GEFRAN

GRP/GRP-H 15/25/30/40/50/60/75/90/120A

STATIC POWER UNITS WITH PARTIAL LOAD BREAK,
LOGIC/ANALOG COMMAND AND IO-LINK COMMUNICATION

CONFIGURATION AND PROGRAMMING MANUAL

For all specifics, documentation and App for smarphone

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code: 81906B_MAN_GRP-H_01-2024_ENG

81906B_MAN_GRP-H_01-2024_ENG

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1. PRELIMINARY INSTRUCTIONS

1.1. Profile

The correct management of electric heaters and infrared lamps for industrial heating applications requires robust, safe, fast and diagnostic-capable static contactors.

The range of solid state contactors GRP, meets all these needs, with current ratings from 15 to 120 Ampere, voltages up to 600Vac, in extremely compact dimensions in every single size.
The thermal design of all models guarantees the continuous supply of the rated current at an ambient temperature of 40°C / 104°F through high efficiency heat sinks, assisted by fans for the 90A and 120A models.
For GRP-H with integrated heatsink, the derating curves show how higher current values can also be obtained for lower temperatures as well as the possibility of mounting various devices stacked on the DIN rail.

CONFIGURATION AND DIAGNOSTICS

For the configuration of the GRP series devices, an App is available for smartphones with Android and iOS operating systems, which can be downloaded free of charge from the relative stores. The App interfaces to the device via contactless NFC (Near Field Communication) technology via a small NFC Dongle (which can be ordered as part of the device or as an accessory).
It is also possible to read diagnostic data on the operation of the load and the device (energy meters, current peaks or over-temperatures), duplicate or share the configurations of multiple devices through this interface.

The IO-Link interface guarantees efficient communication, capable of powering, configuring, monitoring and controlling the device, via only 3 wires.
Complete and simple device configuration is possible with IODD files.
The devices can also be configured using a special cable via PC and the GF_eXpress configuration tool.
Alternatively, basic device configuration is made available by means of a button and LED on the front.
The current thresholds for partial load break alarms can be adjusted by means of a front key or digital input, so that multiple objects can be configured at the same time with the electrical panel closed.

CONTROL

The GRP series can be controlled in three different ways based on the options chosen:

1. Logic signals in V DC, OnOff mode.

2. Analogue signal configurable as 0..5V, 0..10V, 0..20mA, 4..20mA and potentiometer, for proportional commands (Burstfiring, FixedCycleTime, HalfSingleCycle, PhaseAngle).

3. Control via the IO-Link point-to-point communication protocol for comprehensive process diagnostics.

All commands are managed via push-in connectors, for faster and easier connection, even without tools.
The device status is always displayed by a multi-colour LED on the front panel, for an immediate view of its operation. In the event of an error in the command signal, a fault power can be programmed which the device will maintain until the signal is restored.

POWER CONNECTIONS

Both the line voltage terminal available on the upper part of the device and the load terminal on the lower part are of the “cage” type, which offers the best and safest seal even for cables of different cross-sections, whether mounted with a cable lug or simply stripped.

DIAGNOSTICS AND ALARMS

It is increasingly vital for operators and maintainers to recognize possible anomalies in the system immediately and solve them quickly in order to ensure the efficiency and profitability of machinery and plants. The GRP series offers complete availability of load information.
The physical alarm output, PNP type, is ready to diagnose partial or total load breaks, lack of voltage on the load and over-temperature (configurable output). The thermal alarm is triggered if heat dissipation exceeds a critical threshold, signalling it with a red led on the front panel, interrupting the power supply and triggering the alarm output.
This function is always present, on all current sizes.

1.2. Installation

Use the extra-rapid fuse shown in the catalogue according to the connection example supplied. Applications with uninterruptible power supply units must also include a safety circuit breaker for disconnecting the power line from the load. To obtain high device reliability, it is essential to install it correctly inside the panel in order to obtain adequate heat exchange between the heat sink and the surrounding air under conditions of natural convection.
Mount the device vertically (maximum 10° inclination from the vertical axis)

- Vertical distance between a device and the panel wall >50mm
- Horizontal distance between a device and the panel wall at least 20mm
- Vertical distance between one device and another at least 50mm.
- Horizontal distance between one device and another at least 20mm (in the event of installation at shorter distances, see derating curves).

Make sure that the cable ducts do not reduce these distances; in this case, mount the units overhanging the panel, so that the air can flow vertically on the heat sink without hindrance.

limitations of use

- Ambient temperature limits, depending on derating curves.
- Need for air exchange with the outside or an air conditioner to transfer the dissipated power to the outside of the panel.
- Installation limits (distances between devices to ensure dissipation under natural convection conditions)
- Maximum voltage limits and derivative of the transients present on the line, for which the static unit provides internal protection devices (depending on the models).
- Presence of leakage current < 3mA (max. value with nominal voltage and junction temperature of 125°C / 257°F).

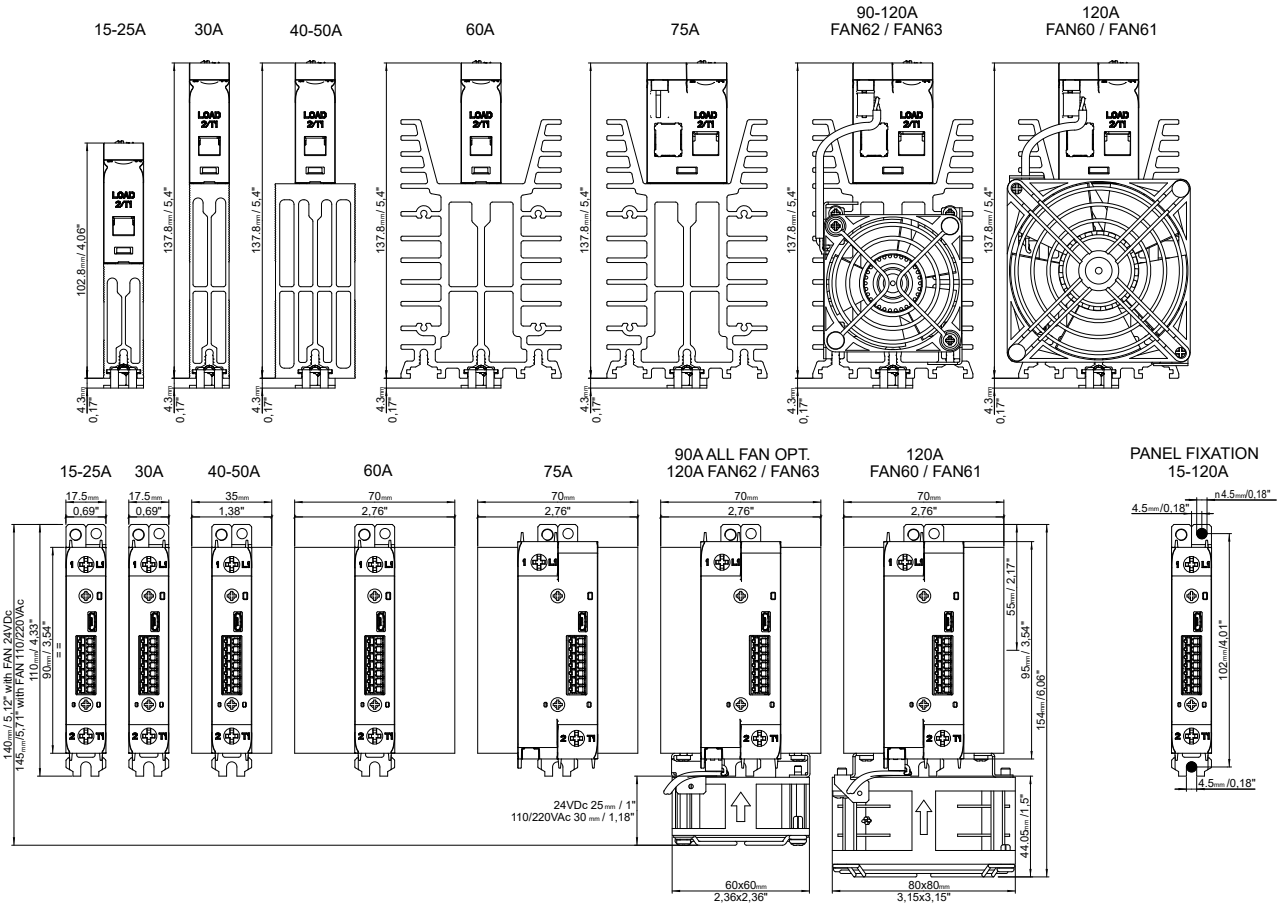
Mounting procedure on the heatsink for version without integrated heat sink (GRP):
The module-heatsink contact surface must have a maximum flatness error of 0.05mm and a maximum roughness of 0.02mm. The anchorage holes on the heatsink must be threaded and countersunk. Caution: Spread 1 gram of heat-conducting silicone paste (DOW CORNING 340 HeatSink is recommended) on the dissipative metal surface of the module. The surfaces must be clean, and there must be no impurities in the heatconducting paste. Tighten the two fixing screws alternately until a torque of 0,30 Nm / 2,65 lb.in for M4 screws is reached. Wait 30 minutes so that the excess paste can drain away. Tighten the two fixing screws alternately until a torque of 1,3 Nm / 11,5 lb.in for M4 screws.

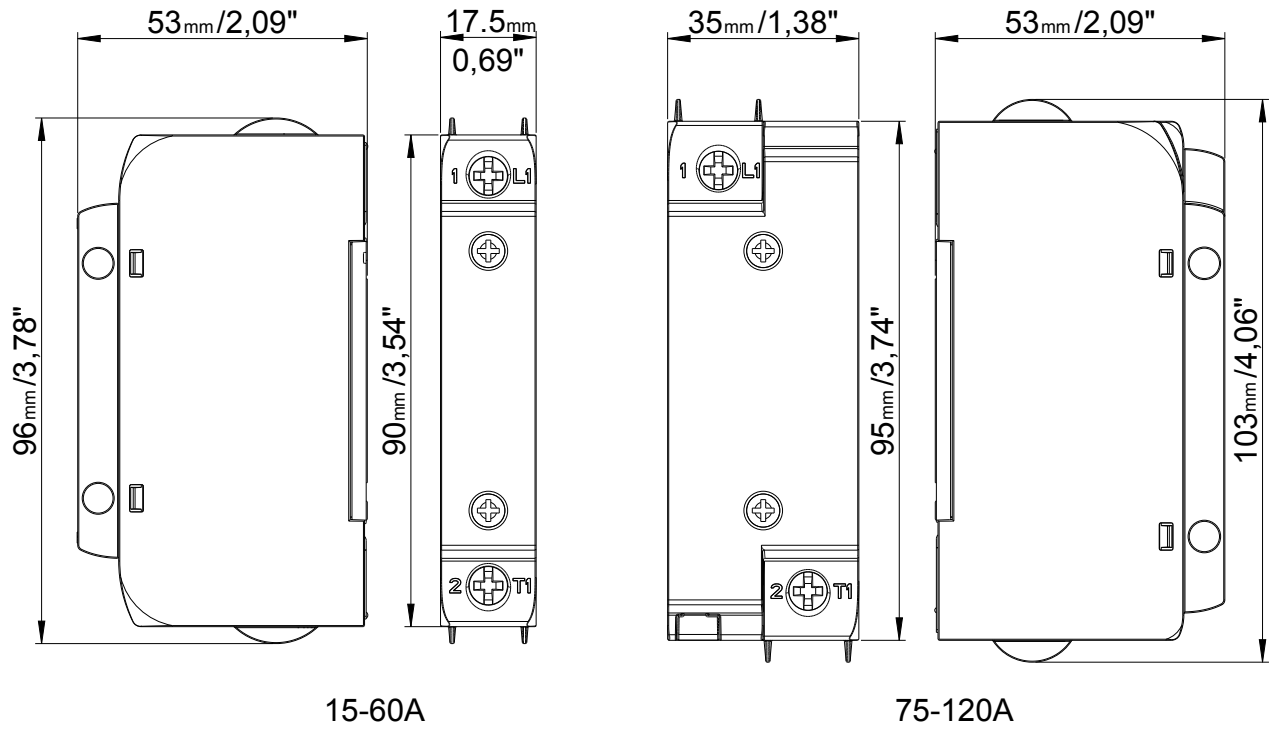
Solid State Relay Dissipated Power Calculation
Single-phase relay Pd = 1.2 * IRMS [W]
IRMS = single-phase load current

Heatsink Thermal Resistance Calculation
Rth[°C/W] = (90°C - max amb. T) / Pd where Pd = dissipated power
Max. amb. T = max air temperature inside the electrical cabinet.Use a heatsink with thermal resistance inferior to the calculated one (Rth). Maximum surrounding air temperature 40°C “Open Type Equipment” suitable for use in pollution degree 2 or better.

2. INSTALLATION AND CONNECTION

2.1. Dimensions and mounting measurements

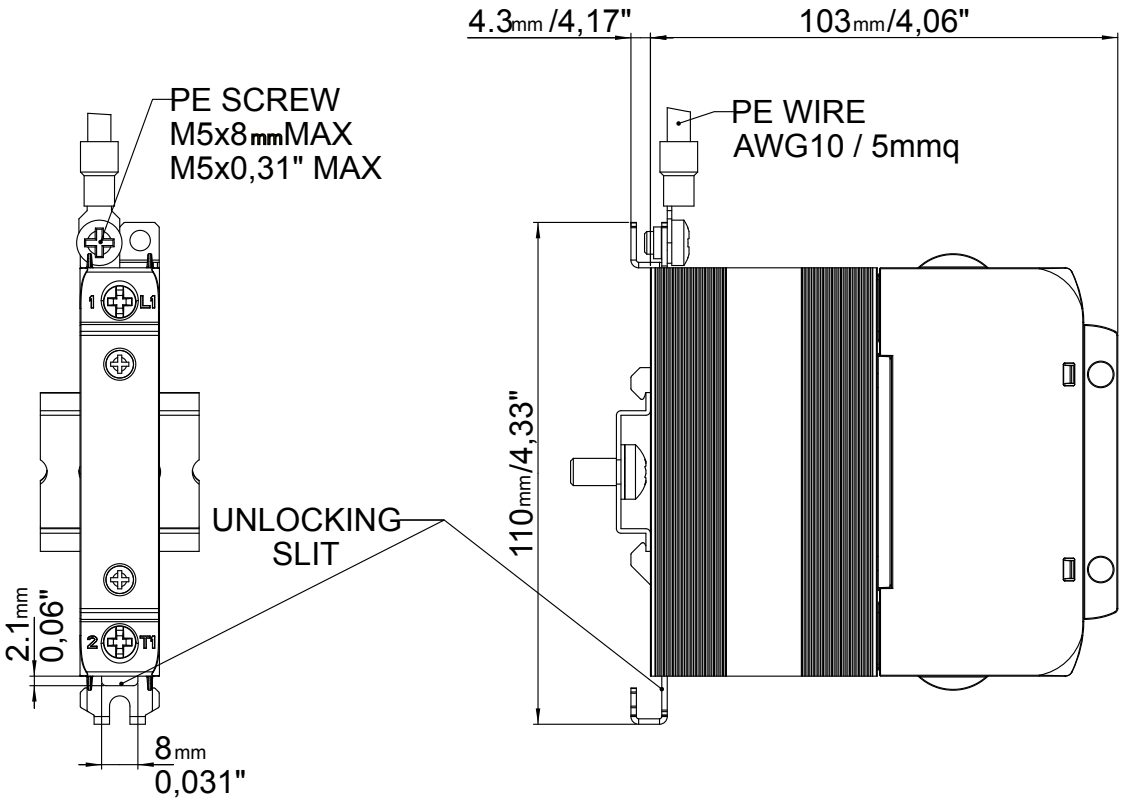




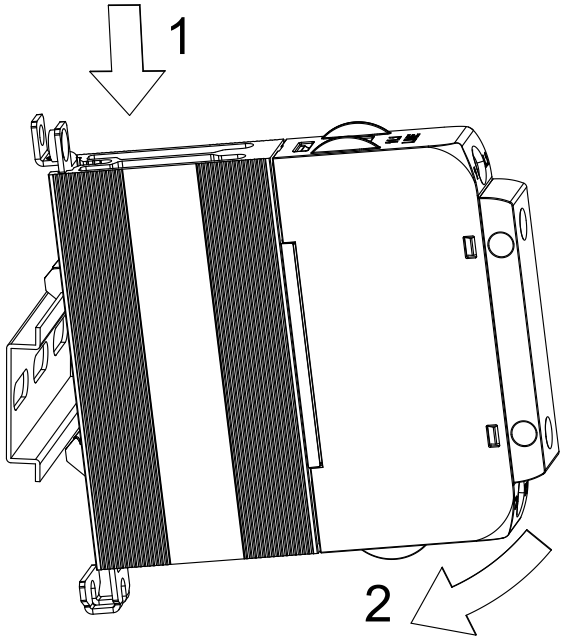
15-60A

75-120A

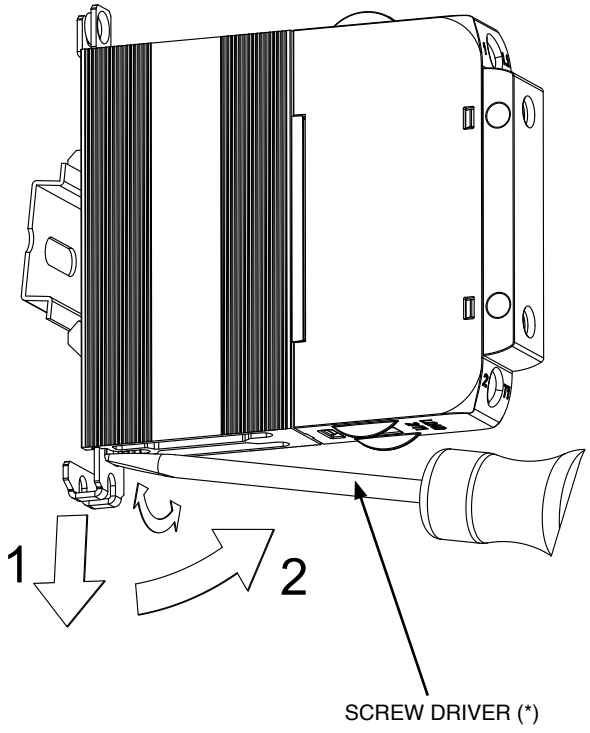
2.2. DIN rail fixing



DIN rail coupling sequence

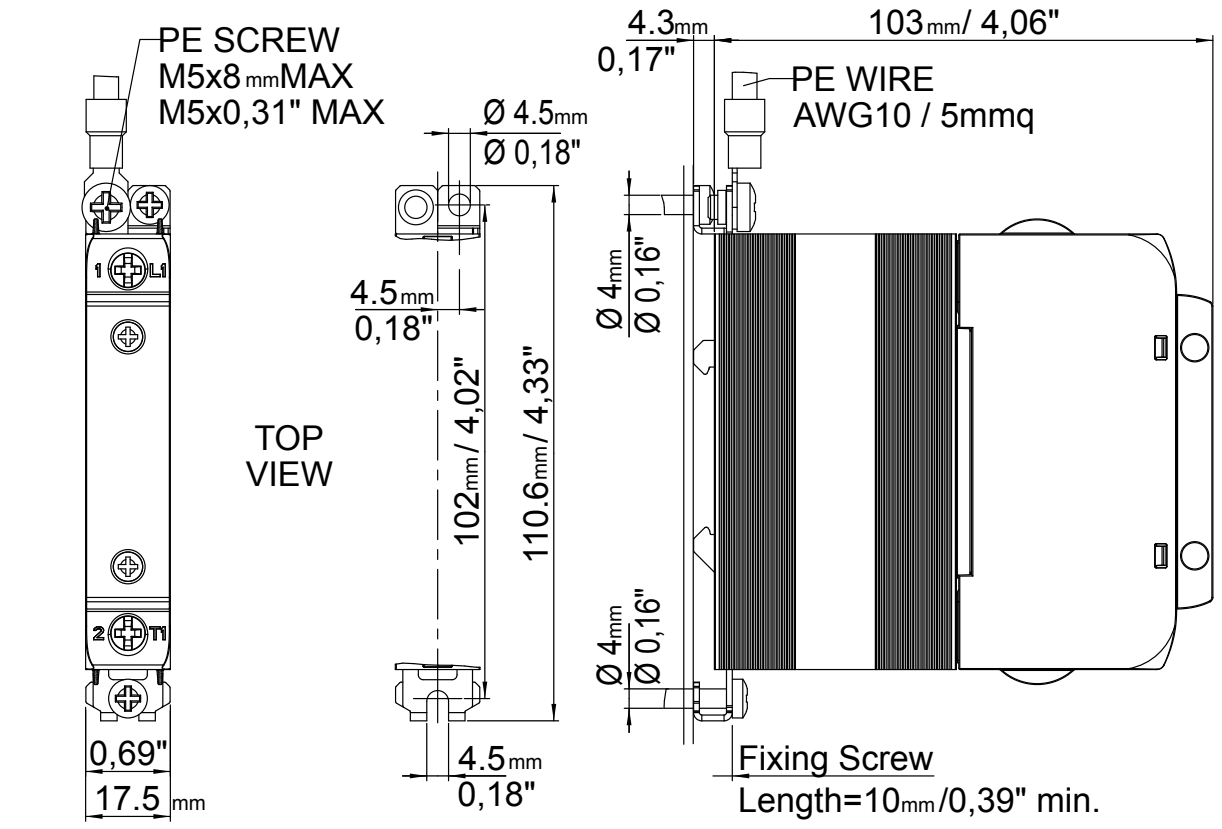


DIN rail release sequence



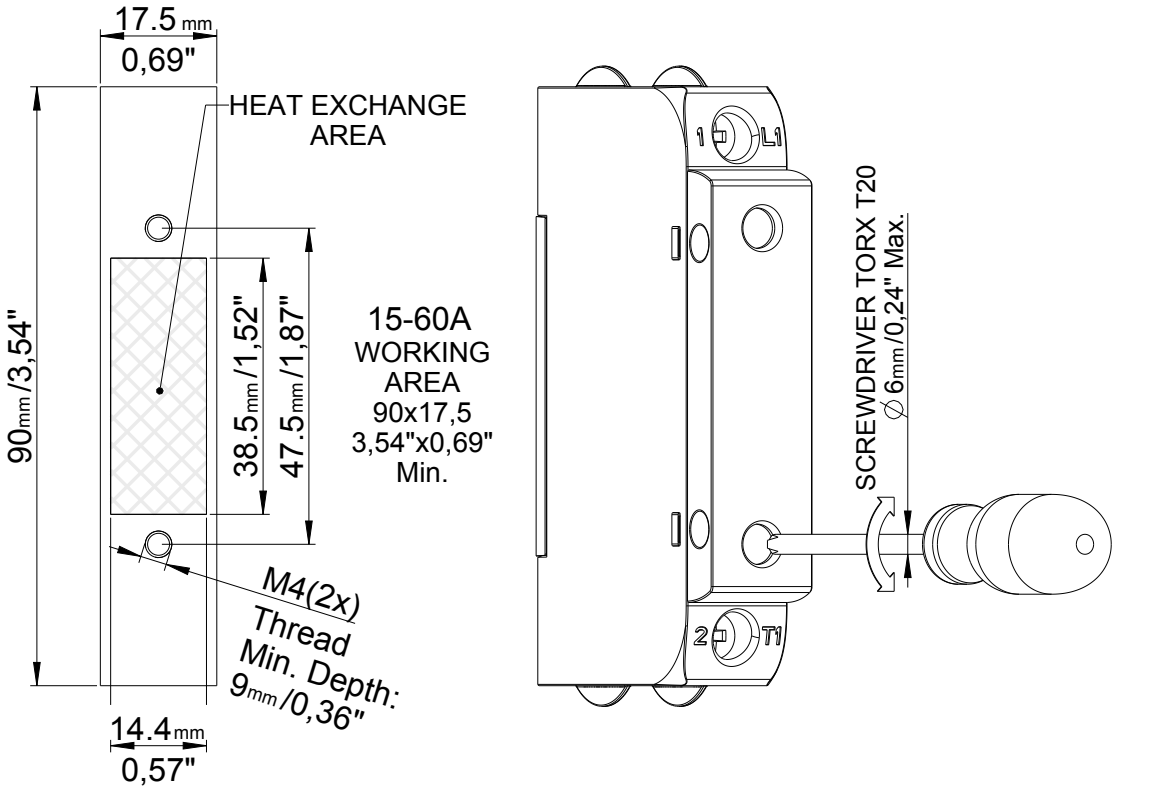
(*) Use of a slotted screwdriver with a max. diameter of 6mm is recommended

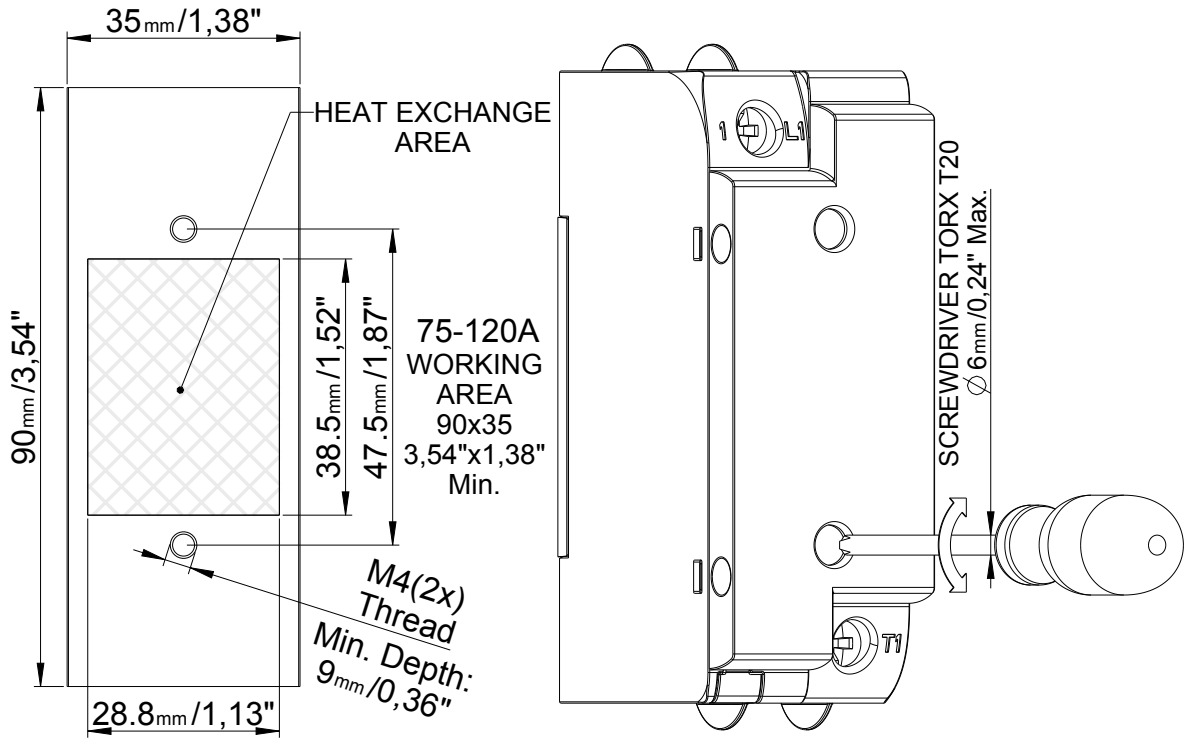
2.3. Panel fixing



For integrated heatsink version

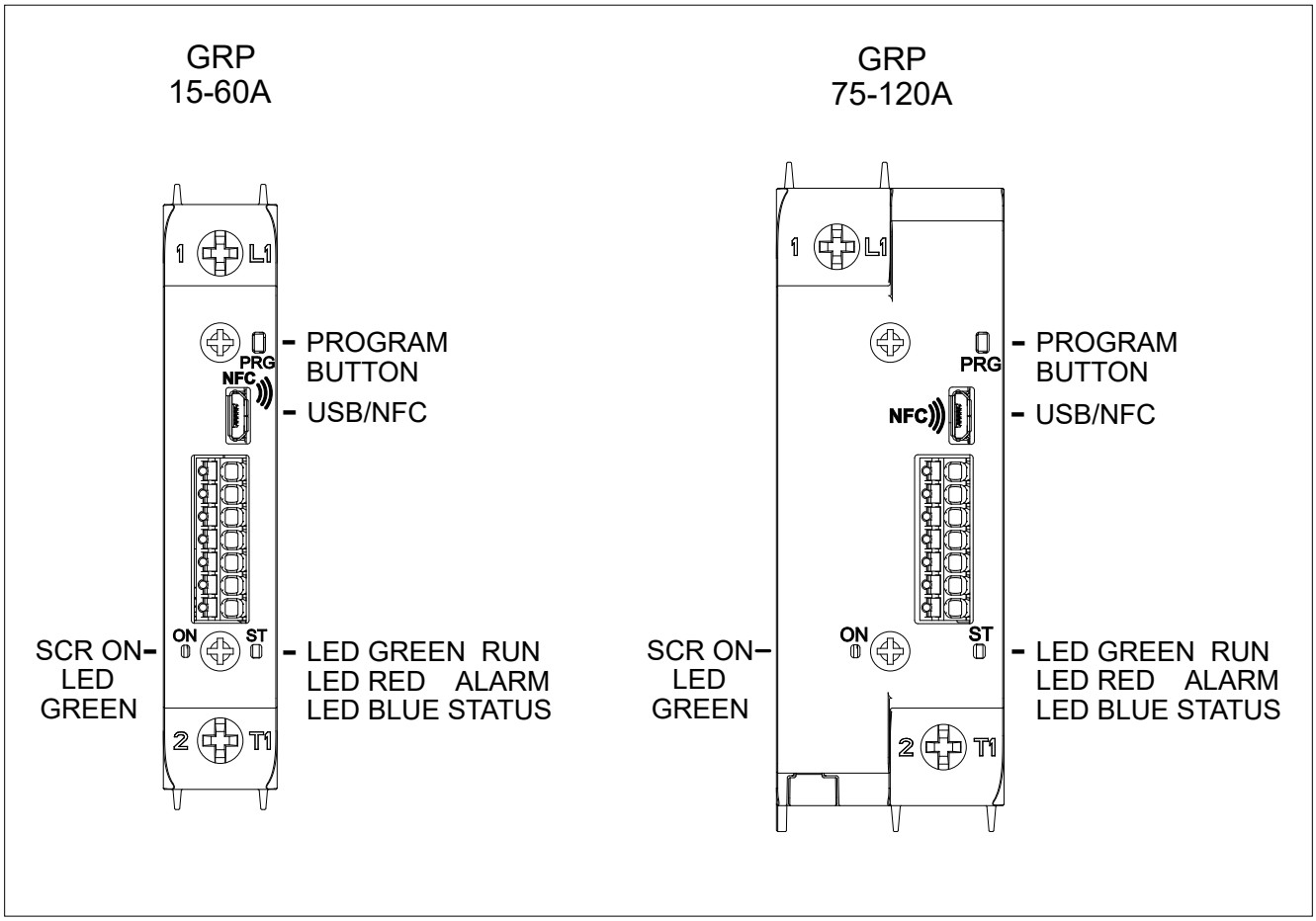
2.4. Heatsink mounting





For version without integrated heatsink

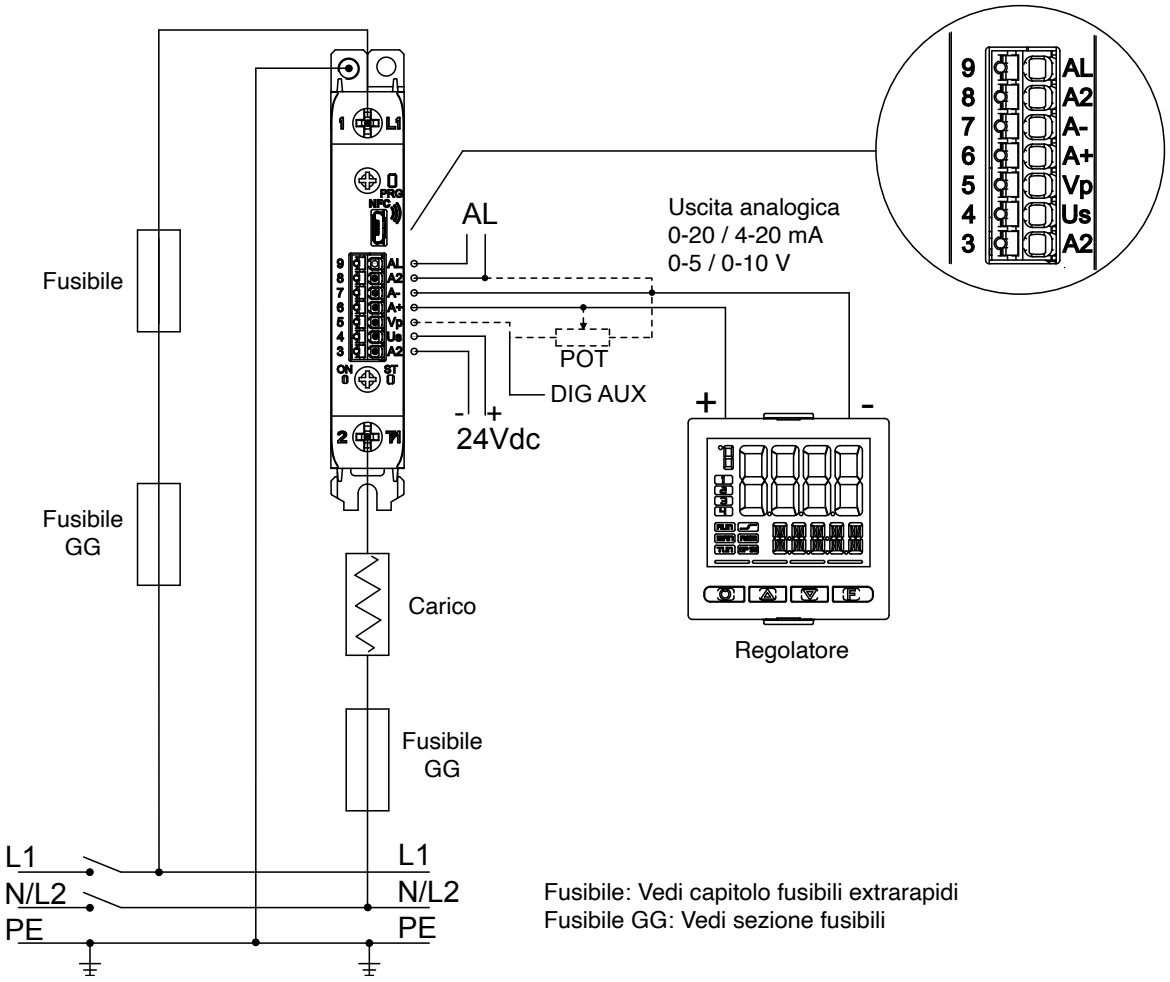
2.5. Front view



2.6. Pinout

2.6.1. Analogue control

VERSION WITH ANALOGUE INPUT



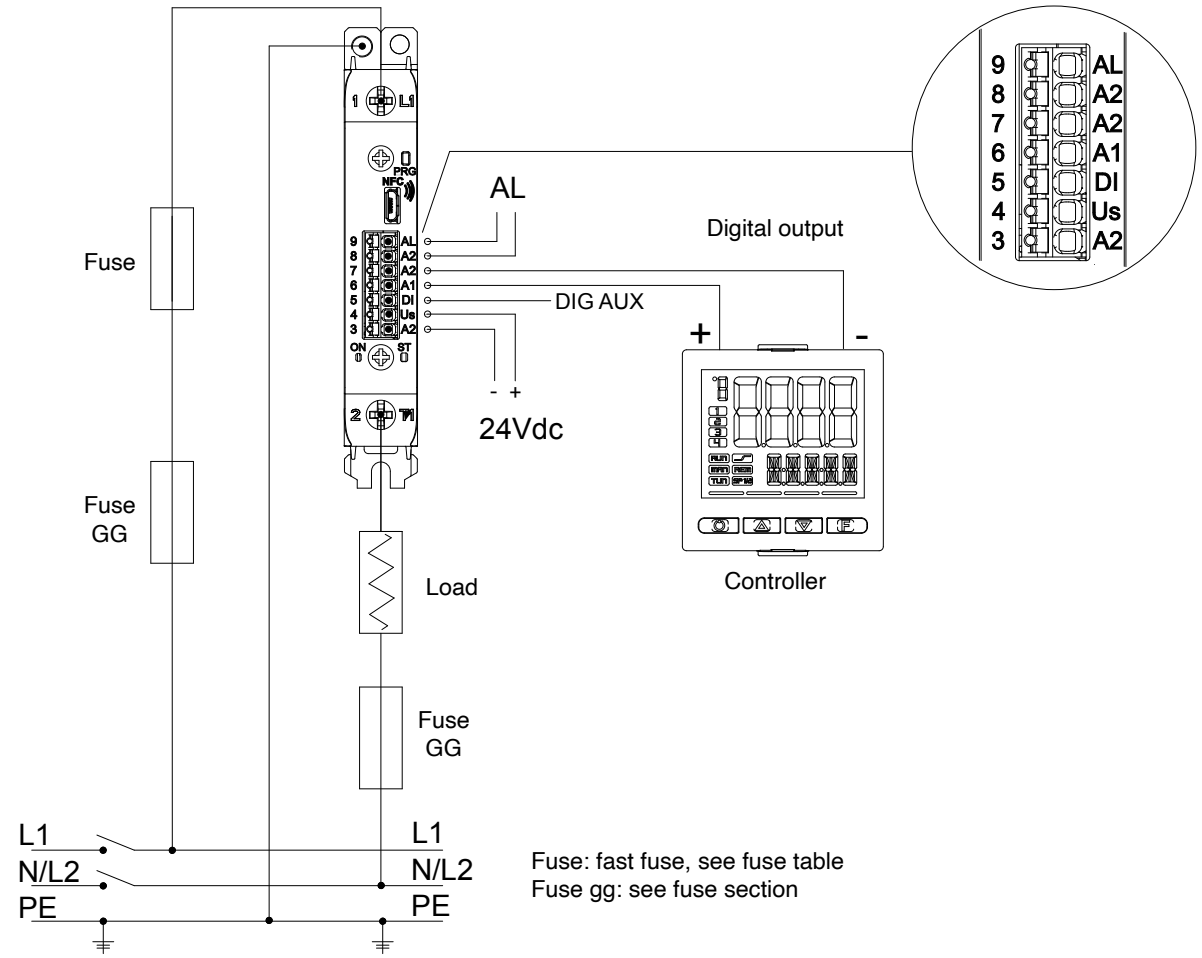
Fusibile: Vedi capitolo fusibili extrarapidi
Fusibile GG: Vedi sezione fusibili

Collegamento per carico mononase

Power terminals		
Ref.	**Description**	**Notes**
1/L1	Line Connection	
2/T1	Load Connection	
AN version signal connector (analogue input)		
3/A2-	Power GND	
4/Us	+ V DC power supply	GRP power supply (Range from 10 to 30 V DC, Imax = 20 mA at 24V)
		GRP-H-90 ..120A-..FAN63: GRP-H + Fan power supply (Range from 20 to 27 V DC, Imax <150 mA at 24V with Fan active)
5/Vp	Potentiometer power supply output (+ 5Vdc) / Auxiliary digital input	Potentiometer output voltage: 5V DC, Iout max = 10mA Digital input: 5-30V max 3 mA
6/A+	Analogue differential command input	
7/A-		
8/A2-	GND alarm output (common to terminal 3/A2-)	
9/AL	Alarm output	Digital output normally off (settable with normally on). PNP type, output voltage: Us(24Vdc)-0.7Vdc, Iout max =15mA

2.6.2. Digital version

VERSION WITH DIGITAL INPUT



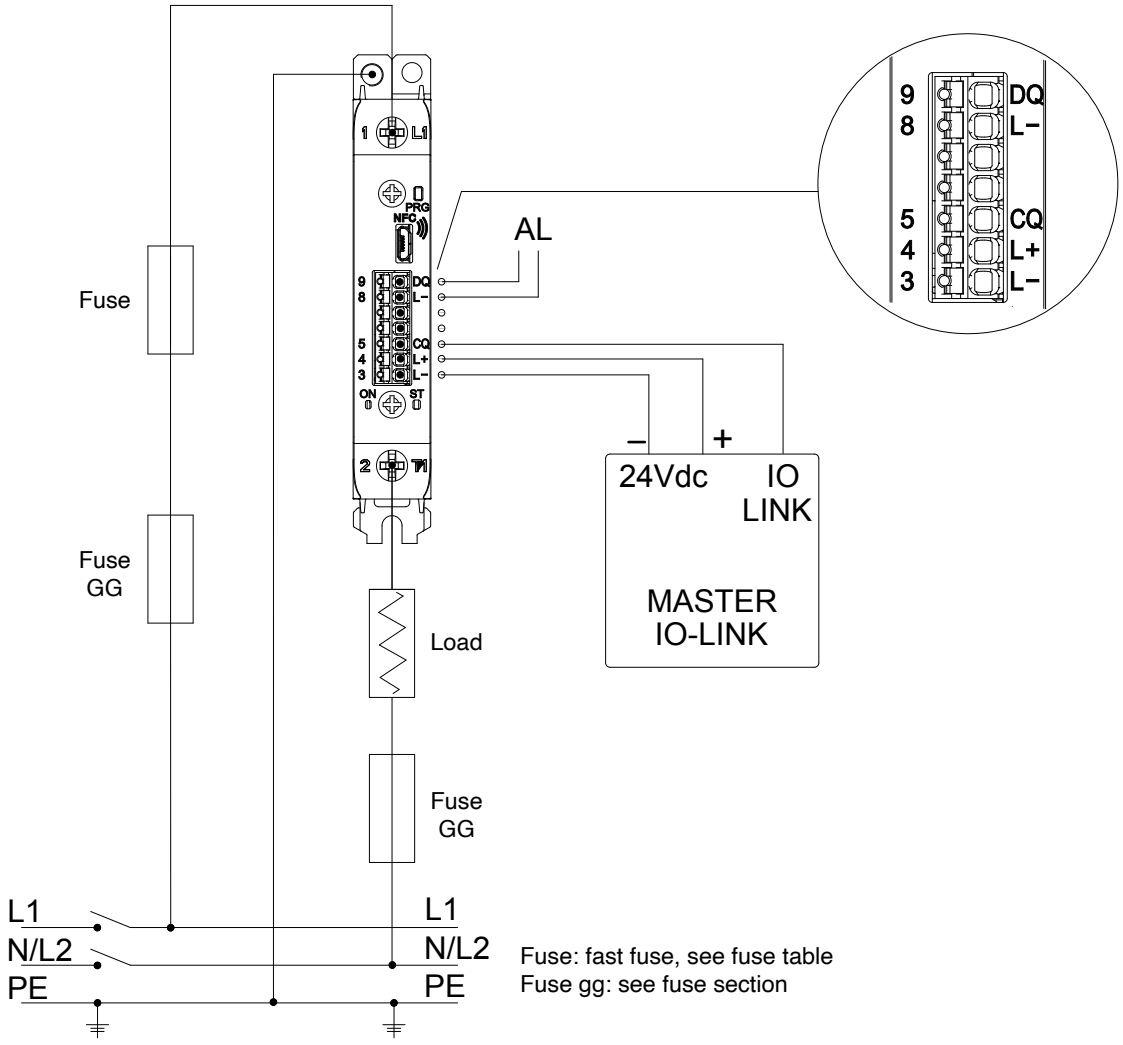
Fuse: fast fuse, see fuse table
Fuse gg: see fuse section

Connection for single phase load

Power terminals		
Ref.	**Description**	**Notes**
1/L1	Line Connection	
2/T1	Load Connection	
Connettore di segnale versioni D (ingresso digitale)		
3/A2-	Power GND	
4/Us	+ V DC power supply	GRP power supply (Range from 10 to 30 V DC, Imax = 20 mA at 24V)
		GRP-H-90..120A-..FAN63: GRP-H + Fan power supply (Range from 20 to 27 V DC, Imax <150 mA at 24V with Fan active)
5/DI	Auxiliary digital input	Digital input: 5-30V max 3 mA
6/A1+	Command digital input	Digital input: 5-30V max 3 mA
7/A2-	GND command input (common to terminal 3/A2-)	
8/A2-	GND alarm output (common to terminal 3/A2-)	
9/AL	Alarm output	Digital output normally off (settable with normally on). PNP type, output voltage: Us(24Vdc)-0.7Vdc, Iout max =15mA

2.6.3. IO-Link control

VERSION WITH IO-LINK INPUT



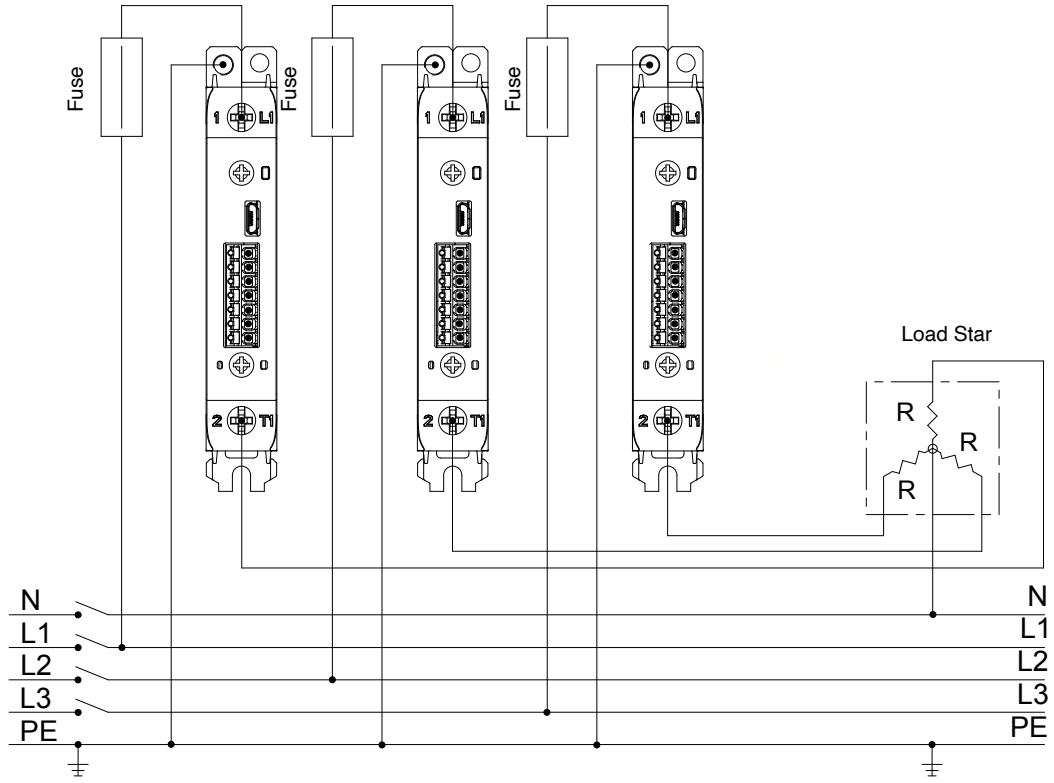
Fuse: fast fuse, see fuse table
Fuse gg: see fuse section

Connection for single phase load

Power terminals (common to all versions)		
Ref.	**Description**	**Notes**
1/L1	Line Connection	
2/T1	Load Connection	
I version signal connector (IO-LINK)		
3/L-	Power GND	
4/L+	+ V DC power supply	GRP power supply (Range from 10 to 30 V DC, Imax = 20 mA at 24V)
		GRP-H-90..120A-..FAN63: GRP-H + Fan power supply (Range from 20 to 27 V DC, Imax <150 mA at 24V with Fan active)
5/CQ	IO-LINK communication line	
8/L-	GND alarm output (common to terminal 3/L-)	
9/DQ	Alarm output	Digital output normally off (settable with normally on). PNP type, output voltage: Us(24Vdc)-0.7Vdc, Iout max =15mA

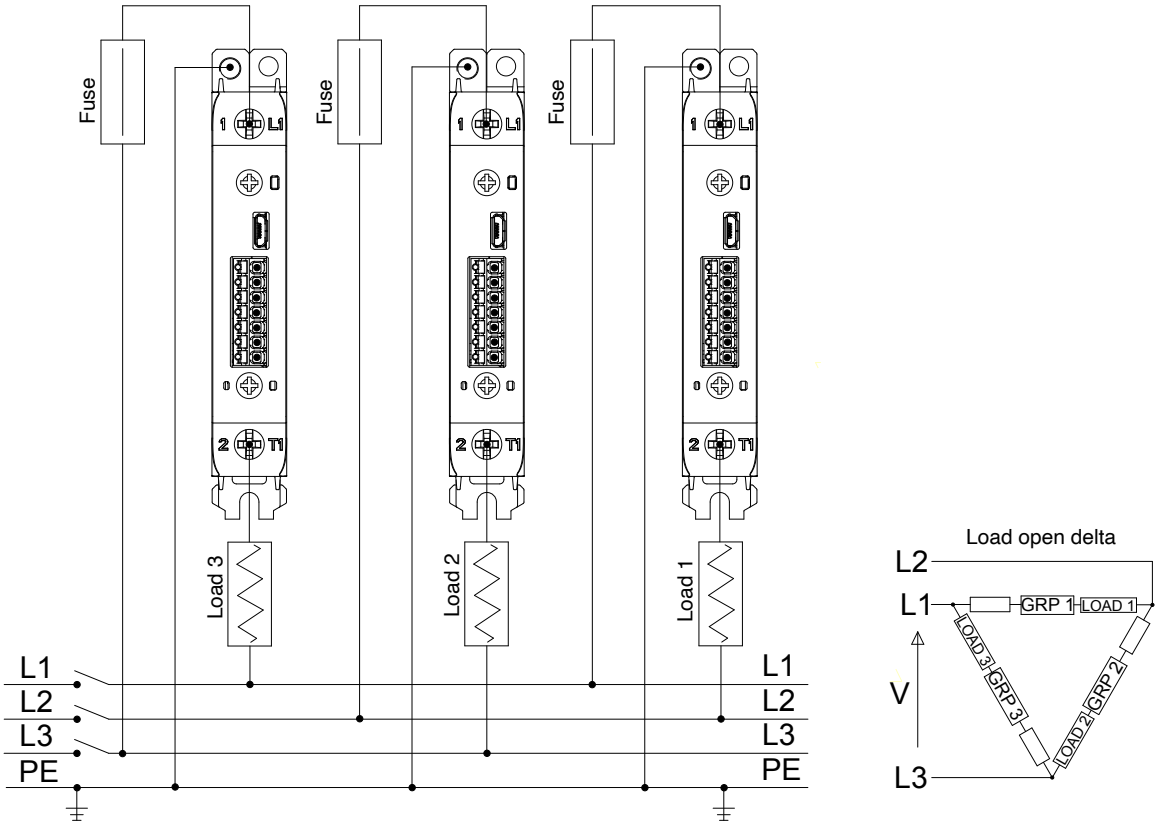
2.7. Load wiring

CONNECTION FOR THREE-PHASE STAR WITH NEUTRAL LOAD



Connect the control signals (analog or digital) on all the devices as shown in the specific section

CONNECTION FOR THREE-PHASE OPEN DELTA LOAD



Connect the control signals (analog or digital) on all the devices as shown in the specific section

2.8. Terminal and conductor table

POWER TERMINALS									
Nominal current of the load	**15A**	**25A**	**30A**	**40A**	**50A**	**60A**	**75A**	**90A**	**120A**
Contact area (WxD)	9,2 x 8 mm						10,5 x 10,7 mm		
Stripping length	11 mm						13 mm		
1 Conductor section ***2 Conductors section*** *(minimum section)*	1 x 2.5 mm^2 / 2 x 1.5 mm^2	1 x 6 mm^2 / 2 x 4 mm^2		1 x 10 mm^2 / 2 x 6 mm^2	1 x 16 mm^2 / 2 x 10 mm^2	1 x 25 mm^2 / 2 x 16 mm^2		35 mm^2	1 x 50 mm^2 / 2 x 25 mm^2
	1 x 14 AWG / 2 x 17 AWG	1 x 10 AWG / 2 x 12 AWG		1 x 8 AWG / 2 x 10 AWG	1 x 6 AWG / 2 x 8 AWG	1 x 4 AWG / 2 x 6 AWG	1 x 3 AWG / 2 x 6 AWG	2 AWG	1 x 1/0 AWG / 2 x 3 AWG
Maximum allowed section	1 x 25 mm^2 /2 x 16 mm^2 1 x 3 AWG /2 x 6 AWG						1 x 50 mm^2 / 2 x 25 mm^2 1 x 1/0 AWG / 2 x 3 AWG		
Tightening torque	2,5-3 Nm (22-26,6lb-in)								
Note: Use 75°C (167°F) copper (CU), multi-stranded conductors									

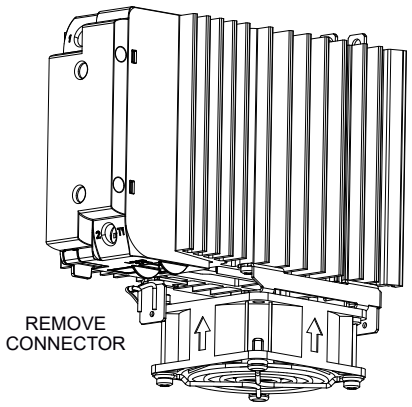
CONTROL/SIGNAL TERMINALS *Rigid/flexible / cable lug conductor cross section*	
1 Conductor section ***2 Conductors section***	1 x 0.2-1.5 mm^2 / 2 x 0.1-0.75 mm^2
	1 x 24-16 AWG 2 x 27-19 AWG
Stripping length / cable lug	8 mm
Note: Use rigid or multiwire copper conductors (CU) 60/75°C (140/167°F)	

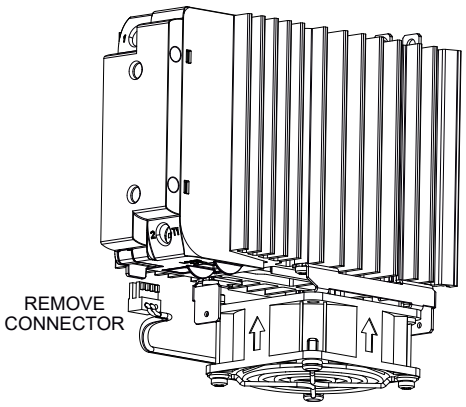
GROUND TERMINAL (*)	
Contact area (WxD) screw type	9 x 9 mm M5
Tightening torque	1,5-2,5 Nm (13.3 lb-in – 22 lb-in)

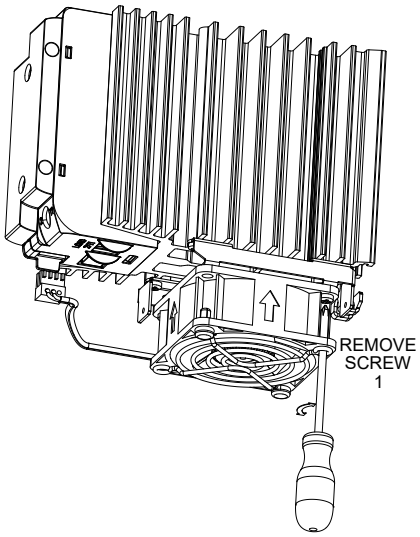
- (*) The screw terminals are only suitable for on-site wiring connection when the wire is equipped with a tube terminal with eyelet. It is possible to make ground connection using a copper bar suitably ground connected and fixed to the heatsink of more GRP-H.

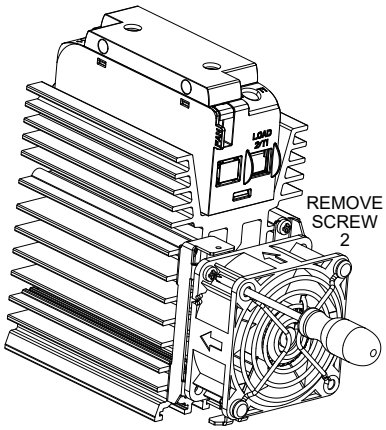
2.9. Fan maintenance

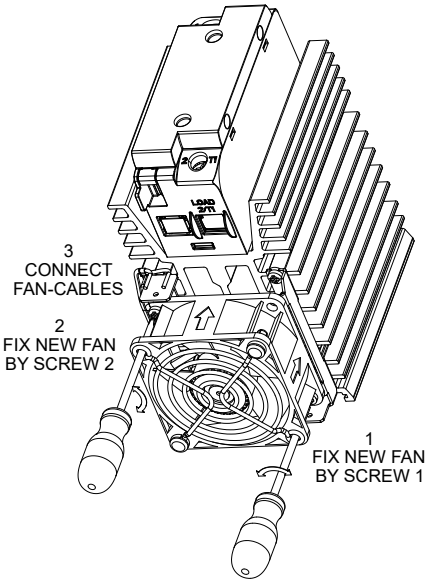
Caution: make sure that the arrow showing the direction of the air flow on the fan is pointing toward the dissipater

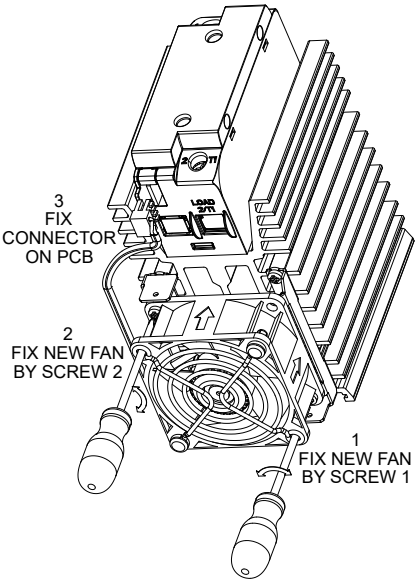












Use a Phillips screwdriver with a MAX 3.5mm diameter.

3. CONFIGURATION

3.1. Device configuration

Some basic settings can be set using the key on the front of the device.
The complete configuration can be completed via the “Gefran NFC” smartphone application, via PC with GF_eXpress software or via IO-Link. Configuration via Smartphone and with cable from PC can also be performed with the device not powered.

3.1.1. Gefran NFC application

The Gefran NFC application can be downloaded from the Play Store for Android devices and from the AppleStore for iOS devices.
NFC (Near Field Communication) must be enabled on the smartphone. It can be enabled from the settings (or quick settings in the drop-down menus) commonly the logos are the following:
or

This technology permits wireless exchange of data from one device to another (Smartphone <-> GRP), only when they are at close range. The same technology is used daily to read TagNFC, “Contactless” payment with credit cards and smartphones, etc. Data is exchanged by placing the smartphone NFC antennas a few mm from the Gefran NFC Dongle (see table **"6.7. Accessoires" on page 73**).

The NFC Dongle must be inserted into the microUSB port on the front of the device. All GRP devices are enabled to read and write data via NFC Dongle. The dongle can be ordered as an accessory or directly in the GRP order code. It can be removed after use or left inserted. **The NFC Dongle is not the device memory**, but an antenna, which allows communication at close range.

The application can read/write configuration recipes, model information and diagnostic data.
The application allows you to open recipes on the smartphone memory, read them from the device and retransmit them to it or similar devices. Recipes in .gfe format can also be saved and forwarded (Gefran format common to GF_eXpress recipe files).
All the reading and writing operations can be performed with the device powered or NOT powered.

This is possible thanks to the powered supplied by the smartphone to the internal GRP memory during NFC connection. Recipes are written on a GRP device in two ways:

Powered Device: the recipe is written via the smartphone in a portion of the device memory dedicated to writing via NFC. Immediately afterwards, the GRP device automatically checks the validity and consistency of the data transmission. These checks ensure that, even in the event of communication disturbances or interruptions, the GRP and the information within it are protected. If the check fails, the transmitted data is ignored and the GRP continues to work with the original recipe. If the checks are passed, the device loads the recipe transmitted from the NFC write memory to the memory that contains the recipe used for operation. To know the results of the data transmission, check the section **"3.2. LED" on page 21**.

Device NOT powered: the recipe is written via the smartphone in a portion of the device memory dedicated to writing via NFC. At first start-up, the checks described above are carried out in the case of “Device powered”.

3.1.2. Configuration software and real-time checks

Caution! It is first necessary to supply the 24Vdc power supply to the device and then connect it to the PC using the appropriate cable to diagnose and measure the electrical values controlled in real time Connecting the GRM and powering it later can lead to inconsistent current readings due to the dual power supply (programming cable +24Vdc).

The connection between PC and GRP via cable allows you to configure, read and acquire the data read from the field in real-time (measured voltage, current, power, alarms and device status etc.).
The GF_eXpress configuration software allows the complete configuration of the GRP using a USB converter cable (F060800), which can be ordered as a Gefran accessory.
For more information on programming with a PC, see the GF_eXpress documentation available at www.gefran.com.

Caution! A high level of knowledge of the problems and techniques for controlling electricity is required to correctly configure the GRP device so that it meets the application needs.

Caution! Before commissioning the GRP device, the user must ensure the parameters are set correctly to avoid damages to persons or property. If you are unsure of your skills or not fully aware of the potential consequences of incorrect parameter settings, we advise you not to proceed with the configuration. If in doubt, or if you would like some clarification, please visit www.gefran.com or contact the Gefran Customer Care service.

3.1.3. IO-Link

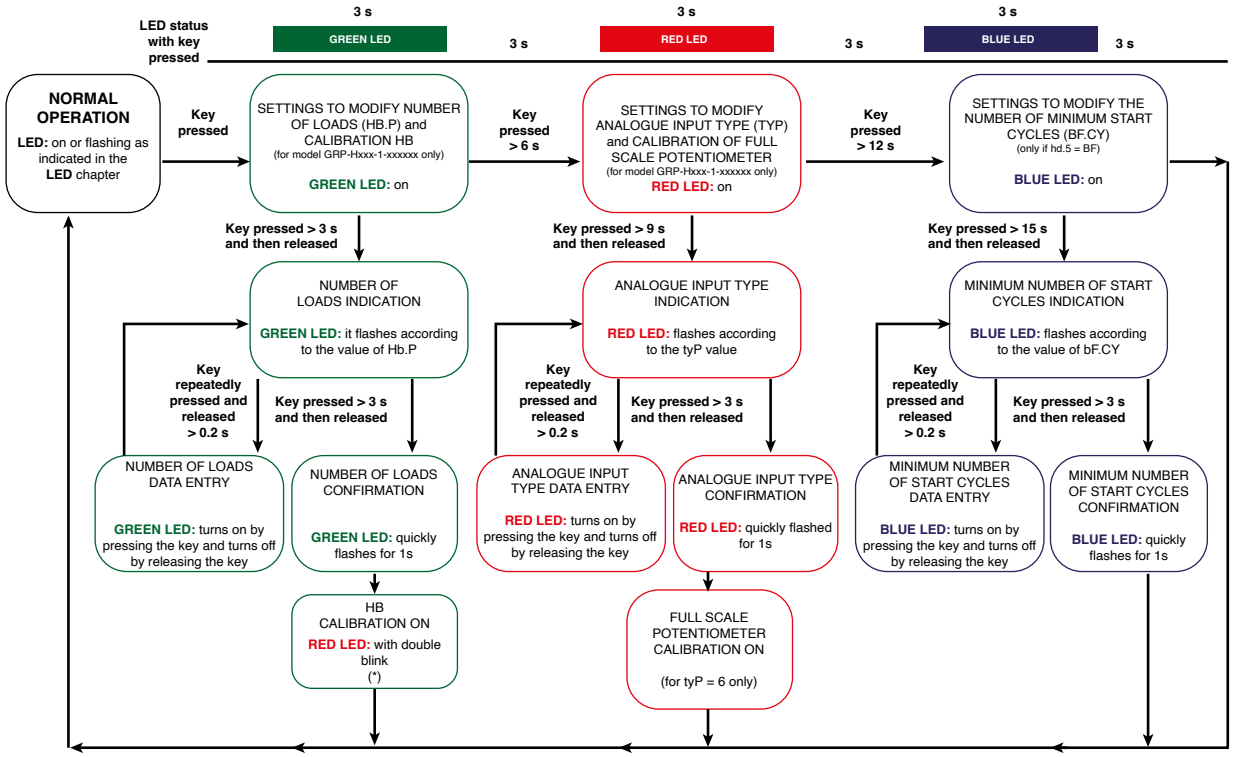
The GRP device can be fully configured, controlled and monitored via the IO-Link point-to-point communication protocol. The IODD files characteristic of the device can be downloaded from www.gefran.com, from the page dedicated to the GRP device.
For details of all parameters and commands available in IO-Link, refer to section **"5. IO-Link" on page 57**

3.1.4. Key

Some basic settings can be edited or the load current calibration phase started using the key and the LEDs on the front of the object. The basic settings are:

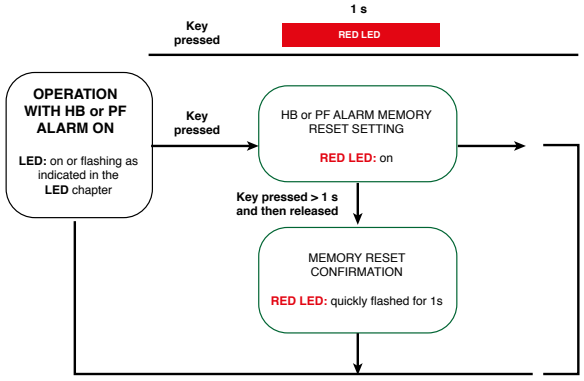
- "Partial HB alarm threshold learning" command See chapter **Allarme HB (Heater Break)** →"**4.2.1.1. HB alarm threshold teach-in function" on page 33** (for GRP-x-x-x-x-1-x-x-x-x-x models)
- Number of loads in parallel under a single zone for calculating the partial HB alarm threshold (see parameter Hb.P) (for GRP-xxxx-1-xxxxx models)
- Type of analogue input (see tyP parameter) (for GRP-xxx-AN-xxxxxx models)
- Minimum number of cycles of the Burst Firing mode (see parameter bF.Cy) (only if hd.5 = BF).
- Full scale potentiometer calibration
- Alarm memory reset

Below are the instructions to change settings via key and feedback from the front LED.
With the key released for at least 30 s (15 s if you are in the phase of indicating the setting to be modified) you return to normal operation.



* The device does NOT automatically enable the power output after the HB calibration is applied.
The device waits for the command signal (digital signal ON, analogue or IO-Link is recommended > 50%). A few operating waves are enough for the device to register the current and voltage value as the nominal value of the load and exit calibration.
It is recommended to carry out calibration in load regime conditions. This is to avoid false alarms due to current drop, not due to load break in parallel, but to the consumption of different current between resistors at room temp. and working temp.
With the button released for at least 15s you return to operation by exiting the configuration flow. Still, if the calibration has been activated, the device remains in the calibration state until it registers a current flow, even after a restart of the device.

In Heater Break or Power Fault with memory alarm conditions, the alarm memory can be reset by pressing the key according to the flow illustrated below:

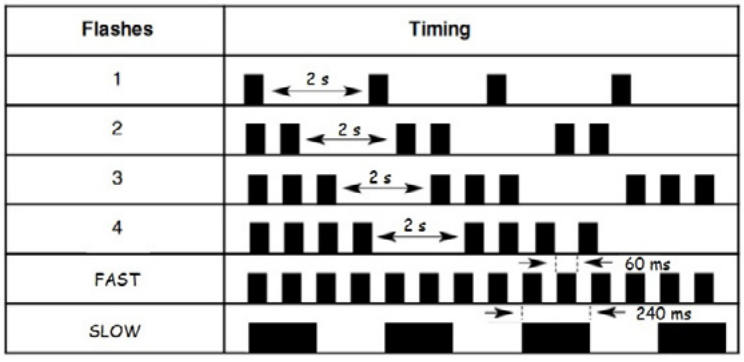


3.2. LED

The ST LED shows the following states which are shown in **order of priority** (the first in the table has the highest priority):

STATO	GREEN		RED		BLUE	
	STEADY	FLASHES	STEADY	FLASHES	STEADY	FLASHES
High visualization priority						
Key management (see chapter **Configuration → Device configuration →"3.1.4. Key" on page 20**)						
NFC connection: field detection on					■	
NFC connection: recipe processing phase received						
NFC connection: recipe saving error received						■3
Thermal alarm (SSR_over_heat or SSR_temperature_sensor_ broken)				■ fast		
SSR_SHORT alarm (*)				■ slow		
Current sensor broken (*)				■ 4		
Device with partial HB option with activated calibration (*)				■ 2		
Device with partial HB option not calibrated (just installed) (*)				■ 1		
HB alarm (*)			■			
NO_VOLTAGE or NO_CURRENT alarm				■ 3		
Mains voltage frequency alarm (**)		■ 4				
MAN		■ 1				
RUN for DIGITAL / ANALOG control (***)		■ slow				
OFF software		■ 2				
RUN for IO-LINK control (****)						■ slow
Low visualization priority						

(*) Only for GRP-H-x-x-x-1-x-x-x-x-x-x models
(**) Only for GRP-H-x-x-x-1-x-x-x-x-x-x models and hd.5 = HSC or hd.5 = PA
(***) Only for GRP-H-x-x-D-x-x-x-x-x-x-x and GRP-H-x-x-AN-x-x-x-x-x-x-x models
(****) Only for GRP-H-x-x-I-x-x-x-x-x-x-x models



4. PARAMETER DESCRIPTIONS

4.1. Inputs

4.1.1. Analogue input

Available only for GRP-x-x-x-AN-x-x-x-x-x-x model

Settings

4.1.1.1. Analogue input type

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
tyP	Inputs → Analog input	R/W	■		1
The parameter sets the type of analogue input. **Options:** (*) full scale calibration only, activated by key					

4.1.1.2. Analogue input scale minimum limit

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Lo.S	Inputs → Analog input	R/W	■	s.p.	0.0
The parameter sets the analog input scale minimum limit. It can be used to recalibrate the analog input or set a minimum power. Example, if Lo.S=10.0, when the 0..10V input is at 0V, the delivered power will be 10.0%, at 10V it will be 100.0%. Intermediate values will be heated. *min...max*: -100.0...+200.0					

4.1.1.3. Analogue input scale maximum limit

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
HI.S	Inputs → Analog input	R/W	■	s.p.	100.0
The parameter sets the analog input scale maximum limit. It can be used to recalibrate the analog input or set an upper power limit. Example, if HI.S=90.0, when the 0..10V input is at 10V, the power delivered will be 90.0%, at 0V it will be 0.0%. The intermediate values will be heated. *min...max*: Lo.S...+200.0					

4.1.1.4. Analogue input correction offset

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
oFS	Inputs → Analog input	R/W	■	s.p.	0.0
The parameter sets the analog input correction offset. It can be used to recalibrate the analog input or set a minimum power. Example, if oFS=10.0, when the 0..10V input is at 0V the power supplied will be 10.0%, at 9V it will be 100.0%. *min...max*: -99.9...99.9					

4.1.1.5. Analog input signal digital low-pass filter

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
FLt	Inputs → Analog input	R/W	■	s	0.1
The parameter sets the time of the low pass filter on the analogue input signal. *min...max:* 0.0 ...20.0 s					

4.1.1.6. Fault Action Power

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
FA.P	Controls	R/W	■	%	0.0
The parameter sets the power to be supplied in the event of an analogue input fault. When a 4 ... 20 mA input is used and the current is less than 2 mA, the Err state is generated and the power defined in FA.P is supplied. *min...max:* 0...100.0 %					

Status

4.1.1.7. Analogue input value (process variable)

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
P.V.	Status	R	-	s.p.	-
Analogue input engineering value read (process variable).					

4.1.1.8. Analogue input status

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Err	Status	R	-	-	-

Analogue input self-diagnosis status

Value	Meaning
0	No error
1	
2	
3	Error (*)

(*) The input is in error when a 4 ... 20 mA input is used and the current is less than 2 mA: the Error status is generated and the power defined in FA.P is supplied.

4.1.2. Load current value

Available only for models with GRP-x-x-x-x-1-x-x-x-x-x “Advanced Diagnostics” option

Settings

4.1.2.1. Current reading correction offset

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
o.tA	Inputs → CT input	R/W	■	A	0.0

Current reading correction offset.

min...max: -99.9 ...99.9 A

4.1.2.2. Current reading low pass digital filter

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
F.tA	Inputs → CT input	R/W	■	s	0.1

Current reading digital filter.

min...max: 0.0 ...20.0 s

Status

4.1.2.3. Current reading scale minimum limit

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
L.tA	Inputs → CT input	R	■	A	0.0

Current reading scale minimum limit.

4.1.2.4. Current reading scale maximum limit

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
H.tA	Inputs → CT input	R	■	A	(*)

Current reading scale maximum limit.

(*)

Model	Default
15 A	25.0
25 A 25I A	40.0
30 A 30I A	50.0
40 A	60.0
50 A	80.0
60 A	100.0
75 A	120.0
90 A	150.0
120 A	200.0

4.1.2.5. Real-time current reading input value

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
I.tA	Expert → Status → Current	R	-	A	-

Current reading real-time value.

4.1.2.6. Current reading input value

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
I.onF	Expert → Status → Current	R	-	A	-

Filtered current reading value, at active power output (SSR operating phase).

4.1.2.7. Current reading status

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS3	Expert → Status → Diagnostics	R	-	-	-

Current reading self-diagnosis status.

bit	Meaning
13	Broken current sensor

4.1.3. Line voltage value

Settings

4.1.3.1. Voltage reading correction offset

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
o.tV	Inputs → VT line input	R/W	■	V	0.0
Voltage reading correction offset. *min...max*: -99.9 ...99.9 V					

4.1.3.2. Voltage reading low pass digital filter

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
F.tV	Inputs → VT line input	R/W	■	s	2.0
Voltage reading digital filter. *min...max*: 0.0 ...20.0 s					

4.1.3.3. Voltage reading update time

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
U.tV	Inputs → VT line input	R/W	■	s	10

U.tV is the period beyond which a voltage reading is forced and thus power is cut off. It forced interruption is performed when the power is at 100.0% for a period longer than U.tV.

The device is capable of taking voltage readings only in a nonconducting state. For perform a valid voltage reading, at least 60 ms of nonconduction is required. For these reasons, if for long periods the device delivers power (remains in conduction all the time) power delivery will be interrupted for 60ms. This interruption is necessary for updating the voltage reading and thus to be able to ensure complete diagnostics.

Notes
Phase Angle: if the control is Phase Angle type, for a voltage reading it is necessary that the power to be 0.0% for at least 60ms, or it will be automatically interrupted every U.tV seconds.

Zero Crossing (including BurstFiring and HalfSingleCycle): If the control is of the Zero Crossing type, it is enough that there are periods of at least 60ms of Off between the On and Off states to make valid valid readings (otherwise power output will be interrupted every U.tV).
A U.tV value > 0 interrupts the command on the SSR for 60ms. To prevent the device from taking voltage readings even during conduction phases (**thus to avoid short power interruptions**) set the parameter U.tV=0.
Setting U.tV=0 does not allow the voltage value to be always up-to-date. In this case, the voltage value will be updated at the first available nonconducting phase.
The effect of U.tV >0 and interruptions of 60ms can be seen in electrical loads with low inertia, such as infrared lamps, every U.tV seconds will have a decrease in brightness. to be taken into account In fast processes.

min...max: 0 ...999

Status

4.1.3.4. Voltage reading scale minimum limit

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
L.tV	Inputs → VT line input	R	■	V	0.0
Voltage reading scale minimum limit.					

4.1.3.5. Voltage reading scale maximum limit

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
H.tV	Inputs → VT line input	R	■	V	(*)

Voltage reading scale maximum limit.
(*)

Model	Default
480 V	560.0
600 V	690.0

4.1.3.6. Voltage reading input real-time value

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
I.tV	Expert → Status → Voltage	R	-	V	-
Voltage reading real-time value.					

4.1.3.7. Voltage reading input value

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
I.tVF	Status	R	-	V	-
Filtered voltage reading value.					

4.1.3.8. Mains voltage frequency

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
FrEq	Status	R	-	Hz	-
Mains voltage frequency.					

4.1.3.9. Voltage reading status

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS3	Expert →Status →Diagnostics	R	-	-	-

Voltage reading self-diagnosis status.

Bit	Meaning
4	Frequency warning: frequency outside the 50Hz or 60Hz range
5	50Hz (0) / 60 Hz (1)

4.1.4. Values on load

Status

4.1.4.1. RMS load current

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ld.A	Status	R	-	A	-
RMS load current.					

4.1.4.2. Load voltage

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ld.V	Status	R	-	V	-
Load voltage.					

4.1.4.3. Power on load

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ld.P	Status	R	-	kW	-
Power on load.					

4.1.4.4. Load impedance

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ld.I	Status	R	-	Ohm	-
Load impedance					

4.1.4.5. Consumed energy meter 1

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ld.E1	Status	R	■	kWh	-
Value of the E1 energy consumed since the first start-up or since the last meter reset.					

4.1.4.6. Consumed energy meter 2

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ld.E2	Status	R	■	kWh	-
Value of the E2 energy consumed since the first start-up or since the last meter reset.					

Commands

4.1.4.7. Energy meter reset

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS11	Expert → Status → Diagnostics	R/W	-	-	0

Energy meter reset commands.

Bit	Meaning
3	Ld.E1 reset
4	Ld.E2 reset

4.1.5. Digital input

Settings

4.1.5.1. Digital input 1 function (pin 5/Vp or 5/DI)

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
dIG.1	Inputs → Digital inputs	R/W	■	-	1

Digital input 1 function (Dig Aux), corresponding to pin 5/Vp in versions with analog control (GRP-X-X-AN...) and 5/DI in versions with digital control (GRP-X-X-D...)

In the case of a potentiometer input, the digital input 1 function has no effect and the connector terminal is used as the potentiometer power supply output.

Options:

0	Disabled input (no function)
1	HB calibration (saving of the values on the trigger signal (from off to on), of the ausiliary input
2	Software Off (In=1: Software Off, In=0: Software On)

4.1.5.2. Digital input 1 type (pin 5/Vp or 5/DI)

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
dIG.1.t	Inputs → Digital inputs	R/W	■	-	0

Digital input 1 type (Dig Aux), corrispondente al pin 5/Vp nelle versioni con comando analogico (GRP-X-X-X-AN...) e 5/DI nelle versioni con comando digitale (GRP-X-X-X-D...)

Options:

0	Direct
1	Reverse

4.1.5.3. Digital input 2 function (command signal, pin 6/A1+)

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
dIG.2	Inputs → Digital inputs	R/W	■	-	(*)

Digital input 2 function (control signal, pin 6/A1+) available only in versions with control digital (GRP-X-X-X-D...).

Options:

0	Disabled input (no function)
1	Main command (SSR)

When switched on, the following is set: (model GRP-HxxDxxxxxx) dIG.2 = 1
(all other models) dIG.2 = 0

(*)

Model	Default
GRP-x-x-x-D-x-x-x-x-x-x	1
All other models	0

4.1.5.4. Digital input 2 type (command signal, pin 6/A1+)

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
dIG.2.t	Inputs → Digital inputs	R/W	■	-	0

Digital input 2 type (control signal, pin 6/A1+) available only in versions with control digital (GRP-X-X-X-D...).

Options:

0	Direct
1	Reverse

Status

4.1.5.5. Digital input 1 Status

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
INPUT_DIG	Expert → Status → Diagnostics	R	-	-	-

Status read by the digital inputs Dig Aux and control signal (pin 6/A1+).

Bit	Meaning
0	dIG.1 status (pin 5/Vp or 5/DI)
1	dIG.2 status (pin 6/A1+, On Off command)

4.1.6. Key

Settings

4.1.5.6. Front key enabling

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
but	Inputs →Button	R/W	■	-	1

Enable physical button on the front of the object.

Options:

0	Button disabled (no function)
1	Button enabled

By pressing the button according to the flow illustrated in the chapter **"Device configuration →"3.1.4. Key" on page 20"** you can set:

- The number of loads in parallel (for GRP-xxxx-1-xxxxx models) and enable HB calibration. Changing the number of loads in parallel automatically changes the percentage threshold (Hb.P) for the HB alarm used to calculate the threshold in Ampere.
- The type of analogue input (for GRP-xxx-AN-xxxxxx models) and activate full scale potentiometer calibration.
- The minimum number of Burst Firing cycles (only if hd.5 = BF).

With the key released for at least 30 s (15 s if you are in the phase of indicating the setting to be modified) you return to normal operation.
See chapter **"Device configuration → "3.1.4. Key" on page 20"**

4.2. Alarms

The device is able to detect different alarm conditions, they are divided into three types below:
-Heater Break HB alarms
-Power Fault alarms
-Thermal protection alarms
The alarm status signal is reported on the physical output named Out1 (pin 9/AL, or 9/DQ in case of IO-Link).
Only for IO-Link: In SIO Mode, Pin 5 / CQ retransmits the same alarm output, defined Out1, as pin9 / DQ.
By default, the alarm on the physical output managed via the OR logic of the three alarms (parameter out.1 = 5: Heater Break or Power Fault alarms or SSR Over Heating). By modifying the parameter out.1 it is possible to consider just some types of alarm. It is possible, for example, to change the parameter at out.1 = 6 (Heater Break alarm or SSR Over Heating), to prevent the alarm output from rising with the conditions of Power Fault alarms (eg: lack of voltage). See the Output chapter for more details and options.
The conditions of the three types of alarm are in turn configurable, with the parameters described in the following chapters.

4.2.1. HB (Heat Break) Alarm

Available only for models with GRP-x-x-x-x-1-x-x-x-x-x “Advanced Diagnostics” option

This type of alarm makes it possible to identify breakage (partial or total) or interruption of the load through the measurement of the current delivered, obtained by means of an integrated current sensor.
The following three fault situations can occur:

The current delivered is lower than the rated current recorded during calibration: this is the most common situation and indicates that an element of the load has failed.
- The current delivered remains significant even during periods when it should be zero: this is a situation of load drive circuit short-circuit or due to relay contacts welded together. Prompt intervention in these situations is very important to prevent greater damage to the load and/or the pilot circuits.

The device controls the power flow through alternating ON (operating) and OFF (non operating) states, modulating according to the set cycle time, or according to the digital command.

The current reading taken during the ON phase makes it possible to identify an abnormal deviation from its rated value due to a fault on the load (the first fault situation listed above). The current reading taken during the OFF phase makes it possible to detect a possible fault on the SSR control, resulting in an output that is always active (second fault situation).

The alarm is enabled by means of the Hd.E parameter and the type of function required is selected with the Hb.F parameter:
- Hb.F = 0: the alarm is triggered if the current load value is below the threshold value set in A.Hbx while the SSR control output is ON.
- Hb.F = 1: the alarm is triggered if the current load value is above the threshold value set in A.Hbx while the SSR control output is OFF
- Hb.F = 2: the alarm is triggered by joining functions 0 and 1 with a logical OR.

The A.Hbx = 0 setting disables both types of HB alarm by forcing the Alarm status off.
The alarm is reset automatically if its cause is eliminated.
An additional configuration parameter for each zone, related to the HB alarm is:

Hb.t = wait time for HB alarm trigger, intended as the sum of the times for which the alarm is considered on. For example, with:

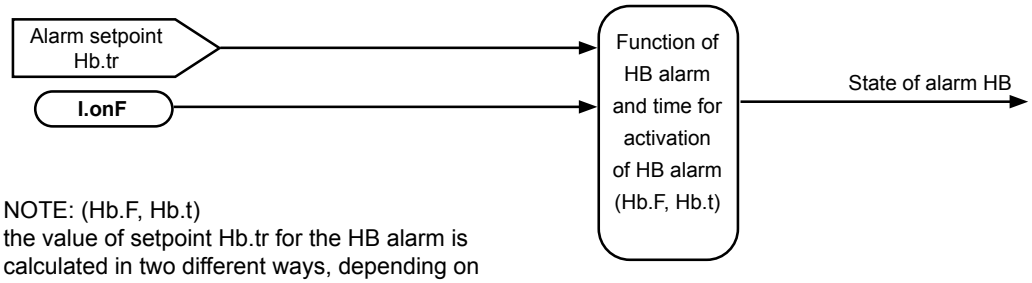
- Hb.F = 0 (alarm on with current below the set threshold value),
-
- Hb.t = 60 s and control output cycle time = 10 s,
-
- Power delivered at 60%, the alarm will trigger after 100 s (output ON for 6 s each cycle); and if the delivered power is 100%, the alarm will trigger after 60 s.

If the alarm goes off during this interval, the time sum is reset.
The delay time set in Hb.t must exceed the cycle time of the SSR output.

4.2.1.1. HB alarm threshold teach-in function

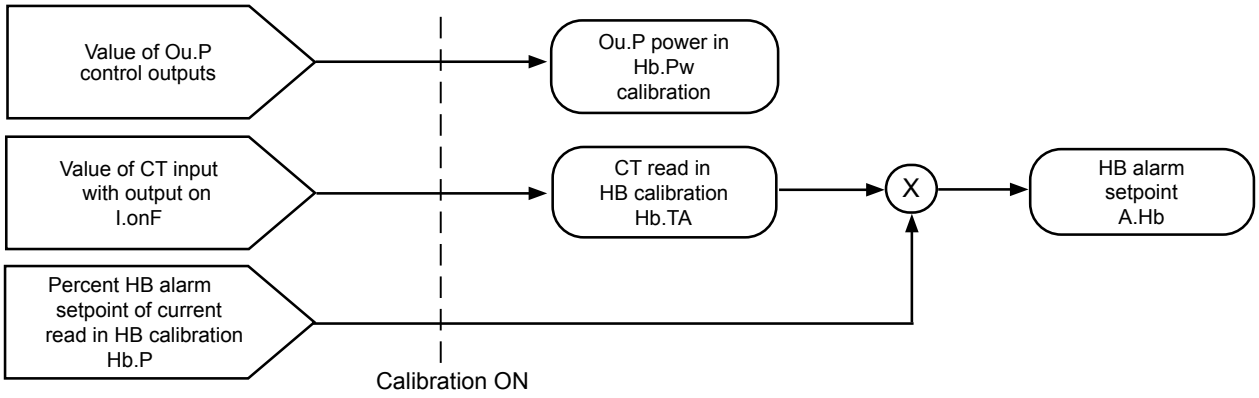
This function allows teach-in of the HB alarm threshold.
To use this function, it is first necessary to set the Hb.P parameter, which defines the percentage of current in relation to the rated load below which the alarm is triggered.
The function can be activated by command from serial line, from IO-Link, from digital input (see **Inputs →"3.1.4. Key" on page 20**).
When the Teach-in function is activated in FCT, BF and HSC modes, the RMS current value in operating ON multiplied by the Hb.P parameter determines the HB alarm threshold.
When the Teach-in function is activated in PA mode, the RMS current value is recalculated at 100% power, which, when multiplied by the Hb.P parameter, determines the HB alarm threshold.
Before activating the function, the SSR must be activated by the digital input (for model GRP-x-x-x-D-x-x-x-x-x-x) or switched on with power, recommended greater than 50% (for models GRP-x-x-x-AN-x-x-x-x-x and GRP-x-x-x-I-x-x-x-x-x-x).
The measured current threshold will be written automatically in the A.Hb parameter.

4.2.1.2. Functional diagram

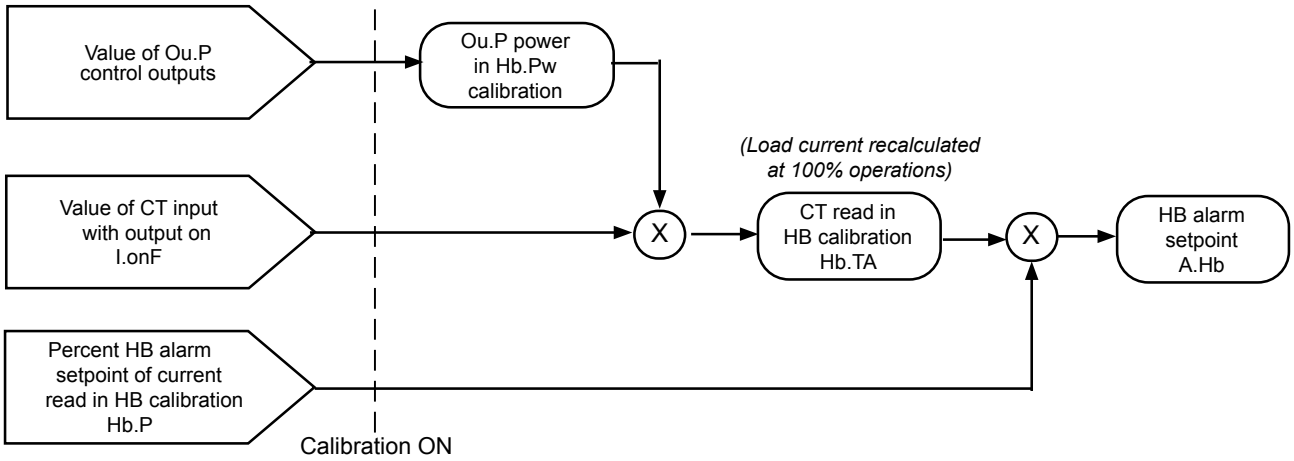


NOTE: (Hb.F, Hb.t)
the value of setpoint Hb.tr for the HB alarm is calculated in two different ways, depending on the selected function mode:
if ZC, BF, HSC mode: ..... Hb.tr = A.Hb
if PA mode: Hb.tr = A.Hb * $\sqrt{(Ou.P)}$

HB Calibration in modes FCT - BF - HSC



HB Calibration in mode PA



Settings

4.2.1.3. Enabling HB alarm

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Hb.E	Alarms → HB alarm	R/W	■	-	1

Enabling HB alarm.

Options:

0	Disabled
1	Enabled

4.2.1.4. Enable memory for HB alarm

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Hb.m	Alarms → HB alarm	R/W	■	-	0

Enabling memory for HB alarm: after the causes that triggered the HB alarm have disappeared, the alarm remains active until a reset is triggered by a key, serial line or IO-Link.

Options:

0	Disabled
1	Enabled

4.2.1.5. HB alarm functionB

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Hb.F	Alarms → HB Alarm	R/W	■	-	0

HB alarm function.

Options:

0	Alarm triggered at a load current value lower than the set threshold (during control output ON period).
1	Alarm triggered at a load current value higher than the set threshold (during control output OFF period).
2	Alarm triggered if one of the two previous conditions persists (logical OR between functions 0 and 1).

4.2.1.6. Delay time for HB alarm activation

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Hb.t	Alarms → HB Alarm	R/W	■	s	10
Delay time for HB alarm activation The value must be greater than the power output cycle time. *min...max*: 0 ...999 s					

4.2.1.7. HB alarm threshold

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
A.Hb	Alarms → HB Alarm	R/W	■	A	10.0
Current threshold for the HB alarm: below this measured current threshold, for a period greater than Hb.t, the alarm will trigger (with Hb.F = 0) *min...max*: L.tA ...H.tA A					

4.2.1.8. Current Hb.tr alarm threshold

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Hb.tr	Expert → Status → Diagnostics	R	-	A	-
HB alarm threshold as function of power on load The Hb.tr threshold value of the HB alarm is calculated in two different ways, depending on the chosen operating mode: if FCT, BF, HSC mode: Hb.tr = A.Hb if PA mode: Hb.tr = A.Hb * sqrt(Ou.P)					

4.2.1.9. Calibration status

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS	Controls	R/W	■	-	-

Device Status STATUS indicates whether the device is in calibration/current threshold learning mode.

NOTE: The status is stored in the retentive memory, so if the device is put in calibration mode and then turned off, it will still be in learning mode at the next start.

bit	Meaning
7	HB alarm threshold calibration in progress

4.2.1.10. Alarm states

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS2	Expert → Status → Diagnostics	R	-	-	-

Alarm states connected to the HB alarm.

bit	Meaning
0	AL.HB or Power Fault
1	AL.HB

4.2.1.11. Detailed HB alarm status

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
ALSTATE_HB	Expert → Status → Diagnostics	R	-	-	-

Detail of HB alarm status.

bit	Meaning
4	HB alarm during SSR ON time
5	HB alarm during SSR OFF time
6	HB alarm OR of the two previous conditions

Calibration

4.2.1.12. Calibration command

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS11	Expert → Status → Diagnostics	R/W	■	A	0.0

Valore di potenza letto durante la procedura di calibrazione HB.

Bit	Meaning
1	HB alarm threshold calibration

4.2.1.13. HB alarm threshold percentage

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Hb.P	Alarms → HB Alarm	R/W	■	%	90.0

HB alarm threshold percentage of the current read in HB calibration.

Recommended values for the number of equal parallel loads controlled by a single SSR:

no. loads	Recommended percentage Hb.P
1 load	50.0%
2 loads	75.0%
3 loads	83.0%
4 loads	87.0%
5 loads	90.0%
6 loads	92.0%
7 loads	93.0%
8 loads	94.0%

min...max: 0.0 ...100.0%

4.2.1.14. Current reading in HB calibration

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Hb.tA	Alarms → HB Alarm	R/W	■	A	0.0

Current value read during the HB calibration procedure.

4.2.1.15. Voltage reading in HB calibration

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Hb.tV	Alarms → HB Alarm	R/W	■	A	0.0

Voltage value read during the HB calibration procedure
If ,after calibration, the parameter is set back to 0.0 (like the default) the partial load breakdown diagnostics (HB Alarm) will be performed without compensation for voltage fluctuations. That is, only current draw will be evaluated without taking into account possible current dips caused by voltage dips.

4.2.1.16. Power read in HB calibration

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Hb.Pw	Alarms → HB Alarm	R/W	■	A	0.0

Power value read during the HB calibration procedure.

Commands

4.2.1.17. Alarm reset

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS11	Expert → Status → Diagnostics	R/W	-	-	0

Alarm reset command which includes the HB alarm reset.

Bit	Meaning
0	Reset alarms SSR_SHORT / NO_VOLTAGE / NO_CURRENT / **AL.HB**

4.2.2. Allarme di Power Faut

The SSR_SHORT alarm cannot be diagnosed in GRP-H-x-x-x-0-x-x-x-x-x-x models.

The POWER_FAULT diagnostics can be configured via the hd.2 parameter, with which it is also possible to enable only a part of it.

- SSR_SHORT SSR module shorted
- NO_VOLTAGE lack of line voltage
- NO_CURRENT for SSR module open or load interrupted

The NO_CURRENT alarm is triggered with load current threshold <300 mA . .

For HB alarm (partially interrupted load) refer to the relevant section of this manual.

Settings

4.2.2.1. Enabling Power Fault alarms

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
hd.2	Alarms→PF Alarms	R/W	■		7

Enabling Power Fault alarms.

Options:

	SSR_SHORT	NO_ VOLTAGE	NO_CURRENT
0			
1	**x**		
2		x	
3	**x**	**x**	
4			**x**
5	**x**		**x**
6		x	x
7	**x**	**x**	**x**

4.2.2.2. Enable memory for Power Fault alarms

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
PF.m	Alarms → PF alarms	R/W	■	-	0

Enable memory for Power Fault alarm: after the causes that triggered the PF alarms have disappeared, the alarms remain on until reset by key, serial line or IO-Link.

Options:

0	Disabled
1	Enabled

4.2.2.3. SSR_SHORT update time

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
dG.t	Alarms → PF Alarms	R/W	■	s	10

SSR_SHORT alarm update or wait (in seconds) for alarm activation.

min...max: 1 ...999 s

4.2.2.4. NO_VOLTAGE and NO_CURRENT alarm filter

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
dG.F	Alarms → PF Alarms	R/W	■	s	10

Time filter for NO_VOLTAGE and NO_CURRENT alarms

Note: it is recommended to set a value not lower than the cycle time.

min...max: 0 ...99 s

Status

4.2.2.5. Alarm states

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS2	Expert → Status → Diagnostic	R	-	-	-

Alarm status connected to Power Fault and HB.

bit	Meaning
0	Heater Break or Power Fault alarms
1	Heater Break alarm
2	Power Fault alarms (OR of 3,4,5)
3	SSR_SHORT
4	NO_VOLTAGE
5	NO_CURRENT

Status

4.2.2.6. Alarm reset

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS11	Expert → Status → Diagnostic	R/W	-	-	0

Alarm reset command which includes Power Fault alarm reset.

Bit	Meaning
0	Reset allarmi SSR_ SHORT / NO_VOLTAGE / NO_CURRENT / AL.HB

4.2.3. Thermal protection alarm

The device is equipped with a temperature sensor for the internal heat sink;
The heatsink temperature value is contained in the Ntc.SSR variable, the over_heat alarm is triggered when 105° C (221° F) is exceeded.
This condition could be caused by improper ventilation of the electrical panel, obstruction of the ventilation slots or blocked cooling fan (if installed).

With the over_heat alarm on, the control disables control outputs

4.2.3.1. SSR temperature

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ntc.SSR	Status	R		°C	-
SSR temperature.					

4.2.3.2. SSR temperature derivative

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ntc.SSR.der	Status	R		°C/12s	-
SSR temperature derivative.					

4.2.3.3. SSR temperature derivative

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS3	Expert → Status → Diagnostics	R	-	-	-

Temperature reading status.

bit	Meaning
0	SSR temperature sensor broken
1	SSR over heat

4.3. Counters

4.3.3.1. HB alarms counter 1

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Hb.c1	Counters	R	■	-	0
HB alarm event counter 1 **(resettable).** The counters are saved in the retentive memory every hour and when the line voltage is switched off.					

4.3.3.2. HB alarms counter 2

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Hb.c2	Counters	R	■	-	0
HB alarm event counter 2 **(not resettable).** The counters are saved in the retentive memory every hour and when the line voltage is switched off.					

4.3.3.3. Counter reset

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS11	Expert → Status → Diagnostics	R/W	-	-	0.0

HB event counter 1 reset command.

Bit	Meaning
5	Hb.c1 count reset

4.3.3.4. Overheat event counter 1

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
SH.c1	Counters	R	■	-	0
SSR overheat event counter 1 **(azzerabile)**. The counters are saved in the retentive memory every hour and when the line voltage is switched off.					

4.3.3.5. Overheat event counter 2

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
SH.c2	Counters	R	■	-	0
SSR overheat event counter 2 **(not resettable)**. The counters are saved in the retentive memory every hour and when the line voltage is switched off.					

4.3.3.6. Counter reset

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS11	Expert → Status → Diagnostics	R/W	-	-	0

Overheat counter 1 reset command.

Bit	Meaning
6	SH.c1 count reset

4.3.3.7. Max temperature value reached 1

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ntc.SSR.Max1	Expert → Status → Temperature	R	■	°C	0.0
SSR temperature Maximum value 1 (**resettable**). The counters are saved in the retentive memory every hour and when the line voltage is switched off.					

4.3.3.8. Max temperature value reached 2

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ntc.SSR.Max2	Expert → Status → Temperature	R	■	°C	0.0
SSR temperature maximum value 2 (**not resettable**). The counters are saved in the retentive memory every hour and when the line voltage is switched off.					

4.3.3.9. Reset Max temperature value

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS11	Expert → Status → Diagnostic	R/W	-	-	0

Max temperature reset command 1.

Bit	Meaning
2	Maximum value reset Ntc.SSR.Max1

4.3.3.10. Number of hours of SSR operation

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
OH.c	Counters	R	■	h	0

Number of device operating hours with SSR on (digital input present or POWER > 0).

The counters are saved in the retentive memory every hour and when the line voltage is switched off.

4.4. Output

4.4.3.1. Reference for output 1 (pin 9/AL or 9/DQ)

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
out.1	Outputs	R/W	■		5

Reference for output 1, pin 9/AL or 9/DQ, for IO-Link in SIO mode the alarm signal is replicated on pin 5/CQ.

Options:

0	Output disabled
1	Heater Break or Power Fault alarms
2	Heater Break alarm
3	Power Fault alarms
4	SSR Over Heating
5	Heater Break or Power Fault alarms or SSR Over Heating
6	Heater Break alarm or SSR Over Heating
7	Power Fault alarms or SSR Over Heating

4.4.3.2. Output type 1 (pin 9/AL or 9/DQ)

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
ou.1.t	Outputs	R/W	■		0

Output type 1, pin 9/AL or 9/DQ, for IO-Link in SIO mode the alarm signal is replicated on pin 5/CQ.

Options:

0	Direct (normally off)
1	Reverse (normally on)

4.5. Automatic/manual control and On/Off Software status

4.5.3.1. Automatic/Manual status end software ON/OFF

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS	Controls	R		-	(*)

Device status to set Automatic/Manual mode and chek the On/Off Software status set by dIG.1 digital input.

bit	Meaning
4	Automatic (0) / Manual (1)
3	ON (0) / OFF (1) software

When switched on, the following is set:
(GRP-H-x-x-D-x-x-x-x-x-x model) Automatic mode: the state of the SSR output is selected from the state of the command input. It is possible to switch to Manual mode (together with the setting dIG.2 = 0) to deliver the power value from the Man.P parameter.
(GRP-H-x-x-AN-x-x-x-x-x-x model) Automatic mode: the power value to be supplied is selected from the analogue input value. It is possible to switch to Manual mode to deliver the power value from the Man.P. parameter.
(GRP-H-x-x-I-x-x-x-x-x-x model) Manual mode: the power value to be delivered is selected from the value of the Man.P. parameter.
(*)

Model	Default
GRP-H-x-x-D-x-x-x-x-x-x e GRP-H-x-x-AN-x-x-x-x-x-x	0
GRP-H-x-x-I-x-x-x-x-x-x	16

4.5.3.2. Manual power percentage value

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Man.P	Status	R/W	■	%	0.0

Percent power delivered by the device in Manual mode.

min...max: 0.0% ...100.0%

4.5.3.3. Percent value of delivered power

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ou.P	Status	R		%	-

Percent power delivered by the device.

4.5.3.4. Communication error mode

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
C.E.m	Controls	R/W	■	-	0

Communication error mode
The communication error in GRP-H-x-x-I-x-x-x-x-x-x models is activated in the absence of IO-Link communication

Options:

0	Disabled
1	Power is forced to C.E.P.

4.5.3.5. Communication error timeout

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
C.E.t	Controls	R/W	■	s	0

Communication error timeout

min...max: 0 99 s

4.5.3.6. Communication error power

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
C.E.P	Controls	R/W	■	%	0.0

Output power with communication error

Attention! by setting a value > 0.0, if communication is not established at PowerOn, the device erogates the C.E.P power after the C.E.t period.

min...max: 0.0 100.0 %

4.6. Power control

4.6.3.1. Trigger modes

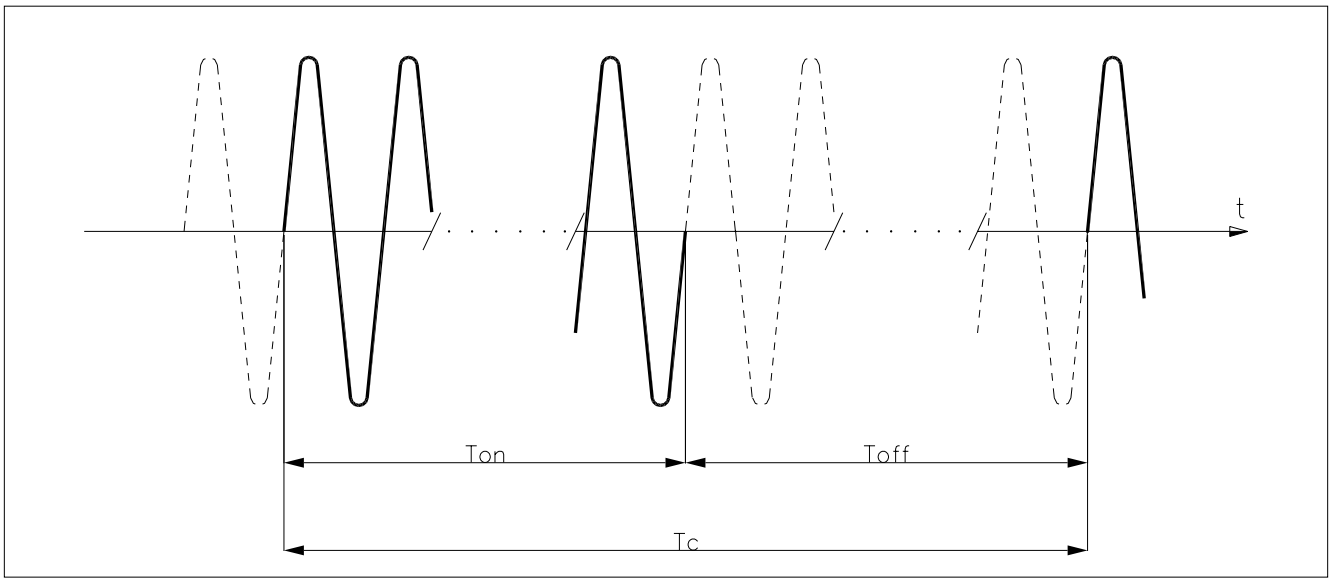
In power control, the GRP-H provides the following modes:

- modulation by varying the number of operating cycles with "zero crossing" triggering
- modulation by changing the phase angle (Phase Angle)

“Zero crossing” mode

This is a type of operation that eliminates EMC interference. This mode manages load power through a series of ON operating cycles rather than OFF operating cycles.

FCT at constant cycle time (Tc ≥ 1 sec, settable from 1 to 200 sec) The cycle time is divided into a series of operating and non-operating cycles in the ratio of the power to be transferred to the load.

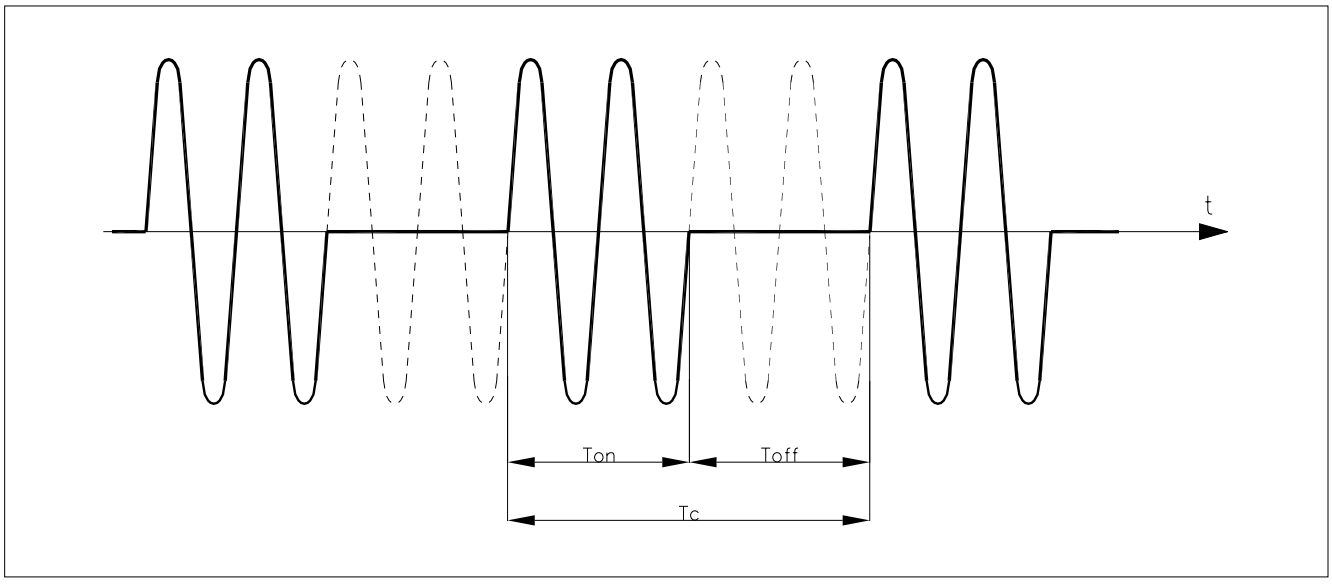


For example if Tc = 10sec, if 20% power value we will have operating for 2 sec (100 operating cycles @ 50Hz) and non-operating for 8 sec (400 non-operating cycles @ 50Hz).

BF to variable cycle time

This mode manages the power on the load through a series of conduction (ON) cycles rather than non-conduction (OFF) cycles. The ratio of the number of ON cycles to the number of OFF cycles is proportional to the value of the power to be supplied to the load.

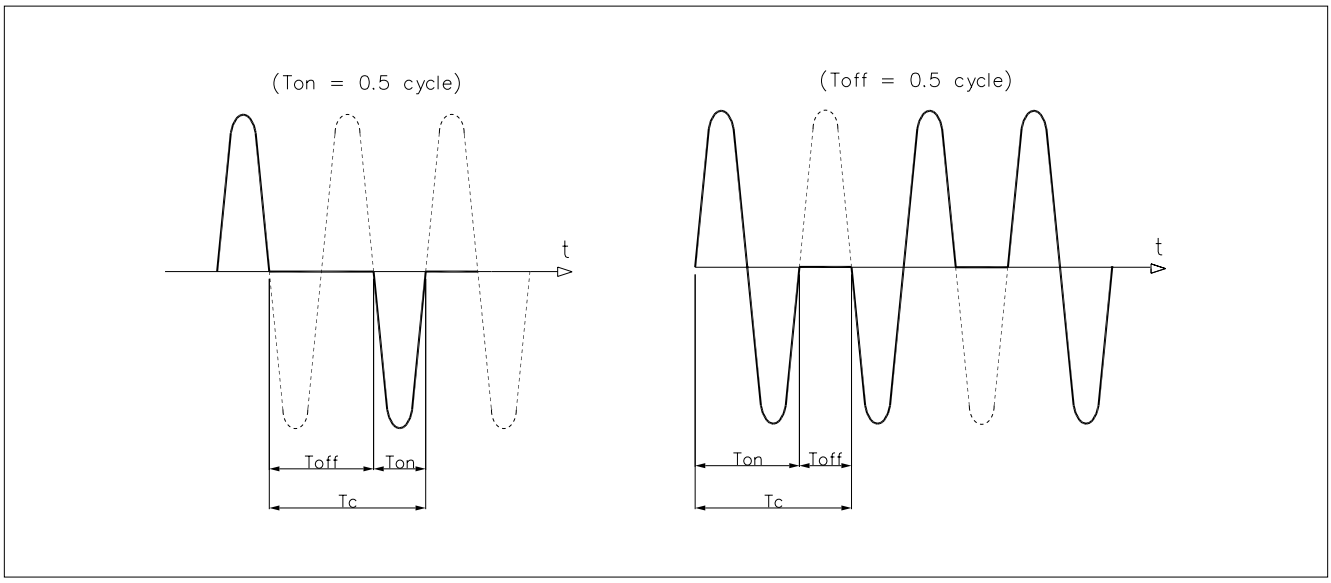
The TC repeat period is kept to a minimum for each power value (whereas in ZC mode this period is always fixed and not optimised).



Example of operation in BF mode at 50% power

The parameter bF.Cy defines the minimum number of operating cycles, which can be set from 1 to 10.
In the example shown in the figure, this parameter is = 2.

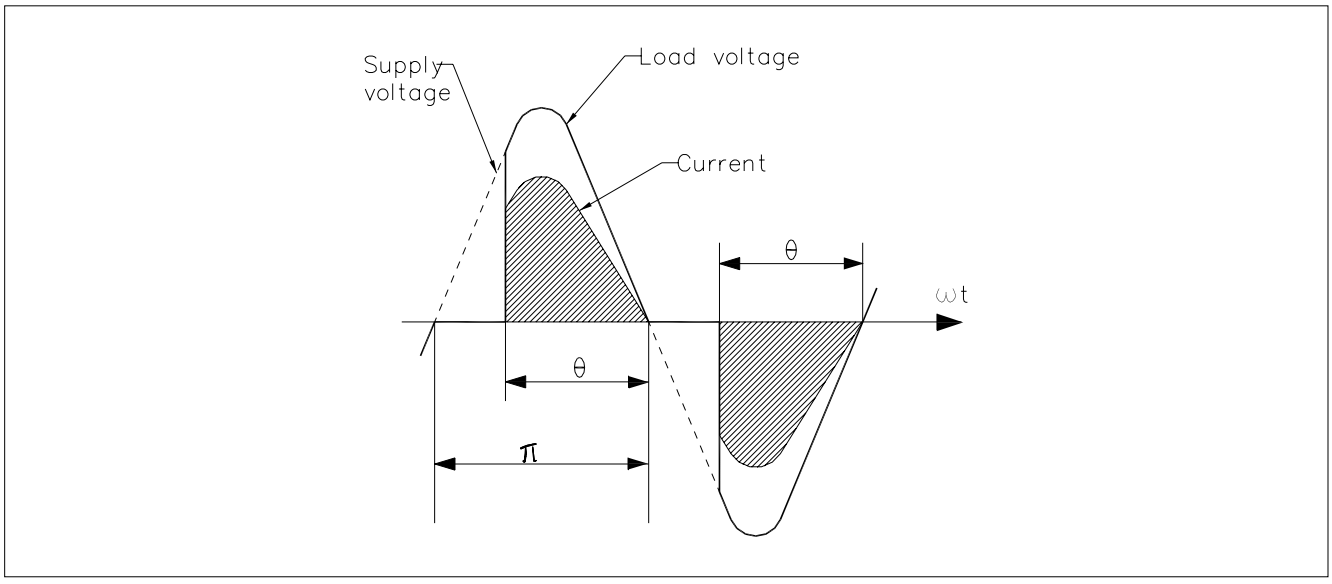
HSC Half single cycle
This mode corresponds to Burst Firing, which handles on/off semi-cycles.
It is useful to reduce the flickering of the filaments with short / medium wave IR lamp loads, with such loads, to limit the steady state current with low power, it is useful to set a minimum power limit (e.g. Lo.P = 10%)



Example of operation in HSC mode at 33% and 66% power

4.6.3.2. Phase Angle (PA) Mode
This mode manages the power on the load by modulating the trigger angle θ:

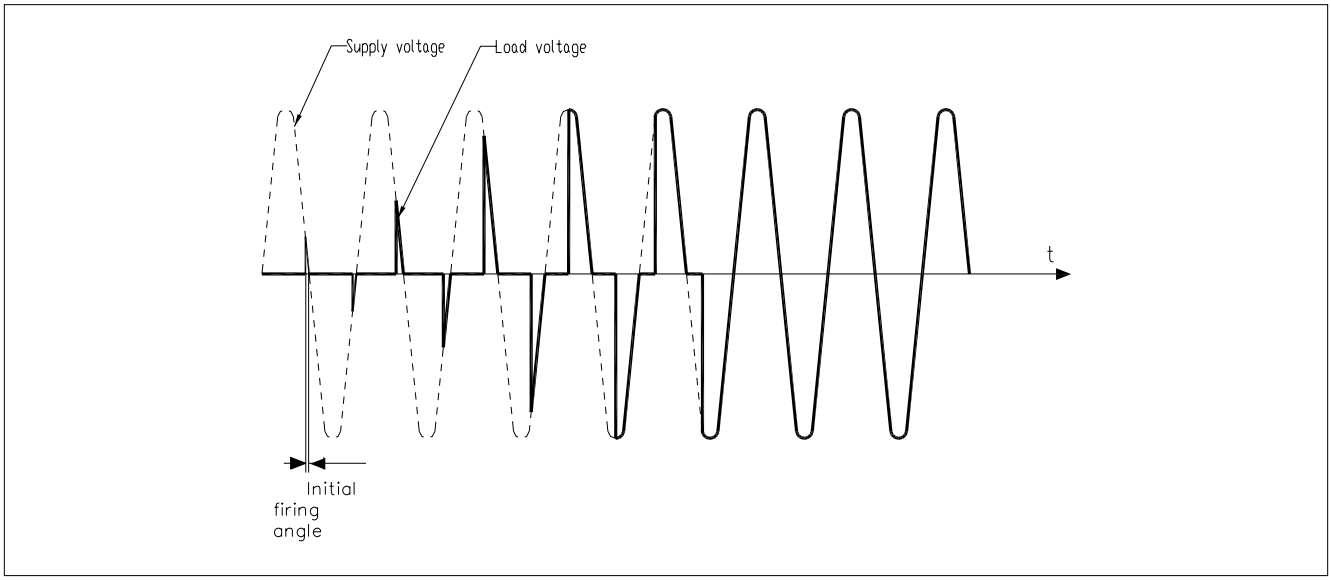
Example:
if the power to be transferred to the load is 100%, θ = 180°, or if the power to be transferred to the load is 50%, θ = 90°



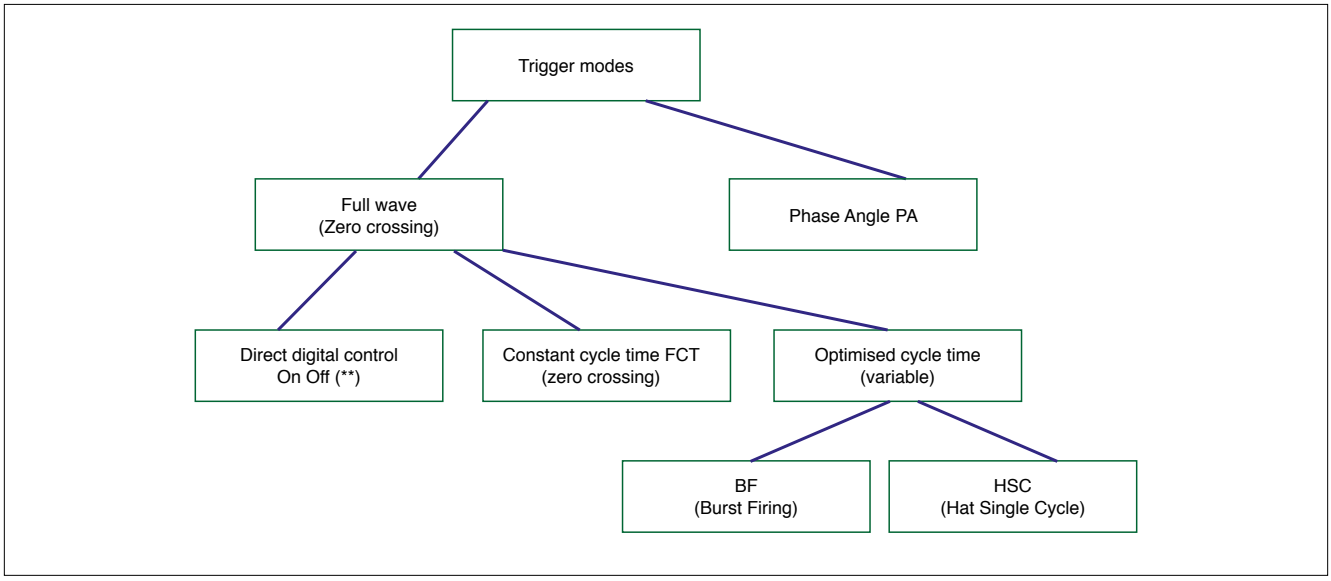
Resistive load

4.6.3.3. Softstart

This type of start-up can be enabled in BF, PA and HSC mode (for versions with type AN or I control).
In the case of phase control, the increase in the conduction angle q stops at the corresponding value of the power to be transferred to the load.
When the load shut-off time (settable) is exceeded, the ramp is reactivated at the next power-on.



Example of ignition ramp with phase Soft-Start



4.6.3.4. Trigger modes

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
hd.5	Power Control	R/W	■	-	(*)

Trigger mode selection.
The trigger mode is selected when ordering the components.
However, it is possible to change the configuration according to the selected trigger mode and the selected control/diagnostic options.
In case of models with trigger option GRP-H-x-x-x-x-x-x-**0**-x-x the default is hd.5 = 0 and the parameter is **ignored** (digital control option with On-Off Zero Crossing trigger)
In case of models with trigger option GRP-H-x-x-x-x-x-x-1-x-x the default is hd.5 = 1 Burst Firing - full wave Zero Crossing trigger; cycle time optimised to deliver the required power with the fastest combination of full waves On and Off (minimum train of waves with On or Off settable with bF.Cy).
It is possible to set hd.5 = 0 FCT-trigger in Zero Crossing with full wave, with fixed cycle time that can be set in parameter Ct.
In case of models with trigger option GRP-H-x-x-x-x-x-x-**2**-x-x the default is hd.5 = 2 Half Single Cycle - trigger in Zero Crossing with full wave; cycle time optimised to deliver the required power with the fastest combination ofi **semi-waves** On and Off. You can also set hd.5 = 0,1 or 3
In case of models with trigger option GRP-H-x-x-x-x-x-x-3-x-x the default is hd.5 = 3 Phase Angle - Wave phase angle control. You can set hd.5 = 0.1 or 2

Options:

0	FCT - Fixed Cycle Time
1	BF - Burst Firing
2	HSC - Half Single Cycle (**)
3	PA - Phase Angle(**)

(**) for GRP-H-x-x-x-1-x-x-2-x-x , GRP-H-x-x-x-1-x-x-3-x-x models only
(*)

Model	Default
GRP-H-x-x-x-x-x-x-0-x-x	0
GRP-H-x-x-x-x-x-x-1-x-x	1
GRP-H-x-x-x-x-x-x-2-x-x	2
GRP-H-x-x-x-x-x-x-3-x-x	3

4.6.3.5. Minimum number of Burst Firing cycles

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
bF.Cy	Power Control	R/W	■	-	1

Minimum number of burst fire cycles (full waves) in BF mode.

min...max: 1 ...10

4.6.3.6. SSR output cycle time

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ct	Power Control	R/W	■	s	2.0
SSR output cycle time in fixed cycle time (FCT) mode. Example: if set to 10.0 if the requested power to be supplied is 75.0%, the On phase (SSR operating) will last 7.5 s, the Off phases (SSR not operating) will last 2.5 s. *min...max*: 0.1 ... 30.0 s					

4.6.1. Soft start ramp settings

For GRP-H-x-x-x-1-x-x-2-x-x and GRP-H-x-x-x-1-x-x-3-x-x models only
It can be enabled in either phase control or pulse train mode and controls the conduction angle.
It is enabled through the PS.E. parameter
The soft start ramp, always in Phase Angle, starts from a conduction angle and reaches 100.0% in a time set in the PS.tm parameter from 0.1 to 60.0 s.
Soft start ends before the defined time if the power reaches the corresponding required value set in manual control or calculated by the analogue input.
The soft start ramp triggers at first start up after power-on. It can be reactivated automatically if the OFF condition occurs for a time longer than that which can be set in PS.oF (if = 0 the function is as if it were disabled).
.

4.6.1.1. Soft start enabling

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
PS.E	Power Control	R/W	■	-	0
Soft start ramp enabling. **Options:** 0 – Disabled 1 – Enabled					

4.6.1.2. Soft start ramp duration

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
PS.tm	**Power Control**	**R/W**	■	**s**	**10.0**
Phase soft start ramp duration. *min...max:* 0.1 ... 60.0					

4.6.1.3. Soft start ramp reactivation time

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
PS.oF	Power Control	R/W	■	s	2
The parameter sets the minimum non-operating time to reactivate the phase soft start ramp. *min...max*: 0 ... 999 s					

Status

4.6.1.4. Soft start ramp status

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS3	Expert → Status → Diagnostic	R	-	-	-

Soft start ramp status.

bit	Meaning
2	Phase soft start on
3	Phase soft start end

4.7. Hardware and Software Information

4.7.1.1. Software version

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
UPd	Info	R	■	-	-
Software version code.					

4.7.1.2. Manufacturer identifier

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
mtmID	Info	R	-	-	5000
Manufacturer - Trade Mark (Gefran).					

4.7.1.3. Model identifier

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
deviceID	Info	R	-	-	221
Device ID (GRP).					

4.7.1.4. Serial number

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
SEr.n	Info	R	■	-	-
Serial number. Data in 32bit DWORD format (LSW + MSW) yy.ww nnnn, where yy = last two digits of the year of manufacture ww = week of production nnnn = sequential number in the week of production					

4.7.1.5. Product code (Fxxxxxx order code)

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
SAP.c	Info	R	■	-	-
Product code (Fxxxxxx) Data in 32bit DWORD format (LSW + MSW)					

4.7.1.6. Last modification user

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
USEr	Info	R	■	-	-
Name of the user (parameter required at the first access of the app) who last wrote a configuration. Data in 8 WORD format (16byte)					

Parameters that depend on the order code

4.7.1.7. Hardware card recognition

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
C.Hd	Info	R	■	-	0

bit	Meaning
0	Model: GRP (0) / GRM (1)
1	Control: DIGITAL
2	Control: ANALOGUE
3	Control: IO-LINK
4	-
5	SSR type: RANDOM (0) / ZC (1)

Parameters that depend on the order code

4.7.1.8. Hardware card recognition 1

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
C.Hd1	Info	R	■	-	0

bit	Meaning
0	Rated current 15A
1	Rated current 25A
2	Rated current 30A
3	Rated current 40A
4	Rated current 50A
5	Rated current 60A
6	Rated current 75A
7	Rated current 90A
8	Rated current 120A
15	Rated voltage 600V

4.7.1.9. Options installed

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Option	Info	R	■	-	0

bit	Meaning
0	Advanced diagnostics option (current sensor installed)

5. IO-LINK

5.1. IO-Link

The static group GRP (-H) is equipped with IO-Link communication.
IO-Link is a bidirectional communication protocol compliant with the IEC 61131-9 standard.
Bothe power and digital communication are in the same cable and connector.
Digital communication allows data transfer between the Device (the static group GRP) and the Master to which the device is connected. The data are:

- Process Data, such as power to be supplied, current/voltage/power/impedance of the load and alarm status
- Acyclic data, such as settings, statistical and diagnostic data

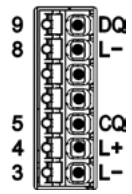
The IO-Link standard requires the use of a description file called IODD (IO Device Description).
This file allows the correct identification of the device and the interpretation of the data sent and exchanged with the master. Please consult the Gefran website to download the IODD files.

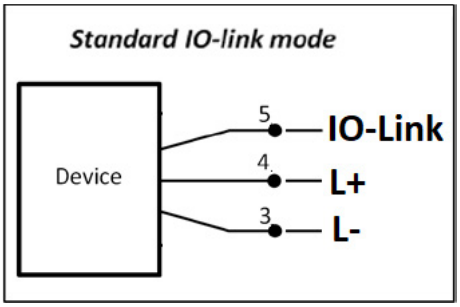
5.2. IO-LINK INSTALLATION AND ELECTRICAL CONNECTIONS

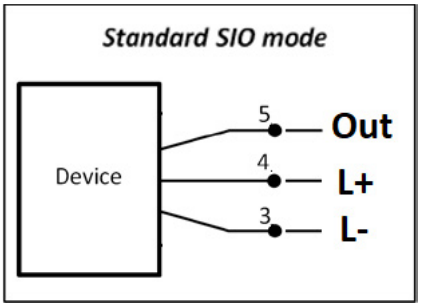
5.2.1. Electrical installation

The static group must be grounded (normally through the machine body or equipment on which it is installed).
The GRP static group has a push-in connector. 3 of the poles present are strictly dedicated to the connection with an IO-Link master:

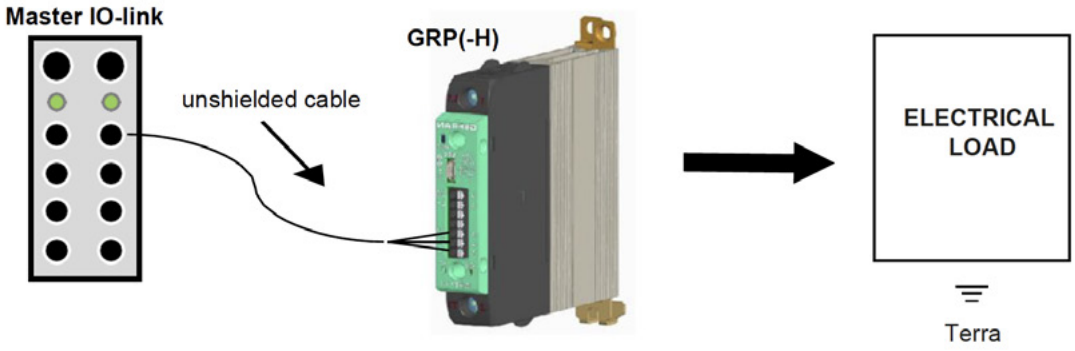
- CQ (IO-Link / Out) = digital communication pin or digital output (IO-Link or SIO mode)
- L + = Power supply + (rated 24 Vdc)
- L- = Power supply - (0 Vdc)
- 2 poles are instead dedicated to a PNP type digital alarm output. This can be intercepted by the IO-Link master itself (if digital inputs are made available), or by other devices (for example the alarm could be intercepted directly by PLC).
- DQ = Digital output normally off (configurable with normally on)
  PNP type, output voltage: Us(24Vdc)-0.7Vdc, Iout max =15mA. See chapter Alarms and chapter Outputs.
- L- = Power supply - (0 Vdc) (common to pin 3)

Push-in connector	IO-Link Output	
	9	DQ
	8	L-
	5	CQ (IO-Link / Out)
	4	L+
	5	L-





Notes:
Connect the device to a standard IO-Link master via a standard unshielded cable (max length 20 m according to IO-Link specifications).



5.3. CONTROL MODE

5.3.1. IO-Link information

Port class	A
Baud rate	COM2 (38.4 kbit/s)
IO-Link version (1)	1.1
Profile	Common profile
Process data input length	14 bytes
Process data output length	2 bytes
Min cycle time	20ms
SIO mode	Supported
ISDU	Supported
Database	Supported

(1) Compliant with IO-Link Interface Specification v.1.1.2 (July 2013)

5.3.2. SIO mode and IO-Link mode

The static group supports both SIO mode and IO-Link mode.
In **IO-Link** mode the static group communicates with a standard IO-Link master on pin 5 of the push-in connector.
Pin 9 / DQ is available as a configurable auxiliary alarm output (see chapters Alarms and Outputs).
In **SIO** mode the device :
- maintains control of the load, continuing to provide the last power set in IO-Link mode.

To change the required power, change mode, from SIO to IO-Link mode.
- commands the pin 5/CQ to acts as an alarm unit, transmitting the status of the alarms as set in the out1 parameter (replicates the alarm output status of pin9 / DQ).

5.3.3. Process data mapping

The device has the following Process Data Input mapping:

Word n	Meaning	Offset	Length	Dec. Point	M.
6	**Actual output power Ou.P** (Percentage value of delivered power))	96	16 bit	1	%
5	**Load current Ld.A** (RMS load current)	80	16 bit	1	A
4	**Load voltage Ld.V** (Load voltage)	64	16 bit	1	V
3	**Load power Ld.P** (Power on load)	48	16 bit	2	kW
2	**Load impedance Ld.I** (Load impedance)	32	16 bit	0	Ohm
1	**STATUS2** Bit 6..15= Not used Bit 5= **STATUS2_NO_CURRENT** Bit 4= **STATUS2_NO_VOLTAGE** Bit 3= **STATUS2_SSR_SHORT** Bit 2= (*) Bit 1= **STATUS2_HB** Bit 0= (*)	16	16 bit	-	-
0	**STATUS3** Bit 14..15= Not used Bit 13=**STATUS3_CURRENT_SENSOR_BROKEN** Bit 5..12= Not used(**) Bit 4=**STATUS3_FREQUENCY_WARNING** Bit 2..3= (**) Bit 1=**STATUS3_SCR_OVER_HEAT** Bit 0=**STATUS3_SCR_TEMP_SENSOR_BROKEN**	0	16 bit	-	-

(*) Bits not published in the IODD file but still available.
Bit 0 OR of Bit 1, Bit 2
Bit 2 Power Fault (OR of Bit 3,4,5)

(**) Bits not published in the IODD file but still available.
Bit 2 Phase soft start on
Bit 3 Phase soft start end
Bit 5 50Hz (0) / 60Hz (1)

The device has the following Process Data Output mapping:

Position	Meaning	Offset	Length
0…15	Output power Man.P (Percent value of manual power to be supplied) (*)	0	16 bit

(*) The power value delivered by the static group GRP is updated starting from the PDO when the mode is OPERATE. In the other modes (SIO, STARTUP, PREOPERATE) the value is not updated (the last value set remains).
During operation in IO-Link the value of the PDO Man.P is NOT saved in the retentive memory.
At start-up, the Man.P value is restored to the default value (equal to Man.P = 0.0%).

5.3.4. Setting data

This paragraph includes the list and explanation of the relevant parameters available for the static group GRP, listed according to the IO-Link specifications.

- ***Default parameters - System***

Index	Sub-index	Name of the object	Access			Length	Data type	Value (example)	Description
				M	S				
0x0002	0x00	System Command	W	W	W	1	Uint8	See table below	

Table 1 *System command values*

Command	Access			Analogue	Data type	Description
	U	M	S			
0x01	W	W	W	ParamUploadStart	Uint8	
0x02	W	W	W	ParamUploadEnd	Uint8	
0x03	W	W	W	ParamDownloadStart	Uint8	
0x04	W	W	W	ParamDownloadEnd	Uint8	
0x05	W	W	W	ParamDownloadStore	Uint8	
0x06	W	W	W	ParamBreak	Uint8	
0X82	-	W	W	RestoreFactorySettings	Uint8	Reset settings to default value
0xA0	-	W	W	TeachHb	Uint8	HB alarm threshold calibration
0xA2	-	W	W	ResetHbPfAlarms	Uint8	Resets the state of the HB and PF alarms
0xA3	-	W	W	ResetEnergy1	UInt8	Resets the value of Ld.E1
0xA4	-	W	W	ResetEnergy2	UInt8	Resets the value of Ld.E2
0xA5	-	W	W	ResetHbc1	UInt8	Resets the value of Hb.c1
0xA6	-	W	W	ResetShc1	UInt8	Resets the value of SH.c1
0xAB	-	W	W	ResetNtcSSRMax1	UInt8	Resets the value of Ntc.SSR.Max1
0xAF	-	W	W	RestorePartialConfiguration	Uint8	Reset settings to default value - Deep reset that requires power to be turned back on
0xFB	-	W	W	EventError_36349_appear	UInt8	Command to test the appearance of the "error" type event (36349)
0xFC	-	W	W	EventError_36349_disappear	UInt8	Command to test the disappearance of the "error" type event (36349)
0xFD	-	W	W	EventWarning_36350_appear	UInt8	Command to test the appearance of the "warning" type event (36350)
0xFE	-	W	W	EventWarning_36350_disappear	UInt8	Command to test the disappearance of the "warning" type event (36350)
0xFF	-	W	W	EventNotification_36351_singleshot	UInt8	Command to test the "notification" event (36351)

U = User, M = Maintenance technician, S = Specialist: commands not available

- ***Default parameters - Identification***

Index	Sub-index	Name of the object	Access			Length	Data type	Value (example)	Description
			U	M	S				
0x0010	0x00	VendorName	RO	RO	RO	10	String	GEFRAN spa	
0x0011	0x00	VendorText	RO	RO	RO	14	String	www.gefran.com	
0x0012	0x00	ProductName	RO	RO	RO	Max64	String	GRP-120-48-I-1-x-x-x-x-x	Full product description
0x0013	0x00	ProductID	RO	RO	RO	12	String	GRP-xxxxxxxxx	Model type
0x0014	0x00	ProductText	RO	RO	RO	Max30	String	Single-phase Solid State Relay	Functional description of the product
0x0015	0x00	SerialNumber	RO	RO	RO	8	String	20400102	Product serial number
0x0016	0x00	HardwareRevision	RO	RO	RO	3	String	1.0	
0x0017	0x00	FirmwareRevision	RO	RO	RO	3	String	1.1	Software version
0x0018	0x00	ApplicationSpecificTag	RO	RW	RW	Max32	String	*** (Default)	The user can specify the function and location of the device in the system in the tag
0x0019	0x00	FunctionTag	RO	RW	RW	Max32	String	Vuoto (Default)	The user can specify the function and location of the device in the system in the tag
0x001A	0x00	LocationTag	RO	RW	RW	Max32	String	Vuoto (Default)	The user can specify the function and location of the device in the system in the tag

U = User, M = Maintenance technician, S = Specialist

- ***Default parameters - Diagnosis***

Index	Sub-index	Name of the object	Access			Length	Data type	Value (example)	Description
			U	M	S				
0x0020	0x00	ErrorCount	RO	RO	RO	2	UInt16	0	Incremental counter of errors from power-on
0x0024	0x00	DeviceStatus	RO	RO	RO	1	UInt8	See the following table (Device Status Values)	Defines the status of the device
0x0025	0x01 0x02 0x03 0x04	DetailedDeviceStatus	RO	RO	RO	Variable	(Array di 4 elementi, 3 bytes per elemento)	See the following Tables (Errors and warnings in the Detailed Device Status and Error Code)	Specifies the detailed status of the Device: Octet 1 = EventQualifier (see IO-Link standard) Octet 2, 3 = EventCode See tables below
0x0028	0x00	ProcessDataInput	RO	RO	RO	PD length	PD	0	Read the last valid Process Data from the PDin channel

- ***Values of the Device Status***

Value	Description
0x00	The device works correctly (no error / warning)
0x01	Maintenance required
0x02	Out of specification
0x03	Functional check
0x04	Failure

- ***Errors and warnings in the Detailed Device Status***

Event code	Event Description	Event type	Device status	Possible failure	Process data value	Reset mode
0x8CA1	SSR temperature sensor broken	Warning	Maintenance required	The temperature sensor does not give a correct value	measured data	Requires intervention on the hardware
0x8CA2	CT sensor broken	Warning	Maintenance required	Current sensor does not provide correct value	measured data	Requires intervention on the hardware
0x8CA3	SSR Over heat	Warning	Maintenance required	The temperature value is greater than the maximum threshold	measured data	Lower the temperature of the device
0x8CA4	Frequency warning	Warning	Maintenance required	The mains frequency is outside the validity range	measured data	Bring the mains frequency back within limits
0x8CA5	HB alarm	Warning	Maintenance required	The Hb alarm is on	measured data	Restore the load
0x8CA6	SSR_SHORT alarm	Warning	Maintenance required	The SCR_SHORT alarm is on	measured data	Restore the load
0x8CA7	NO_CURRENT alarm	Warning	Maintenance required	NO_CURRENT alarm on	measured data	Restore the load
0x8CA8	NO_VOLTAGE alarm	Warning	Maintenance required	NO_VOLTAGE alarm on	measured data	Restore the load

- ***Error code***

Error code	Description
0x8000	Device application error - no details
0x8011	Index not available
0x8012	Sub-index not available
0x8022	Service Unavailable - Device Control
0x8023	Access denied
0x8030	Parameter value out of range
0x8031	Parameter value above limit
0x8032	Parameter value below limit
0x8033	Wrong parameter length (overrun)
0x8034	Wrong parameter length (underrun)
0x8035	Function not available
0x8036	Function temporarily unavailable
0x8040	Invalid Parameter Set
0x8041	Inconsistent Parameter Set

Regarding the Detailed Device Status: when an “event appear” occurs, the event is placed in the first available position.
When the “event disappear” occurs, that position becomes free again. When an event is active and other positions become free, or when an “event appear” of another type occurs, the event does not change its occupied position.
If an "event disappear" occurs and then an "event appear" again, the new position occupied may be different from the one previously occupied (it will occupy the first available one, as written above).
A maximum of four events can be logged in the buffer. The events in excess are not recorded in the buffer (in any case, the messages relating to the events are always sent).

- ***Parametri del dispositivo - Indici primari***

Index	Sub-index	Name of the object	Access			Length	Data type	Value (example)	Range of values	Scale factor	Offset	Unit	Description
			U	M	S								
0x0040	0x00	**Hb.E**	RO	R/W	R/W	2	UInt16	1 (default)	0, 1	1	0	-	Enabling HB alarm
0x0041	0x00	**Hb.m**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Enable memory for HB alarm
0x0042	0x00	**Hb.F**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1, 2	1	0	-	HB alarm function
0x0043	0x00	**A.Hb**	RO	R/W	R/W	2	UInt16	0 (default)	L.tA…H.tA	0.1	0	A	HB alarm threshold
0x0044	0x00	**Hb.t**	RO	R/W	R/W	2	UInt16	10 (default)	0…999	1	0	s	Delay time for HB alarm activation
0x0045	0x00	**Hb.P**	RO	R/W	R/W	2	UInt16	90.0 (default)	0.0…100.0	1	0	%	HB alarm threshold percentage
0x0046	0x00	**Hb.tA**	RO	R/W	R/W	2	UInt16	0 (default)	L.tA…H.tA	0.1	0	A	Current reading in HB calibration
0x0047	0x00	**Hb.tV**	RO	R/W	R/W	2	UInt16	0 (default)	L.tV…H.tV	0.1	0	V	Voltage reading in HB calibration
0x0048	0x00	**Hb.Pw**	RO	R/W	R/W	2	UInt16	0 (default)	0.0…100.0	1	0	%	Power read in HB calibration
0x0049	0x00	**hd.5**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1, 2, 3	1	0	-	Trigger modes
0x004A	0x00	**bF.Cy**	RO	R/W	R/W	2	UInt16	1 (default)	1…10	1	0	-	Minimum number of Burst Firing cycles
0x004B	0x00	**PS.E**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Soft start enabling
0x004C	0x00	**PS.tm**	RO	R/W	R/W	2	UInt16	10.0 (default)	0.1…60.0	0.1	0	s	Soft start ramp duration
0x004D	0x00	**PS.oF**	RO	R/W	R/W	2	UInt16	2 (default)	0…999	1	0	s	Soft start ramp reactivation time
0x004E	0x00	**FA.P**	RO	R/W	R/W	2	UInt16	0 (default)	0.0…100.0	1	0	%	Fault Action Power
0x004F	0x00	**tyP**	RO	R/W	R/W	2	UInt16	1 (default)	0, 1, 2, 3, 4, 5, 6	1	0	-	Analogue input type
0x0050	0x00	**Lo.S**	RO	R/W	R/W	2	Int16	0 (default)	-100.0… 200.0	0.1	0	-	Analogue input scale minimum limit
0x0051	0x00	**HI.S**	RO	R/W	R/W	2	Int16	1000 (default)	Lo.S…200.0	1	0	-	Analogue input scale maximum limit
0x0052	0x00	**FLt**	RO	R/W	R/W	2	UInt16	0.1 (default)	0.0…20.0	0.1	0	s	Analog input signal digital low-pass filter
0x0053	0x00	**F.tA**	RO	R/W	R/W	2	UInt16	0.1 (default)	0.0…20.0	0.1	0	s	Current reading low pass digital filter
0x0054	0x00	**F.tV**	RO	R/W	R/W	2	UInt16	2.0 (default)	0.0…20.0	0.1	0	s	Voltage reading low pass digital filter
0x0055	0x00	**oFS**	RO	R/W	R/W	2	UInt16	0 (default)	0.0…99.9	0.1	0	-	Analogue input correction offset
0x0056	0x00	**o.tA**	RO	R/W	R/W	2	UInt16	0 (default)	0.0…99.9	0.1	0	A	Current reading correction offset
0x0057	0x00	**o.tV**	RO	R/W	R/W	2	UInt16	0 (default)	0.0…99.9	0.1	0	V	Voltage reading correction offset
0x0058	0x00	**U.tV**	RO	R/W	R/W	2	UInt16	10 (default)	0…999	1	0	s	Voltage reading update time
0x0059	0x00	**out.1**	RO	R/W	R/W	2	UInt16	5 (default)	0, 1, 2, 3, 4, 5, 6, 7	1	0	-	Reference for output 1
0x005A	0x00	**out.1.t**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Output type 1
0x005B	0x00	**out.2**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Reference for output 2 (*)
0x005C	0x00	**Ct**	RO	R/W	R/W	2	UInt16	2.0 (default)	0.1…30.0	0.1	0	s	SSR output cycle time
0x005D	0x00	**hd.2**	RO	R/W	R/W	2	UInt16	7 (default)	0, 1, 2, 3, 4, 5, 6, 7	1	0	-	Enabling Power Fault alarms
0x005E	0x00	**PF.m**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Enable memory for Power Fault alarms
0x005F	0x00	**dG.t**	RO	R/W	R/W	2	UInt16	10 (default)	1…999	1	0	s	SSR_SHORT update time
0x0060	0x00	**dG.F**	RO	R/W	R/W	2	UInt16	10 (default)	0…99	1	0	s	NO_VOLTAGE and NO_CURRENT alarm filter
0x0061	0x00	**but**	RO	R/W	R/W	2	UInt16	1 (default)	0, 1	1	0	-	Front key enabling

	Sottoindice	Nome dell' oggetto	RO	RO	RO	Lung-hezza	Tipo di dati	Valore (esempio)	Range dei valori	Fattore di scala	Offset	Unità	Descrizione
			RO	RO	RO								
Index	Sub-index	Name of the object	RO	RO	RO	Length	Data type	Value (example)	Range of values	Scale factor	Offset	Unit	Number of hours of SSR operation
0x00B6	0x00	**Ntc.SSR. Max1**	RO	RO	RO	2	Uint16	0	0...65535	1	0	°C	Max temperature value reached 1
0x00B7	0x00	**Ntc.SSR. Max2**	RO	RO	RO	2	Uint16	0	0...65535	1	0	°C	Max temperature value reached 2
0x00B8	0x00	**Ld.E1**	RO	RO	RO	2	Uint16	0	0...65535	0.01	0	kWh	Consumed energy meter 1
0x00B9	0x00	**Ld.E2**	RO	RO	RO	2	Uint16	0	0...65535	0.01	0	kWh	Consumed energy meter 2
0x00BA	0x00	**Hb.c1**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	HB alarms counter 1
0x00BB	0x00	**Hb.c2**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	HB alarms counter 2
0x00BC	0x00	**SH.c1**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	Overheat event counter 1
0x00BD	0x00	**SH.c2**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	Overheat event counter 2
0x0100	0x00	**Hb.tr**	RO	RO	RO	2	Uint16	0	0...65535	0.1	0	A	Current HB alarm threshold
0x0101	0x00	**ALSTA-TE_HB**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	Detailed HB alarm status
0x0102	0x00	**INPUT_DIG**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	Digital input status
0x0103	0x00	**MASKOUT**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	Status outputs
0x0104	0x00	**FrEq**	RO	RO	RO	2	Uint16	0	0...65535	0.1	0	Hz	Mains voltage frequency
0x0105	0x00	**FAD_SE-LECT1**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	Recognition 1
0x0106	0x00	**FAD_SE-LECT2**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	Recognition 2
0x0107	0x00	**FAD_NTC**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	
0x0108	0x00	**FAD_PV**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	
0x0109	0x00	**FAD_TA**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	
0x010A	0x00	**FAD_TV**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	
0x010B	0x00	**Ntc.SSR**	RO	RO	RO	2	Uint16	0	0...65535	0.1	0	°C	SSR temperature
0x010C	0x00	**Ntc.SSr.der**	RO	RO	RO	2	Int16	0	0...65535	0.1	0	°C	SSR temperature derivative
0x010D	0x00	**P.V.**	RO	RO	RO	2	Uint16	0	0...65535	0.1	0	-	Analogue input value (process variable)
0x010E	0x00	**Errr**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	Analogue input status
0x010F	0x00	**I.tA**	RO	RO	RO	2	Uint16	0	0...65535	0.1	0	A	Real-time current reading input value
0x0110	0x00	**I.tV**	RO	RO	RO	2	Uint16	0	0...65535	0.1	0	V	Voltage reading input real-time value
0x0111	0x00	**STATUS2**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	Alarm states
0x0112	0x00	**STATUS3**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	Status
0x0113	0x00	**TA_OFFSET**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	
0x0114	0x00	**Inta_adc_peak**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	
0x0115	0x00	**I.tAP**	RO	RO	RO	2	Uint16	0	0...65535	0.1	0	A	
0x0116	0x00	**I.onADC**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	
0x0117	0x00	**I.onF**	RO	RO	RO	2	Uint16	0	0...65535	0.1	0	A	Current reading input value
0x0118	0x00	**IN_TA_ON_DIAG**	RO	RO	RO	2	Uint16	0	0...65535	0.1	0	A	
0x0119	0x00	**IN_TA_OFF_DIAG**	RO	RO	RO	2	Uint16	0	0...65535	0.1	0	A	
0x011A	0x00	**inta_counter**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	
0x011B	0x00	**IN_TV_ON_DIAG**	RO	RO	RO	2	Uint16	0	0...65535	0.1	0	V	

0x011C	0x00	**IN_TV_OFF_ DIAG**	RO	RO	RO	2	Uint16	0	0...65535	0.1	0	V	
0x011D	0x00	**I.tVF**	RO	RO	RO	2	Uint16	0	0...65535	0.1	0	V	Voltage reading input value
0x011E	0x00	**Pw.PA**	RO	RO	RO	2	Uint16	0	0...65535	0.1	0	%	
0x011F	0x00	**OH.c actual**	RO	RO	RO	2	Uint16	0	0...65535	1	0	h	SSR operating hours counter - actual value
0x0120	0x00	**Hb.c1 actual**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	HB alarm counter 1 - actual value
0x0121	0x00	**Hb.c2 actual**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	HB alarm counter 2 - actual value
0x0122	0x00	**SH.c1 actual**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	Counter 1 overheat events - actual value
0x0123	0x00	**SH.c2 actual**	RO	RO	RO	2	Uint16	0	0...65535	1	0	-	Counter 2 overheat events - actual value
0x012C	0x00	**C.Hd**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Hardware card recognition
0x012D	0x00	**C.Hd1**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Hardware card recognition 1
0x012E	0x00	**OPTION**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Options
0x012F	0x00	**SAP.C**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Product code (Fxxxxxx order code)
0x0130	0x00	**SEr.N**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Serial number
0x0131	0x00	**USER_1**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Last modification user
0x0132	0x00	**USER_2**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Last modification user
0x0133	0x00	**USER_3**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Last modification user
0x0134	0x00	**USER_4**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Last modification user
0x0135	0x00	**USER_5**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Last modification user
0x0136	0x00	**USER_6**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Last modification user
0x0137	0x00	**USER_7**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Last modification user
0x0138	0x00	**USER_8**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Last modification user
0x0140	0x00	**CAL_10VL**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x0141	0x00	**CAL_10VH**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x0142	0x00	**CAL_5VL**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x0143	0x00	**CAL_5VH**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x0144	0x00	**CAL_020MAL**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x0145	0x00	**CAL_ 020MAH**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x0146	0x00	**CAL_420MAL**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x0147	0x00	**CAL_ 420MAH**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x0148	0x00	**CAL_POTL**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x0149	0x00	**CAL_POTH**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x014A	0x00	**CAL_TAL**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x014B	0x00	**CAL_TAH**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x014C	0x00	**CAL_TVL**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x014D	0x00	**CAL_TVH**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x014E	0x00	**CAL_NTC**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x014F	0x00	**CAL_GAIN**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Calibration
0x0150	0x00	**TEST_DATE**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Test date
0x0151	0x00	**TEST_TIME**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Test time
0x0152	0x00	**L.tA**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Current reading scale minimum limit
0x0153	0x00	**H.tA**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Current reading scale maximum limit
0x0154	0x00	**L.tV**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Voltage reading scale minimum limit
0x0155	0x00	**H.tV**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Voltage reading scale maximum limit
0x0156	0x00	**STATUS**	RO	RO	RO	2	Uint16	0	0...65535	1	0		Status

U = User, M = Maintenance technician, S = Specialist

6. TECHNICAL SPECIFICATIONS

6.1. Technical specifications

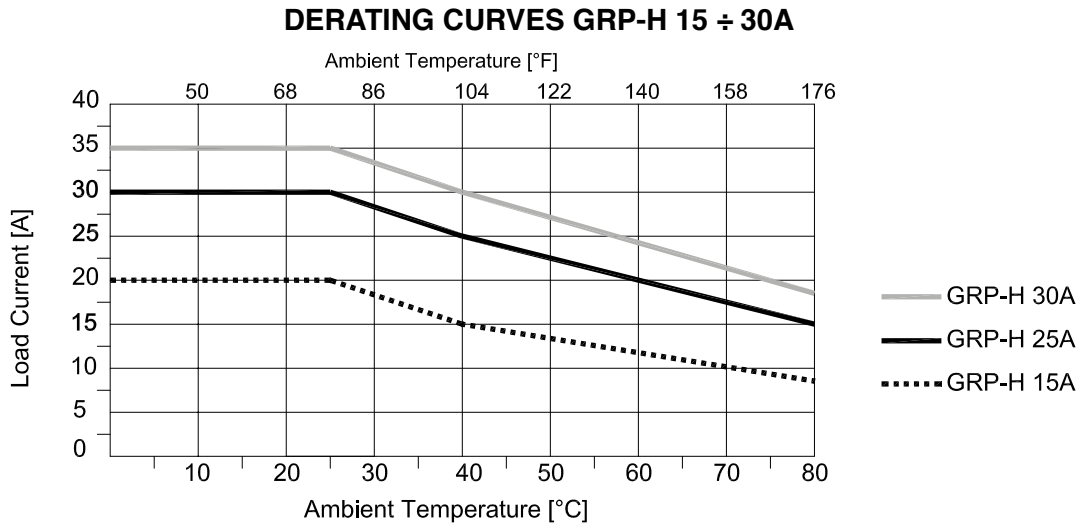
INPUTS	
Analogue command input (Versions with AN input type)	
Function	Command power command
Maximum Error	1% f.s. ± 1 scale point at an ambient temperature of 25°C/ 77°F
Thermal shift	<100 ppm/° C on f.s.
Sampling time	10 ms
0-10V scale	Input impedance > 500 KΩ
0-5V scales	Input impedance > 500 KΩ
0-20mA or 4-20mA scale	Internal Shunt Resistance: 250 Ω
Potentiometer input	Potentiometer resistance: 1 KΩ at 47 KΩ Potentiometer power supply: + 5V (provided by GRP, max 10mA)
Linear input reading scale	0 ... 100.0 %
Common mode immunity	-60V, +60V
Command digital input (Versions with input type D)	
Function	Command input
Voltage range	5-30V (max 3 mA)
Safe voltage reading status “0”	< 2 V
Safe voltage reading status “1”	> 5 V
Input impedance	13 KΩ
IO-LINK input (Versions with input type I)	
Function	IO-LINK fieldbus communication line
Protocol	IO-LINK Type of transmission: COM2 (38.4 kBaud) IO-Link version: 1.1.2 SIO mode: No Auxiliary output: Pin DQ Alarm output
Process data input	14 bytes
Process data output	2 bytes
Line voltage and load current measurement	
Load current measurement function	Measurement range (full-scale f.s.): 0 ... 1.5 * Irated_product
RMS current measurement accuracy	2% f.s. at room temperature of 25°C / 77°F Thermal shift: <200 ppm/° C
Line voltage measurement function	Working voltage range (full-scale f.s.): 60...660Vac
RMS voltage measurement accuracy	2% f.s. at room temperature of 25°C / 77°F Thermal shift: <100 ppm/° C
Current and voltage sampling time	10 ms
Line frequency	50/60 Hz
OUTPUTS	
Alarm output (optional)	
Function	Configurable alarm output
Type	Digital output normally off (settable with normally on). PNP type, output voltage: Us(24Vdc)-0.7Vdc, Iout max =15mA (not protected against short circuit)
COMMUNICATIONS PORTS	
Porta microUSB di servizio	
Functions with TTL serial cable	Only for initial product configuration, via PC. Use a PC connected to the GRP, ONLY via the Gefran adapter cable. The adapter powers the GRP. Cod. F060800 (PC with USB).
Type	Micro USB type B connector
Insulation	TTL serial NOT isolated
Dongle NFC Function	Available for configuration, reading Product Information and diagnostic data. Use App downloadable from PlayStore and AppleStore and NFC Dongle (see accessories table)

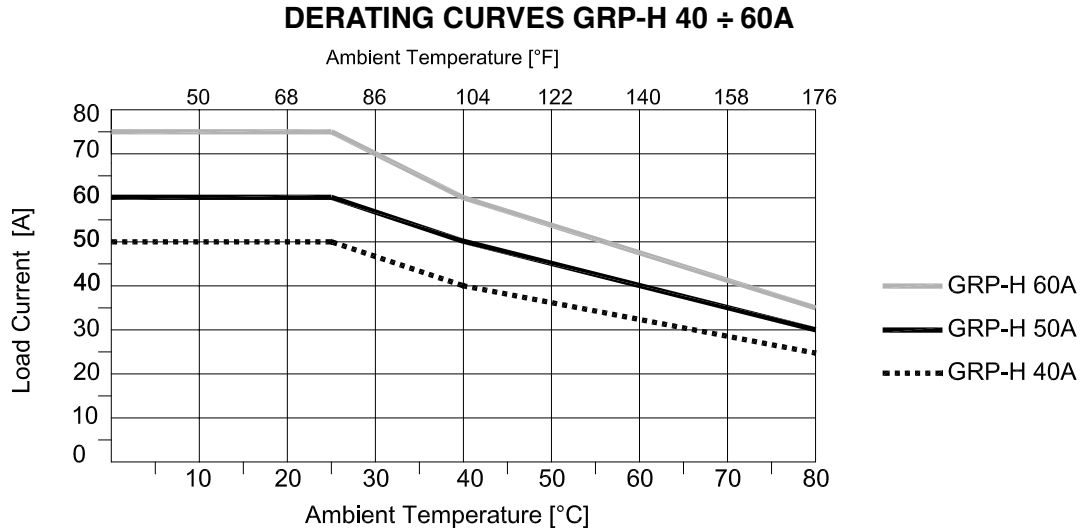
POWER (STATIC GROUP)											
CATEGORY OF USE (Tab. 2 EN60947-4-3)	AC 51: resistive or low-inductance loads AC 55b: infrared lamps										
Trigger modes	**OnOff** - Zero crossing firing. **FCT- Fixed Cycle Time** - Zero Crossing with constant cycle time (settable in the range 1...200 sec). **BF** - Burst Firing with optimised minimum variable cycle time (Zero crossing firing). **HSC** - Half Single Cycle, corresponds to a Burst Firing which handles half on/off cycles (Zero crossing firing). **PA** - load management by adjusting the power-on phase angle. It is useful for reducing flicker with medium-long wave infrared loads. **Softstart** ramp in Phase Angle configurable with any configured Firing mode, only for products with Trigger option = 2 or 3 .										
Max. rated voltage	480 V AC									600 V AC	
Working voltage range	60-530Vac									60-660Vac	
Non-repetitive voltage (Surge protection level)	1200 Vp									1400 Vp	
Rated frequency	50/60Hz with auto-determination										
Rated current	GRP Model										
	15	25	25I	30	30I	40	50	60	75	90	120
	15A	25A	25A	30A	30A	40A	50A	60A	75A	90A	120A
Non-repetitive over-current, (t=20 msec)	620A	620A	1600A	620A	1600A	620A	1600A	1600A	1600A	1500A	1500A
I2t for melting (t = 1… 10msec) A^2s	1800	1800	12800	1800	12800	1800	12800	12800	12800	11250	11250
critical dv/dt with output disabled	1000 V/µs										
Rated impulse withstand voltage	4kV										
Rated current in short circuit condition	5kA										
Minimum load current:	1 A										
Voltage drop over rated current:	= < 1,2Vrms										
Presence of leakage current:	< 3mA (Maximun value with nominal Voltage and Junction temperature of 125°C / 257°F)										
Calculation Of The Power Dissipated By The Solid State Relay	Single-phase static relay Pd = 1.2 * IRMS [W] (for GRP) IRMS = single-phase load current										
Calculation Of The Power Dissipated By The Solid State Relay	Single-phase static relay Pd = 1.2 * IRMS [W] IRMS = single-phase load current Example: load current=20Arms, Thermal power dissipated: Pd=20*1,2= 24 W										
Calculation Of The Heatsink's Thermal Resistance	Rth = (90°C - T.amb. max) / Pd with Pd = power dissipation Max amb. T.= maximum air temperature in the electrical cabinet. Use a heatsink with lower than calculated heat resistance (Rth). Example: Thermal power dissipated: Pd=20*1,2= 24 W T.amb.max = 40°C Rth = (90-40)/24=2,08[°C/W]										

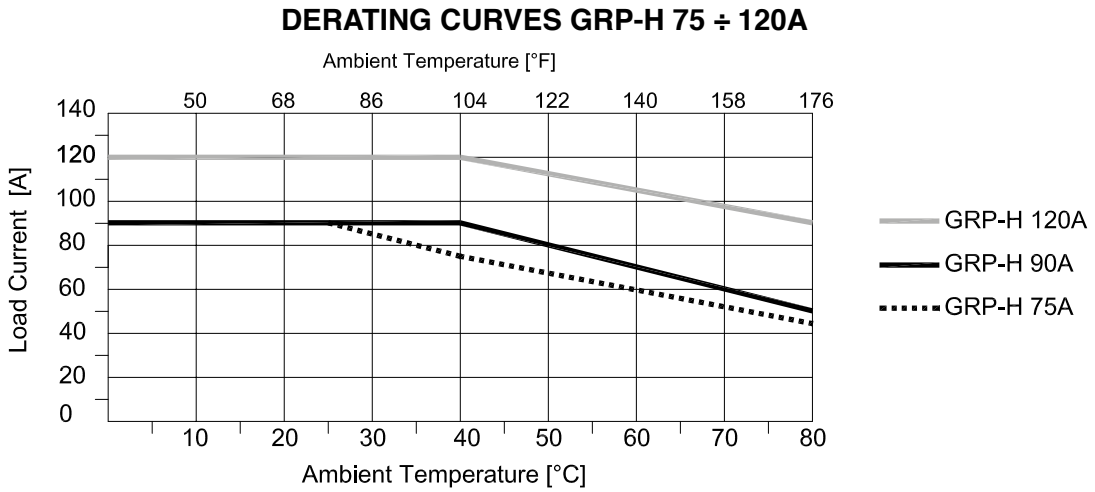
OPTIONS		
Basic Diagnostics on PNP digital output (Option 0)	- Power failure for: SCR open / Load interrupted / No line voltage - Overheating alarm	
Advanced Diagnostics on digital output PNP (Option 1)	- Power failure for: SCR open / Load interrupted / No line voltage - Overheating alarm SCR short circuit (current presence with OFF command). HB (Heat Break) Alarm: - HB alarm load interrupted or partially interrupted, up to 8 loads in parallel. - Automatic calibration of the HB alarm threshold based on the current load level. The alarm threshold default is 90%, of the current read in calibration. Value corresponding to the recommended threshold to intercept the breakdown up to 1/5 of the total load. Threshold can be changed with the appropriate parameter via NFC App, IO-Link and GF_eXpress, or via front button. **Note 1**: with Digital command turn ON minimum time = 50 ms to detect broken load. **Note 2**: For proper operation of the partial load failure alarm even under the most critical conditions (8 equal loads in parallel), it is necessary that the total load current (non-fault) is at least 30% of the rated current of the GRP (on a 15A GRP -->4.5A) Example: a 15A GRP of nominal size drives 8 equal resistors in parallel. To diagnose the failure of only one of the 8 loads in parallel, the single load must have a draw of at least 0.56A, the total load must draw at least 4.5A (0.56A *8 loads).	
GENERAL CHARACTERISTICS		
Power supply	10… 30 V DC ± 10%, absorption 20 mA at 24 V DC (Range from 20 to 27 V DC, Imax <150 mA at 24V with Fan active)	
Indications	2 leds: ON (Green LED): Control status of the thyristor STATUS (RGB LED): State of operation	
Protection rating	IP20	
Working temperature	0...80°C (32 ... 176°F) (see deratIng curves)	
Storage temperature	-20°C - +85°C (-4 ... 185°F) average temperature in a period of 24H not higher than 35°C (95°F) (according to EN 60947-4-3 § 7.1.1)	
Maximum relative humidity	90% non-condensing	
Environmental conditions of use	Indoor use, maximum altitude 2000m For higher altitudes consider: -Decreasing 1% of rated current for every 100m (328ft) above elevation 2000m (6562ft). -Decreasing of maximum voltage by correction factor: 0.88 from 2000 (6562ft) to 3000m (9842ft) 0.77 from 3001 (9846ft) to 4000m (13123ft) 0.68 from 4001 (13127ft) to 5000m (16404ft) Example for GRP-..25-60.. at 2800 mslm (9186ft) - 25A nominal derated by 1%*8-->23A - 600Vac nominal, maximum voltage 660Vac derated to 660*0.88=580.8Vac	
Installation	DIN EN50022 bar or panel mount by screws	
Installation requirements	Installation category II, pollution degree 2 Maximum air temperature around the device 40°C / 104°F (for Temperature > 40°C / 104°F see derating curves)	
Weight	GRP-H 15, 25A, 25I	194 g / 6.84 Oz
	GRP-H 30A, 30I	237 g / 8.36 Oz
	GRP-H 40, 50A	388 g / 16.69 Oz
	GRP-H 60, 75A	688 g / 24.27 Oz
	GRP-H 90A	796 g / 28.09
	GRP-H 120A	796 g / 28.09
	GRP 15, 25, 30, 40, 50, 60A	108 g / 3.81Oz
	GRP 75, 90, 120A	156 g / 5,50 Oz

6.2. Derating curves

Rated current curves as a function of ambient temperature (minimum distance between GRP-H of 20mm).





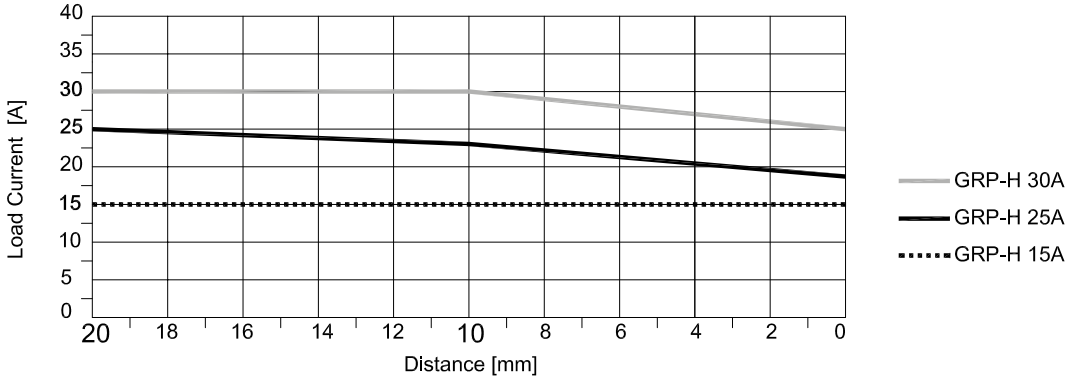


N.B: The curves of the GRP-H 90/120 refer to the device complete with a working specified fan.

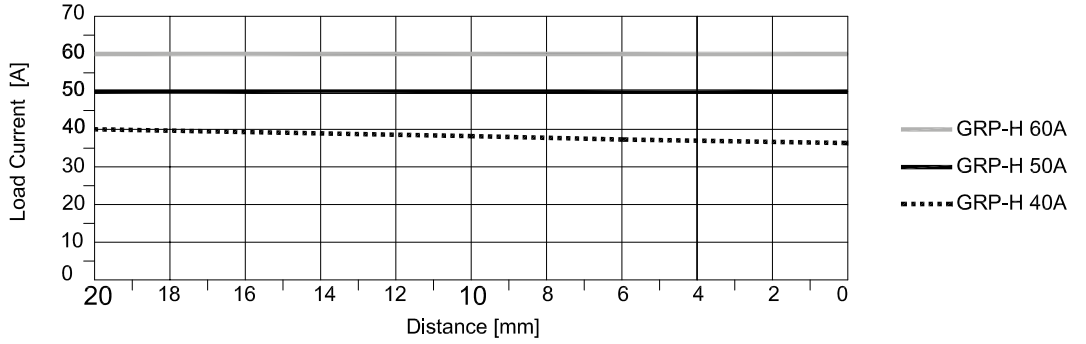
6.3. Downgrade with installation distance

Rated current curves as a function of the horizontal distance between the GRP-Hs (ambient temperature 40 C / 104 F).

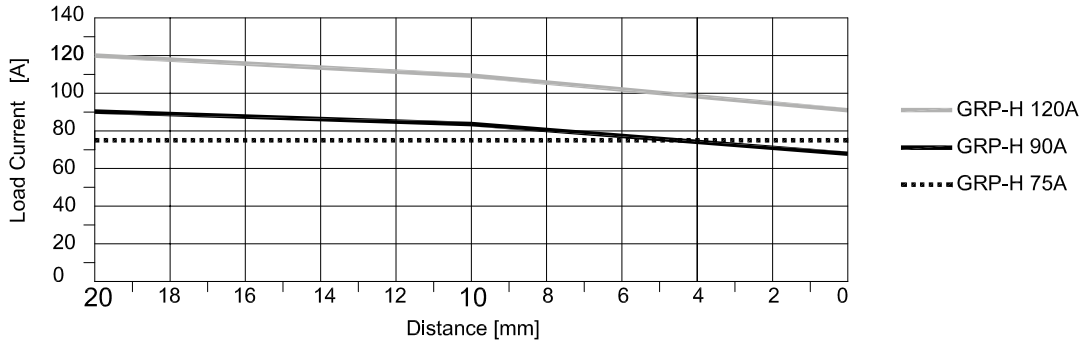
DERATING CURVES GRP-H 15 ÷ 30A



DERATING CURVES GRP-H 40 ÷ 60A



DERATING CURVES GRP-H 75 ÷ 120A



N.B: The curves of the GRP-H 90/120 refer to the device complete with a working specified fan.

6.4. Protection fuses

Type 1 and Type 2 coordination are ratings based on the level of protection and resilience provided during a high current fault. Device is designed to protect people and equipment during a short circuit fault, but the differences between the two levels can be explained as follows:
Type 1 : after a short circuit event it may be too damaged for further use.
Type 2 : after a short circuit event device will still be in working.

Protection co-ordination (Type 2)

Size device	Fuse nominal Current	Model and fuse size (manufacturer Bussmann Div Cooper (UK) Ltd)	Fuse code (descr.)	Fuse holder accessory code (descr.)
15	16	FWC-16A10F 10x38	338470 (FUS-016)	337132 (PF-10x38)
25,25I	25	FWC-25A10F 10x38	338474 (FUS-025)	
30,30I	32	FWC-32A10F 10x38	338483 (FUS-032)	
40	40	FWP-40A14F 14x51	338147 (FUS-040)	337131 (PF-14x51)
50	50	FWP-50A14F 14x51	338079 (FUS-051)	
60	63	FWP-63A22F 22x58	338191 (FUS-063)	337130 (PF-22x58)
75	80	FWP-80A22F 22x58	338199 (FUS-080)	
90	100	FWP100A22F 22x58	338478 (FUS-100)	
120	125	170M1418 000-TN/80	338106 (FUS-100)	337092 (PF-DIN)

Protection co-ordination (Type 1) according to UL 508
The devices are suitable For Use On A Circuit Capable Of Delivering Not More Than 100,000 A rms Symmetrical Amperes, 600 Volts Maximum when Protected by UL Listed fuses with size and class as specified in the table below:

Size device	Fuse Class	Fuse Current Max Size [A]	Prospective short circuit current [kArms]
15, 25 , 30	J	40	100
	CC	30	
40	J	40	
25I		80	
30I		80	
50		80	
60		80	
75		80	
90		125	
120		125	

Use Fuses Only.

6.5. GG fuses

An electrical protection device known as a GG FUSE must be used to ensure protection against short-circuit of the electrical cable (see EN 60439-1, paragraph 7.5 Short-circuit protection and short-circuit withstand strength” and 7.6 “Switching devices and components installed in ASSEMBLIES”, or the equivalent paragraphs of standard EN 61439-1).

6.6. Miniature Circuit Breaker (MCB)

MCB protection

Protection co-ordination (Type 2) with Siemens Miniature Circuit Breaker (MCB / Thermal-Magnetic) 5SY4 series, curve A, 1P and 2P						
Current size model (I2t)	**Current size model (I2t)**	**Current size model (I2t)**	**Current size model (I2t)**	**Current size model (I2t)**	**Current size model (I2t)**	**Current size model (I2t)**
GRP(-H)-15,25,30,40 (1800 A^2s)	5SY4110-5 (10)	1,0	6,0	5SY4210-5 (10)	1,0	6,0
		1,5	9,0		1,5	10,0
		2,5	14,0		2,5	14,0
	5SY4116-5 (16)	1,0	6,0	5SY4216-5 (16)	1,0	6,0
		1,5	9,0		1,5	10,0
		2,5	14,0		2,5	14,0
		4,0	15,0		4,0	25,0
	5SY4120-5 (20)	1,5	9,0	5SY4220-5 (20)	1,5	10,0
		2,5	15,0		2,5	21,0
		4,0	30,0		4,0	30,0
	5SY4125-5 (25)	2,5	18,0	5SY4225-5 (25)	2,5	18,0
		4,0	30,0		4,0	30,0
	5SY4132-5 (32)	2,5	21,0	5SY4232-5 (32)	2,5	36,0
		4,0	35,0		-	-
GRP(-H)-**25I, 30I**, 50, 60,75 (12800 A^2s)	For MCBs smaller than those indicated in the lines below, there are no section and length constraints.					
	5SY4132-5 (32)	2,5	2,0	5SY4232-5 (32)	2,5	2,0
		4,0	4,0		4,0	4,0
		6,0	7,0		6,0	7,0
	5SY4140-5 (40)	4,0	4,0	5SY4240-5 (40)	4,0	4,0
		6,0	7,0		6,0	7,0
		10,0	10,0		10,0	10,0
	5SY4150-5 (50)	6,0	7,0	5SY4250-5 (50)	6,0	7,0
		10,0	10,0		10,0	10,0
		16,0	18,0		16,0	18,0
	5SY4163-5 (63)	6,0	7,0	5SY4263-5 (63)	6,0	7,0
		10,0	10,0		10,0	10,0
		16,0	18,0		16,0	18,0
GRP(-H)-90,120 (11250 A^2s)	For MCBs smaller than those indicated in the lines below, there are no section and length constraints.					
	5SY4132-5 (32)	2,5	2,0	5SY4232-5 (32)	2,5	2,0
		4,0	4,0		4,0	4,0
		6,0	7,0		6,0	7,0
	5SY4140-5 (40)	4,0	4,0	5SY4240-5 (40)	4,0	4,0
		6,0	7,0		6,0	7,0
		10,0	10,0		10,0	10,0
	5SY4150-5 (50)	6,0	7,0	5SY4250-5 (50)	6,0	7,0
		10,0	10,0		10,0	10,0
		16,0	18,0		16,0	18,0
	5SY4163-5 (63)	6,0	7,0	5SY4263-5 (63)	6,0	7,0
		10,0	10,0		10,0	10,0
		16,0	18,0		16,0	18,0

* The sizing is valid for a 230Vac phase-neutral line with an assumed short-circuit current of 2,5KA
** The sizing is valid for a 400Vac phase-to-phase line with an assumed short-circuit current of 5KA
*** The length of the cable is intended between MCB and load, including the return to neutral (1P case), or to the second pole of the MCB (2P case).

Example, for a GRP-H-50- ..., with line voltage of 230Vac, controlled load of 45 A nominal, with a section of 6mm2 of cable, an MCB 5SY4150-5 (50 A) the minimum length of the cables is 7m (cable length is intended between MCB and load, including return).

6.7. Accessoires

Code	Description
F089025	1 NFC dongle for configuration via App + 1 Gefran keychain lanyard
F089026	5 NFC dongles for configuration via App + 5 Gefran keychain lanyards
F089027	10 NFC dongles for configuration via App
F060800	Cable for programming with PC, USB-TTL 3 V with USB - microUSB connectors, length 1,8 m

6.8. Fans (for 90A/120A models only)

Model	Code	Type	Supply
90A FAN60	**363484**	230 Vac 60mm x 60mm x 30mm for 90A models	Separate power supply
120A FAN60	**363011**	230Vac 80mm x 80mm x 38 mm for 120A models	Separate power supply
90A FAN61	**363485**	115Vac 60mm x 60mm x 30 mm for 90A models	Separate power supply
120A FAN61	**363003**	115Vac 80mm x 80mm x 38 mm for 120A models	Separate power supply
FAN62	**363037**	24 Vdc 60mm x 60mm x 25mm	Separate power supply
FAN63	**363037**	24 Vdc 60mm x 60mm x 25mm	Internally powered by GRP-H

PERIODIC CLEANING

Every 6-12 months (depending on dust in the place where it is installed), blow a jet of compressed air downward through the cooling heat-sink (on the opposite side of the fan).
In this way both the heat sink and the cooling fan are cleaned.

IN THE EVENT OF OVERTEMPERATURE ALARM

If periodic cleaning does not eliminate the problem, perform the following operations:
1. Disconnect the fan cables from the terminal block (if present) or disconnect the fan connector from the GRS-H (FAN63).
2. Unscrew the screws securing the fan to the support brackets
3. Check the condition of the fan, clean it or replace it
4. Reassemble the fan

6.9. Order code

For integrated heatsink version

GRP-H	-	A	-	B	-	C	-	D	-	E	-	F	-	G	-	H	-	I

Rated current	
15Aac	**15**
25Aac	**25**
25Aac I2t++	**25I**
30Aac	**30**
30Aac I2t++	**30I**
40Aac	**40**
50Aac	**50**
60Aac	**60**
75Aac	**75**
90Aac	**90**
120Aac	**120**

Rated voltage	
480Vac	**48**
600Vac	**60**

Control type	
Digital with advanced diagnostics	**D-1**
Analogue with basic diagnostics	**AN-0**
Analogue with advanced diagnostics	**AN-1**
IO-Link with advanced diagnostics	**I-1**

For models from 15 A to 76 A	
None	**0**
Ventola per modelli 90A/120A	
230V AC 60x60x30mm for 90A models 230V AC 80x80x38mm for 120A models	**FAN60**
115V AC 60x60x30mm for 90A models 115V AC 80x80x38mm for 120A models	**FAN61**
24Vdc 60x60x25mm	**FAN62**
24V DC 60x60x25mm integrated power supply	**FAN63**

0	

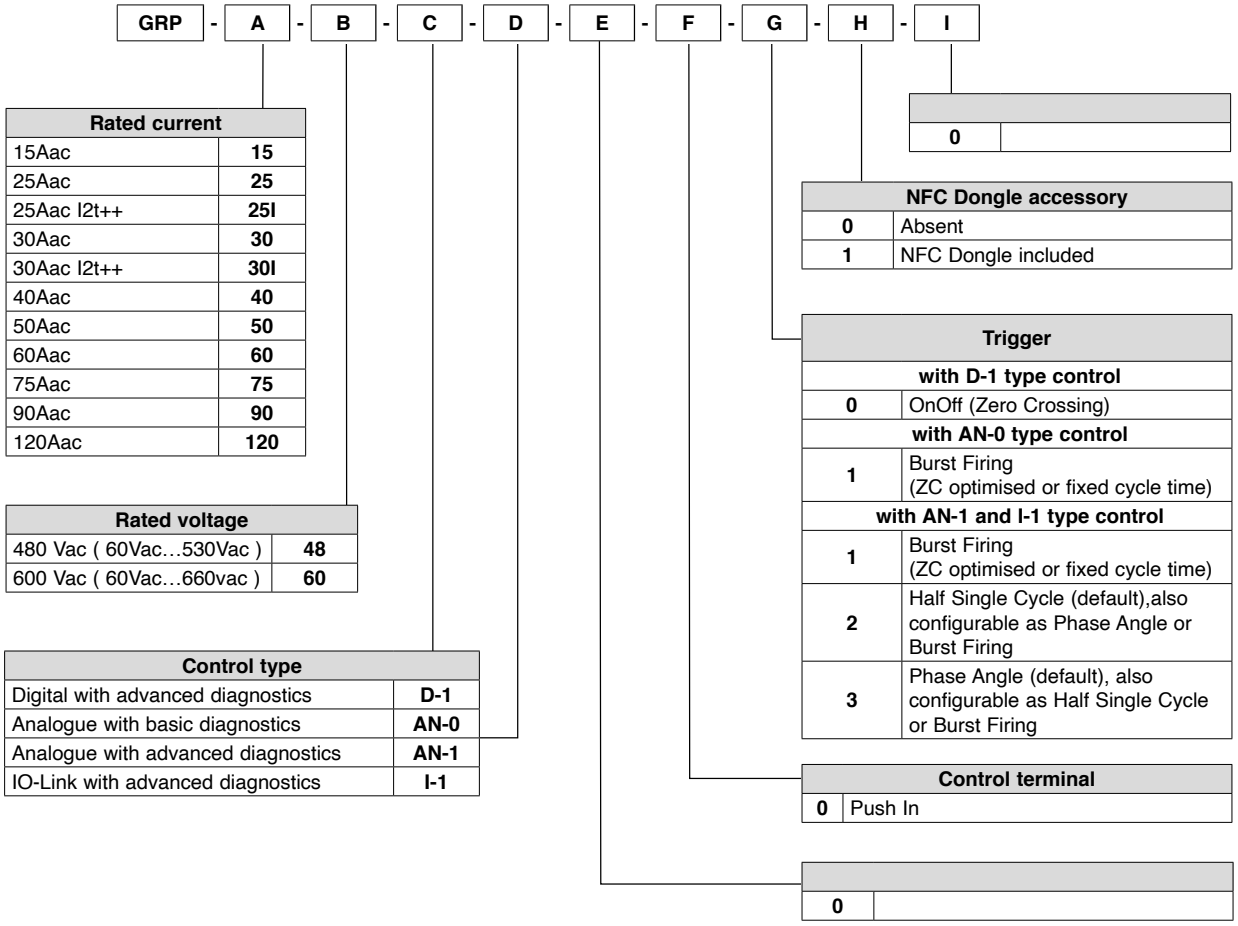
NFC Dongle accessory	
0	Absent
1	NFC Dongle included

Trigger	
with D-1 type control	
0	OnOff
with AN-0 type control	
1	Burst Firing (optimised or fixed cycle time)
with AN-1 and I-1 type control	
1	Burst Firing (optimised or fixed cycle time)
2	Half Single Cycle (default),also configurable as Phase Angle or Burst Firing
3	Phase Angle (default), also configurable as Half Single Cycle or Burst Firing

Control terminal	
0	Push In

Note:
Basic diagnostics: includes thermal safety, thermal alarm, total load break, no line voltage
Advanced diagnostics: Basic diagnostics, current reading, partial load break.

For version without integrated heatsink



Note:
Basic diagnostics: includes thermal safety, thermal alarm, total load break, no line voltage
Advanced diagnostics: Basic diagnostics, current reading, partial load break.

6.10. EMC standards

EMC emissions

AC semiconductor motor controllers and conductors for non-motor loads	EN 60947-4-3	Class A Group 2
Emission enclosure CI compliant in firing mode single cycle and phase angle if external filter fitted	EN 60947-4-3 CISPR-11 EN 55011	

EMC Immunity

Generic standards, immunity standard for industrial environments	EN 60947-4-3	
ESD immunity	EN 61000-4-2	4 kV contact discharge 8 kV air discharge
RF interference immunity	EN 61000-4-3 /A1	10 V/m amplitude modulated 80 MHz-1 GHz 10 V/m amplitude modulated 1.4 GHz-2 GHz
Conducted disturbance immunity	EN 61000-4-6	10 V/m amplitude modulated 0.15 MHz-80 MHz
Burst immunity	EN 61000-4-4	2 kV power line 2 kV I/O signal line
Surge immunity	EN 61000-4-4/5	Power line-line 1 kV Power line-earth 2 kV Signal line-earth 2 kV Signal line-line 1 kV
Magnetic fields immunity	Test are not required. Immunity is demonstrated by the successfully completion of the operating capability test	
Voltage dips, short interruptions and voltage immunity tests	EN 61000-4-11	100%U, 70%U, 40%U

LVD safety

Safety requirements for electrical equipment for measurement, control and laboratory use	EN 61010-1

CAUTION

This product has been designed for class A equipment. Its use in a domestic environment may cause radio interference, in which case the user may be required to use additional attenuation methods.

EMC filters are required in PA operating mode (Phase Angle, i.e., SCR triggering with a modulated phase angle). The filter model and current size depend on the configuration and the load used.
It is important that the power filter is connected as close as possible to the GRP(-H).

6.11. Warnings

WARNING

ENG

Read the following warnings before installing, connecting or using the device:
- follow instructions precisely when connecting the device.
- always use cables that are suitable for the voltage and current levels indicated in the technical specifications.
- In applications with risk of damage to persons, machines or materials, you MUST install auxiliary alarm devices.
- It is advisable to verify frequently that the alarm device is functional even during the normal operation of the equipment.
- DO NOT operate the device in rooms with dangerous (inflammable or explosive) atmosphere.
- During continuous operation, the heat sink can reach up to 100°C / 212°F, and stays at a high temperature even after the device is turned off due to thermal inertia; therefore, DO NOT touch it and avoid contact with electrical wires.
- do not work on the power part without first disconnecting electrical power to the panel.
- do not remove the cover when the device is powered!

Installation:
- correctly ground the device using the specific terminal.
- power supply lines must be separated from device input and output lines; always check that the supply voltage matches the voltage indicated on the device label.
- avoid dust, humidity, corrosive gases and heat sources.
- respect the installation distances between one device and another (to allow for dissipation of generated heat).
- to keep air in movement, we advise you to install a fan near the GRP(-H) group in the electrical panel containing the GRP(-H).
- respect the indicated dissipation curves (for version with integrated heat sink).

Maintenance:

at regular intervals, check operation of the cooling fans and clean all
air ventilation filters.
- repairs must be done out only by trained and specialized personnel. Cut power to the device before accessing internal parts.
- do not clean the box with solvents derived from hydrocarbons (trichloroethylene, gasoline, etc.). Using such solvents will compromise the device's mechanical reliability. Use a clean cloth moistened with ethyl alcohol or water to clean external parts in plastic.

Service:

GEFRAN has a service department.
The warranty excludes defects caused by any use not conforming to these instructions.

7. CERTIFICATIONS

7.1. Certifications

CE	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).
c UL us LISTED	cULus listed, for GRP-H conformity UL508 - File: E243386
c UL us	For GRP conformity UL508 - File: E243386
SCCR RMS SYM 100KA / 600V	Short Circuit Current Rating 100KA / 600V according to UL 508

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