



MRD-415 and MRD-455

Industrial Cellular Router

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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.

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. Management Guide

This product runs MRX Operation System. Instructions for quick start, configuration and factory reset are found in the Management Guide at www.westermo.com/support/product-support/.

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.

Before energising and connecting communication cables 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 mm².

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

The power supply wiring must be sufficiently fused.

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



RADIO PRODUCTS

Observe the usage limitations of radio products at filling stations, in chemical plants, in systems with explosives or potentially explosive locations.

The product may not be used in airplanes. Exercise particular caution near personal medical aids, such as pacemakers and hearing aids. Never perform work on the antenna system during a thunderstorm.

To fulfill human safety, a minimum separation distance of 20 cm or more should be maintained between the antenna of the product and personnel during operation.



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).

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

Approvals and Standards	
Certifications	CE according to RED 2014/53/EU, RoHS
EMC	EN 301489-1, EN 301489-19, EN 301489-52
Safety	EN/IEC 62368-1, Safety Requirements for audio/video, information and communication technology equipment
Radio spectrum usage	EN 301908-1, EN 301908-2, EN 301908-13
Shock and vibration	EN 61373

2.5.2. 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.



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

3. Product Description

3.1. Product Description

The MRD-415 and MRD-455 industrial cellular routers make full use of the 2G, 3G and 4G cellular networks to cost effectively inter-connect systems, sites and operators. Creating a solid foundation for smart automated systems, where machines can communicate with machines and service technicians can remotely monitor and maintain their valuable assets in any system.

Devices connected to the Internet require counter measures towards cybersecurity threats. The MRD-series offers protection of transmissions from malicious eavesdroppers via encrypted communication tunnels (VPN), and features a simple, yet powerful, packet inspection firewall. Configuration of the device is done with a simple and intuitive web-interface, management is also available with a basic CLI and SMS messages can be used for controlling the device and receiving status updates.

The products feature a built-in 2-port Ethernet switch for connecting to any Ethernet device. For legacy support, there is also a built-in serial port that offers a simple modem replacement solution with the benefit of not having to reprogram or change any other component.

Features such as connection maintenance and network to network roaming ensures a very high availability and connection that is always available. Which is crucial in mission critical installations, where even the shortest downtime can prove very costly.

The MRD-415 comes in a very slim and robust casing which is ideal for wall mounting in small spaces, taking up very little space in a cabinet or similar. Connections come out on each end of the product, with antenna connectors on one side and Ethernet and serial interfaces on the other. It features a very low power consumption, making it the ideal choice for battery or solar powered applications. Low power consumption combined with a clever power saving feature allow the unit to run for a long time without the battery.

The MRD-455 comes in a very compact and robust casing ideal for mounting on DIN-rails. All connections and LEDs are located on the front, making it ideal for installation in industrial cabinets and applications. To further strengthen the already high availability, they feature dual-SIM card slots, allowing the user to remove carrier dependency and swapping operators automatically if the primary run into trouble. It also features a galvanic isolation between all interfaces (power supply, Ethernet, serial), to protect the product against electrical surges and overvoltage, which is common in many industrial applications.

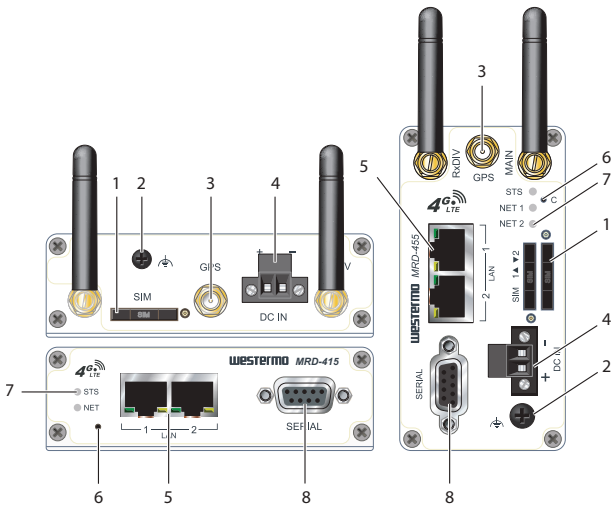
3.2. Available Models MRD

Art. no.	Model
3623-0515	MRD-415
3623-0401	MRD-455
3623-0421	MRD-455-AU

Table 2. List of available models

3.3. Hardware Overview

3.3.1. Hardware Overview



No.	Description		
1	SIM-card drawer(s)	2	Protective Earth
3	Antenna connectors (3 pcs)	4	Power connector
5	Ethernet TX ports	6	Factory reset switch
7	LED indicators	8	Serial port

Table 3. Location of interface ports and LED indicators

3.4. Connector Information

3.4.1. DC Power Connection

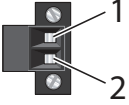
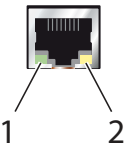
Illustration	Position	Product marking	Direction	Description
	1	-	Input	Common
	2	+	Input	Supply voltage input DC

Table 4. Power input

3.4.2. Ethernet

The Ethernet ports are on the front of the unit and are marked LAN 1 and LAN 2. Each port has a LED indicating the connection speed and a LED indicating activity. Both ports are capable of auto-negotiation, meaning cross-over cables are not required. The Ethernet ports are switched, allowing more than one Ethernet device to be connected to the unit at one time.



No.	Description	No.	Description
1	Activity LED	2	Connection speed LED

Illustration	Pin no.	Signal	Direction	Description
	1	TD+	In/Out	Transmitted/Received data
	2	TD-	In/Out	Transmitted/Received data
	3	RD+	In/Out	Transmitted/Received data
	4	-	-	Not connected
	5	-	-	Not connected
	6	RD-	In/Out	Transmitted/Received data
	7	-	-	Not connected
	8	-	-	Not connected

Table 5. Ethernet TX connections (RJ-45 connector), LAN 1-2

3.4.3. Serial Port (DCE Female)

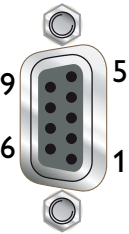
Illustration	Position	Product marking	Direction	Description
	1	DCD	Out	Data Carrier Detect
	2	RxD	Out	Receive Data
	3	TxD	In	Transmit Data
	4	DTR	In	Data Terminal Ready
	5	SG	-	Signal Ground
	6	DSR	Out	Data Set Ready
	7	RTS	In	Request to Send
	8	CTS	Out	Clear to Send
	9	RJ	Out	Ring Indicator

Table 6. Serial Port

3.5. LED Indicators

LED	Status	Description
STS Status	RED	No wireless network has been detected
	RED FLASH	A wireless network has been detected
	GREEN	Power up self test OK/no issues
NET	OFF	Not ready
NET 1	RED	RF circuitry initialising or network registration fault
NET 2 Network indicator	GREEN/RED	Network connection fault
	GREEN FLASH	Searching for network
	GREEN	Locked to network
	GREEN 1 BLINK	Signal strength indication: 1 - Very poor 2 - Normal 3 - Very good
	GREEN 2 BLINKS	
	GREEN 3 BLINKS	
	GREEN 4 BLINKS	
	GREEN 5 BLINKS	
	GREEN 6 BLINKS	

Table 7. LED indicators

3.6. Dimensions

Dimensions are stated in mm.

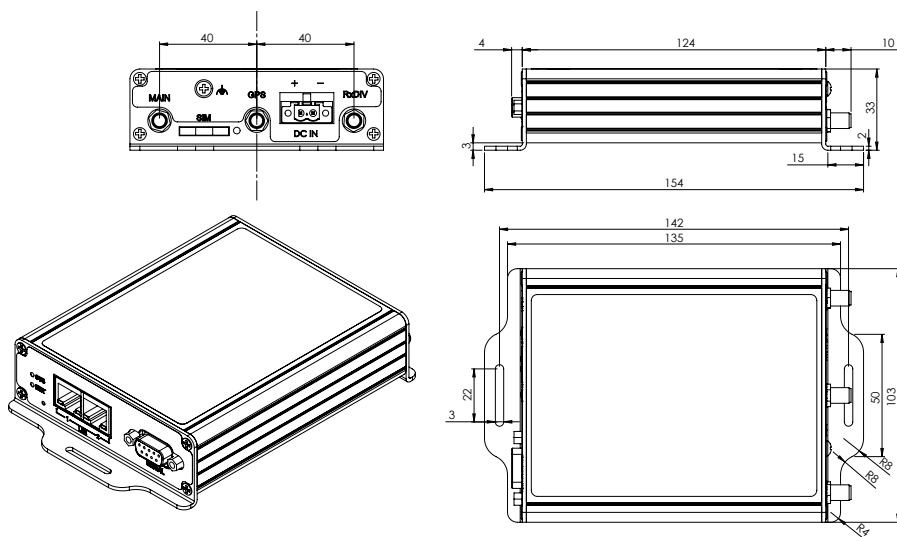


Figure 3. Dimensional drawing MRD-415

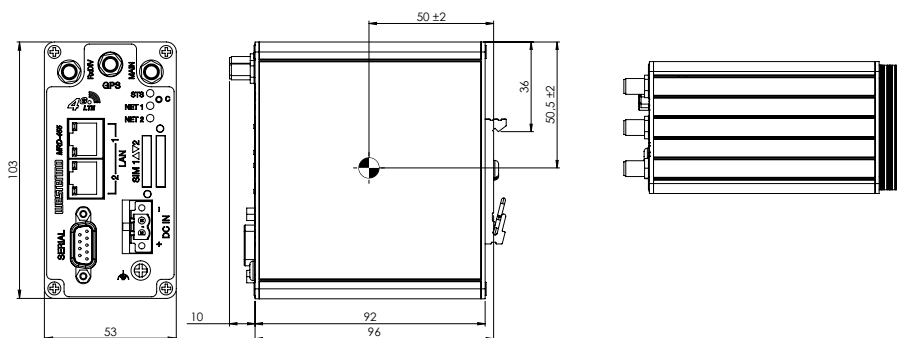


Figure 4. Dimensional drawing MRD-455

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. It is recommended that the DIN-rail is connected to ground. Snap on the product to the DIN-rail according to the figure.

The MRD-415 includes an integrated mounting flange and can be attached to a panel or tray by means of screws, using the slots provided. Alternatively, it can be DIN rail mounted, using the DIN rail mounting kit.

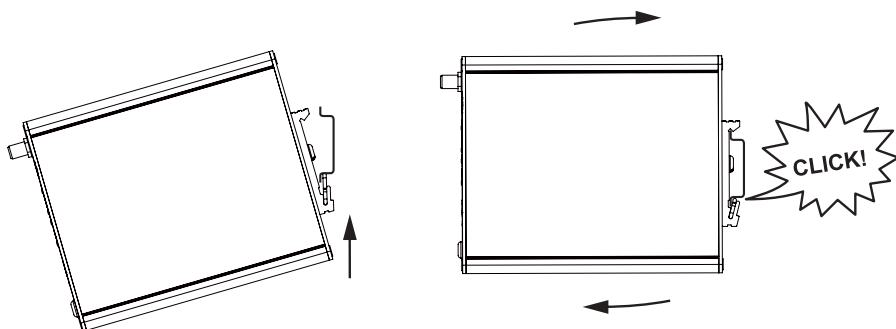


Figure 5. Mounting of product

4.2. Power Supply

The MRD requires a DC power source in the voltage range of 10 to 60 VDC. The product is designed to self-protect from permanent damage if the voltage exceeds 60 VDC or if reverse polarity is applied. The product may need to be returned for service if this occurs.

The product can also be damaged if there is any potential difference between the chassis-ground, RS-232 signal ground, power (–) input, or antenna shield. Before connecting any wiring, ensure all components are earthed to a common ground point. An external isolator will be required if a positive earth power supply is used.

4.3. Antennas

The units have three antenna connectors (SMA). Please ensure that the connecting nut is done up tightly in order to make a good connection.

4.4. 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.

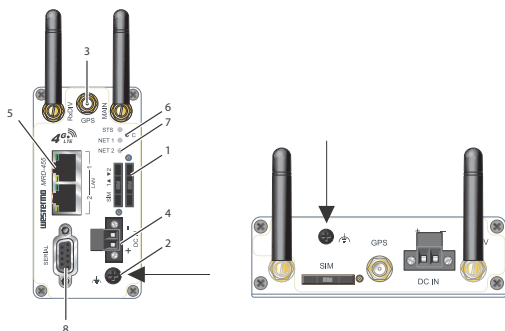


Figure 6. Earth connection

4.5. Cooling

This product uses convection cooling. Make sure that the unit is installed such as its ambient temperature is within its specified maximum/minimum temperature. Spacing is recommended for the use of the product in full operating temperature range and service life. To avoid obstructing the airflow around the product, use the following spacing rules.

Minimum spacing of 25 mm (1 inch) above/below and 10 mm (0.4 inches) left/right of the product is recommended.

The product should be mounted in a clean and dry location, protected from water, excessive dust, corrosive fumes, extremes of temperature and direct sunlight. Allow sufficient ventilation to ensure adequate cooling of the product.

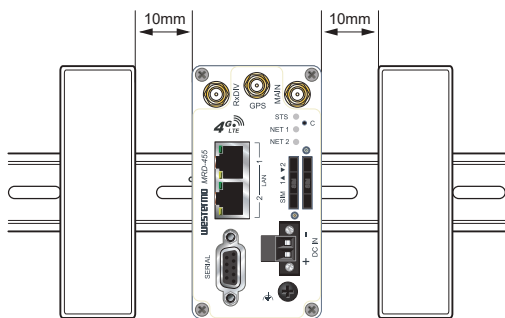
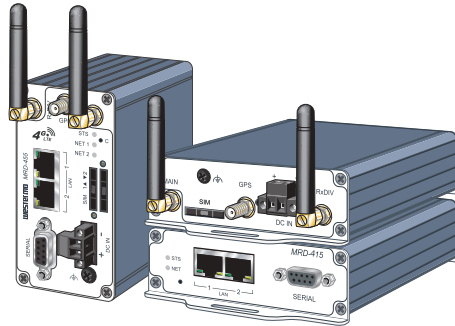


Figure 7. Minimum spacing of product

4.6. Installing the SIM Card

1. To eject the SIM card drawer, press the SIM card eject button using a suitable tool and remove the drawer, refer to figure for the location of the SIM card eject button.
2. Insert the SIM card into the SIM card drawer with the contacts facing up, let chamfered corners align.

- Slide the drawer back into the unit ensuring that it locks into place.



No.	Description
1	SIM card drawer eject button



NOTE

Before removing or inserting the SIM card, ensure that the power has been turned off and the power connector has been removed from the MRD.

4.7. Getting Started

All configuration of the product can be done via the web interface. In order to view the web pages, a computer with a fixed IP address, on the same sub-net as the product, will need to be connected to one of the LAN ports.

The default IP settings of the product are:

IP Address: 192.168.2.200

Netmask: 255.255.255.0

Note: The DHCP server of the unit is by default disabled.

4.7.1. Accessing the MRD

- Open a web browser on the PC and browse to <http://192.168.2.200> (the default MRD IP address).
- A login box will popup. If the box fails to display, re-check the cable connections to the unit and the IP address settings of the PC.
- Enter the following login details:

Username: *admin*

Password: *westermo*

The Status summary page will be displayed.

4.8. Factory Default Reset Switch

The reset switch is used to restore the configuration of the MRD to factory default settings. The switch is accessed through a small hole on the rear of the unit adjacent to the power connector.

To reset the configuration:

1. Power down the unit.
2. Use a suitable tool and depress the reset switch.
3. Power up the unit ensuring the switch remains depressed for approximately 10 seconds after power is applied. The STS LED and NET LED will flash twice to indicate a reset.
4. The router will now re-boot as normal with the factory default settings.



NOTE

Using the Factory default reset switch will erase all existing configuration settings and restore the factory default settings. This includes the network connection profile settings APN, user name and password.

5. Specifications

5.1. Protocols and Functionality

DC, Power port	
Ethernet technologies	IEEE 802.3 for 10BaseT IEEE 802.3u for 100BaseTX
Serial port technologies	RS-232 Serial Over IP (Serial Extender and Virtual Serial Port) Router emulation AT command interpreter MODBUS DNP3
Layer-2 QoS	IEEE 802.1p Class of Service
IP routing, firewall, VPN and cybersecurity	Static IP routing Dynamic IP routing - RIPv1/v2 VRRP GRE Stateful inspection Firewall/ACL, NAT, Port Forwarding 25 x IPsec VPN, PSK and X.509 ^a 1 x L2TP client 1 x PPTP client 1 x OpenVPN/SSL VPN client RADIUS PPP Dial in/Dial out
Manageability	Management tools: web interface (HTTP and HTTPS), Command Line Interface (CLI) via SSHv2 and TELNET, SNMPv1/v2c/v3, SMS Control Flexible alarm/event handling system Syslog (log files and remote syslog server) SNTP (NTP client) DHCP client DHCP server DDNS (Dynamic DNS update client)

^a25 x Configurable IPsec VPNs, processing power in relation to traffic over VPN sets limitation on number of VPNs.

5.2. Interface Specifications

DC, Power port	
Rated voltage	12 - 48 VDC
Operating voltage	10 - 60 VDC
Rated frequency	DC
Startup current	Maximum 400 mA
Polarity	Reverse polarity protected
Isolation	All other ports ^a
Connector	Detachable screw terminal
Shielded cable	Not required

^aOnly applicable for MRD-455 and MRD-455-AU

Ethernet TX	
Electrical specification	IEEE std 802.3
Data rate	10 Mbit/s, 100 Mbit/s, auto
Duplex	Full or half, auto
Circuit type	SELV
Transmission range	100 m/328 ft
Isolation	All other ports
Connection	RJ-45, auto MDI/MDI-X
Cabling	Shielded cable is not required, except when installed in railway applications as signalling and telecommunications apparatus and located close to rails ^a .
Conductive chassis	Yes
Number of ports	2

^aOnly applicable for MRD-455 and MRD-455-AU

RS-232	
Electrical specification	EIA RS-232
Data rate	300 bit/s - 115.2 kbit/s
Data format	7 or 8 data bits, odd, even or none parity, 1 or 2 stop bits
Protocol	Transparent, optimised by packing algorithm
Circuit type	SELV
Transmission range	15 m/49 ft
Connection	9 pin D-sub female
Shielded cable	Not required
Conductive chassis	Yes
Number of ports	1

Cellular interface	MRD-415 frequency bands (MHz)	MRD-455 frequency bands (MHz)	MRD-455-AU frequency bands (MHz)
2G	GSM 900, DCS 1800	GSM 900, DCS 1800	GSM 900, DCS 1800
3G	B1 (2100), B3 (1800), B8 (900)	B1 (2100), B5 (850), B8 (900)	B2 (1900), B8 (850)
4G	B1 (2100), B3 (1800), B7 (2600), B8 (900), B20 (800), B28A (700)	FDD: B1 (2100), B3 (1800), B5 (850), B7 (2600), B8 (900), B20 (800) TDD: B38 (2600), B40 (2300), B41 (2500)	FDD: B1 (2100), B2 (1900), B3 (1800), B4 (1700), B5 (850), B7 (2600), B8 (900), B28 (700) TDD: B40 (2300)
Category	LTE Cat. 1	LTE Cat. 4	LTE Cat. 4

5.3. Type Tests and Environmental Conditions

Environmental phenomena	Basic standard	Description	Test levels
ESD	EN 61000-4-2	Enclosure	Contact: ± 6 kV Air: ± 8 kV
RF field AM modulated	IEC 61000-4-3	Enclosure	10 V/m (80-2700 MHz)
Fast transients	EN 61000-4-4	Signal ports	MRD-415: ± 1 kV MRD-455(-AU): ± 2 kV
		Power ports	± 2 kV
Surge	EN 61000-4-5	Signal ports	MRD-415: ± 1 kV (Crit. B) MRD-455(-AU): ± 2 kV
		Power ports	MRD-415: ± 0.5 kV (Crit. B) MRD-455(-AU): ± 2 kV
Conducted RF immunity	EN 61000-4-6	All ports	10 V (0.15-80 MHz)
Conducted magnetic fields	EN 61000-4-8	Only MRD-455(-AU)	10 A/m
DC voltage dips	EN 61000-4-29		12 VDC and 24 VDC up to 300 ms (A), 1s (B)
Radiated RF emission	CISPR 16-2-3 ANSI C63,4 (FCC part 15)	Enclosure	Class B
Conducted RF emission	CISPR 16-2-1 ANSI C63,4 (FCC part 15 b)	Signal ports	Class B
		Power ports	

Table 8. EMC and electrical conditions

Environmental phenomena	Basic standard	Description	Test levels
Temperatures	EN 60068-2-1 EN 60068-2-2	Operational	-40 to +70°C
		Storage and transport	-40 to +85°C
Humidity	EN 60068-2-30	Operational	0-95% relative humidity
		Storage and transport	
Altitude		Operational	2000 m/80 kPa
Service life		Operational	10 years
MTBF	MIL-217F		MRD-415: 1 367,000 hours MRD-455: 911,000 hours MRD-455-AU: 1 139,000 hours
Vibration	IEC 61373		
Enclosure		Aluminium	
Weight			MRD-415: 0.3 kg MRD-455(-AU): 0.4 kg
Degree of protection	EN 60529	Enclosure	IP40
Cooling			Convection

Table 9. Environmental and mechanical conditions

6. Revision Notes

Revision	Date	Change description
Rev. J	2023-02	2.5.1 Agency Approvals and Standards Compliance updated (Safety)
Rev. I	2022-12	Illustrations of product updated to the new blue colour. 3.2 Available models updated (MRD-455-AU), 5.2. Interface Specifications updated (DC, Power port, Cellular interface and frequency bands), 5.3 Type Tests and Environmental Conditions (MTBF hours for MRD-455-AU added)
Rev. H	2021-11	Westermo logo updated, products MRD-315 and MRD-355 deleted from user guide, new information structure throughout the manual. Agency approval and standards compliance EN/IEC 60950-1 deleted.

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