westermo

www.westermo.com


# Ibex-RT-630-5G Series

EN 50155 5G and WLAN Router

IBEX

# 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.

## 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. For Ibex products, outdoor installation is allowed.

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 $mm^2$.

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**

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.

**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.

**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.

**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.

This product complies with Touch Temperature Limits throughout its operational temperature range.

**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.

**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.

**NOTE**
Devices not used shall be kept in the factory sealed moisture barrier bag. Open, unsealed devices should not be kept unpowered for more than 30 days.

## 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

**REGULATORY NOTICE**

Any changes or modifications shall be approved by the party responsible for compliance. If not, users could void the user's authority to operate the equipment. Country code and antenna gain need to be set properly for correct functionality in the installed country.

### 2.5.1. Agency Approvals and Standards Compliance

| Approvals and Standards | |
|---|---|
| Climate | • EN 50155, class OT4 Railway applications - Electronic equipment used on rolling stock |
| EMC | • EN 50155, Railway applications - Electronic equipment used on rolling stock<br>• EBA EMV 06, German Federal Railway Authority, Radio compatibility of rail vehicles<br>• EN 50121-3-2, Railway applications – Electromagnetic compatibility, Part 3-2: Rolling stock – Apparatus<br>• ETSI EN 301 489-1, Electromagnetic compatibility (EMC) and Radio spectrum Matters (ERM) for radio equipment and services - Part 1: Common technical requirements<br>• ETSI EN 301 489-17, Electromagnetic compatibility (EMC) and Radio spectrum Matters (ERM) for radio equipment - Part 17: Specific conditions for Broadband Data Transmission Systems<br>• ETSI EN 301 489-19, Electromagnetic Compatibility (EMC) standard for radio equipment and services - Part 19: Specific conditions for Receive Only Mobile Earth Stations (ROMES) operating in the 1,5 GHz band<br>• ETSI EN 301 489-24, Electromagnetic compatibility (EMC) and Radio spectrum Matters (ERM) for radio equipment and services - Part 24: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA) for Mobile and portable (UE) radio and ancillary equipment<br>• ETSI EN 301 489-52, Electromagnetic Compatibility (EMC) standard for radio equipment and services - Part 52: Specific conditions for Cellular Communication Mobile and portable (UE) radio and ancillary equipment |
| Mechanical (Shock and vibration) | • EN 61373 category 1, class A and B<br>• EN 60068-2-27, 100 $m/s^2$, 30 ms<br>• MIL STD 810G Method 516.7, 10 g, 11 ms |
| Insulation (Coordination and test) | • EN 50124-1, Railway applications – Insulation coordination<br>• EN 50155, Railway applications - Electronic equipment used on rolling stock |
| Radio communication | • ETSI EN 300 328, Wideband transmission systems; Data transmission equipment operating in the 2.4 GHz ISM band and using wide band modulation techniques<br>• ETSI EN 301 893, 5 GHz RLAN<br>• ETSI EN 300 440, Short Range Devices (SRD)<br>• ETSI EN 301 908-1, IMT cellular networks, Part 1: Introduction and common requirements<br>• ETSI EN 301 908-13, IMT cellular networks, Part 13: Evolved Universal Terrestrial Radio Access (E-UTRA)<br>• 3GPP LTE Advanced standard<br>• 3GPP Release 16 - 5G NSA/SA<br>• IEEE802.11, Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications |
| Safety | • IEC EN 61010-1, Safety Requirements for electrical equipment for measurement, control, and laboratory use<br>• EN 45545-2, Fire protection on railway vehicles |

### 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 Ibex-RT-630-5G a mobile 5G router for onboard usage in trains, trams, locomotives, mining vehicle and bus applications. The router offers outstanding performance and rugged internet connectivity back-up to enable hybrid train-to-ground installations with a single device. It makes full use of the 5G cellular networks and 2.4 and 5 GHz WLAN bands.

The device utilizes a high performance GNSS receiver with concurrent reception of up to 4 GNSS signals from GPS, Galileo, GLONASS or BeiDou systems.

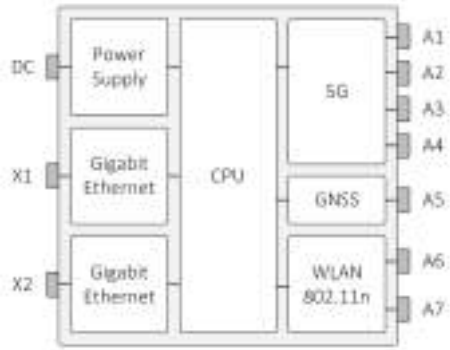



*Figure 3. Ibex-RT-630-5G block diagram*

The Westermo configuration management tool, WeConfig, can be used for discovery and basic configuration and maintenance. The configuration can be done via SNMP or via WebGUI. The status information is available in local LED status indicators, and through SNMP/WebGUI.

The Mobile Communication Gateway (MCG) router is designed to withstand the tough onboard environmental conditions and can be remotely managed using web browser or SNMP management tools. The MCG provides advanced firewall functionalities and high-performance VPN connectivity.

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

The is engineered to maintain uninterrupted data communication, even in exceptionally harsh environments. Tested and certified to withstand extreme temperatures, vibrations and shocks, these routers 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.

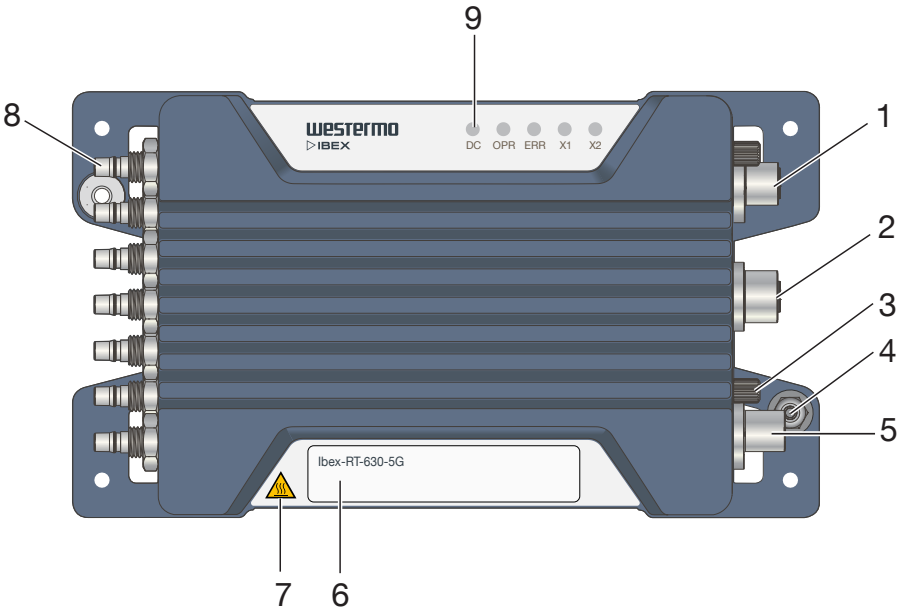
## 3.2. Available models

| Art. no. | Model | Region | PoE Port | Rated current |
|---|---|---|---|---|
| 3629-06301 | Ibex-RT-630-5G-LV EU | Europe | X2 | 24 VDC |

*Table 2. List of available models*

## 3.3. Hardware Overview

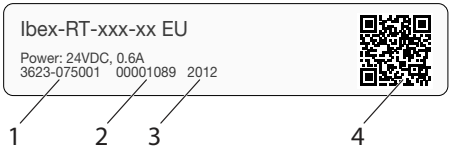
### 3.3.1. Frontside Overview




| No. | Description | | |
|---|---|---|---|
| 1 & 2 | Gigabit Ethernet ports X1 and X2 | 3 | SIM card slot |
| 4 | Protective earth terminal | 5 | Power input DC |
| 6 | Frontside label | 7 | Warning symbol for surface temperatures above +60°C |
| 8 | Antenna ports A1 - A7 | 9 | LED indicators |

*Table 3. Location of interface ports and LED indicators*

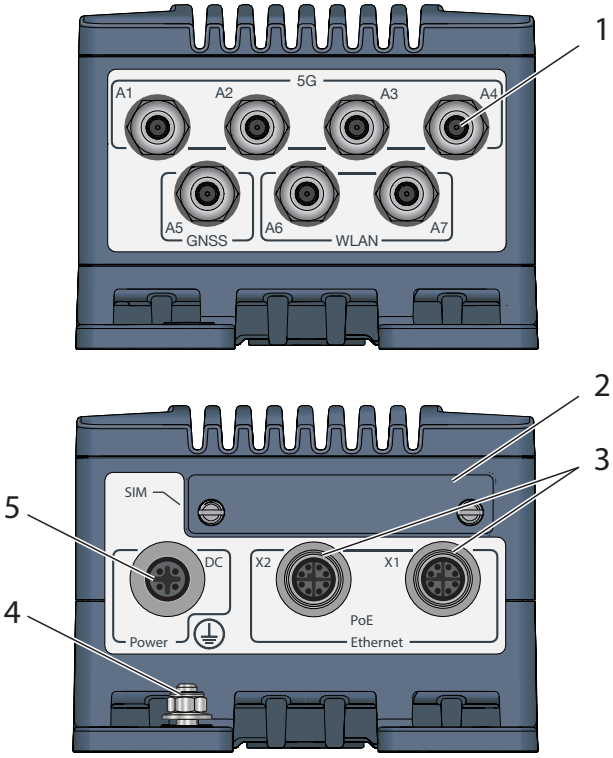
### 3.3.2. Front Side Label




| No. | Description | Remarks |
|---|---|---|
| 1 | Article number | Example of article number |
| 2 | Serial number | Example of serial number |
| 3 | Manufacturing date | The Date Format is: YYWW<br>YY = Manufacturing Year<br>WW = Manufacturing Week |
| 4 | QR code | The data matrix is: AAAAAAAAARR-1-VV-SSSSSSSS-YYWW<br>AAAAAAAAA = Article number<br>RR = Region code<br>VV = Product revision<br>SSSSSSSS = Serial number<br>YY = Manufacturing Year<br>WW = Manufacturing Week |

*Table 4. Front side label*

### 3.3.3. Interface Ports View




| No. | Description | No. | Description |
|---|---|---|---|
| 1 | Antennas | 2 | SIM |
| 3 | 1000Base-T | 4 | Grounding point |
| 5 | Power | | |

*Table 5. Interface ports view*

## 3.4. Connector Information

### 3.4.1. Power Input Connection

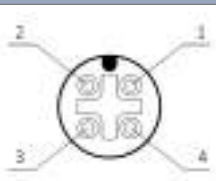
| Marking | Position | Direction | Description | |
|---|---|---|---|---|
| DC | 1 | +DC | Positive terminal |  |
| | 2 | - | | |
| | 3 | -DC | Negative terminal | |
| | 4 | - | | |
| | Housing | Shield | Chassis of product (ground) | |



*Table 6. M12 A-coded 4-pin male power connector according to IEC 61076-2-101*

**NOTE**
If the product is powered by PoE, the protective dust cap which is part of the delivery must be closed to protect the power interface from water or dust ingress.

### 3.4.2. SIM Card Slot

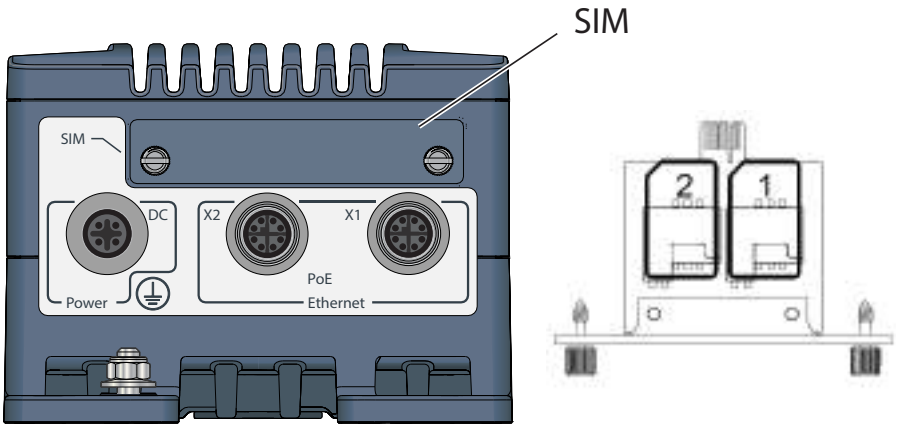



*Figure 4. SIM card slot*

To remove the SIM card drawer, untighten the two knurled screws until they are loose and not anymore connected to the unit frame. Carefully move the drawer out of the frame. Place the SIM cards into the sockets in slot 1 and/or slot 2 with the contacts facing down. Let chamfered corners align according markings on the drawer.

Put the SIM card drawer back into the unit, ensuring that it fits into place and tighten the knurled screws on both sides until the drawer is fully inserted and plane with the unit frame.

**NOTICE**
To use the device in its specified temperature range it is important to use a robust industrial SIM card with extended temperature range.

**NOTICE**
In order to guarantee proper IP against dust and water, please check carefully that the drawer is fully inserted and screws are properly tightened.

**NOTICE**
Before removing and inserting the SIM drawer, ensure that power has been turned off by removing the power connector from the unit.

**NOTE**
The sim cards must be fully inserted into the sockets until the mechanical stop.

**NOTE**
The product supports two SIM cards with the restriction that only one SIM card is active.

### 3.4.3. Ethernet Ports

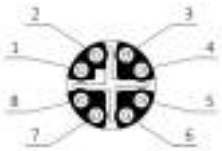
| Marking | Position | Direction | Description | |
|---|---|---|---|---|
| X1/X2 | 1 | In/Out | DA+ |  |
| | 2 | In/Out | DA- | |
| | 3 | In/Out | DB+ | |
| | 4 | In/Out | DB- | |
| | 5 | In/Out | DD+ | |
| | 6 | In/Out | DD- | |
| | 7 | In/Out | DC- | |
| | 8 | In/Out | DC+ | |
| | Housing | Shield | Chassis of product (ground) | |

*Table 7. M12 X-coded 8-pin female Ethernet connector according to IEC 61076-2-109*

| Position | Device mode A | Device mode B |
|---|---|---|
| 1 | +DC | |
| 2 | +DC | |
| 3 | -DC | |
| 4 | -DC | |
| 5 | | -DC |
| 6 | | -DC |
| 7 | | +DC |
| 8 | | +DC |

*Table 8. Ethernet PoE connection on X2*

**NOTE**
If the Ethernet function is not used, the protective dust cap which is part of the delivery must be closed to protect the interface from water or dust ingress.

### 3.4.4. Antenna Ports

The antenna connectors are identified on the product with A1 to A7. QMA industrial standard connector is used.

A1 to A4 are used for 5G communication. It is recommended to use all 4 antenna ports.

A6 and A7 are used for WLAN communication. At least A6 must be connected to an external WLAN antenna. The antenna configuration is made through the software interface.

A5 is used for the included GNSS receiver. The antenna port must be connected to an external GNSS antenna.

**NOTICE**
Any unused antenna ports must be properly terminated with 50 Ohm, otherwise the product might be damaged when power is applied to a non-terminated antenna port.

**NOTE**
To ensure specified IP protection, suitable QMA connectors/cables and terminations must be used.

## 3.5. LED Indicators


*Figure 5. LED indicators*

| LED | Description |
|---|---|
| DC | Power status |
| OPR | Operation status |
| ERR | Error status |
| X1 | Ethernet status for X1 port |
| X2 | Ethernet status for X2 port |

*Table 9. LED indicators*

**NOTE**
Refer to management guide for detailed LED status indication.

## 3.6. Dimensions

Dimensions are stated in mm and are regardless of variants.

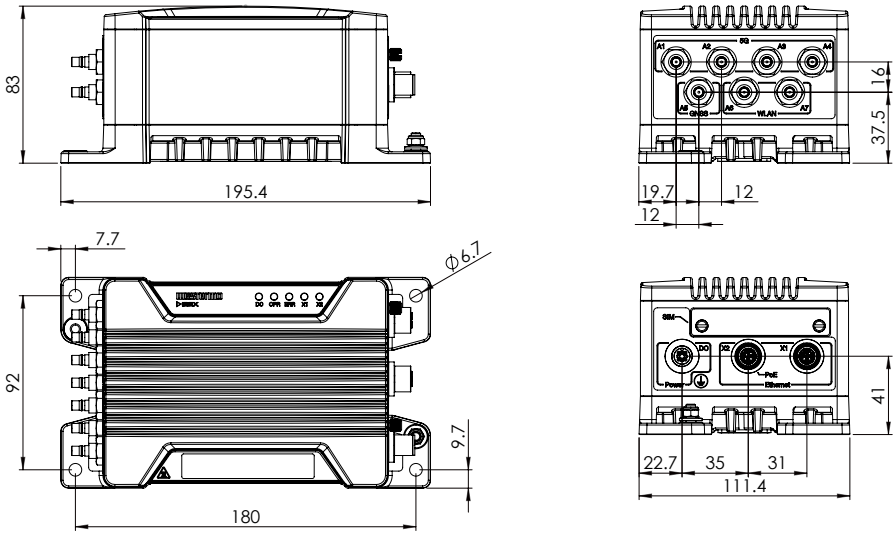



*Figure 6. Dimensional drawing*

# 4. Installation

## 4.1. Mounting

The product is fixed with the four fixing points located at the corners of the product. M5 or M6 screws are used for the fixation of the product. The screws are tightened with min. 3.0 Nm (fixing screw ISO 898/1, quality class 8.8).

**NOTICE**
All four specified fixing points must be used for fixing. The installation surface should be flat to have all fixing points connected to the surface.

**NOTE**
For indoor installation, consider additional protection against dust to ensure proper heat dissipation.

**NOTE**
For outdoor installation, consider additional protection against sun radiation, dust and dirt to optimize ambient temperature range.

**NOTE**
Unused connectors must be covered by a protective cap (delivered with the product), tightened to the specified torque in order to fulfill the specified ingress protection code.

## 4.2. Factory Reset

To reset the product into factory default settings, a reset adapter is needed which is plugged into one of the Ethernet ports X1 or X2 during startup.

| Art. no. | Description |
|---|---|
| 3623-0799 | Factory Reset Plug, X-coded |

***Factory reset procedure***

1. Plug the factory reset adapter to one of the Ethernet interfaces.

2. Power the product.
3. Wait until factory reset adapter is detected. This is indicated by solid RED ON LED.
4. Remove factory reset adapter within 15 seconds.
5. Successful initiation of the factory reset is indicated by blinking RED ON LED.

### 4.3. Earth connection

For correct function, the earth connection at the grounding point needs to be properly connected to a solid ground. An M5 grounding screw at the housing is used for grounding. A short wire with a cross section of at least 4 mm2 shall be used. The grounding wire is set below the rip-lock washer. The nut is fixed for good reliable grounding contact. The tightening torque of the nut shall be 2.0 Nm.

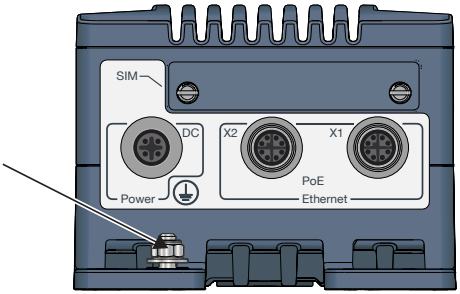



*Figure 7. Earth connection*

**NOTICE**
Do not use equipment without protective earth connection.

### 4.4. Connection of Cables

Recommended tightening torque for the M12 connectors is 0.6 Nm. All M12 connections are screw connections.

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

**NOTE**
This product has no replaceable fuse and should be connected via an external fuse for protection.

## 4.5. Cooling

This product uses 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 product.

It is recommended to install the product in areas where the natural convection airflow is not blocked and that there is enough spacing around the product.

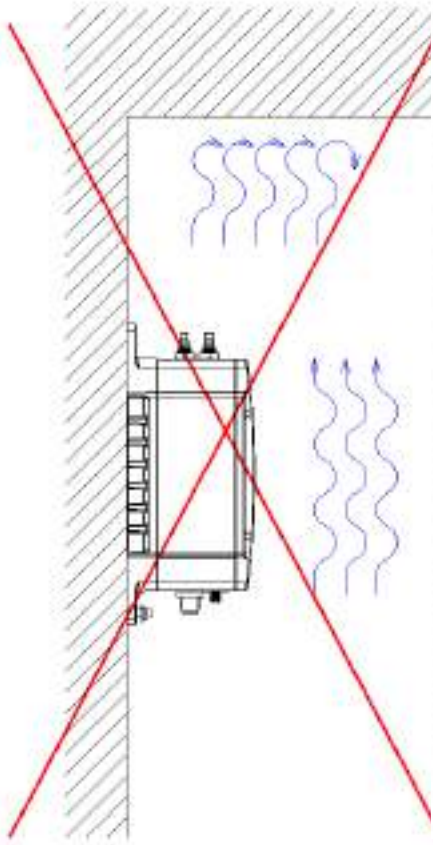


*Figure 8. Installation with reduced natural convection airflow*

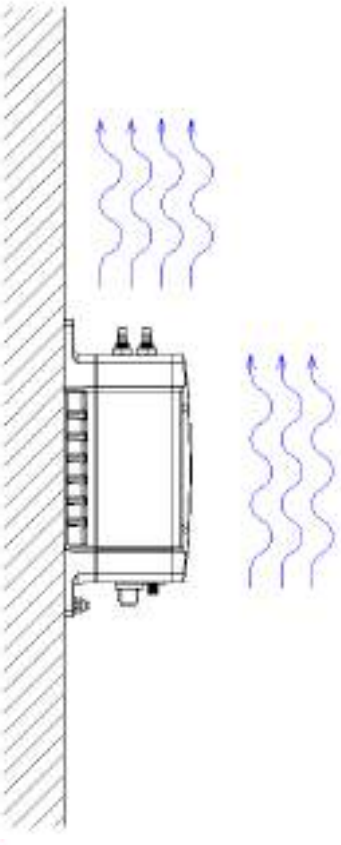


*Figure 9. Installation with natural convection airflow*

When operating the product at high ambient temperatures, it is recommended to mount the product to a metallic base plate to improve the heat dissipation. The base plate increases the surface to spread the heat.

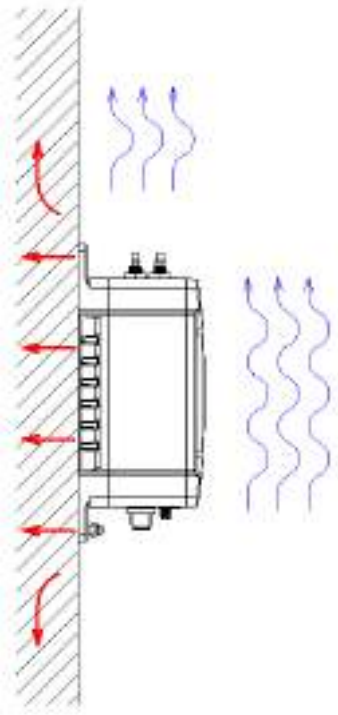


*Figure 10. Improved heat transfer based on fixing plate and natural convection*

**NOTICE**
Limited air flow is rising the product temperature and may lower the upper limit of the operating temperature range.

**NOTICE**
Temperature is dependent on the operational parameters, like RF output power, amount of traffic.

**NOTICE**
This product has integrated temperature sensors for monitoring the internal device temperatures. If temperature limits are exceeded, alarms are sent through the SW interface.

**NOTICE**
The operating conditions shall be ensured so that the normal operation does not cause temperature alarms. Improve installation conditions or RF parameters in case of any temperature alarms.

### 4.6. Replacement of Product

The device cannot be repaired. In case of a malfunction, it must be replaced.

Disconnect all cables and unscrew the product from the wall. Mount the replacement product and reconnect all cables, observing the instructions in Connection of Cables.

MTTR (Mean Time To Repair), i.e. time for replacement of product is: < 10 minutes.

**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.

This product complies with Touch Temperature Limits throughout its operational temperature range.

# 5. Specifications

## 5.1. Interface Specifications

| DC, Power port | |
|---|---|
| Connector | M12 A-coded male |
| Rated voltage | 24 VDC |
| Operating voltage | 16.8 to 31.2 VDC |
| Rated current | 0.6 A |
| Rated frequency | DC |
| Inrush current | 44 $mA^2s$ at 24 VDC |
| Startup current | 2 x rated current |
| Polarity | Reverse polarity protected |
| Redundant power input | No |
| Conductor cross section (flexible) | > 0.5 $mm^2$ (AWG 20) |
| Cable temperature rating | -40 to +70°C |
| Shielded cable | Not required |

| PoE (on X2 only) | |
|---|---|
| Connector | M12 X-coded female |
| Device mode | A and B |
| Rated voltage | 48 VDC |
| Operating voltage | 42.5 to 57 VDC |
| Power classification | Class 4 |

| Ethernet TX | |
|---|---|
| Connector | M12 X-coded female |
| 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 |
| Transmission range | Up to 100 m with CAT5e cable or better |
| Cabling | Shielded cable CAT5e or better is recommended |
| Conductive chassis | Yes |

**NOTE**
The product is to be connected to internal Ethernet networks without exiting a facility and being subjected to TNVs.

**NOTICE**
To avoid damages on the Ethernet interfaces, ensure that the far end side of the Ethernet cable shield itself is connected to protective earth.

| SIM card | |
|---|---|
| SIM type | Mini-SIM 2FF |
| Recommended temperature rating | Industrial grade |

| Antenna WLAN (A6 and A7) | |
|---|---|
| Connector | QMA female |
| Direction | Transmit and receive |
| Cabling | 50 Ohm coaxial cable and WLAN antenna required |
| Conductive chassis | Yes |
| WLAN interface | High-power 2x2 MIMO 802.11n Access Point/Client |
| WLAN frequency bands | 2.400 to 2.4835 GHz, 5.150 to 5.350 GHz, 5.470 to 5.725 GHz, 5.725 to 5.850 GHz |
| Transmitting power | Max. conducted combined transmit power within the whole frequency range:<br>1 port: BPSK...16QAM: 22 dBm, 64QAM: 20 dBm<br>2 ports: BPSK...16QAM: 25 dBm, 64QAM: 23 dBm |

**NOTICE**
Depending on the installation country there are frequency/band restrictions and output power limitations.

| Antenna 5G (A1 to A4) | |
|---|---|
| Connector | QMA |
| Direction | Transmit and receive |
| Cabling | 50 Ohm coaxial cable and 5G antenna required |
| Conductive chassis | Yes |
| Mobile interface | 4x4 MIMO 5G , sub 6GHz, LTE fallback DL Cat 19 / UL Cat 18, UMTS WDMCA, 3GPP Release 16 NSA/SA operation |
| Mobile frequency bands | **5G NR SA:**<br>n1/n2/n3/n5/n7/n8/n12/n13/n14/n18/n20/n25/n26/n28/n29/n30/n38/n40/n41/n48/n66/n70/n71/n75/n76/n77/n78/n79<br>**5G NR NSA:**<br>n1/n2/n3/n5/n7/n8/n12/n13/n14/n18/n20/n25/n26/n28/n29/n30/n38/n40/n41/n48/n66/n70/n71/n75/n76/n77/n78/n79<br>**LTE-FDD:**<br>B1/B2/B3/B4/B5/B7/B8/B12/B13/B14/B17/B18/B19/B20/B25/B26/B28/B29/B30/B32/B66/B71<br>**LTE-TDD:** B34/B38/B39/B40/B41/B42/B43/B48<br>**LAA:** B46 (TDD)<br>**UMTS-WCDMA:** B1/B2/B4/B5/B8/B9/B19 |
| MIMO | **5G-SA**<br>DL 4 × 4 MIMO: n1/n3/n7/n38/n40/n41/n77/n78<br>UL 2 × 2 MIMO: n38/n40/n41/n77/n78<br>**5G-NSA**<br>DL 4 × 4 MIMO: n1/n3/n7/n38/n40/n41/n77/n78<br>**LTE**<br>DL 4 × 4 MIMO: B1/B3/B7/B38/B40/B41/B42/B43 |
| Transmitting power | Class 3 (23 dBm) for 5G NR bands<br>Class 2 (26 dBm) for 5G NR HPUE bands (n38/n40/n41/n77/n78/n79)<br>Class 1.5 (29 dBm) for 5G NR HPUE2 bands (n41/n77/n78/n79)<br>Class 3 (23 dBm) for LTE bands<br>Class 2 (26 dBm) for LTE HPUE bands (B38/B41/B42/B43)<br>Class 3 (24 dBm) for WCDMA bands |
| Antenna mapping | **A1:**<br>*5G NR:*<br>- Reframed: LB[a.] TX0/PRX & MHB[b.] TX0/PRX & UHB[c.] TX1/DRX<br>- n41 TX0/PRX<br>- n77/n78[d.]/n79[e.] TX1/DRX<br>*LTE:* LB TX0/PRX & MHB TX0/PRX & UHB TX1/DRX<br>*WCDMA:* LMB TRX<br><br>**A2:**<br>*5G NR:*<br>- Reframed: MHB PRX MIMO & UHB PRX MIMO<br>- n41 PRX MIMO<br>- n77/n78/n79 PRX MIMO<br>*LTE:* MHB PRX MIMO & UHB PRX MIMO & LAA[f.] PRX<br><br>**A3:**<br>*5G NR:* |

| Antenna 5G (A1 to A4) | |
|---|---|
| | - Refarmed: MHB TX1[g]/DRX MIMO & UHB TX0/PRX<br>- n41 TX1/DRX MIMO<br>- n77/n78/n79 TX0/PRX<br>*LTE:* MHB TX1[g]/DRX MIMO & UHB TX0/PRX<br><br>A4:<br>*5G NR:*<br>- Refarmed: LB TX1 / DRX & MHB DRX & UHB DRX MIMO<br>- n41 DRX<br>- n77/n78/n79 DRX MIMO<br>*LTE:* LB TX1/DRX & MHB DRX & UHB DRX MIMO & LAA DRX<br>*WCDMA:* LMB DRX |

[a] 617–960 MHz
[b] 1452–2690 MHz
[c] 3400–3800 MHz
[d] n77/n78: 3300–4200 MHz
[e] n79: 4400–5000 MHz
[f] 5150-5925 MHz
[g] MHB TX1 will be active when supporting Sub 2.6 GHz EN-DC

| Antenna GNSS (A5) | |
|---|---|
| Connector | QMA |
| Direction | Receive |
| LNA supply voltage | Max. 3.7 VDC (DC voltage for active antenna) |
| LNA supply current | Max. 70 mA (DC current for active antenna) |
| Cabling | 50 Ohm coaxial cable and GNSS antenna required |
| Conductive chassis | Yes |
| GNSS receiver | GPS: L1C/A<br>SBAS: L1C/A: WAAS, EGNOS, MSAS<br>QZSS: L1C/A/S<br>GLONASS: L1OF<br>BeiDou: B1I<br>Galileo: E1B/C |
| Supported GNSS constellations | Concurrent GPS, GLONASS, Galileo and BeiDou plus SBAS and QZSS reception[a] |
| Sample rate | 25 Hz (independent of the GNSS constellation) |
| Protocols | NMEA 4.10/4.11, UBX |

[a] SBAS and QZSS are only active in combination with GPS

**NOTICE**
Unused antenna port must be terminated with 50 Ohm terminations.

**NOTICE**
To avoid damages on the antenna interfaces, ensure that the far end side of the antenna cable and/or the antenna itself is connected to protective earth.

**NOTE**
External GNSS LNA is recommended to improve sensitivity.

## 5.2. Type Tests and Environmental Conditions

| Environmental phenomena | Basic standard | Description | Test levels |
|---|---|---|---|
| ESD | EN 61000-4-2 | Enclosure | Contact: ±6 kV<br>Air: ±8 kV |
| Fast transients | EN 61000-4-4 | DC power port | ± 2 kV, direct coupling |
| | | Ethernet ports | ± 2 kV, capacitive coupling clamp |
| | | Antenna ports | |
| Surge | EN 61000-4-5 | DC power port | L-E: ± 1 kV, 12 Ω, 9 µF, 1.2/50 µs<br>L-E: ± 2 kV, 42 Ω, 0.5 µF, 1.2/50 µs<br>L-L: ± 1 kV, 12 Ω, 9 µF, 1.2/50 µs<br>L-L: ± 2 kV, 42 Ω, 0.5 µF, 1.2/50 µs |
| | | Ethernet ports | L-E: ± 1 kV, 2 Ω, 18 µF, 1.2/50 µs |
| | | Antenna ports | |
| Power frequency magnetic field | EN 61000-4-8 | Enclosure | 300 A/m continues, DC, 16.7 Hz, 50 Hz, 60 Hz |
| Radiated RF immunity | EN 61000-4-3 | Enclosure | 20 V/m, 80% AM (1kHz) at 80 MHz to 6 GHz<br>30 V/m, PM 200 Hz square at 380 MHz to 385 MHz<br>30 V/m, PM 200 Hz square at 390 MHz to 395 MHz<br>3 V/m, PM 200 Hz square at 104, 136, 165, 200, 260, 330, 430, 560, 715 ±1, 920 ±1 MHz |
| Conducted RF immunity | EN 61000-4-6 | DC power port | 10 V, 80% AM (1 kHz) from 0.15 to 80 MHz |
| | | Ethernet ports | |
| | | Antenna ports | |
| Radiated RF emission | EN 55032 | Enclosure | Class B |
| Conducted RF emission | EN 55032 | DC power port | Class B |
| | | Ethernet ports | |
| Insulation resistance | EN 50155 | Power port (DC) to all other ports | > 100 MOhm |
| Dielectric strength | EN 50155 | Power port (DC) to all other ports | 750 VDC, 60 s |

*Table 10. EMC and electrical conditions*

| Environmental phenomena | Basic standard | Description | Test levels |
|---|---|---|---|
| Temperatures | EN 60068-2-1<br>EN 60068-2-2<br>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 |
| | | Storage and transport | |
| Altitude | | Operational | 2000 m |
| MTBF | IEC TR 62380 | | 283'858 hours |
| Vibration | EN 60068-2-64 (random) | Operational, endurance test | 2.3 $m/s^2$ random, 5 to 2000 Hz, 3 x 4 h |
| | EN 60068-2-64 (random) | Operational, endurance test | 11.44 $m/s^2$ random, 5 to 150 Hz, 3 x 5 h |
| Shock[b.] | EN 60068-2-27 | Operational | 100 $m/s^2$, 30 ms, 3 x 6 shocks (half sine) |
| | MIL STD 810, M516.7 | | 10 g, 11 ms, 3 x 6 shocks (saw tooth) |
| Weight | | | 1650 gr |
| Degree of protection | EN 60529 | Enclosure | IP66[c.] |
| Cooling | | | Convection |
| Pollution degree | EN 61010-1 | | PD2 |
| Conformal coating type | IPC-A-610 | Electronic modules | AR (Acrylic) |

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

[b.] The power and Ethernet cables need to be fastened 200 mm or closer to the unit. The same recommendation applies to the Antenna cables.

[c.] Provided all connectors are connected with IP66 cabling or fitted with protective caps (delivered with the unit) and tightened to the specified torque

*Table 11. Environmental and mechanical conditions*

# 6. Abbreviations and Terms

| Abbreviation | Description |
|---|---|
| 3GPP | 3rd Generation Partnership Project |
| 5G | 5th GenerationStandard for Wireless Broadband Communication |
| AM | Amplitude Modulation |
| AREMA | American Railway Engineering and Maintenance-of-Way Association |
| AWG | American Wire Gauge |
| BeiDou | Chinese Global Positioning System |
| BPSK | Binary Phase Shift Keying |
| CA | Carrier Aggregation |
| CAT5e | Category 5 Enhanced Cable |
| CE | Conformité Européenne |
| CPU | Central Processing Unit |
| DC | Direct Current |
| DL | Down Link |
| DRX | Discontinuous Reception |
| EMC | Electromagnetic Compatibility |
| EN | European Standard |
| ERR | Error |
| ESD | Electro Static Discharge |
| ETSI | European Telecommunications Standards Institute |
| FCC | Federal Communication Commission |
| FDD | Frequency Division Duplex |
| FLOSS | Free/Libre Open Source Software |
| Galileo | European Global Positioning System |
| GNSS | Global Navigation Satellite System |
| GLONASS | Russian Global Positioning System |
| GPS | US Global Positioning System |
| IEC | International Engineering Consortium |
| IC | Industry Canada |
| ID | Identification |
| IMT | International Mobile Telecommunications |
| I/O | Input / Output |
| IP | Ingress Protection |

| Abbreviation | Description |
|---|---|
| ISO | International Standardization Organisation |
| LAA | License Assisted Access |
| LAN | Local Area Network |
| LB | Low Band |
| LED | Light Emitting Diode |
| LMB | Low-mid Band |
| LTE | Long Term Evolution (4G) Standard for Wireless Broadband Communication |
| LV | Low Voltage |
| MHB | Mid-high Band |
| MIMO | Multiple Input, Multiple Output |
| MTBF | Mean Time between Failure |
| MTTR | Mean Time to Repair |
| NR | New Radio |
| NSA | Non Stand Alone |
| OPR | Operation |
| PM | Pulse Modulated |
| PoE | Power over Ethernet |
| PRX | Primary Reception |
| QMA | Quick-connect RF Connectors |
| QR | Quick Response |
| QZSS | Quasi-Zenith Satellite System |
| RF | Radio Frequency |
| SA | Stand Alone |
| SBAS | Satellite-Based Augmentation System |
| SIM | Subscriber Identity Module |
| SN | Serial Number |
| SNMP | Simple Network Management Protocol |
| TDD | Time Division Duplex |
| TNV | Telephone Network Voltage |
| TRX | Transmitter / Receiver |
| UHB | Ultra-high Band |
| UL | Up Link |
| UMTS | Universal Mobile Telecommunications System |
| VPN | Virtual Private Network |
| WCDMA | Wideband Code Division Multiple Access |

| Abbreviation | Description |
|---|---|
| WebGUI | Web Graphical User Interface |
| WeConfig | Westermo Configuration Tool |
| WEEE | Waste Electrical and Electronics Equipment |
| WLAN | Wireless Local Area Network |

*Table 12. Abbreviations and terms*

# 7. Revision Notes

| Revision | Date | Change description |
|---|---|---|
| Rev. A | 2023-12 | First revision |

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