



1 Series Description

The Altus G Series of distributed remote I/O systems, which includes the GT-3158 current analog input expansion module, was developed to meet the requirements of industrial automation applications that demand high performance, high availability, modularity, and operational flexibility. Designed for modern industrial environments, its architecture enables the implementation of robust and scalable solutions across several market segments, including building automation, machinery and equipment, sanitation, energy, manufacturing, utilities, and general industrial processes. The platform's versatility allows it to adapt to a wide range of project requirements, from compact applications to large-scale distributed systems. Its modular concept facilitates future expansions and simplifies system maintenance, reducing operational costs and downtime. In addition, the G Series provides broad compatibility with different control architectures, enabling efficient integration with PLCs, HMIs, SCADA systems, and industrial networks widely used in the market. Its modern and optimized design delivers high signal density, contributing to more compact and organized projects without compromising performance or reliability.

Designed for DIN rail mounting, the G Series offers a complete range of digital and analog input/output modules, special modules, and network heads compatible with the main industrial communication protocols currently available, such as PROFINET, EtherNet/IP, and MODBUS/TCP. This wide variety of options ensures high interoperability and ease of integration in different automation environments. Another important feature is the practicality of installation and maintenance provided by the RTB (Removable Terminal Block) connectors, which allow fast and safe module replacement without the need to remove field wiring. The modules also feature diagnostic and status indication LEDs, simplifying the identification of faults, operating conditions, and power supply status. DIN rail locking mechanisms ensure secure and stable mounting, while the extremely compact design — with modules starting at 12 mm width — enables significant space savings in electrical panels and automation cabinets. These characteristics make the G Series an efficient solution for both new installations and industrial retrofit or modernization projects.

Another key highlight of the G Series is its high operational performance, provided by a high-speed internal bus capable of operating with update times as low as 1 ms, ensuring fast and accurate responses for critical applications and processes requiring a high level of synchronization and reliability. The platform's slice technology eliminates the need for additional busbars, backplanes, or dedicated cabinets for power distribution and communication between modules, making installation simpler, more cost-effective, and more flexible. This feature reduces the mechanical complexity of the installation and contributes to greater system robustness, while also facilitating future expansions and maintenance activities. The distributed architecture also helps reduce field wiring, simplifying electrical projects and lowering installation costs. By combining performance, modularity, ease of integration, and an excellent cost-benefit ratio, the G Series establishes itself as a modern and reliable solution for industrial applications requiring operational efficiency, scalability, and high availability of automation systems.

1.1 Key Features of the Series

- Modular flexibility for system expansion;
- Compact design and space savings in control panels;
- Simple wiring and module replacement;
- Fast and accurate communication between modules;
- Ideal for the manufacturing, process, energy, water and wastewater, infrastructure and machinery industries.

2 Ordering Information

2.1 GT-3158

The product must be specified according to the corresponding code below:

CODE	DESCRIPTION
GT-3158	Expansion Module, 8 Analog Inputs 0 to 20 mA / 4 to 20 mA, 16-bit

The product package contains the following items:

- One Expansion Module.

2.2 Related Products

The following chart shows a list of G Series products, which must be purchased separately as needed:

CODE	DESCRIPTION
GL-9087	PROFINET Network Adapter/Head Module. Light version, maximum expansion: 10 slots
GL-9089	Modbus/TCP and EtherNet/IP Network Adapter/Head Module. Light version, maximum expansion of 16 slots
GT-12DF	Expansion Module, 16 Digital Inputs 24 Vdc, Sink or Source
GT-226F	Expansion Module, 16 Digital Outputs 24 Vdc/0.3A, Source
GT-3428	Expansion Module, 8 Analog Inputs 0 to 10 Vdc / 0 to 5 Vdc / 1 to 5 Vdc, 12-bit
GT-3704	Expansion Module, 4 RTD Inputs, 16-bit
GT-3804	Expansion Module, 4 Thermocouple Inputs, 16-bit
GT-4254	Expansion Module, 4 Analog Outputs 4 to 20 mA, 16-bit
GT-4424	Expansion Module, 4 Analog Outputs 0 to 10 Vdc, 12-bit
GT-7511	Bus Power Supply, 24 Vdc Input, 5 Vdc/1A Output.
GT-5112	Expansion Module, 2 Channels: High-Speed Counting (300 kHz) / Encoder (750 kHz), 32-bit
AMJG0808¹	RJ45-RJ45 Cable (2m)

Notes:

¹**AMJG0808**: CAT5 Ethernet network cable with na RJ45 male connector at each end. Designed for a variety of applications, ensuring high-quality communication between the devices that use it (2 meters).



ATTENTION:

The GT-3158 module operates only as an expansion for an Altus G Series adapter/network head. It cannot be used without the appropriate adapter/network head.

3 Product Features

The GT-3158 module is an I/O expansion module equipped with 8 current analog inputs, designed for signal acquisition applications in industrial automation systems. Each channel can be individually configured via parameter registers to operate in the 0 to 20 mA or 4 to 20 mA ranges, providing high flexibility for integration with different types of transmitters, sensors, and field instruments. This ability to configure each channel independently allows the module to be adapted to the specific needs of each application, simplifying engineering and expanding the system's versatility.

To facilitate commissioning, diagnostics, and maintenance, the GT-3158 features a front panel with 8 status indicator LEDs, one for each analog input. These indicators allow for a quick check of the channel's operating conditions, contributing to rapid fault identification and reduce field intervention time. Its compact and functional design was developed to offer practicality without compromising the ruggedness required by industrial environments.

The module is mounted directly on a DIN rail, and the slice technology enables automatic connection to the system's internal bus, eliminating the need for additional wiring for power and communication between modules. This architecture simplifies assembly, reduces installation time, and facilitates future system expansions. Analog signal connections are made via removable RTB (Removable Terminal Block) connectors, allowing for quick replacement of the equipment without the need to disconnect field wires. In addition, the GT-3158 is designed to operate with high reliability in harsh industrial environments, with certifications and compliance standards that attest to its resistance to electromagnetic interference, mechanical vibrations, and wide temperature variations. As a result, the module offers a robust, flexible, and high-performance solution for analog signal monitoring and acquisition applications.

3.1 Electrical Features

The GT-3158 expansion module consists of 8 analog inputs and offers advanced configuration capabilities, allowing the measurement range to be adjusted to meet the specific requirements of each application. Its technical, functional and electrical features have been designed to provide flexibility, reliability, and high performance in industrial environments, as detailed below:

Feature	DESCRIPTION
Number of Inputs	8 Current Analog Inputs
Indicators	8 green status LEDs (1 for each input)
Isolated Inputs	No
Range	0~20mA 4~20mA
Resolution	16 bits (including signal) 15 bits AD conversion 0.61 μ A/bit (0~20mA) 0.49 μ A/bit (4~20mA)
Conversion time	1.5ms for all inputs
Error	$\pm 0.1\%$ of full scale @ 25°C $\pm 0.3\%$ of full scale @ -40°C, 70°C
Input impedance	121.5 ohms
Field adjustment	Not required
Common	2 x COM. Common for all 8 inputs
Current consumption	Maximum 30mA @ 5V
Field Power Supply (UL)	Supply Voltage: 24Vdc nominal, Class 2
Field Power Supply	Supply Voltage: 24Vdc nominal Range: 18~30Vdc Current Draw: Max. 30mA @ 24V
Wiring	AWG 14 / 2.0mm ²

3.2 Environmental Characteristics

The GT-3158 expansion is designed to operate reliably over a wide range of temperatures and humidity levels, meeting the performance requirements for industrial requirements for industrial environments. In addition, its construction complies with applicable standards and certifications, ensuring safety, ruggedness, and operational reliability, as shown in the following table:

Feature	DESCRIPTION
Operating temperature	-40 a 70°C
UL temperature	-20 a 60°C
Storage temperature	-40 a 85°C
Relative humidity	5% a 95% (non-condensing)
Mounting	DIN rail mounting
Installation position	Can be installed vertically or horizontally
Weight	58g
Dimensions	99mm x 12mm x 70mm (H x W x D)

3.3 Certifications

The GT-3158 expansion module has certifications that attest to its robustness and reliability in industrial applications, ensuring resistance to electromagnetic interference and vibrations, as well as compliance with construction, safety, and operational requirements established by internationally recognized standards, as shown in the following table:

Characteristic	DESCRIPTION
Mechanical shock	IEC 60068-2-27: 2008 / 15g, 11ms
Vibration resistance	Based on IEC 60068-2-6 DNVGL-CG-0039 : Vibration Class B, 4g
Industrial Emission	EN61000-6-4/All : 2011
Industrial Protection	EN 61000-6-2 : 2005
Product Certifications	CE, UL, FCC

4 Installation

The GT-3158 expansion module must be installed in a bus-based system and requires a network adapter to communicate with a controller.

4.1 Mechanical Installation

The mechanical installation of the module is straightforward: it is connected to the adjacent module via a side connector and slid toward the DIN rail until it locks into place on the rail.



ATTENTION:

To prevent damage to the system, perform this procedure with the power disconnected.

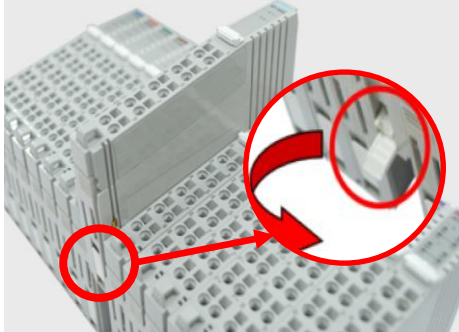


CAUTION:

Do not touch the internal bus terminals with your finger.

The procedure for installing an expansion module is described in the following steps:

- Open (unlock) the DIN rail latch;
- Position the module so that it snaps into place with the adjacent modules;
- Slide the module down until it snaps into the DIN rail;
- Close (lock) the DIN rail latch;



Removing the module is done in a similar manner:

- Open (unlock) the DIN rail latch;
- Unclip the module from the DIN rail and slide it upward until it is completely removed.

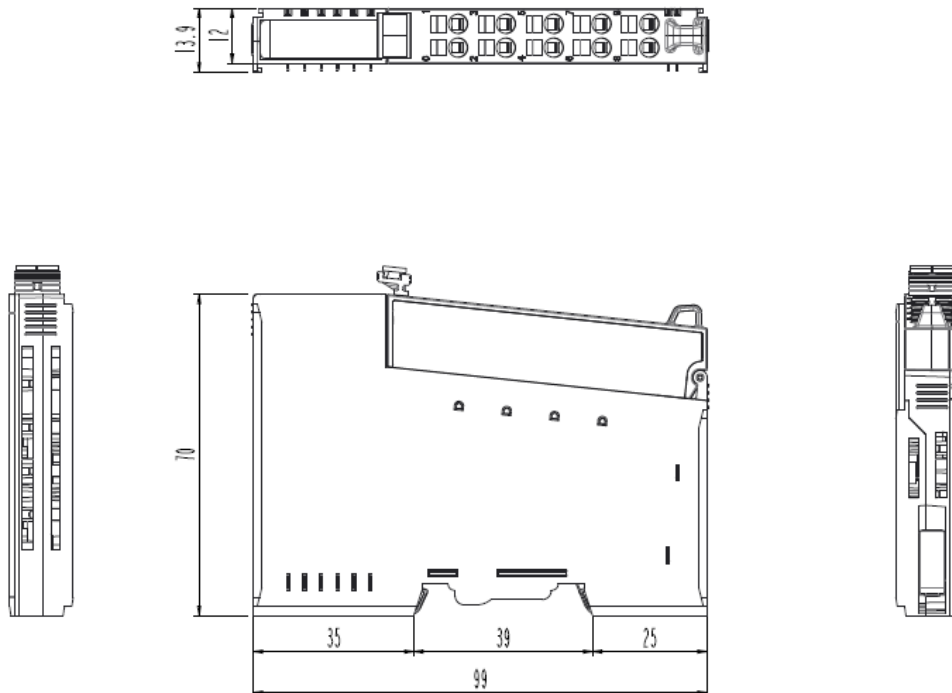
A bus terminator can be installed at the end of the system's last expansion module to protect the internal bus's electrical connections and provide a neater appearance. This part is included with the network adapter in its packaging.

4.2 Physical Dimensions

The GT-3158 expansion module measures 12mm wide, 99mm high and 70mm deep when installed vertically (with the DIN rail in a horizontal position).

The 2D (DWG) and 3D (STEP) files are available on the Altus website.

The following image illustrates the module's views, shown in mm (millimeters).

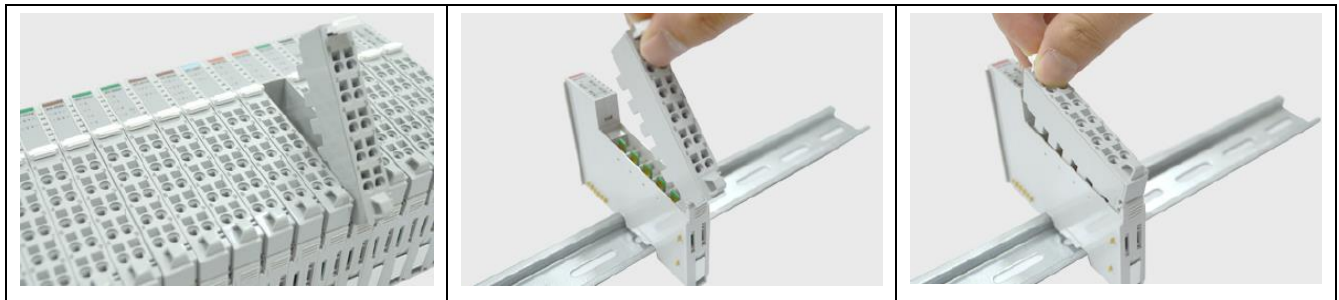


4.3 Electrical Connections

The G Series I/O expansion modules do not require additional electrical connections for power, since both the system power supply and the field power supply for the inputs and outputs (I/Os) are provided directly by the remote unit's internal bus. This feature simplifies installation, reduces the need for cabling, and contributes to a faster and more organized setup. The following table lists and describes all the electrical connections available for the module.

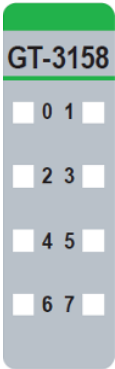
Front View	Connector	Description
	0	Analog Input 0 Connector
	1	Analog Input 1 Connector
	2	Analog Input 2 Connector
	3	Analog Input 3 Connector
	4	Analog Input 4 Connector
	5	Analog Input 5 Connector
	6	Analog Input 6 Connector
	7	Analog Input 7 Connector
	8	Common connector (for all inputs)
	9	Common connector (for all inputs)

To facilitate electrical installation, the modules are equipped with RTB (Removable Terminal Block) connectors, which, in the event of a module replacement, eliminate the need to disconnect and reconnect the electrical connections in the field.



4.4 LED Panel

The GTL-3158 module features a panel with 8 diagnostic and status LED indicators, one for each analog input. The designation and status of each indicator are shown in the table below:

Panel	LED Description	Input	Color	< 0,5 % Range ¹ / Under Range ²	Normal Operation	No Field Power ³
	0	AI 0	Green	Off	On	Flashing
	1	AI 1	Green	Off	On	Flashing
	2	AI 2	Green	Off	On	Flashing
	3	AI 3	Green	Off	On	Flashing
	4	AI 4	Green	Off	On	Flashing
	5	AI 5	Green	Off	On	Flashing
	6	AI 6	Green	Off	On	Flashing
	7	AI 7	Green	Off	On	Flashing

Notes:

¹ A turned-off LED may indicate normal operation when it input is configured for the 0-20mA range and its reading is below 0.5% of the range;

² “Under Range” indicates that an input configured for 4-20mA is reading a value below 3mA;

³ When there is no field power supply to the module, all LEDs flash simultaneously.

5 Communication

The expansion modules communicate directly with the network adapter via a dedicated internal bus. It is not possible to establish direct communication with the expansion module. Therefore, all communication for reading or writing data or parameters must be initiated through the network adapter, which can operate using either the Profinet or Modbus/TCP protocols.

5.1 Profinet

When the module is connected to a Profinet network adapter (GL-9087), it must be added to the project as a component of the adapter, which, in turn, will be associated with a Profinet Controller. Profinet settings for both the network adapter and the expansion module are available in the GSD file integrated into MasterTool, which can also be downloaded from the Altus website. The module's I/O data is available in the “PN Module I/O Mapping” tab, where it can be viewed, read, and linked to project variables. The module's configuration parameters can be viewed and adjusted via the “General” tab, allowing its operation to be tailored to the application's needs.

The tutorial on communication between a Nexto device and a G-Series Profinet network adapter can be accessed at: <https://suporte.altus.com.br/hc/pt-br/articles/40148216672397-Série-G-Configuração-e-comunicação-PROFINET>.

5.2 Modbus/TCP

When the module is connected to a Modbus/TCP network adapter (GL-9089), it must be configured in the project by mapping the Modbus device's variables, which will be associated with a Modbus Client. In this mapping, both input and output (I/O) data and the module's configuration and diagnostic parameters are made available through specific Modbus addresses, allowing the controller to read and write them. This way, access to the module's information is performed directly through the mapped registers, enabling simple and efficient integration and remote parameterization within the application.

The tutorial on communication between a Nexto device and a G-Series Modbus/TCP network can be accessed at: <https://suporte.altus.com.br/hc/pt-br/articles/40132326144525-Série-G-Configuração-e-comunicação-MODBUS-TCP>.

5.2.1 I/O Mapping

According to the GL-9089 Network Adapter documentation, the MODBUS addresses assigned to the digital input (DI) and digital output (DO) expansion modules start at 0x0000 and 0x0800 (0 and 2048), respectively. However, the same document states that for coil read operations, discrete input read operations, and coil write operations – whether single or multiple – the base addresses should be considered as 0x0000 (0) for input modules and 0x1000 (4096) for output modules.

Therefore, given the 1-based addressing convention, access to the input and output points, now uses addresses starting at 0x0001 and 0x1001 (1 and 4097), respectively. Therefore, it is important to distinguish between the physical addressing assigned to the expansion modules and the addressing actually used in MODBUS communication functions, to avoid misinterpretations during system configuration and integration.

The module parameters can be accessed through the mapping of special register addresses for the expansion modules, as shown in the table below. Unlike data mapping, special registers have a fixed address corresponding to the slot number in which the module is located, regardless of its type (input or output).

Slot	Starting Address	Ending Address
1	0x2000	0x201F
2	0x2020	0x203F
3	0x2040	0x205F
4	0x2060	0x207F
5	0x2080	0x209F
6	0x20A0	0x20BF
7	0x20C0	0x20DF
8	0x20E0	0x20FF
9	0x2100	0x211F
10	0x2120	0x213F
11	0x2140	0x215F
12	0x2160	0x217F
13	0x2180	0x219F
14	0x21A0	0x21BF
15	0x21C0	0x21DF
16	0x21E0	0x21FF

To access the module's parameter information

- [Start Address] + 0x0010 to read the number of parameter bytes the module has
- [Start Address] + 0x0011 to read/write the module's parameters

5.2.2 Data

The GT-3158 current analog input expansion module has a data set of 16 bytes, with 2 bytes for each of the 8 analog inputs.

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte 0	Analog Input 0 – Low Byte							
Byte 1	Analog Input 0 – High Byte							
Byte 2	Analog Input 1 – Low Byte							
Byte 3	Analog Input 1 – High Byte							
Byte 4	Analog Input 2 – Low Byte							
Byte 5	Analog Input 2 – High Byte							
Byte 6	Analog Input 3 – Low Byte							
Byte 7	Analog Input 3 – High Byte							
Byte 8	Analog Input 4 – Low Byte							
Byte 9	Analog Input 4 – High Byte							
Byte 10	Analog Input 5 – Low Byte							
Byte 11	Analog Input 5 – High Byte							
Byte 12	Analog Input 6 – Low Byte							
Byte 13	Analog Input 6 – High Byte							
Byte 14	Analog Input 7 – Low Byte							
Byte 15	Analog Input 7 – High Byte							

Bytes will be addressed according to the module's position on the bus, in accordance with the mapping criteria already described in 5.2.1.

5.2.3 Parameters

The GT-3158 current analog input expansion module has a set of 10 parameter bytes, as follows:

- Byte 0 through Byte 7 for configuring the range of each input individually;
- Byte 8 for the input filter time. Common to all inputs;
- Byte 9 Reserved / Not used.

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte 0	Analog Input 0 Range (H00: 0~20mA, H01: 4~20mA)							
Byte 1	Analog Input 1 Range (H00: 0~20mA, H01: 4~20mA)							
Byte 2	Analog Input 2 Range (H00: 0~20mA, H01: 4~20mA)							
Byte 3	Analog Input 3 Range (H00: 0~20mA, H01: 4~20mA)							
Byte 4	Analog Input 4 Range (H00: 0~20mA, H01: 4~20mA)							
Byte 5	Analog Input 5 Range (H00: 0~20mA, H01: 4~20mA)							
Byte 6	Analog Input 6 Range (H00: 0~20mA, H01: 4~20mA)							
Byte 7	Analog Input 7 Range (H00: 0~20mA, H01: 4~20mA)							
Byte 8	Filter time (H00: Default (20) / H01: fast ~ / H3E: slow)							
Byte 9	Reserved							

Bytes will be addressed according to the module's position on the bus, in accordance with the mapping criteria already described in 5.2.1.