



1 Series Description

The Altus G Series of distributed remote I/O systems, which includes the GT-12DF digital 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-12DF

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

CODE	DESCRIPTION
GT-12DF	Expansion Module, 16 Digital Inputs 24 Vdc, Sink or Source

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-226F	Expansion Module, 16 Digital Outputs 24 Vdc/0.3 A, Source
GT-3158	Expansion Module, 8 Analog Inputs 0 to 20 mA / 4 to 20 mA, 16 bits
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/1 A 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 an 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-12DF module operates only as an expansion unit for an Altus G Series adapter/network head. It cannot be used without the appropriate adapter/network head.

3 Product Features

The GT-12DF module is an I/O expansion module equipped with 16 digital inputs, allowing configuration for source or sink mode operation; all of the module's inputs must operate in the same configuration. To facilitate field diagnostics and maintenance, the device features a front panel with 16 status indicator LEDs – one for each input – allowing for quick visualization of active signals and simplifying the identification of operating conditions and potential faults.

Designed for direct installation on a DIN rail, the GT-12DF uses slice technology, which enables automatic connection to the system's internal bus, eliminating the need for additional wiring for power and communication between modules. This feature reduces assembly time, minimizes the possibility of installation errors and provides greater flexibility for future expansions and maintenance. In addition, its compact design helps optimize space in electrical panels and automation systems.

The digital inputs are connected via removable RTB (Removable Terminal Block) connectors, allowing for quick replacement of the module, without having to disconnect the field wires. The device was also designed to operate reliably in demanding industrial environments, with certifications and compliance standards that attest to its resistance to electromagnetic interference, mechanical vibrations, and temperature fluctuations. As a result the GT-12DF offers high ruggedness, operational reliability, and ease of maintenance, making it a suitable solution for a wide variety of industrial automation applications.

3.1 Electrical Features

The GT-12DF expansion module consists of 16 digital inputs and offers advanced configuration features, allowing you to adjust the operating mode and input filters to meet the specific requirements of each application. Its technical, functional, and electrical characteristics are designed to provide flexibility, reliability, and high performance in industrial environments, as detailed below:

Feature	DESCRIPTION
Number of inputs	16 digital inputs (sink or source)
Indicators	16 green status LEDs (1 for each input)
Supply Voltage	24Vdc nominal 15 ~ 26.4Vdc @ 60°C
Supply Current	4mA @ 24Vdc 5mA @ 30Vdc
Voltage	12.5Vdc @ 25°C
Delay	0.3ms max
Input filter	Adjustable up to 10ms
Input impedance	5,6kohm
Common	Common for all 16 inputs
Current consumption	Maximum 50mA @ 5V
Isolation	Internal logic power supply: Non-isolated; IO module power supply: Isolated
Field power supply (UL)	Supply voltage: 24Vdc nominal, Class 2
Field power supply	Supply voltage: 24Vdc nominal Range: 15~30Vdc Current consumption: 0mA @ 24Vdc
Wiring	AWG 18 / 0.75mm ²



ATTENTION:

The input mode setting (sink or source) is not configured individually for each input. Either all inputs will operate in sink mode, or all inputs will operate in source mode.

3.2 Environmental Characteristics

The GT-12DF expansion module is designed to operate reliably over a wide range of temperatures and humidity levels, meeting the performance requirements for industrial environments. In addition, its construction complies with applicable standards and certifications, ensuring safety, durability, and operational reliability, as shown in the following table:

Feature	DESCRIPTION
Operating temperature	-40 a 60°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	63g
Dimensions	109mm x 12mm x 70mm (H x W x D)

3.3 Certifications

The GT-12DF 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:

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

4 Installation

The GT-12DF 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 snaps into place.



ATTENTION:

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

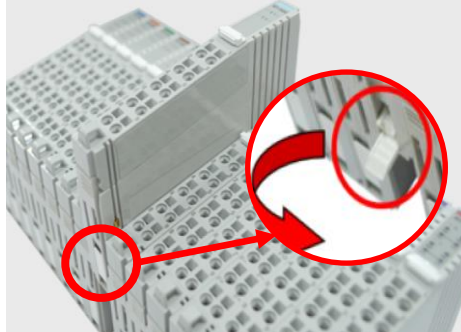


WARNING:

Do not touch the internal bus terminals with your fingers.

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.

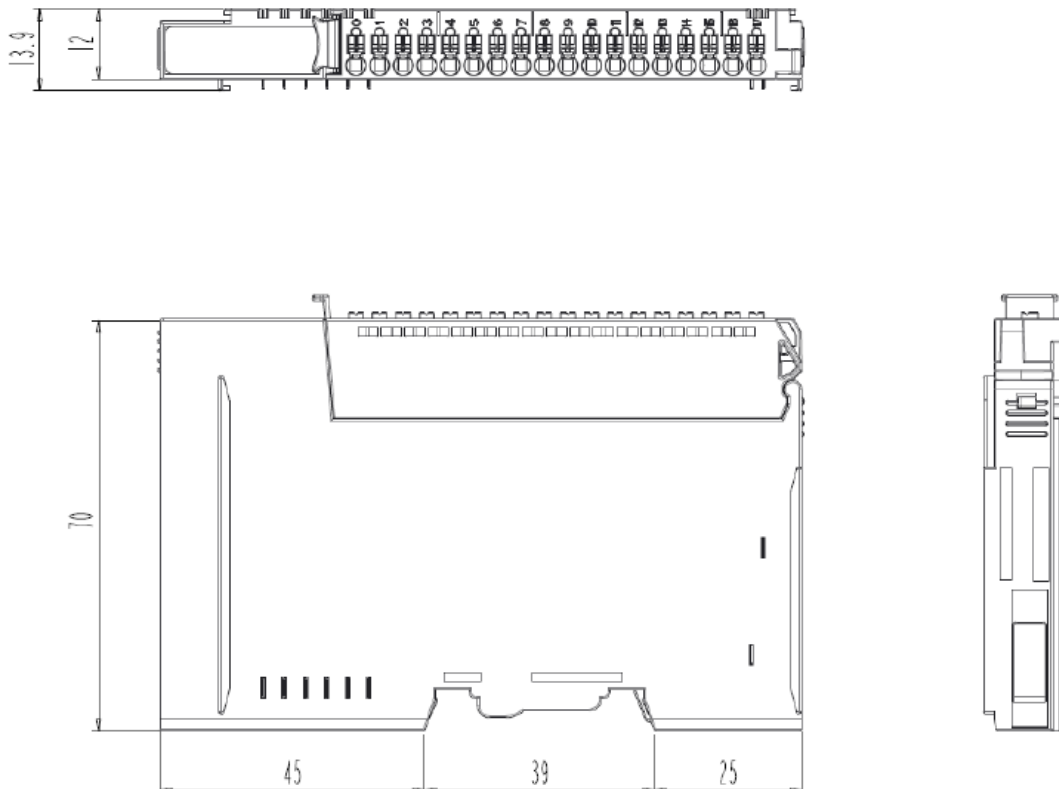
A bus terminator can be installed at the end of the system's last expansion module to protect the internal bus's electrical connections and provide a neater appearance. This part is included with the network adapter in its packaging.

4.2 Physical Dimensions

The GT-12DF expansion module measures 12 mm wide, 109 mm high, and 70 mm 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

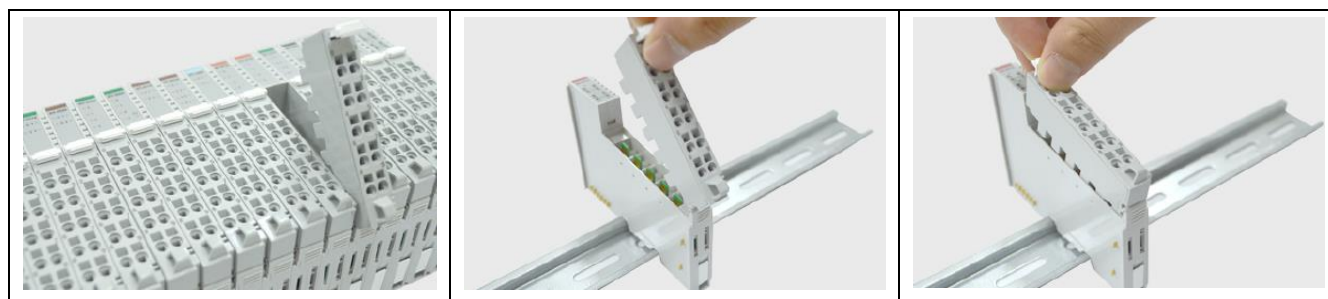
The G Series I/O expansion modules do not require additional electrical connections for power, since both the system power supply and the field power supply for the inputs and outputs (I/Os) are provided directly by the remote unit's internal bus. This feature simplifies installation, reduces the need 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	Digital Input Connector 0
	1	Digital Input Connector 1
	2	Digital Input Connector 2
	3	Digital Input Connector 3
	4	Digital Input Connector 4
	5	Digital Input Connector 5
	6	Digital Input Connector 6
	7	Digital Input Connector 7
	8	Digital Input Connector 8
	9	Digital Input Connector 9
	10	Digital Input Connector 10
	11	Digital Input Connector 11
	12	Digital Input Connector 12
	13	Digital Input Connector 13
	14	Digital Input Connector 14
	15	Digital Input Connector 15
	16	Common Connector (for all inputs)
	17	Common Connector (for all inputs)

The device can operate in two modes: SINK or Source. All digital inputs will operate in the same mode.

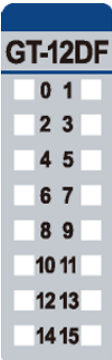
Front View	SINK mode	
	COM connected to 0V	Inputs trigger at 24V Dry contact Sensor with 24V output
Front View	SOURCE mode	
	COM connected to 24V	Inputs trigger at 0V Dry contact Sensor with 0V output

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-12DF module features a panel with 16 diagnostic and status LEDs, one for each digital input. The designation and status of each LED are shown in the table below:

Panel	LED Description	Input	Color	Input Not Activated / OFF	Input Activated / ON
	0	DI 0	Green	Off	On
	1	DI 1	Green	Off	On
	2	DI 2	Green	Off	On
	3	DI 3	Green	Off	On
	4	DI 4	Green	Off	On
	5	DI 5	Green	Off	On
	6	DI 6	Green	Off	On
	7	DI 7	Green	Off	On
	8	DI 8	Green	Off	On
	9	DI 9	Green	Off	On
	10	DI 10	Green	Off	On
	11	DI 11	Green	Off	On
	12	DI 12	Green	Off	On
	13	DI 13	Green	Off	On
	14	DI 14	Green	Off	On
	15	DI 15	Green	Off	On

5 Communication

Communication between the expansion modules and the network adapter takes place directly 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 the 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 adapter 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.

That way, considering the 1-based addressing convention, access to 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 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	Start Address	End 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 bytes of parameters the module has
- [Start Address] + 0x0011 to read/write the module's parameters

5.2.2 Data

The GT-12DF digital input expansion module has a 2-byte data set, with 1 bit for each of the 16 digital inputs.

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte 0	D7	D6	D5	D4	D3	D2	D1	D0
Byte 1	D15	D14	D13	D12	D11	D10	D9	D8

The 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-12DF digital input expansion module has a 2-byte parameter set, with Byte 0 representing the filter value parameter, which is common to all digital inputs.

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte 0	Input filter: 0 – 10 (ms)							
Byte 1	Reserved							

The 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.