WESTERMO

USER GUIDE

Lynx 5500 Series

Industrial Gigabit switch

WeOS

Table of Contents

1. General Information

1.1. Legal Information

The contents of this document are provided "as is". Except as required by applicable law, no warranties of any kind are made in relation to the accuracy and reliability or contents of this document, either expressed or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Westermo reserves the right to revise this document or withdraw it at any time without prior notice.

Under no circumstances shall Westermo be responsible for any loss of data or income or any special, incidental, and consequential or indirect damages howsoever caused.

More information about Westermo can be found at www.westermo.com.

1.2. About This Guide

This guide is intended for installation engineers and users of the Westermo products.

It includes information on safety and regulations, a product description, installation instructions and technical specifications.

1.3. Software Tools

Related software tools are available at https://www.westermo.com/support/product-support.

1.4. License and Copyright for Included FLOSS

This product includes software developed by third parties, including Free/Libre Open Source Software (FLOSS). The specific license terms and copyright associated with the software are included in each software package respectively. Please visit the product web page for more information.

Upon request, the applicable source code will be provided. A nominal fee may be charged to cover shipping and media. Please direct any source code request to your normal sales or support channel.

1.5. WeOS

This product runs WeOS 5 (Westermo Operating System). Instructions for quick start, configuration and factory reset are found in the WeOS user documentation at www.westermo.com.

2. Safety and Regulations

2.1. Warning Levels

Warning signs are provided to prevent personal injuries and/or damages to the product. The following levels are used:

Level of warning	Description	Consequence personal injury	Consequence material damage
  WARNING	Indicates a potentially hazardous situation	Possible death or major injury	Major damage to the product
  CAUTION	Indicates a potentially hazardous situation	Minor or moderate injury	Moderate damage to the product
  NOTICE	Provides information in order to avoid misuse of the product, confusion or misunderstanding	No personal injury	Minor damage to the product
  NOTE	Used for highlighting general, but important information	No personal injury	Minor damage to the product

Table 1. Warning levels

2.2. Safety Information
Before installation:

Read this manual completely and gather all information available on the product. Make sure it is fully understood. Check that your application does not exceed the safe operating specifications for the product.

SAFETY DURING INSTALLATION
The product must be installed and operated by qualified service personnel and installed into an apparatus cabinet or similar, where access is restricted to service personnel only.

Refer to chapter Compliance Information to see the required level of qualified service personnel according to safety standards.

Before energising and connecting communication clables to the product, ensure a protective earthing conductor is first connected to the protective earthing terminal (only valid for metallic housings). Westermo recommends a cross-sectional area of at least 4 mm^2.

Upon removal of the product, disconnect the product from the power supply and all other communication ports before disconnecting the protective earthing conductor.

HAZARDOUS VOLTAGE
Do not open an energised product. Hazardous voltage may occur when connected to a power supply.

PROTECTIVE FUSE
It must be possible to disconnect manually from the power supply. Ensure compliance to national installation regulations.

Replacing the internal fuse must only be performed by Westermo qualified personnel.

POWER SUPPLY CONNECTION
There are safety regulations governing the power source that can be used in conjunction with the product. Refer to chapter Interface Specifications.

REDUCE THE RISK OF FIRE

To reduce the risk of fire, use only telecommunication line cords with a cable diameter of AWG 26 or larger. Regarding power cable dimensions, see chapter Interface Specifications.

HOT SURFACE

Be aware that the surface of this product may become hot. When it is operated at high temperatures, the external surface may exceed Touch Temperature Limit according to the product's relevant electrical safety standard.

CLASS 1 LASER PRODUCT

Do not look directly into a fibre optical port or any connected fibre, although the product is designed to meet the Class 1 Laser regulations and complies with 21 CFR 1040.10 and 1040.11.

HANDLING OF SFP TRANSCEIVERS

SFP transceivers are supplied with plugs to avoid contamination inside the optical port. They are very sensitive to dust and dirt. If the fibre optic cable is disconnected from the product, a protective plug must be used on the transmitter/receiver. The protective plug must be kept on during transportation. The fibre optic cable must be handled the same way.

CORROSIVE GASES

If the product is placed in a corrosive environment, it is important that all unused connector sockets are protected with a suitable plug, in order to avoid corrosion attacks on the gold plated connector pins.

ELECTROSTATIC DISCHARGE (ESD)

Prevent electrostatic discharge damage to internal electronic parts by discharging your body to a grounding point (e.g. use a wrist strap).

> ⚠️ **CABLE TEMPERATURE RATING FOR FIELD TERMINAL WIRES**
> There may be a requirement on the minimum temperature rating of the cable to be connected to the field wiring terminals, see chapter Interface Specifications.

2.3. Care Recommendations

Follow the care recommendations below to maintain full operation of the product and to fulfill the warranty obligations:

- Do not drop, knock or shake the product. Rough handling above the specification may cause damage to internal circuit boards.
- Use a dry or slightly water-damp cloth to clean the product. Do not use harsh chemicals, cleaning solvents or strong detergents.
- Do not paint the product. Paint can clog the product and prevent proper operation.

If the product is used in a manner not according to specification, the protection provided by the equipment may be impaired.

If the product is not working properly, contact the place of purchase, the nearest Westermo distributor office or Westermo technical support.

2.4. Product Disposal

This symbol means that the product shall not be treated as unsorted municipal waste when disposing of it. It needs to be handed over to an applicable collection point for recycling electrical and electronic equipment.

By ensuring the product is disposed of correctly, you will help to reduce hazardous substances and prevent potential negative consequences to both the environment and human health, which could be caused by inappropriate disposal.

Figure 1. WEEE symbol for treatment of product disposal

2.5. Compliance Information

2.5.1. Agency Approvals and Standards Compliance

Type	Approval/Compliance
EMC	• EN/IEC 61000-6-1, Immunity residential environments • EN/IEC 61000-6-2, Immunity industrial environments • EN/IEC 61000-6-3, Emission residential environments • EN/IEC 61000-6-4, Emission industrial environments
Environmental	• NEMA TS 2, Traffic Controller Assemblies with NTCIP Requirements • AREMA
Safety	• EN/IEC/UL 61010-1, -2-201, Safety requirements for electrical equipment for measurement, control, and laboratory use
Trackside	• EN 50121-4/IEC 62236-4, Railway signalling and telecommunications apparatus
Marine	• DNV rules for classification - Ships and offshore units

Table 2. Agency approvals and standards compliance

2.5.2. EN/IEC/UL 61010-2-201 Notice
This product has been tested and found compliant to EN/IEC/UL 61010-2-201, Safety requirements for electrical equipment for measurement, control, and laboratory use. In accordance with the definitions of the standard, this product shall be handled by skilled service personnel.

2.5.3. AREMA
The product has been tested according to AREMA Part 11.3.3, 11.5.1 and 11.5.2.

Port	Test	Remark
DC Power	$3 \times U_N$, 80 ms	U_N (max)=24 VDC when powered from a vital signal battery

Table 3. AREMA Part 11.3.3 C.4. - Signal equipment surge withstand capability for DC input port

	Class C	Class D	Class E	Remarks
Temperature	X	X	X	
Relative humidity	X	X	X	
Vibration	X	X	X	
Mechanical shock	X	X	X	
Dielectric strength			X	Tested with 1.5 kVAC rms

Table 4. AREMA Part 11.5.1. - Environmental Class

	External	Internal
Enclosure port		
Radiated RF immunity Power Frequency Magnetic Field Pulse Magnetic Field	X X X	X X X
DC power port		
EFT/Burst Surge (1.2/50μs) Conducted RF	X - X	X X X
DI-, DO-port		
EFT/Burst Surge (1.2/50μs) Conducted RF	X - X	X X X
Ethernet ports		
EFT/Burst Surge (1.2/50μs) Conducted RF	X X X	X X X

Table 5. AREMA Part 11.5.2. - Exposure Class

AREMA Part 11.3.3.E. - Equipment surge withstand documentation DC power port

1. Maximum normal circuit voltage when powered from a vital signal battery is 24 VDC otherwise 48 VDC
2. Surge protection clamping voltage is 58.1 VDC
3. Maximum energy handling capability is 2 J, 1 ms

2.5.4. NEMA TS2
The product has been third party tested according to The National Electrical Manufacturers Association (NEMA) TS2, including pass of high temperature tests in 74°C. Please note that the product is specified for long-term operation in maximum 70°C.

2.5.5. FCC Part 15.105 Class B Notice
This product has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This product generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this product does cause harmful interference to radio or television reception, which can be determined by turning the product off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the unit and receiver
- Connect the product into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

2.5.6. Corrosive Environment

This product has been successfully tested in a corrosion test according to IEC 60068-2-60, method 3. This means that the product meets the requirements to be placed in an environment classified as ISA-S71.04 class G3.

> ⚠ **CORROSIVE GASES**
> If the product is placed in a corrosive environment, it is important that all unused connector sockets are protected with a suitable plug, in order to avoid corrosion attacks on the gold plated connector pins.

2.5.7. Simplified Declaration of Conformity

Hereby, Westermo declares that this product is in compliance with applicable EU directives and UK legislations. The full declaration of conformity and other detailed information is available at www.westermo.com/support/product-support.

CE UKCA

Figure 2. The European Conformity and the UK Conformity Assessment markings

3. Product Description

3.1. Product Description

The Lynx 5500 series is the most compact high-performance industrial Ethernet switch series on the market. It has been developed with the needs of current and future industrial data network, combining outstanding performance, durability and reliability. These switches are ideal for handling big data and high bandwidth requirements typically found within transportation, manufacturing, energy, smart cities and other applications.

Integrating hardware, software and network design support tools, this next generation switch platform offers advanced capabilities, the lowest total cost of ownership and will create the most reliable and resilient networks on the market.

The switch is engineered to maintain uninterrupted data communication, even in exceptionally harsh environments. The Lynx 5500 series is tested and certified to withstand extreme temperatures, vibrations and shocks. These switches only use industrial grade components which contributes towards a market leading mean time between failure (MTBF), maximized service life, and reduced operational and life cycle costs.

By providing full gigabit speed on all 12 ports, four flexible SFP ports and layer 2 and layer 3 functionality, a broad range of applications are possible. Powered by the next generation WeOS operating system, which ensures robust operation and support for an expanding range of protocols and features. The Lynx 5512 features intuitive set-up and configuration, removing the need for specialized IT support or training, and enabling easy and cost-efficient installation. In addition, recognizing the growing sophistication of cyberattacks, an extensive suite of cyber security tools is available.

The switches support IEEE 1588v2 PTP time synchronization, ideal for real-time applications. In addition, they are prepared for hardware accelerated routing[1] and hardware cybersecurity features, making them the ideal solution to meet future security and bandwidth requirements.

3.2. Available Models

Art. no.	Model	Gigabit TX ports	Gbit SFP ports	SW	Rated voltage
3643-0300	Lynx 5512-F4G-T8G-LV	8	4	L2	12-48 VDC
3643-0305	Lynx-5512-E-F4G-T8G-LV	8	4	L3	12-48 VDC

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[1]Released in 2nd phase

3.3. Hardware Overview

Figure 4. Location of interface ports and LED indicators

No.	Description	No.	Description
1	Gigabit ports	2	Console port
3	Micro SD	4	Label with data matrix[a.]
5	Gigabit SFP Ports	6	Protective earth terminal
7	Power Input and I/O connection	8	Warning symbol, see warning in Power Input and I/O Connection [13]
9	LED indicators		

[a.]The base MAC address and production date of the product is included in the front label data matrix.

Figure 3. Location of interface ports and LED indicators

3.4. Connector Information

3.4.1. Power Input and I/O Connection

Illustration	Position	Product marking	Direction	Description
	1 - I/O connection	DI+	Input	Digital in positive
		DI-	Input	Digital in negative
		C	Output	Relay output common
		NO	Output	Relay output normally open
	2 - Power input	+DC1	Input	DC1 positive
		+DC2	Input	DC2 positive
		COM	Input	Common
		COM	Input	

Table 6. Power input and I/O connection

Unit condition	Status NO- C
Unpowered / pre-operational or Alarm active	OPEN
Operational and Alarm inactive	CLOSED

Table 7. I/O connection status output

> ⚠️ **POWER SUPPLY CONNECTION**
> There are safety regulations governing the power source that can be used in conjunction with the product. Refer to chapter Interface Specifications.

3.4.2. Console Port

The console port can be used to connect to the CLI (Command Line Interface). The console connector is a USB cable that connects to a FTDI FT232R USB to serial converter internally. For drivers, refer to www.ftdichip.com and download the appropriate VCP driver.

3.4.3. Micro SD

To insert the micro SD card correctly, turn the gold plated pins to the left side.

Figure 5. Insertion of micro SD card

3.4.4. SFP Transceivers

The product supports UL and IEC certified transceivers only. See Westermo's modular transceivers datasheets 100 Mbit and 1 Gbit for supported SFP transceivers, which can be downloaded from the product support pages at www.westermo.com/support/product-support.

Each SFP slot can hold one SFP transceiver. See "*Transceiver User Guide 6100-0000*" for transceiver handling instructions, which also can be downloaded from the product support pages at www.westermo.com/support/product-support.

In the event of contamination, the optical connectors in the SFP transceivers should only be cleaned by the use of forced nitrogen and some kind of cleaning stick. Recommended cleaning fluids are methyl-, ethyl-, isopropyl- or isobutyl alcohol, hexane or naphtha.

> ⚠️ **HANDLING OF SFP TRANSCEIVERS**
> SFP transceivers are supplied with plugs to avoid contamination inside the optical port. They are very sensitive to dust and dirt. If the fibre optic cable is disconnected from the product, a protective plug must be used on the transmitter/receiver. The protective plug must be kept on during transportation. The fibre optic cable must be handled the same way.
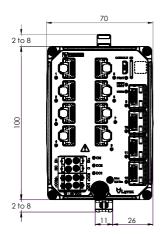
3.5. LED Indicators

LED	Status	Description
ON	OFF	Product has no power
	GREEN	All OK, no alarm condition
	RED	Alarm condition, or until product has started up. (Alarm conditions are configurable, see *WeOS5 User Guide*)
	BLINK	Location indicator ("Here I am!"). Activated when connected to WeConfig tool, or upon request from web or/and CLI. RED BLINK during boot indicates pending cable factory reset.
RSTP/ USR1	Configurable, see *WeOS5 User Guide*	
FRNT	OFF	FRNT disabled
	GREEN	FRNT OK
	RED	FRNT error
	FLASH	Product configured as FRNT focal point
DC1	OFF	Product has no power
	GREEN	Power OK on DC1
	RED	+DC1 input voltage is below operating voltage limit
DC2	OFF	Product has no power
	GREEN	Power OK on DC2
	RED	+DC2 input voltage is below operating voltage limit
USR2	Configurable, see *WeOS5 User Guide*	
TX/FX ports	OFF	No link
	GREEN	Link established
	GREEN FLASH	Data traffic indication
	YELLOW	Port alarm and no link. Or if FRNT or RSTP mode, port is blocked.

Table 8. LED indicators

3.6. Dimensions

Dimensions are stated in mm and are regardless of model.
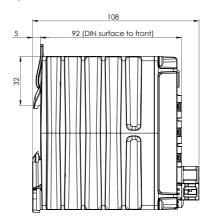

Figure 6. Dimensional drawing

4. Installation

4.1. Mounting
This product should be mounted on a 35 mm DIN-rail, which is horizontally mounted inside an apparatus cabinet or similar. The DIN-rail must be connected to ground.

1. To mount the product, first push the support pin down, then towards the front of the product to lock the support pin.
2. Then, place the product on to the DIN-rail. First the upper part, then the lower part of the product.
3. Lastly, push the support pin forward to lock the product to the DIN-rail. Make sure the products is secured to the DIN-rail.
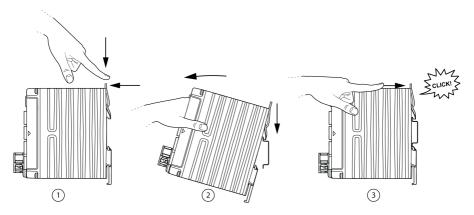

Figure 7. Mounting of product

4.2. Removal of Product
To remove the product either push the support pin down and towards the front of the product, or press down the support at the back with a screwdriver, and lift off the product from the DIN-rail.
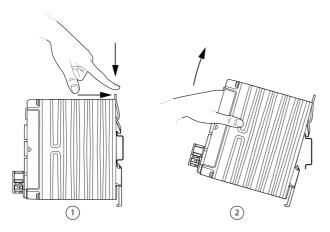
Figure 8. Removal of product by pushing the support pin
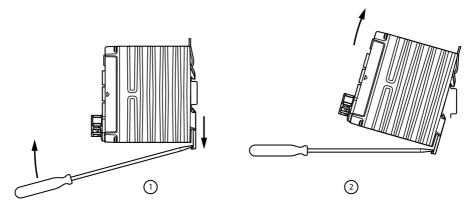

Figure 9. Removal of product with screwdriver

4.3. Protective Earth Connection

For correct function, the earth connection needs to be properly connected to a designated PE rail. See the figure below. Torx: T25 and torque: 3.2 Nm.
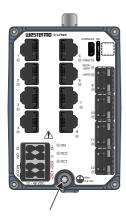
Figure 10. Earth connection

4.4. Cooling

This unit uses convection cooling. To avoid obstructing the airflow around the unit, use the following spacing rules. Minimum spacing 25 mm (1.0 inch) above / below and 10 mm (0.4 inches) left / right the unit. Spacing is recommended for the use of unit in full operating temperature range and service life.

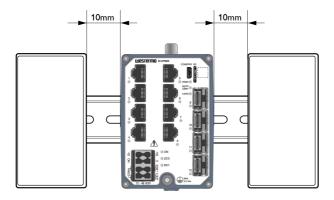*Figure 11. Miminum spacing of product*

⚠ **REDUCE THE RISK OF FIRE**
To reduce the risk of fire, use only telecommunication line cords with a cable diameter of AWG 26 or larger. Regarding power cable dimensions, see chapter Interface Specifications.

5. Specifications

5.1. Interface Specifications

DC, Power port		
Rated voltage[a.]	12-48 VDC, Class III (SELV/PELV)	
Operating voltage	9.6-60 VDC	
Rated current	1.7 A at 12 VDC 0.67 at 24 VDC 0.35 A at 48 VDC	
Fuse rating Component: U2	Denote time-delay fuse	4A(T)
Rated frequency	DC	
Inrush current, I²t[b.]	0.087 A^2s at 12 VDC 0.137 A^2s at 24 VDC 0.400 A^2s at 48 VDC	
Startup current	2× nominal current	
Polarity	Reverse polarity protected	
Redundant power input	Yes	
Isolation	All other ports	
Connector	Detachable push-in terminal	
Conductor cross section (flexible)	0.2-1.5 mm² (AWG 24-16). Use copper conductors only.	
Stripping length cable	10 mm	
Cable temperature rating	For minimum temperature rating of the cable to be connected to the field wiring terminals: +90 °C	
Circuit type	SELV	
Shielded cable	Not required	

[a.]Only CE-compliant Class I or Class II power supplies with SELV/PELV output shall be used with the product

[b.]Measured for 1 second at startup

I/O connection, Digital input[a.]	
Isolation to	All other ports
Connector	Detachable push-in terminal
Conductor cross section	0.2 -1.5 mm² (AWG 24 - 16). Use copper conductors only.
Stripping length cable	10 mm
Circuit type	SELV
Maximum voltage/current	60 VDC, I_{IN} ≤ 2.9 mA at 60 VDC
Voltage levels	Logic one: >8 VDC Logic zero: <5 VDC

[a.]External circuits connected to I/O connectors shall be SELV-rated circuits, galvanic isolated from mains.

I/O connection, Relay output[a.]	
Type of switch	Solid state, DC general use
Connect resistance	Maximum 30 Ω
Isolation to	All other ports
Connector	Detachable push-in terminal
Conductor cross section	0.2-1.5 mm² (AWG 24-16). Use copper conductors only.
Stripping length cable	10 mm
Circuit type	SELV
Maximum voltage/current	60 VDC/80 mA

[a.]External circuits connected to I/O connectors shall be SELV-rated circuits, galvanic isolated from mains.

Ethernet TX[a.]	
Electrical specification	IEEE std 802.3
Data rate	10 Mbit/s, 100 Mbit/s, 1000 Mbit/s, manual or auto
Duplex	Full or half, manual or auto
Circuit type	SELV according to EN/IEC/UL 61010-2-201 TNV-1 according to IEC 62151
Transmission range	Up to 100 m with CAT5e cable or better
Isolation	All other ports
Cabling	Shielded cable CAT5e or better is recommended
Conductive chassis	Yes

[a.]10/100/1000 Mbit/s ports are no. 1 to 8

SFP ports[a]	
Optical/Electrical specification	IEEE std 802.3
Data rate	100 Mbit/s, 1000 Mbit/s[b]
Duplex	Full or half, manual or auto
Transmission range	Depending on transceiver
Connector	SFP slot holding fibre transceiver

[a] SFP ports are 9 to 12

[b] 100 Mbit/s or 1000 Mbit/s tranceiver supported

Console port[a]	
Electrical specification	USB 2.0 device interface
Data rate	Up to 480 Mbps (high-speed mode)
Circuit type	SELV
Maximum supply current	100 mA
Connector	USB Micro B connector in device mode

[a] External circuits connected to I/O connectors shall be SELV-rated circuits, galvanic isolated from mains.

Micro SD	
Electrical specification	Secure Digital 2.0
Circuit type	SELV
Maximum supply current	100 mA
Connector	Micro SD connector

5.2. Type Tests and Environmental Conditions

Environmental phenomena	Basic standard	Description	Test levels
ESD	EN 61000-4-2	Enclosure	Contact: ±6 kV Air: ±8 kV
Fast transients	EN 61000-4-4	DC power port	± 2 kV, direct coupling
		Earth port	
		I/O port	± 2 kV, capacitive coupling clamp
		Ethernet ports	
Surge	EN 61000-4-5	DC power port	L-E: ± 1 kV, 12 Ω, 9 µF, 1.2/50 µs L-E: ± 2 kV, 42 Ω, 0.5 µF, 1.2/50 µs L-L: ± 0,5 kV, 2 Ω, 18 µF, 1.2/50 µs L-L: ± 1 kV, 12 Ω, 9 µF, 1.2/50 µs L-L: ± 1 kV, 42 Ω, 0,5 µF, 1.2/50 µs
		I/O port	L-E, L-L: ± 1 kV, 12 Ω, 9 µF, 1.2/50 µs L-E: ±2 kV, 42 Ω, 0.5 µF, 1.2/50 µs L-L: ±1 kV, 42 Ω, 0.5 µF, 1.2/50 µs
		Ethernet ports	L-E: ± 2 kV, 2 Ω, Direct on shield, 1.2/50 µs
Power frequency magnetic field	EN 61000-4-8	Enclosure	300 A/m continues, DC, 16.7 Hz, 50 Hz, 60 Hz 1000 A/m 10 s, 50, 60 Hz
Pulsed magnetic field	EN 61000-4-9	Enclosure	300 A/m
Radiated RF immunity	EN 61000-4-3 IEEE Std C37.90.2	Enclosure	20 V/m, 80% AM (1kHz) at 80 MHz to 2,7 GHz, spot freq.: 80, 160, 380, 450, 900, 1600, 1850 MHz 10 V/m, 80% AM (1 kHz) at 2.7 to 6 GHz, spot freq.: 2150, 3800 MHz 20 V/m, pulse keying (2 Hz) at 80 MHz to 1 GHz, spot freq.: 1732, 1800 MHz 10 V/m, pulse keying (2 Hz), spot freq.: 2310, 2450, 5800 MHz 20 V/m, PM 200 Hz square at 900 MHz
Conducted RF immunity	EN 61000-4-6	DC power port	10 V, 0.15 to 80 MHz, spot freq.: 2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz
		Ethernet ports	
		I/O port	
		Earth port	
Radiated RF emission	CISPR 16-2-3	Enclosure	Class B (Residential), 30 MHz to 6 GHz DNV-CG - Bridge and Deck Zone, 0.15 to 2000 MHz FCC Part 15 B, Class B, 30 MHz to 20.5 GHz
	DNV-CG-0339		
	ANSI C63,4		
Conducted RF emission	CISPR 16-2-1	DC power port	Class B (Residential), 0.15 to 30 MHz

Environmental phenomena	Basic standard	Description	Test levels
			DNV-CG - Bridge and Deck Zone, 10 kHz to 30 MHz
		Ethernet ports	Class B (Residential), 0.15 to 30 MHz
Compass safe distance	IEC 60945	Enclosure	Minimum safe distance to: standard compass: 25 cm steering compass: 20 cm
Supply voltage surge	AREMA	DC power port	$3 \times U_N$, 80 ms (72V)
Power supply failure	DNV-CG-0339	DC power port	U_N-100%, 30 s
Power supply variation	DNV-CG-0339	DC power port	$1.3 \times U_N$ (62.4 VDC), $0.75 \times U_N$ (18 VDC), 15 min
Immunity to conducted low frequency interference	IEC 60945	DC power port	3 Vrms, 0.05 to 10 kHz
Insulation resistance	DNV-CG-0339	Power port (DC) to all other ports	500 VDC, 60 s
		I/O port to all other ports	
	IEEE 802.3	Ethernet ports to all other ports	
Dielectric strength	AREMA	Power port (DC) to all other ports	2121 VDC, 60 s 1500 VAC rms, 60 s
		I/O port to all other ports	
	Westermo	Power port (DC) to all other ports	1500 VAC rms, 60 s
		I/O port to all other ports	
	IEEE 802.3	Ethernet ports to all other ports	
Impulse withstand	IEEE 802.3	Ethernet ports to all other ports	2.4 kV

Table 9. EMC and electrical conditions

Environmental phenomena	Basic standard	Description	Test levels
Temperatures	EN 60068-2-1 EN 60068-2-2 EN 60068-2-14	Operational	-40 to +70°C (-40 to +158°F)[a.]
		Storage and transport	-55 to +85°C (-67 to +185°F)
Humidity	EN 60068-2-30	Operational	5-95 % relative humidity +25 °C/40 °C, 93/98 % RH, cyclic, 6 days +40 °C, 93 % RH, ready state, 10 days
	EN 60068-2-78	Storage and transport	
Corrosive gases	IEC 60068-2-60	Operational	Method 3, 21 days[b.]
Altitude		Operational	2000 m/80 kPa
MTBF	MIL-HDBK 217F		506,000 hours
	Telcordia		955,000 hours
Vibration[c.]	IEC 60068-2-6 (sine)	Operational	5 to 20 Hz, 1,3 mm 20 to 200 Hz, 1 g 20 sweep cycles in each axis, 1 octave/min
			Class 2, 10 to 150 Hz at 2 g 20 sweep cycles in each axis, 1 octave/min
			5 to 8 Hz at ± 7.5 mm 8 to 500 Hz at 2 g 5 sweep cycles in each axis (3 × 5), 1 octave/min
		Non-operational, resonance test	2 to 13.2 Hz at ± 1 mm 13.2 to 100 Hz at 1 g 1 sweep cycle in each axis, 1 octave/min
	IEC 60068-2-64 (random)	Operational	2.3 m/s^2 random, 5 to 2000 Hz, 3 × 1.5 h
		Operational, endurance test	1 g random, 2-100 Hz, 3 × 150 min
Shock[c.]	IEC 60255-21-2	Operational	Class 2, 30g/11ms, 3 × 6 shocks (half sine)
	IEEE 1478		200 m/s^2, 11 ms, 3 × 6 shocks (saw tooth)
Bump[c.]	IEC 60255-21-2	Operational	Class 2, 20g/16 rms, 6 × 1000 bumps
Enclosure	EN/IEC/UL 61010-1	Aluminium	Fire enclosure
Weight			690 gr
Degree of protection	EN 60529	Enclosure	IP40
Cooling			Convection
Overvoltage category	EN/IEC/UL 61010-1		OVC II

Environmental phenomena	Basic standard	Description	Test levels
Pollution degree	EN/IEC/UL 61010-1, EN 50124-1		PD2 macro and micro environment
Location	EN/IEC/UL 61010-1		Indoor

[a.]Refer to "Safety and Regulations" chapter regarding touch temperature

[b.]Method 3, 21 days corresponds to Harsh Industrial Environment G3 which is defined in ANSI/ISA 17.04: 2015

[c.]The power and I/O cables need to be fastened 200 mm or closer to the unit. The same recommendation applies to the Ethernet cables.

Table 10. Environmental and mechanical conditions

6. Revision Notes

Revision	Date	Change description
Rev, G	2023-02	1.3 Software Tools updated, 2.2 Safety Information; warning Safety during installation updated, 2.5.1 Agency Approvals and Standards Compliance updated (DNV), 2.5.3 AREMA; table 5 updated, text added, 3.1 Product Description updated (footnote removed for "features"), 3.3 Hardware Overview; table updated (data matrix), 3.4.2 Console Port; text updated, 3.5 LED Indicators updated (WeOS5 User Guide and BLINK > FLASH), 4.3 Protective Earth Connection; Torx added, 5.2 Type Tests and Environmental Conditions updated
Rev. F	2022-01	2.2 Safety Information updated (Warning - Safety during installation), 2.5.2 EN/IEC/UL 61010-2-210 Notice added, 5.2 Type Tests and Environmental Conditions updated (UL added to EN/IEC 61010-1)
Rev. E	2021-12	3.1 Product Description updated (text), 5.1 Interface Specifications updated (DC Power port)
Rev. D	2021-06	2.5.1 Agency Approvals and Standards Complience updated, 3.2 Available models updated, 5.1 Interface Specifications updated
Rev. C	2021-01	2.5.1 Agency Approvals and Standards Compliance updated with Arema, 2.5.4 NEMA TS2 new chapter, 5.1 Interface Specifications, DC Power port updated (cable temperature rating), 5.2 Type Tests and Environmental Conditions updated (temperature range updated).
Rev. B	2020-08	Illustrations updated from brown to blue products.
Rev. A	2019-12	First revision

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