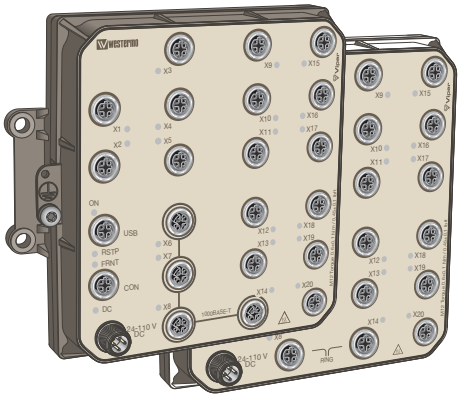
User Guide
6641-22531
REV. C

2TEST

Viper 20A Series



20 port Ethernet M12 switches

WESTERMO

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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.

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 in the folder *Software tools* under *Technical support*

1.4. License and Copyright for Included Free/Libre Open Source Software

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 Management Guide

This product runs WeOS (Westermo Operating System). Instructions for quick start, configuration, factory reset and use of USB port are found in the WeOS Management Guide

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	Minor 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 unit. Make sure it is fully understood. Check that your application does not exceed the safe operating specifications for this unit.

This unit should only be installed by qualified personnel.

This unit should be built-in to an apparatus cabinet or similar, where access is restricted to service personnel only.

The power supply wiring must be sufficiently fused, and if necessary, it must be possible to disconnect it manually from all power supply. Ensure compliance to national installation regulations.

This unit relies on convection cooling. Make sure that it is installed so that the ambient temperature is within the specified temperature range, e.g. by avoiding obstruction of the airflow around the unit. Also see EN 45545-2 Mounting Notes [16] chapter.

WARNING - PREVENT ACCESS TO HAZARDOUS VOLTAGE
Before mounting, using or removing this unit: Prevent access to hazardous voltage by disconnecting the unit from all power supply.

WARNING - HAZARDOUS VOLTAGE
Do not open the connected unit. Hazardous voltage may occur within this unit when connected to power supply.

CAUTION - HOT SURFACE
Be aware of that the surface of this unit may become hot. When this unit is operated at high temperatures, the external surface of the equipment may exceed Touch Temperature Limit according to EN/IEC/UL 60950-1.

NOTICE - PROTECTIVE EARTHING CONDUCTOR
Before powering-up, a protective earthing conductor must be connected to the protective earth terminal and have a cross-sectional area of at least 1.5 mm^2. Note that this unit can be connected to two different power sources.

NOTICE - REDUCE RISK OF FIRE
To reduce the risk of fire:

1. Use only No. 21 AWG or larger power cable
2. Use only No. 26 AWG or larger telecommunication line cord

NOTICE - CONNECT EXTERNAL FUSE
The unit has no internal fuse and should be connected via an external fuse. The fuse should be calculated in accordance with the rated current.

2.3. Care Recommendations

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

- Do not attempt to dissassemble the unit. There are not any user serviceable parts inside.
- Do not drop, knock or shake the unit. Rough handling above the specification may cause damage to internal circuit boards.
- Do not use harsh chemicals, cleaning solvents or strong detergents to clean the unit.
- Do not expose the unit to any kind of liquid (water, beverages, paint etc), unless all connectors are connected or fitted with protective caps (delivered with the unit), tightened to the specified torque. Connected cables must have the appropriate ingress protection code.
- Do not use or store the unit in dusty or dirty areas, unless all connectors and the ventilation membrane are sufficiently protected.
- Do not cover or bring mechanical force to the ventilation membrane on the back of the unit.

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

2.4. Maintenance

No maintenance is required, as long as the unit is used as intended within the specified conditions.

2.5. Environmental Protection

Waste electrical products should not be disposed of with household waste. Please recycle where facilities exist. Check with your local authority or retailer for recycling advice.

2.6. Compliance Information

2.6.1. Agency Approvals and Standards Compliance

Type	Approval/Compliance
Climate	• EN 50155/IEC 60571 class TX, Railway applications - Electronic equipment used on rolling stock • IEEE 1478 class 1, condition E4 (incl Salt Mist), Environmental conditions for transit rail car electronic equipment
EMC	• EN 61000-6-2, Immunity industrial environments • EN 61000-6-4, Emission industrial environments • EN 50121-3-2/IEC 62236-3-2 Railway applications – Rolling stock – apparatus • Tested and verified for Class S1, DB EMC Regulation 06, Commodity team Radio compatability in VDB Rev 1.0 (Shunting Radio). Compliant with SBB requirements. • Tested and verified for Class S1, ÖBB Radio compatability in near field in accordance with ÖBB Infrastructure Edition 4, Revision 14 (Shunting Radio). • Tested and verified for FCC part 15
Mechanical (Shock and vibration)	• EN 61373 category 1, class B (tested at two times-level) • EN 60068-2-27 20 g, 11 ms and 100 g, 6 ms
Insulation (Coordination and test)	• EN 50124-1, Railway applications – Insulation coordination • EN 50155/IEC 60571, Railway applications - Electronic equipment used on rolling stock
Fire protection	• EN 45545-2, Fire protection on railway vehicles • NFPA130, Fire protection for fixed guideway transit and passenger rail system

Table 2. Agency approvals and standards compliance

2.6.2. FCC Part 15.105 Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residental area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

2.6.3. Declaration of Conformity

Declaration of Conformity

The manufacturer Westermo Teleindustri AB
SE-640 40 Stora Sundby, Sweden

Type of product	Model[1]
20-port managed Ethernet M12 Switch	Viper-x20A
20-port managed Ethernet M12 Switch with 4Gbps ports	Viper-x20A-T4G

is in conformity with the following EU directive(s).

No	Short name
2014/30/EU	Electromagnetic Compatibility (EMC)
2011/65/EU	Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)

References of standards applied for this EU declaration of conformity.

No	Title	Issue
EN 50121-3-2	Railway applications – Electromagnetic compatibility – Rolling stock – Apparatus	2015
EN 50121-4	Railway applications – Electromagnetic compatibility – Emission and immunity of the signaling and telecommunications apparatus	2015
EN 61000-6-2	Electromagnetic compatibility - Generic standards - Immunity for industrial environments	2005
EN 61000-6-4	Electromagnetic compatibility - Generic standards - Emission standard for industrial environments	2007 +A1:2011
EN 50581	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances	2012


Signature

Pierre Öberg
Technical Manager
2nd June 2017

[1] Model Differences: x = 1 or 2 and indicates Software Class

3. Product Description

3.1. Product Description

The Viper-20A series is a series of managed 20 port switches optimised for the needs of the railway rolling stock market. Gbps ports cope with high bandwidth devices such as access points and NVRs (Network Video Recorders).

The Viper is designed to withstand the tough environment on-board trains, exposing the switch to constant vibration, extreme temperatures, humidity and a demanding electrical environment.

A GORE-TEX® membrane prevents internal condensation. Threading integrated in chassis provides for additional vibration resistance. High-level isolation between all interfaces enables direct connectivity to vehicle auxiliary power and protects against overvoltage and flashover. IP67 protection prevents ingress of water and dust. An overall optimised design results in an extremely compact package in combination with very high MTBF for easy integration and low lifecycle cost.

Thorough type testing at independent ISO/IEC 17025 and ILAC MRA certified labs, accredited to a wide range of standards, show that the Viper series fulfilles EN 50155 and other requirements. The state-of-the-art Westermo production facility ensures the quality of each individual unit, e.g. through temperature cycling burn-in testing.

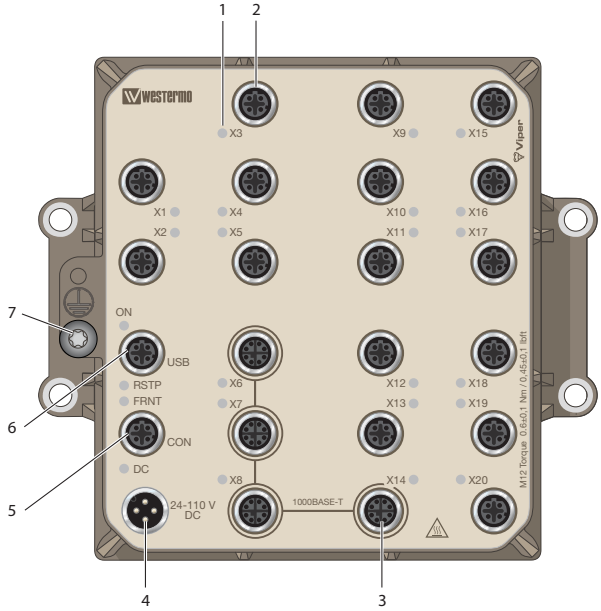
Meeting the requirements of the railcar market, the Viper is very well suited for deployment in any other application with severe operating conditions and tough environments, for instance in the mining industry.

3.2. Available Models

All switches are managed. Viper x20A is used when referring to both models 120A and 220A.

Art.no.	Model	Layer	Gbps ports
3635-0910	Viper-120A	2	-
3635-0920	Viper-220A	3	-
3635-1210	Viper-120A-T4G	2	4
3635-1220	Viper-220A-T4G	3	4

3.3. Hardware Overview



No.	Description	No.	Description
1	LED indicator	2	100 Mbps port
3	Gbps port	4	DC port
5	Console port	6	USB port
7	Protective earth connection		

Figure 1. Location of interface ports and LED indicators

3.4. Connector Pinout

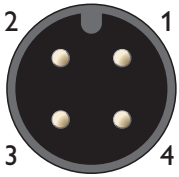
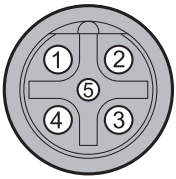
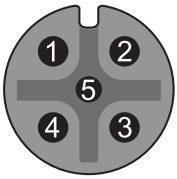
Pin no.	Signal	Illustration
1	+DC1	
2	+DC2	
3	-COM	
4	-COM	
Viper-x20A supports redundant power connection. The positive inputs are +DC1 and +DC2. The negative input for both supplies is -COM		

Table 3. Power connector

Pin no.	Signal	Illustration
1	NC[a]	
2	TX	
3	RX	
4	NC[a]	
5	GND	

[a]*No Connect.* Do not connect.

Table 4. Console connector

Pin no.	Signal	Illustration
1	DN	
2	VBUS	
3	NC[a]	
4	DC	
5	GND	

[a]*No Connect.* Do not connect.

Table 5. USB connector

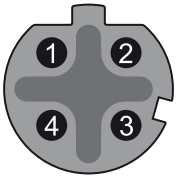
Pin no.	Signal	Illustration
1	TD+	
2	RD+	
3	TD-	
4	RD-	
MDI, MDI-X and auto MDI/MDI-X modes are supported. The table shows signals in MDI mode.		

Table 6. 100 Mbps Ethernet connector

Pin no.	Signal	Illustration
1	DA+	
2	DA-	
3	DB+	
4	DB-	
5	DD+	
6	DD-	
7	DC-	
8	DC+	

Table 7. Gbps connector

3.5. LED Indicators

LED	Status	Description
ON	OFF	Unit has no power
	GREEN	All OK, no alarm condition
	RED	Alarm condition, or until unit has started up. (Alarm conditions are configurable, see *WeOS Management 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	OFF	RSTP disabled
	GREEN	RSTP enabled
	BLINK	Unit selected as RSTP/STP root switch
FRNT	OFF	FRNT disabled
	GREEN	FRNT OK
	RED	FRNT error
	BLINK	Unit configured as FRNT focal point
DC	OFF	Unit has no power
	GREEN	Power OK on DC1 and DC2
	RED	Power failure on DC1 or DC2
X1 to X20	OFF	No link
	GREEN	Link established
	GREEN FLASH	Data traffic indication
	YELLOW	Port alarm, or port is set in blocking state by link redundancy protocol

Table 8. LED indicators

3.6. Dimensions

Dimensions are stated in millimetres

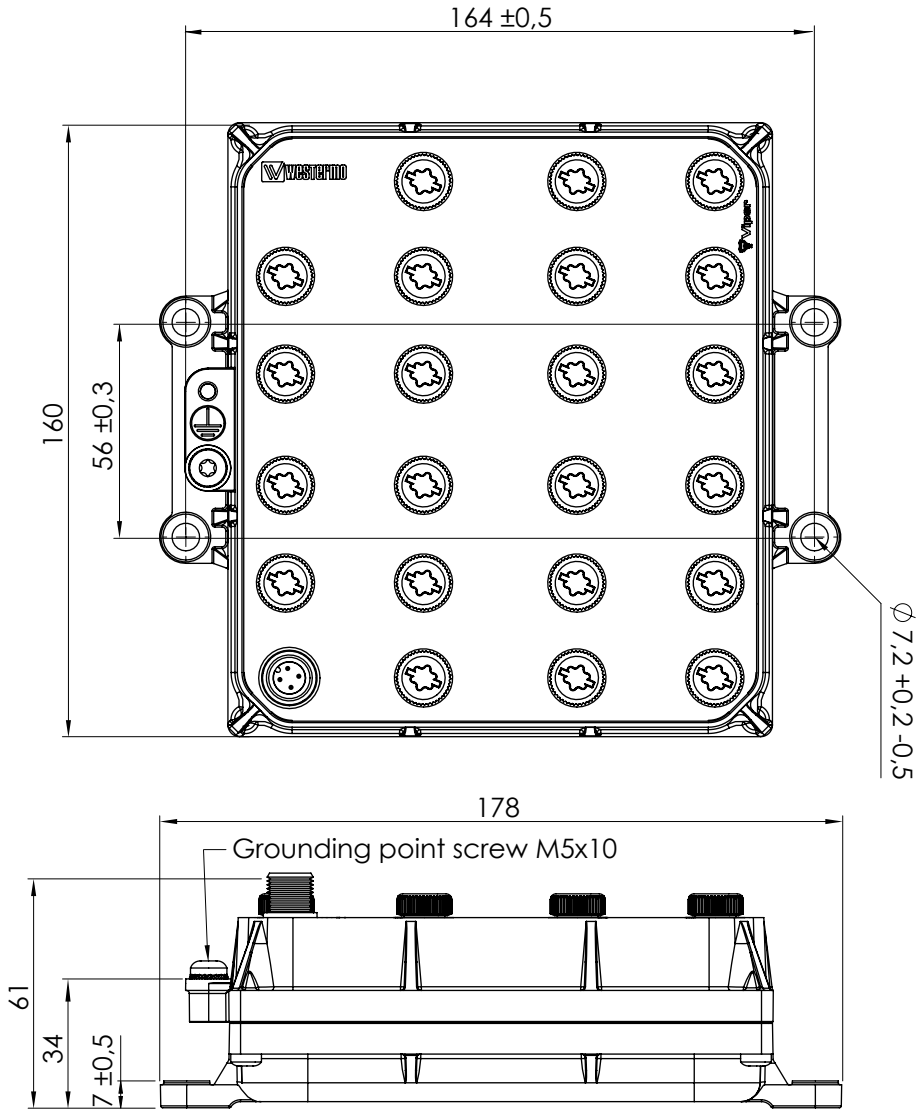


Figure 2. Dimensional drawing

4. Installation

4.1. Wall Mounting

The unit can be wall mounted vertically or horizontally. There are four pieces of 7 mm bores for this. Use four M5, M6 or 1/4" screws with 12 mm washers on a flat and stable surface.

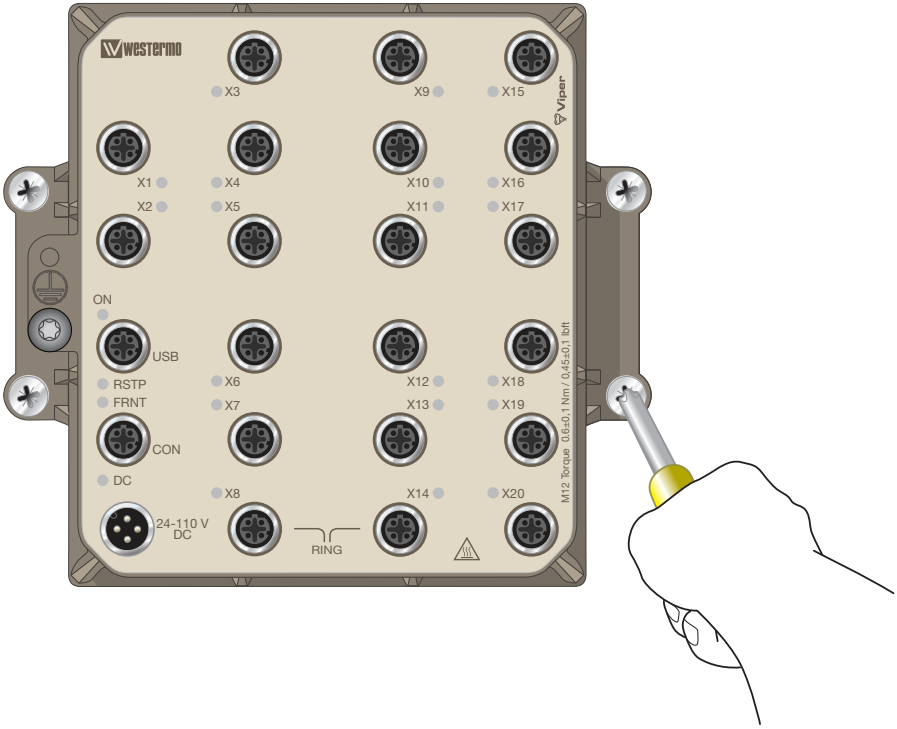


Figure 3. Wall mounting

4.2. Connection of Cables

Recommended tightening torque for the M12 connectors is 0.6 Nm.

When connecting the power cable, ensure that the pins are connected correctly before tightening the power cable to the unit.

NOTICE - UNUSED CONNECTORS
Unused connectors must be covered by a protective cap (delivered with the unit), tightened to the specified torque in order to fulfill the specified ingress protection code.

4.3. Cooling

This unit relies on convection cooling. Make sure that it is installed so that the ambient temperature is within the specified temperature range, e.g. by avoiding obstruction of the airflow around the unit.

4.4. Removal of Product

Disconnect all cables and unscrew the unit from the wall. Time for replacement: < 15 minutes.

CAUTION - HOT SURFACE
Be aware of that the surface of this unit may become hot. When this unit is operated at high temperatures, the external surface of the equipment may exceed Touch Temperature Limit according to EN/IEC/UL 60950-1.

4.5. EN 45545-2 Mounting Notes

Two units can be mounted together and as a single interior non-listed group in the sense of EN 45545-2 definitions. For multiple units, the spacing requirements for interior non-listed groups must be met.

5. Specifications

5.1. Interface Specifications

DC, Power port	
Rated voltage	24 to 110 VDC
Operating voltage	16.8 to 143 VDC (14.4 to 154 VDC for 100 ms)
Rated current	Max 670 mA at 24 VDC, max 160 mA at 110 VDC
Rated frequency	DC
Inrush current, I^2t	32 mA^2s at 110 VDC
Startup current[a]	Max 1,37 A at 16.8 VDC
Polarity	Reverse polarity protected
Redundant power input	Yes
Isolation to	2250 VDC to all other ports
Connector	4-pin, male, M12, A-coded, recommended Westermo cables: 3146-1106 for 1.5 m 3146-1107 for 5 m
Cable size	M12, recommended cable area 0.5 mm^2 (minimum 0.25 mm^2) Cable dimensions depend on choice of M12 connector

[a]External supply current capability for proper startup

100 Mbps ports[a]	
Electrical specification	IEEE std 802.3
Data rate	10 Mbps, 100 Mbps, manual or auto
Duplex	Full of half, manual or auto
Circuit type	TNV-1
Transmission range	Up to 150 m with CAT5e cable or better
Isolation to	2250 VDC to all other ports[b]
Connector	4-pin, female, M12, D-coded, auto MDI/MDI-X, recommended Westermo cables: 3146-1100 M12-M12 - 1 m 3146-1101 M12-M12 - 5 m 3146-1103 RJ45-M12 - 1 m 3146-1104 RJ45-M12 - 5 m
Shielded cable	Required
Conductive chassis	Yes
FRNT reconfiguration time	Typically below 20 ms

[a]100 Mbps ports are:
X1-X20 on Viper-x20A
X1-X5, X9-X13, X15-X20 on Viper-x20A-T4G

[b]750 VDC after damp heat, according to EN 50155

Gbps ports[a]	
Electrical specification	IEEE std 802.3
Data rate	10 Mbps, 100 Mbps, 1000 Mbps, manual or auto
Circuit type	TNV-1
Transmission range	Up to 150 m with CAT5e cable or better
Isolation to	2250 VDC to all other ports[b]
Connector	8-pin, female, M12, X-coded
Shielded cable	Required
FRNT reconfiguration time	Typically below 20 ms

[a]Gbps ports are: X6-X8, X14 on Viper-x20A-T4G

[b]750 VDC after damp heat, according to EN 50155

USB port	
Electrical specification	USB 2.0 host interface
Data rate	Up to 480 Mbps (high-speed mode)
Maximum supply current	500 mA
Circuit type	SELV
Isolation to	Ethernet and DC ports: 2250 VDC No isolation to CON or chassis
Connector	5-pin, female, M12, A-coded, recommended Westermo USB plug 3641-0190

Console port	
Electrical specification	RS-232
Data rate	115.2 kbit/s
Data format	8 data bits, no parity, 1 stop bit, no flow control
Circuit type	SELV
Isolation to	Ethernet and DC ports: 2250 VDC No isolation to USB or chassis
Connector	5-pin, female, M12, B-coded, recommended Westermo cables: 1211-2215 (serial port) or 1211-4073 (USB)

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	Power port	± 2 kV
		Signal ports	
		Earth port	
Surge	EN 61000-4-5	Power port	L-E: ± 2 kV, 42 Ω, 0.5 µF, 1.2/50 µs L-E: ± 0.5 kV, 12 Ω, 9 µF, 1.2/50 µs L-L: ± 2 kV, 42 Ω, 0.5 µF, 1.2/50 µs L-L: ± 0.5 kV, 2 Ω, 18 µF, 1.2/50 µs
		Ethernet port	L-E: ± 2 kV, 2 Ω
Pulsed magnetic field	EN 61000-4-9	Enclosure	300 A/m
Radiated RF immunity	EN 61000-4-3	Enclosure	20 V/m at (80 MHz to 2 GHz) 10 V/m at (2-6 GHz) 1 kHz sine, 80% AM
Conducted RF immunity	EN 61000-4-6	Power ports	10 V, 80% AM, 1 kHz; (0.15-80) MHz
		Ethernet ports	
		Earth port	
Radiated RF emission	CISPR 16-2-3	Enclosure	EN 61000-6-4 (30-6000 MHz)
	ANSI C63,4 (FCC Part 15)		EN 61000-6-4 (30-6500 MHz)
Conducted RF emission	CISPR 16-2-1	Power port	EN 61000-6-4
		Ethernet ports	EN 61000-6-3
Dialectric strength	EN 60950-1	Power port to all other ports	2250 VDC, 1 min
		Fast Ethernet ports to all other ports	2250 VDC, 1 min[a]
		Gbps Ethernet ports to all other ports	2250 VDC, 1 min[a]

[a]750 VDC after damp heat, according to EN 50155

Table 9. EMC and electrical conditions

Environmental phenomena	Basic standard	Description	Test levels
Temperatures	EN 60068-2-1 EN 60068-2-2	Operating	-40 to +70°C (-40 to +158°F)[ab]
		Storage and transport	-55 to +85°C (-67 to +185°F)
Humidity	EN 60068-2-30	Operating	5-95% relative humidity
		Storage and transport	
Altitude		Operating	2000 m/70 kPa
Service life		Operating	20 years according to IEC/TR 62380
MTBF		*Viper-x20A:* 530,500 hours	MIL-C217F2, GB, 25°C (+77°F)
		Viper-x20A-T4G: 522,000 hours	
Vibration	IEC 60068-2-6 (sine)	Operational	2 g rms 5-500 Hz, 5 sweeps
	IEC 60068-2-64 (random)	Non-operational long life simulation	11.44 m/s² rms 5-150 Hz, 5 hours 2.3 m/s² rms 5-2000 Hz, 5 hours
Shock	IEC 60068-2-27	Operational	10 g, 30 ms, half sine 20 g, 11 ms, saw tooth 100 g, 6 ms, half sine
Enclosure	EN 60950-1	Zinc (front), Aluminium (rear)	Fire enclosure
Dimension WxHxD with connectors			See "Dimensions" chapter for details
Weight			1.6 kg
Degree of protection	EN 60529	Enclosure	IP67[c]
Cooling			Convection

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

[b]Operational at +85°C for a limited time

[c]Provided all connectors are connected with IP67 cabling or fitted with protective caps (delivered with the unit) and tightened to the specified torque.

Table 10. Environmental and mechanical conditions

6. Revision Notes

Revision	Date	Change description
Rev. A	2017-05	First issue of user guide
Rev. B	2017-07	New chapter (2.1 Warning levels chapter), Shock and NFPA 130 updated (2.6.1 Agency approvals updated), text updated (3.1 Product description), inrush current updated (5.1 Interface specifications), service life, shock and operating temperature updated (5.2 Type Tests and environmental conditions).
Rev. C	2017-09	2.6.1 Mechanical data updated, 3.6 Dimensional drawing updated, 5.1 Transmission range for Gbps ports updated, 5.2 Radiated + Conducted RF emission updated, Enclosure updated