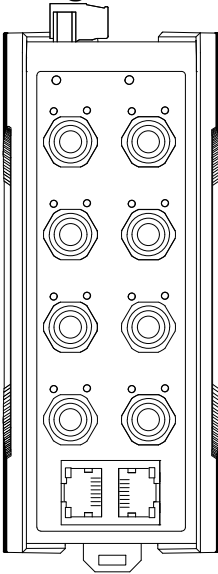


User Manual

Installation

Single Pair Ethernet Lite Managed Switch BEETLE



Read the assembly and operating instructions on the following pages carefully before starting up the device. Keep this information where it is accessible to all users.

The texts, figures, diagrams, and examples used in this document are exclusively used to explain how to operate and apply the device.

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Lumberg Automation™ reserves the right to change the contents of this document without prior notice. You can get the latest version of this manual on the Internet at:

<http://doc.beldensolutions.com>

Please contact us if you have any detailed questions on installing and starting up the devices:

Belden Deutschland GmbH
Lumberg Automation™
Im Gewerbepark 2
D-58579 Schalksmühle
Germany

<https://lumberg-automation-support.belden.com>

<https://belden.com>

<https://catalog.belden.com>

About this manual

The “Installation” user manual contains a device description, safety instructions, a description of the display, and the other information that you need to install the device.

Documentation mentioned in the “Installation” user manual that is not supplied with your device as a printout can be found as PDF files for downloading on the Internet at: <http://doc.beldensolutions.com>

Important information

Read these instructions carefully, and familiarize yourself with the device before trying to install, operate, or maintain it. The following notes may appear throughout this documentation or on the device. These notes warn of potential hazards or call attention to information that clarifies or simplifies a procedure.

Warning symbols



This is a general warning symbol. This symbol alerts you to potential personal injury hazards. Observe all safety notes that follow this symbol to avoid possible injury or death.



If this symbol is displayed in addition to a safety instruction of the type "Danger" or "Warning", it means that there is a danger of electric shock and failure to observe the instructions will inevitably result in injury.



This symbol indicates the danger of hot surfaces on the device. In connection with safety instructions, non-observance of the instructions will inevitably result in injuries.

DANGER



DANGER draws attention to an immediately dangerous situation, which will inevitably result in a serious or fatal accident if not observed.

WARNING



WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION



CAUTION indicates a possible danger which, if not avoided, may result in minor injuries.

NOTICE

NOTICE provides information about procedures that do not involve the risk of injury.



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1. Safety instructions

 WARNING	
	<p>UNCONTROLLED MACHINE ACTIONS Failure to follow these instructions can result in death, serious injury, or equipment damage.</p> <p>To avoid uncontrolled machine actions caused by data loss, configure all the data transmission devices individually.</p> <p>Before you start any machine which is controlled via data transmission, be sure to complete the configuration of all data transmission devices.</p>

You operate this device with electricity. Improper usage of the device entails the risk of physical injury or significant property damage. The proper and safe operation of this device depends on proper handling during transportation, proper storage and installation, and careful operation and maintenance procedures.

- Verify that the electrical installation meets local or nationally applicable safety regulations.
- Before connecting any cable, read this document, and the safety instructions and warnings.
- Operate the device with undamaged components exclusively.
- The device is free of any service components. In case of a damaged or malfunctioning device, turn off the supply voltage and return the device to Lumberg Automation™ for inspection.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

1.1. Qualification requirements for personnel

Only allow qualified personnel to work on the device.

Qualified personnel have the following characteristics:

- Qualified personnel are properly trained. Training as well as practical knowledge and experience make up their qualifications. This is the prerequisite for grounding and labeling circuits, devices, and systems in accordance with current standards in safety technology.
- Qualified personnel are aware of the dangers that exist in their work.
- Qualified personnel are familiar with appropriate measures against these hazards in order to reduce the risk for themselves and others.
- Qualified personnel receive training on a regular basis.

1.2. Intended use

- Use the product only for the application cases described in the Lumberg Automation™ product information, including this manual.
- Operate the product only according to the technical specifications.

See [General data on page 42](#)

- Connect to the product only components suitable for the requirements of the specific application case.

1.3. Installation site requirements

WARNING



FIRE HAZARD

Failure to follow these instructions can result in death, serious injury, or equipment damage.

If you connect the device to a power supply that does **NOT** meet the requirements for Limited Power Source, NEC Class 2 or PS2 according to IEC/EN 62368-1 and is **NOT** limited to 100 W output power, the device must be installed in either a switch cabinet or other fire enclosure.

The fire enclosure can be made of metal or plastic with fire-protection properties of at least V-1 according to IEC 60695-11-10. Bottom openings of the fire enclosure must **NOT** exceed 2 mm in diameter.

- Operate the device only at the specified ambient temperature (temperature of the ambient air at a distance of 5 cm (2 in) from the device) and at the specified relative humidity.
- When you are selecting the installation location, make sure you observe the climatic threshold values specified in the technical data.
- Use the device in an environment with a maximum pollution degree that complies with the specifications in the technical data.

[General data on page 42](#)

1.4. Device casing

Only technicians authorized by the manufacturer are permitted to open the casing.

- Never insert pointed objects (narrow screwdrivers, wires, etc.) into the device or into the connection terminals for electric conductors. Do not touch the connection terminals.
- Keep the ventilation slits free to ensure good air circulation.
- Mount the device in the vertical position.

1.5. Strain relief

Note: If the strain relief is insufficient, there is a potential risk of torsion, contact problems and creeping interruptions.

- Relieve the connection points of cables and lines from mechanical stress.
- Design strain reliefs in such a way that they help prevent any mechanical damage to cables, wires or conductors caused by external influences or their own weight.
- To help prevent damage to device connections, connectors and cables, follow the instructions for proper installation in accordance with DIN VDE 0100-520:2013-06, sections 522.6, 522.7 and 522.13.

1.6. Electrical connections

1.6.1. Grounding the device

- Ground the device before connecting any other cables.
- Disconnect the grounding only after disconnecting all other cables.

1.6.2. General requirements for connecting electrical wires

Before connecting the electrical wires, **always** verify that the requirements listed are complied with. The following requirements apply without restriction:

- The electrical wires are voltage-free.
- The device is grounded via the designated ground connection(s).
- The cross-section of the ground conductor is the same size or larger than the cross-section of the power supply cables.
- The connected voltage is limited by a current limitation device or a fuse.
- The device is only switched on after installation.
- The ground connection is disconnected only after all other cables have been disconnected.
- The cables used are permitted for the temperature range of the application case.



Relevant for North America: Exclusively use +60/75 °C
(+140/167 °F or +75 °C (+167 °F) copper wire (Cu wire).

1.6.3. General requirements for connecting the supply voltage

Before connecting the supply voltage, **always** verify that the requirements listed are complied with. The following requirements apply without restrictions:

- The supply voltage corresponds to the voltage specified on the type plate of the device.
- The power supply cable is suitable for the required voltage, current, and physical load.
- The cross-section of the ground conductor is the same size as or larger than the cross-section of the power supply cables.
- The power supply conforms to overvoltage category I or II.
- The power supply conforms to NEC Class 2.
- The power supply has an easily accessible disconnecting device (for example a switch or a plug). This disconnecting device is clearly labelled and identifiable, so that in case of an emergency it is clear which power supply the disconnecting device belongs to.
- The power supply is potential-free.
- Lumberg Automation™ recommends a wire cross-section of at least 0.75 mm^2 (18 AWG).

1.6.4. Specific requirements for connecting the supply voltage

The following requirements apply alternatively. Relevant when the device is supplied via 1 voltage input:

Alternative 1	The power supply complies with the requirements for a limited power source (LPS) according to IEC 60950-1 or ES1 + PS2 according to IEC/EN 62368-1.
Alternative 2	Relevant for North America: The power supply complies with the requirements according to NEC Class 2.
Alternative 3	All of the following requirements are complied with:

- The power supply complies with the requirements for a safety extra-low voltage (SELV) according to IEC 60950-1 or ES1 according to IEC/EN 62368-1.
- Supply with DC voltage:
A back-up fuse suitable for DC voltage is located in the plus conductor of the power supply.
The minus conductor is on ground potential. Otherwise, a back-up fuse is also located in the minus conductor.
Regarding the properties of this back-up fuse:
[General data on page 42](#)

1.7. Recycling note



The symbol of a crossed-out wheeled bin shown on the device indicates that the device **MUST NOT** be disposed of with household waste at the end of its service life.

After its service life, the used device must be disposed of properly as electronic waste in accordance with the locally applicable disposal regulations.

End users are responsible for deleting personal data from the used device prior to disposal.

End users are obliged to separate used batteries and accumulators that are not enclosed by the used device from the used device in a non-destructive manner before disposing of the used device. The used batteries and accumulators must be handed in for separate collection. This does not apply if the used device is handed in for reuse.

2. Approvals

2.1. CE marking

The labeled devices comply with the regulations contained in the following European directive(s):

- **2011/65/EU and 2015/863/EU (RoHS)**
Directive of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
- **2014/30/EU (EMC)**
Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

In accordance with the above-named EU directive(s), the EU conformity declaration will be available to the relevant authorities at the following address:

Lumberg Automation™
Im Gewerbepark 2
D-58579 Schalksmühle
Germany

You can download the PDF file of the EU conformity declaration at: <http://doc.beldensolutions.com/certificates.html>

The device can be used in industrial environments.

- Interference immunity: EN 61000-6-2
- Emitted interference: EN 55032

For more information, see [General data on page 42](#)

The assembly guidelines provided in these instructions must be strictly adhered to in order to observe the EMC threshold values.

Warning! This is a Class A device. This device can cause interference in living areas, and in this case the operator may be required to take appropriate measures.

2.2. UKCA marking

The labeled devices comply with the following UK regulations:

- **S.I. 2012 No. 3032**
Restriction of the Use of Certain Hazardous Substances in Electrical and Electronical Equipment Regulations
- **S.I. 2016 No. 1091**
Electromagnetic Compatibility Regulations



The UKCA conformity declaration will be available to the relevant authorities at the following address:

Belden UK Ltd.
1 The Technology Centre, Station Road
Framlingham, IP13 9EZ, United Kingdom

You find the UKCA conformity declaration as PDF file for downloading on the Internet at: <http://doc.beldensolutions.com/certificates.html>

The device can be used in industrial environments.

- Interference immunity: EN 61000-6-2
- Emitted interference: EN 55032

For more information on technical standards, see [General data on page 42](#)

The assembly guidelines provided in these instructions must be strictly adhered to in order to observe the EMC threshold values.

Warning! This is a class A device. This device can cause interference in living areas, and in this case the operator may be required to take appropriate measures.

3. Description

The device is designed for the special requirements of industrial automation. The device meets the relevant industry standards, provides very high operational reliability, even under extreme conditions, and also long-term reliability and flexibility.

The device allows you to set up switched Industrial Ethernet networks according to the standard IEEE 802.3.

You have numerous options of combining the device characteristics. You can determine the possible combinations using the configurator which is available in the Belden Online Catalog <https://catalog.belden.com> on the web page of the device.

3.1. Device name and product code

The device name corresponds to the product code. The product code is made up of characteristics with defined positions. The characteristic values stand for specific product properties.

Table 1. Device name and product code

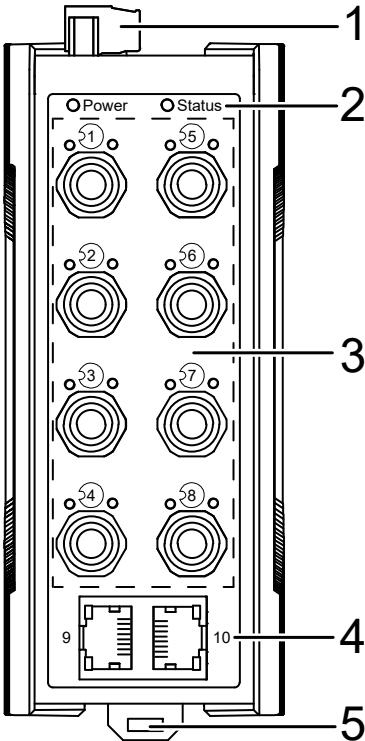
Item	Characteristic	Characteristic value	Description
1 ... 3	Product	BTL	BEETLE
4	(hyphen)	–	
5	Data rate	1	10BASE-T1 (802.3cq)
6	Distance	L	long
7	Hardware Type	5	PoDL
8	Housing	1	IP40
9	SPE ports: connector standard	6	IEC 63171-6
		5	IEC 63171-5
10 ... 11	SPE ports: type	W1	T1 Industrial Connector
		W2	M8 Connectors
		W3	M12 Connectors
12... 15	SPE ports: number	08T1	8 x SPE port
		06T1	6 x SPE port

Table 1. Device name and product code (continued)

Item	Characteristic	Characteristic value	Description
16	Twisted pair ports: standard	2	Fast Ethernet
		4	Gigabit Ethernet (GE)
17... 20	Twisted pair ports: number	02TX	2 x twisted pair RJ45 copper ports
		03TX	3 x twisted pair RJ45 copper ports
21	Temperature range	S	Standard -10 °C ... +60 °C (+14 °F ... +140 °F)
22 .. 23	Certificates and declarations	Z9	CE, FCC, EN 61131, EN 62368-2
24 ... 25	Customer-specific version	HH	Standard (6-pin terminal block)
26 ... 27	Configuration & Software	HH	Standard General data on page 42
		XX	Variable

3.2. Device views

3.2.1. Front view



Front view of device BTL-1L516W208T1202TXSZ9HHH

Item	Description
1	6-pin, pluggable terminal block for power supply
2	LED display elements for device status
3	8 × M8 Single Pair Ethernet ports 10BASE-T1L downlink
4	2 × RJ45 Multi Pair Ethernet ports 10BASE-T/100BASE-TX uplink
5	Rail lock slide for DIN rail mounting

3.3. Power supply

The following options for power supply are available:

3.3.1. Supply voltage range 18 V DC ... 32 V DC

Corresponds in the product code with the supply voltage characteristic value HH (items 26 ... 27).

- 12 V DC ... 24 V DC with 6-pin terminal block with screws:

Corresponds in the product code with the customer-specific version characteristic value HH (items 24 ... 25).

- 12 V DC ... 24 V DC with 6-pin terminal block with spring:

Corresponds in the product code with the customer-specific version characteristic value HK (items 24 ... 25).

You will find information on connecting the supply voltage here:

[Connecting the supply voltage on page 34](#)

3.4. Ethernet ports

You have the option to connect end devices or other segments to the ports of the device via twisted pair cables.

You find information on the pin assignments for making patch cables here:

[Pin assignments on page 24](#)

You find information on the port configuration here:

[Ports on page 64](#)

3.4.1. Single Pair Ethernet port 10 Mbit/s

This port is an M8 socket.

The 10 Mbit/s SPE (Single Pair Ethernet) port allows you to connect network components according to the IEEE 802.3 10BASE-T1L standard.

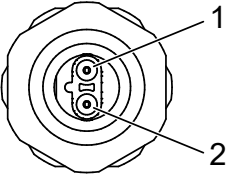
This port supports:

- Auto-Negotiation
- Autopolarity
- PoDL (Power over Data Line)
- 10 Mbit/s full duplex mode

Delivery state: Auto-Negotiation enabled

Pin assignment

Table 2. Pin assignment 10 Mbit/s SPE port, M8 socket

M8	Pin	10 Mbit/s
	1	RX/TX+
	2	RX/TX-

3.4.2. Twisted pair port 10/100 Mbit/s

This port is an RJ45 socket.

The 10/100 Mbit/s twisted pair port allows you to connect network components according to the IEEE 802.3 10BASE-T/100BASE-TX standard.

This port supports:

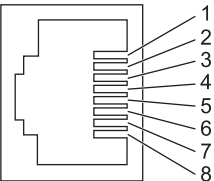
- Auto-Negotiation
- Autopolarity
- Auto-Crossover (if Auto-Negotiation is enabled)
- 100 Mbit/s half duplex mode, 100 Mbit/s full duplex mode
- 10 Mbit/s half duplex mode, 10 Mbit/s full duplex mode

Delivery state: Auto-Negotiation enabled

The pin assignment corresponds to MDI.

Pin assignments

Table 3. Pin assignment 10/100/1000 Mbit/s twisted pair port, RJ45 socket, MDI and MDI-X mode

RJ45	Pin	10/100 Mbit/s
	MDI mode	
	1	TX+
	2	TX-
	3	RX+
	4	—
	5	—
	6	RX-
	7	—
8	—	
MDI-X mode		
1	RX+	
2	RX-	
3	TX+	
4	—	
5	—	
6	TX-	
7	—	
8	—	

3.4.3. Support of PoDL

BEETLE supports Power over Data Line (PoDL) in accordance with IEEE 802.3 clause 104 including additions from IEEE 802.3cg.

PoDL-capable Ethernet ports are designed as M8 sockets. See [Device views on page 21](#).

The PoDL ports allow the connection and remote supply of, for example, sensors, scanners and Web cams. With PoDL, power is supplied to these terminal devices through the twisted pair cable.

With the presence of the PoDL power supply, a separate power supply for the connected devices is unnecessary.

The PoDL power is supplied via the wire pairs transmitting the signal.

The individual ports are not electrically insulated from each other (common PoDL voltage).

For the maximum power of PoDL end devices in total, refer to the technical data: [Power consumption/power output on page 42](#)

Note: Connect only PoDL-powered devices whose data connections are located in the interior of the building and are specified as SELV circuits according to IEC 60950-1 or ES1 circuits according to IEC/EN 62368-1.

CAUTION



POTENTIAL EQUIPMENT DAMAGE
Failure to follow these instructions can result in equipment damage.

Ensure that the device does not exceed the specified maximum PoDL power output.

Maximum power available to PoDL end devices in total: 120 W

PoDL complies with the following technical standards:

Technical standard	Description
IEEE 802.3, clause 104	PoDL max. power provided from the Power Source Equipment (PSE) Class 10/11/12 with 1.85 W/4.8 W/12.63 W at a voltage range between 20 V DC... 30 V DC

3.5. Display elements

After the supply voltage is switched on, the device performs a self-test. During this process, various LEDs light up.

3.5.1. Device status

This LED provides information about conditions which affect the operation of the whole device.

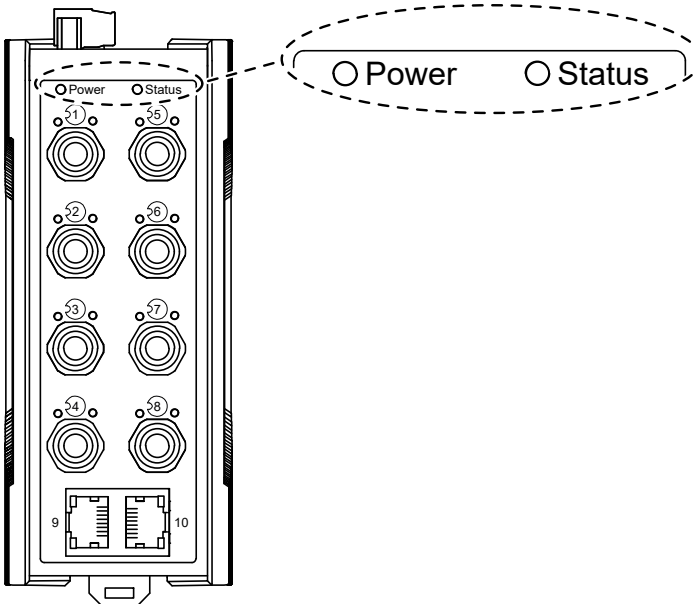


Table 4. Power LED: Color, activity and meaning

Color	Activity	Meaning
none	none	Supply voltage is too low or not available
green	lights up	Supply voltage is on

Table 5. Status LED: Color, activity and meaning

Color	Activity	Meaning
none	none	Device is starting and/or is not ready for operation
red	solid	Device status not ok:

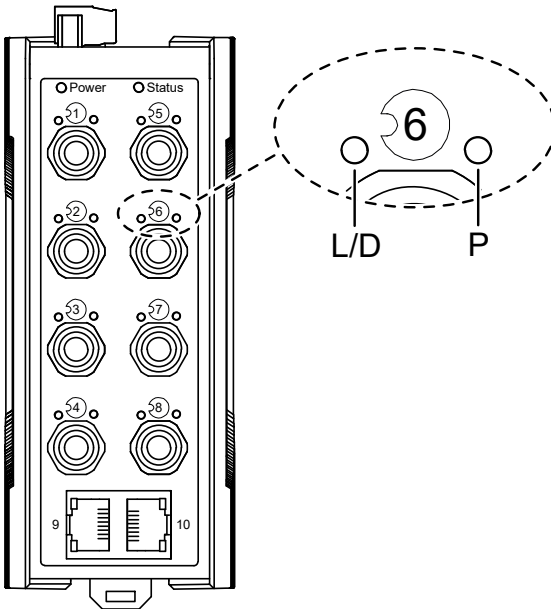
Table 5. Status LED: Color, activity and meaning (continued)

Color	Activity	Meaning
		Configuration failed Firmware update in progress
green	solid	Device is ready for operation

3.5.2. Port status

These LEDs display port-related information.

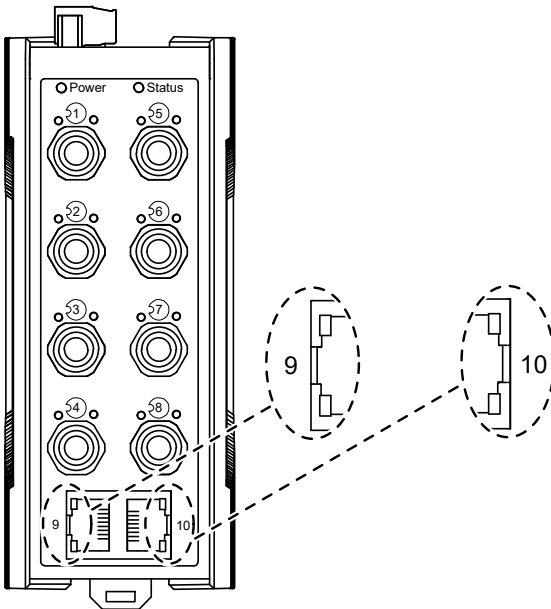
Ports 1 ... 8

**Table 6. M8 port Led L/D (link/data): Color, activity and meaning**

Color	Activity	Meaning
none	none	Device detects an invalid or missing link
green/yellow	flashing alternately	Device is transmitting and/or receiving data
green	lights up	Device detects a valid link

Table 7. M8 port LED P (PoDL): Color, activity and meaning

Color	Activity	Meaning
none	none	Power off
yellow	lights up	Power fault (e.g. voltage out of range)
green	lights up	Power on (PoDL or Hybrid power)

Ports 9 + 10**Table 8. RJ45 sockets (lower LED): Color, activity and meaning**

Color	Activity	Meaning
none	none	No activity
yellow	lights up	Device is transmitting and/or receiving data
green	lights up	Device detects a valid link

4. Installation

The devices have been developed for practical application in a harsh industrial environment.

On delivery, the device is ready for operation.

Perform the following steps to install and configure the device:

- [Checking the package contents on page 30](#)
- [Mounting the device on page 30](#)
- [Grounding the device on page 33](#)
- [Connecting the supply voltage on page 34](#)
- [Operating the device on page 36](#)
- [Connecting data cables on page 36](#)

4.1. Checking the package contents

- Check whether the package includes all items named in the section [Scope of delivery on page 47](#).
- Check the individual parts for transport damage.

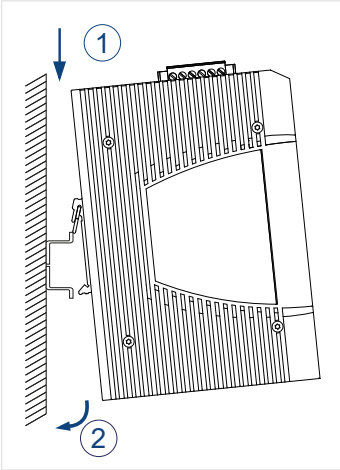
4.2. Mounting the device

You have the following option(s) for mounting your device:

- [Mounting the device onto the DIN rail on page 31](#)
- [Mounting on a flat surface on page 32](#)

4.2.1. Mounting the device onto the DIN rail

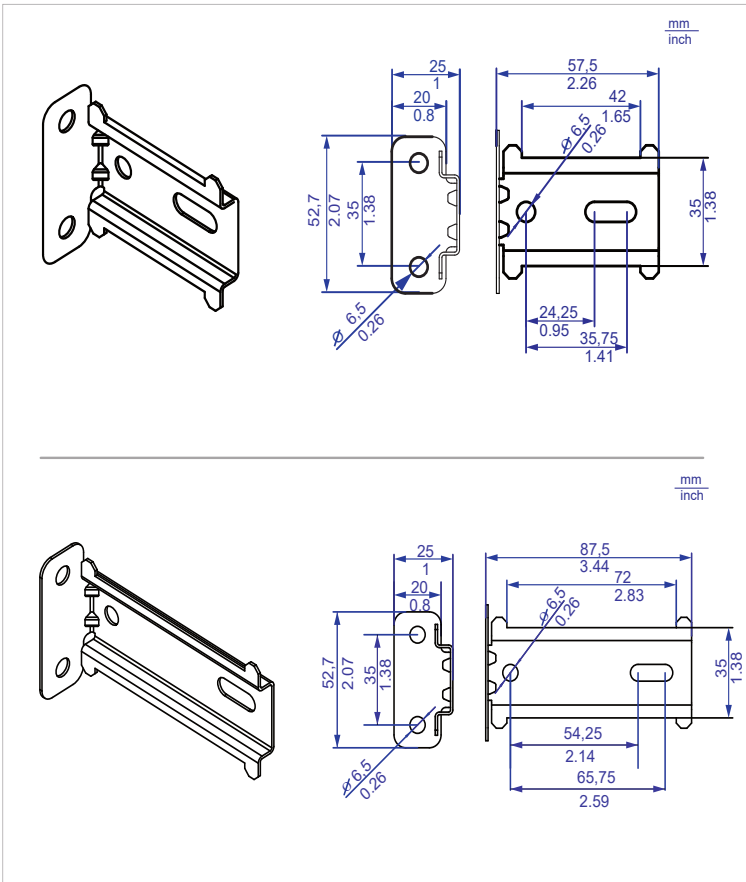
The device is designed to be mounted on a 35 mm (1.38 in) DIN rail in accordance with DIN EN 60715.



Perform the following work steps:

- Slide the upper snap-in guide of the device onto the DIN rail.
- Push the device downwards and onto the DIN rail.
- Snap-in the device.

4.2.2. Mounting on a flat surface



2 models of wall mounting plates are available:

[Accessories on page 46](#)

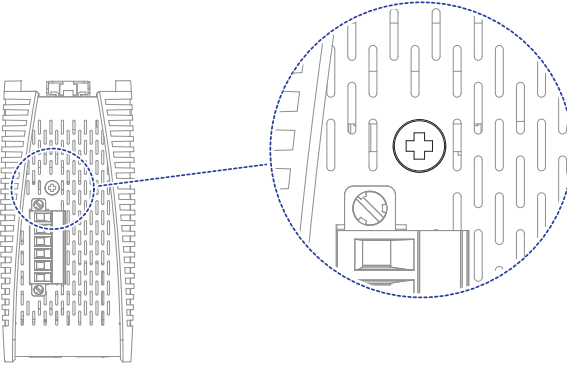
Perform the following work steps:

- Attach the wall mounting plate to a flat surface of the wall using screws. You will find the dimensions necessary for mounting the device in the illustration.

- Mount the device on the wall mounting plate. Insert the upper snap-in guide of the device into the rail and press it down against the rail until it snaps into place.

4.3. Grounding the device

Use a wire diameter for the ground conductor that is no smaller than the diameter of the supply voltage connection, however of at least 0.75 mm² (18 AWG).





Perform the following work steps:

- Ground the device via the ground screw.

The grounding screw is located on the topside as shown in the illustration.

4.4. Connecting the supply voltage

 WARNING	
	<p>ELECTRIC SHOCK Failure to follow this instruction can result in death, serious injury, or equipment damage.</p> <p>Exclusively connect a supply voltage that corresponds to the type plate of your device.</p> <p>Never insert sharp objects (small screwdrivers, wires, etc.) into the connection terminals for the supply voltage, and do not touch the terminals.</p>

The supply voltage can be connected redundantly. Both inputs are uncoupled. There is no distributed load. With redundant supply, the power supply unit with the higher output voltage supplies the device on its own. The supply voltage is electrically isolated from the housing.

Note: With non-redundant supply voltage, the device reports inoperable supply voltage. You can help prevent this message by applying the supply voltage via both inputs, or by changing the configuration.

4.4.1. Supply voltage range 18 V DC ... 32 V DC

Corresponds in the product code with the supply voltage characteristic value HH (items 26 ... 27).

Table 9. Type and specification of the supply voltage and pin assignment on the device

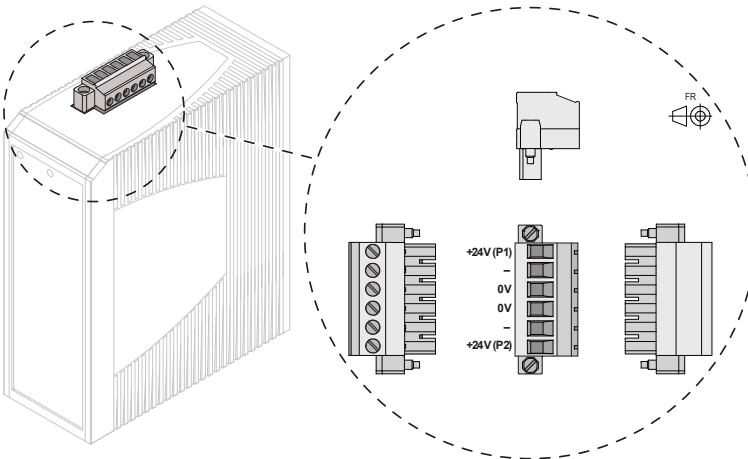
Type of the voltages that can be connected	DC voltage	
Specification of the supply voltage	Configuration: Hirschmann standard (characteristic value HH)	Rated voltage (operation) 24 V DC Voltage range incl. maximum tolerances 18 V DC ... 32 V DC, 20 V DC ... 30 V DC (for PoDL)

Table 9. Type and specification of the supply voltage and pin assignment on the device (continued)

Pin assignment	+24 V DC (P1)	Plus terminal of the supply voltage P1
	–	Not connected
	0 V DC	Minus terminal of the supply voltage P1
	0 V DC	Minus terminal of the supply voltage P2
	–	Not connected
	+24 V DC (P2)	Plus terminal of the supply voltage P2

4.4.2. Connecting the 6-pin terminal block with screws

Corresponds in the product code with the customer-specific version characteristic value HH (items 24 ... 25).

Figure 1. 6-pin terminal block with screws

Perform the following work steps:

- Verify the required conditions for connecting the voltage supply.
Safety instructions on page 10
- Remove the terminal connector from the device.
- Connect the wires according to the pin assignment on the device with the clamps.
- Fasten the wires in the terminal block by tightening the terminal screws.
- Mount the terminal block for the supply voltage using screws.

4.5. Operating the device

By connecting the supply voltage via the terminal block, you start the operation of the device.

4.6. Connecting data cables

Note the following general recommendations for data cable connections in environments with high electrical interference levels:

- Keep the cable length to a minimum, but in any case within the maximum distances specified in the applicable standards.
- When using copper cables, provide a sufficient separation between the power supply cables and the data cables. Ideally, install the cables in separate cable ducts.
- Verify that power supply cables and data cables do not run parallel over longer distances. If reducing the inductive coupling is necessary, verify that the power supply cables and data cables cross at a 90° angle.
- Use shielded data cables according to IEC 61156-13, IEC 61156-14 and ISO/IEC 11801.
- Connect the data cables according to your requirements.
See [Ethernet ports on page 22](#)

5. Monitoring ambient conditions

5.1. Monitoring the ambient air temperature



Operate the device below the specified maximum ambient air temperature exclusively.

See [Climatic conditions during operation on page 44](#).

The ambient air temperature is the temperature of the air at a distance of 5 cm (2 in) from the device. It depends on the installation conditions of the device, for example the distance from other devices or other objects, and the output of neighboring devices.

6. Maintenance and service



- When designing this device, Lumberg Automation™ largely avoided using high-wear parts. The parts subject to wear and tear are dimensioned to last longer than the lifetime of the product when it is operated normally. Operate this device according to the specifications.
- Depending on the pollution degree in the operating environment, check regularly that the ventilation slots in the device are not obstructed.



 CAUTION	
	<p>RISK OF TRANSIENTS OR ELECTROSTATIC DISCHARGES</p> <p>Failure to follow these instructions can result in injury or equipment damage.</p> <p>Do not open the casing.</p>

You find information on settling complaints on the Internet at: <http://www.beldensolutions.com/en/Service/Repairs/index.phtml>.

7. Disassembly

7.1. Removing the device

 WARNING	
	<p>ELECTRIC SHOCK Failure to follow these instructions can result in death, serious injury, or equipment damage.</p> <p>Disconnect the grounding only after disconnecting all other cables.</p>

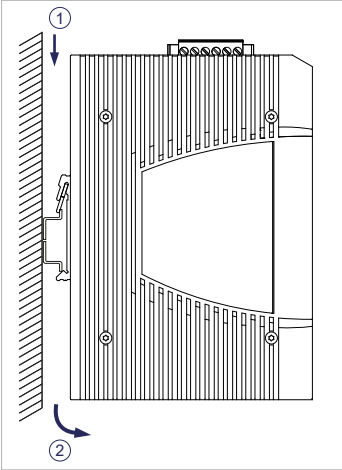
 WARNING	
	<p>ELECTRIC SHOCK Failure to follow this instruction can result in death, serious injury, or equipment damage.</p> <p>Disconnect the grounding only after disconnecting all other cables.</p>

To prepare the deinstallation, perform the following work steps:

- Disconnect the data cables.
- Disable the supply voltage.
- Disconnect the terminal blocks.
- Disconnect the grounding.

To remove the device from the DIN rail, perform the following work steps:

- Press the device downwards and pull it out from under the DIN rail.



8. Technical data

8.1. General data

Dimensions W × H × D	BEETLE		Dimension drawings on page 43
Weight	BTL-1L516W208T1202TXSZ9HHHH		1016 g (35.84 oz)
Power supply	Configuration: standard (characteristic value HH, items 26 ... 27)	Rated voltage (operation)	24 V DC
		Voltage range incl. maximum tolerances	18 V DC ... 32 V DC, 20 V DC ... 30 V DC (for PoDL)
	Connection type	6-pin terminal block (characteristic value HH, items 24 ... 25)	Tightening torque 0.51 Nm (4.5 lb-in)
		6-pin voltage terminal with spring (characteristic value HK, items 24 ... 25)	
	Power loss buffer	without PoDL devices	>10 ms at 20.4 V DC
Nominal rating:	10 A		
Characteristic:	slow blow		
Pollution degree			2
Protection classes	Degree of protection	IP40	

8.2. Supply voltage

8.3. Power consumption/power output

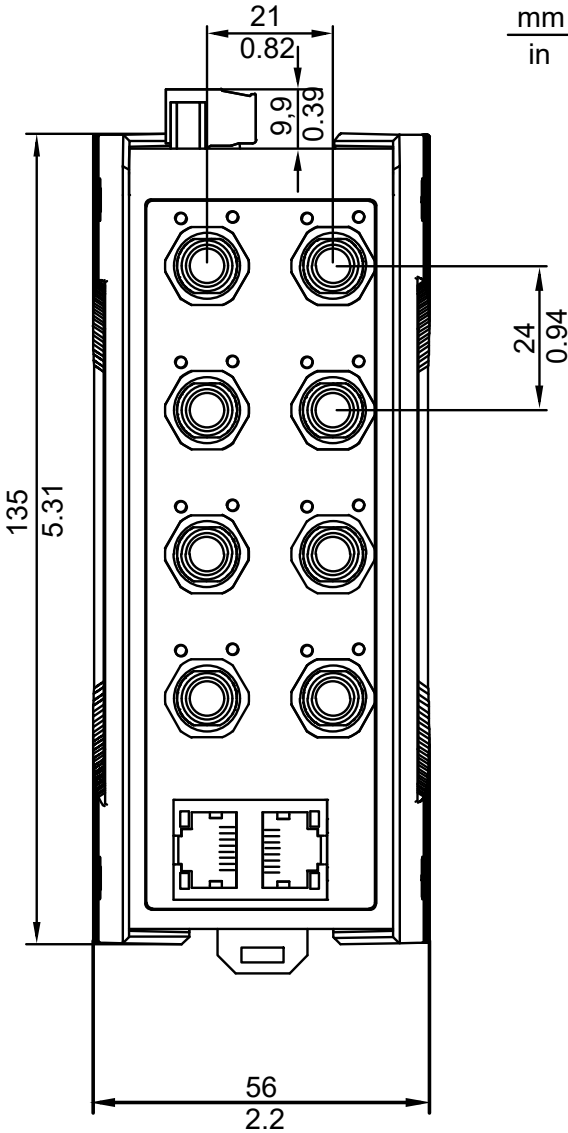
Table 10. Power consumption/power output of the device

Device name	Use case	Maximum power consumption ¹	Thermal power output	PoDL power output
BTL-1L516W208T1202TXSZ9H-HHH	without PoDL devices	7.2 W	25 Btu (IT)/h	–
	with PoDL devices	111.2 W	35 Btu (IT)/h	8 x 12.63 W = 101 W

1. Tested at room temperature

8.4. Dimension drawings

8.4.1. Dimension drawings



8.5. Climatic conditions during operation

Table 11. Climatic conditions during operation

Climatic conditions during operation	
Ambient air temperature ²	-10 °C ... +60 °C (+14 °F ... +140 °F) Derating
Humidity	1 % ... 95 % (non-condensing)
Air pressure	min. 700 hPa (+3000 m ASL; +9842 ft ASL)

8.6. Climatic conditions during storage

Table 12. Climatic conditions during storage

Climatic conditions during storage		
Ambient air temperature ²	-40 °C ... +70 °C (-40 °F ... +158 °F)	up to 1 year
	0 °C ... +30 °C (+32 °F ... +86 °F)	up to 10 years
Humidity	1 % ... 95 % (non-condensing)	
Air pressure	min. 700 hPa (+3000 m ASL; +9842 ft ASL)	

8.7. Immunity

Table 13. Immunity: Standard applications

EN 61131-2, CE, FCC – applies to all devices

Applicable standard		
IEC 60068-2-6, test Fc	Vibration	5 Hz ... 8.4 Hz with 3.5 mm (0.14 in) amplitude
IEC 60068-2-6, test Fc	Vibration	8.4 Hz ... 150 Hz with 1 g
IEC 60068-2-27, test Ea	Shock	15 g at 11 ms

2. Temperature of the ambient air at a distance of 5 cm (2 in) from the device

8.8. Electromagnetic compatibility (EMC)

Note: Use shielded data cables according to IEC 61156-13, IEC 61156-14 and ISO/IEC 11801.

Note: Use shielded data cables according to IEC 61156-13, IEC 61156-14 and ISO/IEC 11801.

8.8.1. EMC interference emission

Table 14. EMC interference emission: Standard applications

Applicable standard		
Radiated emission		
FCC 47 CFR Part 15		Class A
EN 55032		Class A
EN 61000-6-4		Fulfilled
Conducted emission		
FCC 47 CFR Part 15	Supply connection	Class A
EN 55032	Supply connection	Class A
EN 55032	Telecommunication connections	Class A
EN 61000-6-4	Supply connection	Fulfilled
EN 61000-6-4	Telecommunication connections	Fulfilled

8.8.2. EMC interference immunity

Table 15. EMC interference immunity: Standard applications

Applicable standard		
Electrostatic discharge		
EN 61000-4-2 IEEE C37.90.3	Contact discharge	±4 kV
EN 61000-4-2	Air discharge	±8 kV

Table 15. EMC interference immunity: Standard applications (continued)

Applicable standard		
IEEE C37.90.3		
Electromagnetic field		
EN 61000-4-3	80 MHz ... 3000 MHz	max. 10 V/m
Fast transients (burst)		
EN 61000-4-4 IEEE C37.90.1	DC supply connection	2 kV
EN 61000-4-4 IEEE C37.90.1	Data line	1 kV
Voltage surges - DC supply connection		
EN 61000-4-5	line/ground	1 kV
EN 61000-4-5	line/line	0.5 kV
Voltage surges - data line		
EN 61000-4-5	line/ground	1 kV
Conducted disturbances		
EN 61000-4-6	150 kHz ... 80 MHz	10 V

8.9. Accessories

You find more information on available accessories in the Belden Online Catalog, <https://catalog.belden.com>

Note that products recommended as accessories may have different characteristics to those of the device, which may limit the application range of the overall system. For example, if you add an accessory with IP20 to a device with IP40, the degree of protection of the overall system is reduced to IP20.

Table 16. General accessories

Article	Order number
6-pin terminal block with screw lock (50 pieces)	943845013
Rail Power Supply RPS 30	943662003
Rail Power Supply RPS 80 EEC	943662080
Rail Power Supply RPS 120 EEC (CC)	943662121
Wall mounting plate for DIN rail mounting, width 40 mm (1.58 in)	942177001

Table 16. General accessories (continued)

Article	Order number
Wall mounting plate for DIN rail mounting, width 70 mm (2.76 in)	942177002

8.10. Scope of delivery

Table 17. Scope of delivery

Amount	Article
1 ×	Device
1 ×	Safety and general information sheet
1 ×	Terminal block for supply voltage

8.11. Order number

Device	Order number
BTL-1L516W208T1202TXSZ9HHHH	935800001

8.12. Underlying technical standards

The device has an approval based on a specific standard exclusively if the approval indicator appears on the device casing.

The device generally fulfills the technical standards named in their current versions.

If your device has a shipping approval according to DNV, you find the approval mark printed on the device label. You will find out whether your device has other shipping approvals on the Lumberg Automation™ website at: <https://belden.com> in the product information.

Table 18. List of the technical standards

EN 55032	Electromagnetic compatibility of multimedia equipment – Emission Requirements
EN 61000-3-2	Electromagnetic compatibility (EMC) – Part 3-2: Threshold values – threshold values for harmonic currents (device input current ≤16 A per conductor)

Table 18. List of the technical standards (continued)

EN 61000-3-3	Electromagnetic compatibility (EMC) – Part 3-3: Threshold values – limitation of voltage changes, voltage fluctuations and flickering in public low power supply networks for devices with a rated current ≤16 A per conductor that are not subject to any special connection condition
EN 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments
EN 61000-6-4	Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emitted interference in industrial environments
EN 61131-2	Programmable controllers – Part 2: Equipment requirements and tests
IEC/EN 62368-1	Equipment for audio/video, information and communication technology - Part 1: Safety requirements
FCC 47 CFR Part 15	Code of Federal Regulations
IEEE 802.3 Clause 9	Ethernet Environment A
IEC/EN 61010-2-201	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-201: Particular requirements for control equipment
IEC 61140, EN 61140, VDE 0140-1	Protection Class II
EN 60664-1, VDE 0110-1	Pollution degree 2

9. Graphical User Interface (GUI)

This section will cover the following topics:

- **Accessing the Graphical User Interface (GUI):** Find instructions on how to access the web-based interface. See [Access on page 49](#).
- **User Management:** Learn the ins and outs of user management and authentication processes to help ensure secure access. See [User Management on page 51](#).
- **Informative Data and Monitoring:** Gain insights into monitoring the device status, providing system information, viewing logs and audit information. See [Data and Monitoring on page 54](#).
- **Configuration Settings:** Dive into details on configuring network parameters, security features, and other customizable options. See [Configuration Settings on page 63](#).
- **Firmware Update:** Follow guidelines for updating the firmware to benefit from the latest enhancements and security patches. See [Firmware Update on page 93](#).
- **Restoring Factory Configuration:** Discover the process for restoring the device to its factory configuration, providing a fallback option. See [Restore Default Configuration on page 95](#).

9.1. Access

In order to access the Graphical User Interface (GUI), follow these step-by-step instructions:

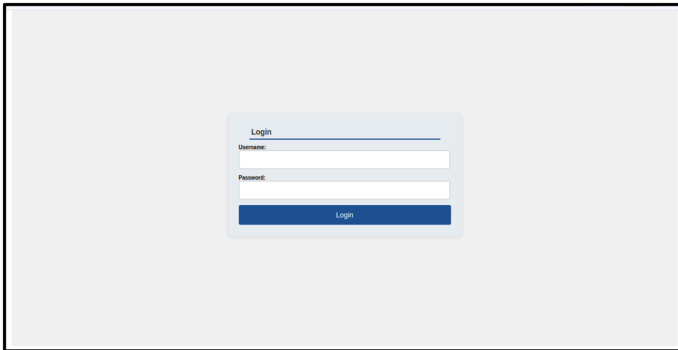
- Validate that the device is connected to the power supply and to the network. Confirm that the device IP address is obtained and known as this is a condition to have access to the device's GUI.
- Open the Web browser on the device which is used to access the device and type in the following address in the browser's address bar. The [Device IP address] is the address which was obtained in the former step:

[Device IP address]/index.htm

Example:



- The following access screen will be shown:

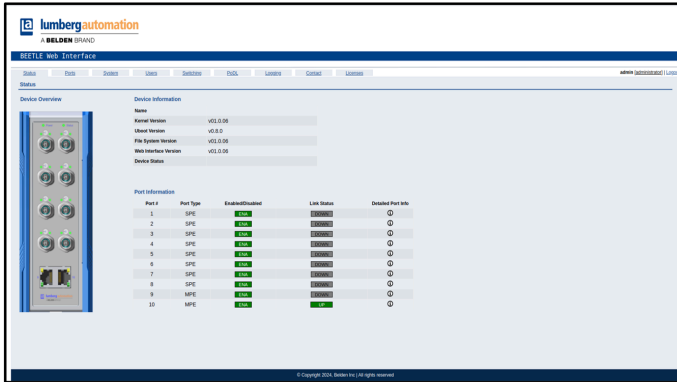


- Fill in Username and Password credentials to log in to the GUI.

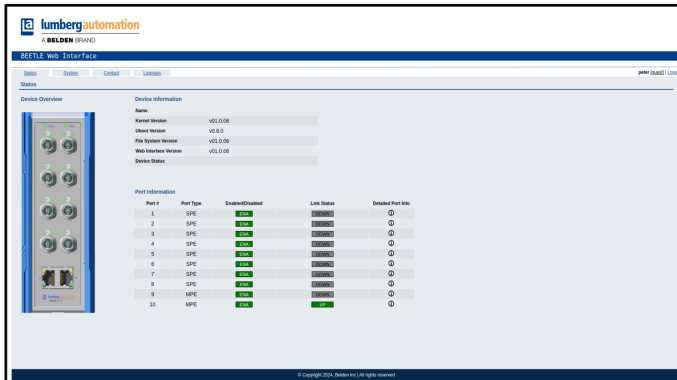
Username (default): admin

Password (default): private

- Once the Username and password credentials have been provided and the login process to the GUI is completed, the following GUI portal will show up:



Note: In case a user is logged in without having the administrator role, the following read-only GUI will show up:



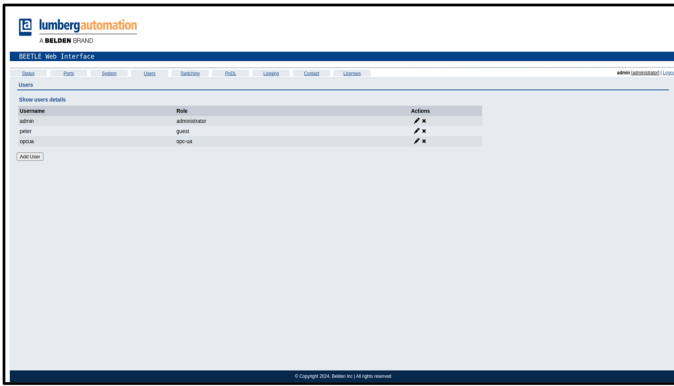
9.2. User Management

User management refers to the process of organizing, controlling, and administering user access within a device. It allows creating and deleting users, assigning users to the users groups and granting permissions, and helps ensuring the security of user credentials.

Important: In order to proceed with user management functionality, users with administrative privileges should be logged in to the Graphical User Interface.

An administrator user should follow the next steps in order to add a new GUI user:

- In the menu ribbon at the top, navigate to the tab “User” and click on it. The following screen will show up:

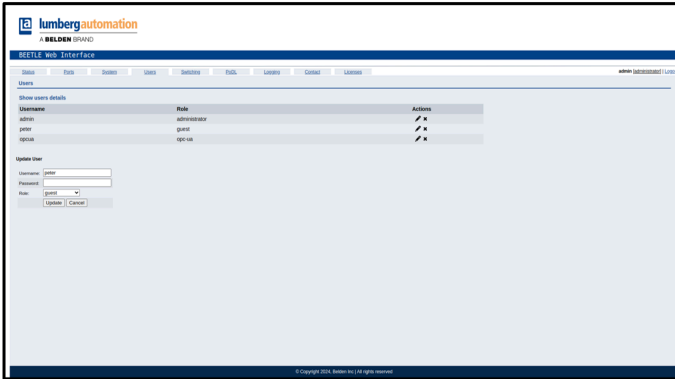


This screen provides overall information and a summary of all existing users which have the permission to login onto the device. All user names and their respective roles will be visible in this view.

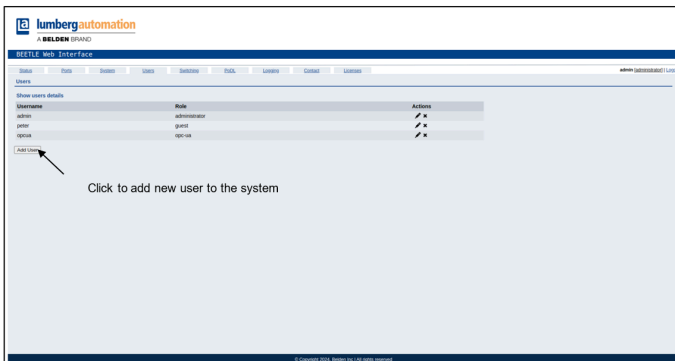
Edit button " " - Edit the settings of the selected user

Delete button " " - Delete the selected user

Once clicked on the edit icon " ", the form "Update user" will show up below the table "Users". Username, Password and Role can be updated there.



- In order to add a new user to the device's GUI, click on the button "Add User" below the table "Users":



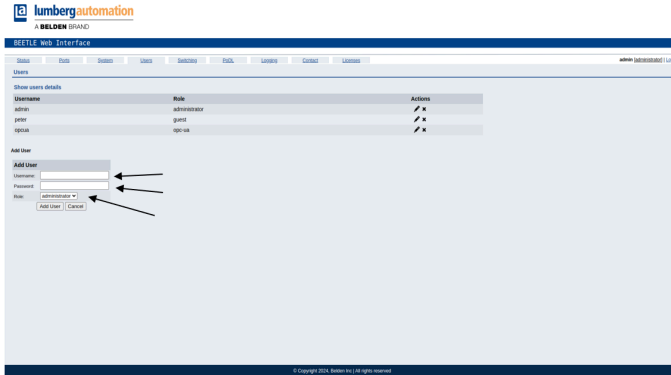
- By clicking on the button "Add User", the following form "Add User" will be displayed. In order to add a new user, the administrator is required to provide a username, to choose a login password and to assign the new user to one of the available user groups/roles.

The following user groups/roles are available:

Administrator: Allows users to have full access to all device functionalities and to administrate users in the system.

Guest: Allows users a read-only access to the device functionalities. These users can only observe device status information, system information, contact information and licensing information.

OPCUA: Allows users a read-only access to the device functionalities except full access to the OPC UA server configuration functionality.



Fill in the required fields in the form "Add User" and click on the button "Add User" in order to create a new user in the GUI.

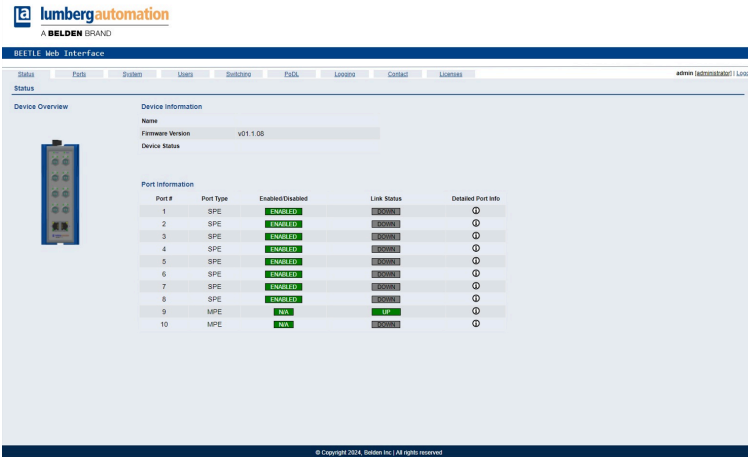
9.3. Data and Monitoring

Monitoring involves real-time observation of the Switch's status and obtaining of the device information through the Graphical User Interface.

For BEETLE devices, the following pages containing informative and status monitoring functionalities are available:

9.3.1. Status

This is a landing page in the device's GUI. This tab will be displayed as a first page after logging in to the GUI:



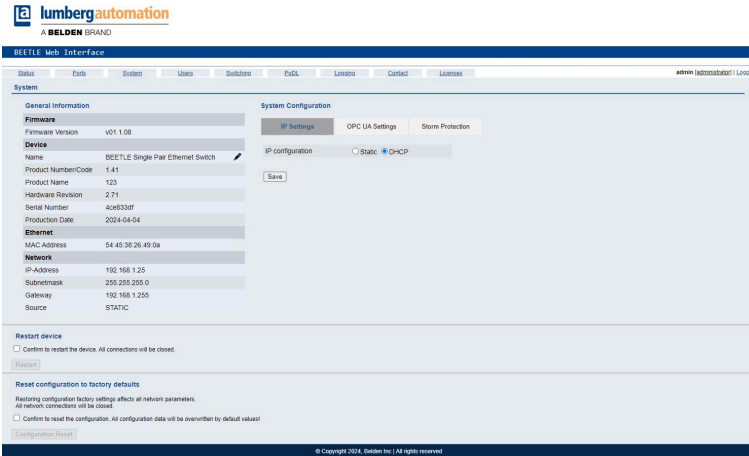
The tab "Status" contains three informative sections:

- **Device Overview:** This section contains a graphical representation of the device.
- **Device Information:** The following section provides information about current firmware version and current device status.
- **Port Information:** This section implements and demonstrates the real-time status of the device's ports.

In the BEETLE device, there are a total of ten ports, two Multi-Pair Ethernet ports represented as "MPE" type and eight Single-Pair Ethernet ports represented as "SPE" type accordingly. In addition, the page contains information about the Enable/Disable status, the Link status and a link to a detailed port information tab per each port.

9.3.2. System

This tab in the main menu contains general information about the device. The System page includes additional configuration information such as IP settings, OPC UA settings, Reboot the device, Restore default configuration, and firmware upgrade functionalities. These additional features are available for users with administrative privileges only and are described in section [Configuration Settings on page 63](#).



The "System" tab contains the following general information:

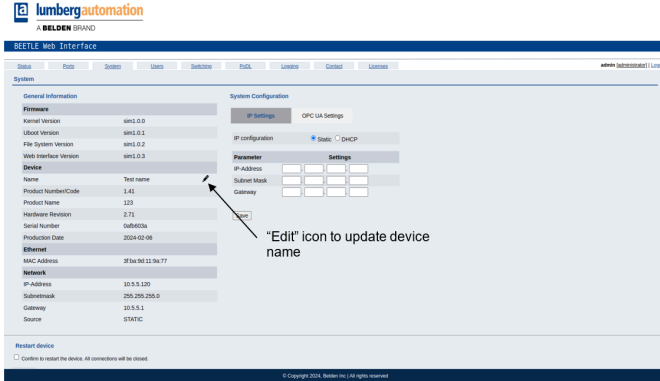
Firmware

This section contains the actual firmware version.

Device

This informative section contains the following information:

- **Name:** Represents the assigned device name. This field can be modified and changed by users with administrative privileges. In order to update the device name, click on the edit icon "✎" next to the current device name, provide a new device name and save all changes.



- **Product Number/Code:** A unique alphanumeric identifier assigned to the device, often used for inventory management and ordering purposes.
- **Product Name:** The designated name or label given to the device. It provides a recognizable and human-friendly identification of the product for users.
- **Hardware Revision:** A version or revision number assigned to the hardware of the device. It indicates changes or updates to the physical components or design, helping users identify the specific hardware configuration.
- **Serial Number:** A unique identifier assigned to each individual unit of the device type.
- **Production Date:** The date when the device was manufactured or produced.

Ethernet

This section contains the Media Access Control (MAC) address, which is a unique identifier assigned to a network interface card (NIC) of the device for network communication.

Network

In this part of the device general information section the current device network parameters are displayed. The following parameters are included in this section:

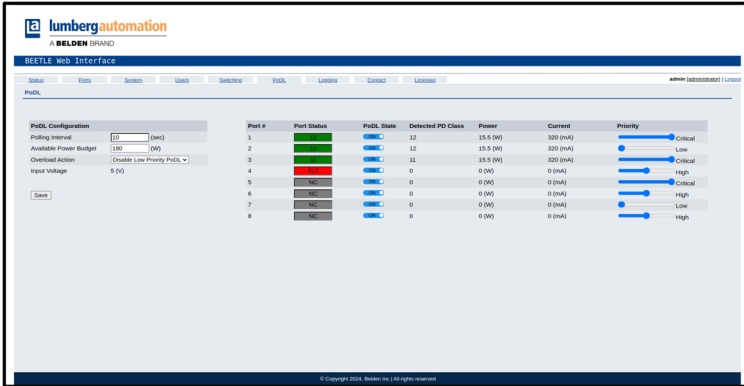
- **Device IP address:** This parameter represents the actual IP address of the device.
- **Device network subnet mask:** This parameter represents the actual subnet mask of the device. The subnet mask is used to identify the range of IP addresses that belong to the same network.
- **Device network gateway:** This parameter represents the actual Gateway address of the device. It serves as the exit and entry point for data traffic between the local network and external networks.
- **Source:** This parameter indicates how the device obtains its network parameters, specifically the IP address, subnet mask, and gateway. There are two common sources mentioned:

'Static' → The network parameters are manually configured and do not change unless modified by an administrator. This is a common approach for devices with fixed addresses.

'DHCP (Dynamic Host Configuration Protocol)' → The device dynamically receives its network parameters from a DHCP server on the network. DHCP automatically assigns IP addresses, subnet masks, and other configuration details, simplifying network management.




9.3.3. PoDL

The PoDL page consolidates global information and configuration settings related to the Power over Data Line technology. This section provides a centralized view for managing and monitoring PoDL parameters and helps ensuring efficient power delivery and connectivity.



This page provides users with administrative privileges to monitor and configure Power over Data Line functionality per each single-pair ethernet port available on the device.

- **Port Status:** This graphical indicator demonstrates real-time status of the PoDL functionality on the specific single-pair ethernet (SPE) port. This indicator may include one of the following options:

	Indicates an error/ failure of the PoDL functionality on the corresponding SPE port.
	Indicates that either PoDL functionality is disabled, or no power equipment is connected to the specified SPE port.
	Indicated normative PoDL connectivity between the device and the connected power equipment. The number indicates the detected Power Device class.

- **Detected PD Class:** Power devices connected to Single-Pair Ethernet (SPE) ports are classified into different classes. This classification helps the device, acting as the Power Sourcing Equipment (PSE), to determine the power needs of each connected Power Device and allocate power accordingly per SPE port. BEETLE supports PoDL class 10 ... class 12.
- **Power:** Indicates measurement of the power consumption on a connected Powered Device (PD) in a Power over Data Line (PoDL) system. This indicator provides information about the amount of electrical power that the connected device is currently drawing from the PSE. The measurement unit for power consumption is watts. Each value represents the power consumption on a specific SPE port.
- **Current:** Provides measurement of the current consumption on a connected Powered Device (PD) in a Power over Data Line (PoDL) system. This indicator provides information about the amount of electrical current that the connected device is currently drawing from the network. The measurement unit for current consumption is milliampere. Each value represents the current consumption on a specific SPE port.

9.3.4. Logging

This Tab stands as a resource for administrators and privileged users, providing monitoring and archiving of system activities. This section comprises two types of archived logging information:

Audit Log

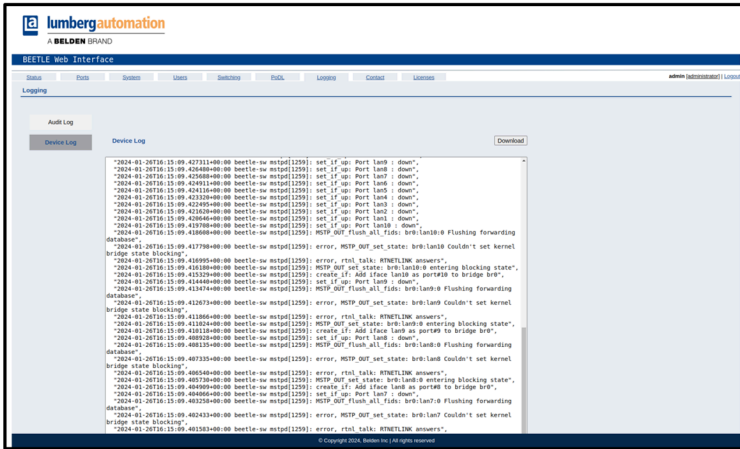
This section records every interaction within the GUI, providing a transparent and accountable trail of user actions. Each record in the audit log table represents a unique event generated by user action. The following information is presented in the audit log record:

- ID: Assigned sequence running identificational enumerator .
- Timestamp: Represents the date, time and time zone of the logged event.
- Endpoint: Specifies the endpoint which was involved in the specific event.
- Payload: Contains all payload data which was sent or received from the specified endpoint.
- Username: Logs the username of the user who triggered the event.

ID	Timestamp	Endpoint	Payload	Username
112	Wed, 07 Feb 2024 18:30:16 GMT	/jsoffconfig	[{"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "1", "name": "Power", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "2", "name": "Fan", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "3", "name": "LED", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "4", "name": "Speaker", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "5", "name": "Microphone", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "6", "name": "Camera", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "7", "name": "Webcam", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "8", "name": "Microphone Array", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "9", "name": "Microphone Array", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "10", "name": "Microphone Array", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "11", "name": "Microphone Array", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "12", "name": "Microphone Array", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "13", "name": "Microphone Array", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "14", "name": "Microphone Array", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "15", "name": "Microphone Array", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "16", "name": "Microphone Array", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "17", "name": "Microphone Array", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "18", "name": "Microphone Array", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "19", "name": "Microphone Array", "value": "On"}, {"@type":"@odata.type":"#Microsoft.PowerShell.Commands.SwitchablePowerState", "id": "20", "name": "Microphone Array", "value": "On"}]	admin
111	Wed, 07 Feb 2024 18:30:01 GMT	/jsoffitem		admin
110	Wed, 07 Feb 2024 17:05:07 GMT	/jsoffitem		admin
109	Wed, 07 Feb 2024 16:58:16 GMT	/jsoffitem		admin
108	Wed, 07 Feb 2024 03:36:15 GMT	/jsoffsystem		admin

Device Log

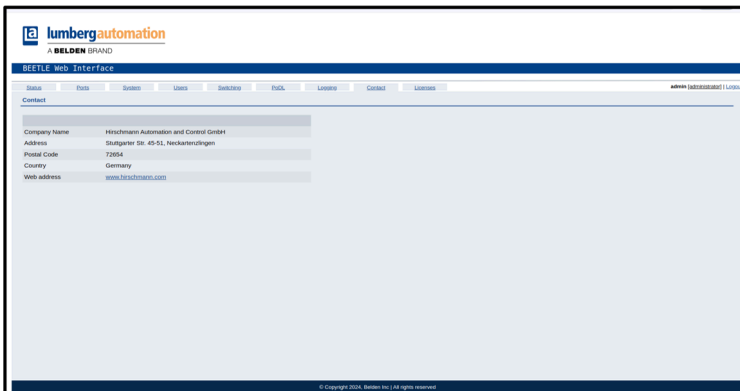
This log captures real-time events, warnings, and errors, offering a live diagnostic feed of the system's operational status.



Note: The Audit logging table can only display the latest 100 event records. Use the button "Download" to download the whole audit log from the device.

9.3.5. Contact

The "Contact" page contains manufacturer information such as: Company name, Company address and Postal code, Country, and Web site address.



9.3.6. Licenses

This section provides in-depth details about the open-source software components utilised in constructing the firmware and applications for the Lite Managed Switch BEETLE. The licenses information is organized in a table providing the following data:

- **SW component name:** Represents the name of the software component.
- **Open Source:** This parameter indicates whether the corresponding software component is an open source component.
- **Version:** Provides the corresponding software component official version number.
- **License:** Indicates the corresponding software component license type.
- **Repository:** Provides the public available link to the corresponding software component repository.

Name	Open Source	Version	License	Repository
Beetle	✓	1.1.1	BSD	https://github.com/lumbergautomation/Beetle
Click	✓	7.0	BSD	https://github.com/lumbergautomation/Click
Flask-Login	✓	0.4.1	MIT	https://github.com/lumbergautomation/Flask-Login
Flask-SQLAlchemy	✓	2.4.1	BSD	https://github.com/lumbergautomation/Flask-SQLAlchemy
FlaskPy	✓	1.0.0	BSD	https://github.com/lumbergautomation/FlaskPy
FlaskJinja2	✓	1.1.0	BSD	https://github.com/lumbergautomation/FlaskJinja2
FlaskWTF	✓	2.1.0	BSD	https://github.com/lumbergautomation/FlaskWTF
FlaskYaml	✓	1.1.1	BSD	https://github.com/lumbergautomation/FlaskYaml
FlaskJinja2	✓	0.10.9	MIT	https://github.com/lumbergautomation/FlaskJinja2
FlaskWTF	✓	1.0.7	LOPL	https://github.com/lumbergautomation/FlaskWTF
FlaskPy	✓	1.0.4	BSD	https://github.com/lumbergautomation/FlaskPy
FlaskJinja2	✓	0.7.0	BSD	https://github.com/lumbergautomation/FlaskJinja2
FlaskWTF	✓	1.0.0	LOPL	https://github.com/lumbergautomation/FlaskWTF
FlaskPy	✓	1.0.0	LOPL	https://github.com/lumbergautomation/FlaskPy
FlaskJinja2	✓	0.10.0	MIT	https://github.com/lumbergautomation/FlaskJinja2
FlaskWTF	✓	0.10.0	MIT	https://github.com/lumbergautomation/FlaskWTF
FlaskPy	✓	0.10.0	MIT	https://github.com/lumbergautomation/FlaskPy
FlaskJinja2	✓	0.10.0	MIT	https://github.com/lumbergautomation/FlaskJinja2
FlaskWTF	✓	0.10.0	MIT	https://github.com/lumbergautomation/FlaskWTF
FlaskPy	✓	0.10.0	MIT	https://github.com/lumbergautomation/FlaskPy
FlaskJinja2	✓	0.10.0	MIT	https://github.com/lumbergautomation/FlaskJinja2
FlaskWTF	✓	0.10.0	MIT	https://github.com/lumbergautomation/FlaskWTF

9.4. Configuration Settings

The Configuration Settings section provides users with administrative privileges to customize the behaviour of the device. This empowers users to optimize the switch's performance, enhance security measures, and tailor specific functionalities to meet the unique requirements of their network environment.

The Configuration Settings encompass the following potential device configurations:

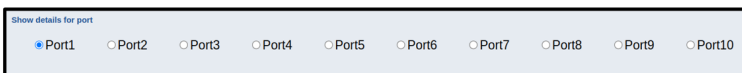
- Port settings: [Ports on page 64](#)
- RSTP settings: [RSTP on page 67](#)
- ACL settings: [ACL on page 71](#)
- LLDP settings: [LLDP on page 74](#)
- VLAN settings: [VLAN on page 74](#)
- QoS settings: [QoS on page 80](#)
- MAC Table settings: [MAC Table on page 83](#)
- PoDL settings: [PoDL on page 87](#)
- IP settings: [IP on page 89](#)
- OPC UA settings: [OPC UA on page 91](#)

9.4.1. Ports

Port configuration settings implemented in a "Ports" page contain configurable parameters that define the behavior and characteristics of individual ports on a device. These settings allow administrators to customize the functionality of each port to meet specific requirements.

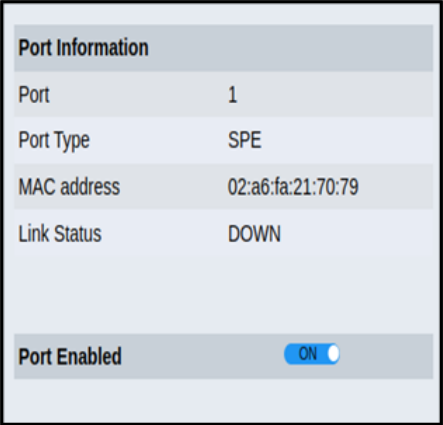
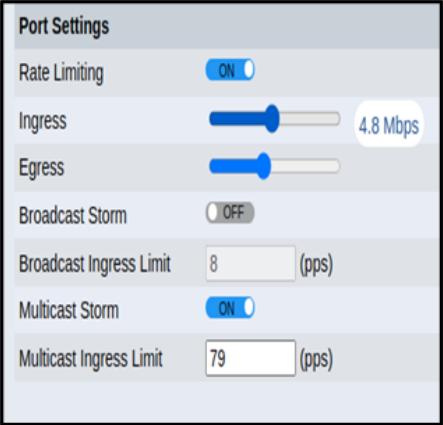

The Lite Managed Switch BEETLE has 8 single-pair ethernet ports and 2 multi-pair ethernet ports and implements different sets of port configurations based on the port type.

The "Ports" page contains a "Port selection panel" that allows users to select a specific port and to load its configuration parameters.



Additionally, each one of the ports implements the following set of common configuration parameters:

Table 19. Port parameters

Web interface	Parameter	Description	
	Port:	Represents the port enumerator which ranges from 1 to 10.	
	Port Type:	Indicates the type of the selected port. There are two options: SPE for a single-pair ethernet port or MPE for a multi-pair ethernet port.	
	MAC address:	Implements the MAC address of the selected port.	
	Link Status:	Refers to the current operational state of the connection between that port and its connected device.	
	Port State:	Is implemented as an ON/OFF switch button, enabling users to change the operational state of a port.	
	Rate Limiting Switch:	This configuration option enables or disables a rate limiting functionality on the specific port. Once the rate limiting functionality is enabled it allows administrators to control and manage the flow of data entering (ingress) and leaving (egress) a specific port.	
	Broadcast Storm:	Enables or Disables broadcast an Ingress Limitation functionality. This option allows configuring a specific limit of incoming broadcast packets per second.	
	Multicast Storm:	Enables or Disables multicast Ingress Limitation functionality. This option allows configuring a specific limit of incoming multicast packets per second.	
		Unicast Storm:	Enables or Disables unicast Ingress Limitation functionality. This option allows configuring a specific limit of incoming unicast packets per second.

9.4.1.1. SPE ports

Single-Pair Ethernet ports support the following two additional configuration options:

Port Signaling

Refers to the configuration parameter which determines how the SPE port communicates, the voltage levels involved in the signaling process, and whether the port automatically adjusts its settings or operates with predefined voltage levels as following:

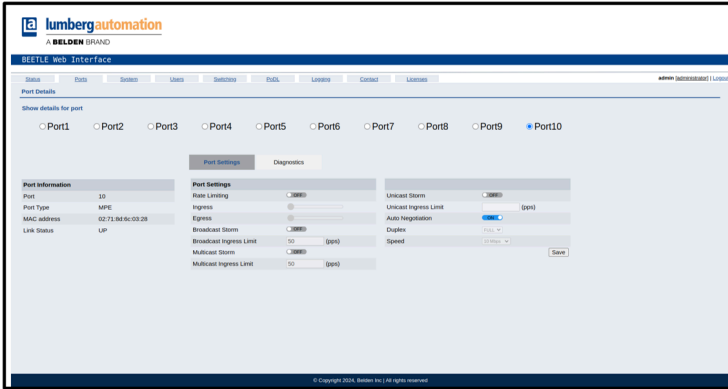
- Auto: This setting enables Auto-Negotiation. The port automatically negotiates and adjusts its signaling parameters based on the connected device and prevailing network conditions.
- 2.4 vpp: With this configuration, the port uses a signaling voltage level of 2.4 volts peak-to-peak (vpp). Range: up to 1000 m (3280 ft).
- 1 vpp: In this configuration, the port utilises a signaling voltage level of 1 volt peak-to-peak (vpp). Range: up to 200 m (656 ft).

9.4.1.2. MPE ports

Multi-Pair Ethernet ports support the following additional configuration option:

Auto-Negotiation

Feature in networking that allows devices to automatically configure their connection settings, such as speed, duplex mode, and flow control, to establish optimal communication. Once this configuration parameter is off it allows users to configure proprietary speed and duplex mode.



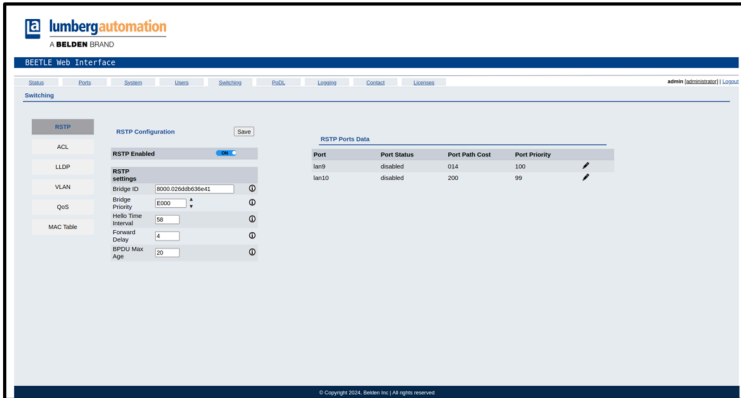
In order to save the port settings, the administrator should click on the button "Save" at the right bottom part of the RSTP configuration settings form.

9.4.2. RSTP

RSTP configuration settings specify parameters that control the behavior of RSTP on individual switch ports. These parameters influence the role of each port in the RSTP topology and determine how quickly the switch can adapt to changes in the network.

These configuration settings are implemented in a "Switching" page in the main menu. On the left side of the "Switching" page, users need to click on the button "RSTP" to access the RSTP configuration settings page.

Note: The RSTP page is a default page showing up by clicking on the "Switching" page in the main menu.




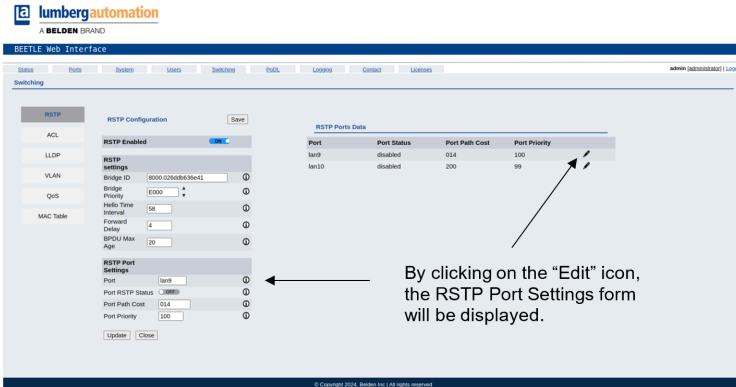
The RSTP configuration settings contain the following configuration parameters:

- **RSTP State:** This property enables or disables RSTP functionality for the device. If this configuration is disabled, no RSTP configuration parameters are displayed.
- **Bridge ID:** The Bridge ID is a combination of the switch's priority value and its MAC address. It plays a critical role in the RSTP topology, influencing the selection of the root bridge. This value is a read-only value.
- **Bridge Priority:** A numeric value that determines the priority of a switch in the election process for the Root Bridge. The lower the system priority value, the higher the priority.

The bridge priority values range between 0x0000 and 0xF000, incrementing in 0x1000 value steps.

- **Hello Time Interval:** This configuration parameter is expressed in seconds, and it defines the interval at which the switch sends BPDUs to announce its presence and gather information about the network topology. The default Hello Time in RSTP is typically 2 seconds but ranges between 0 to 60 seconds.
- **Forward Delay:** This configuration option defines the time it takes for a switch to safely transition from one state to another while maintaining a loop-free topology. The default Forward Delay value in RSTP is typically 15 seconds but can range between 4 and 30 seconds.
- **BPDU Max Age:** The Max Age timer is typically set by the Root Bridge and represents the maximum age (time) allowed for a BPDU to propagate through the network. The default value for the Max Age timer is typically set to 20 seconds but can range between 6 to 40 seconds.

On the right-hand side of the RSTP configuration screen you find the table "RSTP Ports Data". This table summarizes every available RSTP configuration per port. Each record in the table can be modified by clicking on the edit icon  on the right.



By clicking on the "Edit" icon, the RSTP Port Settings form will be displayed.

The form "RSTP Port Settings" includes the following RSTP port configuration parameters:

- **Port:** This read-only parameter identifies the port name.
- **Port RSTP Status:** This property is used in order to enable or disable the RSTP functionality on a specific port.
- **Port Path Cost:** Represents the expense associated with sending data through a specific network port. In the spanning tree algorithm, the port cost is a crucial metric used to determine the most favourable path for data transmission. A lower port cost indicates a more efficient and preferred route within the network topology, influencing the selection of optimal paths and contributing to the overall performance of the network.
- **Port Priority:** Designates the importance of a specific port within the bridge. Lower values indicate higher priority, with a range typically set between 0 and 255. This parameter plays a key role in the spanning tree algorithm, influencing the determination of roles for individual ports and contributing to the overall network stability and efficiency.

Note: RSTP configuration settings are applicable only to Multi-Pair Ethernet ports.

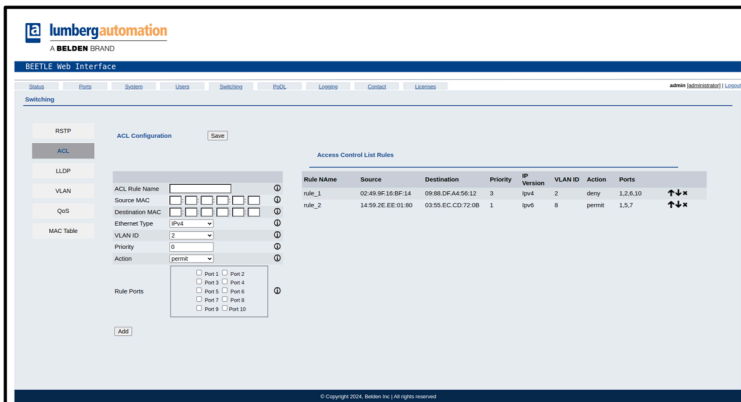
In order to save the RSTP settings, the administrator should click on the button "Save" at the top of the RSTP configuration settings page.

9.4.3. ACL

Access Control Lists (ACLs) serve as crucial components in network security by providing a method to selectively permit or deny traffic based on specified criteria. In essence, ACLs function as traffic filters, allowing network administrators to define rules that control which packets are allowed or blocked at the device interface.

In this context, administrative users define rules specifying which MAC addresses are permitted or denied access through network interfaces. These rules serve as filters, enabling precise control over the flow of data at the data link layer.

These configuration settings are implemented in a "Switching" page on the main menu. On the left-hand side of the "Switching" page, users need to click on the button "ACL" in order to access the ACL configuration page.



ACL configuration settings contain two sections. On the left-hand side there is the form "ACL Rule" which allows the administrative user to define and assign a new ACL rule. On the right-hand side of the ACL configuration page you find the table "Access Control Lists Rules" that includes all assigned rules in the system.

In order to create and add a new ACL rule, the following configurable information has to be provided as part of the "ACL Rule" form data:

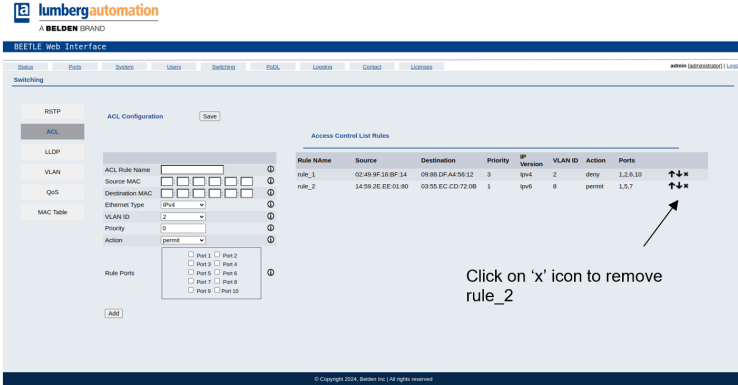
- **ACL Rule Name:** This parameter represents a unique ACL rule name. The ACL name may contain any alphanumeric characters.
- **Source MAC:** This field Source MAC address refers to the MAC address of the network interface card (NIC) in the device that is transmitting a network frame or packet into the network. The address is represented in hexadecimal (hex) format.
- **Destination MAC:** This field Destination MAC address refers to the MAC address of the network interface card (NIC) of the device to which the network frame or packet is being sent. The address is represented in hexadecimal (hex) format.
- **Ethernet Type:** Indicates the type of payload carried by the frame. In the case of IPv4, the Ethernet Type value is commonly set to 0x0800, signifying that the payload encapsulates an IPv4 packet. Similarly, for IPv6, the Ethernet Type is typically set to 0x86DD, indicating the presence of an IPv6 packet within the frame.
- **Priority:** This property is employed to manage the flow of traffic based on priority levels assigned to specific rules. The priority values range from 0 to 7, with 0 being the highest priority. In this context, a lower numerical value corresponds to a higher priority level. When configuring a ACL with priority, administrator users can assign different priority levels to individual rules within the list. The ACL processes traffic based on these priorities, allowing higher-priority rules to take precedence over lower-priority ones when conflicts arise.
- **Action:** This parameter selects and dictates the response to be taken when a packet aligns with the specified criteria outlined in the rule. In this context, the available actions are typically 'permit' and 'deny.'

Permit → When the action is set to 'permit ', the ACL allows the packet to traverse the network. It grants permission for the packet to continue its journey based on the conditions specified in the rule.

Deny → Conversely, when the action is set to 'deny,' the ACL blocks or rejects the packet. This action restricts the packet from proceeding further through the network, in accordance with the conditions outlined in the rule.

- **Rule Ports:** This property is used to associate MAC addresses with specific switch ports to control which devices are allowed to communicate through those ports.

The table "Access Control Lists Rules" includes all assigned rules in the system. Each row in the table represents an ACL rule. The rule can be removed by administrative users by clicking on the icon "✕" as it is shown in the following example:



Moreover, administrators have the flexibility to modify the order in which rules are verified in the Access Control List (ACL). The verification process for network packets follows the sequence established in the ACL rule table, starting from the top and moving downwards. When necessary, administrators can rearrange the position of a rule by utilising the "up" and "down" arrow icons located on the right-hand side of each rule. This feature allows administrators to adjust the priority and sequence of rules, ensuring precise control over the network packet verification process based on their specific requirements.

Note: There are a maximum of 16 MAC-based ACL rules supported in the system.

In order to save the ACL settings, the administrator should click on the button "Save" at the top of the ACL configuration settings page.

9.4.4. LLDP

LLDP (Link Layer Discovery Protocol) in a device is a protocol that facilitates the automatic discovery of neighbouring network devices, providing information such as device type, port identification, and capabilities. This protocol enhances network visibility, simplifies device management, and promotes interoperability by allowing devices to dynamically share key details about their presence and configuration.

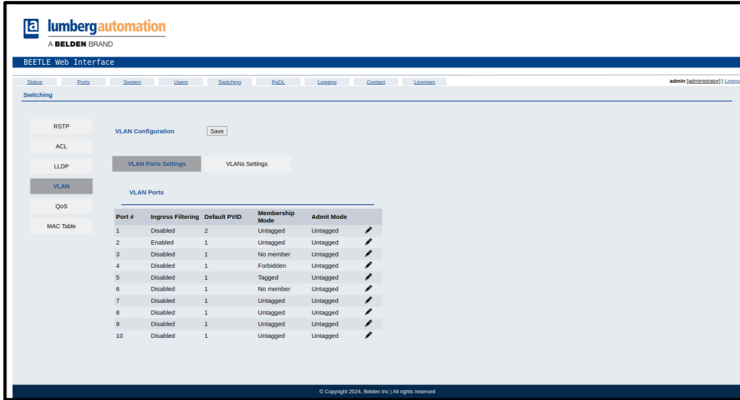
LLDP configuration settings are implemented in the "Switching" page on the main menu. On the left-hand side of the "Switching" page, users need to click on the button "LLDP" in order to access the LLDP configuration settings page.

9.4.5. VLAN

Virtual Local Area Network (VLAN) functionality plays a pivotal role in network segmentation and management. VLANs allow administrator users to logically divide the network into isolated broadcast domains, each functioning as a separate and independent network entity.

This segmentation is achieved by assigning specific ports or devices to designated VLANs, irrespective of their physical location. VLANs enhance network security, optimize bandwidth utilization, and streamline traffic management. This functionality facilitates the isolation of devices, enhances network organization, and provides administrators with a powerful tool for tailoring the network infrastructure to meet specific operational requirements.

These configuration settings are implemented in the "Switching" page on the main menu. On the left-hand side of the "Switching" page, users need to click on the button "VLAN" in order to access the VLAN configuration settings page.



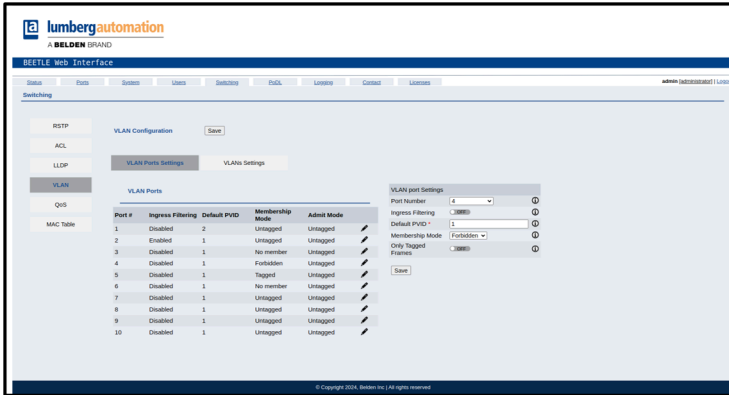
The "VLAN" page consists of two sub-pages, "VLAN Ports Settings" and "VLANs Settings".

9.4.5.1. VLAN Ports Settings

By default, upon opening the VLAN configuration settings page, the sub-page "VLAN Ports Settings" is displayed. This section provides details regarding VLAN-related configurations for each of the device ports. The details are organized and encapsulated in the table "VLAN ports" as shown below:

VLAN Ports					
Port #	Ingress Filtering	Default PVID	Membership Mode	Admit Mode	
1	Disabled	2	Untagged	Untagged	
2	Enabled	1	Untagged	Untagged	
3	Disabled	1	No member	Untagged	
4	Disabled	1	Forbidden	Untagged	
5	Disabled	1	Tagged	Untagged	
6	Disabled	1	No member	Untagged	
7	Disabled	1	Untagged	Untagged	
8	Disabled	1	Untagged	Untagged	
9	Disabled	1	Untagged	Untagged	
10	Disabled	1	Untagged	Untagged	

Each row in the table "VLAN ports" represents the VLAN configuration for a specific device port. Administrative users can modify and update a VLAN port setting by clicking on the icon . The following "VLAN Ports Settings" form will be displayed:



The "VLAN Ports Settings" form contains the following configurable parameters:

- **Port Number:** Designates the number of the port for which the VLAN settings will be modified.
- **Ingress Filtering:** This parameter enables or disables the ingress filtering functionality that controls how incoming traffic is handled within a specific port.
- **Default PVID:** Refers to the default Port VLAN ID assigned to untagged frames on a specific switch port. When a switch port receives an untagged frame (a frame that does not have VLAN tagging information), the Default PVID determines the VLAN to which the frame belongs.
- **Membership Mode:** This configuration determines how the port behaves in relation to VLAN membership. It specifies how the switch interprets and handles incoming frames.

The following 4 options are supported for BEETLE devices:

'No Member' → In this mode, the switch port is not a member of any VLAN. It does not participate in VLAN-related activities, and incoming frames are not associated with any VLAN.

'Forbidden' → Frames with this VLAN tag are explicitly forbidden on the switch port. If a frame with the specified VLAN tag arrives, it is typically dropped or ignored.

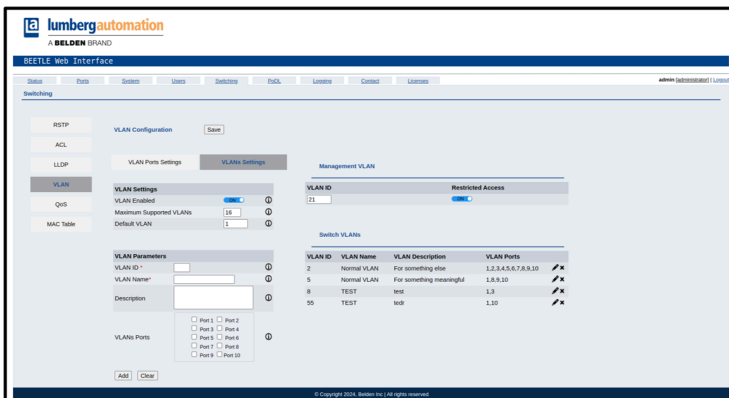
'Tagged' → In mode 'Tagged', the switch port accepts frames with VLAN tags. This allows the switch to distinguish between different VLANs based on the tagged information in the frame.

'Untagged' → Frames arriving on the switch port are assumed to belong to a specific VLAN, and the VLAN tag is removed (stripped) from the frame. This mode is often used for devices that are not VLAN-aware.

- Only Tagged Frames: This configuration option on a specified port is a setting that determines whether the port will accept only tagged frames or if it will accept both tagged and untagged frames.

9.4.5.2. VLANs Settings

The sub-page "VLANs Settings" implements VLAN configuration settings for the device, defining various VLANs, including VLAN dedicated to management purposes. To access this sub-page, click the button "VLANs Settings", as depicted below:



The sub-page "VLANs Settings" defines the following four configuration sections:

- **VLAN Settings:** Located on the left-upper side of the "VLANs Settings" sub-page, representing general VLAN settings. This section contains the following informative and configurable parameters:

'VLAN State' → This property enables or disables VLAN functionality for the device. Once this configuration is disabled no VLAN settings configuration parameters are displayed.

'Maximum Supported VLANs' → This informative parameter represents the maximum number of VLANs that can be configured and assigned for a device.

'Default VLAN' → This parameter establishes the default VLAN ID within the system. This value remains unalterable and is implemented as a firmware parameter.

- **VLAN Parameters:** Located on the left-lower side of the sub-page "VLANs Settings", representing the form "VLAN settings" which is used for adding or updating VLAN configuration. This section contains the following configurable parameters:

'VLAN ID' → This parameter is used in networking to identify and separate broadcast domains within a larger network. The value of VLAN ID should be unique in the system per defined Virtual Local Area Network.

'VLAN Name' → This property represents a human-readable label assigned to a VLAN to help provide a more descriptive identification than a numerical ID.

'VLAN Description' → Refers to a human-readable label or text assigned to a VLAN. This description is meant to be more easily understandable to network administrators or users, offering insights into the purpose or function of the VLAN beyond its numerical identifier.

'VLANs Ports' → This field refers to the ports on a device that are assigned to a specific Virtual Local Area Network. Each VLAN is a logical segmentation of a network, and VLAN switch ports determine which devices and traffic belong to a particular VLAN.

Note: The form "VLAN settings" is also reused in order to edit/update already existing VLAN parameters.

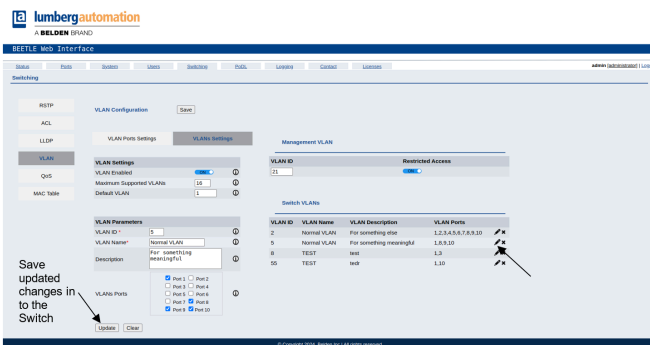
- **Management VLAN:** Located on the right-upper side of the sub-page "VLANs Settings", representing the "Management VLAN" settings configuration. This section contains the following configurable parameters:

'VLAN ID' → This parameter is used in networking to identify and separate broadcast domains within a larger network. The value of VLAN ID should be unique in the system per defined Virtual Local Area Network.

'Restricted Access' → This parameter functions as an off/on switch, determining whether restricted access is enabled or disabled for the specified VLAN.

Note: The VLAN ID assigned to Management VLAN should be unique for every configured VLAN in the system.

- **Switch VLANs:** Located on the right-lower side of the sub-page "VLANs Settings", summarizing all VLANs in the system in the table "Switch VLANs". Each row in the table represents a single VLAN. In order to update the specific VLAN parameters, click on the edit icon "✎" on the right-hand side of the corresponding VLAN row. Selected VLAN parameters are populated into the setting form "VLAN Parameters" and administrators can modify each one of the parameters in the form. To save updated information into the table, click on the button "Update".



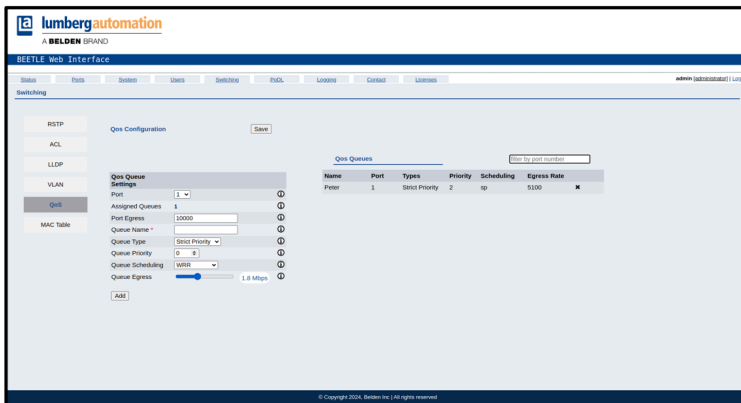
Note: The maximum supported VLANs for Lite Managed Switch BEETLE is set to 16 VLANs.

In order to save VLAN settings, the administrator should click on the button "Save" at the top of the VLAN configuration settings page.

9.4.6. QoS

Quality of Service (QoS) implementation involves the utilization of queues, which are instrumental for organizing and prioritizing network traffic. Queues serve as designated lanes for different types of data, allowing administrators to assign priorities based on the nature of the traffic. This helps ensure that critical applications or services receive preferential treatment, optimizing network performance and minimizing latency, enhancing overall service quality.

The QoS configuration settings are implemented in the "Switching" page on the main menu. On the left-hand side of the "Switching" page, users need to click on the button "Qos" in order to access the Qos configuration page.



On the left-hand side of the "QoS" page there is the form "QoS Queue Settings" which is used to configure specific QoS queues per selected device network port. This form contains the following configuration parameters:

- **Port:** This parameter allows the administrator to select an appropriate port to which a new Qos queue will be assigned. There are 10 network ports implemented in BEETLE devices.
- **Assigned Queues:** This property shows how many queues were assigned to the specific network port. In the current implementation there are four queues allowed to be assigned per single network port.
- **Port Egress:** This property specifies the overall bandwidth or rate limit for outgoing traffic on a specific port. It represents the maximum amount of traffic that can be transmitted from the port. The value of this property is provided by the device firmware and can not be modified by administrators.
- **Queue Name:** This parameter specifies a unique name to the new queue. The valid value is up to 15 alphanumeric characters.
- **Queue Type:** This parameter provides different methods of managing and prioritizing network traffic within a system. Each type of queue is designed to handle data packets with specific characteristics.

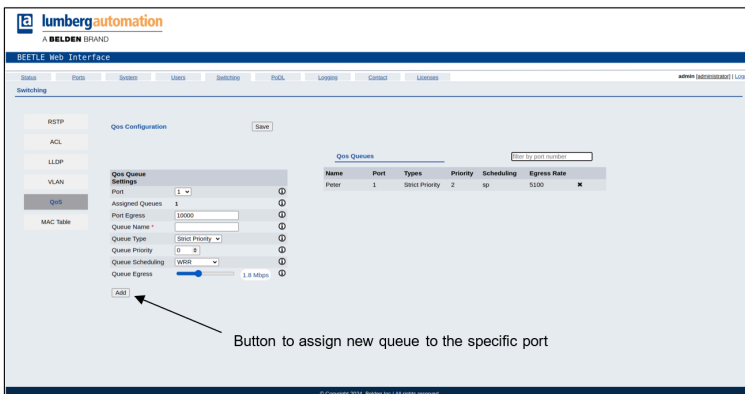
BEETLE devices support a strict Priority type queue.

- **Queue Priority:** This parameter refers to the priority assigned to a specific queue in the egress (outgoing) direction. Different queues are often used to prioritize or categorize traffic based on their characteristics, and assigning priority helps determine the order in which packets are processed and transmitted. This parameter's numeric value ranges from 0-15 where the lowest value represents the highest priority.
- **Queue Scheduling:** This property refers to the scheduling algorithm employed for managing the transmission of packets from various queues within a QoS configuration on the devices. The scheduling algorithm determines the order and priority in which packets are sent, and is helping ensure the efficient utilization of network resources and the adherence to defined QoS policies.

BEETLE devices support a strict Priority scheduling.

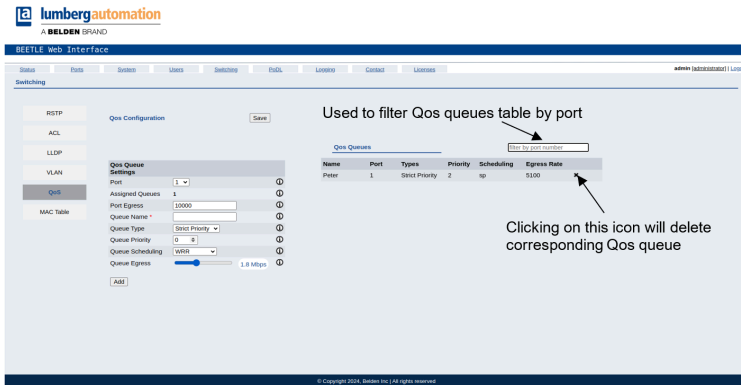
- **Queue Egress:** This field configures the distribution of available egress bandwidth among different queues. Each queue can be assigned a distinct rate limit, defining the specific portion of the total egress bandwidth it is allowed to utilize. This configuration helps ensure that different traffic classes receive proportional and controlled access to the overall egress bandwidth, contributing to effective network traffic management.

In order to add a configured QoS queue to the specified network port, administrators should click the button "Add" below the QoS queue:



On the right-hand side of the "QoS" page there is the table "QoS Queues" which is used to show and summarize every queue assigned in the system. There is a filtering option to help users to filter relevant network port queues by providing the port number.

Each row in the table "QoS Queues" represents a separate queue and presents each of its configuration parameters. On the right-hand side of each row there is an icon button "✕" which is used to delete the corresponding queue.



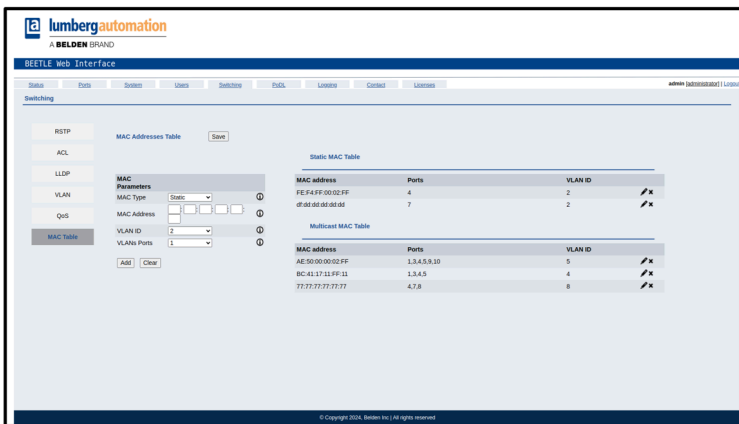
In order to save QoS settings, the administrator should click on the button "Save" at the top of the QoS configuration settings page.

9.4.7. MAC Table

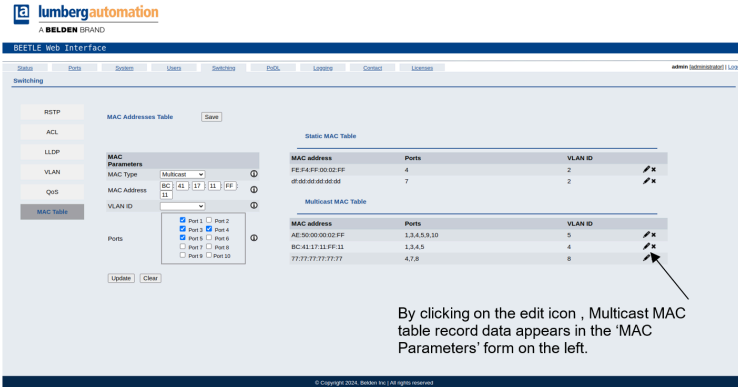
A MAC Table, also known as a MAC Address Table or MAC Forwarding Table, is a network device's internal record that associates Media Access Control (MAC) addresses with corresponding network interfaces. In the current implementation, there are two types of MAC address table records which are organized in two different tables and define as follows:

- **Static MAC Addresses:** These are manually configured MAC addresses associated with specific devices on the network. Static MAC addresses are predetermined and remain fixed, providing a means of controlling access to the network based on known device addresses.
- **Multicast MAC Addresses:** Multicast MAC addresses are utilized for communication with a group of devices rather than a single device. Packets sent to a multicast MAC address are delivered to multiple devices within the specified multicast group. In the MAC Table, Multicast MAC addresses may be listed to facilitate and manage communication with multicast groups on the network.

Note: BEETLE devices support 16 static MAC addresses and 8 Multicast MAC addresses.



On the right-hand side of the MAC Addresses Table page there is an implementation of the tables "Static MAC Table" and "Multicast MAC Table". Each table record contains a single MAC address table entity that describes the configured MAC address value, network ports associated with corresponding MAC address and VLAN ID of the VLAN assigned to the MAC address. Additionally, each record contains the "✎" icon allowing to edit a specific record in the table and the "✖" icon for deleting the corresponding record in the table.



On the left-hand side of the MAC address Addresses Table page there is the form "MAC Parameters" that is used in order to add a new MAC address or update a specific one from one of the MAC tables. This form contains the following parameters:

- **MAC Type:** This parameter designates the classification of the MAC address record, specifying whether it will be incorporated as a "Static" or "Multicast" MAC address record. Depending on this parameter, the MAC address configuration is then added or updated in the respective table.

Note: Changing "MAC Type" parameters generates changes in the displayed form "MAC Parameters" as follows:

Figure 2. Static "MAC Type"

The screenshot shows the "MAC Parameters" form with the following fields and values:

- MAC Type:** Static (dropdown menu)
- MAC Address:** [] : [] : [] : [] : [] : [] (input fields)
- VLAN ID:** 2 (dropdown menu)
- Ports:** 1 (dropdown menu)

Buttons: Add, Clear

Figure 3. Multicast "MAC Type"

The screenshot shows the "MAC Parameters" form with the following fields and values:

- MAC Type:** Multicast (dropdown menu)
- MAC Address:** [] : [] : [] : [] : [] : [] (input fields)
- VLAN ID:** 2 (dropdown menu)
- Ports:** A list of checkboxes for Port 1 through Port 10.

Buttons: Add, Clear

- **MAC Address:** Signifies a unique hardware identifier number composed of six double hexadecimal digit pairs.
- **VLAN ID:** This parameter designates the Virtual LAN (VLAN) to which a specific MAC address belongs. This parameter helps organize and segregate traffic into different VLANs. Each MAC address entry in the table is associated with a VLAN ID, allowing the switch or network device to correctly forward traffic based on VLAN membership.

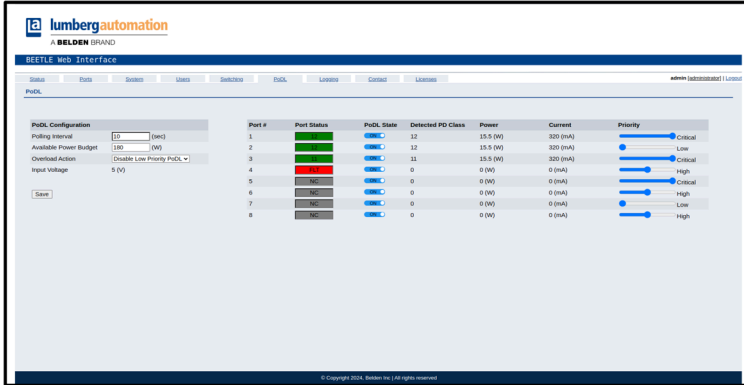
- Ports: Specific network ports or interfaces associated with individual MAC addresses. This functionality is integral to network switches and devices as it establishes the correspondence between MAC addresses and their respective physical or virtual ports. For “Static” MAC addresses there is only a single port that might be assigned and for “Multicast” MAC addresses multiple ports can be assigned.

In order to save MAC Address Table settings, the administrator should click on the button "Save" at the top of the MAC Address Table configuration settings page.

9.4.8. PoDL

In chapter [PoDL on page 58](#), the PoDL functionality was described from a monitoring perspective. In this section, the configuration part of PoDL implementation is described.

In order to configure the PoDL functionality of the device, click on the "PoDL" item in the main menu. The following page will be displayed:



On the left-hand side of the "PoDL" page, there is the form "PoDL Configuration" which contains the following configuration options:

- **Available Power Budget:** This property provided by the device firmware and represents the maximum amount of electrical power that can be allocated or supplied for PoDL functionality over data lines. The value can not be overwritten and is represented in watts.
- **Overload Action:** This parameter refers to actions or responses that can be taken when a Power over Data Lines (PoDL) system experiences an overload. In PoDL systems, overload situations may occur when the total power demand from connected devices exceeds the available power budget or when the system detects an abnormal condition. In current implementation there are two available option for overloading action:

'Notification' → In case this option is selected, the system will provide alerts or notifications to inform administrators about an overload condition in the PoDL functionality. This allows for proactive awareness of the situation without taking action automatically.

'Disable Low Priority PoDL' → When this option is configured, the system takes a preventative measure by automatically disabling power delivery to low-priority PoDL devices during overload conditions. This action helps mitigate the overload and protect critical or higher-priority PoDL devices.

- **Input Voltage:** This property refers to the voltage level supplied to the device through the data lines. It represents the electrical potential provided to support PoDL, where power is delivered alongside data transmission over the same cables. This Value is updated automatically and can not be modified by the administrator.

Additionally, there are some settings configurable per port that can be modified by the administrator. The following parameters can be configured as an administrator:

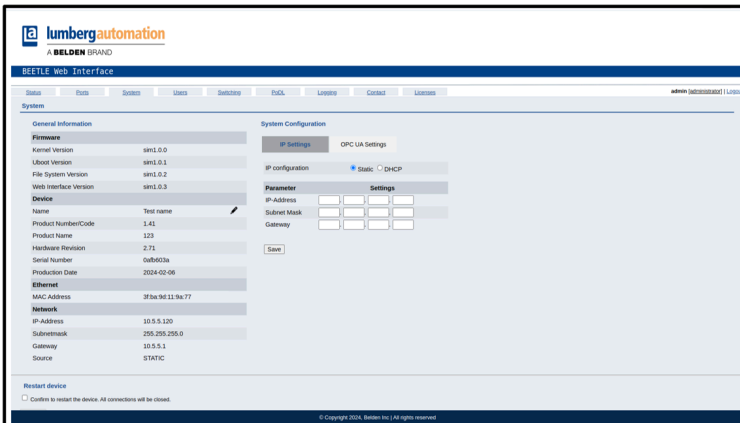
- **PoDL State:** This configuration option enables or alternatively disables the PoDL functionality on the specific network port.
- **Priority:** This parameter specifies the level of importance or priority assigned to that particular port in terms of power delivery. This parameter allows administrators to prioritize the allocation of power to different network ports based on their specific needs.

9.4.9. IP

There are two different methods for assigning IP addresses to the devices on a network:

- **Static IP Configuration:** With static IP configuration, an administrator manually assigns a specific IP address to a device. The assigned IP address remains constant, providing stability for devices that need a fixed, unchanging address.
- **DHCP (Dynamic Host Configuration Protocol):** DHCP automatically assigns IP addresses to devices when they join the network. IP addresses are leased for a specific period and can change when the lease expires or upon network reconfiguration.

In order to change or configure the device's IP address, click on the option "System" in the main menu. The following page will be displayed:



Under the topic "System Configuration", click the button "IP Settings". The following IP setting form will be displayed:

System Configuration

IP Settings OPC UA Settings

IP configuration Static DHCP

Parameter	Settings
IP-Address	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>
Subnet Mask	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>
Gateway	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>

This form contains two configuration options, "Static" and "DHCP". Once the option "Static" is selected, there are three parameters that need to be provided:

- **IP Address:** Users need to manually assign an IP address following the standard IP address format. This is the specific address that will be assigned to the device.
- **Subnet Mask:** Determines the network portion of the IP address in order to define the network's boundaries and identify the host part of the IP address.
- **Gateway:** Represents the IP address of the router or gateway device that connects the local network to external networks. It serves as the exit point for traffic destined for networks outside the local subnet.

By selecting the option "DHCP" in the IP configuration, there are no additional configuration parameters needed to be provided. IP address assignment and configuration will be performed automatically.

Note: In order to save the configuration, click the button "Save" under the form.

9.4.10. OPC UA

Open Platform Communications Unified Architecture (OPC UA) is a standardized cross-platform communication protocol designed for industrial automation and the Industrial Internet of Things (IIoT). It serves as a foundation for secure and reliable data exchange between various devices and systems within industrial environments. The BEETLE comes with an OPC UA server implementation as part of its feature set and the Graphical User Interface provides OPC UA configuration capabilities.

In order to access the OPC UA configuration, click on the option "System" in the main menu. Under the topic "System Configuration", click the button "OPC UA Settings". The following OPC UA configuration form will be displayed:

The screenshot shows the BEETLE web interface with the following configuration details:

General Information		System Configuration	
Hardware		IP Settings	OPC UA Settings
Kernel Version	sm13.0.0		
Libc61 Version	sm13.0.1	OPC UA Server Enabled <input checked="" type="checkbox"/>	
File System Version	sm13.0.2	Protocol	OPC UA
Web Interface Version	sm13.0.3	Conformance Profile	Mini-Embedded Device Server Profile
Device		IEC Standard	IEC61511
Name	Test name	Network Model	OPC UA/2003/22 UA/1st/22 Basic Network Model
Product Number/Code	3.43	Port	6541
Product Name	123	Anonymous login	<input checked="" type="checkbox"/>
Hardware Revision	2.71	Maximum Sessions	1
Serial Number	32384643		
Production Date	2024-02-10		
Ethernet			
Mac Address	8F:9A:30:11:9A:77		
Network			
IP Address	10.5.5.100		
Subnetmask	255.255.255.0		
Gateway	10.5.5.1		
Source	STATIC		

Restart device Confirm to restart the device. All connections will be closed.

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The OPC UA configuration form contains the following configuration options for the OPC UA server:

System Configuration

IP Settings **OPC UA Settings**

OPCUA Server Enabled ON

Protocol	OPC-UA
Conformance Profile	Micro Embedded Device Server Profile
IEC Standard	IEC62541
Network Model	OPC 10000-22: UA Part 22: Base Network Model
Port	<input type="text" value="4841"/>
Anonymous login	<input type="checkbox"/> OFF
Maximum Sessions	<input type="text" value="2"/>

- **Port:** This parameter specifies the network port number on which the OPC UA server will listen for incoming connections. In this case, it is set to '4841'.
- **Anonymous Login:** This option determines whether the OPC UA server allows connections without explicit user authentication. When set to 'ON', it means anonymous login is permitted and clients can connect without providing user credentials. When set to 'OFF', authentication is required for any connection.
- **Maximum Sessions:** This parameter defines the maximum number of concurrent sessions that the OPC UA server can handle. A session represents a logical connection between a client and the server. This setting helps manage the server's resources and helps to ensure that it does not become overloaded with too many simultaneous connections.

Note: In order to apply the configuration settings, click the button "Save" below the form.

9.5. Firmware Update

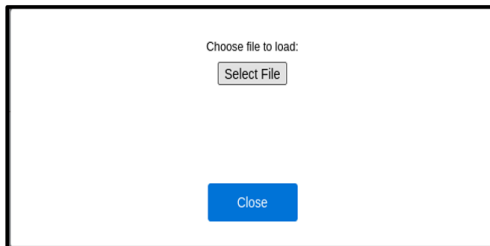
The "Firmware Update" functionality within the Graphical User Interface of a device empowers users to enhance and optimize their device's performance, security, and feature set by applying the latest firmware releases provided by the device manufacturer. Firmware, the embedded software that controls the device's fundamental operations, is periodically updated to introduce bug fixes, security patches, performance improvements, and additional features.

In order to perform a firmware update on the BEETLE via the GUI, perform the following work steps:

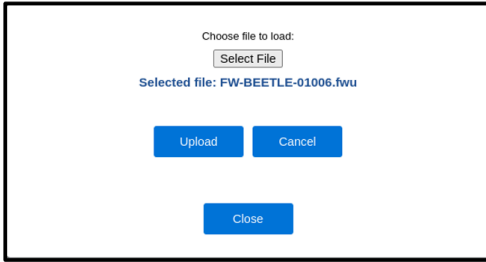
- 1. Select the option "System" from the main menu and scroll down to the very bottom part of the displayed page.



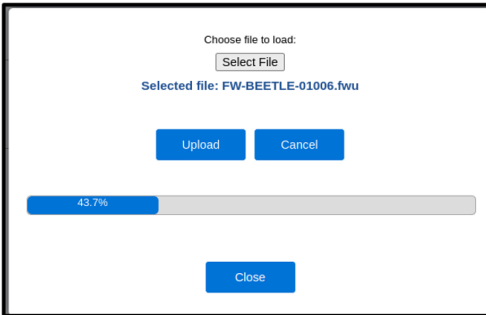
- 2. Click on the button "Upload fwu file" in order to upload the firmware file with "fwu" extension. The following Dialog box will appear:



- 3. Click on "Select File". A dialog box will be opened to select the "fwu" file from the PC or any other device from where the user is accessing the GUI. Once the file has been selected, the following dialog box will show up:



- 4. Click on the button "Upload" in order to upload the desired firmware file into the system. The file will be uploaded and a process bar will be displayed:



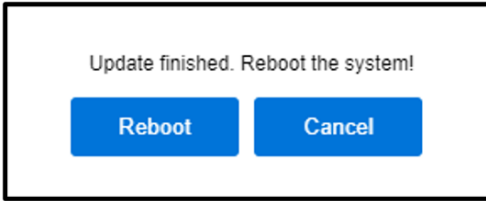
- 5. Once the uploading process is completed, click on the button "Close". The dialog box will be closed. The following change will show up now on the "System" page:



- 6. Click on the button "FW-Update". The firmware update process will start. The update status will be displayed next to the button "FW-Update":



- 7. Once the firmware update process is completed, a device reboot will be required and is requested as following:



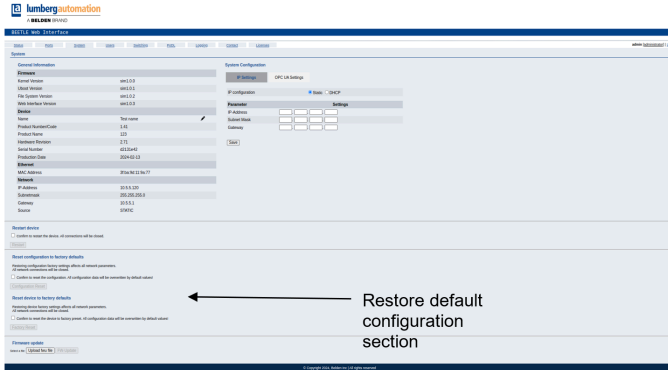
- 8. Click the button "Reboot" in order to reboot the device and complete the firmware update process.
- 9. Validate that the firmware version is matching the firmware version of the provided firmware image file.

9.6. Restore Default Configuration

The "Restore Default Configuration" functionality in the Graphical User Interface of a device allows administrators to revert the device's settings to the original factory-default configuration. This feature is useful in scenarios where users need to reset the device to its initial state, erasing any customized configurations or changes made since its purchase.

In order to revert the device configuration settings to the factory preset values, perform the following work steps:

- 1. Select the option "System" in the main menu and scroll down to the bottom part of the displayed page:

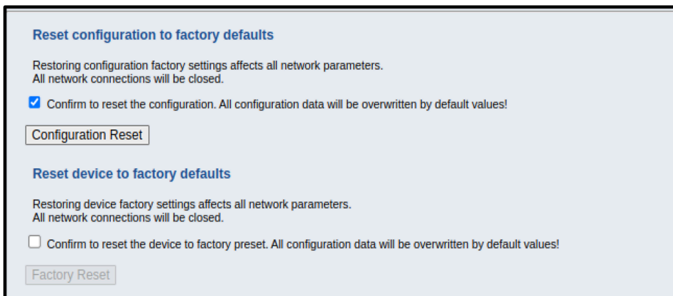


There are two restore options available:

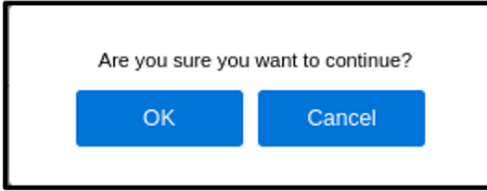
'Reset configuration to factory defaults' → This option resets the device configuration settings to the factory defaults.

'Reset device to factory defaults' → This option resets and overwrites the device with the factory defaults software image and configuration.

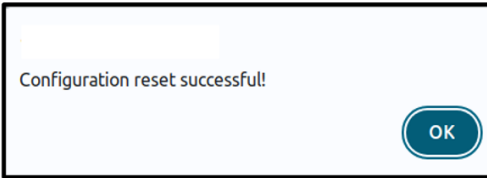
- 2. In order to reset the configuration settings to the factory defaults, check the upper confirmation checkbox under "Reset configuration to factory defaults":



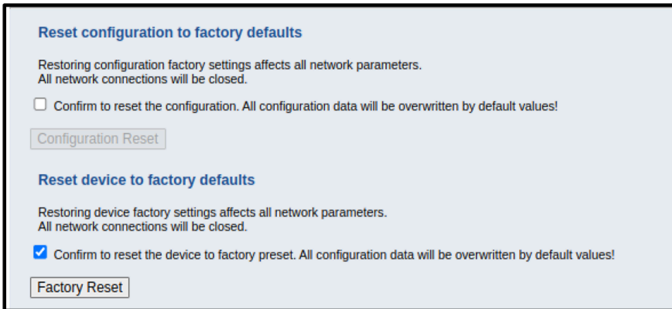
- 3. Click the button "Configuration Reset" to start the restore configuration process. The confirmation dialog will be displayed:



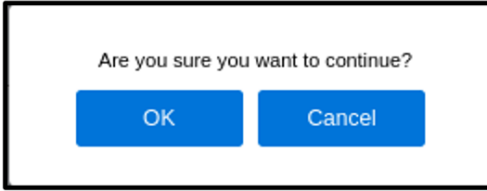
- 4. By clicking "Ok", the restore process will start and upon its completion the following message will be displayed:



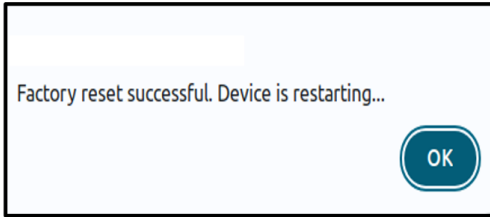
- 5. In order to reset the device to the factory defaults, check the lower confirmation checkbox under "Reset device to factory defaults":



- 6. Click the button "Factory Reset" to start the device resetting process. The confirmation dialog will be displayed:



- 7. By clicking "Ok", the restore process will start and upon its completion the following message will be displayed:



A. Further support

Technical questions

For technical questions, please contact any Hirschmann dealer in your area or Hirschmann directly.

You find the addresses of our partners on the Internet at:

<https://belden.com>

A list of local telephone numbers and email addresses for technical support directly from Lumberg Automation™ is available at:

<https://lumberg-automation-support.belden.com>

This site also includes a free of charge knowledge base and a software download section.

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