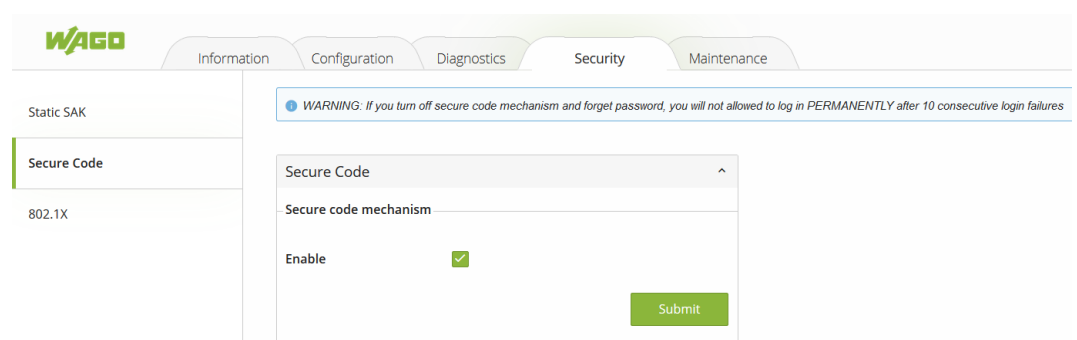


Figure 46: WBM “Security” Page – “Secure Code” Tab

10.6.3 802.1X (IEEE 802.1X)

The 802.1X tab under the Security page is subdivided into three sub-tabs which are: Setting, Parameters Setting, and Port Setting as shown below.

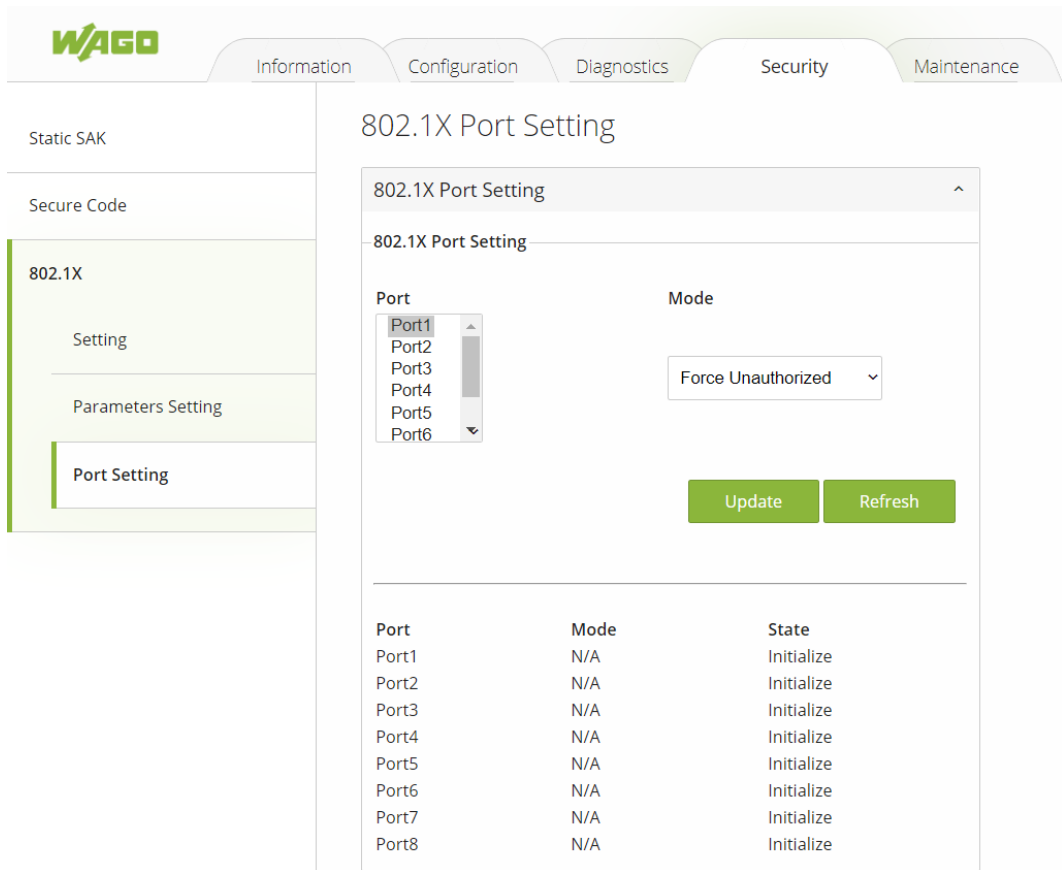


Figure 47: WBM “Security” Page – “802.1X” Tab

10.6.3.1 Setting (IEEE 802.1X - Setting)

The 802.1X security mechanism can be enabled in this tab page as shown in Figure “WBM “Security” Page – “802.1X” – “Setting” Tab. When the user checks the Enabled box, the rest of the option fields will become active. The user then have to enter all the required fields to configure the 802.1X Setting which are the IP address of RADIUS server, the RADIUS server’s port number, the RADIUS server’s accounting port number, the NAS identifier, and a shared key. Summary of 802.1X Setting options are given in Table “WBM “Security” Page – “802.1X” – “Setting” Tab”. After inputting all the required fields, click the **[Update]** button to keep the change.

Figure 48: WBM “Security” Page – “802.1X” – “Setting” Tab

Table 33: WBM “Security” Page – “802.1X” – “Setting” Tab

Parameters	Factory Default	Description
802.1x	Disabled	Choose to Enable/Disable 802.1X for all ports.
Radius Server IP	0.0.0.0	Set an IP address of the RADIUS server.
Server Port	1812	Set the port number of the RADIUS server. The range is from 0 to 65535.
Accounting Port	1813	Set the accounting port number of the RADIUS server. The range is from 0 to 65535.
NAS Identifier	Managed-Switch	Specify the identifier string for the 802.1X Network Access Server (NAS). The maximum length is 30 characters.
Shared Key	NULL	A shared key between the managed switch and the RADIUS Server. Both devices must be configured to use the same key where the maximum length is 30 characters.
Confirmed Shared Key	Dependent	Re-type the shared key string.

10.6.3.2 Parameters Setting (IEEE 802.1X - Parameter Setting)

A setting tab page of the 802.1X parameters is shown in Figure “WBM “Security” Page – “802.1X” – “802.1X Parameter Setting” Tab”. These parameters are related to the authentication periods, the timeout durations, and the maximum number of authentication requests. Table “WBM “Security” Page – “802.1X” – “802.1X Parameter Setting” Tab” summarizes the descriptions of these parameters and their default settings. To keep the change of any input parameters, a user should click on the **[Update]** button afterwards.

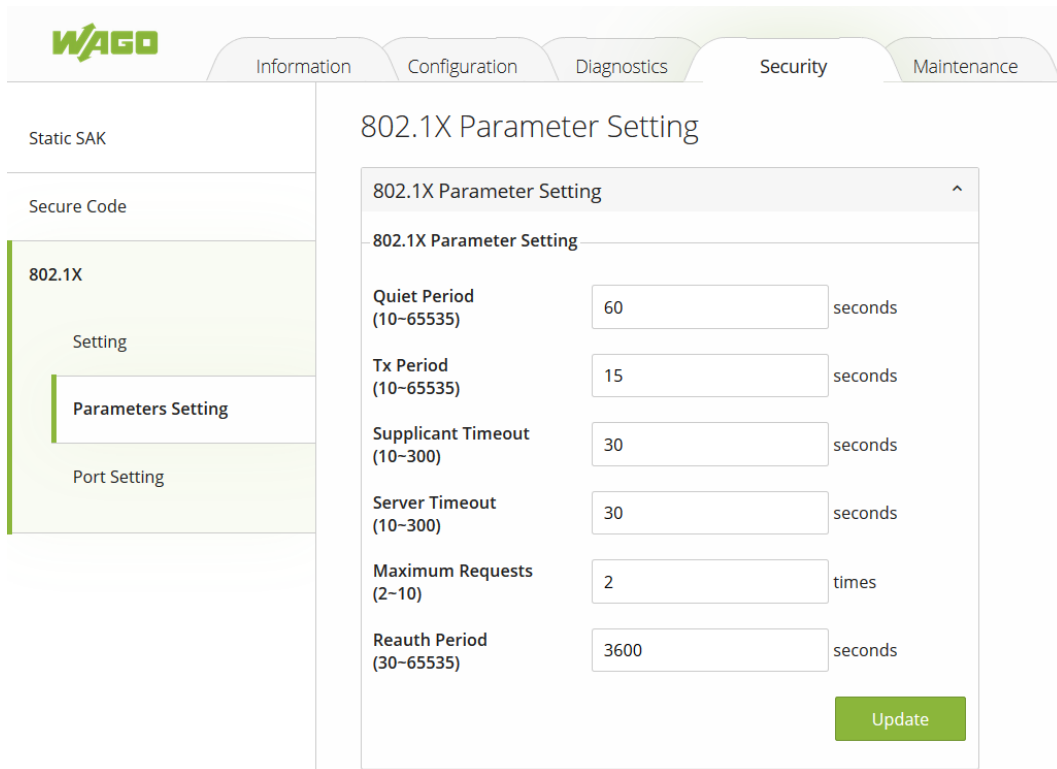


Figure 49: WBM “Security” Page – “802.1X” – “802.1X Parameter Setting” Tab

Table 34: WBM “Security” Page – “802.1X” – “802.1X Parameter Setting” Tab – Parameters Settings

Parameters	Factory Default	Description
Quiet Period	60	Waiting time before a new request can be submitted after the authorization failed. The range is from 10 to 65535 seconds.
Tx Period	15	Waiting time for the supplicant’s EAP response before retransmitting another EAP request. The range is from 10 to 65535 seconds.
Supplicant Timeout	30	Waiting time for the supplicant to respond to the authentication server’s EAP packet. The range is from 10 to 300 seconds.
Server Timeout	30	Waiting time for the authentication server to respond to the supplicant’s EAP packet. The range is from 10 to 300 seconds.
Maximum Requests	2	The maximum number of the retransmissions that the authentication server can send the EAP request to the supplicant before the authentication session times out. The range is from 2 to 10 times.
Reauth Period	3600	Time between the periodic re-authentication of the supplicant. The range is from 30 to 65535 seconds.

10.6.3.3 Port Setting (IEEE 802.1X - Port Setting)

The user can configure the 802.1x security mechanism on each port of the WAGO secure switch as shown in Figure “WBM “Security” Page – “802.1X” – “802.1X Port Setting” Tab”. Each port can be set for any of the four authorization modes which are Force Authorization (FA), Force Unauthorization (FU), IEEE 802.1X Standard Authorization (AU), and no authorization (NO), as described in Table “WBM “Security” Page – “802.1X” – “802.1X Port Setting” Tab”.

Port	Mode	State
Port1	N/A	Initialize
Port2	N/A	Initialize
Port3	N/A	Initialize
Port4	N/A	Initialize
Port5	N/A	Initialize
Port6	N/A	Initialize
Port7	N/A	Initialize
Port8	N/A	Initialize

Figure 50: WBM “Security” Page – “802.1X” – “802.1X Port Setting” Tab

The webpage’s representation is divided into two parts. The upper part of the webpage allows the setting of port(s) to be changed, while the lower part of the webpage is a table displaying the current status of the authorization mode and the state of each port on the managed switch. To enable the 802.1X security on any of the port(s), click one of the port or press Ctrl key and click multiple ports on the list and choose the Authorization Mode from the dropdown list and click the **[Update]** button. To check the latest status of the 802.1X port setting, user can click on the **[Refresh]** button.

Table 35: WBM “Security” Page – “802.1X” – „802.1X Port Setting” Tab

Parameters	Factory Default	Description
Port	Option	Set specific port(s) to be configured.
Mode	NO	Choices: FU (Force Unauthorized): Specify forced unauthorized FA (Force Authorized): Specify forced authorized AU (Standard Authorization): Specify authorization based on IEEE 802.1X. NO: Specify disable authorization

10.6.4 Port Security

Port security is a security feature that makes it possible to link each port of a switch with a specific number of MAC addresses so that communication is permitted only with authorized MAC addresses. For this, the switch checks the sender MAC address each time a link is established before any user data is transmitted.

The Port Security functions can specify the maximum number of MAC addresses per interface. If this number is exceeded, incoming packets with new MAC addresses are dropped. The allowed MAC addresses are defined automatically after the activation of the respective port. Once enabled, the switch stores the MAC addresses of the sender in a table each time a link is established at the port until the permitted number defined by the user is reached.

When the state of a port on the switch is changed from disabled to enabled, all MAC addresses captured by that port are deleted.

Note

Configuration of the Port Security

Port security configuration will allow the user to configure MAC limitations to permit the interface. This product supports up to 1,000 MAC address for one port.

The screenshot shows the WAGO WBM interface for configuring Port Security. The left sidebar contains navigation options: Static SAK, Secure Code, 802.1X, Port Security (selected), and VLAN. The main content area is titled 'Port Security' and includes three sections:

- Port Security Global Setting:** A 'Global State' checkbox is currently unchecked, with a 'Submit' button to its right.
- Port Security Settings:** Contains a note: 'Note: Port security configuration will allow the user to configure MAC limitations to permit the interface.' Below this are fields for 'Port Range' (set to 1 ~ 1), 'Port State' (set to Disable), and 'Maximum MAC' (set to 1, with a range of 1-1000). A 'Submit' button is at the bottom right.
- Port Security Status:** A table showing the status of ports 1 through 8.

Port	State	Maximum MAC	Edit
1	disabled	1	
2	disabled	1	
3	disabled	1	
4	disabled	1	
5	disabled	1	
6	disabled	1	
7	disabled	1	
8	disabled	1	

Figure 51: WBM "Security" tab – "Port Security" page

Table 36: WBM "Security" tab – "Port Security Settings" tab

Parameter	Description
Port Security Global Setting	
Global State	Select Global State to enable port security on the switch. Deselect Global State to disable port security on the switch.
Port Security Settings	
Port Range	Select the range of ports for which you want to enable/disable port security.
Port State	Enable or disable port security on the selected range of ports.
Maximum MAC	Select the maximum number of MAC addresses for the selected range of ports

10.6.5 VLAN

10.6.5.1 Port Isolation

Port Isolation is a port-based virtual LAN function. It partitions the switching ports into virtual private domains designated on a per port basis. Data switching outside of the switch's private domain is not allowed. VLAN tag information of the packets is ignored.

This function can be used to configure one or more egress ports that allow the data received by the specific port to forward it.

If you want to allow communications between two subscriber ports, you must define the egress port for both ports. By default, it forms a VLAN with all ETHERNET ports.

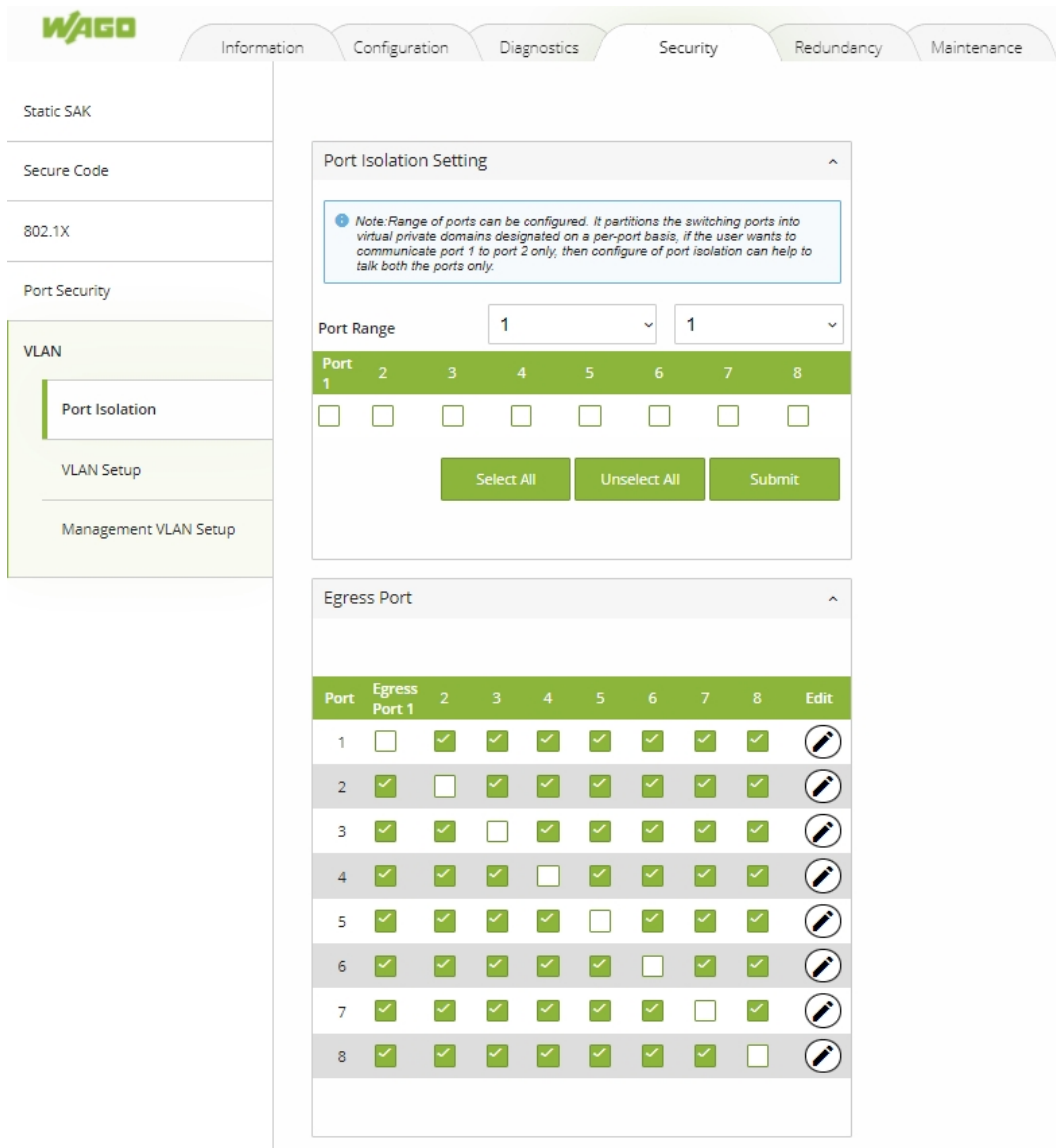


Figure 52: WBM "Security" tab – "Port Isolation Setting" page

Table 37: WBM "Security" tab – "Port Isolation Settings" page

Parameter	Description
Port Range	Select the range of ports for which you want to submit the Port Isolation Settings.
Port (1-8)	Select the egress ports for the selected range of ports.

10.6.5.2 VLAN Setup

A VLAN (**V**irtual **L**AN) is a group of hosts with a common set of requirements that communicate as if they were attached to a broadcast domain, regardless of their physical location. A VLAN has the same attributes as a physical LAN, but it allows end stations to be grouped together even if they are not located on the same network switch. Networks can be reconfigured through software instead of spatially offset devices.

VID (**V**LAN-**I**D) is the identification of a VLAN that is generally used by the 802.1Q standard. It has 12 bits and allows the identification of 4096 (2¹²) VLANs. Of the 4096 possible VIDs, VID 0 is used to identify Priority Frames and value 4095 (FFF) is reserved, so the maximum possible VLAN configurations are 4094.

A Tagged VLAN uses an explicit tag (VLAN ID) in the MAC header to identify the VLAN membership of a frame across Bridges; they are not confined to the switch on which they were created. VLANs can be created statically (manually by users) or dynamically via the GVRP (GARP VLAN Registration Protocol). The VLAN ID associates a frame with a specific VLAN and provides the information that switches need to process the frame across the network. A tagged frame is four bytes longer than an untagged frame and contains two bytes of TPID (Tag Protocol Identifier, residing within the type/length field of the ETHERNET Frame) and two bytes of TCI (Tag Control Information, starting after the source address field of the ETHERNET Frame).

Forwarded Tagged and Untagged Frames

Each port on the switch is capable of forwarding tagged or untagged frames. To forward a frame from an 802.1Q VLAN-aware switch to an 802.1Q VLAN-unaware switch, the switch first decides where to forward the frame and then strips off the VLAN tag. To forward a frame from an 802.1Q VLAN-unaware switch to an 802.1Q VLAN-aware switch, the switch first decides where to forward the frame and then inserts a VLAN tag reflecting the ingress port's default VID. The default PVID is VLAN 1 for all ports, but this can be changed.

A broadcast frame (or a multicast frame for a multicast group that is known by the system) is duplicated only on ports that are subscribers of the VID (except the ingress port itself), thus confining the broadcast to a specific domain.

Port-Based 802.1Q VLAN

As a subscriber of a port-based VLAN, the port is assigned to a specific VLAN independent of the user or system attached to the port. This means all users attached to the port should be subscribers of the same VLAN. The network administrator typically performs the VLAN assignment. The port configuration is static and cannot be automatically changed to another VLAN without manual reconfiguration.

Two roles can be assigned to a port in a Port-Based VLAN:

- Access port: A port that carries only traffic to and from the specific VLAN to which it is assigned.
- Trunk port: A port that can carry traffic for one or all VLANs that a specific switch can access.

As with other VLAN approaches, the packets forwarded using this method are not transmitted to other VLAN domains or networks. After a port has been assigned to a VLAN, the port cannot send to or receive from devices in another VLAN without the intervention of a Layer 3 device.

The device that is attached to the port likely has no understanding that a VLAN exists. The device simply knows that it is part of a subnet and that the device should be able to talk to all other network subscribers by simply sending information via the cable connection. The switch is responsible for identifying that the information came from a specific VLAN and for ensuring that the information gets to all other subscribers of the VLAN. The switch is also responsible for ensuring that ports in a different VLAN do not receive the information.

This approach is quite simple, fast and easy to manage in that there are no complex lookup tables required for VLAN segmentation. If the Port-to-VLAN connection is designed with an application-specific integrated circuit (ASIC), performance is very good. An ASIC allows Port-to-VLAN mapping at the hardware level.

Note

Creating VLANs

Up to 128 VLANs can be set up. It is recommended to configure a trunk port with tag and have all ports join the VLAN.

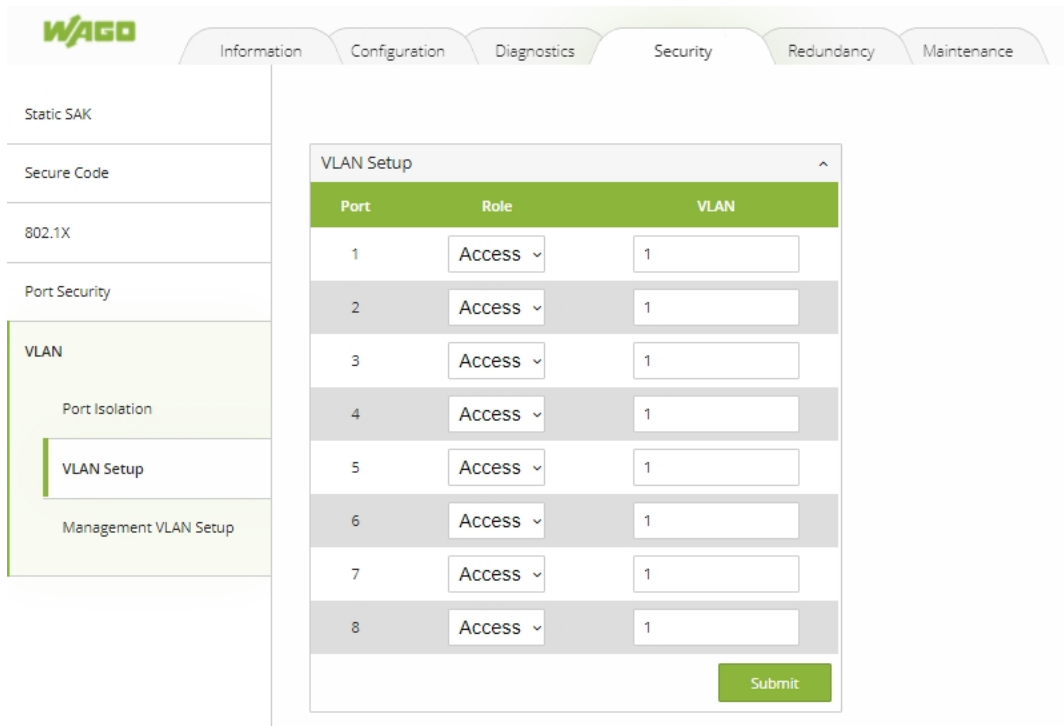


Figure 53: WBM "Security" tab – "VLAN Setup" page

Table 38: WBM "Security" tab – "VLAN Setup" page

Parameter	Description
Role	Select whether that port should be assigned the Access or Trunk role.
VLAN	Select the VLAN to be assigned to the port (for trunk e.g. 1,3,6,19)

10.6.5.3 Management VLAN

There must always be a port in the Management VLAN. Otherwise, the switch cannot be configured.

Note

Obtaining the management VLAN information

If the information for the Management VLAN is missing, you can obtain this information via LLDP.

- Step 1: Connect Port1 to your laptop or PC.
- Step 2: Port1 will send the information of management VLAN configuration three times via LLDP DA when the system is booting up (Interval time of 5 seconds).
- Step 3: Use the network monitoring tool to monitor LLDP packets and find the management VLAN. In the example below, the management VLAN has the ID 1. Ports 1, 3, 5, and 7 have been set up for VLAN 1.

```

0000  01 80 c2 00 00 0e 00 01 02 03 04 05 88 cc 02 07 .....
0010  04 00 60 e9 28 3d 11 04 09 07 70 6f 72 74 2d 30 ... (= ... port-0
0020  30 31 06 02 00 78 ff ff 56 4c 49 6e 66 6f 20 3a 01 ... x ... VI Info
0030  4d 61 6e 61 67 65 20 56 6c 61 6e 3a 30 30 30 31 Manage V lan:0001
0040  7c 70 6f 72 74 2d 30 31 20 41 63 63 65 73 73 7c |port-01 Access|
0050  7c 70 6f 72 74 2d 30 33 20 54 72 75 6e 6b 20 7c |port-03 Trunk |
0060  7c 70 6f 72 74 2d 30 35 20 41 63 63 65 73 73 7c |port-05 Access|
0070  7c 70 6f 72 74 2d 30 37 20 41 63 63 65 73 73 7c |port-07 Access|
0080  70 70 70 70 70 70 70 70 70 70 70 70 70 70 70 70
    
```

Figure 54: Management VLAN – Example

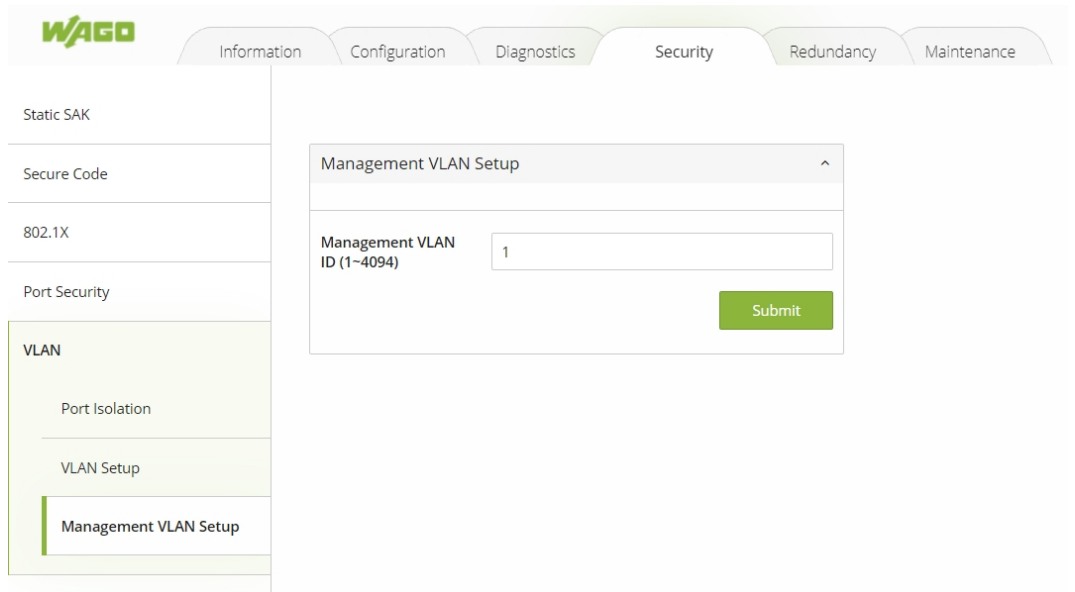


Figure 55: WBM "Security" tab – "Management VLAN Setup" page

Table 39: WBM "Security" tab – "Management VLAN Setup" page

Parameter	Description
Management VLAN	Select the VLAN ID for the Management VLAN

Note

If the management VLAN is not configured as an access port on the switch, the configuration must be accessed via the trunk port. In this case, the configuration must be performed via an access port of a second switch that is located in the same management VLAN.

10.7 Redundancy

10.7.1 RSTP

10.7.1.1 General Information

The Rapid Spanning Tree Protocol (RSTP) is a development of the Spanning Tree Protocol (STP). Both protocols are defined by the IEEE in the following standards:

- IEEE 802.1D: Spanning Tree Protocol
- IEEE 802.1w: Rapid Spanning Tree Protocol

RSTP can detect and break network loops and provide backup links (spare connections) between switches, bridges or routers. By regularly exchanging Bridge Protocol Data Units (BDPU), a switch can interact with other RSTP-capable switches in the network to ensure that only one connection exists between any two stations in the network at any given time.

Compared to STP, RSTP allows faster adaptation of the spanning tree. It is also backward compatible with STP-only bridges. With RSTP, information about changes in topology is broadcasted throughout the network directly from the device generating the change. With STP, a longer delay is required because the device causing a topology change first notifies the root bridge, which in turn notifies the rest of the network. Both RSTP and STP remove unwanted learned addresses from the filter database.

To create the spanning tree, a root bridge must be selected first. This is the starting point of a spanning tree. Starting from the root bridge, all paths are defined via which the other bridges in the

network can be reached. The root bridge is selected according to a defined procedure. For this purpose, the switches exchange their Bridge-ID (BID - consisting of priority, system ID and MAC address) via multicast messages and select the switch with the lowest priority as the root bridge of the spanning tree. If the lowest priority is assigned to more than one switch, other criteria such as the MAC address are decisive.

After the root bridge has been selected, the paths through which the other bridges in the network can be reached are defined. For this purpose, all paths on which other switches can be reached are first determined. If several paths are recognized over which a switch can be reached, the paths with the least favorable path costs are blocked. The path costs are the costs for transmitting a frame through the port in the LAN. The IEEE standard defines the path costs, but also allows them to be set manually. This value should be adjusted to the transmission speed. The valid range is 1 to 200000000. A path with higher costs is more likely to be blocked by STP if a network loop is detected.

If the topology changes in a LAN coupled via bridge, a new tree is spanned. Once a stable network topology has been established, all bridges listen for Hello BPDUs transmitted from the Root Bridge. If a bridge does not get a Hello BPDU after a predefined interval (Max Age), the bridge assumes that the link to the Root Bridge is down. This bridge then initiates negotiations with other bridges to reconfigure the network to re-establish a valid network topology.

RSTP Switch Port States:

- **Discarding**
If a port causes a Switching Loop (looping connection between two ports), user data can no longer be sent or received. However, the port can go into the Forwarding state if the other active connections fail and the Spanning Tree algorithm determines that the port may transition to that state. BPDU data (**B**ridge **P**rotocol **D**ata **U**nit, configuration message) continues to be received and sent in the "Discarding" state.
- **Learning**
Even before the port has forwarded any frames (packets), it can learn source addresses from frames received and add them to the filter database (Switching Database).
- **Forwarding**
The port is in normal operating mode; it receives and sends data. RSTP still monitors incoming BPDUs, which would indicate that the port should return to the Blocking state to prevent a loop.

RSTP Bridge Port Roles

- **Root**
The Root Port is a forwarding port that can best transmit data from the Non-Root Bridge to the Root Bridge.
- **Designated**
This is a forwarding port for every LAN segment.
- **Alternate**
This port represents an alternate path to the Root Bridge. However, this path differs from the Root Port.
- **Backup**
This port is used as a backup/redundant path to a segment to which another Bridge Port is already connected.
- **Disabled**
This is not actually part of RSTP because a network administrator can manually disable a port.

Other important terms:

Table 40: Other important terms

Term	Description
Forward Time	The Forward Time or Forward Delay is the maximum time (in seconds) that the switch waits before it changes states. This delay is required because every switch must first receive information on topology changes before it forwards frames. In addition, each port needs time to receive information on conflicts that would make it return to the blocking state. Otherwise, temporary data loops might result. The valid range is 4 to 30 seconds.
Max Age	The Max Age is the maximum time (in seconds) that the switch can wait without receiving a BPDU (Bridge Protocol Data Unit, configuration message) before attempting to reconfigure. All switch ports (except for Designated Ports) receive BPDUs at regular inter-

Term	Description
	vals. Each port that ages out RSTP information (from the last BPDU) becomes the Designated Port for the attached LAN. If it is a Root Port, a new Root Port is selected from among the switch ports attached to the network.
Hello Time	The Hello Time is the time interval in seconds between configuration messages (BPDU Bridge Protocol Data Unit) sent from the root switch.
Edge Port	Edge Ports are attached to a LAN that has no other bridges attached. These ports can transition directly to the Forwarding state. RSTP continues to monitor the port for BPDUs in case a bridge is connected. RSTP can also be configured to automatically detect Edge Ports. As soon as the bridge detects a BPDU coming to an Edge Port, the port loses its status as an Edge Port.
Transmission Limit	The Transmission Limit is used to configure the minimum interval between the transmission of consecutive RSTP BPDUs. This function can only be enabled in RSTP mode. The valid range is from 1 to 10 seconds.
Priority	<p>The priority is used in determining the root switch, root port, and designated port. The switch with the highest priority (lowest numeric value) becomes the RSTP root switch. If all switches have the same priority, the switch with the lowest MAC address becomes the root switch.</p> <p>Enter a value from 0~61440.</p> <p>The lower the numeric value you assign, the higher the priority for this bridge.</p> <p>The priority determines the root bridge, which in turn determines the root hello time, maximum root age, and root forwarding delay.</p>
Convergence Time	Time required to recalculate the spanning tree in the event of a link failure.
BPDU Guard	This setting is configured individual for each port. If the port is enabled in BDU Guard and receives a BPDU, the port is switched to the Disabled state to prevent a faulty environment. The user must then manually enable the port.
BPDU Filter	This function is used to set up a filter for sending or receiving BPDUs on a switch port. If the port receives BPDUs, the BPDUs are dropped. If both of the BPDU Filter and BPDU Guard are enabled, the BPDU Filter has the higher priority.
Root Guard	The Root Guard function forces an interface to become a Designated Port to prevent neighboring switches from becoming a root switch. This function provides a way to specify the selection of a Root Bridge in a network. It prevents a Designated Port from becoming the Root Port. If a port with the Root Guard function receives a superior BPDU, the port moves to a root-inconsistent state (effectively equal to the Listening state) to maintain the status of the current Root Bridge. The port can be moved to the Forwarding state if no superior BPDU received over the period of three Hello Times.

10.7.1.2 RSTP Setup

The screenshot shows the WAGO WBM interface for RSTP Setup. The navigation tabs are Information, Configuration, Diagnostics, Security, Redundancy, and Maintenance. The 'Spanning Tree' section is active, showing 'RSTP Setup' and 'RSTP Port Setup'. The 'Spanning Tree Protocol Settings' panel contains a note: 'Note: RSTP detects and breaks network loops and provides backup links between switches, bridges or routers. Default values: Forward Delay 15 sec, Max Age 20 sec and Hello Time 2 sec'. Below the note, there is an 'Enable State' checkbox (unchecked), a 'Mode' dropdown menu (set to 'RSTP'), and a 'Bridge Parameters' section with a 'Priority' input field (set to '32768', with a range of '0-61440') and a green 'Submit' button.

Figure 56: WBM "Redundancy" tab – "RSTP Setup" page

Table 41: WBM "Redundancy" tab – "RSTP Setup" page

Parameter	Description
Enable State	Select Enable State to enable RSTP on the switch. Deselect Enable State to disable RSTP on the switch.
Mode	Only one mode (RSTP) is supported.
Bridge Parameters	
Priority	Define the priority of the switch, which is used to determine the root switch, the root port, and the designated ports.

i Note

Maximum switches in RSTP ring

A maximum of 20 switches can be connected in one RSTP ring (Default values: "Max Age" = 20 seconds).

10.7.1.3 RSTP Port Setup

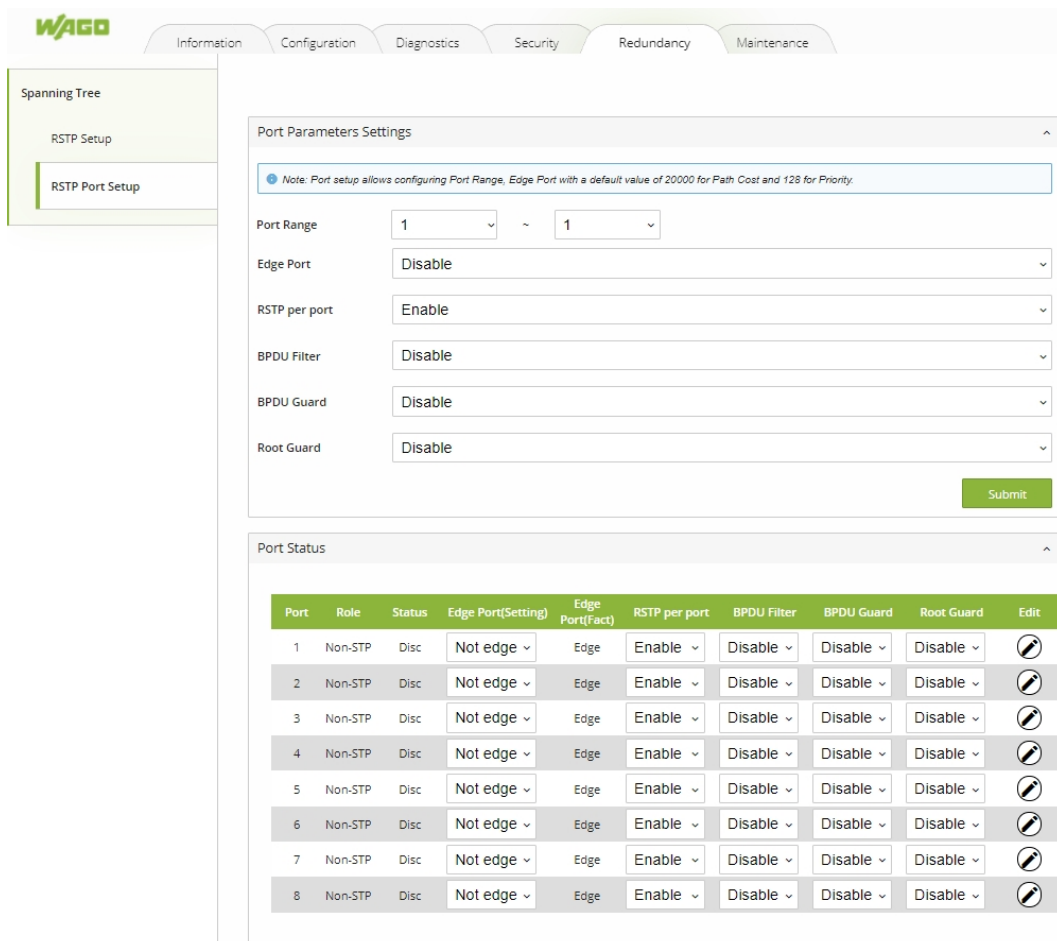


Figure 57: WBM "Redundancy" tab – "RSTP Port Setup" page

Table 42: WBM "Redundancy" tab – "RSTP Port Setup" page

Parameter	Description
Port Range	Select the range of ports for which you want to apply the Port Parameters Settings.
Edge Port	Select if the Edge Port setting should be enabled or disabled on the selected port range.
RSTP per port	Select if RSTP should be enabled or disabled on the selected port range.
BPDU Filter	Select if the BPDU Filter setting should be enabled or disabled on the selected port range.
BPDU Guard	Select if the BPDU Guard setting should be enabled or disabled on the selected port range.
Root Guard	Select if the Root Guard setting should be enabled or disabled on the selected port range.

10.7.1.4 RSTP Failover & Recovery Times

Industrial automation applications require robust communication networks that ensure high availability. The availability of an Ethernet network is largely determined by how quickly a network can recover from a cable or device failure.

There are several approaches to ensuring availability. The ring-based network topology is the simplest and most widely used. However, not all solutions achieve the same system availability and are directly dependent on the network topology. In order to make conclu-

sions about the performance for a specific industrial network application, the results of the measurements of the failover and recovery time of the network are presented below. The tested topologies correspond to an RSTP ring with 10 and 20 switches.

Cable Break (Failover) & New Uplink (Recovery)

Number of devices in the ring (852-1322)	Bidirectional traffic (TCP)		Bidirectional traffic (UDP)	
	Average failover time (ms)	Average recovery time (ms)	Average failover time (ms)	Average recovery time (ms)
10	1210.7	127.0	1213.3	127.8
20	1238.8	528.7	1239.0	530.0

Power-off Root (Failover)

Number of devices in the ring (852-1322)	Bidirectional traffic (TCP)		Bidirectional traffic (UDP)	
	Average failover time (ms)	Average recovery time (ms)	Average failover time (ms)	Average recovery time (ms)
10	1064.9	N/A	1064.5	N/A
20	1233.6	N/A	1232.6	N/A

10.8 Maintenance

10.8.1 Firmware Upgrade

The user can update the device firmware via web interface as shown in Figure “WBM “Maintenance” Page – “Firmware Upgrade” Tab”.

To update the firmware, the user can download a new firmware from WAGO’s website and save it in a local computer. Then, the users can click **[Browse...]** button and choose the firmware file that is already downloaded. The switch’s firmware typically has a “.dld” extension such as 0852-132x-V223.dld. After that, the users can click **[Update]** button and wait for the update process to be finished.

i Note

Firmware-Upgrade

Please make sure that the switch is plug-in with power supply all the time during the firmware upgrade.

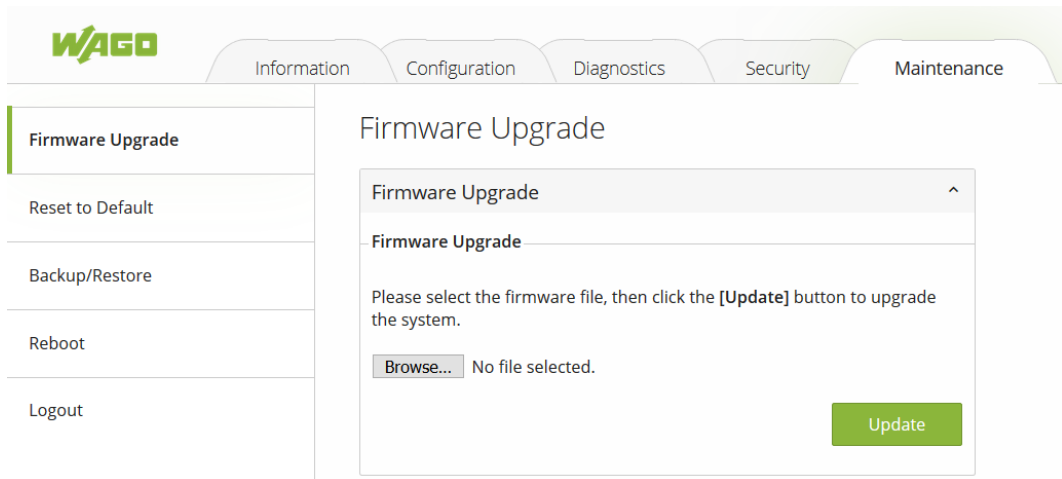


Figure 58: WBM “Maintenance” Page – “Firmware Upgrade” Tab

10.8.2 Reset to Default

When the switch is not working properly, the user can reset it back to the original factory default setting by clicking on the **[Reset]** button as shown in Figure “WBM “Maintenance” Page – “Reset to Default” Tab”. When the switch is restarted, the web browser will be re-directed to the login web page as depicted in Figure “Login Web Page”. Note that there is no physical reset button on the front panel of the box; therefore, the user will have to either using the **[Reset]** button on this page.

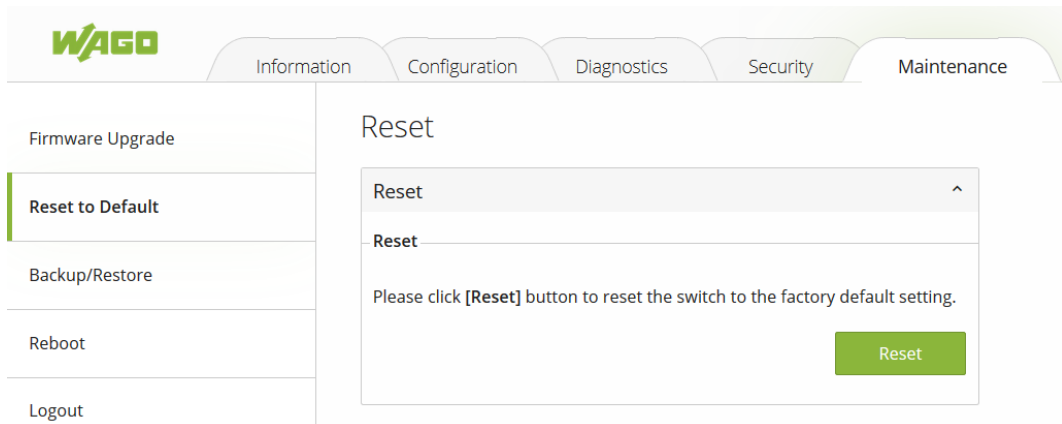


Figure 59: WBM “Maintenance” Page – “Reset to Default” Tab

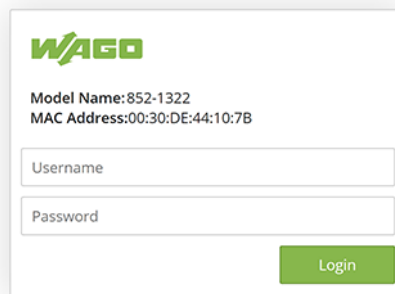


Figure 60: Login Web Page (Example)

10.8.3 Backup/Restore

The Backup/Restore tab page allow the user to back up the current configuration of the switch to a file, save the configuration file on the local PC, or upload a new configuration from a previously saved configuration file. Figure “WBM “Maintenance” Page – “Backup/Restore” Tab” shows the Backup/Restore tab page where it can be divided into two parts: Backup the Configuration and Restore the Configuration.

When clicking on the **[Download]** button on the upper part of the page (Backup the Configuration box), the user will be prompted to save or keep the file name 852-1322_XXX.XXX.XXX.XXX.ini by the Web browser. Choosing to Save File will back up the switch’s current configuration to your local drive on the local PC.



Figure 61: WBM “Maintenance” Page – “Backup/Restore” Tab

To restore a configuration file to the switch, click on **[Browse...]** button to open a file chooser to select a configuration file from the local drive of your PC. Before clicking the **[Upload]** button, the user can check any of the options above the file name, which are “Keep the username & password configuration” and “Keep the network configuration”. These two options will help to prevent the users from un-necessary logging-in to the switch using previously stored username, password, and/or network configuration after settings are restored.

10.8.4 Reboot

A simple reboot function is provided in this tab page requiring only one single click on the **[Reboot]** button as shown in Figure “WBM “Maintenance” Page – “Reboot” Tab”.

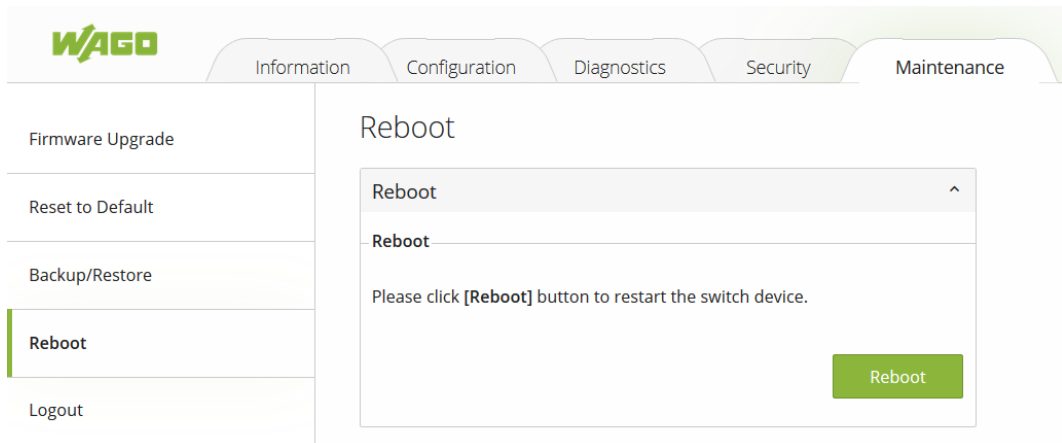


Figure 62: WBM "Maintenance" Page – "Reboot" Tab

10.8.5 Logout

For security best practice, the users should logout of the device if they no longer need to modify the system configuration. The logout process is highly recommended to ensure that the correct user settings will not be changed easily by unauthorized access or user. The user can logout of the device by either browsing to the Logout page and click **[Logout]** button or using the logout quick button which is located on the upper right corner of the web page as shown in Figure "WBM "Maintenance" Page – "Logout" Tab" and Figure Logout Quick Button on the Upper Right Conner", respectively.

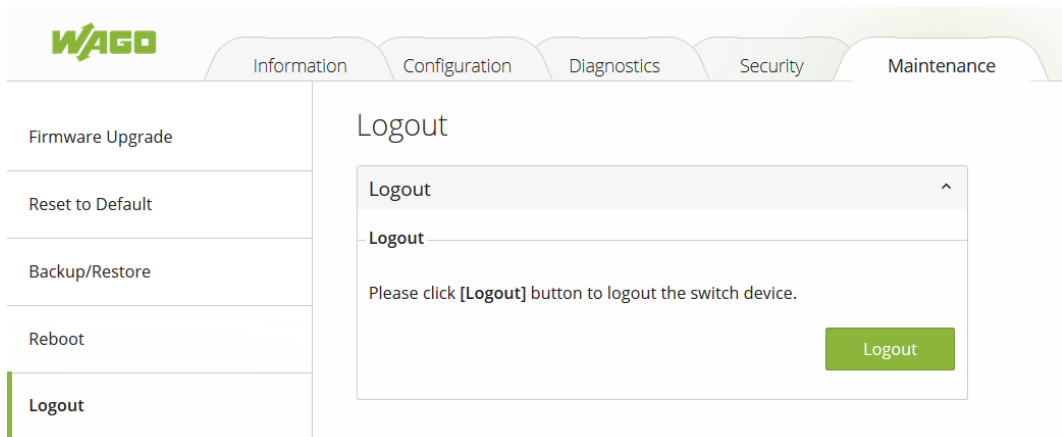


Figure 63: WBM "Maintenance" Page – "Logout" Tab

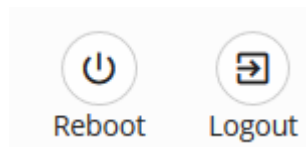







Figure 64: Logout Quick Button on the Upper Right Conner

Commissioning

Note

For important and useful information on commissioning, see sections:

- System Settings:  [System Settings \[▶ 36\]](#)
- Network Settings:  [Network Settings \[▶ 41\]](#)
- Port Settings:  [Setting \[▶ 42\]](#)
- Password:  [Password \[▶ 44\]](#)
- Clock Settings:  [SNTP Setup \[▶ 39\]](#)

Diagnostics

Note

For diagnostics and troubleshooting, see sections:

Diagnostics via LED Indicators:

- Diagnostics using product LEDs: [🔗 Unit LEDs \[▶ 18\]](#)
- Diagnostics using connection LEDs: [🔗 Port LEDs \[▶ 19\]](#)






Diagnostics via WBM:

- Diagnostics using SNMP network management: [🔗 SNMP \[▶ 45\]](#)
 - Diagnostics in the System Log: [🔗 System-Log \[▶ 55\]](#)
 - Monitoring ports: [🔗 Port Monitor \[▶ 59\]](#)
-

Service

Note

The following topics are useful for maintenance, for which the sections in the WBM description are given:


- Update the firmware:  [Firmware Upgrade \[▶ 77\]](#)
- Reset to factory settings:  [Reset to Default \[▶ 78\]](#)
- Backup and restore:  [Backup/Restore \[▶ 79\]](#)
- Reboot:  [Reboot \[▶ 79\]](#)
- Logout:  [Logout \[▶ 80\]](#)

Decommissioning

14.1 Disposal and Recycling

- Observe national and local regulations for the disposal of batteries, packaging and electrical and electronic equipment.
- Clear any data stored on electrical and electronic equipment.
- Remove any batteries or memory cards installed in electrical and electronic equipment.
- Dispose of all types of packaging to ensure a high level of recovery, reuse and recycling.
- Have electrical and electronic equipment sent to a local collection point.
- The guidelines 2006/66/EG, PPWD 2018/852/EU and WEEE 2012/19/EU apply throughout Europe. National directives and laws may vary.

Table 43: WEEE Mark

Logo	Description
	Electrical and electronic equipment may not be disposed of with household waste. This also applies to products without this mark.

Electrical and electronic equipment contain materials and substances that can be harmful to the environment and health. Electrical and electronic equipment must be disposed of properly after use. Environmentally friendly disposal benefits health, protects the environment from harmful substances in electrical and electronic equipment and enables sustainable and efficient use of resources.

Appendix

15.1 MODBUS/TCP Map

15.1.1 Modbus-Register

Table 44: Modbus-Register

Address	Data Type	Read/Write	Description
Systeminformation			
0x0020 (32)	1 word	R	Firmware Version =
			Ex: Version = 1.02
			Word 0 Hi byte = 0x01
			Word 0 Lo byte = 0x02
0x0021 (33)	3 words	R	ETHERNET MAC Address
			Ex: MAC = 00-01-02-03-04-05
			Word 0 Hi byte = 0x00
			Word 0 Lo byte = 0x01
			Word 1 Hi byte = 0x02
			Word 1 Lo byte = 0x03
			Word 2 Hi byte = 0x04
Word 2 Lo byte = 0x05			
0x0024 (36)	1 word	R	Kernel Version
			Ex: Version = 1.03
			Word 0 Hi byte = 0x01
			Word 0 Lo byte = 0x03
IP-Information			
0x0050 (80)	1 word	R	DHCP Status
			0x0000: Disabled
			0x0001: Enabled
0x0051 (81)	2 words	R	IP Address of switch
			Ex: IP = 192.168.1.1
			Word 0 Hi byte = 0xC0
			Word 0 Lo byte = 0xA8
			Word 1 Hi byte = 0x01
Word 1 Lo byte = 0x01			
0x0053 (83)	2 words	R	Subnet Maske of switch
			Ex: IP = 255.255.255.0
			Word 0 Hi byte = 0xFF
			Word 0 Lo byte = 0xFF
			Word 1 Hi byte = 0xFF
Word 1 Lo byte = 0x00			
0x0055 (85)	2 words	R	Gateway Address of switch
			Ex: IP = 192.168.1.254
			Word 0 Hi byte = 0xC0
			Word 0 Lo byte = 0xA8
			Word 1 Hi byte = 0x01
Word 1 Lo byte = 0xFE			

Address	Data Type	Read/Write	Description
Port Status			
0x1000 (4096)	5 words	R	Port Status
			0x0000: Disabled
			0x0001: Enabled
			Word 0 Hi byte = Port 1 Status
			Word 0 Lo byte = Port 2 Status
			Word 1 Hi byte = Port 3 Status
			Word 1 Lo byte = Port 4 Status
			Word 2 Hi byte = Port 5 Status
			Word 2 Lo byte = Port 6 Status
			Word 3 Hi byte = Port 7 Status
			Word 3 Lo byte = Port 8 Status
			Word 4 Hi byte = Port 9 Status
			Word 4 Lo byte = Port 10 Status
0x1040 (4160)	5 words	R	Port Speed
			Status, 10M = 0x01
			Status, 100M = 0x02
			Status, 1000M = 0x03
			Word 0 Hi byte = Port 1 Status
			Word 0 Lo byte = Port 2 Status
			Word 1 Hi byte = Port 3 Status
			Word 1 Lo byte = Port 4 Status
			Word 2 Hi byte = Port 5 Status
			Word 2 Lo byte = Port 6 Status
			Word 3 Hi byte = Port 7 Status
			Word 3 Lo byte = Port 8 Status
			Word 4 Hi byte = Port 9 Status
Word 4 Lo byte = Port 10 Status			
0x10A0 (4256)	5 words	R	Port Link Status
			Status, down = 0x00
			Status, up = 0x01
			Word 0 Hi byte = Port 1 Status
			Word 0 Lo byte = Port 2 Status
			Word 1 Hi byte = Port 3 Status
			Word 1 Lo byte = Port 4 Status
			Word 2 Hi byte = Port 5 Status
			Word 2 Lo byte = Port 6 Status
			Word 3 Hi byte = Port 7 Status
			Word 3 Lo byte = Port 8 Status
			Word 4 Hi byte = Port 9 Status
			Word 4 Lo byte = Port 10 Status

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