

# G3-E20

G-Mation G3 – 20 Digital Inputs

## USE AND INSTALLATION MANUAL

G3 E20 code F092700

code: 80651A - Ver 1.0 - 01-2025 - ENG





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# 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<sup>®</sup>** 

**EtherCAT<sup>®</sup> is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.**

## 2. G-MATION G3 PLATFORM

### 2.1. System



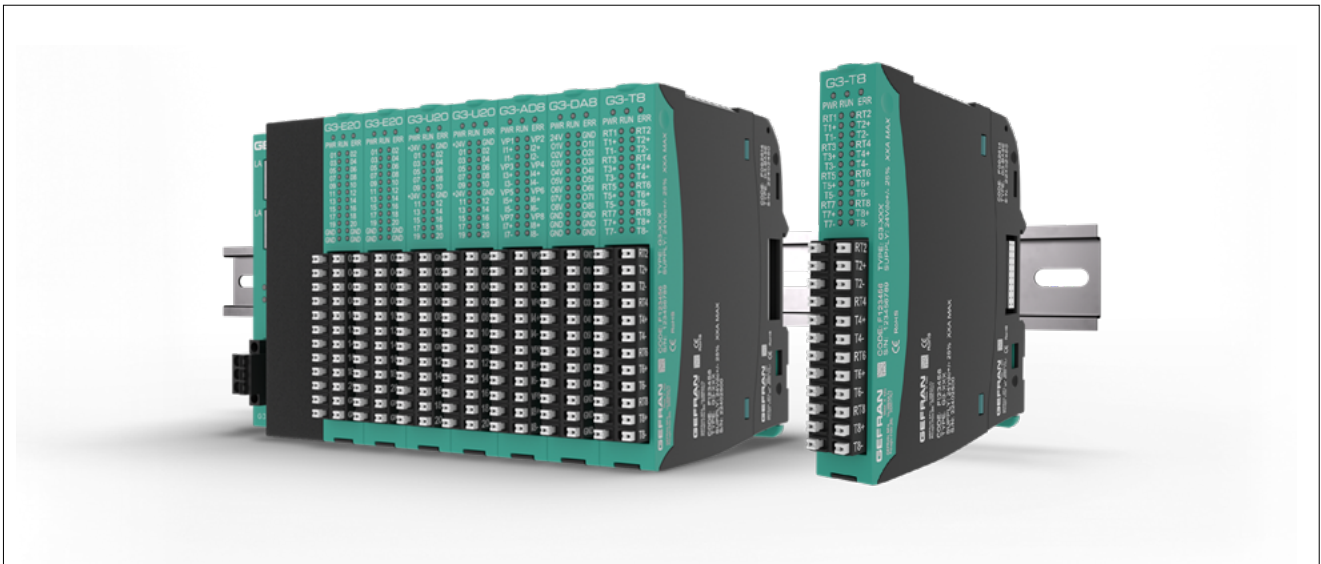
G-Mation G3 is a modular IO system based on EtherCAT technology. EtherCAT provides a maximum of 65535 addressable modules.

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.

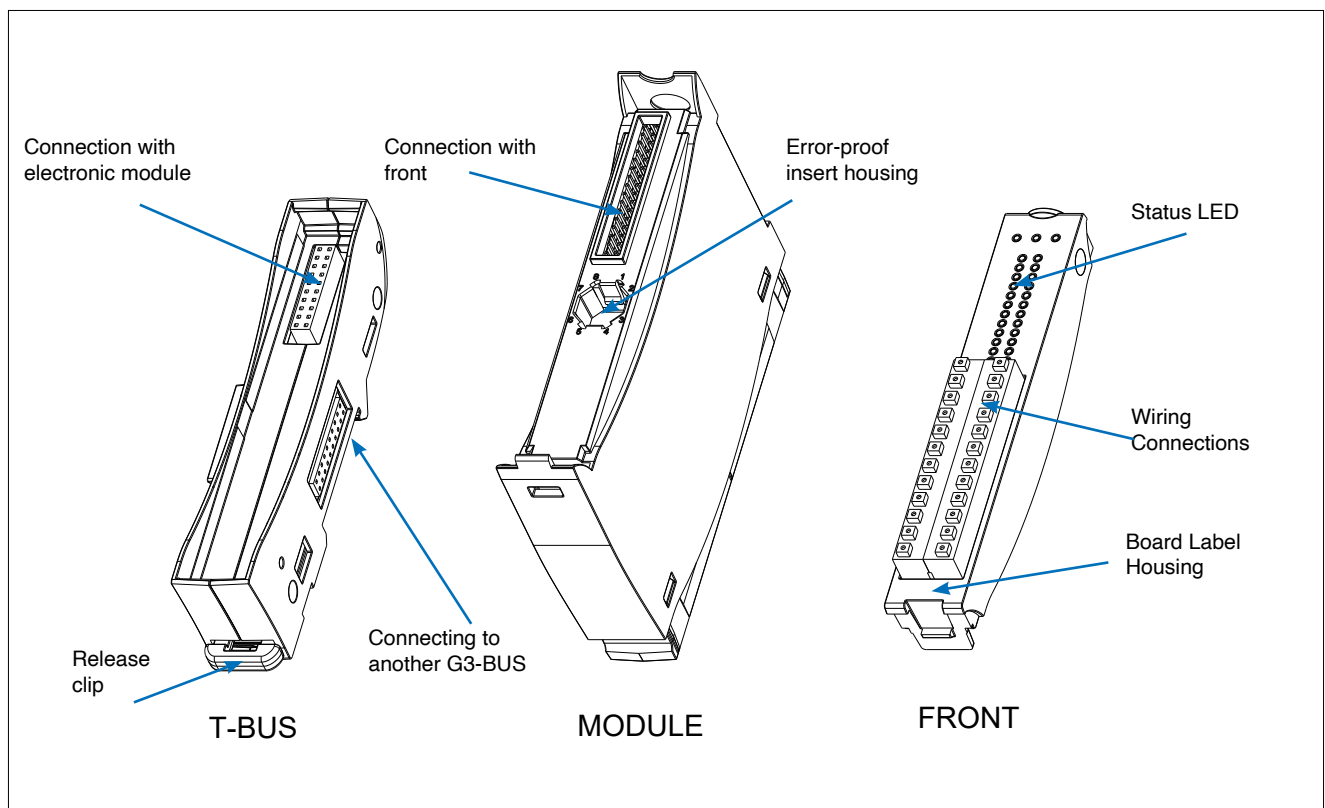
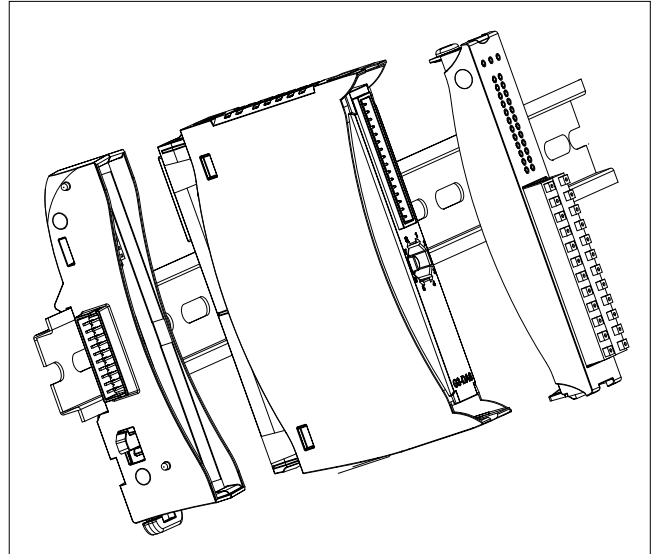
The boards are designed for coupling on a 35 mm DIN rail and the lateral coupling with the rack takes place by sliding to the left (refer to paragraph “2.6. DIN rail mounting” on page 13).



## 2.2. Board modularity

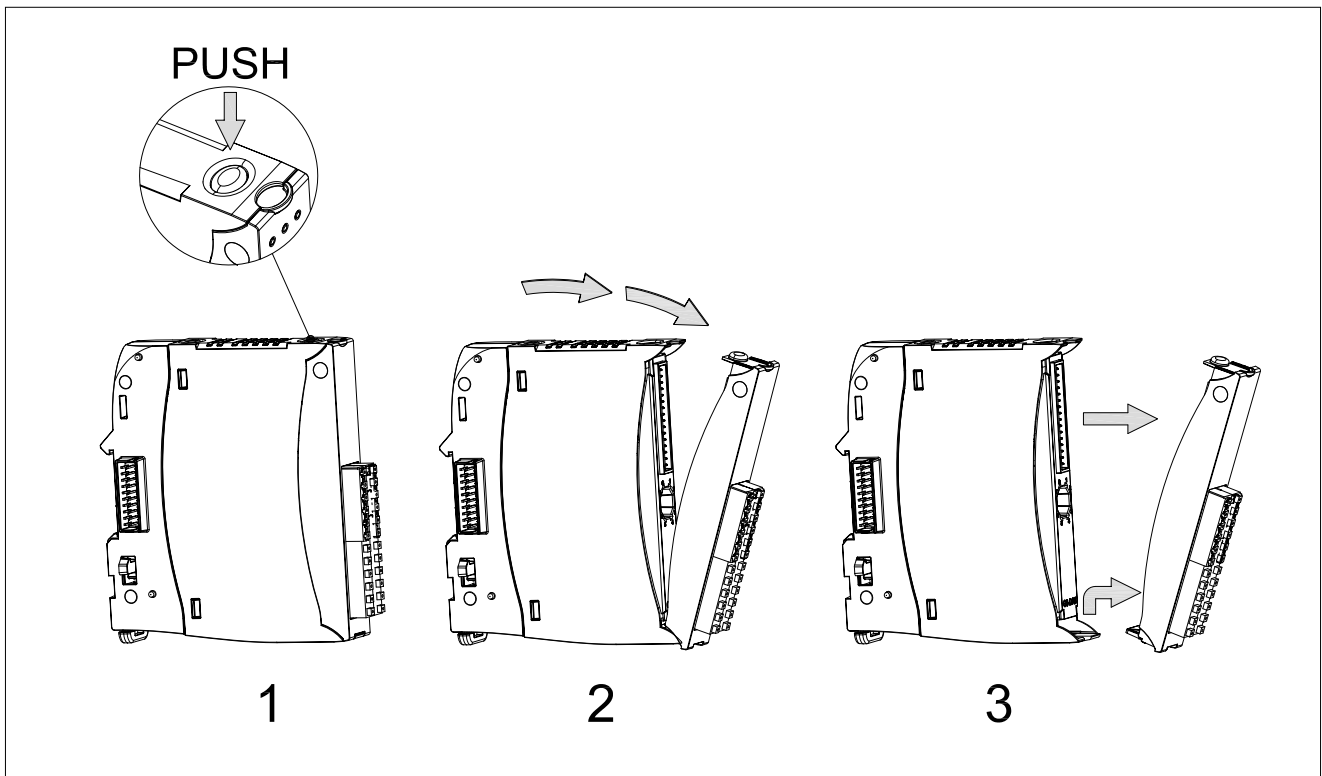
Each I/O board consists of three parts:

- **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

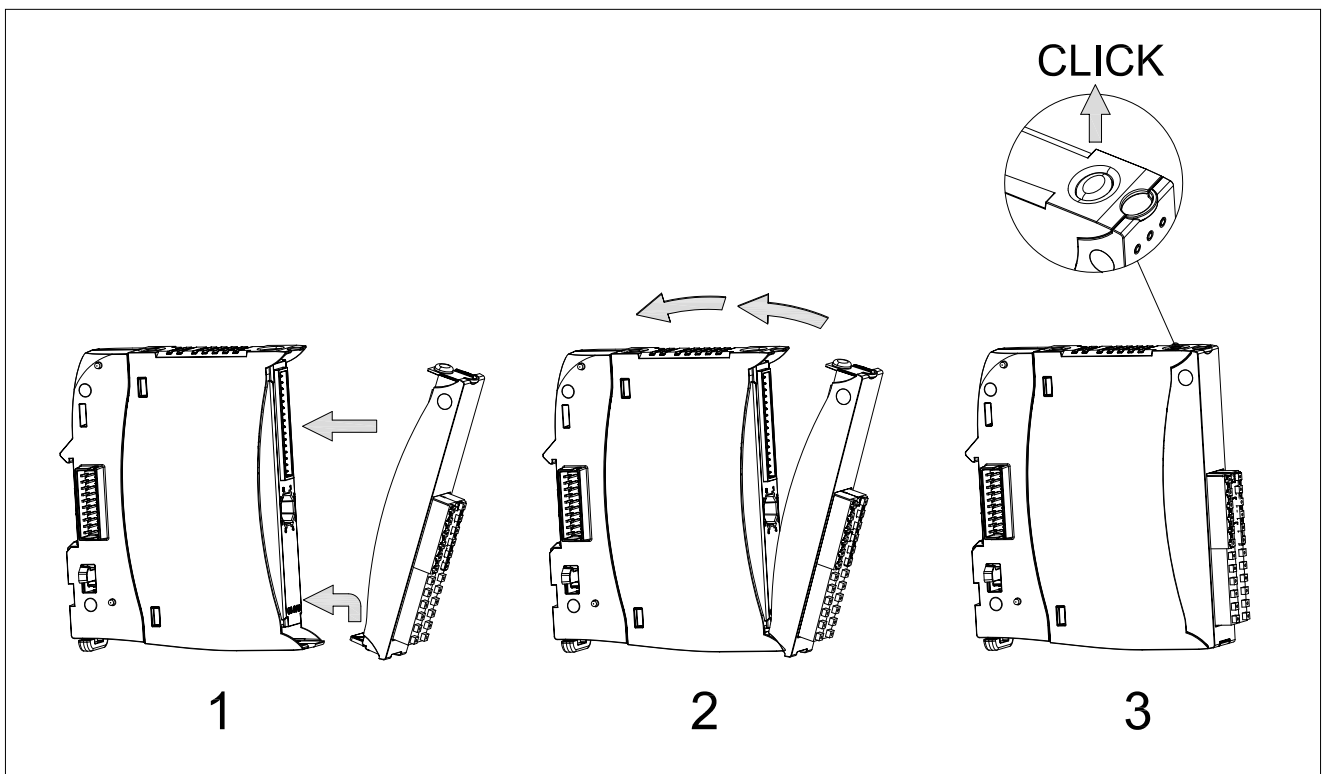


The coupling and uncoupling between the different parts is possible without the use of tools, using only your hands. The movement is constrained in such a way as to be easy and to prevent alignment errors that could compromise the connections.

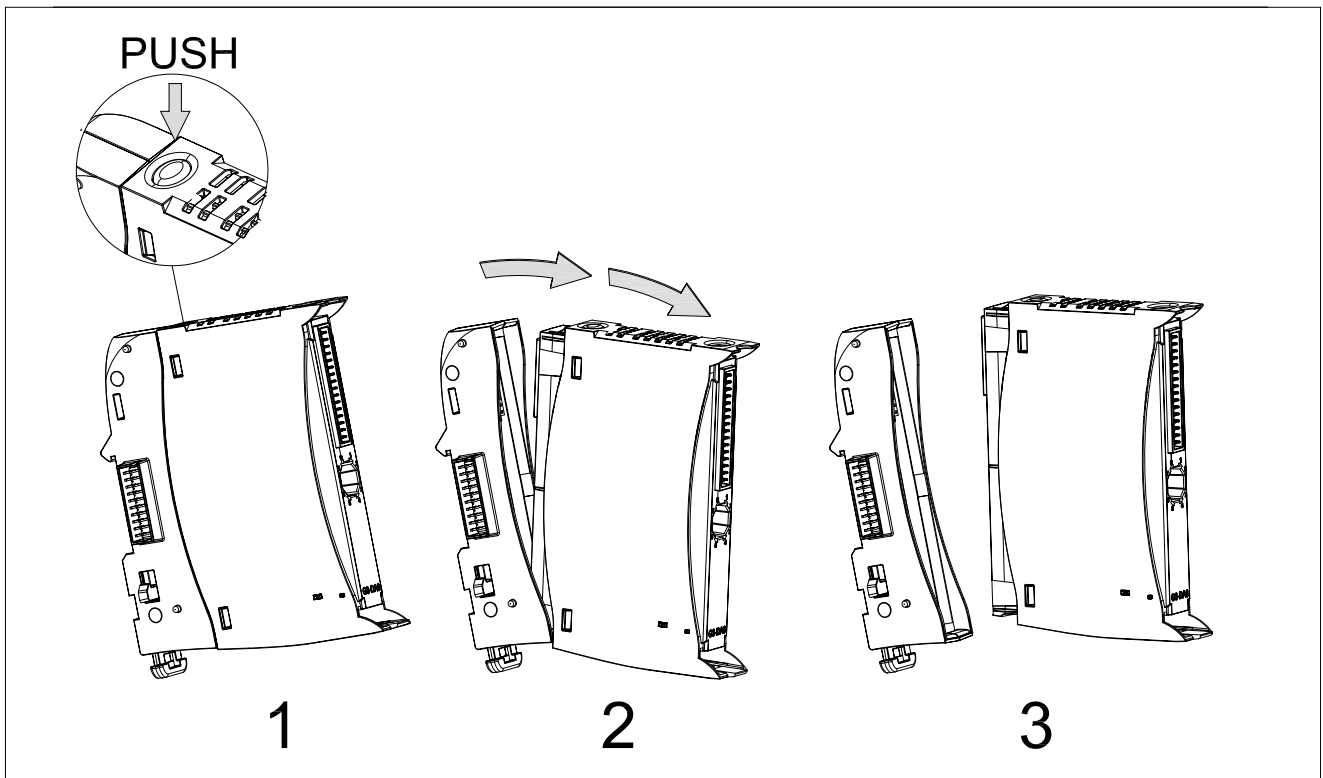
Press the upper button as shown in the figure and pull the board down in the indicated direction to remove the front module.



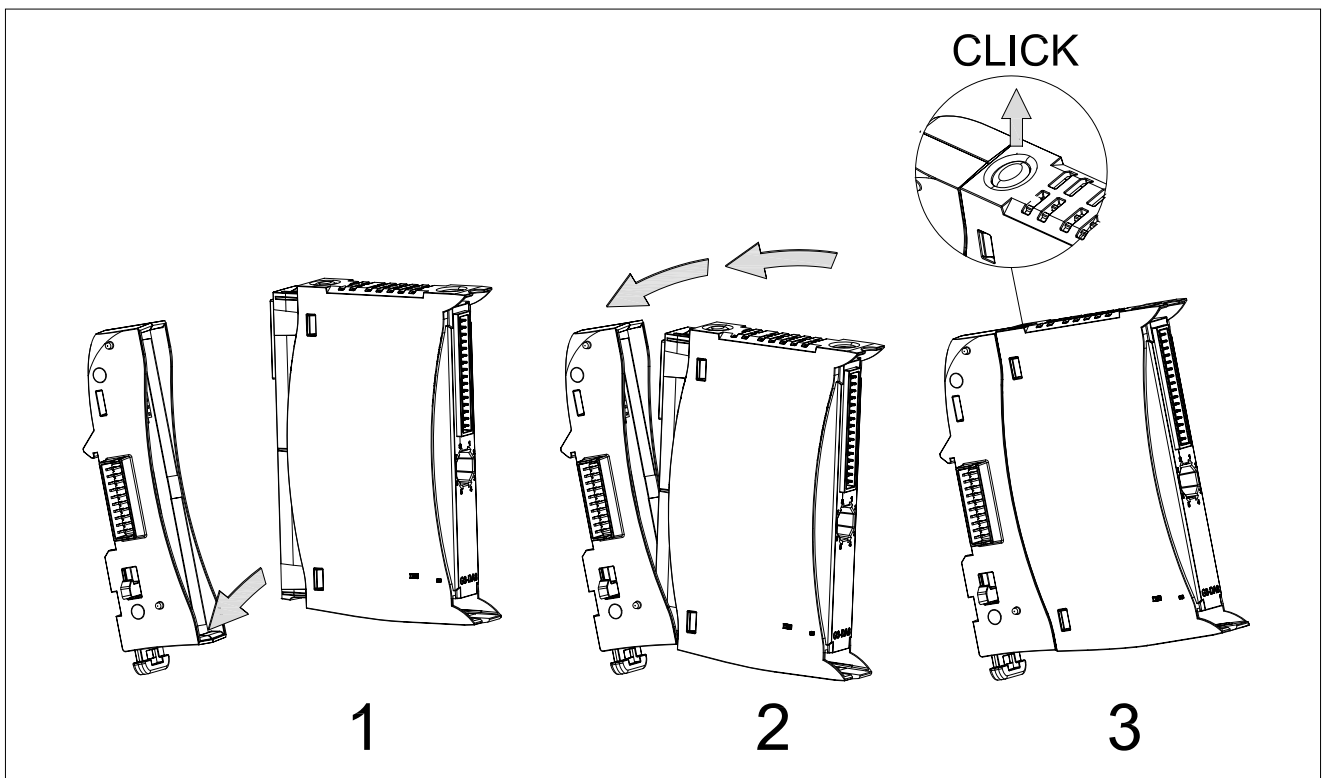
To re-couple the module, first place the lower part inside the constrained housing of the electronic part and then push the front until you feel the upper button couple.



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.



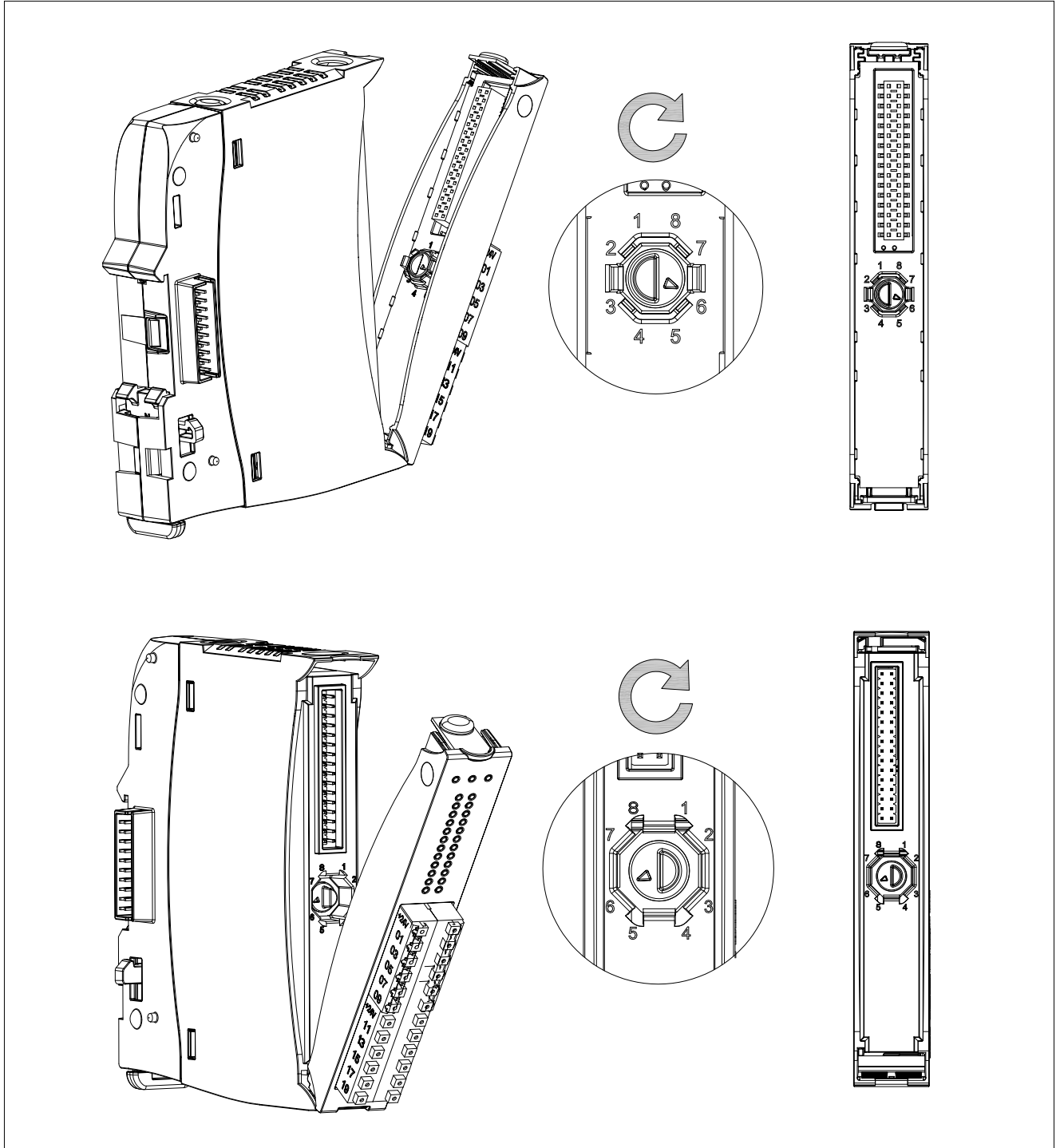
## 2.3. Front polarisation

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

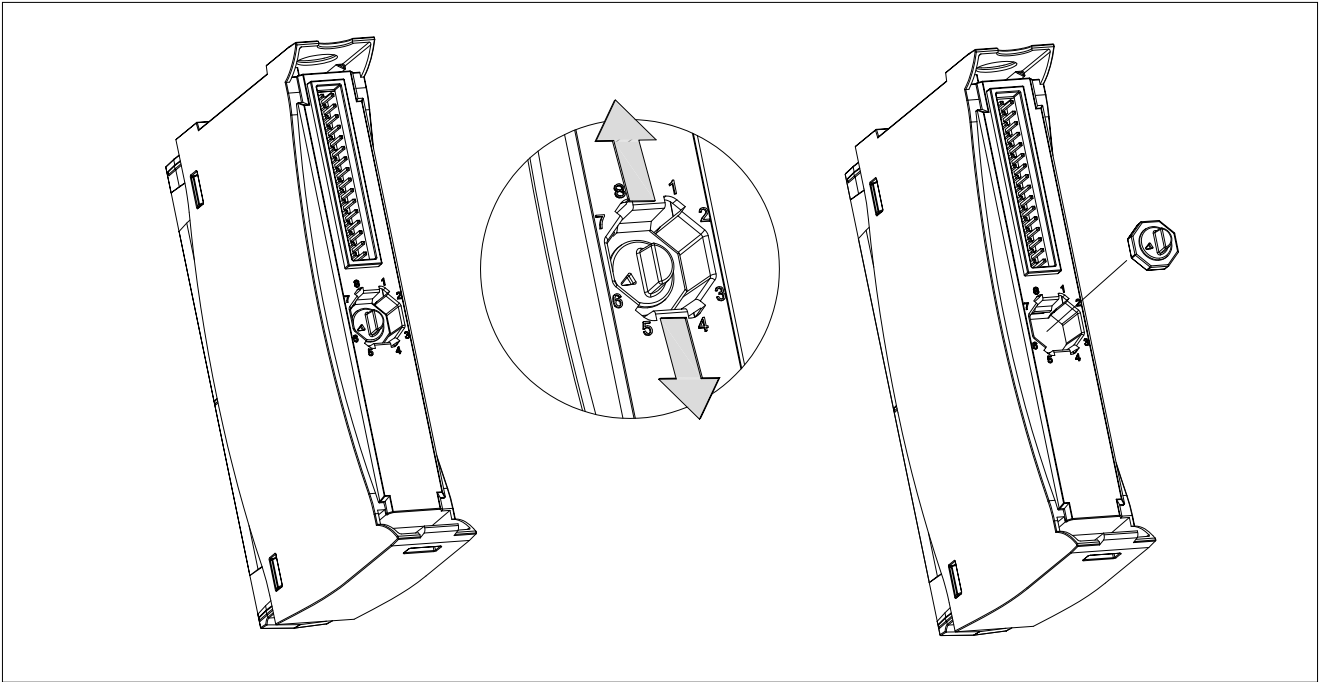
A kit of male-female coupled octagonal-shaped inserts may be provided as an accessory.

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

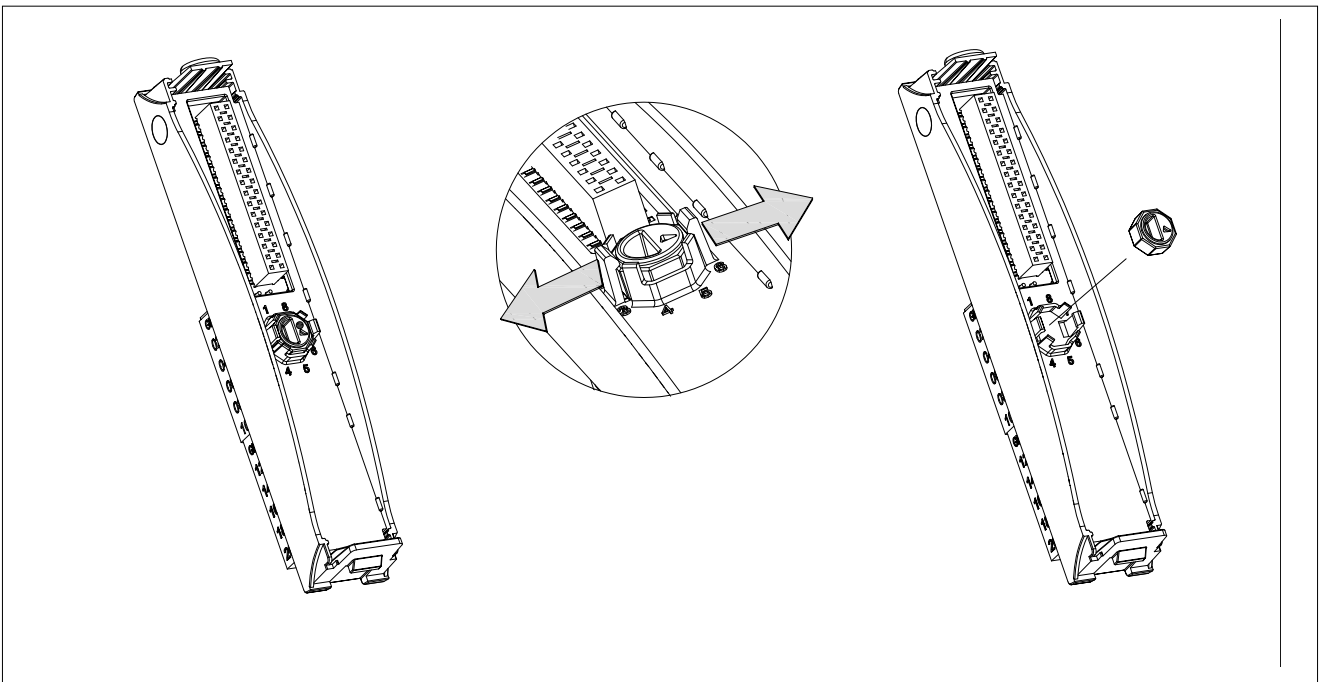
There is a housing for the male insert and one in the front for the female insert in the electronic part.



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.

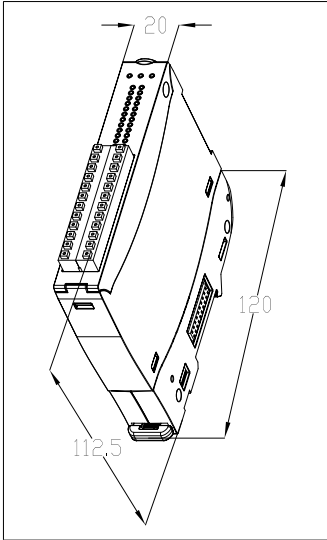


Once inserted, the inserts can be extracted and rotated as desired.

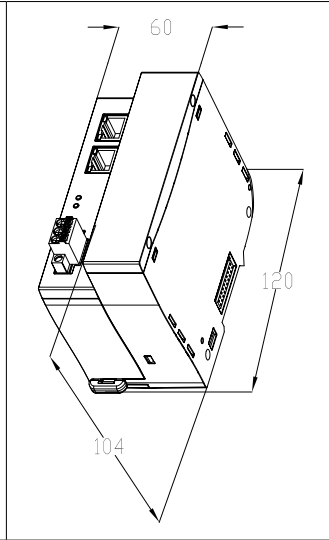
## 2.4. Mechanical dimensions

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

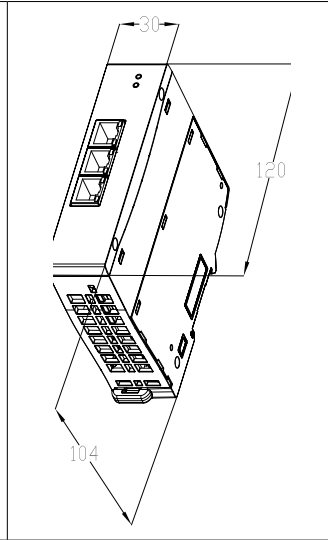
**Full G3-xxxx Board**



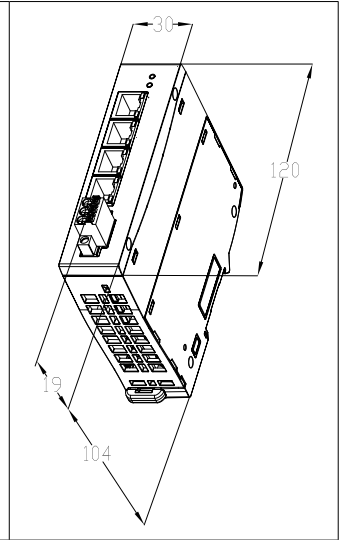
**G3-ECAT hub head**



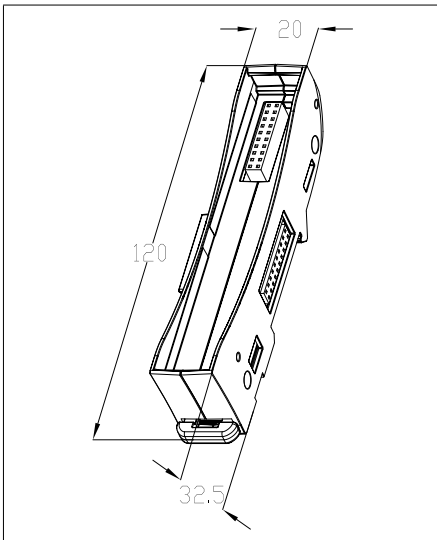
**G3-JNC3**



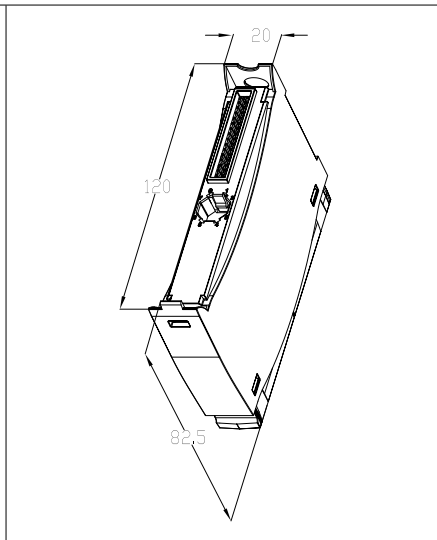
**G3-JNC4**



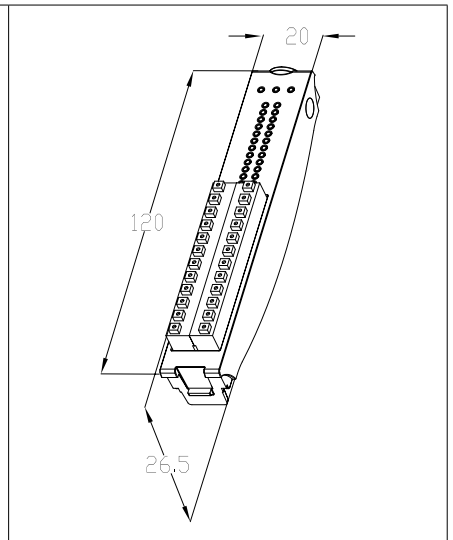
**G3-BUS Base**



**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 mm<sup>2</sup> (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:

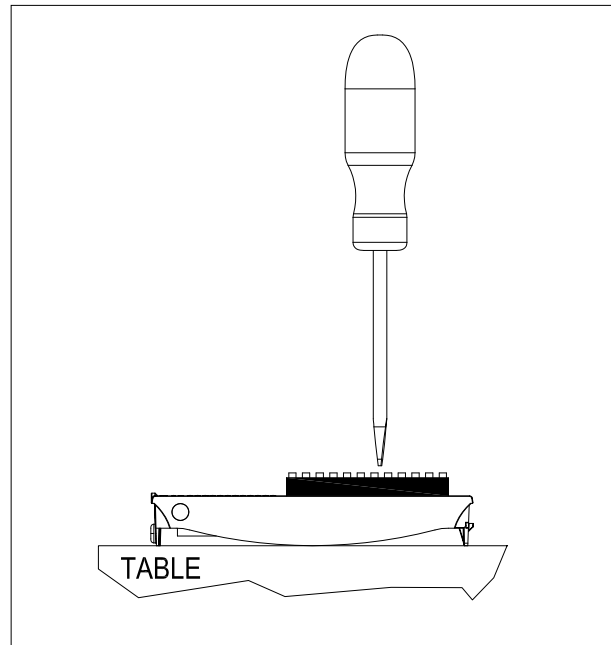
press the button with a screwdriver pull out the wire/tip  
release the button

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



It is recommended NOT TO WELD the electric wire.

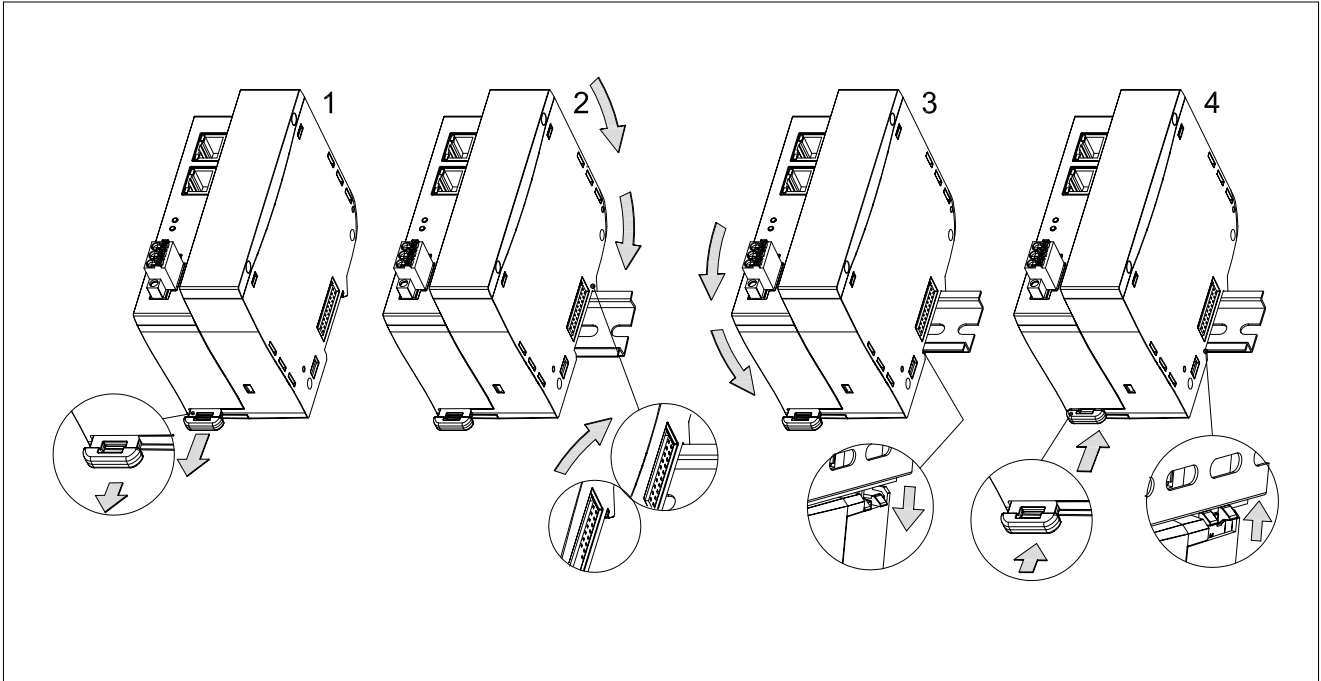
Minimum temperature rating of the cable to be connected to the field wiring terminals, 85 °C



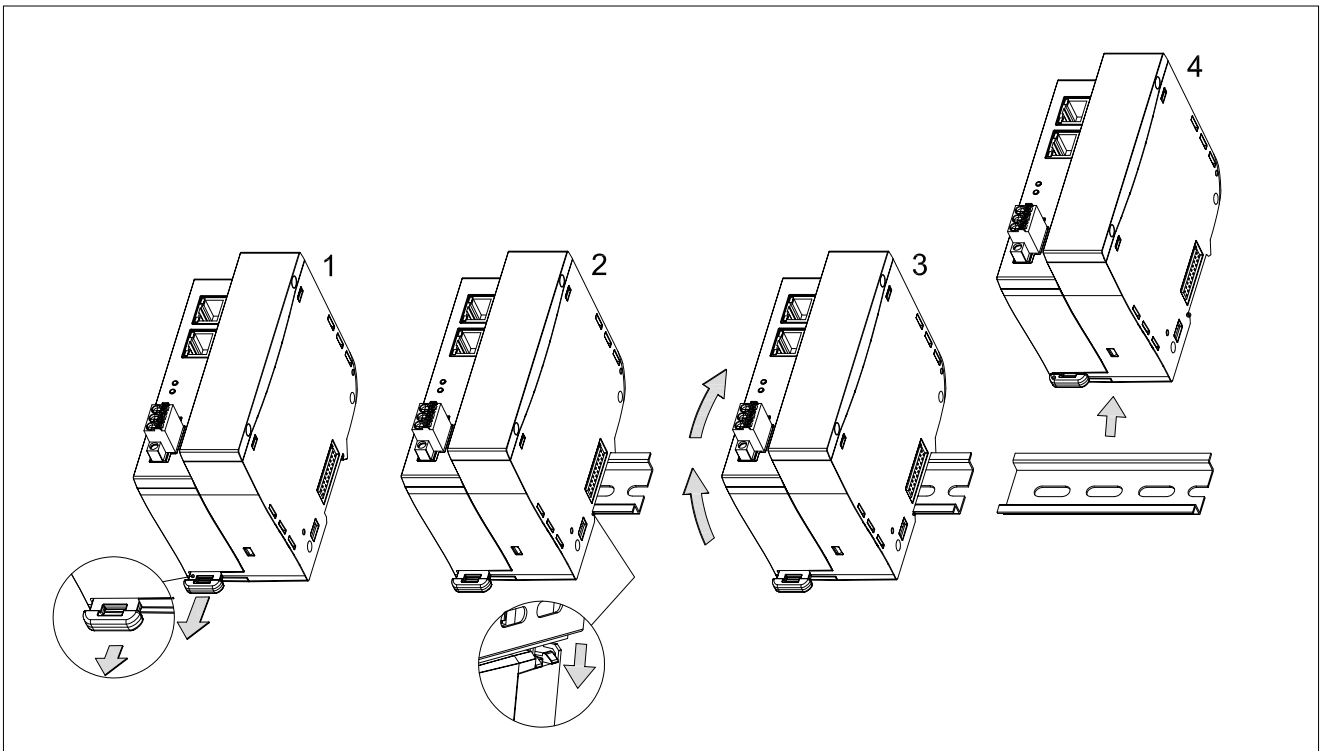
## 2.6. DIN rail mounting

### 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.

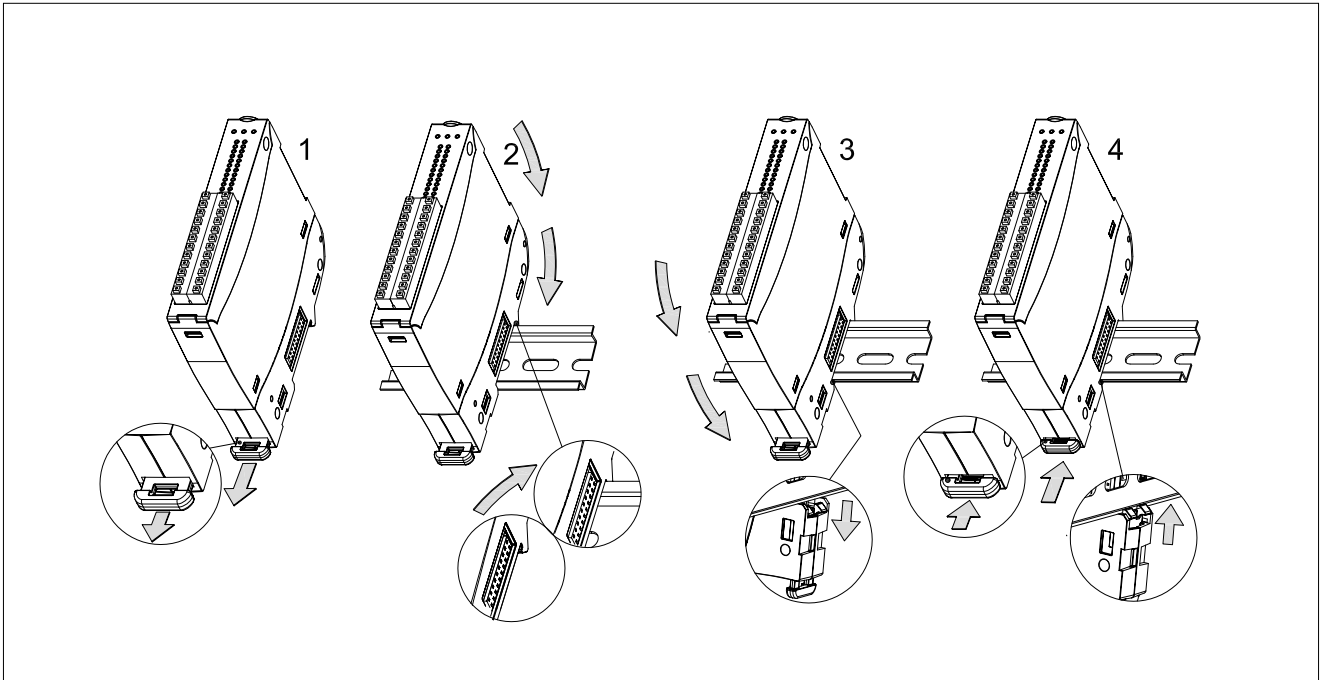


To remove the head the hub from the DIN rail, release the lower clip by slightly levering with a screwdriver and turn the board to release it.

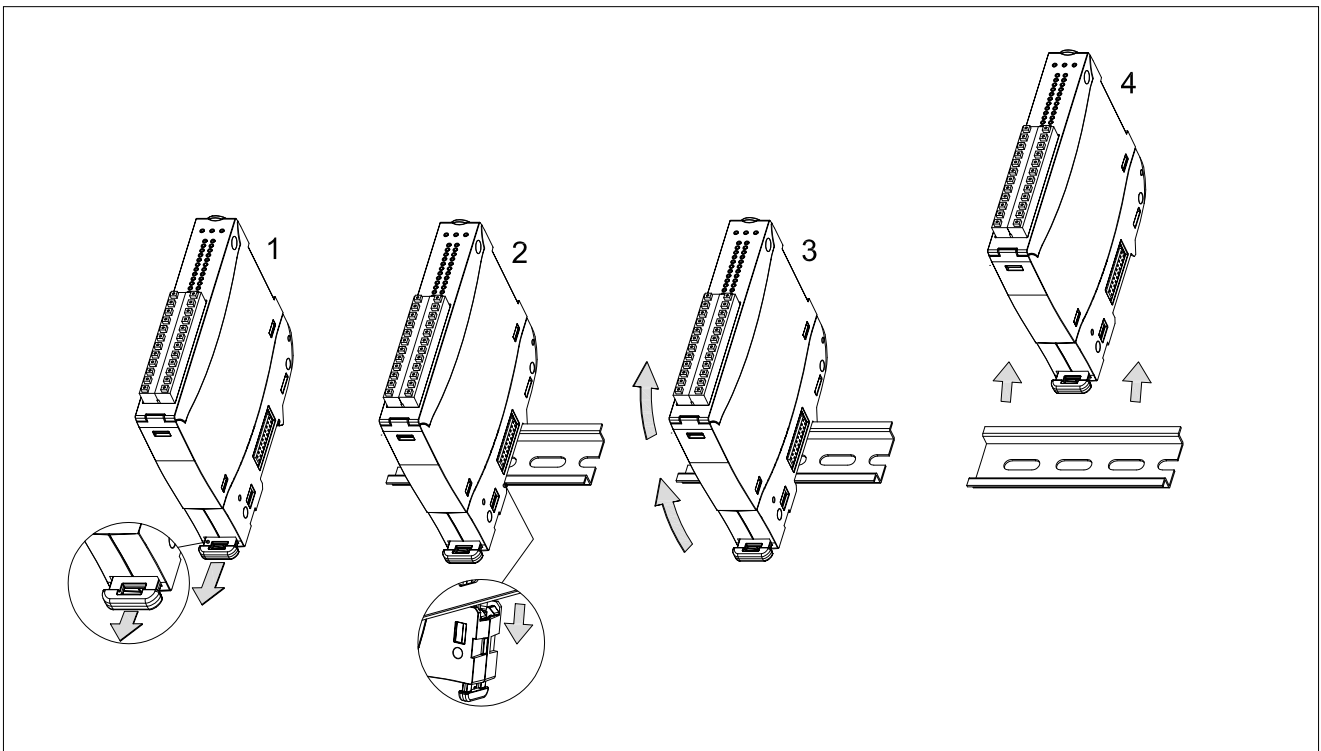


### 2.6.2. G3-xxxx (all models unless otherwise specified)

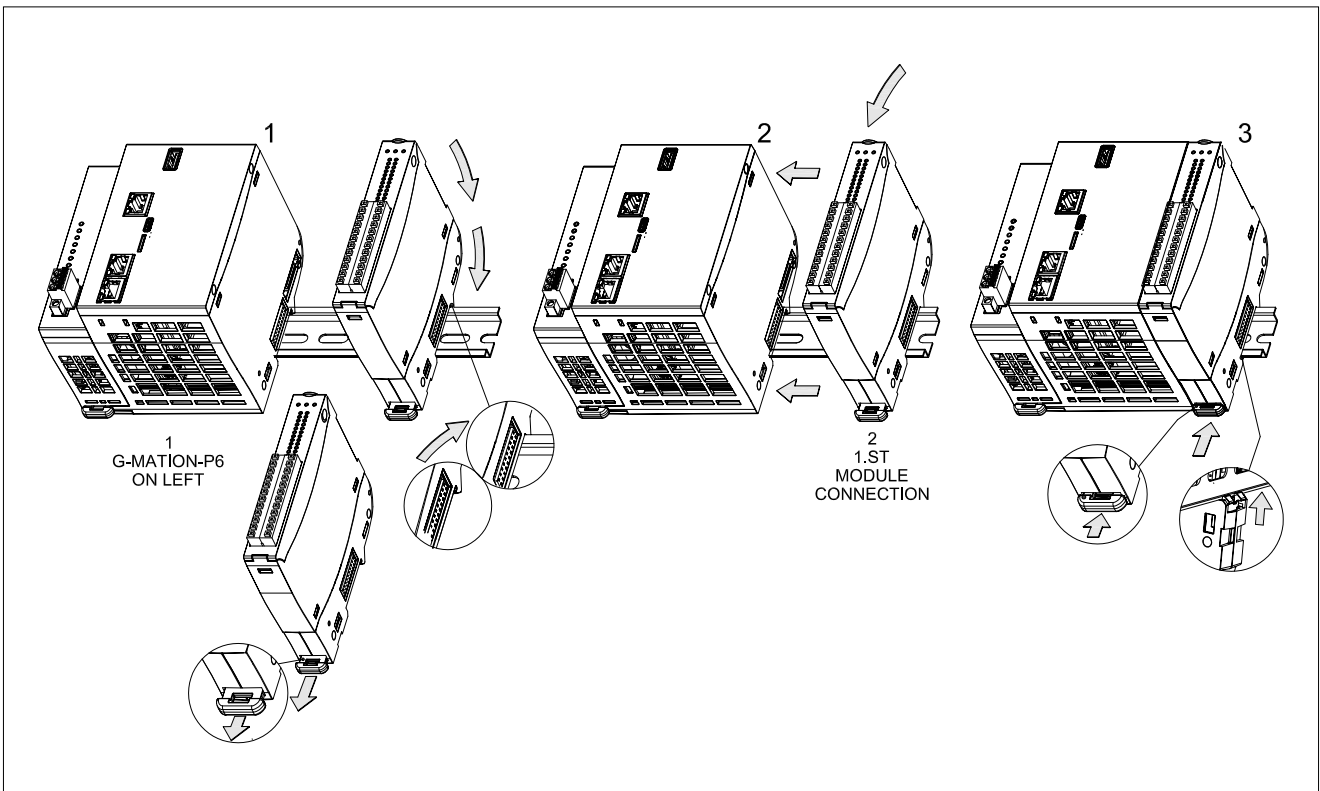
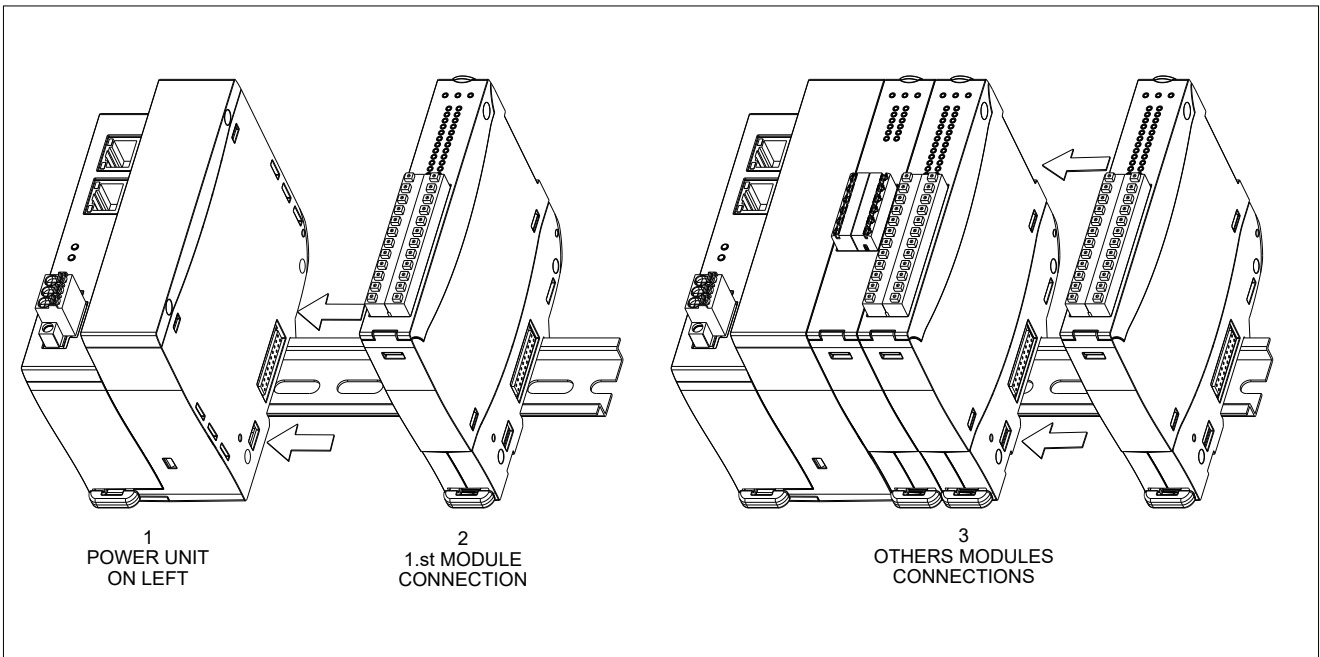
To mount the module to the din rail, unclip the lower clip and leave it in the open stable position. Insert the part top of the hook on the rail, rotate the board and place it on the DIN rail. Raise the lower clothespin slightly to free it and allow it to be hooked to the bar even in the lower part.



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.

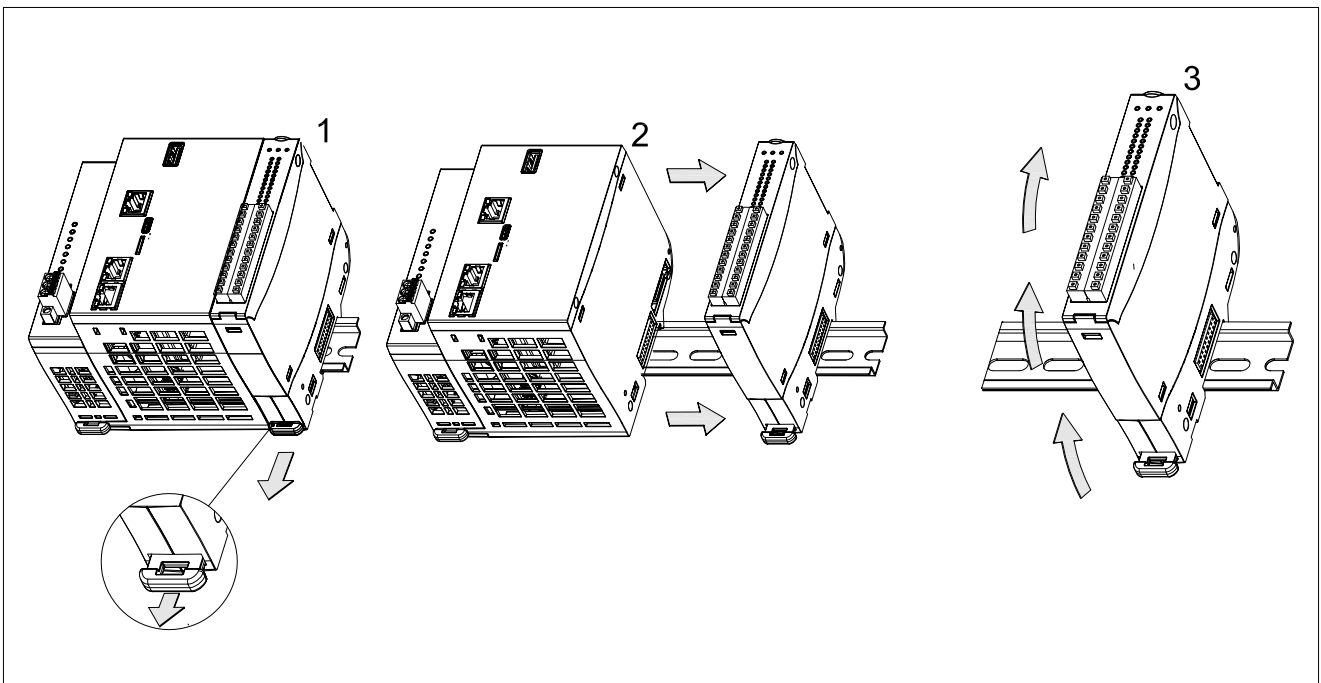
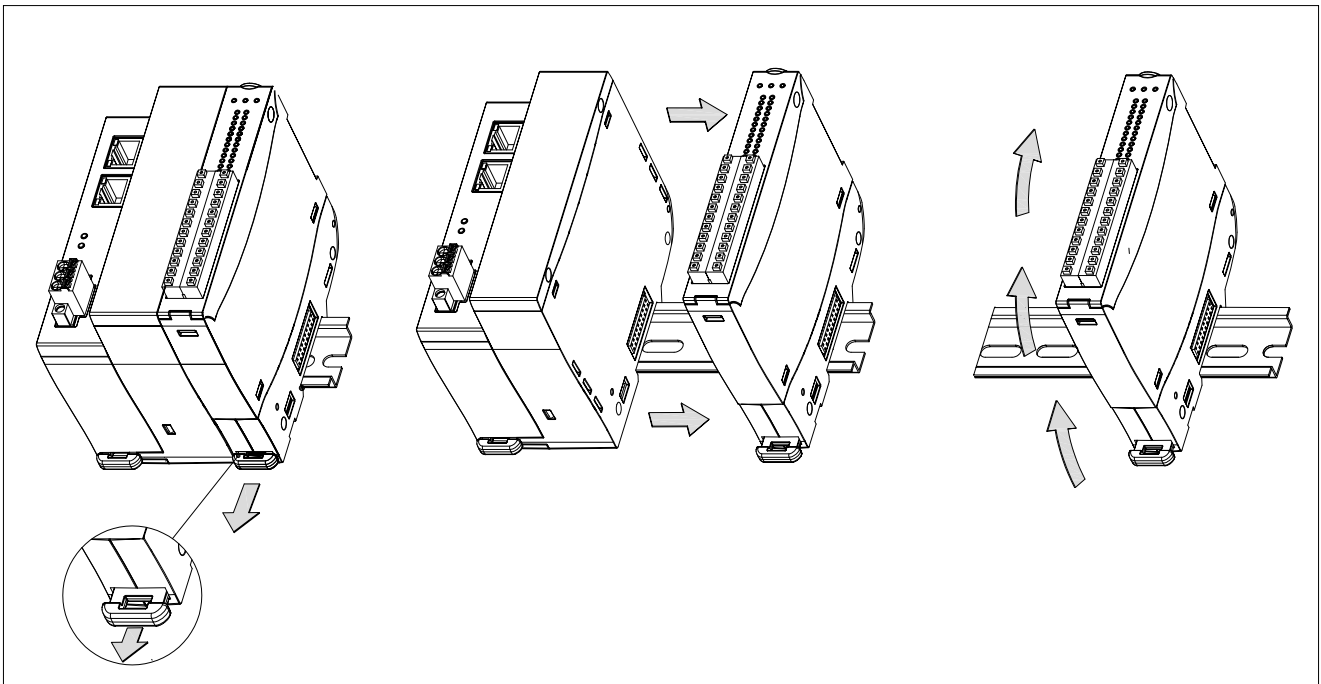


Once the board has been coupled, it is possible to secure the lower clip in the stable released position and slide it longitudinally on the rail until it is coupled to the previous board.



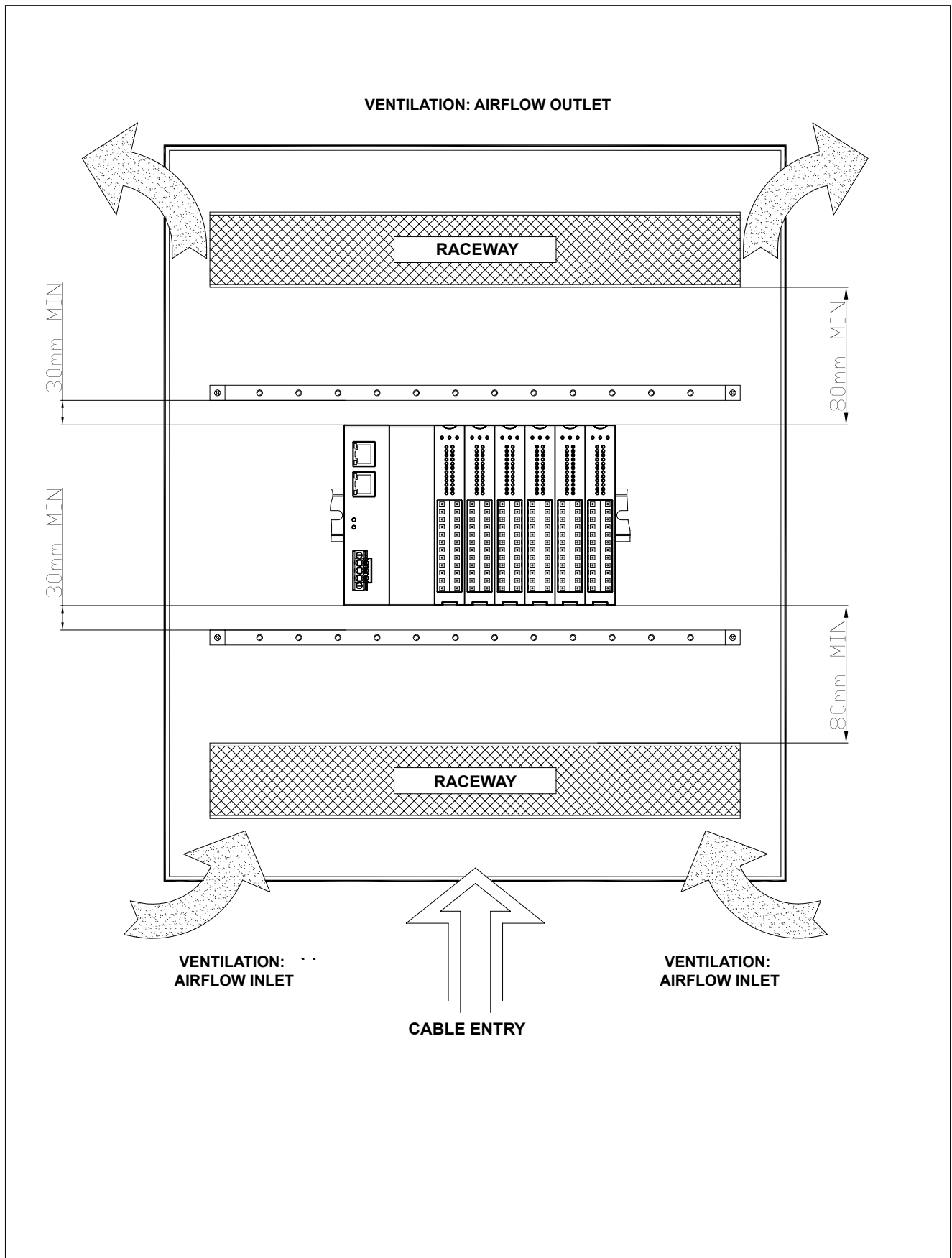
Once coupled, reinsert the lower clip so that the coupling with the DIN rail and the left board is firm and maintained by the force of the internal spring.

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-E20** module has 20 optically isolated digital inputs, 24 VDC, current sink.

It acquires logic signals from contacts, proximity sensors, drives and other IEC61131-2 compatible 24V digital output devices.

G3-E20 can be connected with all the G-Mation gateways and Px CPU from which it receives power supply.


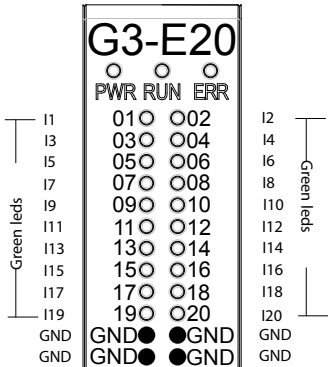
Each input is protected against reverse polarity and has a dedicated LED to indicate its state.

Each input has an independent software selectable input filter. 4 inputs are software configurable to measure frequencies up to 1,5kHz.



TECHNICAL DATA	
Acquisition of sink current optically isolated digital inputs	24Vdc $\pm$ 25%
Maximum input voltage	32V@5mA
Protection against reverse polarity	Yes
Input voltage trigger levels and input current	IEC61131-2 Type1, Type3 inputs
Software selectable input filters	100Hz and 5KHz
Input 17-18-19-20 configurable as frequency meter	Up to 1,5kHz. Frequency value is given in RPM with resolution 1, 10, or 100RPM
Hold time for transition detection	0->1: 10us 1->0: 45us
Isolation	1.5kV
Power supply	From G3-ECAT or Px CPU, it doesn't need any external power supply connection
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°C
Storage temperature	-25...70°C
Humidity	max. 90% Rh not condensing
Pollution degree	2
Maximum altitude	2000 m

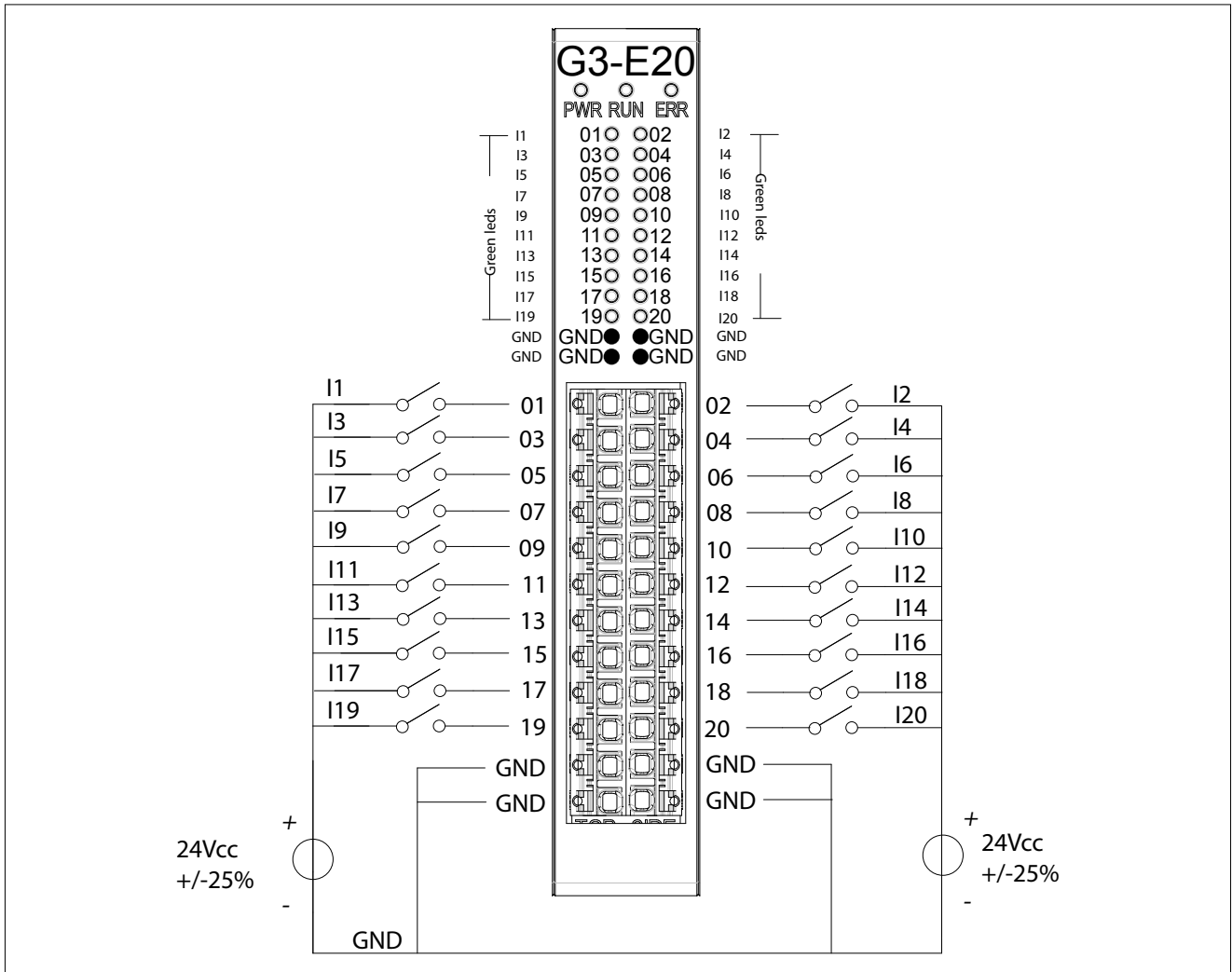
### 3.2. Meaning of LEDs

	ACRONYM	COLOR	LED STATUS	MEANING
<b>MODULE DIAGNOSTICS</b> 	<b>PWR</b>	YELLOW	OFF	no power supply
			ON	power supply present
	<b>RUN</b>	GREEN	OFF	<b>INIT</b> or <b>BOOT</b> status
			Blinking: 2.5 Hz (Slow blinking)	<b>PRE-OPERATIONAL</b> status
			Single Flash: on 200 ms off 1000 ms (Single Flash)	<b>SAFEOP</b> status
			Flickering: 10 Hz (Fast flickering)	<b>BOOT</b> status
			ON	<b>OPERATIONAL</b> status
	<b>ERR</b>	RED	OFF	no error
			Blinking (Slow blinking)	configuration error
			Single Flash	generic runtime error
Double Flash			wdog on cyclic data.	
Flickering (Fast blinking)			error during the <b>BOOTING</b> phase	
<b>IOs DIAGNOSTICS:</b> 20 digital input 	<b>nn (0..20)</b>	GREEN	OFF	active input = 1 logic
			ON	input not active = 0 logic

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 unipolar flexible electrical wire with a 0.75 .. 1.50 mm<sup>2</sup> section and 8 .. 9 mm strip length to wire DIGITAL INPUTS.

See paragraph "2.5. Front connector wiring" a pagina 12 of this manual For wiring modes

### 3.4. Resource software management

G3-E20 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-E20 Vxx** where xx is the version.

The file is available on the Gefran WEBSITE ([www.gefran.com](http://www.gefran.com)).

#### 3.4.1. Module objects

**Module information:**

INDEX	SUB.	STORE	NAME	MAP	TYPE	ACCESS	DEFAULT / NOTE	
0x1000	0	No	Device type	No	Unsigned32	RO	0x0001389	5001 TBD
0x1001	0	No	Error Register	No	Unsigned8	RO	0x00	
0x1008	0	No	Device Name	No	Visible string	RO	G3-E20	
0x1009	0	No	Manufacturer Hardware version	No	Visible string	RO	03	
0x100A	0	No	Manufacturer Software version	No	Visible string	RO	1.3	
0x1018	0	No	Numero di oggetti	No	Unsigned8	RO	4	
	1	No	Vendor Id	No	Unsigned32	RO	0x0000 0093 (Gefran)	
	2	No	Product Code	No	Unsigned32	RO	0x00000BBA (3002)	
	3	No	Revision Number	No	Unsigned32	RO	0x0000 0003	
	4	No	Serial Number	No	Unsigned32	RW	32-bit product serial number	

### 3.4.2. IOs management

#### Digital inputs

INDEX	SUB INDEX	NAME	TYPE	ACCESS	DEFAULT / NOTE
0x6003	0	Numero di oggetti	USINT	RO	21
	1	Digital Input Value 1	BOOL	RO	false
	2	Digital Input Value 2	BOOL	RO	false
	3	Digital Input Value 3	BOOL	RO	false
	4	Digital Input Value 4	BOOL	RO	false
	5	Digital Input Value 5	BOOL	RO	false
	6	Digital Input Value 6	BOOL	RO	false
	7	Digital Input Value 7	BOOL	RO	false
	8	Digital Input Value 8	BOOL	RO	false
	9	Digital Input Value 9	BOOL	RO	false
	10	Digital Input Value 10	BOOL	RO	false
	11	Digital Input Value 11	BOOL	RO	false
	12	Digital Input Value 12	BOOL	RO	false
	13	Digital Input Value 13	BOOL	RO	false
	14	Digital Input Value 14	BOOL	RO	false
	15	Digital Input Value 15	BOOL	RO	false
	16	Digital Input Value 16	BOOL	RO	false
	17	Digital Input Value 17	BOOL	RO	false
	18	Digital Input Value 18	BOOL	RO	false
	19	Digital Input Value 19	BOOL	RO	false
	20	Digital Input Value 20	BOOL	RO	false
	21	pad (allineamento alla word)	4 bit	RO	0x00

The Boolean value of digital input 1..20 is available in the object in sub-indexes 1..20  
 Digital input type (n): **BOOL**

**false:** not active input

**true:** active input

#### Frequency inputs

INDEX	SUB INDEX	NAME	TYPE	ACCESS	DEFAULT / NOTE
0x600D	0	Numero di oggetti	USINT	RO	20
	1	Frequency Value 1	UINT	RO	0x0000
	2	Frequency Value 2	UINT	RO	0x0000
	3	Frequency Value 3	UINT	RO	0x0000
	4	Frequency Value 4	UINT	RO	0x0000

The frequency value 1..4 is available in the object in sub-indexes 1..4  
 Input Type FREQUENCY: **UINT** (frequency value in rpm)

### 3.4.3. IOs Configuration Objects

#### Software Filter

INDEX	SUB INDEX	NAME	TYPE	ACCESS	DEFAULT / NOTE
0x8000	0	Objects number	USINT	RO	21
	1	Software Filter Value 1	BOOL	RW	false
	2	Software Filter Value 2	BOOL	RW	false
	3	Software Filter Value 3	BOOL	RW	false
	4	Software Filter Value 4	BOOL	RW	false
	5	Software Filter Value 5	BOOL	RW	false
	6	Software Filter Value 6	BOOL	RW	false
	7	Software Filter Value 7	BOOL	RW	false
	8	Software Filter Value 8	BOOL	RW	false
	9	Software Filter Value 9	BOOL	RW	false
	10	Software Filter Value 10	BOOL	RW	false
	11	Software Filter Value 11	BOOL	RW	false
	12	Software Filter Value 12	BOOL	RW	false
	13	Software Filter Value 13	BOOL	RW	false
	14	Software Filter Value 14	BOOL	RW	false
	15	Software Filter Value 15	BOOL	RW	false
	16	Software Filter Value 16	BOOL	RW	false
	17	Software Filter Value 17	BOOL	RW	false
	18	Software Filter Value 18	BOOL	RW	false
	19	Software Filter Value 19	BOOL	RW	false
	20	Software Filter Value 20	BOOL	RW	false
	21	Pad 4	4 bit	RW	0x00

Enabling digital filters on inputs 1..20 is available in sub-indexes 1..20.  
Software Type Filter Value (n) : **BOOL**

**false**: filter not activated, max input frequency = 5 kHz  
**true**: filter on, max input frequency = 100 Hz

#### Setting pulse number per revolution (for frequency input only):

INDEX	SUB INDEX	NAME	TYPE	ACCESS	DEFAULT / NOTE
0x8001	0	Objects number	USINT	RO	4
	1	Impulse per Revolution Input 1	USINT	RW	0x00
	2	Impulse per Revolution Input 2	USINT	RW	0x00
	3	Impulse per Revolution Input 3	USINT	RW	0x00
	4	Impulse per Revolution Input 4	USINT	RW	0x00

The setting number of pulses turn 1..4 is available in the object in sub-index 1..4  
Pulse Type/Revolution: **USINT** (Frequency Value in Revolutions/Minute)  
0 : Function not used, default  
1..250 : Number of pulses per revolution

## Frequency resolution (in rpm)

INDEX	SUB INDEX	NAME	TYPE	ACCESS	DEFAULT / NOTE
0x8002	0	Objects number	USINT	RO	4
	1	Frequency Resolution Input 1	ENUM	RW	0
	2	Frequency Resolution Input 2	ENUM	RW	0
	3	Frequency Resolution Input 3	ENUM	RW	0
	4	Frequency Resolution Input 4	ENUM	RW	0

Enabling frequency input resolution is available in sub-indexes 1..4.

- 0 = no selection
- 1 = 1 lsb → 1 rpm
- 2 = 1 lsb → 10 rpm
- 3 = 1 lsb → 100 rpm

### 3.4.4. Control objects

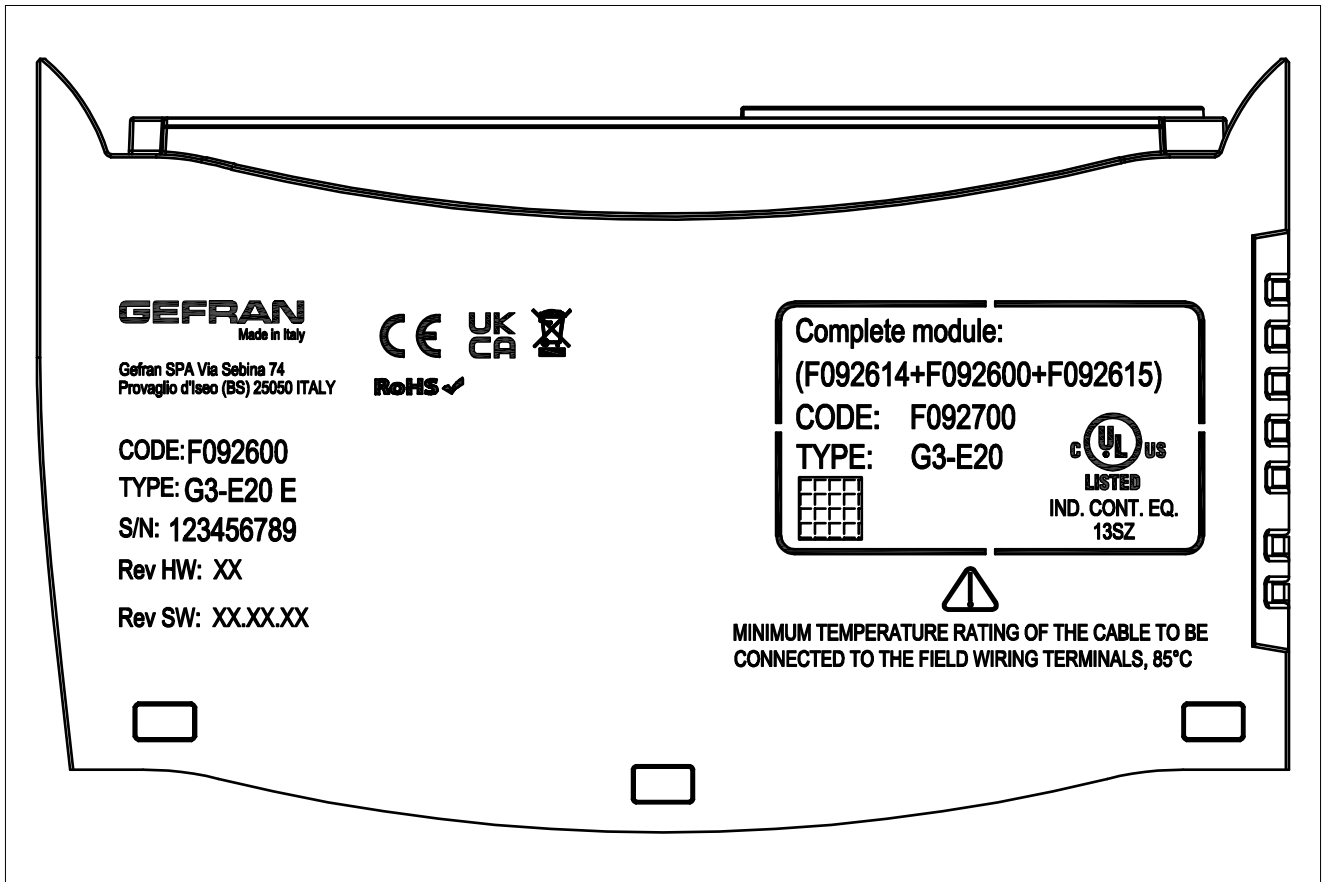
INDEX	SUB INDEX	NAME	TYPE	ACCESS	DEFAULT / NOTE	ACCESS	DEFAULT / NOTE
0x9000	0	No	Device Code	No	UINT	RO	0x0BBA
0x9001	0	No	Hardware Revision	No	UINT	RW	0x03
0x9002	0	No	Firmware Version	No	UINT	RO	0x0130
0x9003	0	No	Serial Number	No	UDINT	RW	0x00000000
0x9004	0	No	Order Code	No	STRING(7)	RO	F092600

## 4. ACRONYM AND ORDER CODE

COMPLETE MODULE	G3-E20	F092700
Front	G3-E20 F	F092615
Electronic module	G3-E20 E	F092600
Bus	G3-BUS	F092614

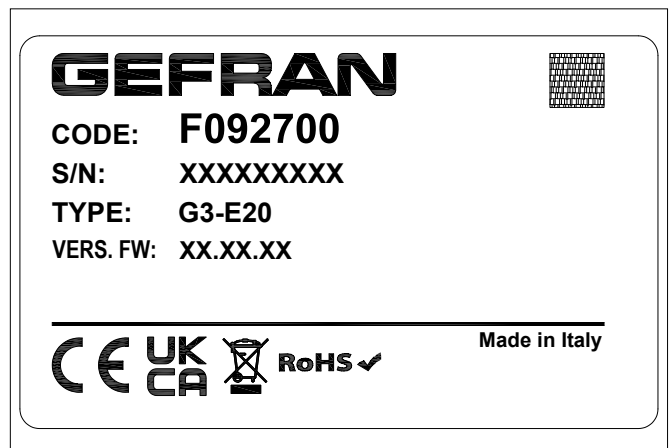
## 5. MARKING

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
- GEFFRAN 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.geffran.com](http://www.geffran.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: <b>EN 61000-6-2</b> (immunity in industrial environment) <b>EN 61000-6-4</b> (emission in industrial environment) - <b>EN 61010-1</b> (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.

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.

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.

**GEFRAN**