

BoltGPU 10-31

AI and Machine Vision Subsystem
for Rolling Stock and Automotive

EN

Hardware manual

Original instructions

Document code: BTGPU-10-31_HWM_EN_0-7

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FOR SAFE AND PROPER USE,
FOLLOW THESE INSTRUCTIONS.
KEEP THEM FOR FUTURE REFERENCE.

Intended audience of this document

This document is intended for **system integrators**. System integrator is a term applied to skilled persons who are specialized in linking together, physically or functionally, different computing systems and software applications to operate as a coordinated whole in compliance with the applicable regulations.

Skilled person is a term applied to persons who have training or experience in the equipment technology, particularly in knowing the various energies and energy magnitudes used in the equipment. Skilled persons are expected to use their training and experience to recognize energy sources capable of causing pain or injury and to take action for protection from injury from those energies. Skilled persons should also be protected against unintentional contact or exposure to energy sources capable of causing injury.

How to get technical support

To get technical support, refer to: <https://www.eurotech.com/en/support>.

The following resources are available:

- Support Portal: <https://support.eurotech.com/>
- Download Area: <https://www.eurotech.com/download>
- RMA (Return Merchandise Authorization): <https://www.eurotech.com/en/support/rma>

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Revision history

Revision	Description	Date of Issue
0-1	First draft release	2022.09.09
0-2	Second draft release. Inserted information from "feedback 1"	2022.09.16
0-3	Third draft release. Updated: <ul style="list-style-type: none"> • LEDs information • Power supply specifications • CAN and Digital I/O specifications 	2022.09.30
0-4	Fourth draft release. Updated sections: <ul style="list-style-type: none"> • 7.1 "Earth connection terminal" • 10.3.2 "How to supply power and turn ON the product" 	2023.02.01
0-5	Fifth draft release. Updated section: <ul style="list-style-type: none"> • 4.2.2 "Intended use" 	2023.02.02
0-6	Sixth draft release. Updated sections: <ul style="list-style-type: none"> • 5.4.1 "FCC marking" • 5.6 "Antennas list" • 6.3.3.1 "TTL Serial Console connector specifications" 	2023.03.02
0-7	Seventh draft release. Updated sections: <ul style="list-style-type: none"> • 4.4 "Product labels" • 5.4.5 "FCC labeling information" • 5.5.4 "ISED labeling information" 	2023.04.27



HOW TO GET STARTED

To get started with the BoltGPU 10-31, complete this procedure:

1. Read carefully and understand the instructions and warnings contained in this Hardware manual.

To lower the risk of personal injury, electric shock, fire, or damage to equipment, observe the instructions and warnings contained in this manual.

For more information, refer to: "[Safety-related information](#)" on page 7.

If you have questions about these instructions, refer to: <https://www.eurotech.com/en/support>.

2. Know the BoltGPU 10-31 and its interfaces.

For more information, refer to:

- "[Product overview](#)" on page 15
- "[Technical specifications](#)" on page 18
- "[Interfaces overview](#)" on page 29

3. Install the BoltGPU 10-31.

For more information, refer to:

- "[Mechanical specifications](#)" on page 47
- "[Product installation](#)" on page 49

4. Supply power to the BoltGPU 10-31 respecting all safety instructions.

For more information, refer to: "[Product power supply](#)" on page 53

5. Start developing your IoT applications.

The BoltGPU 10-31 supports the Eurotech Everyware Software Framework (ESF). ESF is a smart application container that enables the remote management of IoT gateways, and gives a wide range of APIs that allows you to write and deploy your own IoT application.

For more information, refer to:

- <http://esf.eurotech.com/docs>.

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1 SAFETY-RELATED INFORMATION

This chapter gives the following information:

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1.1 Important information

For safe and proper use, obey these instructions. Keep them for future reference.

Failure to obey these instructions, violates the standards of safety, design, manufacture, and intended use of the product.





Eurotech assume no liability for damages caused by failure to obey these instructions.

If you have questions about these instructions, refer to: <https://www.eurotech.com/en/support>.

Additional safety-related information is given in the following chapters.

1.2 Explanation of messages

This Hardware manual uses these messages:

	<p style="text-align: center;">DANGER</p> <p>Indicates a hazardous situation that, if not avoided, will result in death or serious injury. Indicates how to avoid the hazardous situation.</p>
	<p style="text-align: center;">WARNING</p> <p>Indicates a hazardous situation that, if not avoided, could result in death or serious injury. Indicates how to avoid the hazardous situation.</p>
	<p style="text-align: center;">CAUTION</p> <p>Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury. Indicates how to avoid the hazardous situation.</p>
	<p style="text-align: center;">NOTICE</p> <p>Used to address practices not related to physical injury.</p>

1.3 Safety instructions

1.3.1 Power supply safety instructions



WARNING

Risk of electric shock. Failure to supply power correctly could result in death or serious injury, and could damage the equipment or other property.
Refer to **"What to do before you supply power to the product"** below.

1.3.1.1 *What to do before you supply power to the product*

Before you supply power to the product, obey the following safety instructions:

- Make sure that you have understood any instructions for safety, installation, and for operation
- Make sure that your hands are dry
- Make sure that all the cables to use:
 - meet the product requirements and comply with the relevant standards and regulations
 - are in good condition
 - are placed with care
 - are not placed where they may be trampled or compressed
- Make sure that all power-points and plugs:
 - are in good condition
 - are not overloaded
- Make sure that the product has a proper grounding connection
- Make sure that the power supply source meets the product requirements and complies with the relevant standards and regulations
- Make sure that the product installation is made correctly and in compliance with the relevant standards and regulations
- Make sure that you supply power only after the product installation is completed.

If you have questions about these instructions, refer to: <https://www.eurotech.com/en/support>.

1.3.2 Wireless safety instructions

Install the product's antennas with care:

1. **Make sure that the antennas are at least 20 cm away from nearby persons**
2. Make sure that the equipment (product with antennas installed) do not cause interferences with other electronic devices.

If you cannot obey these instructions, make sure that the equipment is assessed to be compliant with the SAR (Specific Absorption Rate) regulations.

1.3.3 Product handling safety instructions: product's surfaces may be hot



CAUTION

If the product is used at high temperatures, its surfaces become hot. Burn hazard.
Before you touch the product's surfaces, make sure that they are cold.

2 CONSIGNES DE SÉCURITÉ

Ce chapitre fournit les informations suivantes:

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2.1 Informations importantes

Pour une utilisation sûre et correcte, suivre ces instructions. Les conserver pour référence ultérieure.

Le non-respect de ces instructions constitue une violation des normes de sécurité, de conception, de fabrication et d'utilisation prévue du produit.





Eurotech rejette toute responsabilité pour les dommages causés en cas de non-respect de ces instructions.

En cas de doutes sur ces instructions, consultez le site: <https://www.eurotech.com/fr/support>.

Des informations supplémentaires liées à la sécurité sont fournies dans les chapitres suivantes.

2.2 Explication des messages

Ce Hardware manual utilise les messages suivants:

	<p style="text-align: center;">DANGER</p> <p>Indique une situation dangereuse qui, si elle n'est pas évitée, entraînera la mort ou un préjudice grave. Indique comment éviter la situation dangereuse.</p>
	<p style="text-align: center;">AVERTISSEMENT</p> <p>Indique une situation dangereuse qui, si elle n'est pas évitée, pourrait entraîner la mort ou un préjudice grave. Indique comment éviter la situation dangereuse.</p>
	<p style="text-align: center;">ATTENTION</p> <p>Indique une situation dangereuse qui, si elle n'est pas évitée, pourrait entraîner un préjudice mineur ou modéré. Indique comment éviter la situation dangereuse.</p>
	<p style="text-align: center;">AVIS</p> <p>Utilisé pour traiter les pratiques non liées à des blessures physiques.</p>

2.3 Instructions de sécurité

2.3.1 Précautions de sécurité pour l'alimentation électrique



AVERTISSEMENT

Risque de choc électrique. Une alimentation électrique incorrecte peut causer la mort ou des blessures graves, et peut endommager l'équipement ou d'autres biens.
Voir "**Que faire avant d'alimenter le produit en électricité**" en dessous.

2.3.1.1 Que faire avant d'alimenter le produit en électricité

Avant d'alimenter le produit, respectez les consignes de sécurité suivantes:

- S'assurer que vous avez compris toutes les instructions relatives à la sécurité, à l'installation et au fonctionnement.
- S'assurer que vos mains sont sèches
- S'assurer que tous les câbles à utiliser:
 - Sont conformes aux exigences du produit et aux normes et réglementations en vigueur
 - Sont en bon état
 - Sont placés avec soin
 - Ne sont pas placés dans des endroits où ils peuvent être piétinés ou compressés
- S'assurer que toutes les prises de courant et les connecteurs d'alimentation :
 - Sont en bon état
 - Ne sont pas surchargés
- S'assurer que le produit est correctement relié à la terre
- S'assurer que la source d'alimentation électrique répond aux exigences du produit et est conforme aux normes et réglementations en vigueur.
- Branchez l'alimentation uniquement après avoir terminé l'installation du système
- S'assurer que l'installation du produit est effectuée correctement et en conformité avec les normes et réglementations en vigueur
- S'assurer de ne fournir l'alimentation qu'une fois l'installation du produit terminée.

En cas de doutes sur ces instructions, consultez le site: <https://www.eurotech.com/fr/support>.

2.3.2 Instructions de sécurité pour les communications sans fil

Installez avec soin les antennes utilisées avec ce produit, **en évitant toute interférence avec d'autres appareils électroniques et en maintenant une distance des personnes supérieure à 20 cm**. Si ces exigences ne peuvent être satisfaites, évaluez le produit final par rapport aux réglementations SAR.

2.3.3 Instructions de sécurité pour la manipulation du produit: les surfaces du produit peuvent devenir chaudes



ATTENTION

Si le produit est utilisé à des températures élevées, ses surfaces deviennent chaudes.
Risque de brûlure.
Avant de toucher les surfaces du produit, assurez-vous qu'elles sont froides.

3 TECHNICAL TERMS AND GRAPHICAL SYMBOLS

This chapter gives the following information:

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3.1 Technical terms (acronyms, abbreviations)

The following technical terms (acronyms, abbreviations) can be used in this manual:







Les termes techniques suivants (acronymes, abréviations) peuvent être utilisés dans ce manuel:

Term Terme	Meaning Signification
GND	Ground <i>Terre</i>
#	Active low signal <i>Signal bas actif</i>
+	Positive signal; Positive signal in differential pair <i>Signal positif ; signal positif dans la paire différentielle</i>
-	Negative signal; Negative signal in differential pair <i>Signal négatif ; Signal négatif dans la paire différentielle</i>
3.3	3.3 V signal level <i>Niveau de signal 3,3 V</i>
5	5 V signal level <i>Niveau de signal de 5 V</i>
I	Signal is an input to the system <i>Le signal est une entrée du système</i>
O	Signal is an output from the system <i>Le signal est une sortie du système</i>
IO	Signal may be input or output <i>Le signal peut être une entrée ou une sortie</i>
P	Power and Ground <i>Alimentation et terre</i>
A	Analog signal <i>Signal analogique</i>
NC	No Connection <i>Absence de connexion</i>
R	Use is reserved to Eurotech <i>L'utilisation est réservée à Eurotech</i>
Reserved	

3.2 Graphical symbols

The following graphical symbols can be used in this manual:

Les symboles graphiques suivants peuvent être utilisés dans ce manuel:

Symbol Symbole	Meaning Signification
	Alternating current (AC) <i>Courant alternatif (CA)</i>
	Direct current (DC) <i>Courant continu (CC)</i>
	Earth; ground <i>Mise à la terre</i>
	Functional earthing; functional grounding (US) <i>Mise à la terre fonctionnelle</i>
	Protective earth; protective ground <i>Mise à la terre de protection (PE)</i>
	Dangerous voltage <i>Tension dangereuse</i>

4 PRODUCT OVERVIEW

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4.1 Product description

The BoltGPU 10-31 is a rugged subsystem that has been designed to deliver GPU acceleration to Rolling Stock and Automotive applications.

Based on NVIDIA Jetson Xavier NX, it combines a 6-core, high-performance ARM CPU with a 384-core GPU and 48 Tensor Cores, offering exceptional power efficiency and up to 21 TOPS of accelerated computing.

The BoltGPU 10-31 is a power efficient, stand-alone unit that enables traditional and GPU-accelerated workloads in harsh environments, and comes with Automotive and Rolling Stock certifications, such as EN 50155, EN 45545 and E-Mark.

With a very complete set of high-speed interfaces, the BoltGPU 10-31 can be used to process multiple video streams from high speed, high frame rate cameras: it provides 3x GbE, 4x GMSL and 3x USB3.1 Gen 2 ports (noise and surge protected) that can be used to connect sensors and to create sophisticated networking architectures. Wireless connectivity is also cutting edge, thanks to Wi-Fi 5, Bluetooth 5.0 and support for optional - global LTE modem.

The BoltGPU 10-31 offers plenty of storage capacity for video and other data via an internal NVMe unit; removable storage is also supported via a microSD interface.

On-vehicle features include isolated CAN-FD and opto-isolated DIO, a GNSS with Untethered Dead Reckoning (optionally RTK), and rugged M12 connectors.

Other transportation and heavy-duty enablers include a wide range power input (24 to 110 V DC, EN 50155) with ignition sense and EN 50155 OT3 operating temperature range.

For customers seeking a tailored product, Eurotech offers a range of personalization and full customization options, ranging from branding ("skins" and color) to deep HW/SW configurations.

For more information visit www.eurotech.com.

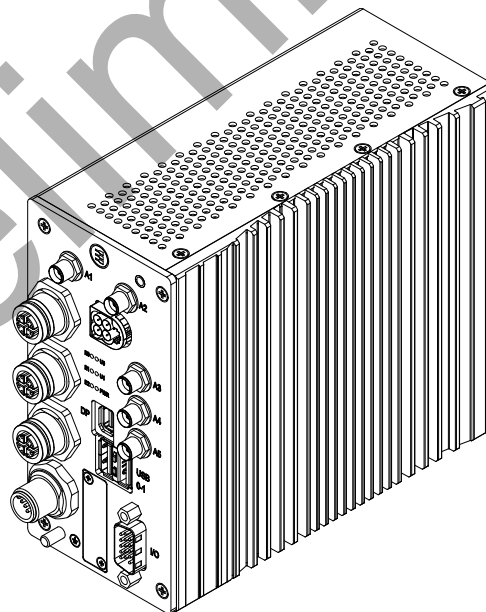


Fig. 1 - The BoltGPU 10-31

4.2 Intended use and not allowed uses of the product

The product is intended for professional use and must be installed by qualified personnel only.

The product must be installed in a secured location, accessible to authorized personnel only (for example in a cabinet / technical compartment).

4.2.1 Deterministic output notice

	NOTICE
This product is not intended to be physically or logically connected to an automation process.	

4.2.2 Intended use

The BoltGPU 10-31 is a rugged subsystem that has been designed to deliver GPU acceleration to Rolling Stock and Automotive applications.

The BoltGPU 10-31 must:

- Be installed in a secured location, only accessible to authorized personnel (for example in a cabinet/ technical compartment), and not exposed to atmospheric agents
- Be used indoors, in railway or in automotive applications*
- Be used with appropriate interconnecting and power cables
- Be used with an external DC power supply source that:
 - meets the requirements stated on the identification label of the product
 - meets the requirements of the product variant in use, refer to "[Power supply specifications](#)" on page 54
 - includes an external fuse on the line coming from the positive terminal of the DC power source (a 4 A fuse is appropriate).

* Before using the BoltGPU 10-31 in automotive applications in any EU Member State, switch-OFF the Wi-Fi bands 5150 MHz – 5250 MHz and 5745 MHz – 5825 MHz.

4.2.3 Not allowed uses

Do not use the BoltGPU 10-31:

- In defence applications
- Outdoors
- In safety-critical applications
- In environments with potentially explosive atmospheres
- If not installed according to the instructions and warnings contained in this document.

When used in automotive applications in any EU Member State, do not use the BoltGPU 10-31 with the following Wi-Fi bands enabled: 5150 MHz – 5250 MHz and 5745 MHz – 5825 MHz.

4.3 Technical specifications

The BoltGPU 10-31 family has the following technical specifications:

Ordering Code: BTGPU-10-31-xx				
Specifications		Product Variants		
		-21	-24	-25
NVIDIA MODULE	Core	NVIDIA® Jetson Xavier NX™		
	CPU	6-core NVIDIA Carmel ARM® v8.2 64-bit CPU 6 MB L2 + 4 MB L3		
	GPU	384-core NVIDIA Volta™ GPU with 48 Tensor Cores		
MEMORY	RAM	16 GB 128-bit LPDDR4x, 59.7 GB/s		
STORAGE	Embedded	16 GB eMMC 5.1		
	NVMe	-	512 GB on M.2 Key M	
	Additional Storage	Micro SD Slot (User Accessible)		
I/O INTERFACES	Ethernet	3x 10/100/1000 Mbps - M12		
	USB 3.0	2x Host USB3.1 Gen.2 (Noise and Surge Protected) - Type A		
	Serial	1x TTL Serial Console		
	CAN	1x CAN-FD (Isolated) - DB9		
	Digital I/O	2x Digital Inputs Optoisolated 2x Digital Outputs Optoisolated		
	Video OUT	1x Video Output (DisplayPort)		
CAMERA INPUT	Camera IN	4x GMSL (1.5Gbps to CSI-2)		
RADIO INTERFACES	Wi-Fi/BT Radio	-	Wi-Fi (IEEE 802.11 a/b/g/n/ac) + BT5.0 (BLE and ANT+)	
	Cellular Radio	Factory Option		Global LTE Cat. 4
	GNSS	-	Internal (72 channels BeiDou, Galileo, GLONASS, GPS, QZSS) - Untethered Dead Reckoning (RTK GNSS - Factory Option)	
EXPANSIONS	M.2 Key B	1x M.2 Key B (3042, 3052) - (USB3.1, USB2, PCIe x1)		
	M.2 Key E	1x M.2 Key E (1630, 2230, 3030) - (PCIe x1, USB2.0, SDIO, I2C, I2S) - Used for Wi-Fi/BT		
	M.2 Key M	1x M.2 Key M (2242, 3042, 2280) - (PCIe x4) - Used for NVMe		
	Side Connector	PCIe x4 Endpoint Mode +12 V Power Input; PCIe x4 Shared with M.2 Key M		
OTHER	RTC	Yes (SuperCAP Backed) with Anti-tampering Timestamp		
	Discrete Watchdog	Yes		
	Serial EEPROM on I2C	256 Kbit		
	TPM	Internal TPM 2.0		
	Sensors	Internal Temperature		
	LED Indicators	1x Power (Blue) 1x Cellular Activity (Green) 4x User Configurable (2x Green, 2x Amber)		
MISC	Buttons	1x Reset		
	Anti-Tamper Detection	Yes		
	SIM Slot	Yes (User Accessible)		
POWER	Power Input	Nominal: 24 to 110 V DC (EN 50155) with Ignition Key Sense		
	Power Consumption	Typ. 18 W, Max. 40 W	Typ. 21 W, Max. 45 W	Typ. 23 W, Max. 48 W
ENVIRONMENT	Operating Temperature	EN 50155 OT3		
	Storage Temperature	-40 to +85 °C		
	Humidity	RH 5 to 95% Operating Non-Condensing (40 °C)		



Ordering Code: BTGPU-10-31-xx				
Specifications		Product Variants		
		-21	-24	-25
CERTIFICATIONS	Regulatory	CE, FCC, ISED		
	Safety	EN 62368, UL 60950 (§)		
	Vertical	EN 50155, EN 45545, E-Mark		
	Environmental	RoHS3, REACH		
	Wi-Fi/BLE Radio	-	RED, FCC, ISED	
	Cellular Radio	-		RED, FCC, ISED
	Ingress Protection	IP 40		
MECHANICAL	Dimensions	66 x 132 x 150 mm (W x H x D) - Connectors and DIN Rail Mounting Clip Excluded		

(§) UL, NRTL Listing Factory Option

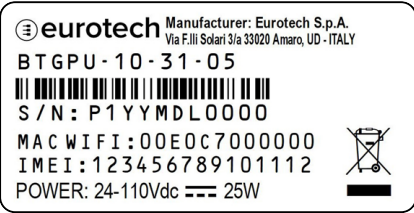



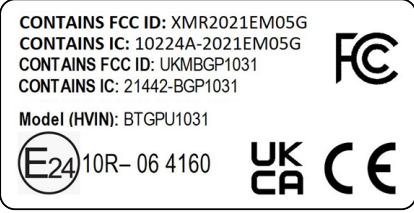



SOFTWARE		
SOFTWARE	OS	Eurotech Everyware Linux
	SDK	Yocto-based Eclipse Tooling, Azul Java
	IoT Framework	Everyware Software Framework (Java/OSGi)

Preliminary




4.4 Product labels

The following labels are placed on the product:

Label example	Label type and content	Label position
 <p> eurotech Manufacturer: Eurotech S.p.A. Via F.lli Solari 3/a 33020 Amaro, UD - ITALY BTGPU-10-31-05  S/N: P1YYMDL0000 MACWIFI: 00E0C7000000 IMEI: 123456789101112 POWER: 24-110Vdc  25W  </p>	Product Label* <ul style="list-style-type: none"> • Eurotech logo • Manufacturer address • Product number (example) • Serial number • MACWIFI number • IMEI number • Power supply specifications** • WEEE mark 	Rear side of the product
 <p> CONTAINS FCC ID: XMR2021EM05G CONTAINS IC: 10224A-2021EM05G CONTAINS FCC ID: UKMBGP1031 CONTAINS IC: 21442-BGP1031 Model (HVIN): BTGPU1031  10R-06 4160   </p>	Certification Label* <ul style="list-style-type: none"> • CONTAINS FCC ID: XMR2021EM05G • CONTAINS IC: 10224A-2021EM05G • CONTAINS FCC ID: UKMBGP1031 • CONTAINS IC: 21442-BGP1031 • Model (HVIN): BTGPU1031 • Regulatory marks* 	Rear side of the product

* Information included in the label depends on the product variant. For more information, refer to: "[Technical specifications](#)" on page 18

** The symbol  stands for direct current

5 CERTIFICATIONS

Note about the Declaration of Conformity

Upon request, Eurotech can provide the product Declaration of Conformity.

For more information, refer to: <https://www.eurotech.com/en/support>.

This chapter gives the following information:

5.1 CE marking	22
5.2 REACH compliance	23
5.3 UKCA marking	23
5.4 FCC compliance	24
5.5 ISED Canada compliance	26
5.6 Antennas list	28

Preliminary



5.1 CE marking

This section applies to all product variants.

This product is CE marked and complies with the essential requirements and other relevant requirements of the directives reported in the following sections.

Eurotech does not approve the use of this product with equipment (for example: power supplies, personal computers, etc.) that is not CE marked and that is not compliant with the requirements specified in this Hardware manual.



5.1.1 Safety

This product complies with the standard EN 62368-1:2014 on the safety requirements in information and communication technology equipment.

5.1.2 RoHS 3 compliance

This product complies with the following Directives:

- Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
- Commission Delegated Directive (EU) 2015/863 of 31 March 2015 amending Annex II to Directive 2011/65/EU of the European Parliament and of the Council as regards the list of restricted substances

5.1.3 Packaging and packaging waste

This product complies with the European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste.

5.1.4 Product disposal and recycling

This product, at the end of its life cycle, must be collected separately and managed in accordance with the provisions of the Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste of electrical and electronic equipment (WEEE).

For more information, refer to: ["The WEEE label"](#) below.

5.1.4.1 The WEEE label

This symbol, placed on the product, indicates that the product at the end of its life cycle must be sent to separate collection facilities for recovery and recycling.

Because of the substances present in the product, improper disposal can cause damage to human health and to the environment.

For collecting and recycling information, refer to: <https://www.eurotech.com/en/support>.



5.1.5 RED compliance

This section applies to all product variants.

This product complies with the Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment.

Modification statement


Eurotech does not approve any changes or modifications to this product by the user. Any changes or modifications could void the user's authority to operate this product.

5.1.5.1 Class II product and EU restrictions on 5 GHz Wi-Fi usage

According to Commission Decision 2000/299/EC of 6 April 2000, establishing the initial classification of radio equipment and telecommunications terminal equipment and associated identifiers, the product falls within the scope of Class II.

Due to EU restrictions on 5 GHz Wi-Fi bands the product is limited to indoor operation and can only be operated in the frequency band 5150 MHz – 5250 MHz (U-NII-1) covering 20 MHz channels (36,40,44,48), 40 MHz channels (38,46), and 80 MHz channel (42).

Dynamic Frequency selection (DFS) as master or subordinate is not supported by the product.

	AT	BE	BG	CH	CY	CZ	DE
	DK	EE	EL	ES	FI	FR	HR
	HU	IE	IT	IS	LI	LT	LU
	LV	MT	NL	NO	PL	PT	RO
	SE	SI	SK	TR	UK(NI)		

5.2 REACH compliance

This product is assessed to be compliant with the regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), with the exceptions allowed by the EU Technical Committee.

Eurotech has set in place a monitoring process to assess compliance to REACH regulation. For details and more information, refer to: <https://www.eurotech.com/en/support>.

5.3 UKCA marking

This section applies to all product variants.

This product is UKCA marked and complies with the relevant UK Statutory Instruments and their amendments:

- 2017 No 1206 The Radio Equipment Regulations 2017
- 2012 No 3032 The Restriction of the Use of Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Eurotech does not approve the use of this product with equipment (for example: power supplies, personal computers, etc.) that is not UKCA marked and that is not compliant with the requirements specified in this Hardware manual.



5.4 FCC compliance

This section applies to all product variants.

5.4.1 FCC marking

This product is FCC marked and complies with the regulatory information reported in the following sections.

Eurotech is not responsible for the use of the product together with equipment (for example: power supplies, personal computers, etc.) that are not FCC marked and not compliant with the requirements specified in this instructions for use.

Cet appareil est certifié FCC et est conforme aux exigences réglementaires décrites dans les sections suivantes.

Eurotech n'est pas responsable de l'utilisation du appareil avec des équipements (par exemple : alimentations, ordinateurs personnels, etc.) non certifiés FCC et qui ne sont pas conformes aux exigences spécifiées dans ce instructions d'utilisation.

Modification statement

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Les changements ou modifications qui ne sont pas expressément approuvés par la partie responsable de la conformité peuvent annuler l'autorité de l'utilisateur à utiliser l'équipement.



5.4.2 FCC compliance: Class B Digital Device

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment 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 equipment 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 equipment 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 product and the 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

Cet appareil est conforme à la partie 15 des règlements de la FCC. L'utilisation est soumise aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Remarque: Cet appareil a été testé et déclaré conforme aux limites d'un appareil numérique de classe B, conformément à la partie 15 des règlements de la FCC. Ces limites sont conçues pour fournir une protection raisonnable contre les interférences nuisibles dans une installation résidentielle.



Cet appareil génère, utilise et peut émettre des ondes radio qui peuvent causer des interférences nuisibles s'il n'est pas installé et utilisé conformément aux instructions.

Si néanmoins cet appareil cause des interférences nuisibles à la réception de la radio ou de la télévision, ce qui peut être déterminé en éteignant et en rallumant l'appareil, l'utilisateur est encouragé à essayer de corriger l'interférence par une ou plusieurs des mesures suivantes:

- *Réorienter ou déplacer l'antenne de réception*
- *Augmenter la distance entre le produit et le récepteur*
- *Brancher l'appareil sur une prise de courant différente de celle à laquelle le récepteur est raccordé*
- *Consulter le revendeur ou un technicien radio/TV expérimenté pour obtenir de l'aide.*

5.4.3 RF radiation exposure statement

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. The antenna should be installed and operated with minimum distance of 20 cm between the radiator and your body.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

Cet appareil est conforme aux limites d'exposition aux rayonnements de la FCC pour un environnement non contrôlé. L'antenne doit être installée de façon à garder une distance minimale de 20 cm entre la source de rayonnements et votre corps.

Cet appareil et son (ses) antenne(s) ne doivent pas être co-localisés ou utilisés en conjonction avec une autre antenne ou un autre émetteur, sauf en conformité avec les procédures du produit multi-émetteur de la FCC.

5.4.4 FCC restrictions on 5 GHz Wi-Fi usage

The product is limited to indoor operation and can only be operated in the frequency bands: 5150 MHz – 5250 MHz and 5745 MHz – 5825 MHz.

Le produit est limité à un fonctionnement en intérieur et ne peut être utilisé que dans les bandes de fréquences 5150 MHz – 5250 MHz et 5745 MHz – 5825 MHz.

5.4.5 FCC labeling information

This device contains:

- FCC ID: UKMBGP1031
- FCC ID: XMR2021EM05G

For the FCC information stated on the product label, see: ["Product labels" on page 20](#).

Cet appareil contient:

- *FCC ID: UKMBGP1031*
- *FCC ID: XMR2021EM05G*

Pour les informations de la FCC indiquées sur l'étiquette du produit, voir: ["Product labels" page 20](#).

5.5 ISED Canada compliance

This section applies to all product variants.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Le présent appareil a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

5.5.1 ISED compliance: Class B Digital Device

ICES-003 Class B Notice - Avis NMB-003, Classe B.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

5.5.2 RF radiation exposure statement

This product complies with ISED radiation exposure limits set forth for an uncontrolled environment. The antenna should be installed and operated with minimum distance of 20 cm between the radiator and your body.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with ISED multi-transmitter product procedures.

This device complies with Health Canada's Safety Code. The installer of this device should ensure that RF radiation is not emitted in excess of the Health Canada's requirement

Cet appareil est conforme aux limites d'exposition aux rayonnements de la ISED pour un environnement non contrôlé. L'antenne doit être installée de façon à garder une distance minimale de 20 cm entre la source de rayonnements et votre corps.

Cet appareil et son (ses) antenne(s) ne doivent pas être co-localisés ou utilisés en conjonction avec une autre antenne ou un autre émetteur, sauf en conformité avec les procédures du produit multi-émetteur de la ISED.

Cet appareil est conforme avec Santé Canada Code de sécurité 6. Le programme d'installation de cet appareil doit s'assurer que les rayonnements RF n'est pas émis au-delà de l'exigence de Santé Canada



5.5.3 ISED restrictions on 5 GHz Wi-Fi usage

The product is limited to indoor operation and can only be operated in the frequency bands: 5150 MHz – 5250 MHz and 5745 MHz – 5825 MHz.

Le produit est limité à un fonctionnement en intérieur et ne peut être utilisé que dans les bandes de fréquences 5150 MHz – 5250 MHz et 5745 MHz – 5825 MHz.

5.5.4 ISED labeling information

This device contains:

- IC : 21442-BGP1031
- IC : 10224A-2021EM05G

For the ISED information stated on the product label, see: "[Product labels](#)" on page 20.

Cet appareil contient:

- IC : 21442-BGP1031
- IC : 10224A-2021EM05G

Pour les informations de la ISED indiquées sur l'étiquette du produit, voir: "[Product labels](#)" page 20.

5.5.5 Responsible parties: Canadian Representative contact information

The Canadian Representative has the following contact information:

Le Représentant Canadien dispose des coordonnées suivantes:

Contact Information	
Company Name	Canadian Certification Consulting, Inc.
Company Number ¹	10842A
Company Address	2210 Horizon Drive, Suite 17
City	West Kelowna
Province/State	BC
Postal Code	V1Z 3L4
Country	Canada
Contact Name	Jon Hughes
Title	President
Phone Number	1-250-575-1719
Email	info@can-cert.com

¹Company Number is issued by Innovation, Science and Economic Development Canada (formerly Industry Canada).

Le numéro d'entreprise est délivré par Innovation, Science et Développement économique Canada (anciennement Industrie Canada)

5.6 Antennas list

The BoltGPU 10-31 has been certified with the following antennas:

Le BoltGPU 10-31 a été certifié avec les antennes suivantes:

Types Types	Manufacturer and Model Fabricant et Modèle	Bands (MHz) Bandes (MHz)	Peak Gain (dBi) Max. Gain (dBi)	VSWR
Wi-Fi/BT	Linx Technologies ANT-DB1-RAF-RPS	2.4 GHz 5 GHz	2.5 4.6	< 1.9
GNSS	2J-ANTENNA 2J4301MPCF	-	28	< 1.4
Cellular	2J-ANTENNA 2JW0124-C868B	700/850/900 1700/1800/1900/2100 2600	0.4 2.6 1.3	~ 2.4 ~ 1.6 ~ 2.2
	2J-ANTENNA 2JW0124Z-C868B	700/850/900 1700/1800/1900/2100 2600	0.4 2.6 1.3	~ 2.4 ~ 1.6 ~ 2.2

5.6.1 Notice for EU

In the EU, antennas must be used in compliance with the RED requirements.

5.6.2 Notice for UK

In the UK, antennas must be used in compliance with the UK RER requirements.

5.6.3 Notice for US

In the US, antennas must be used in compliance with the FCC requirements.

5.6.4 Notice for Canada / Avis pour le Canada

In the Canada, antennas must be used in compliance with the ISED requirements.

Au Canada, les antennes doivent être utilisées conformément aux exigences de la ISED.

6 INTERFACES OVERVIEW

This chapter gives the following information:

6.1 Connectors overview	30
6.2 LED Indicators overview	31
6.3 Service Panel overview	32

Preliminary



6.1 Connectors overview

The connectors are as follows¹:

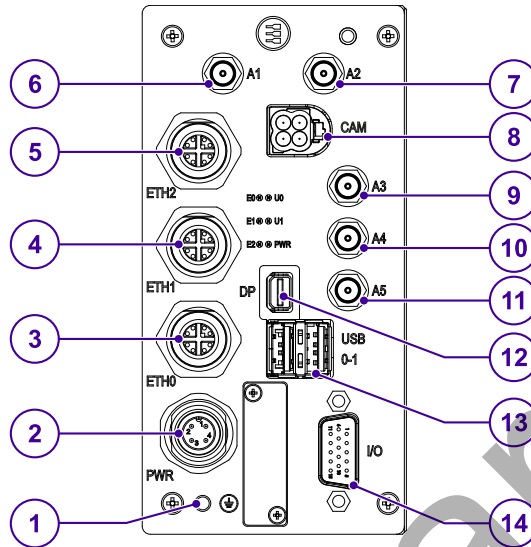



Fig. 2 - Connectors layout

Ref #	Label	Description
1		Earth connection terminal
2	PWR	Power IN connector
3	ETH0	10/100/1000 Mbps Ethernet connector
4	ETH1	10/100/1000 Mbps Ethernet connector
5	ETH2	10/100/1000 Mbps Ethernet connector
6	A1	LTE main antenna connector (SMA Female)
7	A2	LTE diversity antenna connector (SMA Female)
8	CAM	4x GMSL Camera IN connector
9	A3	GNSS antenna connector (SMA Female)
10	A4	Wi-Fi and Bluetooth co-existence main antenna connector (RP-SMA Female)
11	A5	Wi-Fi (MIMO) diversity antenna connector (RP-SMA Female)
12	DP	Video OUT connector (Mini DisplayPort)
13	USB0-1	2x Host USB 3.1 Gen 2 ports (Type A; USB0 on the left; USB1 on the right)
14	I/O	I/O connector. It includes: <ul style="list-style-type: none"> • 2x Digital Inputs Optoisolated • 2x Digital Outputs Optoisolated • 1x CAN-FD Isolated

Tab. 1 - Connectors description

¹Connectors availability depends on product variant. For more information, refer to: "Technical specifications" on page 18.

6.2 LED Indicators overview

The LED Indicators **A** are as follows:

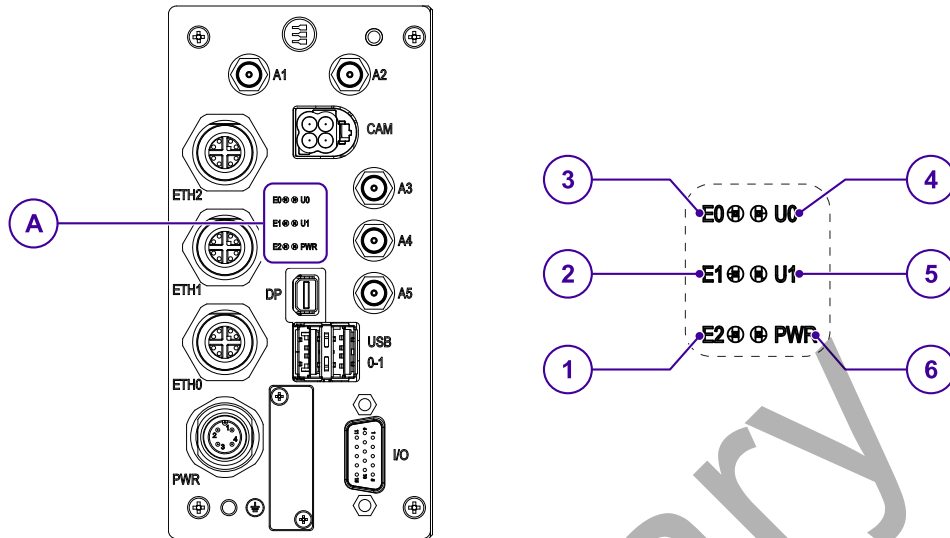


Fig. 3 - LED Indicators layout

Ref #	Label	Description	Color
1	E2	ETH2 status: <ul style="list-style-type: none"> • Amber solid: 1000 Mbit link • Amber blinking: 1000 Mbit activity ongoing • Green solid: 100 Mbit link • Green blinking: 100 Mbit activity ongoing 	Amber/ Green
2	E1	ETH1 status: <ul style="list-style-type: none"> • Amber solid: 1000 Mbit link • Amber blinking: 1000 Mbit activity ongoing • Green solid: 100 Mbit link • Green blinking: 100 Mbit activity ongoing 	Amber/ Green
3	E0	ETH0 status: <ul style="list-style-type: none"> • Amber solid: 1000 Mbit link • Amber blinking: 1000 Mbit activity ongoing • Green solid: 100 Mbit link • Green blinking: 100 Mbit activity ongoing 	Amber/ Green
4	U0	User programmable LED	Amber/ Green
5	U1	User programmable LED	Amber/ Green
6	PWR	Power input presence	Blue

Tab. 2 - LED Indicators description

6.3 Service Panel overview

The Service Panel **A** is placed on the front side of the product and contains the Service Interfaces:

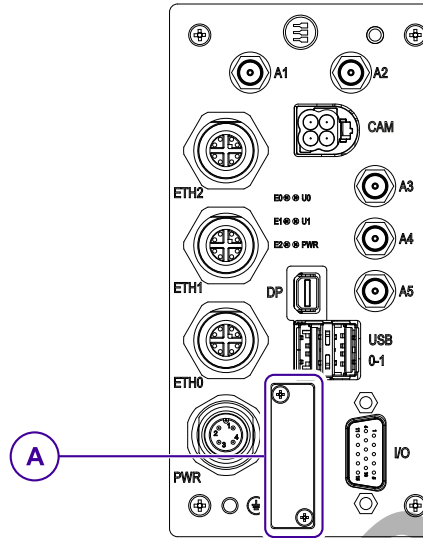



Fig. 4 - Service Panel layout

6.3.1 How to remove the Service Panel cover

NOTICE



The IP rating is not maintained when the Service Panel cover is removed. Do not use the product for long periods with the Service Panel cover removed, otherwise dust and other particulates can go into the system. If you need to have access to the Service Panel for long periods, use appropriate precautions to stop the particulates.

To remove the Service Panel cover, use the tool PH1x60 (or PH1x80) and release the two M2x3 CSK locking screws (see Fig. 5 below):

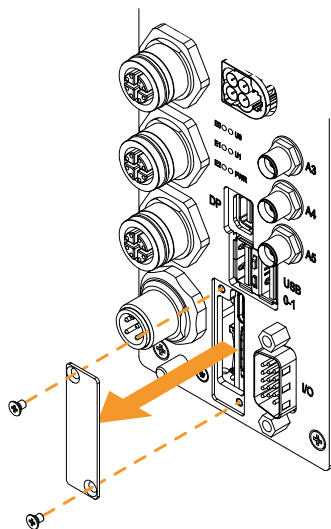


Fig. 5 - How to remove the Service Panel cover



6.3.2 Service Interfaces overview

The Service Interfaces are as follows:

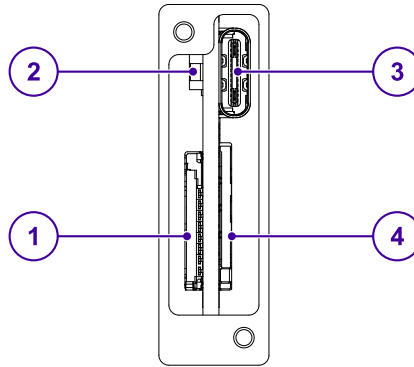


Fig. 6 - Service Interfaces layout

Ref #	Description
1	MicroSD Card Push-push Connector
2	Reset Pushbutton
3	TTL Serial Console (3.3 V TTL compatible) USB Type-C Female Connector
4	MicroSIM Card Push-push Connector

Tab. 3 - Service Interfaces description

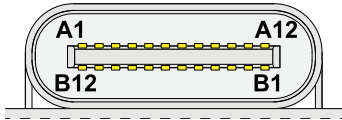
Preliminary

6.3.3 TTL Serial Console

The serial console is provided over a USB Type-C connector via an on-board USB2.0-to-UART adapter.

6.3.3.1 TTL Serial Console connector specifications

Connector Layout:



Connector Specifications:

- USB 2.0 Type-C receptacle

Mating Connector Specifications:

- USB 2.0 Type-C plug

Connector Pinout (pins not listed are reserved):

Pin #	Signal	Type	Description
A1	GND	P	Ground return
A4	V _{BUS}	P	Bus Power
A5	CC1	IO	Configuration Channel
A6	Dp1	IO	Positive half of the USB 2.0 differential pair – Position 1
A7	Dn1	IO	Negative half of the USB 2.0 differential pair – Position 1
A9	V _{BUS}	P	Bus Power
A12	GND	P	Ground return
B12	GND	P	Ground return
B9	V _{BUS}	P	Bus Power
B7	Dn2	IO	Negative half of the USB 2.0 differential pair – Position 2
B6	Dp2	IO	Positive half of the USB 2.0 differential pair – Position 2
B5	CC2	IO	Configuration Channel
B4	V _{BUS}	P	Bus Power
B1	GND	P	Ground return

6.3.4 MicroSD and MicroSIM card connectors

The connectors for the MicroSD and MicroSIM cards are placed in the Service Panel. Both connectors are **push-push** type.

Disable the SIM PIN (Personal Identification Number) before inserting the SIM card in the slot. The cellular connection will not work if the SIM PIN is ON.

To insert the MicroSD and MicroSIM cards, orient them as in the figures below:

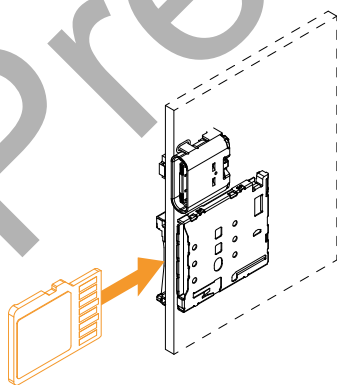


Fig. 7 - MicroSD card orientation

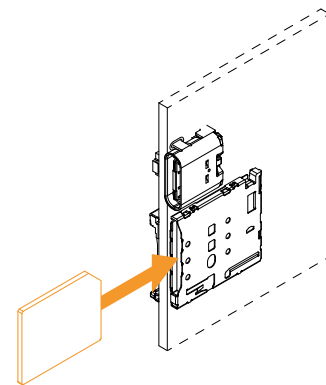


Fig. 8 - MicroSIM card orientation

7 INTERFACES IN DETAIL

The interfaces availability depends on the product variant. For more information, refer to: "[Technical specifications](#)" on page 18.

This chapter gives the following information:

7.1 Earth connection terminal	36
7.2 PWR (Power IN) connector	36
7.3 ETH0, ETH1, ETH2 connectors	37
7.4 CAM (Camera IN) connector	38
7.5 Cellular Modem	39
7.6 GNSS	41
7.7 Wi-Fi and Bluetooth	42
7.8 DP (Video OUT) connector	44
7.9 USB0, USB1 connectors	44
7.10 I/O (Digital I/Os and CAN FD) connector	45

Preliminary



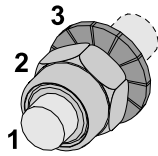
7.1 Earth connection terminal

The BoltGPU 10-31 has a terminal on the front side that is the earth connection interface of the product.

Always use this terminal to connect the product to an earth point in the installation.

For more information, refer to: "[Product power supply](#)" on page 53.

Terminal Layout:



Terminal Label:



Terminal Parts:

Part #	Description
1	M4 stud bolt (length = 7 mm)
2	M4 lock nut
3	M4 serrated lock washer



NOTICE

The earthing conductor to be connected to this terminal must have a size of 1.5 mm², with a terminal ring having a diameter of 4 mm.

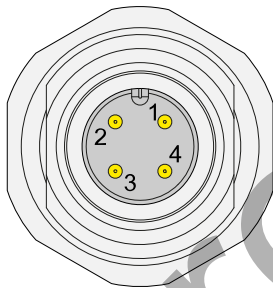
7.2 PWR (Power IN) connector

The BoltGPU 10-31 has a connector (PWR) on the front side that is the power input interface of the product.

For more information, refer to: "[Product power supply](#)" on page 53.

7.2.1 PWR connector specifications

Connector Layout:



Connector Pinout:

Pin #	Signal	Type	Description
1	VIN+	P	Power IN +
2	VIN-	P	Power IN -
3	NC	NC	Not Connected
4	KEY	P	Key Signal

Connector Specifications:

- Panel-mount; M12 series
- Gender: Male
- Type: B-Coded; 4-pin

Mating Connector Specifications:

- Cable-Mount; M12 series
- Gender: Female
- Type: B-Coded; 4-pin
- Example of cable:
Manufacturer: Conec
Part Number: 43-00292
(or equivalent)



7.3 ETH0, ETH1, ETH2 connectors

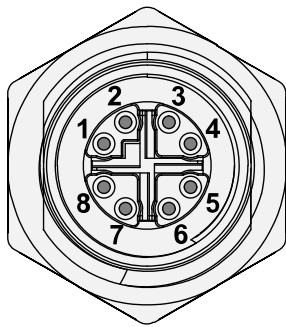
The BoltGPU 10-31 has three connectors (ETH0, ETH1, ETH2) on the front side and each provides a 10/100/1000 Mbps Ethernet connection.

7.3.1 Ethernet specifications

Feature	Description
Network Standard	10BASE-Te/100BASE-Tx/1000 BASE-T IEEE 802.3 compliant Supports 1000 BASE-T PCS and auto negotiation with next page support
Speeds	10/100/1000 Mbps Tri-speed
Notes	The interfaces are noise and surge protected

7.3.2 ETH0, ETH1, ETH2 connectors specifications

Connector Layout:



Connector Pinout:

Pin #	Signal	Type	Description	Male RJ45 Pin #
1	TX+_D1	O	Transmit Data +	1
2	TX-_D1	O	Transmit Data -	2
3	RX+_D2	I	Receive Data +	3
4	RX-_D2	I	Receive Data -	6
5	BI+_D4	I/O	Bidirectional Data +	7
6	BI-_D4	I/O	Bidirectional Data -	8
7	BI-_D3	I/O	Bidirectional Data -	5
8	BI+_D3	I/O	Bidirectional Data +	4

Connector Specifications:

- Panel-mount; M12 series
- Gender: Female
- Type: X-Coded; 8-pin

Mating Connector Specifications:

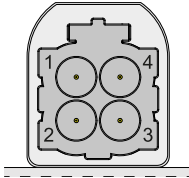
- Cable-Mount; M12 series
- Gender: Male
- Type: X-Coded; 8-pin
- Example of cable:
Manufacturer: Metz Connect
Part Number: 142M2X10005
(or equivalent)

7.4 CAM (Camera IN) connector

The BoltGPU 10-31 has a connector (CAM) on the front side that provides 4x GMSL (1.5 Gbps to CSI-2) camera inputs.

7.4.1 CAM connector specifications

Connector Layout:



Connector Pinout:

Pin #	Signal	Type	Description
1	IN0+	I	GMSL Input 0+
2	IN1+	I	GMSL Input 1+
3	IN2+	I	GMSL Input 2+
4	IN3+	I	GMSL Input 3+

Connector Specifications:

- AUTOMATE Type A Mini-FAKRA Quad Port
- Code: Z - Water Blue (Universal)
- Gender: Male (plug)

Mating Connector Specifications:

- AUTOMATE Type A Mini-FAKRA Quad Jack
- Code: Z - Water Blue (Universal)
- Gender: Female (socket)

Preliminary

7.5 Cellular Modem

This section applies to product variant -25.

The BoltGPU 10-31 integrates a worldwide LTE Cat 4 module.

The antenna connectors are placed on the front side.

7.5.1 Cellular Modem specifications

Feature	Description
Key Features	LTE Cat 4 module optimized for broadband IoT/M2M applications Maximum data rates up to 150 Mbps downlink and 50 Mbps uplink Worldwide LTE and UMTS/HSPA+ coverage MIMO technology
Supported Bands	LTE-FDD B1/B2/B3/B4/B5/B7/B8/B12/B13/B14/B18/B19/B20/B25/B26/B28/B66/B71 LTE-TDD B38/B39/B40/B41 WCDMA B1/B2/B4/B5/B6/B8/B19
Data Transmission (Max.)	LTE-FDD data rate (Mbps) 150 (DL)/ 50 (UL) LTE-TDD data rate (Mbps) 130 (DL)/ 30 (UL) DC-HSDPA+ data rate (Mbps) 42 (DL)/ 5.76 (UL) WCDMA data rate (kbps) 384 (DL)/ 384 (UL)
TX Output Power	Class 3 24 dBm +1/-3 dB for WCDMA bands 24 dBm ±1 dB for LTE-FDD bands 23 dBm ±1 dB for LTE-TDD bands
Main and RX-diversity Antenna Requirements	VSWR ≤ 2 Efficiency > 30% Max Input Power 50 W Input Impedance 50 Ω Cable Insertion Loss < 1 dB : LB (< 1 GHz) < 1.5 dB : MB (1-2.3 GHz) < 2 dB : HB (> 2.3 GHz)

7.5.2 Cellular Modem antennas - Installation guidelines

The antenna must be installed such that it keeps a distance from persons greater than 20 cm, and must not be co-located or operating in conjunction with any other antenna or transmitter.

Do not install the antenna inside metal cases.

7.5.2.1 LTE single antenna operation notes

Single LTE antenna operation can be supported; however, typically, wireless carriers (Mobile Network Operators) impose restrictions. Consult with your carrier before considering single LTE antenna usage.

For optimum performance of the cellular interface, Eurotech recommends the use of both main and diversity antenna connectors.

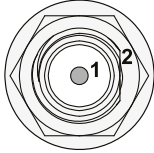
If the diversity antenna is not used/ connected, Eurotech recommends to disable the diversity function.

7.5.3 Cellular Modem antennas - A1 and A2 connectors specifications

Specifications are the same for both antenna connectors:

- A1: LTE main antenna connector
- A2: LTE diversity antenna connector

Connector Layout:



Connector Pinout:

Pin #	Description
1	Female inner pin contact
2	Female connector body (outer thread)

Connector Specifications:

- SMA connector
- Gender: Female

Mating Connector Specifications:

- SMA connector
- Gender: Male

Preliminary

7.6 GNSS

This section applies to product variants -24 and -25.

The BoltGPU 10-31 integrates a 72-channel GNSS receiver with Untethered Dead Reckoning (UDR). The antenna connector is placed on the front side.

7.6.1 GNSS specifications

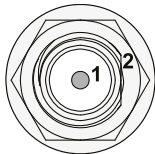
Feature	Description
Receiver type	72-channel GNSS receiver with Untethered Dead Reckoning (UDR) GPS/QZSS L1 C/A, GLONASS L10FBeiDou B1I, Galileo E1B/CSBAS L1 C/A: WAAS, EGNOS, MSAS, GAGAN
Navigation update rate	Up to 30 Hz
Position accuracy	2.5 m CEP
Acquisition	Cold starts: 26 s Aided starts: 3 s Reacquisition: 1 s
Sensitivity	Tracking & Nav.: -160 dBm Cold starts: -148 dBm Hot starts: -157 dBm
Assistance	OMA SUPL & 3GPP compliant
Oscillator	Crystal
Sensor	Onboard accelerometer and gyroscope

7.6.2 GNSS antenna - Installation guidelines

- Do not co-locate or operate the antenna in conjunction with another antenna or transmitter
- Do not install the antenna inside metal cases.

7.6.3 GNSS antenna - A3 connector specifications

Connector Layout:



Connector Pinout:

Pin #	Description
1	Female inner pin contact
2	Female connector body (outer thread)

Connector Specifications:

- SMA connector
- Gender: Female

Mating Connector Specifications:

- SMA connector
- Gender: Male

7.7 Wi-Fi and Bluetooth

This section applies to product variants -24 and -25.

The BoltGPU 10-31 integrates a WLAN module with IEEE 802.11 a/b/g/n/ac Wi-Fi and Bluetooth 5.0 (with BLE and ANT+).

The antenna connector is placed on the front side.

7.7.1 Wi-Fi and Bluetooth specifications

Feature	Description
Standard	IEEE 802.11 a/b/g/n/ac Wi-Fi Bluetooth 5.0 with BLE and ANT+, backwards compatible with BT4.x, BT3.x+HS, BT2.x+EDR
Frequency bands	WLAN: <ul style="list-style-type: none"> • 2.4 GHz ISM Bands 2.412-2.472 GHz, 2.484 GHz • 5.15-5.25 GHz (FCC UNII-low band) for US/Canada, Japan and Europe • 5.25-5.35 GHz (FCC UNII-middle band) for US/Canada and Europe • 5.47-5.725 GHz for Europe • 5.725-5.825 GHz (FCC UNII-high band) for US/Canada Bluetooth: <ul style="list-style-type: none"> • 2402 MHz ~ 2480 MHz
Data Transfer Rates	WLAN 2.4 GHz: <ul style="list-style-type: none"> • 11n: Up to 150 Mbps (PHY dynamic) • 11g: Up to 54 Mbps (PHY dynamic) • 11b: Up to 11 Mbps (PHY dynamic) WLAN 5 GHz: <ul style="list-style-type: none"> • 11ac: Up to 867 Mbps (PHY dynamic) (UDP 362, TCP 304) • 11n: Up to 150 Mbps (PHY dynamic) • 11a: Up to 54 Mbps (PHY dynamic) Bluetooth: <ul style="list-style-type: none"> • 1 Mbps, 2 Mbps and up to 3 Mbps EDR
Media Access Control	CSMA/CA with ACK
Channel	2.4 GHz: 1-13 (14 only for Japan) 5 GHz: 36-48 149-165 Ultra-Fast Channel Switch (FTS): 100 μ s within and 150 μ s across bands Optimized Multi-channel concurrency
Bandwidth Support	5 MHz, 10 MHz, 20 MHz, 40 MHz, 80 MHz
Channel Spacing	5 MHz
Spreading / Modulation	WLAN: <ul style="list-style-type: none"> • 802.11ac/g/n: OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM) • 802.11b: CCK (11, 5.5 Mbps), DQPSK (2 Mbps), DBPSK (1 Mbps) Bluetooth: <ul style="list-style-type: none"> • Header GFSK • Payload 2M: 4-DQPSK • Payload 3M: 8DPSK

Feature	Description		
RF Output Power (Typical - Conductive)	802.11a:	15.5 dBm at 54M	±2 dBm
	802.11b:	18 dBm at 11M	±2 dBm
	802.11g:	15.5 dBm at 54M	±2 dBm
	802.11n 5G HT20:	17 dBm at MCS0	15 dBm at MCS7 ±2 dBm
	802.11n 5G HT40:	16 dBm at MCS0	14 dBm at MCS7 ±2 dBm
	802.11n 2.4G HT20:	18 dBm at MCS0	16 dBm at MCS7 ±2 dBm
	802.11n 2.4G HT40:	17 dBm at MCS0	15 dBm at MCS7 ±2 dBm
	802.11ac 5G VHT20:	15 dBm at MCS0	12 dBm at MCS8 ±2 dBm
	802.11ac 5G VHT40 :	14 dBm at MCS0	11 dBm at MCS8 ±2 dBm
	802.11ac 5G VHT80:	14 dBm at MCS0	11 dBm at MCS8 ±2 dBm
	Bluetooth: (Class 2 Device) +2 dBm ≤ Output Power ≤ +6 dBm		
RF receive Sensitivity (Typical - Conductive)	802.11a:	54M less than 74 dBm	
	802.11b:	11M less than 89 dBm	
	802.11g:	54M less than 75 dBm	
	802.11n 2.4G:	HT20 MCS7 less than 75 dBm	92 dBm at MCS0
		HT40 MCS7 less than 72 dBm	89 dBm at MCS0
	802.11n 5G:	HT20 MCS7 less than 74 dBm	91 dBm at MCS0
		HT40 MCS7 less than 71 dBm	88 dBm at MCS0
	802.11ac 5G:	HT80 MCS9 less than 68 dBm	85 dBm at MCS0
Bluetooth: BER < 0.1% (Anritsu 8852B Tx -83Bm)			

7.7.2 Wi-Fi and Bluetooth antennas - Installation guidelines

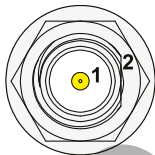
Do not install the antennas inside metal cases.

7.7.3 Wi-Fi and Bluetooth antennas - A4 and A5 connectors specifications

Specifications are the same for both antenna connectors:

- A4: Wi-Fi and Bluetooth co-existence main antenna connector
- A5: Wi-Fi (MIMO) diversity antenna connector

Connector Layout:



Connector Pinout:

Pin #	Description
1	Male inner pin contact
2	Female connector body (outer thread)

Connector Specifications:

- RP-SMA connector
- Gender: Female

Mating Connector Specifications:

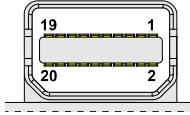
- RP-SMA connector
- Gender: Male

7.8 DP (Video OUT) connector

The BoltGPU 10-31 has a connector (DP) on the front side that provides a Mini DisplayPort video output.

7.8.1 DP connector specifications

Connector Layout:



Connector Specifications:

- Mini DisplayPort socket
- Gender: Female

Mating Connector Specifications:

- Cable-Mount Mini DisplayPort plug
- Gender: Male

Connector Pinout:

Pin #	Signal	Type	Description
1	GND1	P	Ground
2	HP	O	Hot Plug Detect
3	L0+	O	Lane 0 (positive)
4	CF1	O	CONFIG1
5	L0-	O	Lane 0 (negative)
6	CF2	O	CONFIG2
7	GND2	P	Ground
8	GND3	P	Ground
9	L1+	O	Lane 1 (positive)
10	L3+	O	Lane 3 (positive)
11	L1-	O	Lane 1 (negative)
12	L3-	O	Lane 3 (negative)
13	GND4	P	Ground
14	GND5	P	Ground
15	L2+	O	Lane 2 (positive)
16	AUX+	O	Auxiliary Channel (positive)
17	L2-	O	Lane 2 (negative)
18	AUX-	O	Auxiliary Channel (negative)
19	GND6	P	Ground
20	PWR	3.3	Power for connector

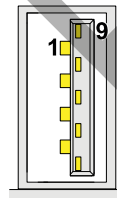
7.9 USB0, USB1 connectors

The BoltGPU 10-31 has two connectors (USB0, USB1) on the front side that provide:

- USB 0: Host 2.0 USB connection, max load: 500 mA, noise and surge protected
- USB 1: Host 2.0 USB connection, max load: 500 mA, noise and surge protected

7.9.1 USB 0 and USB 1 connectors specifications

Connector Layout:



Connector Specifications:

- USB 3.0 Type-A socket
- Gender: Female

Mating Connector Specifications:

- USB 3.0 Type-A plug
- Gender: Male

Connector Pinout:

Pin #	Signal	Type	Description
1	VBUS	5	+5V
2	D-	IO	Data-
3	D+	IO	Data+
4	GND	P	Ground
5	SSRX-	IO	Full-duplex Receive Data-
6	SSRX+	IO	Full-duplex Receive Data+
7	GND	P	Ground
8	SSTX-	IO	Full-duplex Transmit Data-
9	SSTX+	IO	Full-duplex Transmit Data+

7.10 I/O (Digital I/Os and CAN FD) connector

The BoltGPU 10-31 has a connector (I/O) on the front side that provides:

- 2x Optoisolated Digital Inputs
- 2x Optoisolated Digital Outputs
- 1x Isolated CAN-FD

7.10.1 Optoisolated Digital Inputs specifications

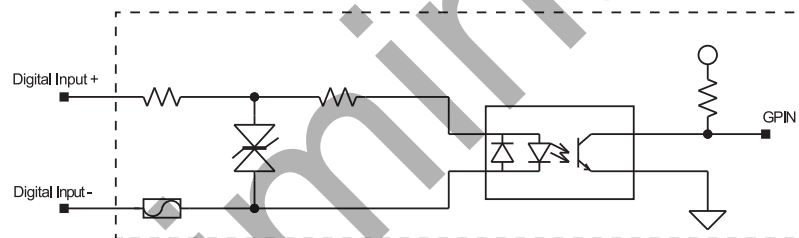
7.10.1.1 Electrical specifications

The table below shows the electrical specifications of a digital input at 24 V DC of nominal supply voltage:

Characteristic	Value @ 24 V DC
Logic Zero	$0\text{ V} \leq V_{IN_low} \leq 1.5\text{ V}$
Logic One	$9\text{ V} \leq V_{IN_high} \leq 36\text{ V}$
Minimum duration of the pulse	10 ms
Response Time	5 ms
Input Current	6 mA

7.10.1.2 Electrical schematics

The figure below shows the electrical schematics of a digital input:



7.10.1.3 Protection and isolation

- Optoisolation: 1500 V DC or 1000 V AC (according to EN 50155)
- Internal protection: 50 mA resettable fuse

7.10.2 Optoisolated Digital Outputs specifications

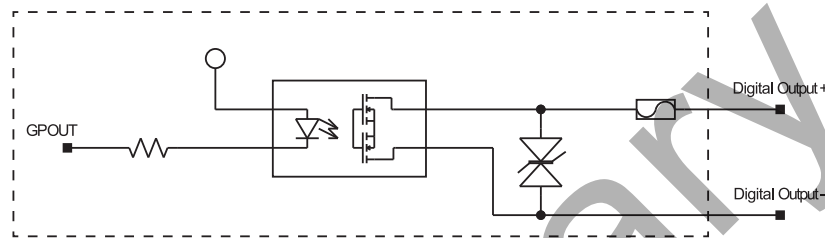
7.10.2.1 Electrical specifications

The table below shows the electrical specifications of a digital output at 24 VDC of nominal supply voltage:

Characteristic	Value @ 24 VDC
Maximum Current	250 mA
Output ON Resistance	Typical: 0.85 Ohm Maximum: 2.5 Ohm

7.10.2.2 Electrical schematics

The figure below shows the electrical schematics of a digital output:



7.10.2.3 Protection and isolation

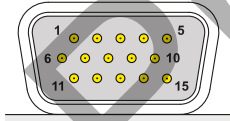
- Optoisolation: 1500 V DC or 1000 V AC (according to EN 50155)
- Internal protection: 500 mA fuse (not user-serviceable)
- PhotoMOS RELAYS output: max 36 V DC

7.10.3 Isolated CAN FD specifications

- 5 kV isolation
- 120 Ohm internal resistors can be enabled/disabled by software
- ISO11898-2:2003 compliant
- Timing guaranteed for data rates up to 5 Mbit/s in the CAN FD fast phase

7.10.4 I/O connector specifications

Connector Layout:



Connector Specifications:

- Standard HD 15-Pin D-Sub (plug)
- Gender: Male

Mating Connector Specifications:

- Standard HD 15-Pin D-Sub (socket)
- Gender: Female

Connector Pinout (pins not listed are reserved):

Pin #	Signal	Type	Description
1	IN1A	I	Isolated Digital Input 1A
2	IN1B	I	Isolated Digital Input 1B
3	IN2A	I	Isolated Digital Input 2A
4	IN2B	I	Isolated Digital Input 2B
5	+5V_CANF	P	CAN External Supply
6	OUT1A	O	Isolated Digital Output 1A
7	OUT1B	O	Isolated Digital Output 1B
8	OUT2A	O	Isolated Digital Output 2A
9	OUT2B	O	Isolated Digital Output 2B
10	CAN_H	IO	CAN H Line
14	CAN_GND	P	CAN Ground
15	CAN_L	IO	CAN L Line

8 MECHANICAL SPECIFICATIONS

This chapter gives the following information:

8.1 Product enclosure specifications	48
8.2 Product mechanical dimensions	48

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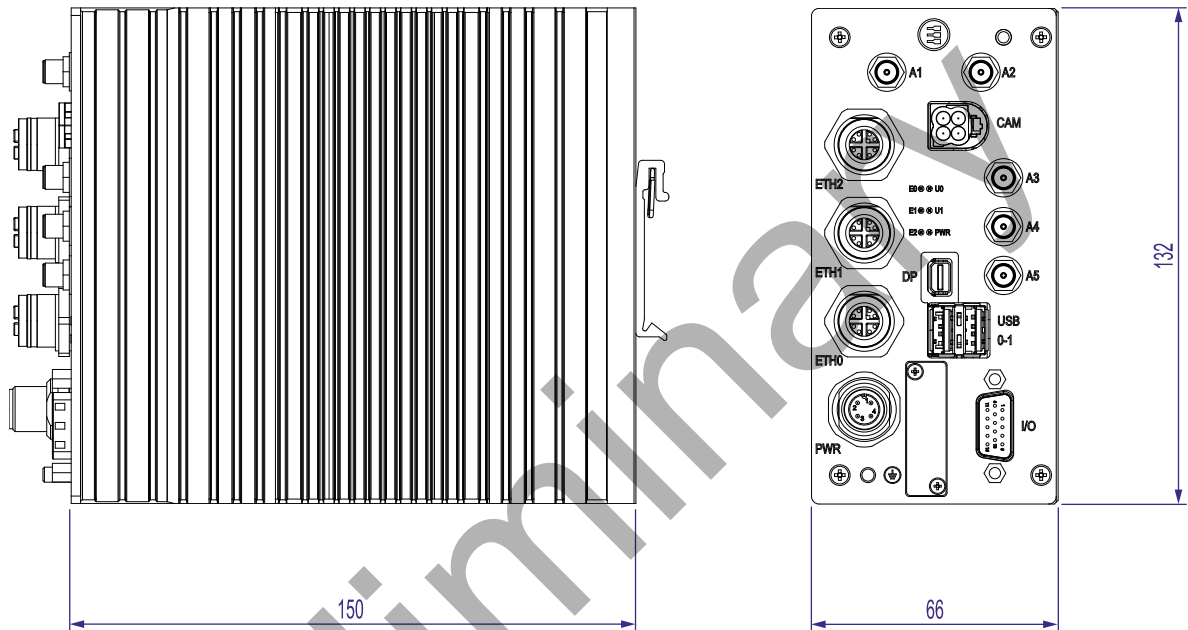
8.1 Product enclosure specifications

The product enclosure has the following specifications:

- Material: Aluminum
- Color: Black
- Finish: Anodized

8.2 Product mechanical dimensions

The product has the following mechanical dimensions: 66 x 132 x 150 mm (W x H x D) - Connectors and DIN Rail Mounting Clip Excluded.



(All dimensions are in millimeters)

Fig. 9 - BoltGPU 10-31 mechanical dimensions

9 PRODUCT INSTALLATION

This chapter gives the following information:

9.1 Introduction	50
9.2 How to install the product on a DIN rail	51
9.3 How to remove the product from a DIN Rail	52

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9.1 Introduction

The product is intended for professional use and must be installed by qualified personnel only.
The product must be installed in a secured location, accessible to authorized personnel only (for example in a cabinet / technical compartment).

This product is intended to be installed on a horizontal DIN rail.



NOTICE

Always use the Earth connection terminal to connect the product to an earth point in the installation.

For more information, refer to: **"Earth connection terminal" on page 36**



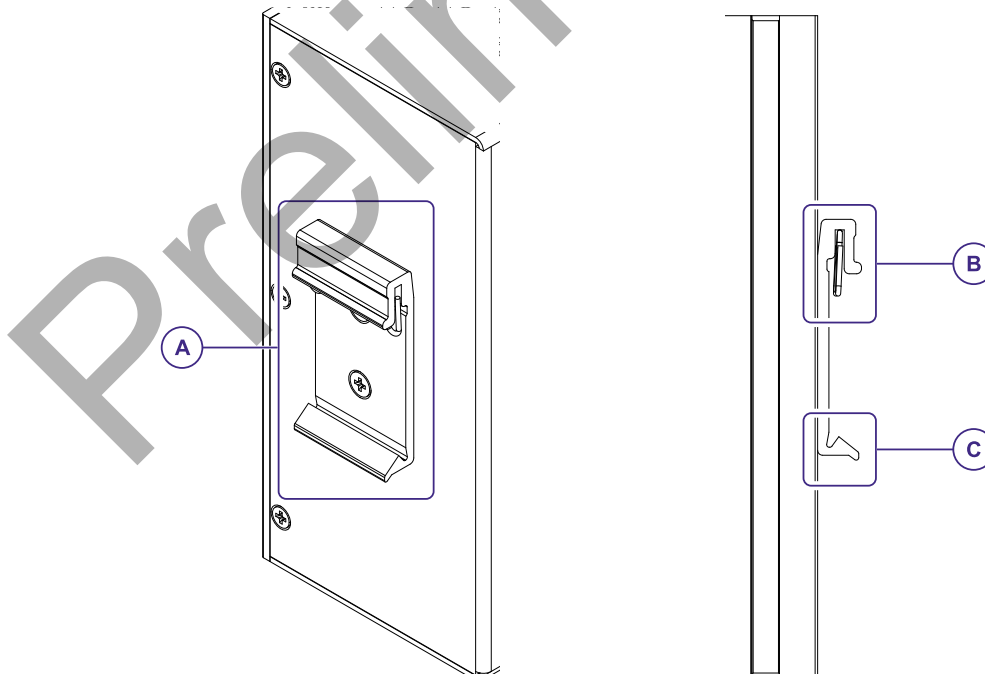
NOTICE

Make sure that the product is installed vertically (the DIN rail must be placed horizontally).
Make sure that the airflow is sufficient: allow a clearance of at least 1 rack unit above and below the product.

The product includes a DIN rail mounting clip **A** located on its rear side. The mounting clip has:

- an upper side provided with a spring **B**, and
- a lower hooked side **C**

Use the mounting clip to install the product on a DIN rail.



9.2 How to install the product on a DIN rail

To install the product on a horizontal DIN rail, complete this procedure:

1. Make sure that the DIN rail is placed horizontally
2. Make sure that the upper side of the DIN rail mounting clip (the clip) hangs on the upper edge of the DIN rail, see Fig. 10 below, part **1**
3. Push the product downward against the DIN rail until the lower hooked side of the clip locks to the lower edge of the DIN rail, see Fig. 10 below, part **2**.

Fig. 10 below, part **3** shows the product installed on the DIN rail.

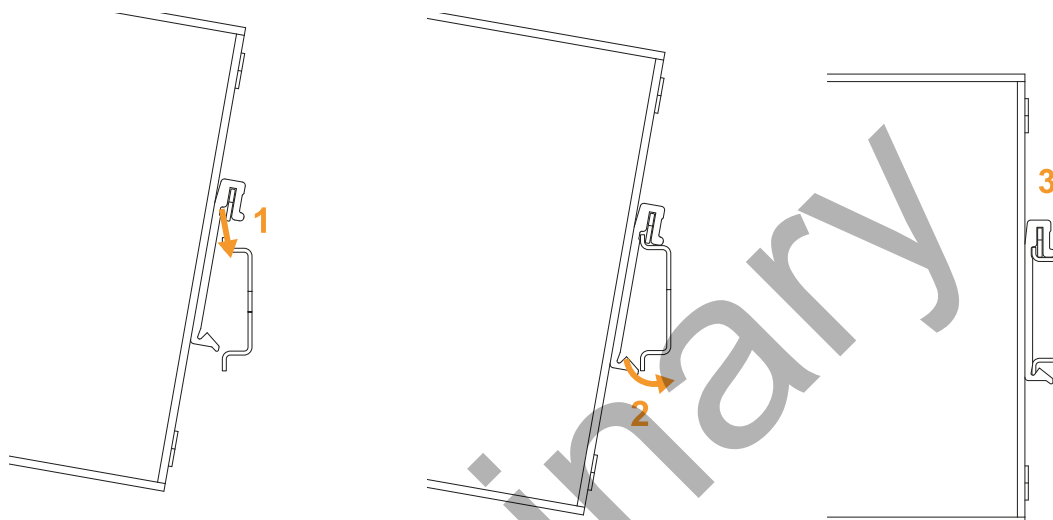


Fig. 10 - How to install the product on a DIN Rail

9.3 How to remove the product from a DIN Rail

To remove the product from a DIN rail, complete this procedure:

1. Push the product downward and release the lower hooked side of the DIN rail mounting clip (the clip) from the lower edge of the DIN rail, see Fig. 11 below, part **1**
2. Lift the product upward and release the upper side of the clip from the upper edge of the DIN rail, see Fig. 11 below, part **2**.

The product is removed from the DIN rail, see Fig. 11 below, part **3**.

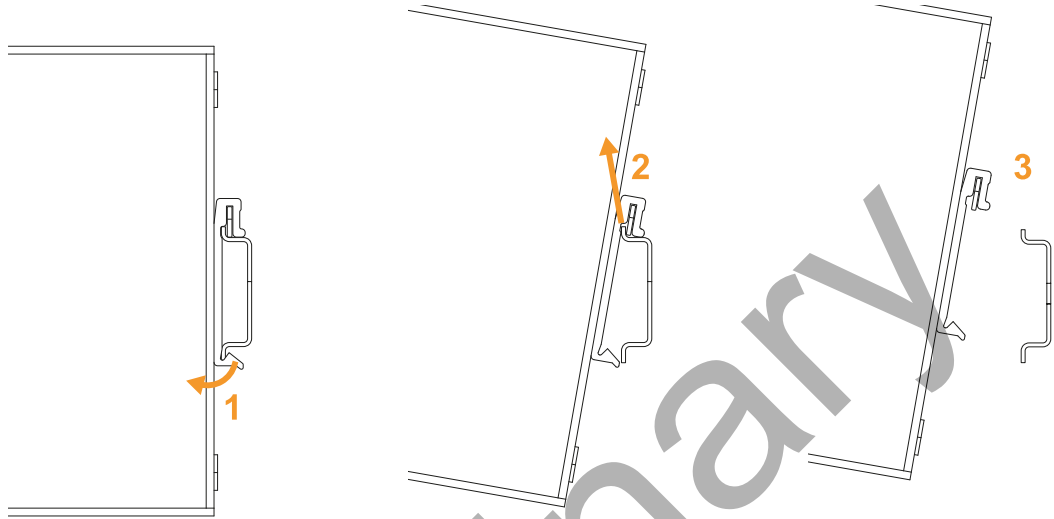


Fig. 11 - How to remove the product from a DIN Rail

10 PRODUCT POWER SUPPLY

This chapter gives the following information:

10.1 Important note	54
10.2 Power supply specifications	54
10.3 How to supply power and turn ON the product	55
10.4 How to turn OFF the product	57
10.5 How to trigger a hardware reset of the product	57

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10.1 Important note

This product does not have a power ON/OFF switch.
 The power input connector (PWR) is the disconnecting means from the power supply network.
 Make sure that you can always reach the PWR connector immediately.

	NOTICE		
	<p>The Power input connector is NOT protected against short circuit. Always include an external fuse to protect the product.</p>		

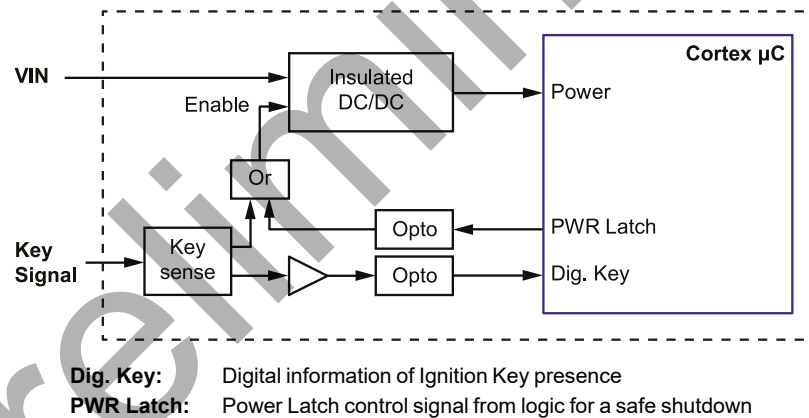
10.2 Power supply specifications

The power input is protected against: surge, noise, reverse polarity, over-voltage.

Specifications	Product Variants		
	-21	-24	-25
Power Input	Nominal: 24 to 110 V DC (EN 50155) with Ignition Key Sense		
Power Consumption	Typ. 18 W, Max. 40 W	Typ. 21 W, Max. 45 W	Typ. 23 W, Max. 48 W

10.2.1 The Ignition Key (Key Signal)

The Ignition Key is a digital input that enables the system to be turned ON/ OFF according to the following operating principle:



Ignition Key Status	Key Signal Level	System Status
From Off (GND) to On (VIN+)	From 0 to 1	The system turns On
From On (VIN+) to Off (GND)	From 1 to 0	The system turns Off after 120 seconds (default condition)



10.3 How to supply power and turn ON the product

10.3.1 Power supply safety instructions



WARNING

Risk of electric shock. Failure to supply power correctly could result in death or serious injury, and could damage the equipment or other property.

Refer to "**What to do before you supply power to the product**" below.

10.3.1.1 What to do before you supply power to the product

Before you supply power to the product, obey the following safety instructions:

- Make sure that you have understood any instructions for safety, installation, and for operation
- Make sure that your hands are dry
- Make sure that all the cables to use:
 - meet the product requirements and comply with the relevant standards and regulations
 - are in good condition
 - are placed with care
 - are not placed where they may be trampled or compressed
- Make sure that all power-points and plugs:
 - are in good condition
 - are not overloaded
- Make sure that the product has a proper grounding connection
- Make sure that the power supply source meets the product requirements and complies with the relevant standards and regulations
- Make sure that the product installation is made correctly and in compliance with the relevant standards and regulations
- Make sure that you supply power only after the product installation is completed.

If you have questions about these instructions, refer to: <https://www.eurotech.com/en/support>.

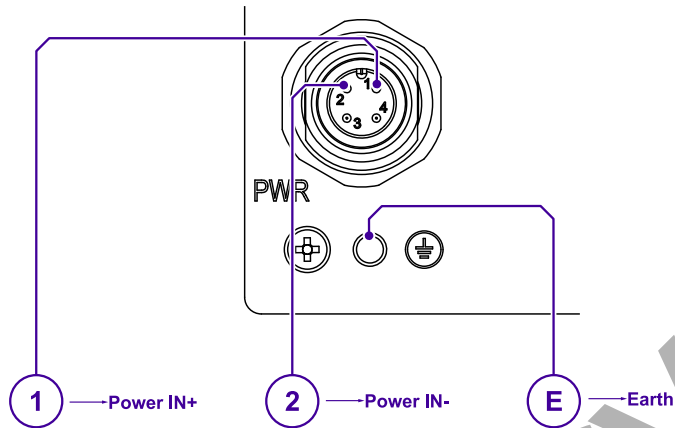
10.3.2 How to supply power and turn ON the product

To supply power and turn ON the system, complete the following steps:

1. Setup a DC power source that:
 - meets the requirements stated on the identification label of the product
 - meets the requirements of the product variant in use, refer to "[Power supply specifications](#)" on the previous page
2. Setup an external fuse on the line coming from the positive terminal of the DC power source (a 4 A fuse is appropriate)
3. Check the input voltage as close as possible to the PWR IN connector. This is to compensate for any cable losses, caused by cable length and other cable characteristics
4. Make sure that the DC power source is turned OFF

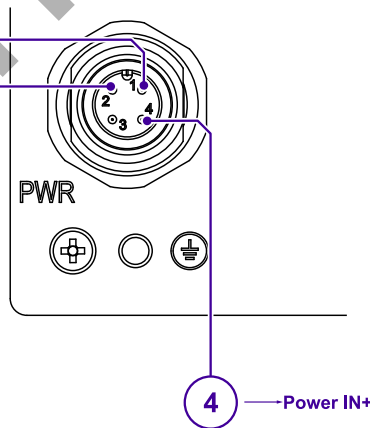
(continued on next page...)

5. Connect the Earth connection terminal (Ref# **E** in the table below) to an earth point in the installation
6. Connect the PWR connector to the DC power source terminals (Ref# **1** and **2** in the table below)



Ref#	Description
1	PWR: pin 1; Positive power supply input (Power IN+)
2	PWR: pin 2; Negative power supply input (Power IN-)
E	Earth connection terminal

7. Turn ON the DC power source. The system remains OFF
8. Connect the KEY pin (Ref# **4** in the table below) to "Power IN +".
The BoltGPU 10-31 automatically turns ON and the PWR LED turns ON.
When connecting the KEY pin to "Power IN +", keep it connected for at least 10 seconds. If you disconnect the KEY pin from "Power IN +" before 10 seconds have passed, the start-up procedure will stop and an immediate and unsafe power down will occur



Ref#	Description
4	Power IN: pin 4; Key Signal Input (KEY)

9. To keep the BoltGPU 10-31 turned ON, make sure that the KEY pin keeps connected to "Power VIN +".



10.4 How to turn OFF the product

There are two ways to turn OFF the system:

- Execute the `poweroff` Linux command.
 - For more information, refer to the software user manual
- Use the Ignition Key.
 - To turn OFF the system with the Ignition Key, complete the following steps:
 1. Turn OFF the Ignition Key. The system turns OFF after 120 seconds (default setting)
 2. Remove the power from the Power IN connector
 - For more information, refer to the software user manual.

10.5 How to trigger a hardware reset of the product

To trigger a hardware reset of the product, push the reset pushbutton that is placed in the Service Panel.

For more information, refer to: "[Service Interfaces overview](#)" on page 33.

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11 PRODUCT MAINTENANCE

This chapter gives the following information:

11.1 How to maintain the product 59

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11.1 How to maintain the product



WARNING

**Before you start product maintenance, always remove the power supply.
Failure to remove the power supply could result in death or serious injury.**

Periodically maintain the product to examine its integrity and to ensure its proper operation. A maximum inspection period of 2 years is recommended, though the installer must assess the impact of environmental conditions when selecting an appropriate inspection regime.

To maintain the product, complete this procedure:

1. Obey the instructions contained in the section "[Safety-related information](#)" on page 7
2. Remove the power supply from the product:
 - a. Make sure that your hands are dry
 - b. Turn OFF all the power supply sources
 - c. Disconnect all the cables
 - d. Make sure that all the circuits are discharged
3. Examine the product and cabling:
 - a. Make sure that the product is not damaged
 - b. Make sure that the LED indicators are visible and not damaged
 - c. Make sure that the external cabling is not damaged or frayed
4. Clean the product:
 - To remove the dust, use a dry lint-free cloth
 - To remove the dirt, use water-based non-flammable cleaning products
 - To dry the product, use a dry lint-free cloth
 - Do not use detergents, aerosol sprays, solvents or abrasive sponges
5. Examine the product installation:
 - a. Make sure that all the locking parts (for example: screws, bolts, nuts) are securely fastened
 - b. Make sure that the product is installed correctly (refer also to "[Product installation](#)" on page 49)
 - c. Make sure that the product is grounded correctly (refer also to "[Earth connection terminal](#)" on page 36).





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