Neousys Technology Inc.

SEMIL-2000 Series

Quick Introduction Guide

v1.0

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Legal Information

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Contact Information

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Declaration of Conformity

FCC	This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.
CE	The product(s) described in this manual complies with all applicable European Union (CE) directives if it has a CE marking. For computer systems to remain CE compliant, only CE-compliant parts may be used. Maintaining CE compliance also requires proper cable and cabling techniques.

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Safety Precautions

- Read these instructions carefully before you install, operate, or transport the system.
- Install the system or DIN rail associated with, at a sturdy location
- Install the power socket outlet near the system where it is easily accessible
- Secure each system module(s) using its retaining screws
- Place power cords and other connection cables away from foot traffic. Do not place items over power cords and make sure they do not rest against data cables
- Shutdown, disconnect all cables from the system and ground yourself before touching internal modules
- Ensure that the correct power range is being used before powering the device
- Should a module fail, arrange for a replacement as soon as possible to minimize down-time
- If the system is not going to be used for a long time, disconnect it from mains (power socket) to avoid transient over-voltage

Battery Warning

- Batteries are at risk of exploding if incorrectly installed
- Do not attempt to recharge, force open, or heat the battery
- Replace the battery only with the same or equivalent type recommended by the manufacturer

Service and Maintenance

- ONLY qualified personnel should service the system
- Shutdown the system, disconnect the power cord and all other connections before servicing the system
- When replacing/ installing additional components (expansion card, memory module, etc.), insert them as gently as possible while assuring connectors are properly engaged

ESD Precautions

- Handle add-on module, motherboard by their retention screws or the module's frame/ heat sink. Avoid touching the PCB circuit board or add-on module connector pins
- Use a grounded wrist strap and an anti-static work pad to discharge static electricity when installing or maintaining the system
- Avoid dust, debris, carpets, plastic, vinyl and 7tyrofoam in your work area.
- Do not remove any module or component from its anti-static bag before installation

Restricted Access Location

The controller is intended for installation only in the certain environment where both these condition apply:

- Access can only be gained by SERVICE PERSONS or by USERS who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken
- Access is through the use of a TOOL or lock and key, or other means of security, and is controlled by the authority responsible for the location

About This Quick Introduction Guide

This quick introduction guide introduces Neousys Technology SEMIL-2000 series, an IP67 waterproof extreme-rugged fanless GPU computer that supports NVIDIA® Tesla L4 while featuring workstation-grade Intel® chipset and offers excellent passive thermal performance with M12 connectors for robust and cost-effectiveness.

Applicable systems

Model No.	**Description**
SEMIL-2000	19" 2U half-rack mount IP69K waterproof computer supporting Intel® 14th / 13th/ 12th-Gen Core™ processor with 2x M12 10GbE and 4x M12 PoE+ ports
SEMIL-2000GC	19" 2U rack mount IP69K waterproof computer including NVIDIA® L4, supporting Intel® 14th/ 13th/ 12th-Gen Core™ processor with 2x M12 10GbE and 4x M12 PoE+ ports

Revision History

Version	**Date**	**Description**
1.0	Mar. 2024	Initial release

1 Introduction

SEMIL-2000GC is an extreme-rugged IP69K dustproof and waterproof edge AI platform in a 2U 19" rack-mount form factor. SEMIL- 2000GC incorporates Neousys' best-in-class thermal design to ensure fanless maximum GPU performance in wide range -40°C to 70°C temperatures. The system is also integrated with an NVIDIA® L4 GPU that offers up to 2.5 times the performance over Tesla T4.

Powered by Intel’s 14th/ 13th/ 12th-Gen platform, SEMIL-2000GC benefits from Intel® 7 photolithography with performance and efficient core hybrid performances while supporting up to 64 GB DDR5 memory.

SEMIL-2000GC adopts a corrosion-proof stainless steel and aluminum chassis to counteract moisture and salinity. By utilizing M12 connectors, it offers extremely rugged connections in shock and vibration environments with two CAN bus 2.0 with SocketCAN driver, two USB 3.2, seven Ethernet (including two 10GbE), and four 802.3at PoE+ ports to supply 25.5W of power per port to connected compatible devices. Internally, there is an M.2 M-key socket to support NVMe SSD and mini-PCIe sockets for extending feature sets. Additionally, SEMIL-2000GC features two 2.5" SATA SDD/ HDD accommodation, 8-48V wide-range DC input with ignition power control, and it is also in compliance with MIL-STD-810H standards.

1.1 SEMIL-2000GC Specifications

System Platform		
Processor	Supporting Intel® 13th-Gen Core™ CPU (LGA1700 socket, 65W/ 35W TDP) - Intel® Core™ i9-13900E/ i9-13900TE - Intel® Core™ i7-13700E/ i7-13700TE - Intel® Core™ i5-13500E/ i5-13400E/ i5-13500TE - Intel® Core™ i3-13100E/ i3-13100TE	Supporting Intel® 12th-Gen Core™ CPU (LGA1700 socket, 65W/ 35W TDP) - Intel® Core™ i9-12900E/ i9-12900TE - Intel® Core™ i7-12700E/ i7-12700TE - Intel® Core™ i5-12500E/ i5-12500TE - Intel® Core™ i3-12100E/ i3-12100TE - Intel® Pentium® G7400E/ G7400TE - Intel® Celeron® G6900E/ G6900TE
Chipset	Intel® Q670E platform controller hub	
Graphics	Integrated Intel® UHD Graphics 770 (32EU)	
Memory	Up to 64 GB DDR5 4800 SDRAM (two SODIMM slots)	
Accelerated GPU	NVIDIA® L4 GPU	
AMT	Supports Intel vPro/ AMT 16.0	
TPM	Supports dTPM 2.0	
I/O Interface		
Ethernet	2x 10Gb Ethernet by X550-AT2 (with WoL) (M12 X-coded) 4x 2.5Gb Ethernet by Intel I226-IT (PoE+) (M12 X-coded) 1x Gb Ethernet by Intel I219-LM (with WoL) (M12 X-coded)	
PoE+	4x IEEE 802.3at PoE+ PSE with 100 W total power budget	
CANbus	2x isolated CAN 2.0 port, supporting SocketCAN in Linux	
Serial port	2x isolated 3-wire RS-232 ports (COM1/ COM2) 1x isolated 3-wire RS232 (COM3) & 1x RS-422/ 485 port (COM4)	
USB port	2x Type-C USB 3.2 Gen1x1 (5Gbps) ports with screw-lock (shared DisplayPort) 2x USB 2.0 ports in M12 A-code	
Video port	2x Type-C USB connector supporting DP output (shared USB3.2 Gen1x1)	
Storage Interface		
SATA HDD	2x internal SATA ports for 2.5” HDD/ SSD installation, supporting RAID 0/ 1	
M.2	1x M.2 2280 M key socket (PCIe Gen4x4) for NVMe SSD	
Expansion Bus		
Mini PCI-E	3x full-size mini PCI Express sockets with SIM slot	
M.2	1x M.2 2242/3052 B key socket with dual SIM slot for M.2 5G/ 4G module 1x M.2 2230 E key socket for Wi-Fi	
Power Supply		
DC Input	8V to 48V DC input, with reverse polarity protection (M12 L-coded)	

Ignition Control	Built-in ignition power control (IGN/ GND signal via M12 L-coded connector)
Max. Power Consumption	For reference only, actual consumption may vary depending on configuration. With i7-12700 (65W mode): 141.4W (Max.) @ 24V With i7-12700 (65W mode): 146.4W (Max.) @ 48V With i7-12700TE (35W mode): 106.6W (Max.) @ 24V With i7-12700TE (35W mode): 111.8W (Max.) @ 48V With i5-12400 (35W mode): 105.1W (Max.) @ 24V With i5-12400 (35W mode): 110.9W (Max.) @ 48V With i5-12400 (65W mode): 120.5W (Max.) @ 24V With i5-12400 (65W mode): 126.2W (Max.) @ 48V
Mechanical	
Dimension	440mm (W) x 310mm (D) x 90.5mm (H) (excluding rack-mount bracket)
Weight	12 kg
Mounting Method	Rack-mount and wall-mount
Environmental	
Operating Temperature	With 35W CPU -40°C to 70°C** With CPU operating >= 65W -40°C to 70°C */ ** (configured as 35W TDP mode) -40°C to 60°C */ ** (configured as 65W TDP mode)
Storage Temperature	-40°C to 85°C
Humidity	10% to 90%, non-condensing
Vibration	MIL-STD-810H, 514.8C-IV. Category 4
Shock	MIL-STD-810H, 516.8 Procedure I
EMC	EN 50121 (EN 50155 EMC) CE/FCC Class A, according to EN 55032 & EN 55024
Ingress protection	IP69K

* For 65W CPUs, the recommended DC input range is 18V to 48V.

** For sub-zero operating temperature, a wide temperature HDD or Solid State Disk (SSD) is required.

1.2 SEMIL-2000 Specifications

System Platform		
Processor	Supporting Intel® 13th-Gen Core™ CPU (LGA1700 socket, 65W/ 35W TDP) - Intel® Core™ i9-13900E/ i9-13900TE - Intel® Core™ i7-13700E/ i7-13700TE - Intel® Core™ i5-13500E/ i5-13400E/ i5-13500TE - Intel® Core™ i3-13100E/ i3-13100TE	Supporting Intel® 12th-Gen Core™ CPU (LGA1700 socket, 65W/ 35W TDP) - Intel® Core™ i9-12900E/ i9-12900TE - Intel® Core™ i7-12700E/ i7-12700TE - Intel® Core™ i5-12500E/ i5-12500TE - Intel® Core™ i3-12100E/ i3-12100TE - Intel® Pentium® G7400E/ G7400TE - Intel® Celeron® G6900E/ G6900TE
Chipset	Intel® Q670E platform controller hub	
Graphics	Integrated Intel® UHD Graphics 770 (32EU)	
Memory	Up to 64 GB DDR5 4800 SDRAM (two SODIMM slots)	
AMT	Supports Intel vPro/ AMT 16.0	
TPM	Supports dTPM 2.0	
I/O Interface		
Ethernet	2x 10GbE Ethernet by X550-AT2 (with WoL) (M12 X-coded) 4x 2.5GbE Ethernet by Intel I226-IT (PoE+) (M12 X-coded) 1x GbE Ethernet by Intel I219-LM (with WoL) (M12 X-coded)	
PoE+	4x IEEE 802.3at PoE+ PSE with 100 W total power budget	
CANbus	2x CAN 2.0 port, supporting SocketCAN in Linux	
Serial port	2x isolated 3-wire RS-232 ports (COM1/ COM2) 1x isolated 3-wire RS232 (COM3) & 1x RS-422/ 485 port (COM4)	
USB port	2x Type-C USB 3.2 Gen1x1 (5Gbps) ports with screw-lock (shared DisplayPort) 2x USB 2.0 ports in M12 A-code	
Video port	2x Type-C USB connector supporting DP output (via the shared USB3.2 Gen1x1 port)	
Storage Interface		
SATA HDD	2x internal SATA ports for 2.5” HDD/ SSD installation, supporting RAID 0/ 1	
M.2	1x M.2 2280 M key socket (PCIe Gen4x4) for NVMe SSD	
Expansion Bus		
Mini PCI-E	3x full-size mini PCI Express sockets with SIM slot	
M.2	1x M.2 2242/3052 B key socket with dual SIM slot for M.2 5G/ 4G module 1x M.2 2230 E key socket for Wi-Fi	
Power Supply		
DC Input	8V to 48V DC input, with reverse polarity protection (M12 L-coded)	

Ignition Control	Built-in ignition power control (IGN/ GND signal via M12 L-coded connector)
Max. Power Consumption	For reference only, actual consumption may vary depending on configuration. With i7-12700 (65W mode): 141.4W (Max.) @ 24V With i7-12700 (65W mode): 146.4W (Max.) @ 48V With i7-12700TE (35W mode): 106.6W (Max.) @ 24V With i7-12700TE (35W mode): 111.8W (Max.) @ 48V With i5-12400 (35W mode): 105.1W (Max.) @ 24V With i5-12400 (35W mode): 110.9W (Max.) @ 48V With i5-12400 (65W mode): 120.5W (Max.) @ 24V With i5-12400 (65W mode): 126.2W (Max.) @ 48V
Mechanical	
Dimension	440mm (W) x 310mm (D) x 90.5mm (H) (excluding rack-mount bracket)
Weight	12 kg
Mounting Method	Rack-mount and wall-mount
Environmental	
Operating Temperature	With 35W CPU -40°C to 70°C** With >= 65W CPU -40°C to 70°C */** (configured as 35W TDP mode) -40°C to 60°C */ ** (configured as 65W TDP mode)
Storage Temperature	-40°C to 85°C
Humidity	10% to 90%, non-condensing
Vibration	MIL-STD-810H, 514.8C-IV. Category 4
Shock	MIL-STD-810H, 516.8 Procedure I
EMC	EN 50121 (EN 50155 EMC) CE/FCC Class A, according to EN 55032 & EN 55024
Ingress protection	IP69K

* For 65W CPUs, the recommended DC input range is 18V to 48V.

** For sub-zero operating temperature, a wide temperature HDD or Solid State Disk (SSD) is required.

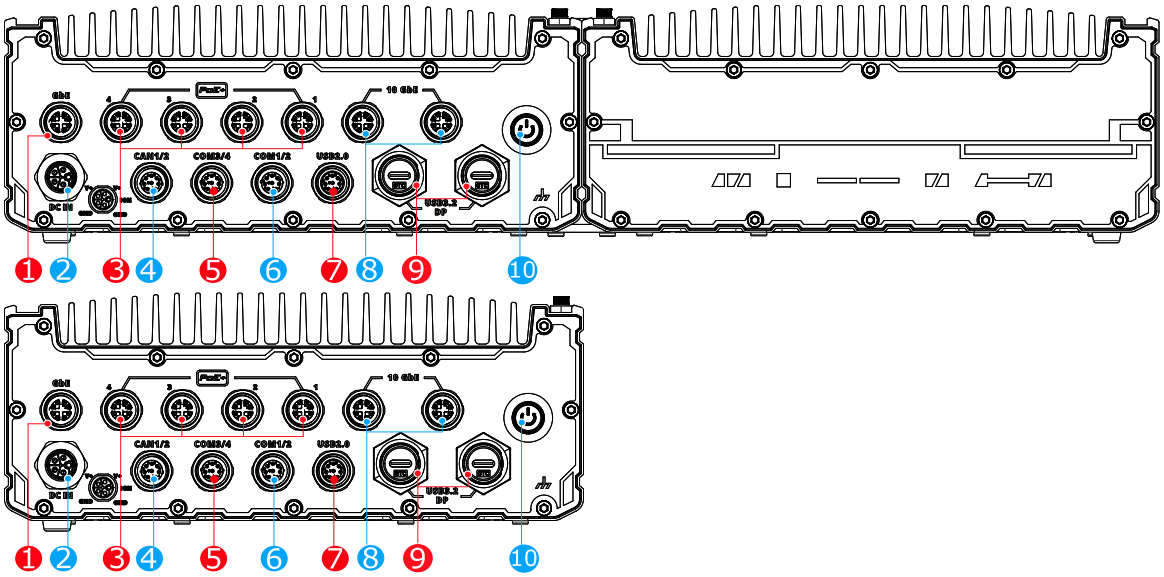
2 System Overview

Upon receiving and unpacking your system, please check immediately if the package contains all the items listed in the following table. If any item(s) are missing or damaged, please contact your local dealer or Neousys Technology.

2.1 SEMIL-2000 Series Packing List

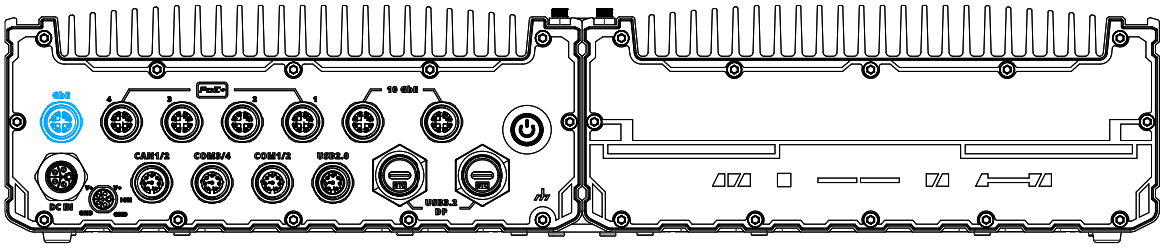
System / Pack	SEMIL-2000GC	Qty
1	SEMIL-2000 series system (If you ordered CPU, RAM, HDD, please verify these items)	1
2	Accessory box, which contains • CPU bracket • Wall-mounting bracket • Rackmount handle	 1 4 2

2.2 SEMIL-2000 Series Front Panel

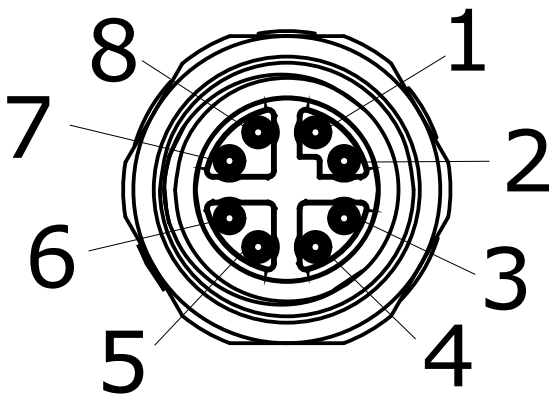


No.	Item	Description
1	GbE	M12 X-coded 1Gb Ethernet via Intel i219-LM
2	DC-in	8V to 48V DC input, with reverse polarity protection (M12 L-coded)
3	2.5GbE & PoE+	The M12 X-coded 2.5Gb Ethernet ports are backward compatible with 1GbE and offer Power over Ethernet (PoE) to provide both data connection and electric power to devices (eg. IP camera).
4	CAN1/ 2	The CANbus 2.0 connectivity allows the system to communicate with other CAN devices
5	COM3/ 4	1x isolated 3-wire RS232 (COM3) & 1x RS-422/ 485 port (COM4)
6	COM1/ 2	COM 1 & 2 are isolated RS-232 ports via an M12 A-coded connector.
7	USB 2.0	The M12 A-coded USB 2.0 port is backward-compatible with USB 1.1 / 1.0.
8	10GbE	The optional 10GbE is backwards compatible with 5Gb, 2.5Gb, and GbE connections.
9	Type-C USB or DisplayPort	Type-C USB 3.2 Gen1x1 (5Gbps) port, and supports alternative mode for DisplayPort
10	Power button	Use this button to turn on or force shutdown the system. This button can also be used to clear the system's CMOS.

2.2.1 Gb Ethernet



The system offers one Gb Ethernet port implemented Intel i219. It supports Wake on LAN and is also compatible with Intel® AMT (Active Management Technology) to support advanced features such as remote SOL desktop and remote on/ off control.

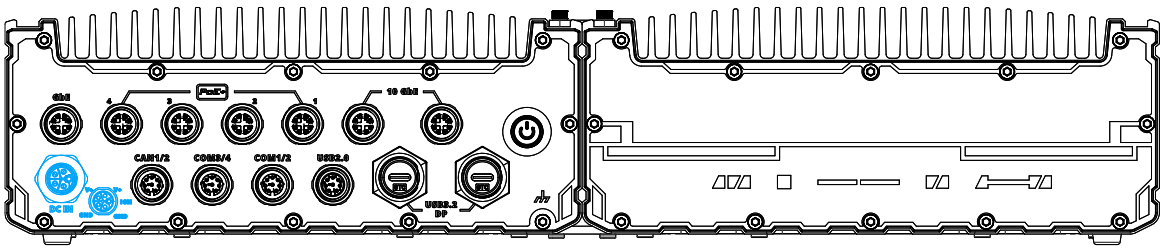


Panel side

Cable connector end

Signal	M12 panel side	M12 cable connector end	Wire color
LAN P0	1	1	
LAN N0	2	2	
LAN P1	3	3	
LAN N1	4	4	
LAN P3	5	5	
LAN N3	6	6	
LAN N2	7	7	
LAN P2	8	8	

2.2.2 DC-IN Connector

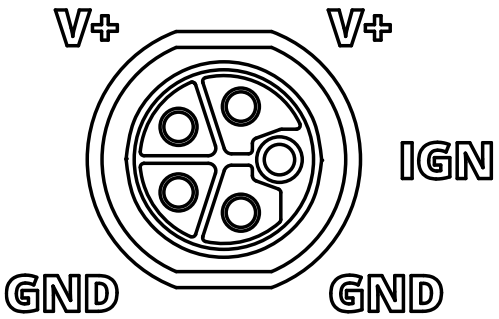


The system accepts a wide range of DC power input from 8V to 48V with reverse polarity protection via a M12 L-coded connector. The M12 L-coded connectors offer COTS availability and ultra-rugged connection reliability when wiring DC power.

WARNING

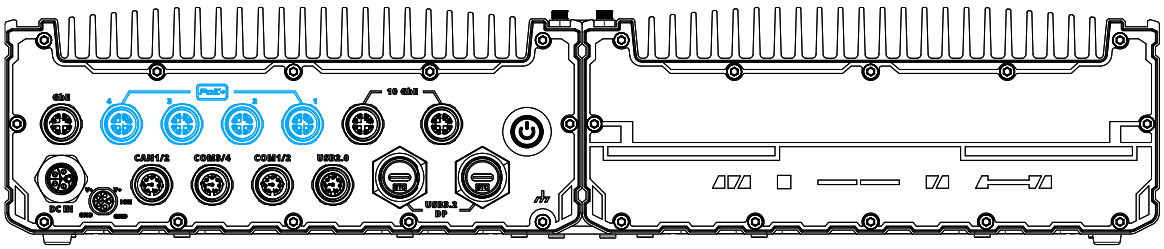
Please make sure the voltage of DC power is correct before you connect it to the system. Supplying a voltage over 48V will damage the system.

Connector Pin Definition



Signal	Wire color
V+	
V+	
GND	
GND	
IGN	

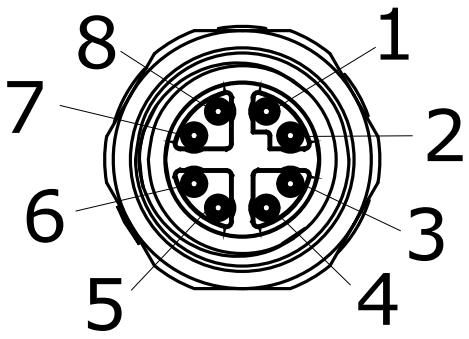
2.2.3 2.5 Gb Ethernet and PoE+ Port



The system offers 2.5Gb ports with PoE+ via M12 X-coded connectors on the front panel. Power over Ethernet (PoE) supplies electrical power and data on a CAT-5/CAT-6 Ethernet cable. Acting as a PoE PSE (Power Sourcing Equipment), compliant with IEEE 802.3at, each PoE port delivers up to 25.5W to a Powered Device (PD). PoE can automatically detect and determine if the connected device requires power or not, so it is compatible with standard Ethernet devices as well.

Each port has one dedicated PCI Express link for maximum network performance.

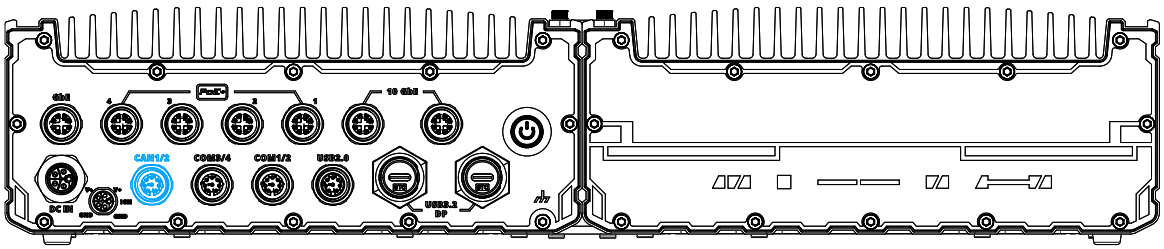
Connector Pin Definition



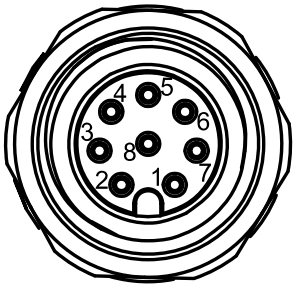
Panel side **Cable connector end**

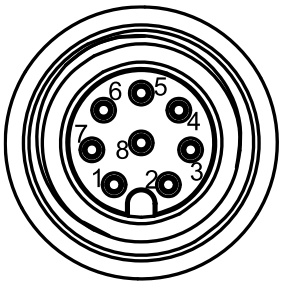
Signal	M12 panel side	M12 cable connector end	Wire color
LAN P0	1	1	
LAN N0	2	2	
LAN P1	3	3	
LAN N1	4	4	
LAN P3	5	5	
LAN N3	6	6	
LAN N2	7	7	
LAN P2	8	8	

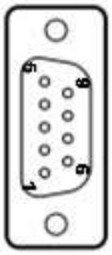
2.2.4 CANbus Port 1/ 2



CAN bus is a robust industrial bus with a pair of differential signals and is commonly used in various industrial and in-vehicles applications. The CAN bus port supports CAN2.0A and CAN2.0B up to 1Mbps.

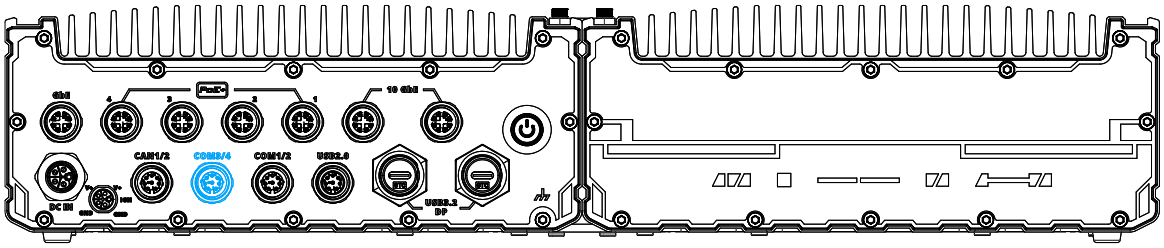






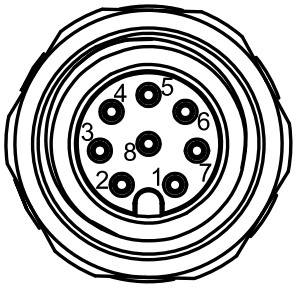
M12 Panel side		M12 Cable end	DB9 end	Signal
Signal	**M12 panel pin**	**M12 cable pin**	**COM pin**	
CAN_ISO1_H	1	1	3	CAN1
CAN_ISO1_L	2	2	2	
CAN_ISO_GND	3	3	5	
-	4	4	-	-
-	5	5	-	-
CAN_ISO2GND	6	6	5	CAN2
CAN_ISO2_L	7	7	2	
CAN_ISO2_H	8	8	3	

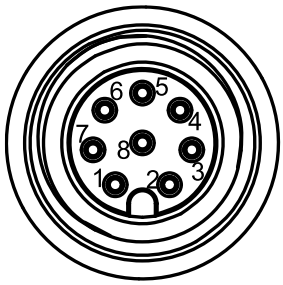
2.2.5 COM3/ COM4 Port

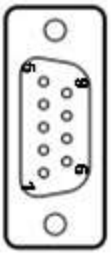


The system provides an isolated COM3 port (RS-232) and a COM4 port (RS-422/ 485) to communicate with external devices.

Connector Pin Definition

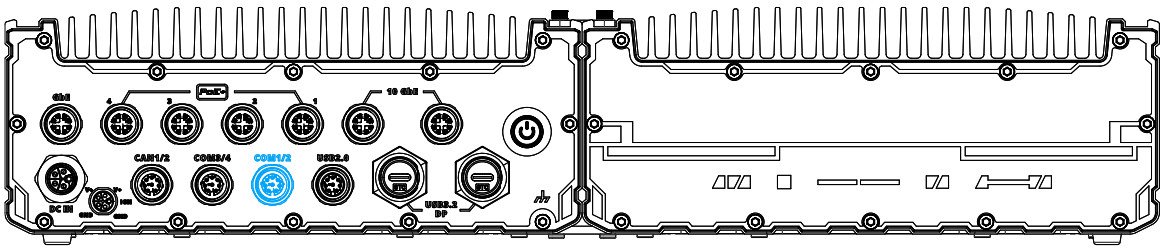






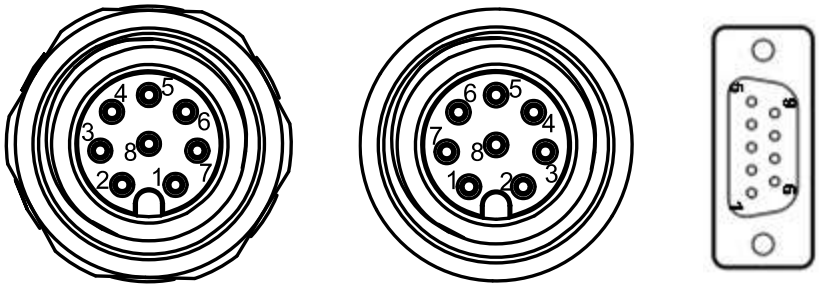
M12 Panel side		M12 Cable end	COM cable	Signal
Signal	**M12 panel pin**	**M12 cable pin**	**COM pin**	
RXD3	1	1	2	COM3
TXD3	6	6	3	
GND	7	7	5	
TXP4	2	2	2	COM4
TXN4	3	3	8	
RXP4	4	4	3	
RXN4	5	5	4	
GND	8	8	5	

2.2.6 COM1/ COM2 Port



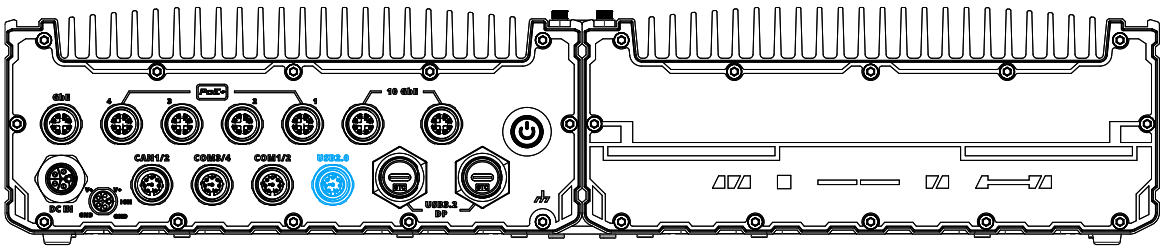
The system provides two isolated COM ports via an M12 A-coded connector for communicating with external devices. COM 1 and 2 ports are 3-wire RS-232 specifications and provide up to 115200 bps baud rate.

Connector Pin Definition



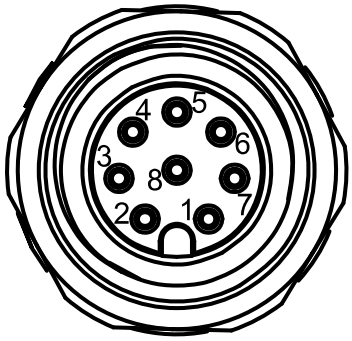
M12 Panel side		M12 Cable end	COM cable	Signal
Signal	**M12 panel pin**	**M12 cable pin**	**COM pin**	
TXD1	1	1	3	COM1
RXD1	2	2	2	
ISOGND1	3	3	5	
-	4	4	-	-
-	5	5	-	-
ISOGND2	6	6	5	COM2
RXD2	7	7	2	
TXD2	8	8	3	

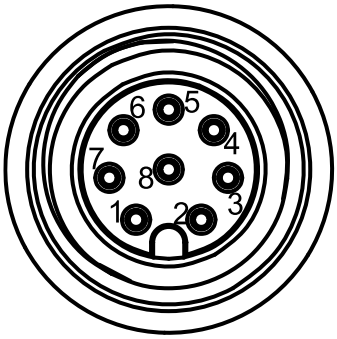
2.2.7 USB2.0 Port



The USB2.0 ports are implemented via native xHCI (eXtensible Host Controller Interface) controller and are backward compatible with USB 1.1 and USB 1.0 devices. Legacy USB support is also provided so you can use USB keyboard/mouse in DOS environment.

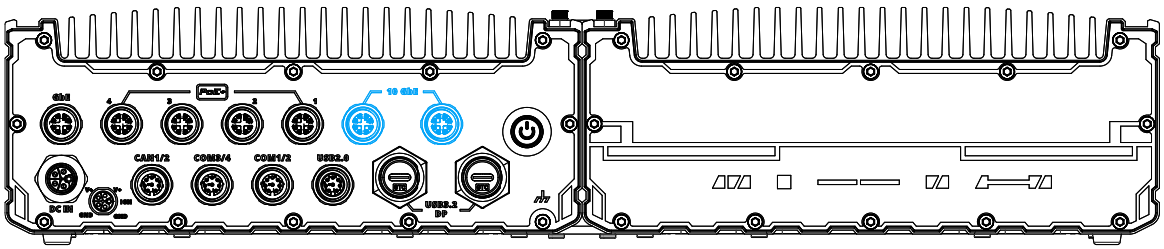
Connector Pin Definition





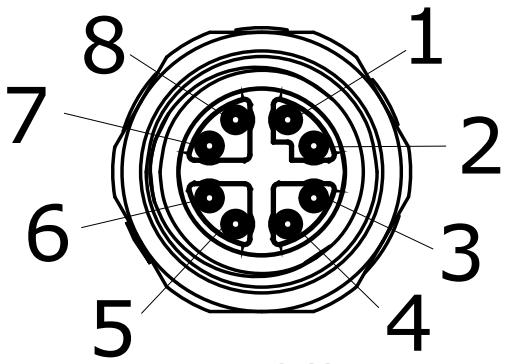
	Panel side		Cable connector end
Signal	**M12 panel side**	**M12 cable connector end**	**Wire color**
D1+	1	1	
D1-	2	2	
VCC_USB	3	3	
GND	4	4	
GND	5	5	
VCC_USB	6	6	
D2-	7	7	
D2+	8	8	

2.2.8 10Gb Ethernet



The system offers two 10Gb Ethernet ports supporting Wake-on-LAN via M12 X-coded connector implemented using Intel® X550AT controller on the front panel. The port is backwards compatible with 5Gb, 2.5Gb, and Gb Ethernet connections.

Connector Pin Definition

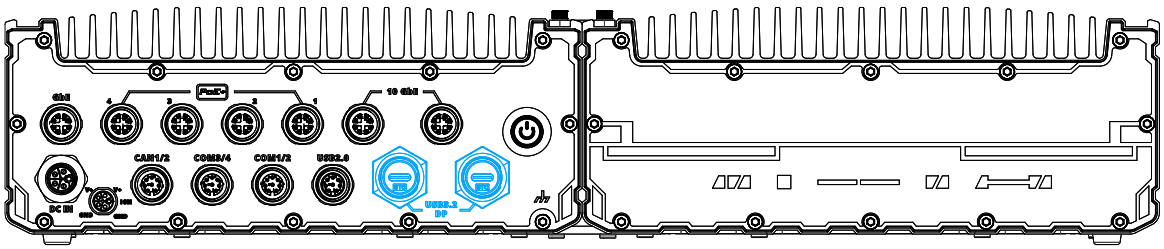


Panel side

Cable connector end

Signal	M12 panel side	M12 cable connector end	Wire color
LAN P0	1	1	
LAN N0	2	2	
LAN P1	3	3	
LAN N1	4	4	
LAN P3	5	5	
LAN N3	6	6	
LAN N2	7	7	
LAN P2	8	8	

2.2.9 Type-C USB 3.2 Gen 1 Ports/ DisplayPort



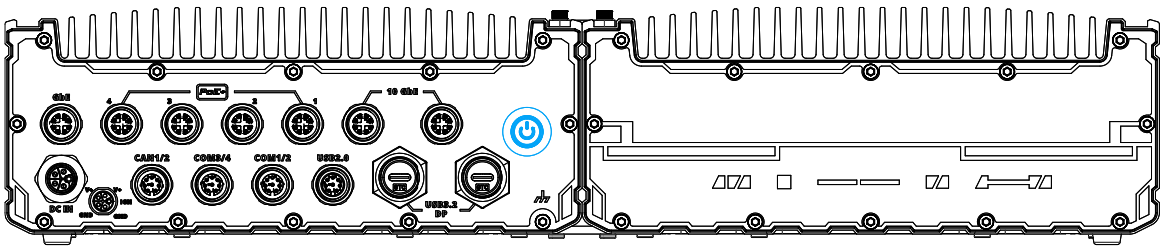
The system's USB 3.2 Gen1x1 type-C port offers up to 5Gbps of data transfer bandwidth, and is implemented via the native xHCI (eXtensible Host Controller Interface) controller. The port is backward compatible with USB3.2 Gen.1 USB 2.0, USB 1.1 and USB 1.0 devices via a USB hub (not included) to connect to external devices.

xHCI driver is supported natively in Windows 10, therefore you do not need to install the xHCI driver prior to utilizing USB functions.

The USB Type-C port can also be used alternatively for DisplayPort output to support resolutions up to 4096 x 2304 (4K).

Or by plugging in a USB Type-C hub, you may use USB and DisplayPort simultaneously.

2.2.10 Power Button



The power button is a non-latched switch for ATX mode on/off operation. To turn on the system, press the power button and the PWR LED should light-up. To turn off the system, issuing a shutdown command in OS is preferred, or you can simply press the power button. To force shutdown when the system freezes, press and hold the power button for 5 seconds. Please note that there is a 5-second interval between on/off operations (i.e. once the system is turned off, there is a 5-second wait before you can power-on the system).

To clear the system CMOS using the power button, please refer to the following instructions.

1. Unplug the DC power cable from the system.
2. With the cable unplugged, press and hold the power button.
3. With the power button held down, reconnect the DC power cable to the system.
4. Continue to press and hold down the button for a further 5 seconds after connecting the DC power cable.
5. Release the power button to complete the clear CMOS procedure.