

G3-AM8

G-Mation G3 – 4 Analog Inputs - 4 Analog Output

USE AND INSTALLATION MANUAL

G3 AM8 code F092708

code: 80656 - Ver 1.0 - 01-2025 - ENG



CONTENTS AND INDICES

1. PREFACE	4
1.1. Warnings and safety	4
1.2. Typographical conventions used in the manual.....	4
1.3. EtherCAT declaration	4
2. G-MATION G3 PLATFORM	5
2.1. System.....	5
2.2. Board modularity	6
2.3. Front polarisation.....	9
2.4. Mechanical dimensions	11
2.5. Front connector wiring	12
2.6. DIN rail mounting.....	13
2.6.1. G3-ECAT	13
2.6.2. G3-xxxx (all models unless otherwise specified).....	14
2.7. Positioning.....	17
3. TECHNICAL SPECIFICATIONS	18
3.1. Board equipment	18
3.2. Meaning of LEDs.....	19
3.3. Connections.....	20
3.3.1. Front connections	20
3.4. Resource software management.....	21
3.4.1. Module Objects	21
3.4.2. IOs managements	22
3.4.3. IOs configuration objects	23
3.4.4. Control objects	23
3.5. Alarms management.....	24
4. ACRONYM AND ORDER CODE	25
5. MARKING	25
6. DISPOSAL	27

1. PREFACE

1.1. Warnings and safety

Although all the information in this document has been carefully checked, Gefran S.p.A. cannot be held liable for the possible presence of errors, or for damage to persons or property due to improper use of this manual. Gefran S.p.A. also reserves the right to make changes to the content and form of this document and to the features of the devices it describes at any time without prior notice.

The devices described in this manual must be installed by qualified technicians, following current laws and regulations and in accordance with the instructions given in this manual. If the card is used in applications with risk of injury, or of damage to machinery or materials, it must be combined with auxiliary alarm devices. It is advisable to provide for the possibility of checking alarm activation also during normal operation.

Before interacting with the card, the operator must be adequately instructed in the system operation, emergency, diagnostics and maintenance procedures.

1.2. Typographical conventions used in the manual

Pay attention when the following symbols are found in the manual.



Indicates particularly important information relevant to correct product operation or safety, or provides instructions that must be strictly followed



Identifies an action that is possible / permitted



Highlights a risk condition for the installation technician or user due to hazardous voltage levels



Identifies an action that is NOT possible / NOT permitted

1.3. EtherCAT declaration

EtherCAT[®]

EtherCAT[®] is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

2. G-MATION G3 PLATFORM

2.1. System



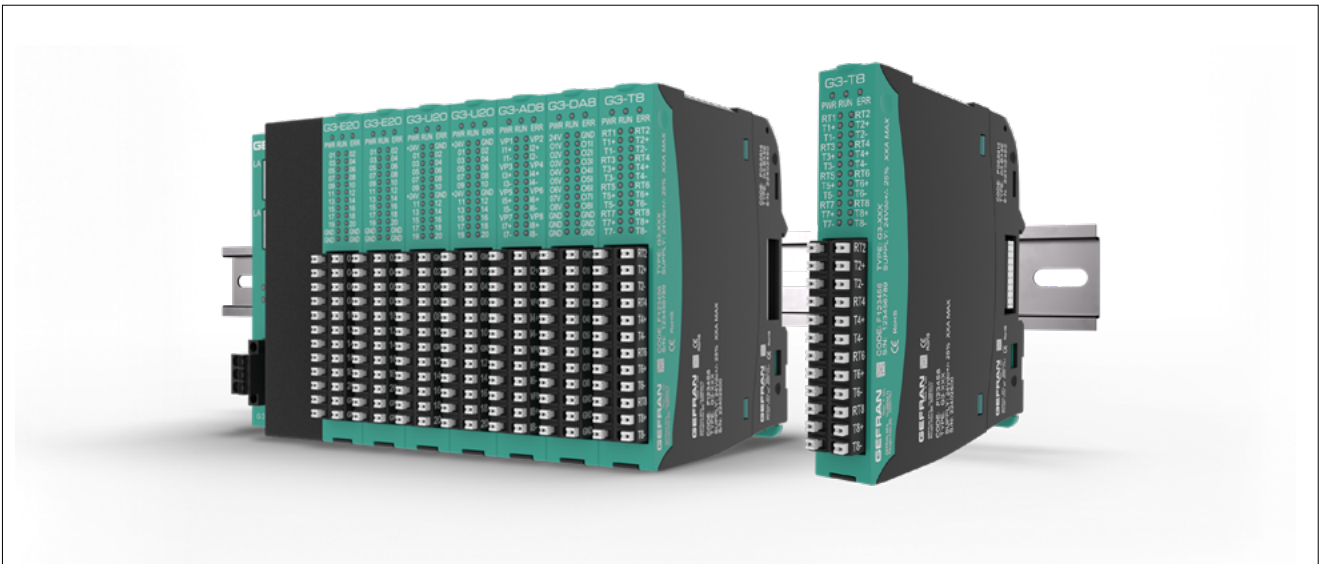
G-Mation G3 is a modular IO system based on EtherCAT technology. EtherCAT provides a maximum of 65535 addressable modules.

A G3 rack of I/Os is composed of the system coupler, G3-ECAT, with a number of I/O boards on the right side as desired according to system needs and up to a maximum of 20.

The G3-ECAT module provides power supply for 20 boards.

If a number of boards greater than 20 is necessary, the power supply module G3-PWR must be inserted between the 20nd and 21st boards.

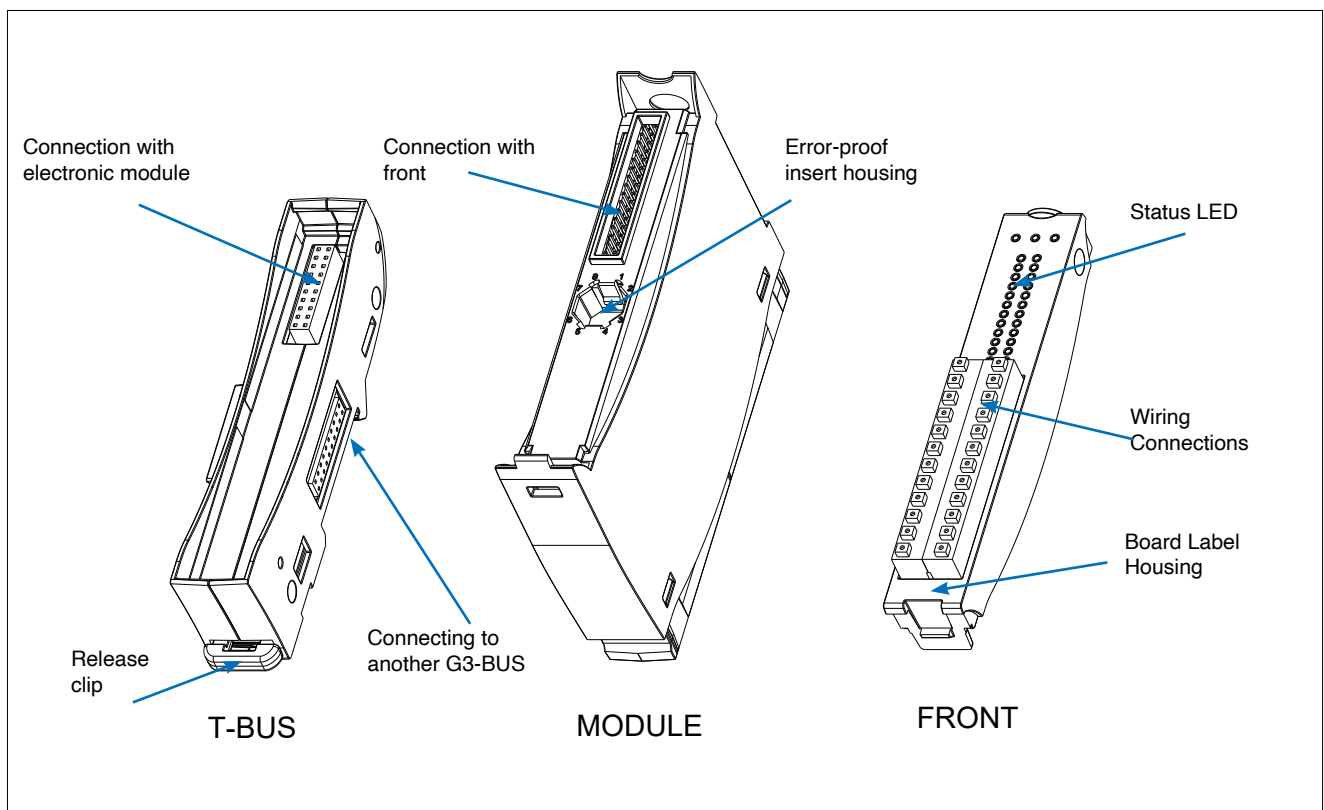
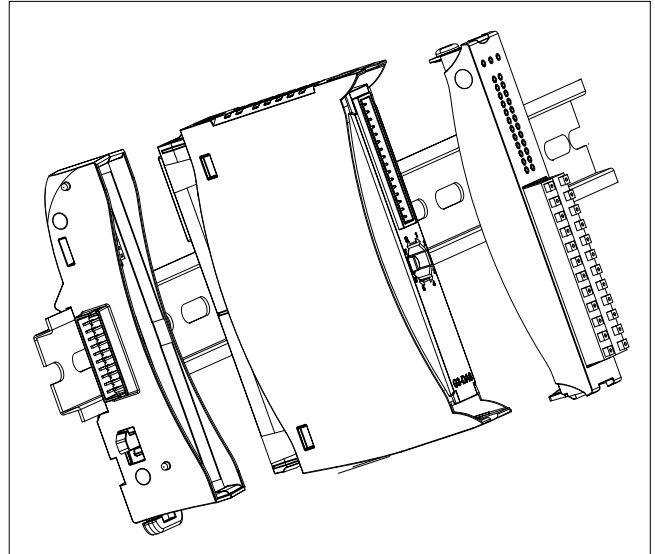
The boards are designed for coupling on a 35 mm DIN rail and the lateral coupling with the rack takes place by sliding to the left (refer to paragraph “2.6. DIN rail mounting” on page 13).



2.2. Board modularity

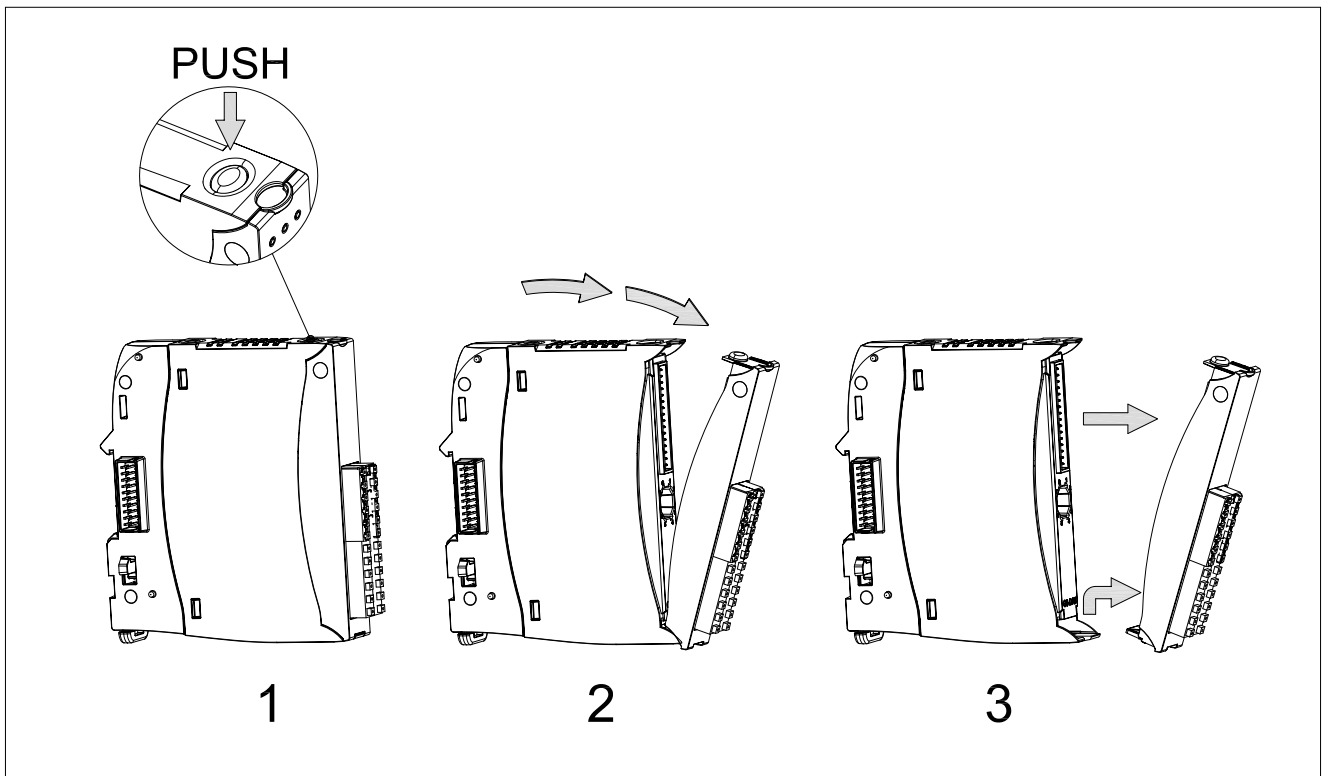
Each I/O board consists of three parts:

- **The base module:** it is the module that guarantees coupling with the din rail and bus transmission between one board and the next. It is called G3-BUS (F092614) and is common to all boards.
- **Electronics:** is the module that contains all the electronics dedicated to managing board I/Os. It is proprietary to each board.
- **The front:** it is the module that houses the push-in connector for the wiring and the front LEDs. It is proprietary to each board

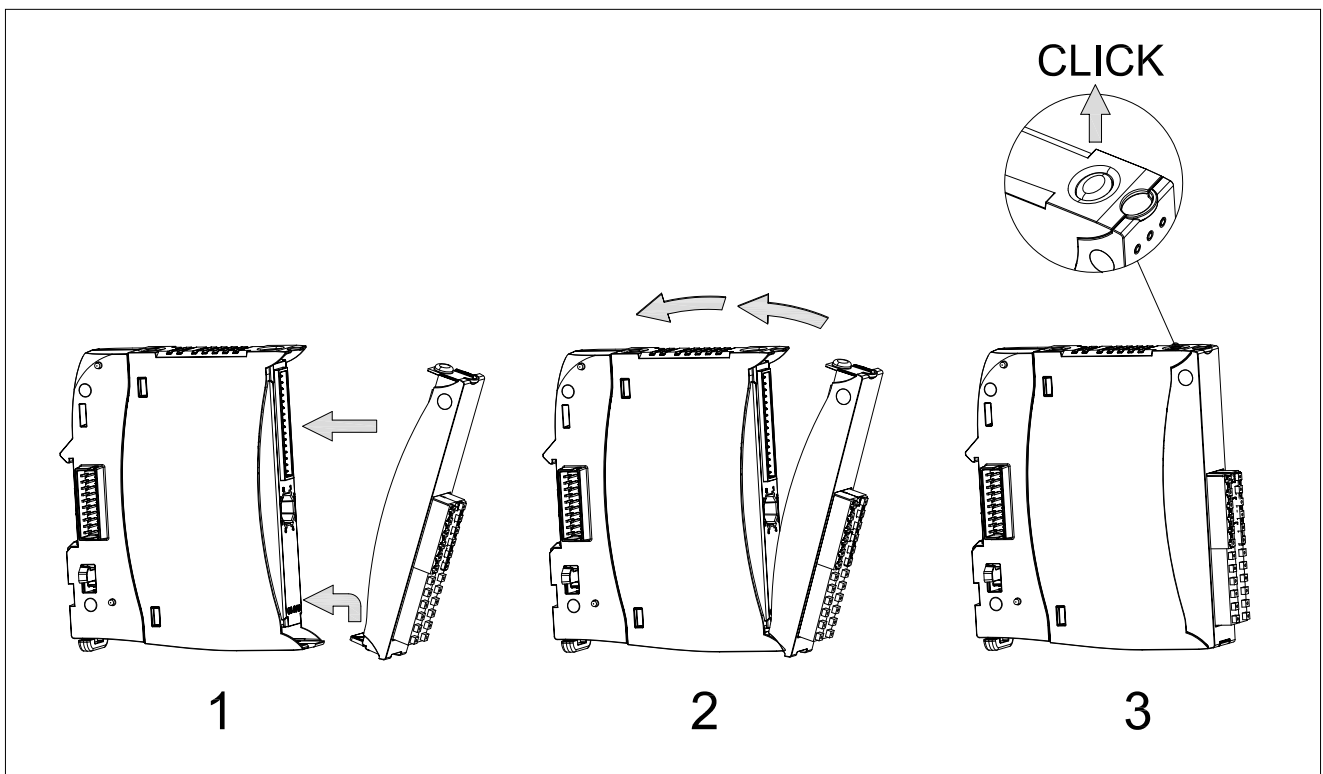


The coupling and uncoupling between the different parts is possible without the use of tools, using only your hands. The movement is constrained in such a way as to be easy and to prevent alignment errors that could compromise the connections.

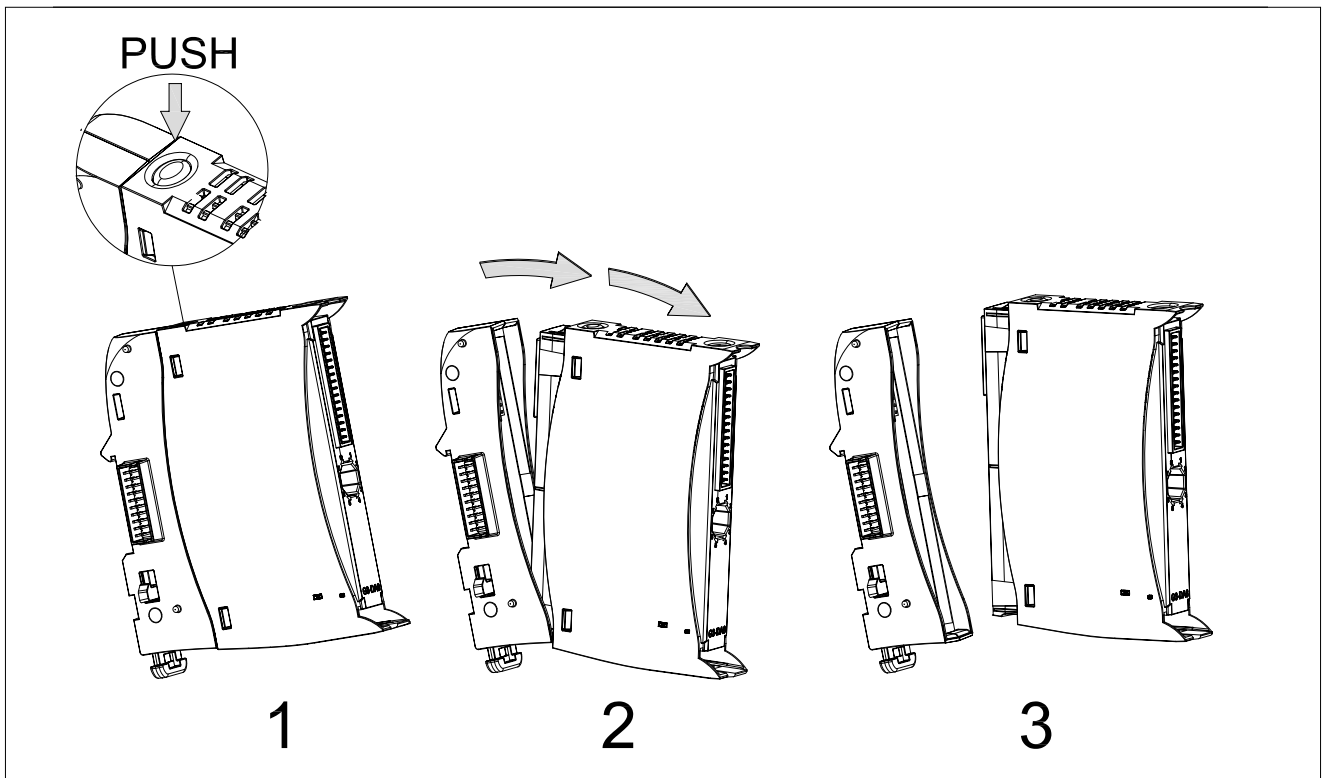
Press the upper button as shown in the figure and pull the board down in the indicated direction to remove the front module.



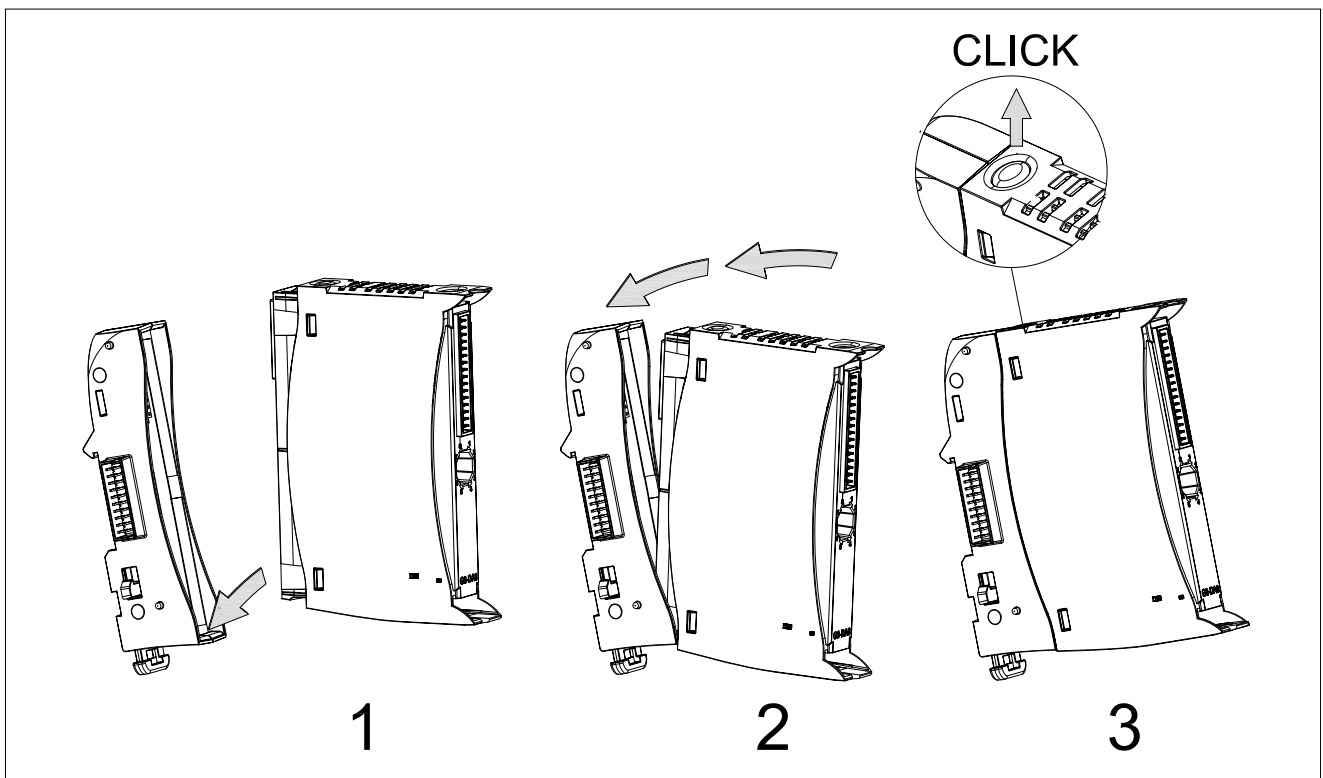
To re-couple the module, first place the lower part inside the constrained housing of the electronic part and then push the front until you feel the upper button couple.



The electronic part can be detached from the base both with the front connected and without. To release the electronic part press the upper button as shown in the figure and pull the board down in the indicated direction.



To re-couple the electronics, first place the bottom part inside the constrained housing of the base and then push the board until you feel the upper button couple.



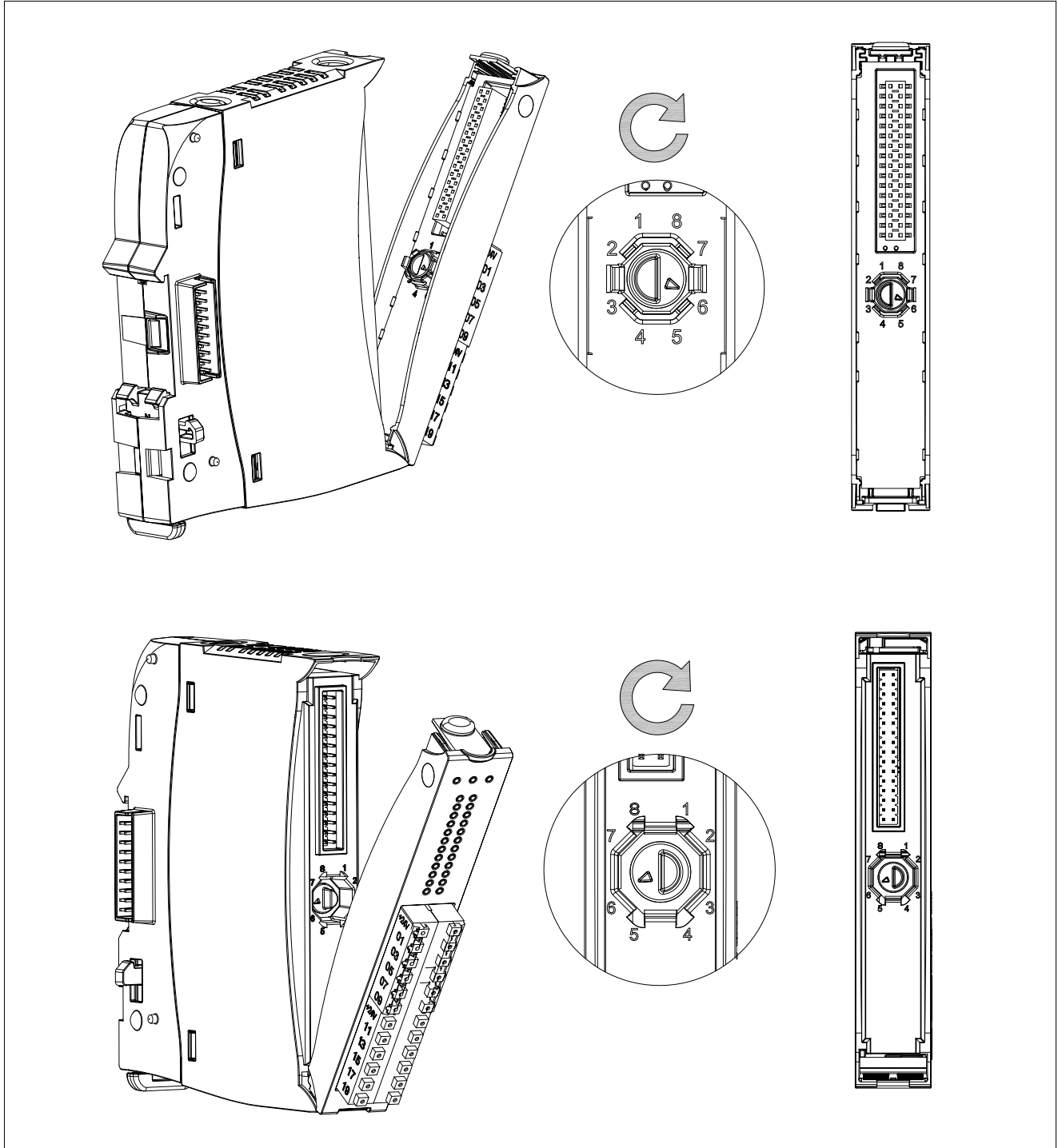
2.3. Front polarisation

A polarisation system is provided that allows you to associate a front to your board to avoid board and front positioning errors.

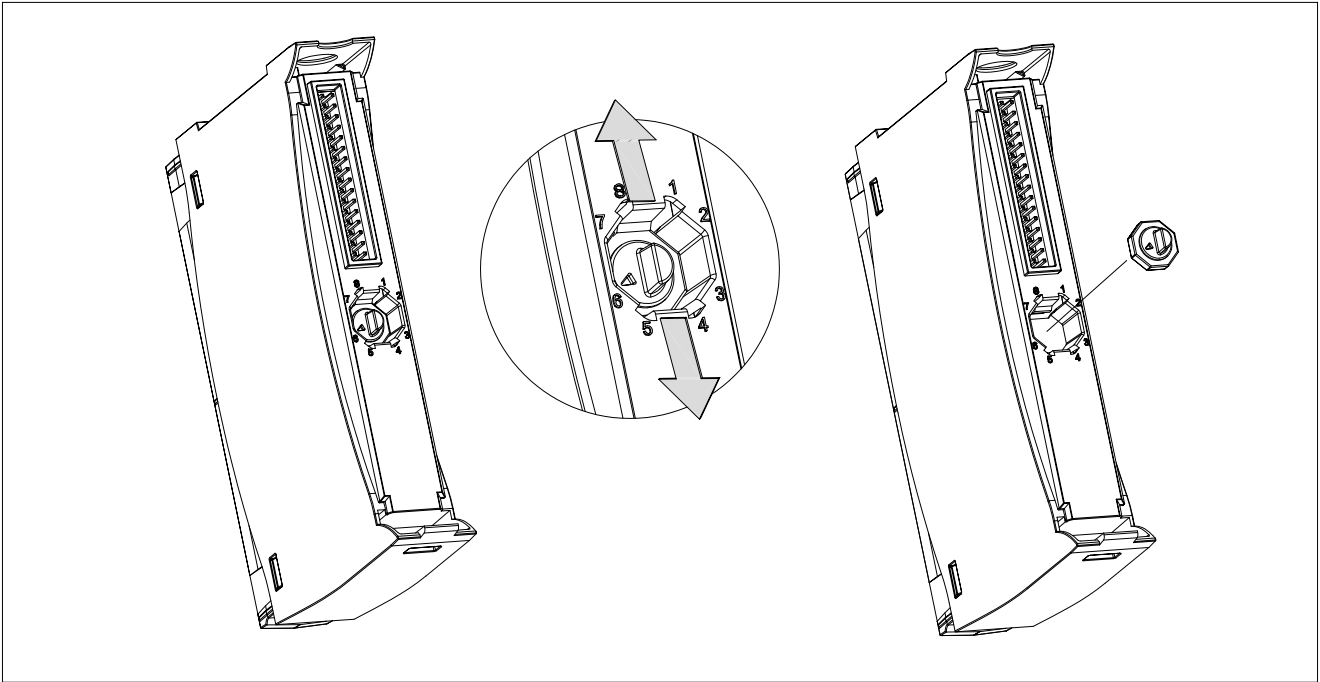
A kit of male-female coupled octagonal-shaped inserts may be provided as an accessory.

The figures on the insert are available in different versions so as to cover a wide range of combinations.

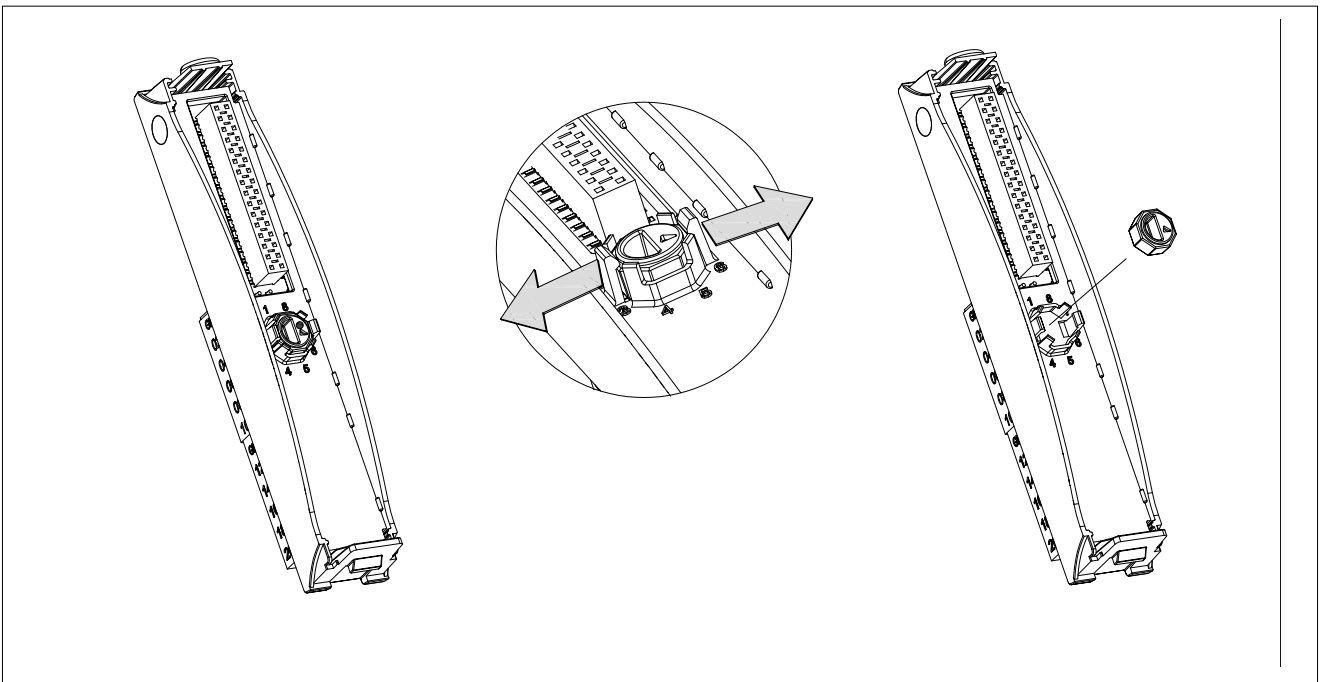
There is a housing for the male insert and one in the front for the female insert in the electronic part.



The insert must be mounted with the aid of tweezers and can be rotated in eight different positions. Proceed as shown in the figure by grasping the insert with tweezers to insert or remove the insert from the electronic board.



Proceed as shown in the figure by grasping the insert with tweezers to insert or remove the insert from the front module.

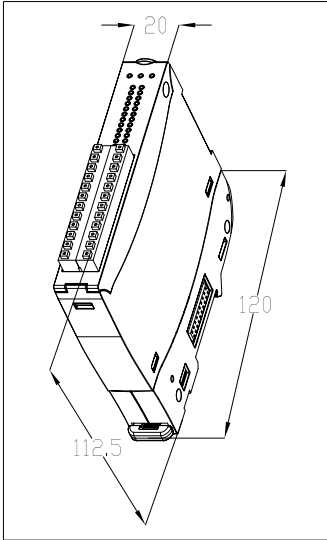


Once inserted, the inserts can be extracted and rotated as desired.

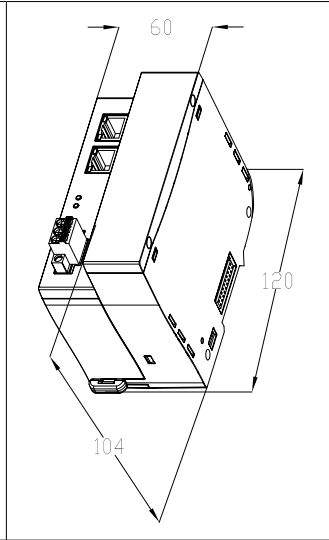
2.4. Mechanical dimensions

The mechanical dimensions of the product, without the DIN rail, may be seen in the image below.

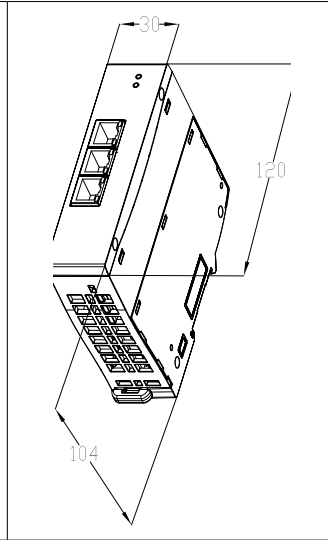
Full G3-xxxx Board



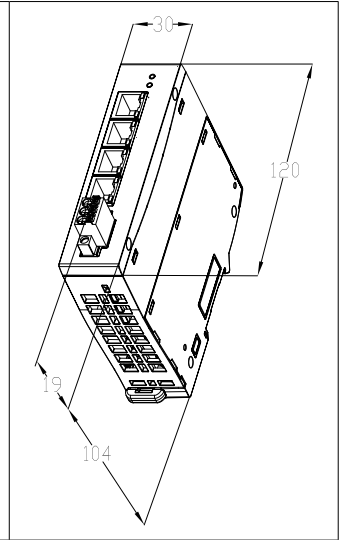
G3-ECAT hub head



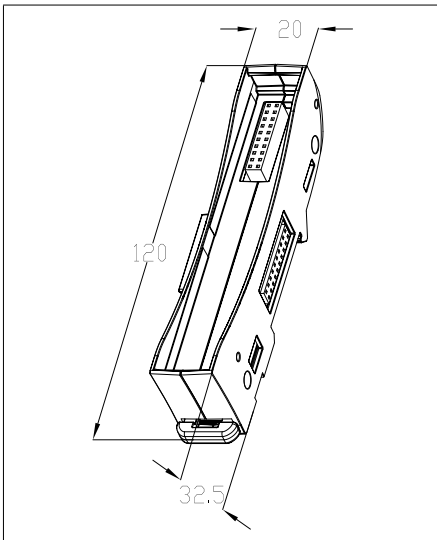
G3-JNC3



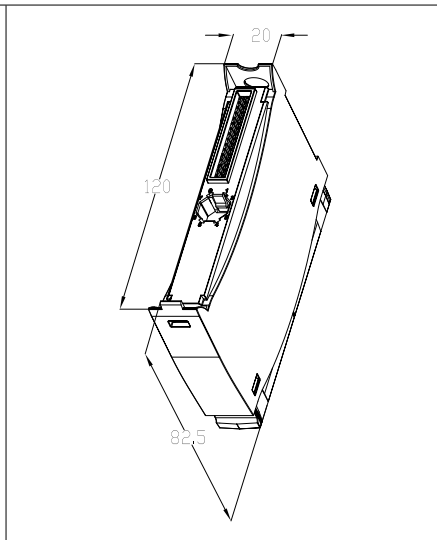
G3-JNC4



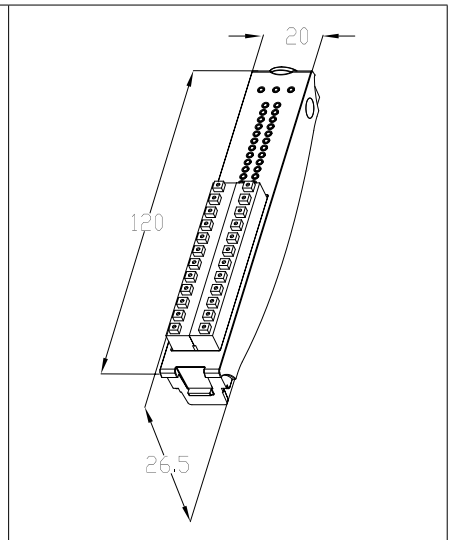
G3-BUS Base



G3-xxxx E Electronic board



G3-xxxx F Front



2.5. Front connector wiring

The connector can be wired both with the front coupled with the module and with the front detached from the module. The front connector can be placed on a bench to facilitate wiring.

For wiring, both the use of NON terminated flexible electrical wire and flexible electrical wire terminated with a TIP are allowed.

Use unipolar flexible electric wire with maximum section of 1.50 mm² (AWG 16) with 8 - 9 mm strip length. If a TIP is used, use a model with a section appropriate to the wire used and with a length of 8 - 9 mm.

To connect the wire **without TIP**:

press the button with a screwdriver insert the wire into the seat release the button.

To connect the wire **with TIP**:

push the tip directly into the seat

To disconnect the wire:

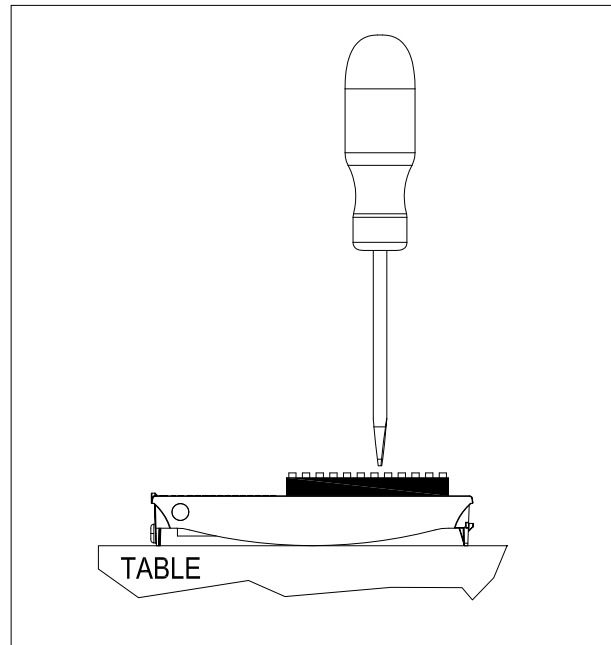
press the button with a screwdriver pull out the wire/tip
release the button

A pressed flexible wire can be used as an alternative to the TIP.



It is recommended NOT TO WELD the electric wire.

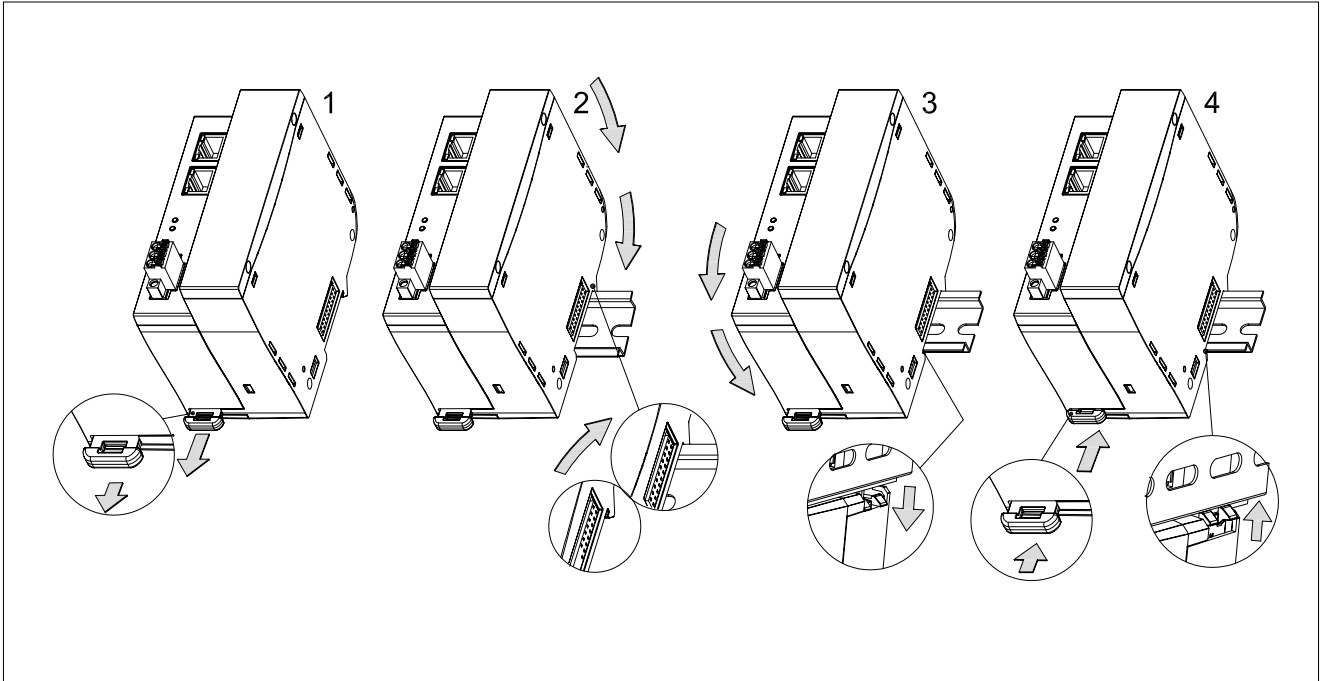
Minimum temperature rating of the cable to be connected to the field wiring terminals, 85 °C



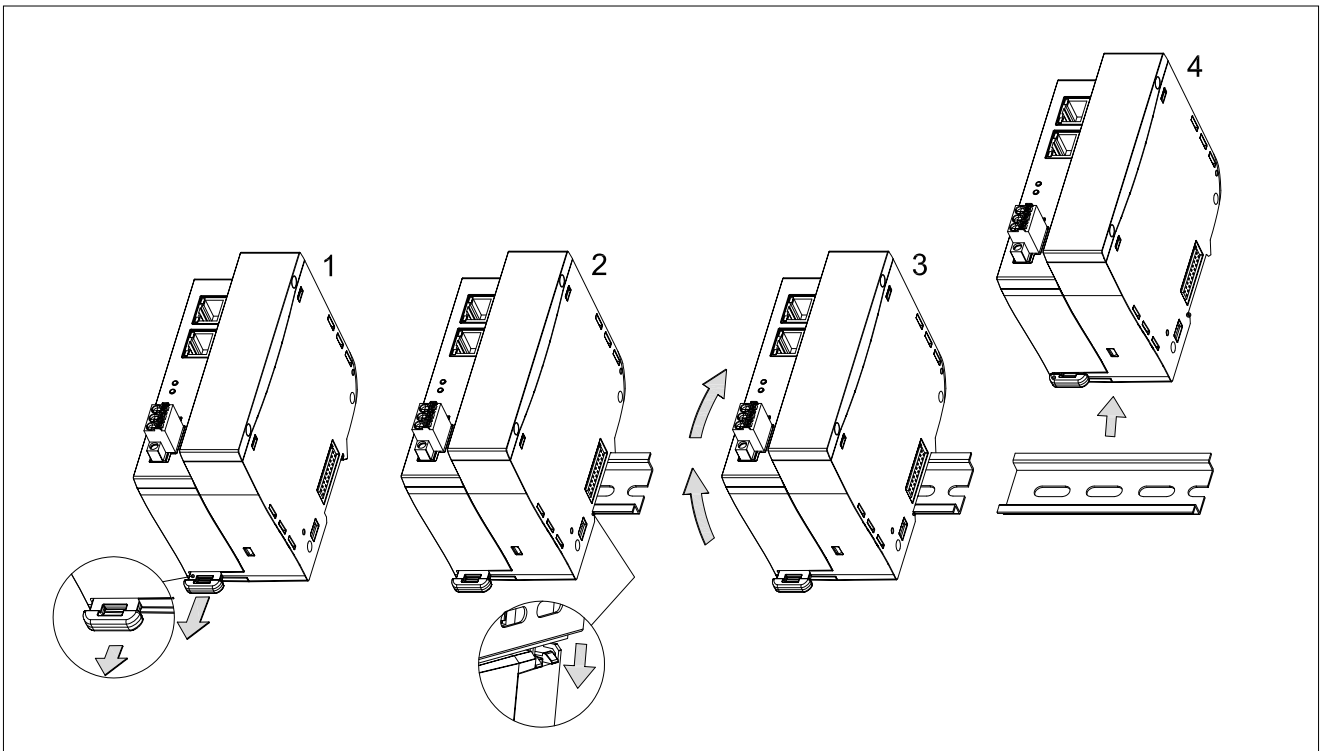
2.6. DIN rail mounting

2.6.1. G3-ECAT

To mount the G3-ECAT to the din bar, unclip the lower clip and leave it in the open stable position. Enter the top of the latch on the rail, rotate the board and place it on the DIN rail. Raise the lower clothespin slightly to free it and allow it to be hooked to the bar even in the lower part.

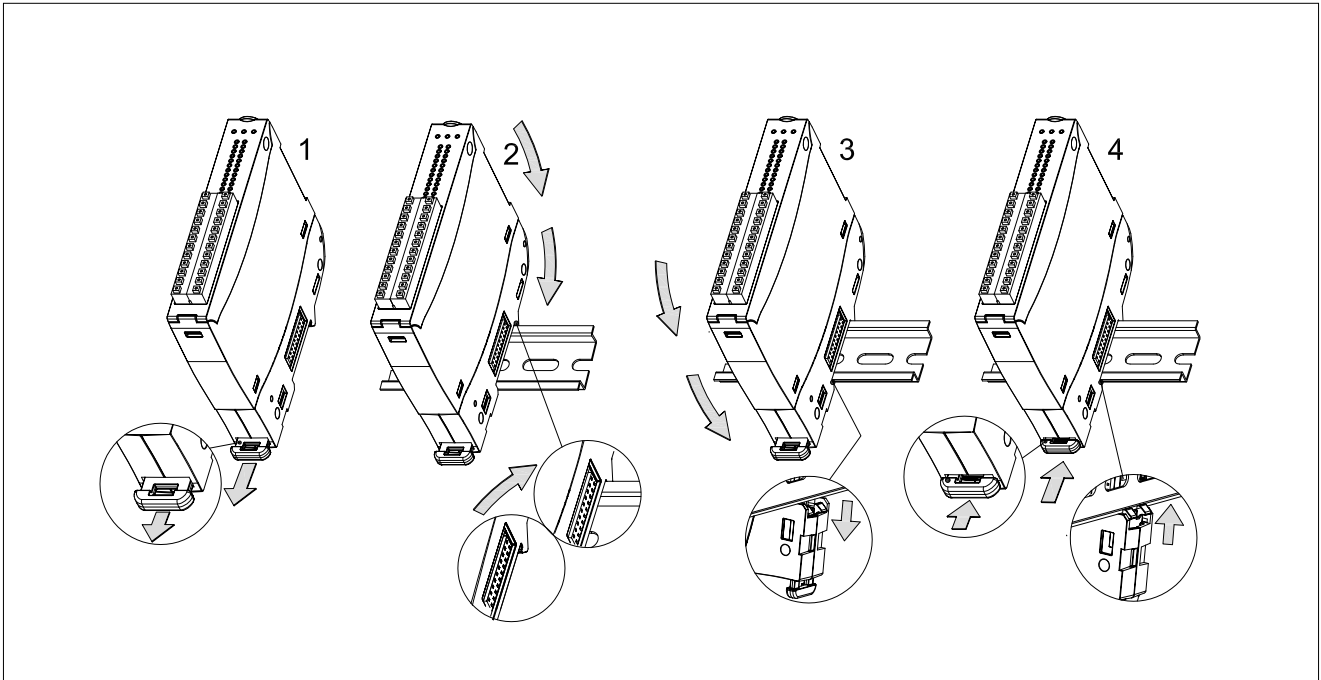


To remove the head the hub from the DIN rail, release the lower clip by slightly levering with a screwdriver and turn the board to release it.

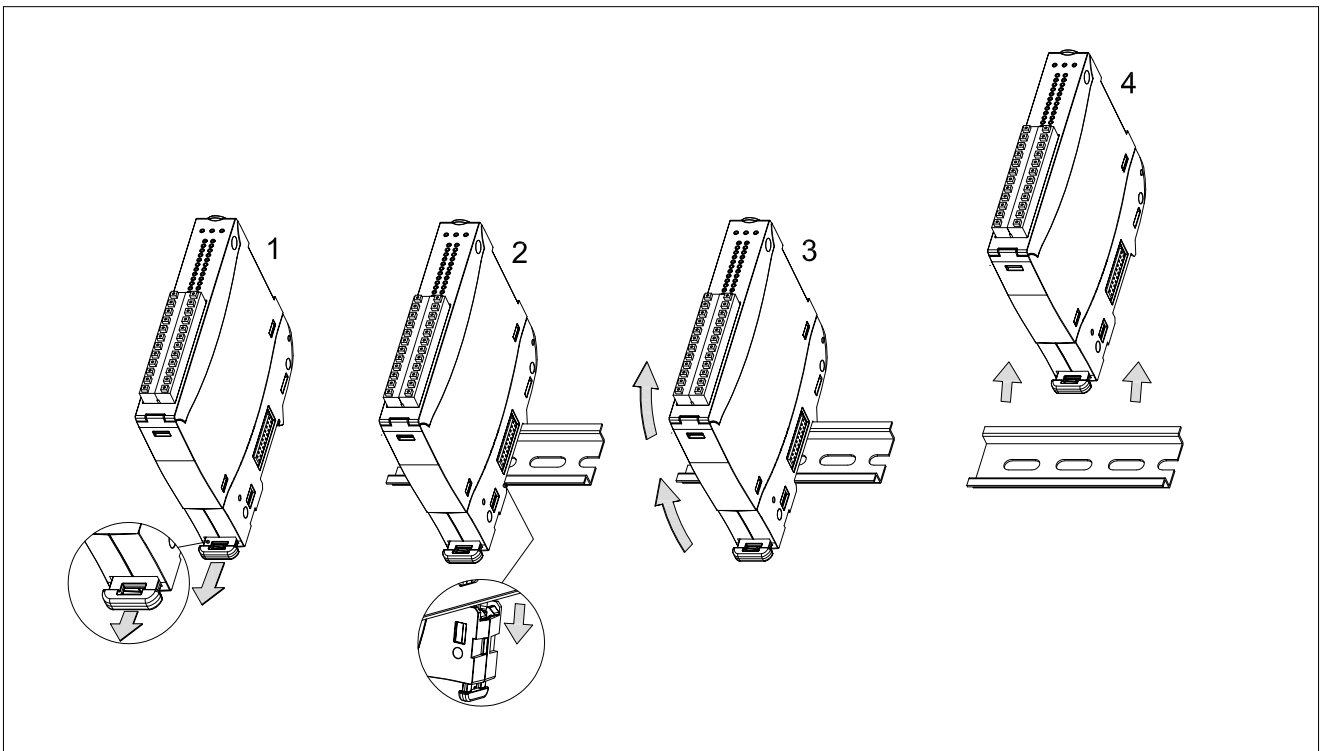


2.6.2. G3-xxxx (all models unless otherwise specified)

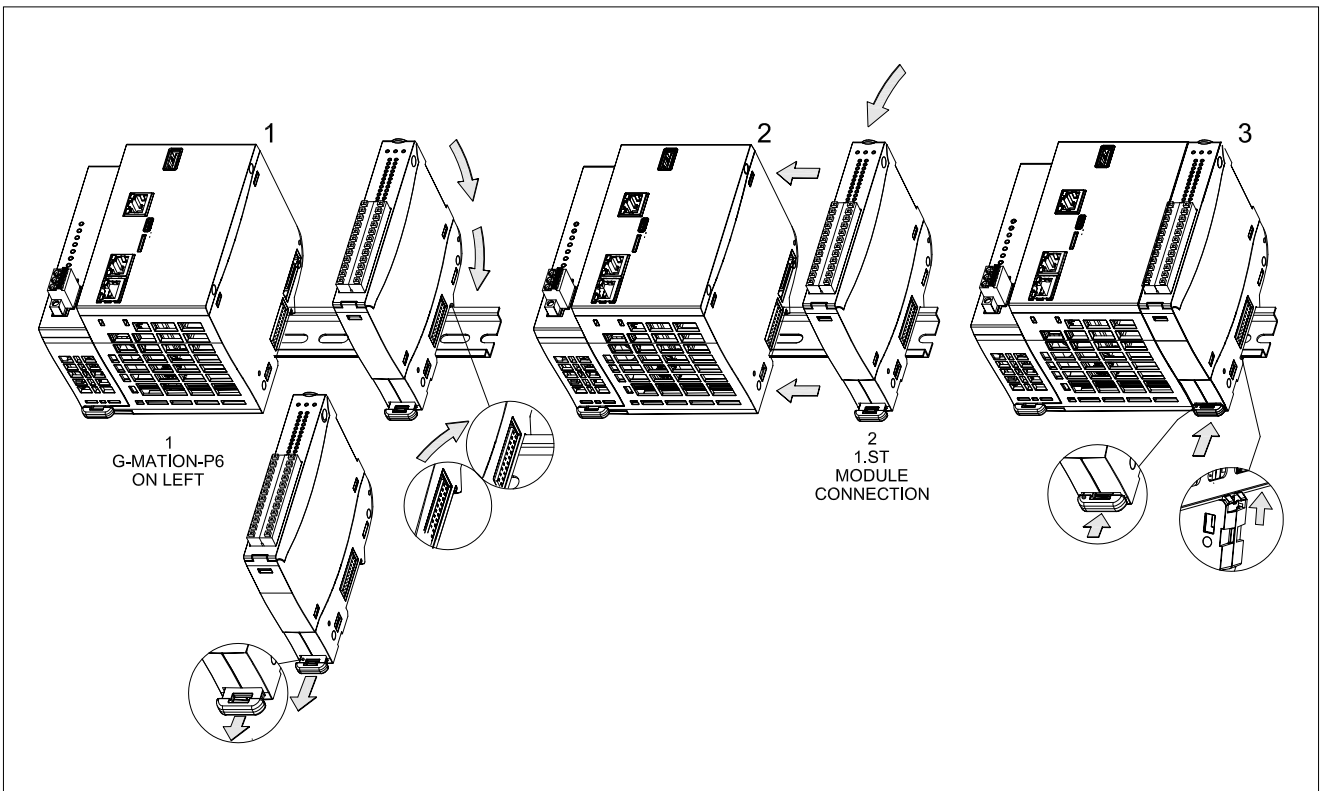
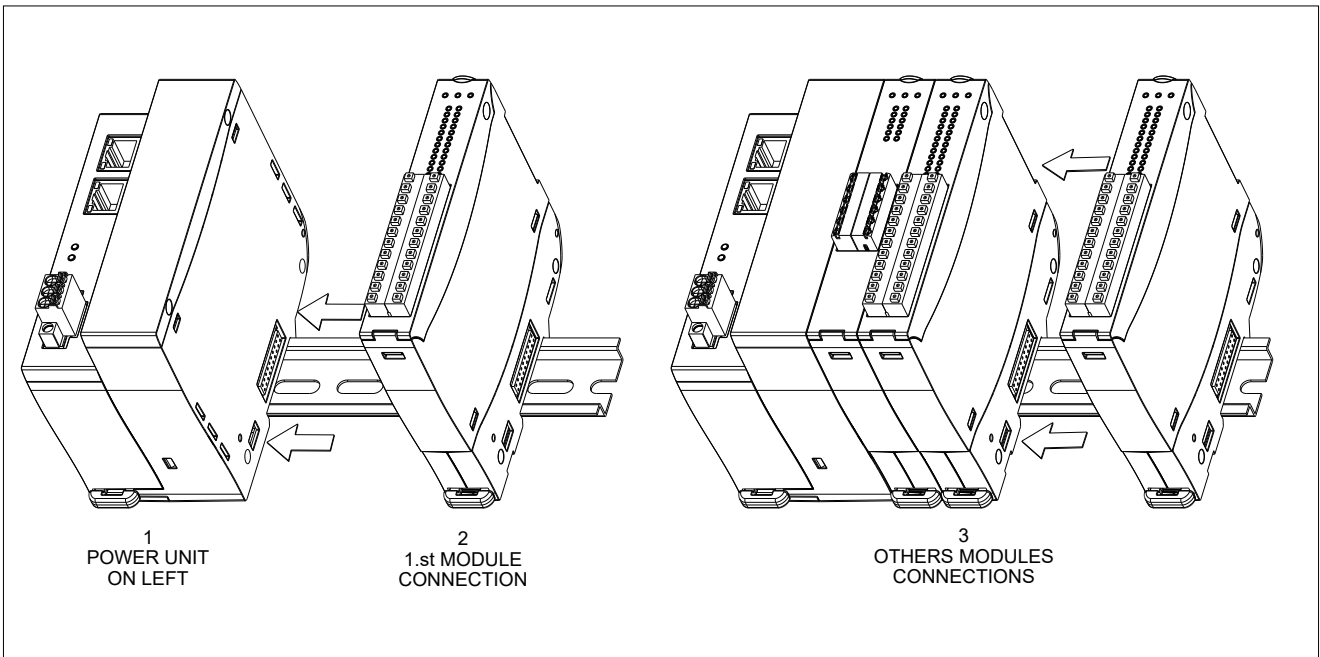
To mount the module to the din rail, unclip the lower clip and leave it in the open stable position. Insert the part top of the hook on the rail, rotate the board and place it on the DIN rail. Raise the lower clothespin slightly to free it and allow it to be hooked to the bar even in the lower part.



Remove the board from the DIN rail, release the lower clip using a screwdriver to lever it slightly, and turn the board to release it.

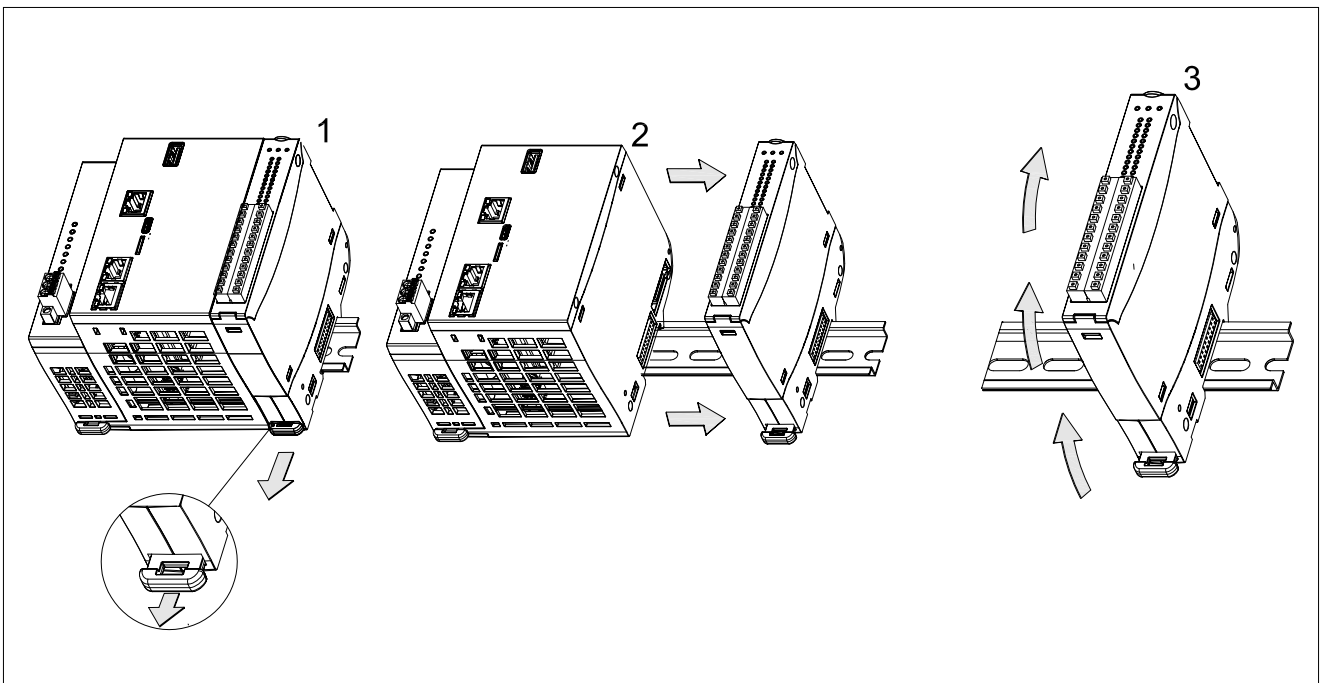
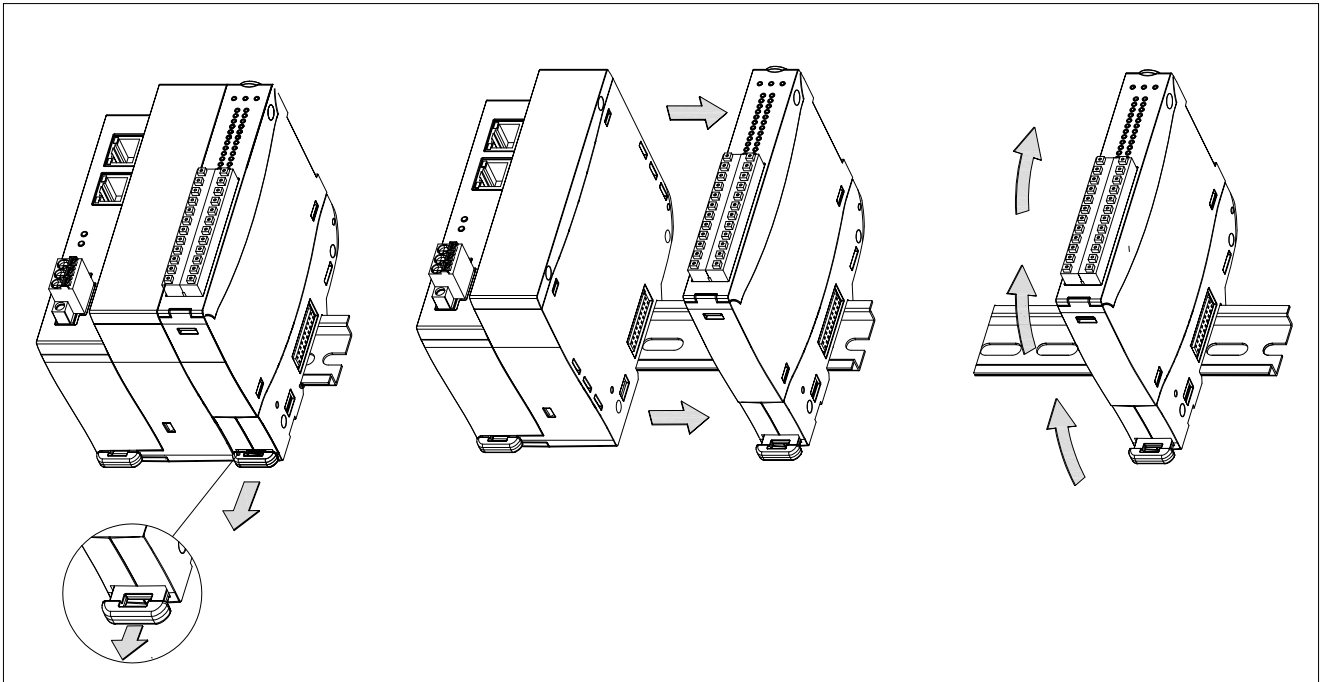


Once the board has been coupled, it is possible to secure the lower clip in the stable released position and slide it longitudinally on the rail until it is coupled to the previous board.



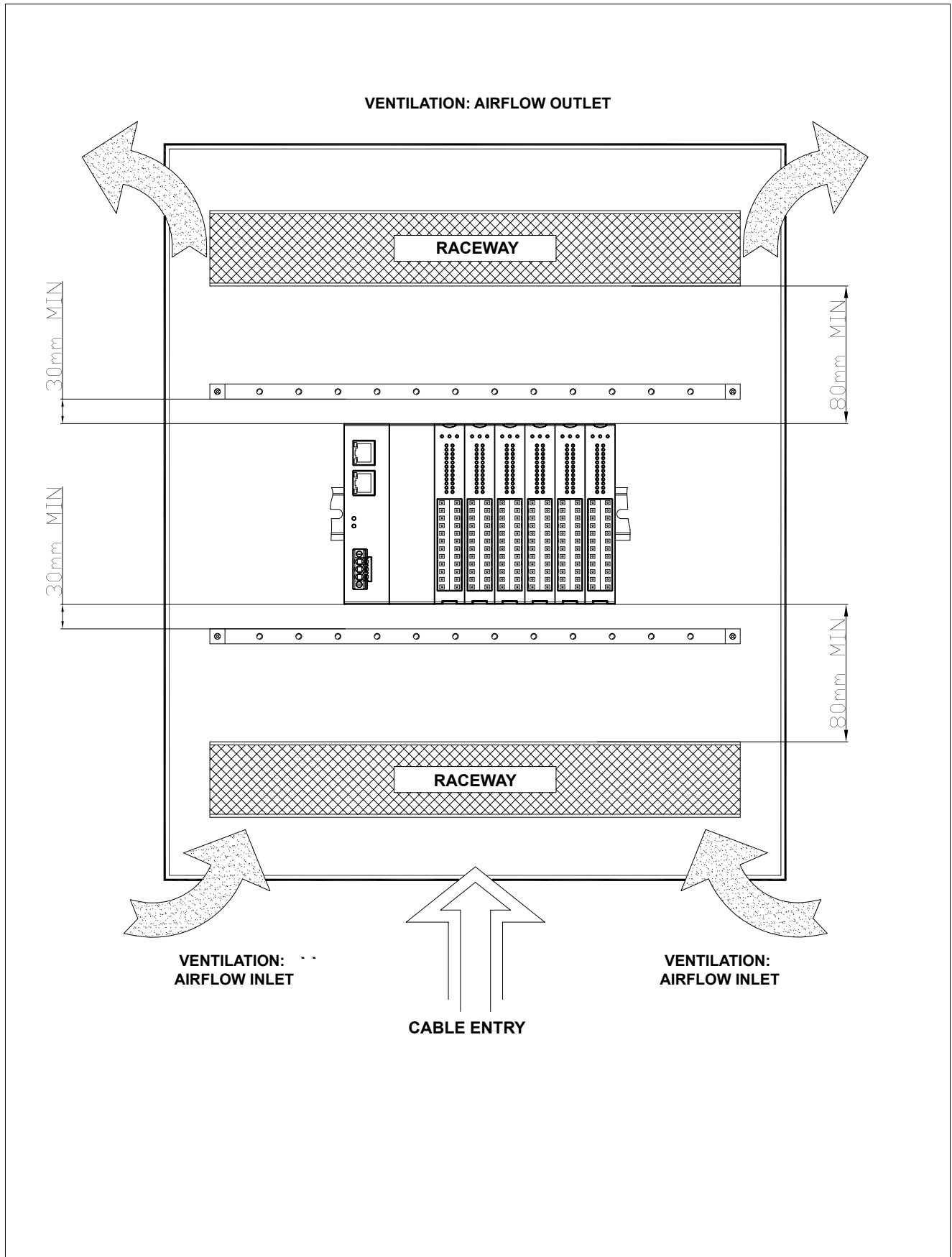
Once coupled, reinsert the lower clip so that the coupling with the DIN rail and the left board is firm and maintained by the force of the internal spring.

To release the board from the rack, use the lower clip and lock it in the stable released position. Slide the board to the right to separate it from the rack. Use the lower clip again and pull it so that you can lift the board from the din r.



2.7. Positioning

For the installation into an electrical cabinet of a G3 I/O rack, the ventilation distances as defined in the figure must be respected underlying.



3. TECHNICAL SPECIFICATIONS

3.1. Board equipment

The **G3-AM8** module has 4 isolated analog inputs and 4 isolated analog outputs that can be used to read signals from various types of linear sensors, from retransmitting units, servocontrols, position systems and to send reference signals to drives, servocontrols, power solid state relays with linear input.

Inputs can be software configurable as voltage (0...10V, $\pm 10V$), current (0...20mA, 4...20mA) or potentiometer ($>1k\Omega$).

Outputs can be software configurable as voltage output ($\pm 10V$) or current output (0...20mA, 4...20mA).


G3-AM8 can be used with all the G-Mation gateways and Px modules from which it receives power supply.

G3-AM8 can acquire 4 analog inputs in less than 100 μ s for 4 channels and refresh 4 analog outputs in less than 80 μ s allowing fast and accurate closed loop and process applications in combination with EtherCAT communication.



TECHNICAL DATA	
4 analog inputs	16 bit A/D conversion
Sample time	< 100 μ s for 4 channels
Inputs type	Potentiometer min. 1k Ω Linear 0...10V, $\pm 10V$ Linear 0...20mA, 4...20mA
Input impedance	Potentiometer > 1M Ω Linear 0...10V, $\pm 10V$ > 1M Ω Linear 0/4...20mA = 500 Ω
4 analog output	16 bit A/D conversion
Refresh time	< 80 μ s for 4 channels (includes analog settling time)
Output types	Linear $\pm 10V$ max 20mA each channel Linear 0...20mA, 4...20mA, max 600 Ω load
Accuracy	Better than 0.1% at full scale over the entire temperature range -10 $^{\circ}$ C to +55 $^{\circ}$ C
Power supply	From G3-ECAT or Px CPU for control electronics, +24V $\pm 25\%$, 0.5A max for field signals
Potentiometer power supply	4.096 V \pm 0.03%
Overvoltage Category	II
Power dissipation	1,2 W, $\pm 5\%$
MECHANICAL DATA	
Dimensions	120x110x20 mm
Weight	150 g
Protection level	IP20 For UL: not UL evaluated. Open type device
Connector	Front 24 pin-5.08 mm pitch removable connection system with spring wire retention, no tool required to fix or remove wires
Attachment	Mechanically snaps onto DIN rail
ENVIRONMENTAL CONDITIONS	
Working temperature	-10...55 $^{\circ}$ C
Storage temperature	-25...70 $^{\circ}$ C
Humidity	max. 90% Rh not condensing
Pollution degree	2
Maximum altitude	2000 m

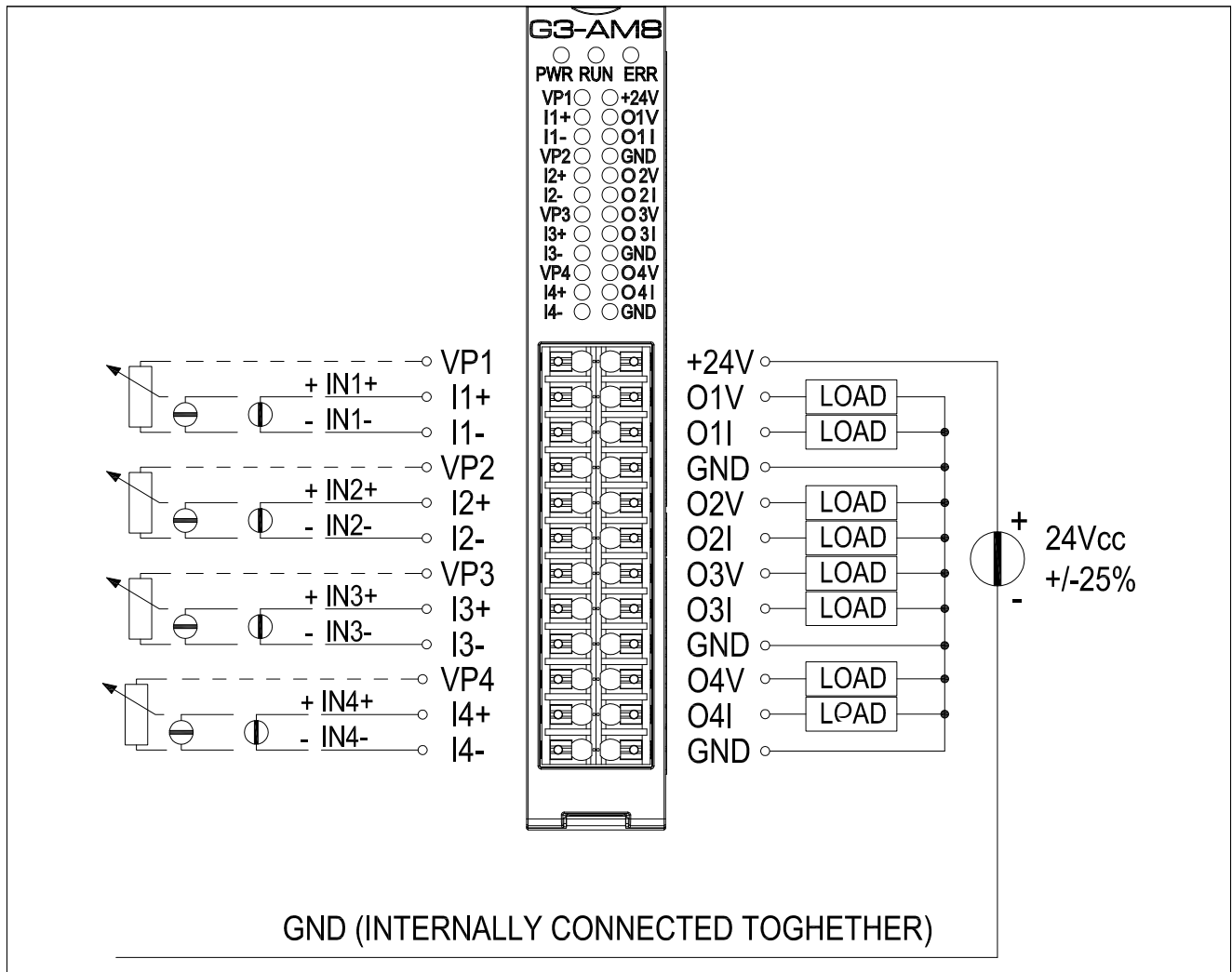
3.2. Meaning of LEDs

	ACRONYM	COLOR	LED STATUS	MEANING
MODULE DIAGNOSTICS 	PWR	YELLOW	OFF	no power supply
			ON	power supply present
	RUN	GREEN	OFF	INIT or BOOT status
			Blinking: 2.5 Hz (Slow blinking)	PRE-OPERATIONAL status
			Single Flash: on 200 ms off 1000 ms (Single Flash)	SAFEOP status
			Flickering: 10 Hz (Fast flickering)	BOOT status
			ON	OPERATIONAL status
	ERR	RED	OFF	no error
			Blinking (Slow blinking)	configuration error
			Single Flash:	generic runtime error
			Double Flash	wdog on cyclic data.
			Flickering (Fast flickering)	error during the BOOTING PHASE

If communication with the master is active, more information can be obtained from the objects in the module itself.

3.3. Connections

3.3.1. Front connections



Use flexible multipolar SHIELDED electric wire with 0.5 section .. 1.0 mm² with a strip length of 8 .. 9 mm to wire ANALOG INPUTS.

Use flexible multipolar SHIELDED electric wire with 0.5 section .. 1.0 mm² with a strip length of 8 .. 9 mm to wire ANALOG OUTPUT

Connect the GROUND shield jacket as close as possible to the transducer (signal source). See paragraph "2.5. Front connector wiring" a pagina 12 of this manual for wiring modes

3.4. Resource software management

The G3-AD8 module resources are available through the objects described below, which are provided by the EtherCAT protocol according to directive ETG 5001.

All objects are made available to the master through the ESI file called:

Gefran G3-AD8 Vxx where xx is the version.

The file is available on the Gefran WEBSITE (www.gefran.com).

The default configuration is programmed in the factory, when turned on the master initializes the card with only the telegrams indicated by the developer, not with the default ones

3.4.1. Module Objects

Module information:

INDEX	SUB.	NAME	TYPE	ACCESS	DEFAULT / NOTE	
0x1000	0	Device type	UDINT	RO	0x0001389	5001 TBD
0x1001	0	Error Register	USINT	RO	0x00	
0x1008	0	Device Name	STRING	RO	G3-AM8	
0x1009	0	Manufacturer Hardware version	STRING	RO	01	
0x100A	0	Manufacturer Software version	STRING	RO	1.1	
0x1018	0	Objects number	USINT	RO	4	
	1	Vendor Id	UDINT	RO	0x0000 0093 (Gefran)	
	2	Product Code	UDINT	RO	0x00000BC5 (3013)	
	3	Revision Number	UDINT	RO	0x0000 0001	
	4	Serial Number	UDINT	RW	32-bit product serial number	

3.4.2. IOs managements

Analog Inputs

INDEX	SUB INDEX	NAME	TYPE	ACCESS	DEFAULT / NOTE
0x6002	0	Objects number	USINT	RO	4
	1	Analog Input Value 1	DINT	RO	IN -10..10 V: -10 V = -32000; 10 V = 32000 IN 0..10 V: 0 V = 0; 10 V = 64000 IN 0.. 20 mA / 4..20 mA: 0 mA = 0; 20 mA = 64000
	2	Analog Input Value 2	DINT	RO	IN -10..10 V: -10 V = -32000; 10 V = 32000 IN 0..10 V: 0 V = 0; 10 V = 64000 IN 0.. 20 mA / 4..20 mA: 0 mA = 0; 20 mA = 64000
	3	Analog Input Value 3	DINT	RO	IN -10..10 V: -10 V = -32000; 10 V = 32000 IN 0..10 V: 0 V = 0; 10 V = 64000 IN 0.. 20 mA / 4..20 mA: 0 mA = 0; 20 mA = 64000
	4	Analog Input Value 4	DINT	RO	IN -10..10 V: -10 V = -32000; 10 V = 32000 IN 0..10 V: 0 V = 0; 10 V = 64000 IN 0.. 20 mA / 4..20 mA: 0 mA = 0; 20 mA = 64000

The value of the analog input 1..4 is available in the object in sub-indexes 1..4
 Analog Input Value Type (n): **DINT**

Analog Output:

INDEX	SUB INDEX	NAME	TYPE	ACCESS	Default / Note
0x7001	0	Numero di oggetti	USINT	RO	4
	1	Analog Output Value 1	INT	RW	OUT -10..10 V: -10 V = -32768; 10 V = 32767 OUT 0..20 mA: 0 mA = 0; 20 mA = 32767 OUT 4..20 mA: 4 mA = 0; 20 mA = 32767
	2	Analog Output Value 2	INT	RW	OUT -10..10 V: -10 V = -32768; 10 V = 32767 OUT 0..20 mA: 0 mA = 0; 20 mA = 32767 OUT 4..20 mA: 4 mA = 0; 20 mA = 32767
	3	Analog Output Value 3	INT	RW	OUT -10..10 V: -10 V = -32768; 10 V = 32767 OUT 0..20 mA: 0 mA = 0; 20 mA = 32767 OUT 4..20 mA: 4 mA = 0; 20 mA = 32767
	4	Analog Output Value 4	INT	RW	OUT -10..10 V: -10 V = -32768; 10 V = 32767 OUT 0..20 mA: 0 mA = 0; 20 mA = 32767 OUT 4..20 mA: 4 mA = 0; 20 mA = 32767

The value of the analog output 1..4 is available in the object in sub-indexes 1..4
 Analog Output Value Type (n): **DINT**

3.4.3. IOs configuration objects

INDEX	SUB INDEX	NAME	TYPE	ACCESS	DEFAULT / NOTE
0x8000	0	Objects number	USINT	RO	8
	1	Analog Input Type 1	ENUM	RW	0
	2	Analog Input Type 2	ENUM	RW	0
	3	Analog Input Type 3	ENUM	RW	0
	4	Analog Input Type 4	ENUM	RW	0

The configuration of the 1..4 analog inputs is available in the 1..4 sub-indexes.
 Analog Input Type (n).

Each of these fields can be configured as follows:

- 0 = -10..10 V (default)
- 1 = 0..10 V
- 2 = 0..20 mA
- 3 = 4..20 mA
- 4 = Potentiometer

INDEX	SUB INDEX	NAME	TYPE	ACCESS	DEFAULT / NOTE
0x8001	0	Objects number	USINT	RO	4
	1	Analog Output Type 1	ENUM	RW	0
	2	Analog Output Type 2	ENUM	RW	0
	3	Analog Output Type 3	ENUM	RW	0
	4	Analog Output Type 4	ENUM	RW	0

The configuration of the 1..4 analog output is available in the 1..4 sub-indexes.
 Analog Output Type (n).

Each of these fields can be configured as follows:

- 0 = -10..10 V (default)
- 1 = 0..10 V
- 2 = 0..20 mA

3.4.4. Control objects

INDEX	SUB.	NAME	TYPE	ACCESS	DEFAULT / NOTE
0x9000	0	Device Code	UINT	RO	0x0BC5
0x9001	0	Hardware Revision	USINT	RW	0x01
0x9002	0	Firmware Version	UINT	RO	0x0110
0x9003	0	Serial Number	DINT	RW	0x00000000
0x9004	0	Order Code	STRING(7)	RW	F092608
	0	Objects number	USINT	RO	1
	1	Command	UINT	RW	0x0000

Object 0xFB00 is for watchdog control. The watchdog will remain active until 0xFB00:01=0x1357

3.5. Alarms management

INDEX	SUB.	NAME	TYPE	ACCESS	DEFAULT / NOTE
0xA000	0	Objects number	USINT	RO	8
	1	Alarm Status Input Channel 1	USINT	RO	0x00
	2	Alarm Status Input Channel2	USINT	RO	0x00
	3	Alarm Status Input Channel 3	USINT	RO	0x00
	4	Alarm Status Input Channel 4	USINT	RO	0x00

The alarm status of inputs 1..4 is available in the object in sub-indexes 1..4
Alarm Status Channel (n) Type: **USINT**

Alarm code for “Alarm Status Input Channel 1..4”:

0 = no alarm .

1 = -10..10 V / 0..10 V / 0..20 mA / 4..20 mA at upper full scale .

2 = -10..10 V / 0..10 V / 0..20 mA / 4..20 mA off top .

3 = -10..10 V / 4..20 mA in lower off-scale (for 4..20 mA means input current < 4mA)

4 = -10..10 V at lower full scale

The alarm thresholds are summarized in the following table :

CONFIGURATION	MAXIMUM FULL SCALE	MAXIMUM OUT OF SCALE	MINIMUM OUT OF SCALE	MINIMUM FULL SCALE
-10..10 V	32639 (10.2 V)	32321 (10.1 V)	-32321 (-10.1 V)	-32639 (-10.2 V)
0..10 V	65410 (10.2 V)	65090 (10.1 V)	-	-
0..20 mA	65410 (20.4 mA)	65090 (20.2 mA)	-	-
4..20 mA	65410 (20.4 mA)	65090 (20.2 mA)	12790 (4 mA)	-

INDEX	SUB.	NAME	TYPE	ACCESS	DEFAULT / NOTE
0xA001	0	Numero di oggetti	USINT	RO	4
	1	Alarm Status Output Channel 1	USINT	RO	0x00
	2	Alarm Status Output Channel 2	USINT	RO	0x00
	3	Alarm Status Output Channel 3	USINT	RO	0x00
	4	Alarm Status Output Channel 4	USINT	RO	0x00

The alarm status of outputs 1..4 is available in the object in sub-indexes 1..4
Alarm Status Channel (n) Type: **USINT**

Alarm code for “Alarm Status Output Channel 1..4”:

0 = no alarm

1 = channell in short circuit (for output in tension)

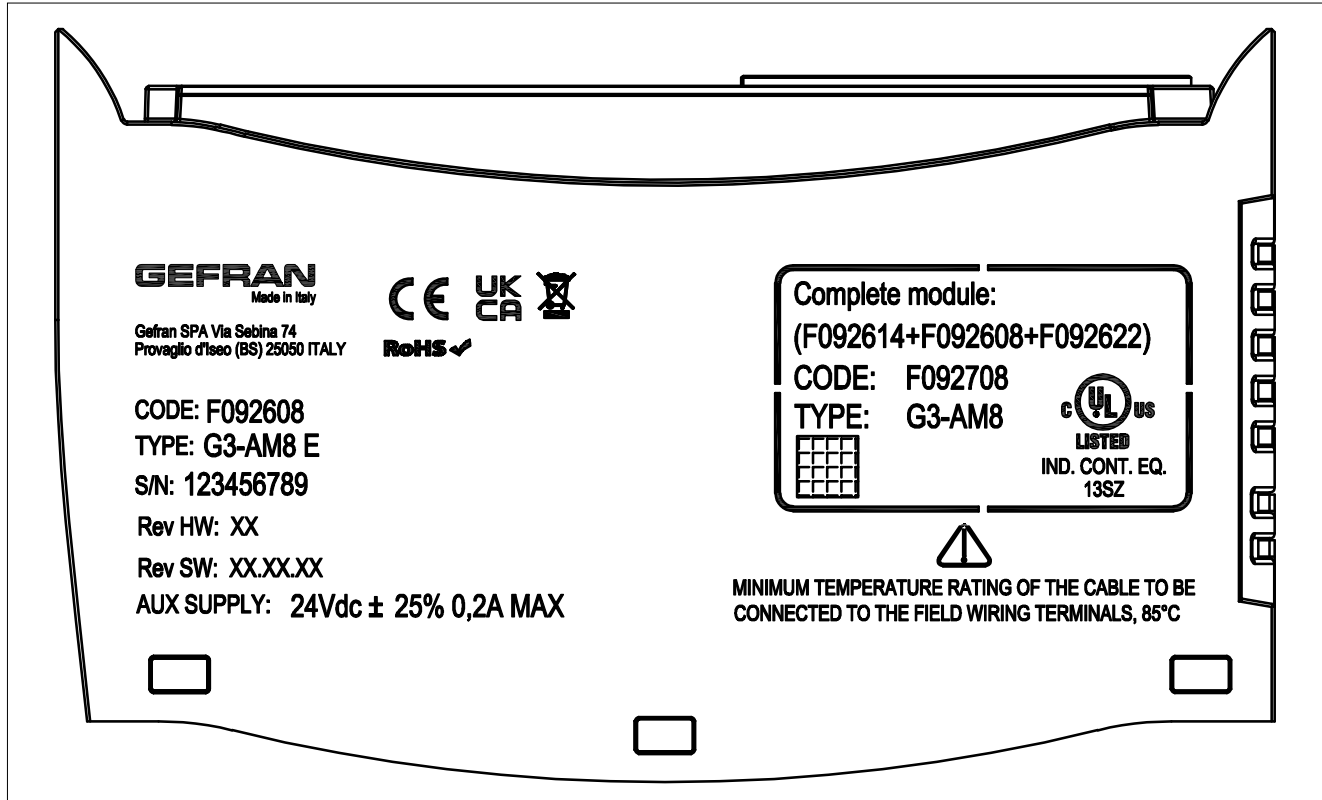
2 = channell in open circuit (for current outputs)

4. ACRONYM AND ORDER CODE

COMPLETE MODULE	G3-AM8	F092708
Front	G3-AM8 F	F092622
Electronic module	G3-AM8 E	F092608
Bus	G3-BUS	F092614

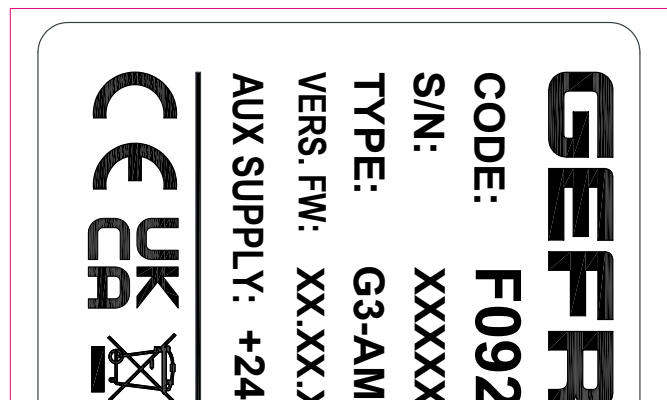
5. MARKING

Every module contain the datas of every module part and the full module:





The following information may be found on the label:

- CODE: product code
- S/N: product serial number
- TYPE: product name / description
- HW: hardware version 1 .. 99
- GEFRAN logo
- certifications
- logo specifying product disposal



This symbol present on the product label stands for further indications on product manual. For correct and sale installation, follow the instructions and observe the warnings contained in this manual. No hazards shall arise by any reasonably foreseeable misuse in a way not intended, and not described in this manual. The complete manual is available for download from the website www.gefran.com. UL file number E-198546.

Certifications

	This device conforms to European Union Directive 2014/30/EU and 2014/35/EU as amended with reference to generic standards: EN 61000-6-2 (immunity in industrial environment) EN 61000-6-4 (emission in industrial environment) - EN 61010-1 (safety regulations).
	cULus listed, Conformity UL61010-1 - File: E198546

6. DISPOSAL



The product must be disposed of in accordance with the regulations in force.

Some of the components used in the devices can cause damage to the environment if incorrectly disposed.

Pursuant to art. 26 of Legislative Decree 14 March 2014, no. 49 "Implementation of Directive 2012/19/EU on waste from electrical and electronic equipment (WEEE)".

The symbol showing a crossed-out wheeled bin on equipment or its packaging indicates that the product must be collected separately from other waste at the end of its useful life.

By collecting the disused equipment separately, it can be recycled, treated or disposed of in an environmentally friendly manner, thus helping to prevent the environment and public health from being affected negatively and enabling reuse and/or recycling of the materials forming the equipment.

GEFRAN