GEFRAN

GRM / GRM-H 10/15/25/30/40/50/60/75/90/120A

COMPACT POWER CONTROLLERS, ANALOG COMMAND, IO-LINK COMMUNICATION AND MODBUS RTU

CONFIGURATION AND PROGRAMMING MANUAL

CE

code: 81909C_MAN_GRM / GRM-H_12-2024_ENG

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81909C_MAN_GRM / GRM-H_12-2024_ENG

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1. PRELIMINARY INSTRUCTIONS

1.1. Profile

Power control of complex loads needs special precautions. This is for example the case with infrared lamps, or Silicon Carbide heating elements. These kind of electrical loads have not to a constant current absorption during the work phases. This means that at startup when cold, you could have currents up to 15 times higher than the rated current of the load. To avoid that these phenomena cause breakdowns or downtime, the GRM continuously monitors the absorptioncurrent and with special algorithms it limits it up to achievement of optimal conditions. The GRM is able to guarantee a stable supply of the energy to the load by compensating for fluctuations of the voltage on the electricity grid, due to variations in the temperature of the loads and the aging of the heating elements. Thanks to the feedback algorithms (feedback in V2, I2 and P) is always delivered same amount of energy. The range of ultra-compact power controllers GRM-H meets all these needs, with sizes of current from 10 to 120 Ampere, voltages up to 600Vac.

The range of solid state contactors with heatsink GRM-H meets all these needs, with current ratings from 10 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 for GRM-H serie, assisted by fans for the 90A and 120A models.
When an integrated heatsink is included 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 GRM 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 GRM series can be controlled in different ways based on the options chosen:

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

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

- Control and diagnostics via the Modbus RTU RS485 communication protocol, with MR option (compatible with analog input model).

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 GRM series offers complete availability of load information.
There are 3 physical outputs, two are PNP type and one voltage-free normally open contact.
The outputs can be configured and associated with different alarm states: partial or total breakages of the load, lack of voltage on the load, faults on the line, over temperature.
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

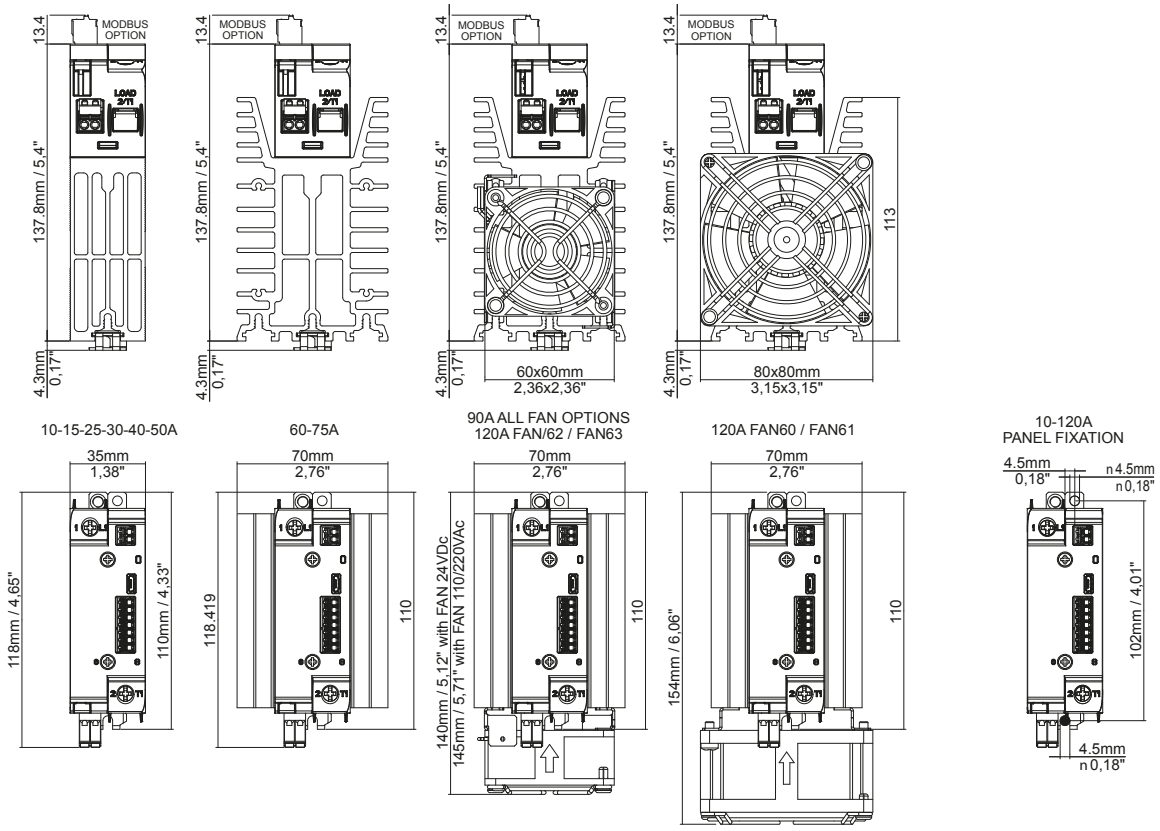
- Ambient temperature limits, depending on derating curves.
- Need for air exchange with the outside or an air conditioner to transfer the dissipated power to the outside of the panel.
- Installation limits (distances between devices to ensure dissipation under natural convection conditions)
- Maximum 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).

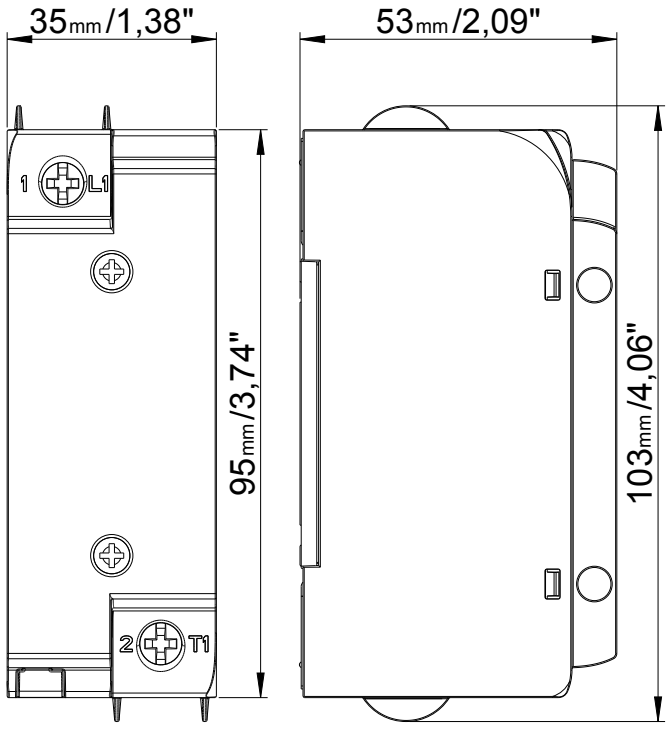
Mounting procedure on the heatsink for version without integrated heat sink (GRM):
The module-heatsink contact surface must have a maximum flatness error of 0.05mm and a maximum roughness of 0.02mm. The anchorage holes on the heatsink must be threaded and countersunk. Caution: Spread 1 gram of heat-conducting 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

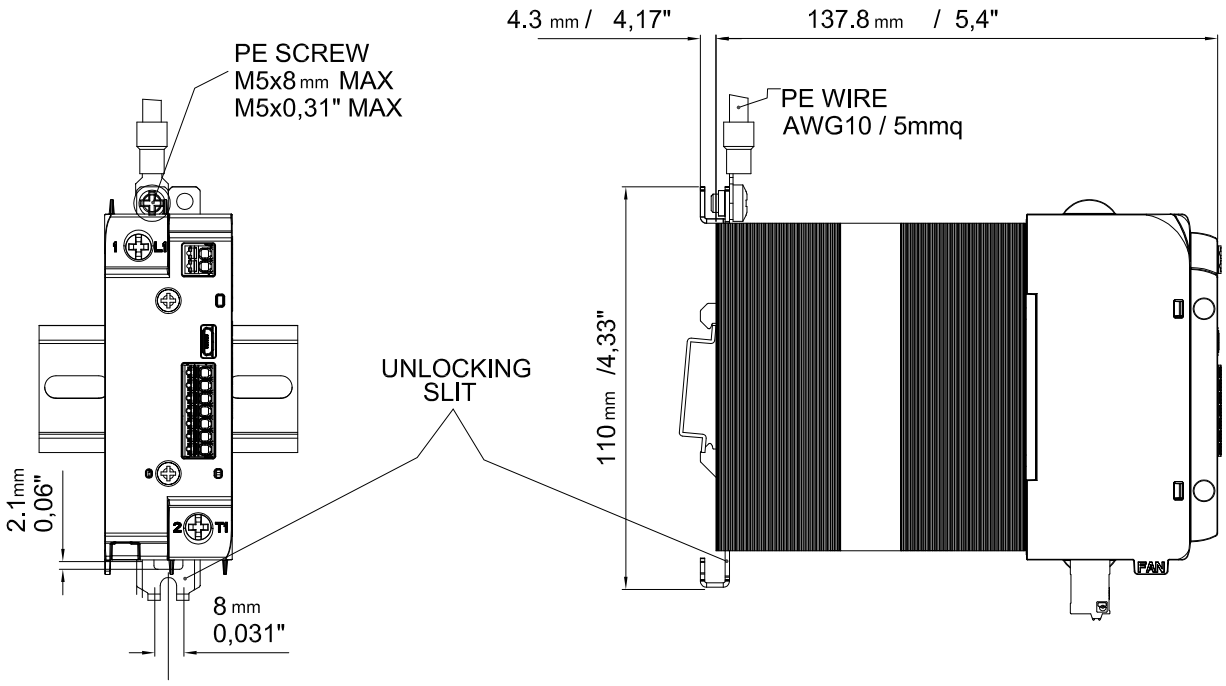
2.1. Dimensions and mounting measurements





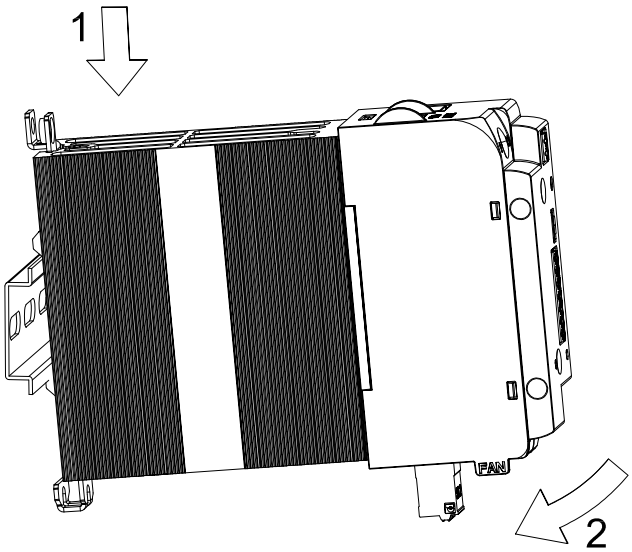
15-120A

2.2. DIN rail fixing

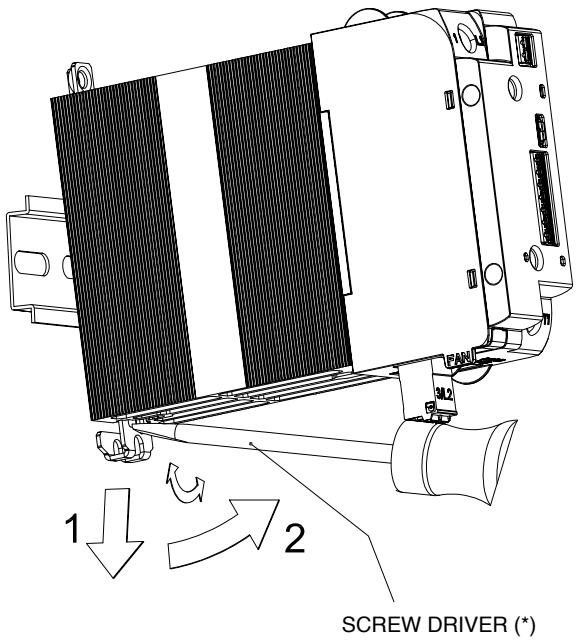


For integrated heatsink version

DIN rail coupling sequence

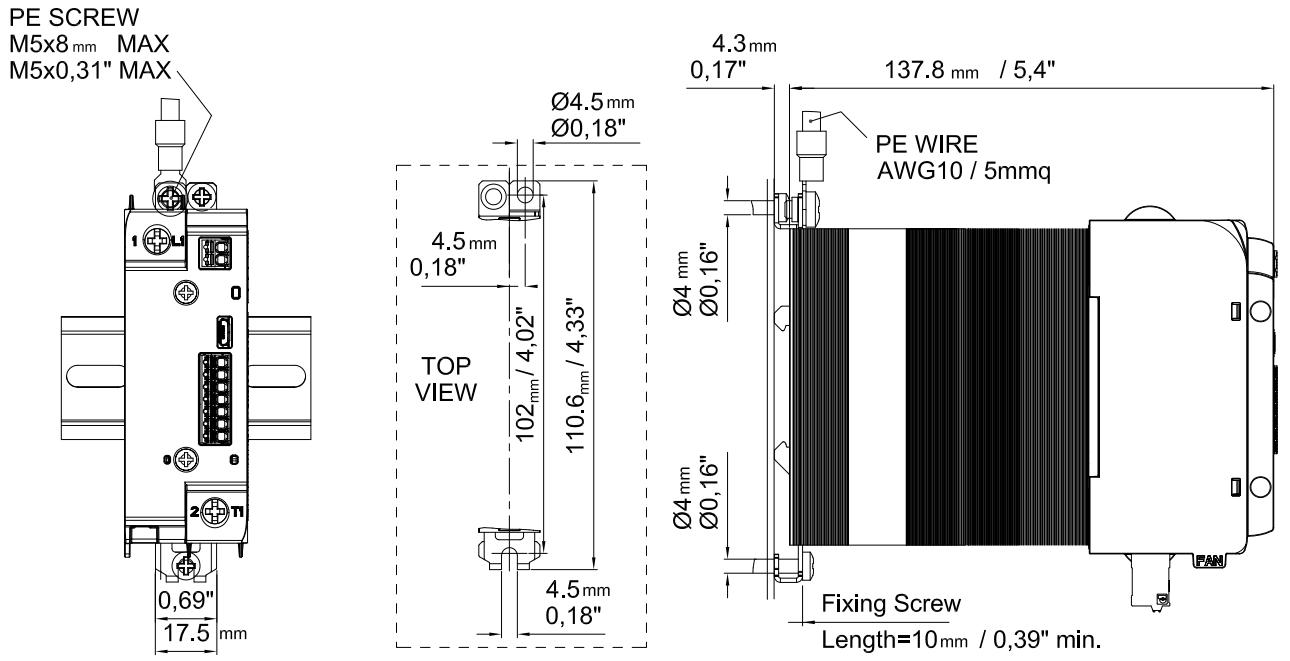


DIN rail release sequence



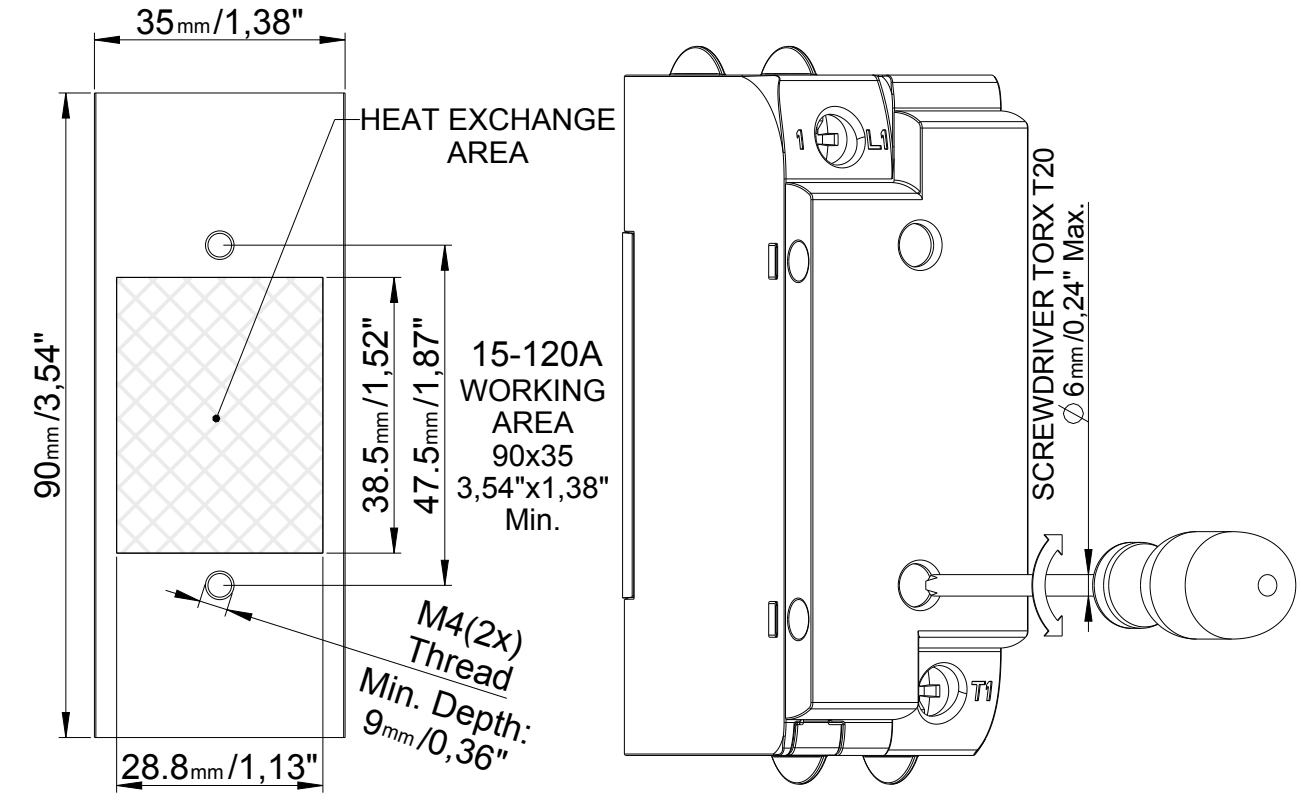
(*) Use of a slotted screwdriver with a max. diameter of 6mm is recommended

2.3. Panel fixing



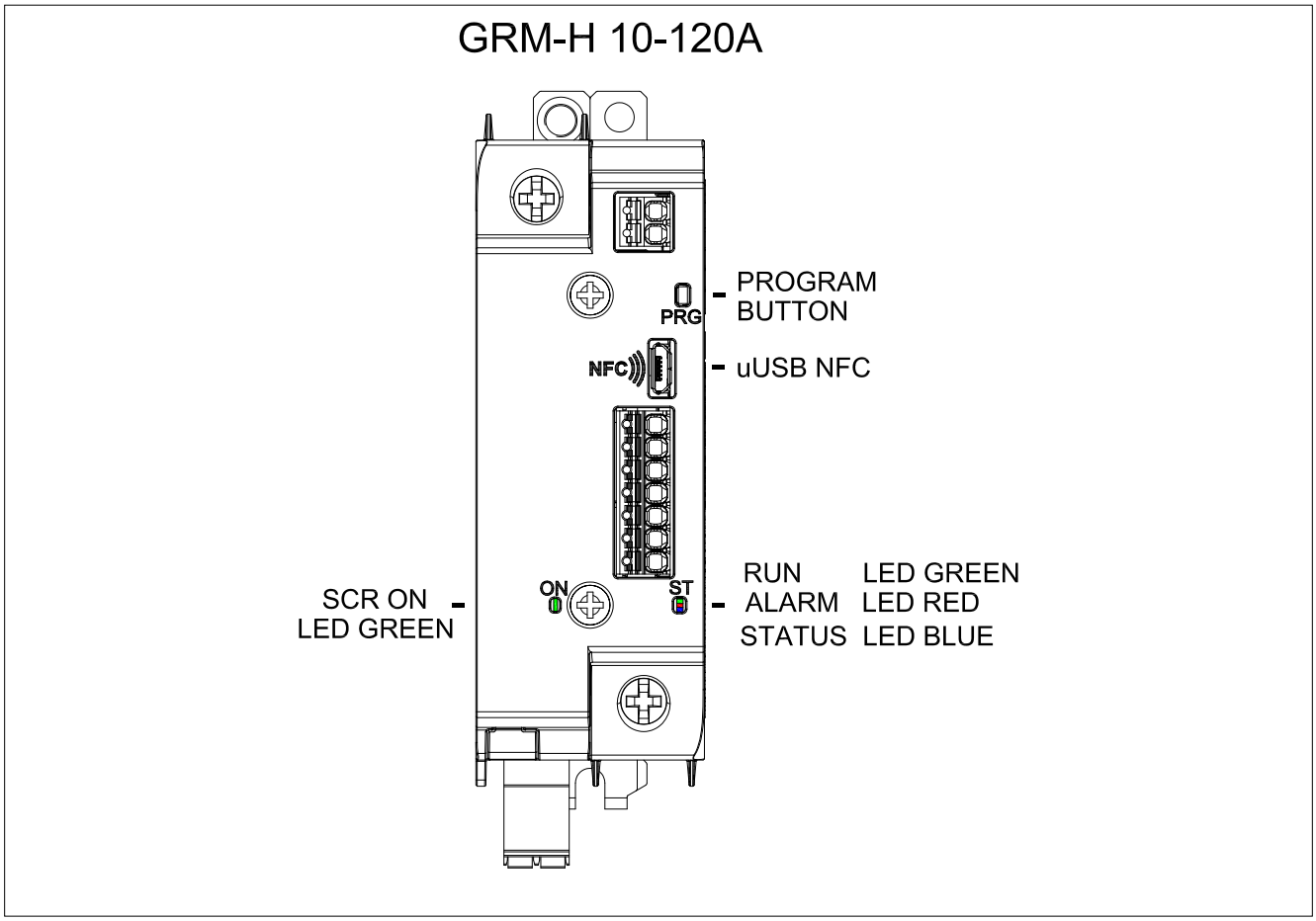
For integrated heatsink version

2.4. Heatsink mounting



For version without integrated heatsink

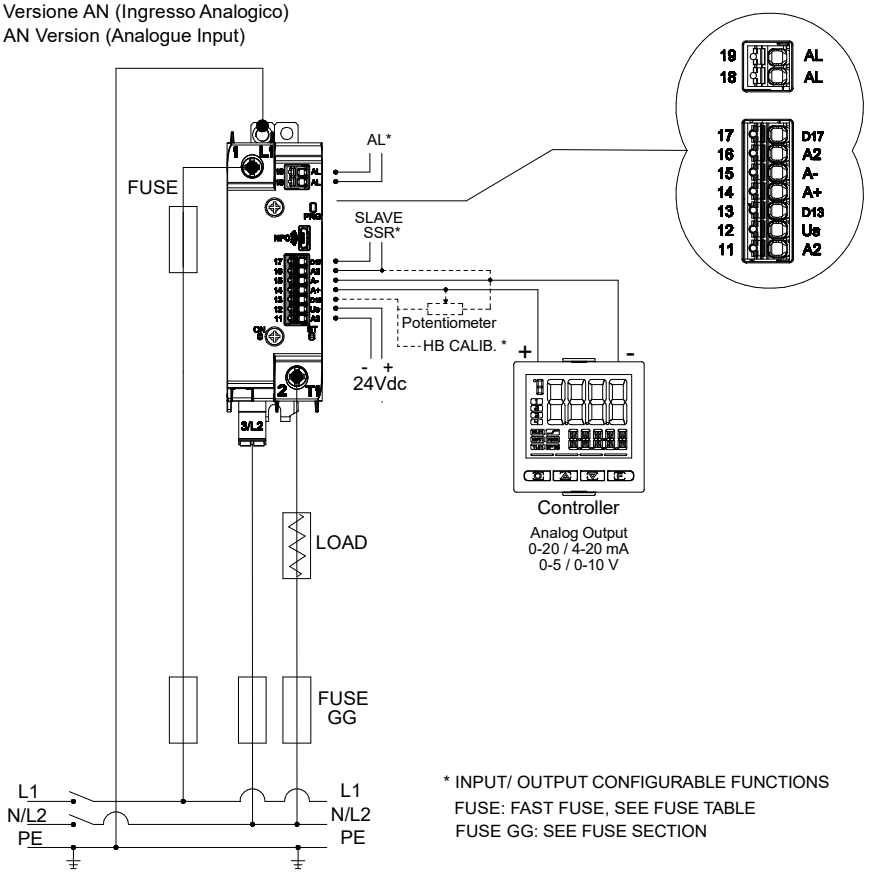
2.5. Front view



2.6. Pinout

2.6.1. Analog control

Versione AN (Ingresso Analogico)
AN Version (Analogue Input)

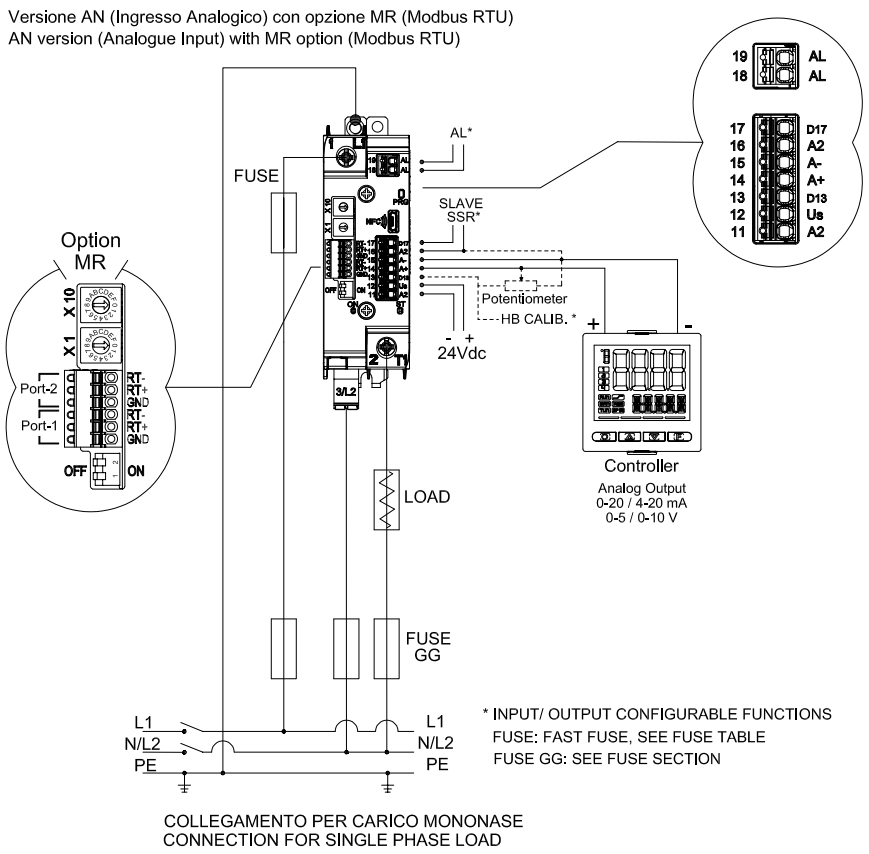


* INPUT/ OUTPUT CONFIGURABLE FUNCTIONS
FUSE: FAST FUSE, SEE FUSE TABLE
FUSE GG: SEE FUSE SECTION

COLLEGAMENTO PER CARICO MONONASE
CONNECTION FOR SINGLE PHASE LOAD

Power terminals		
Rif.	**Description**	**Note**
1/L1	Line Connection	
2/T1	Load Connection	
3/L2	Line voltage reference connection	
Power supply and AN version signal connector (analogue input)		
11/A2-	GND (-) with 24Vdc power supply	
12/Us	Signal (+) with 24Vdc power supply	GRM power supply: Range 12 - 30 Vdc, Imax 20mA @ 24Vdc With option FAN63 (Only 90/120A): Range 20 - 27 Vdc, Imax <150 mA a 24V with running fan
13/D13	Potentiometer power supply output (+ 5Vdc) / Auxiliary digital input 1 / PWM control input	Potentiometer output voltage: 5V DC, Iout max = 10mA Digital input: 5-30V max 3 mA PWM control input: 5-30V max 3 mA, Frequency range: (1, ..., 100 Hz), Resolution max 1% (0.1ms)
14/A+	Analogue differential command input	
15/A-		
16/A2-	GND alarm output	Same as 11/A2- connection
17/D17	Master-Slave output /Alarm output / Digital input auxiliary 2	Master-Slave output: Output voltage: Us - 0.7Vdc, Iout max = 15mA Alarm output: PNP output normally not active (Configurable as normally active) (Us*1,14) – 0.7Vdc (ver. AA), Iout max =15mA Digital input: 5-30V, max 3mA
18/AL	Alarm output	Dry contact N.O. Maximum current: 150mA Maximum voltage = 30 Vdc Closed contact impedance <1 Ω Open contact impedance> 1 MΩ
19/AL		

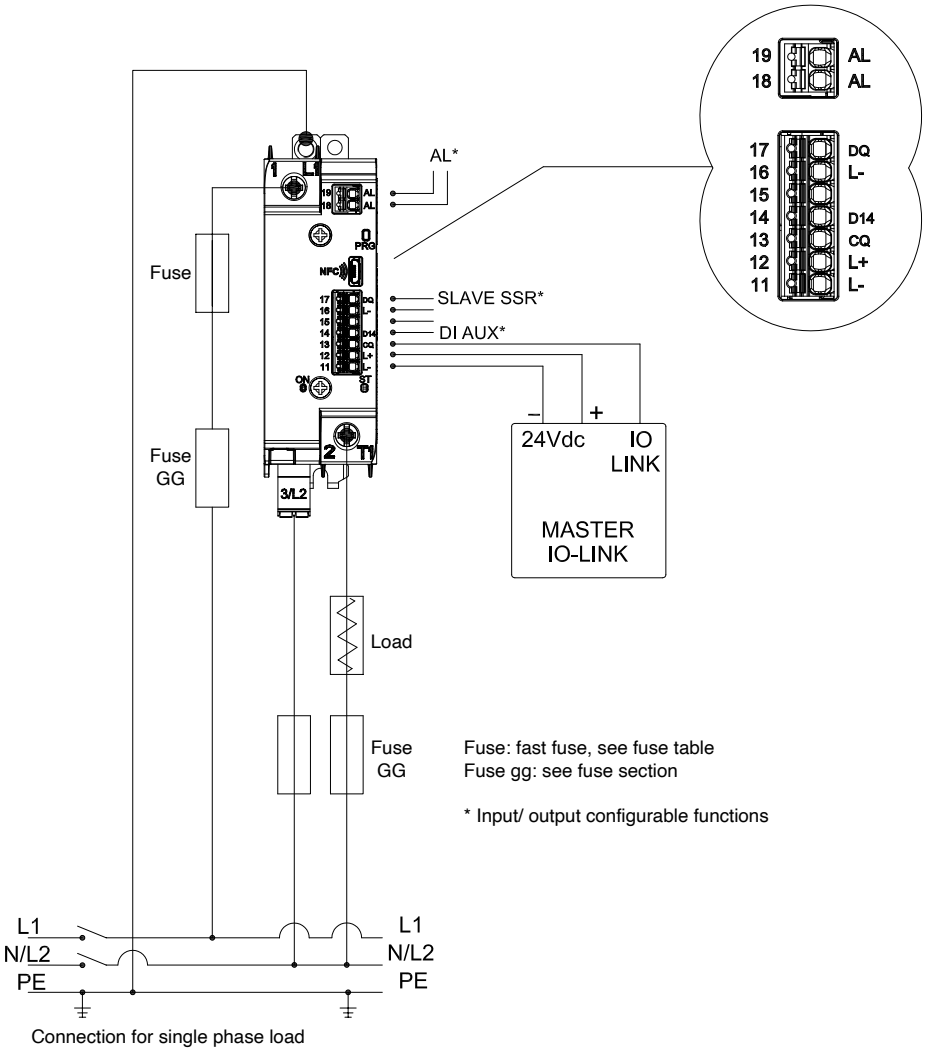
2.6.2. Analog control with MR option (Modbus RTU)



Power terminals		
Ref.	**Description**	**Notes**
1/L1	Line Connection	
2/T1	Load Connection	
3/L2	Line voltage reference connection	
Power supply and AN version signal connector (Analog Input)		
11/A2-	GND (-) with 24Vdc power supply	
12/Us	Signal (+) 24Vdc power supply	GRM power supply with MR option: Range 18 -30 Vdc, Imax 35mA @ 24Vdc
13/D13	Potentiometer power supply output (+ 5Vdc) / Auxiliary digital input 1 / PWM control input	Potentiometer output voltage: 5V DC, Iout max = 10mA Digital input: 5-30V max 3 mA PWM control input: 5-30V max 3 mA, Frequency range: (1, ..., 100 Hz), Resolution max 1% (0.1ms)
14/A+	Analogue differential command input	
15/A-		
16/A2-	GND alarm output	Same as 11/A2 connection
17/D17	Master-Slave output / Alarm output / Digital input auxiliary 2	Master-Slave output: Output voltage: Us - 0.7Vdc, Iout max = 15mA Alarm output: PNP output normally not active (Confi gurable as normally active) Output voltage: Us – 0.7V DC , Iout max =15mA Digital input: 5-30V, max 3mA
18/AL	Alarm output	Dry contact N.O. Maximum current: 150mA Maximum voltage = 30 Vdc Closed contact impedance <1 Ω Open contact impedance> 1 MΩ
19/AL		
RS-485 fieldbus signal connector (only with MR option)		
RT-	Tx/Rx- (Data transmission B-)	Port-1 and Port-2 interconnected for multislave chain connections * GND signal connection between slaves is recommended
RT+	Tx/Rx+ (Data transmission A+)	
GND *	Serial line GND reference signal	
Rotary switch Modbus node address configuration (only with MR option)		
X10	Tens	Node address between 01 to 99
X1	Unit	
RS485 termination line configuration (only with MR option)		
OFF	Serial line termination not active	It is recommended to enable the termination for the last device connected to the serial line. ATTENTION: Both switch must be configured in the same position
ON	Serial line termination active	

2.6.3. IO-Link control

VERSION WITH IO-LINK INPUT



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

* Input/ output configurable functions

Connection for single phase load

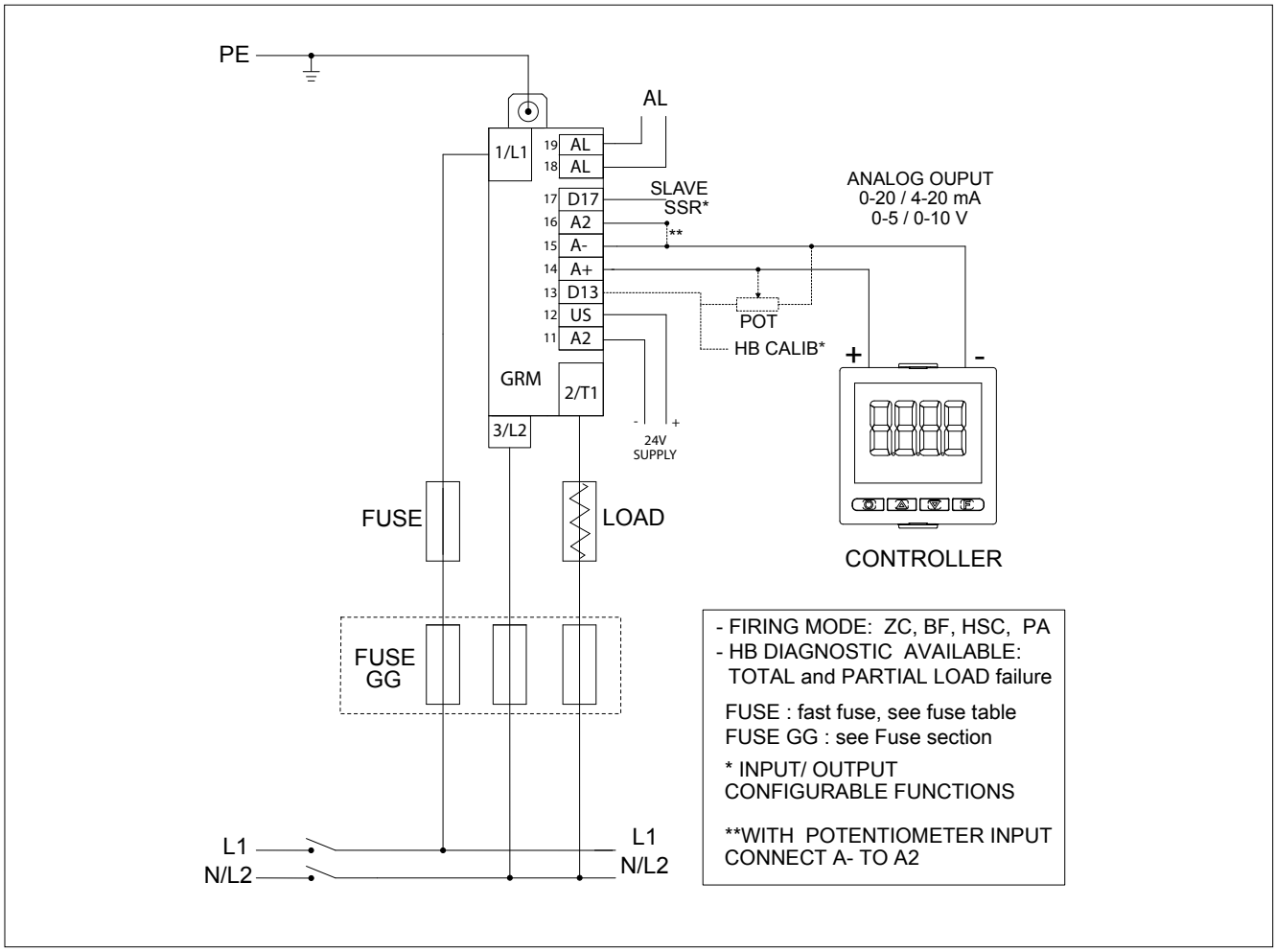
Power terminals		
Ref.	**Description**	**Notes**
1/L1	Line Connection	
2/T1	Load Connection	
3/L2	Line voltage reference connection	
I version signal connector (IO-LINK)		
11/L-	Power GND	
12/L+	+ V DC power supply	GRM power supply (Range from 10 to 30 V DC, Imax = 20 mA at 24V)
		GRM-H-90/120A-..FAN63: GRM-H + Fan power supply (Range from 20 to 27 V DC, Imax <150 mA at 24V with Fan active)
13/CQ	IO-LINK communication line	
14/D14	Auxiliary digital input 1	Digital input: 5-30Vdc, max 3mA
16/L-	GND alarm output (common to terminal 11/L-)	
17/DQ	Master-Slave output /Alarm output / Digital input auxiliary 2	Master-Slave output: Output voltage: Us - 0.7Vdc, Iout max = 15mA Alarm output: PNP output normally not active (Configurable as normally active), output voltage: Us – 0.7V DC , Iout max =15mA Digital input: 18-30Vdc, max 3mA
18/AL	Alarm output	Dry contact N.O. Maximum current: 150mA Maximum voltage = 30 Vdc Closed contact impedance <1 Ω Open contact impedance> 1 MΩ
19/AL		

2.7. Load wiring

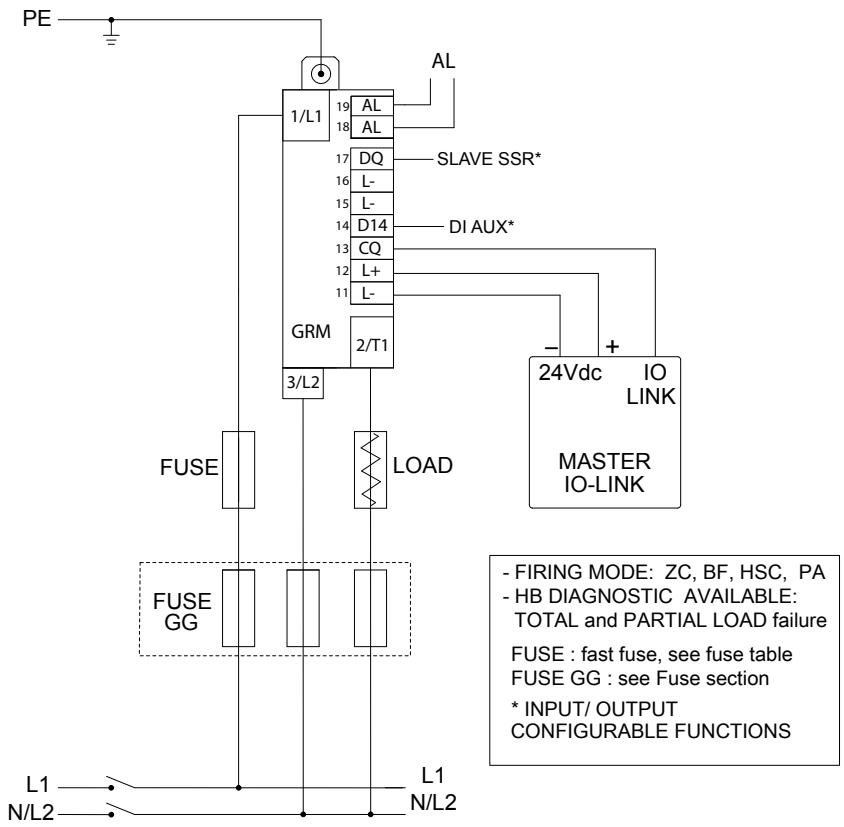
Notes

- To improve immunity to EMC disturbances, it is recommended to connect the A2 pin to earth.
- With potentiometer input connect Always A- to A2
- See parameters dedicated at input and output signal configuration (parameters io.13 and io.17 for Master-Slave).

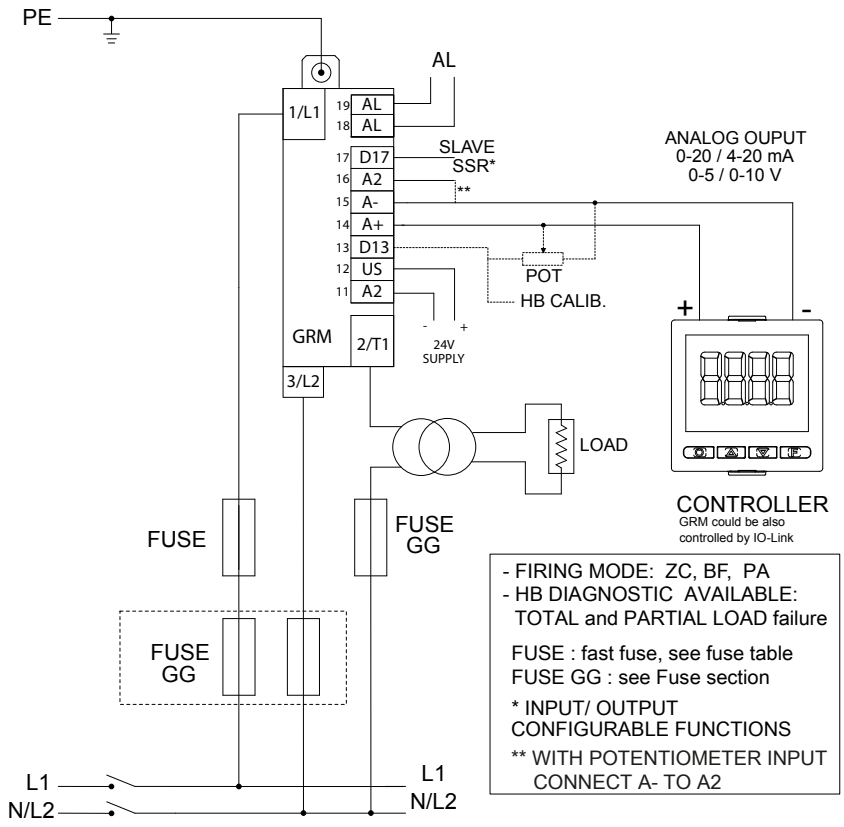
2.7.1. GRM with AN option with monophase resistive load



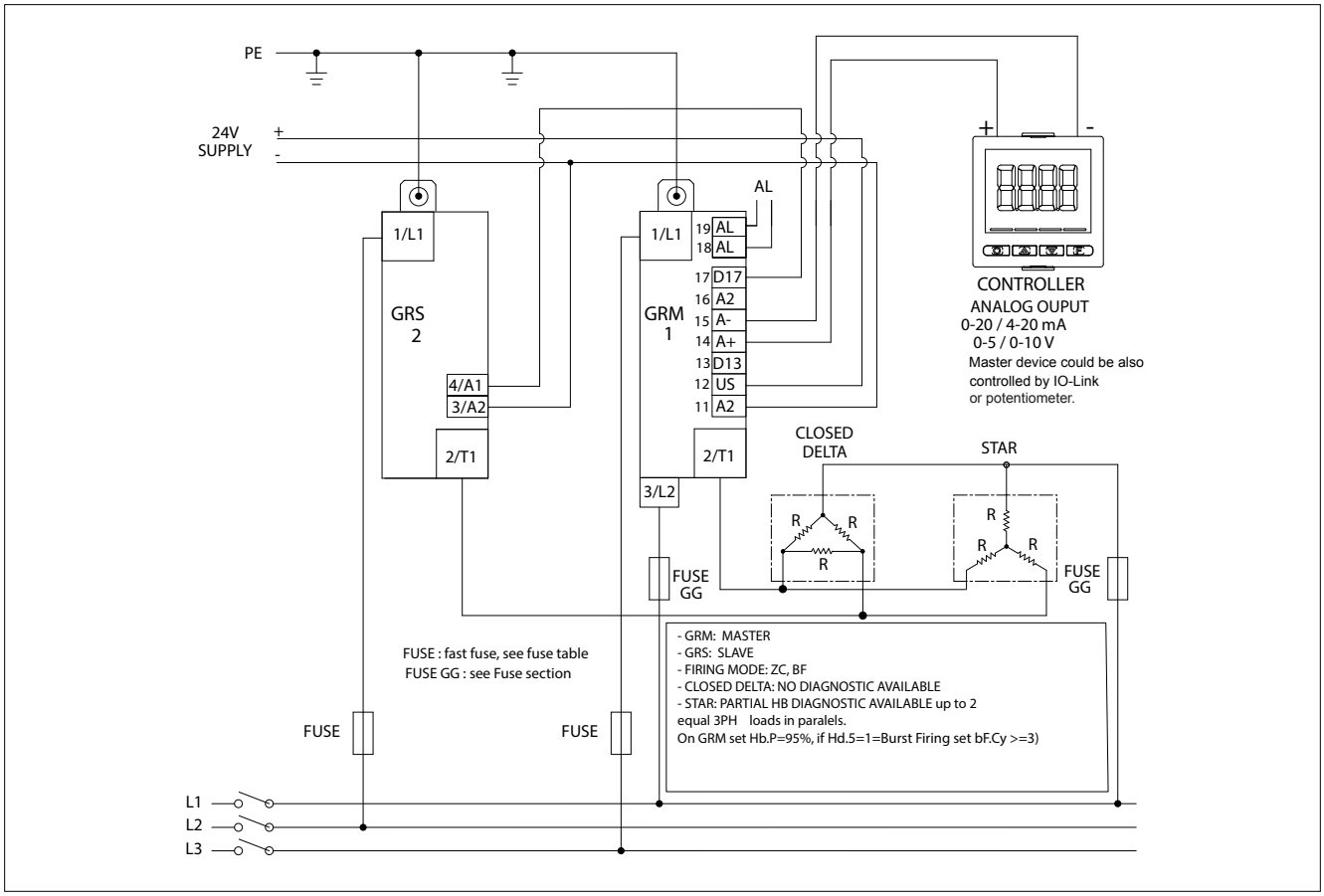
2.7.3. GRM with IO-Link option with monophase resistive load



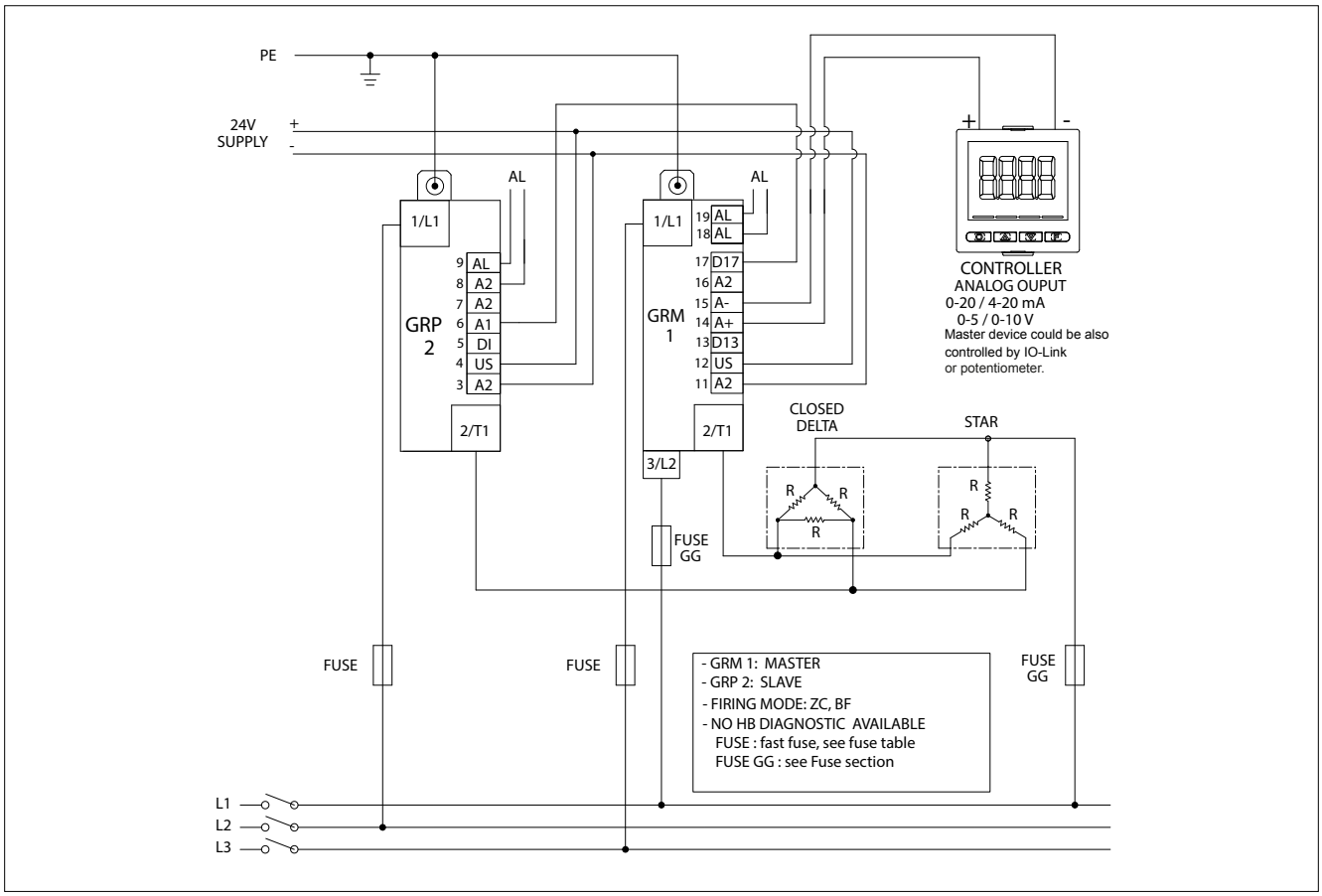
2.7.2. GRM with AN option with monophase transformer



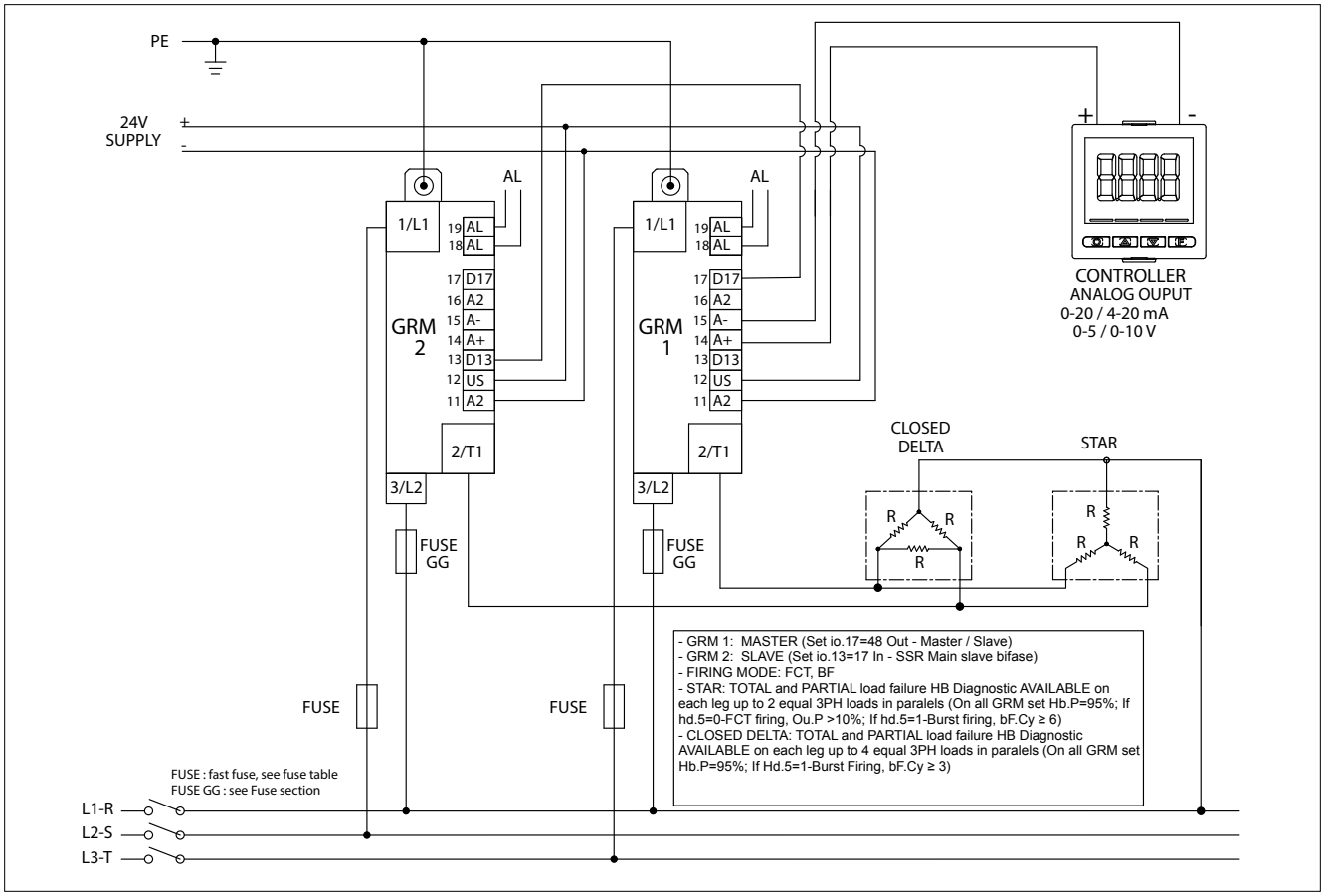
2.7.4. GRM Master + 1 GRS Slave for Star/Delta



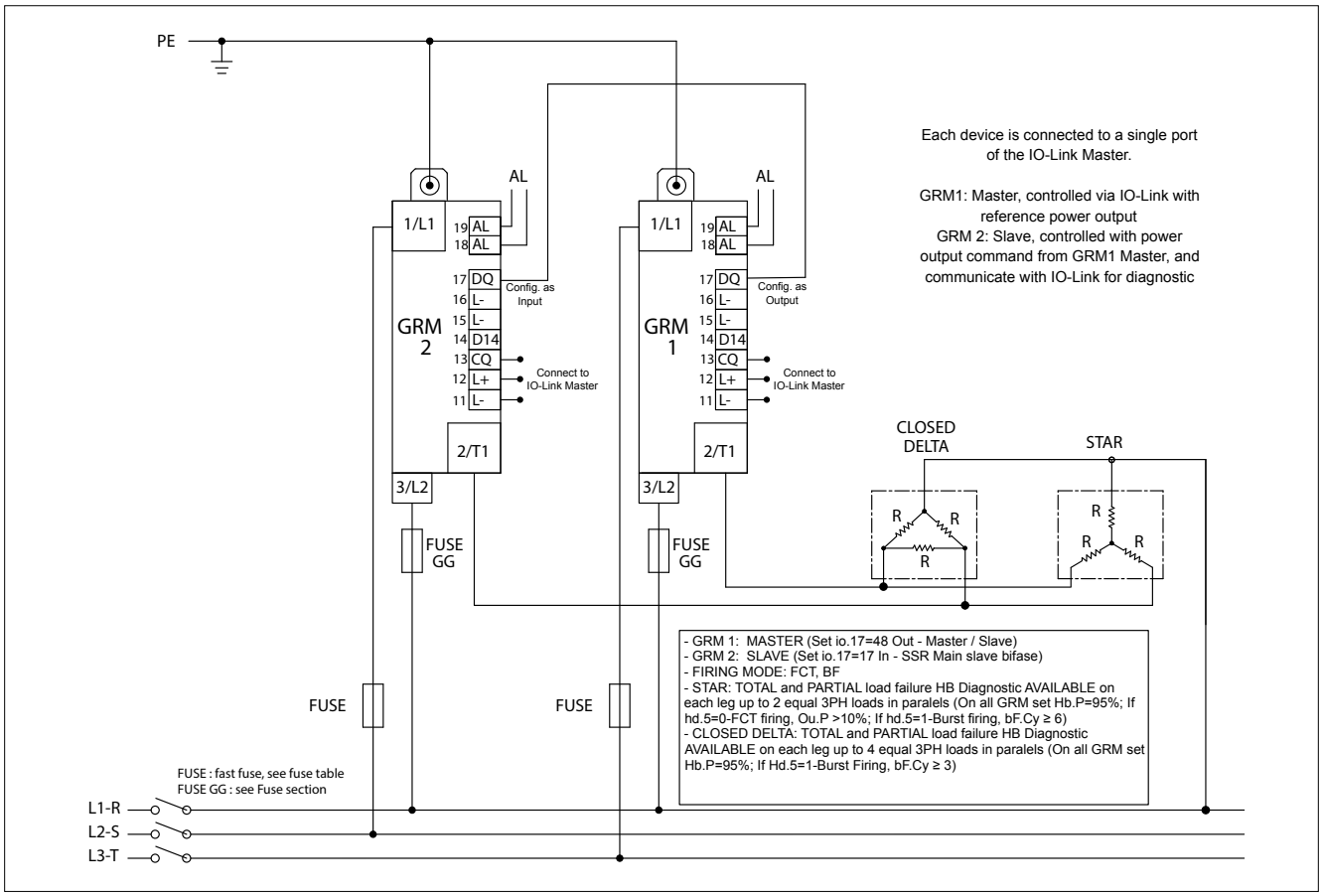
2.7.5. GRM Master + 1 GRP Slave for Star/Delta



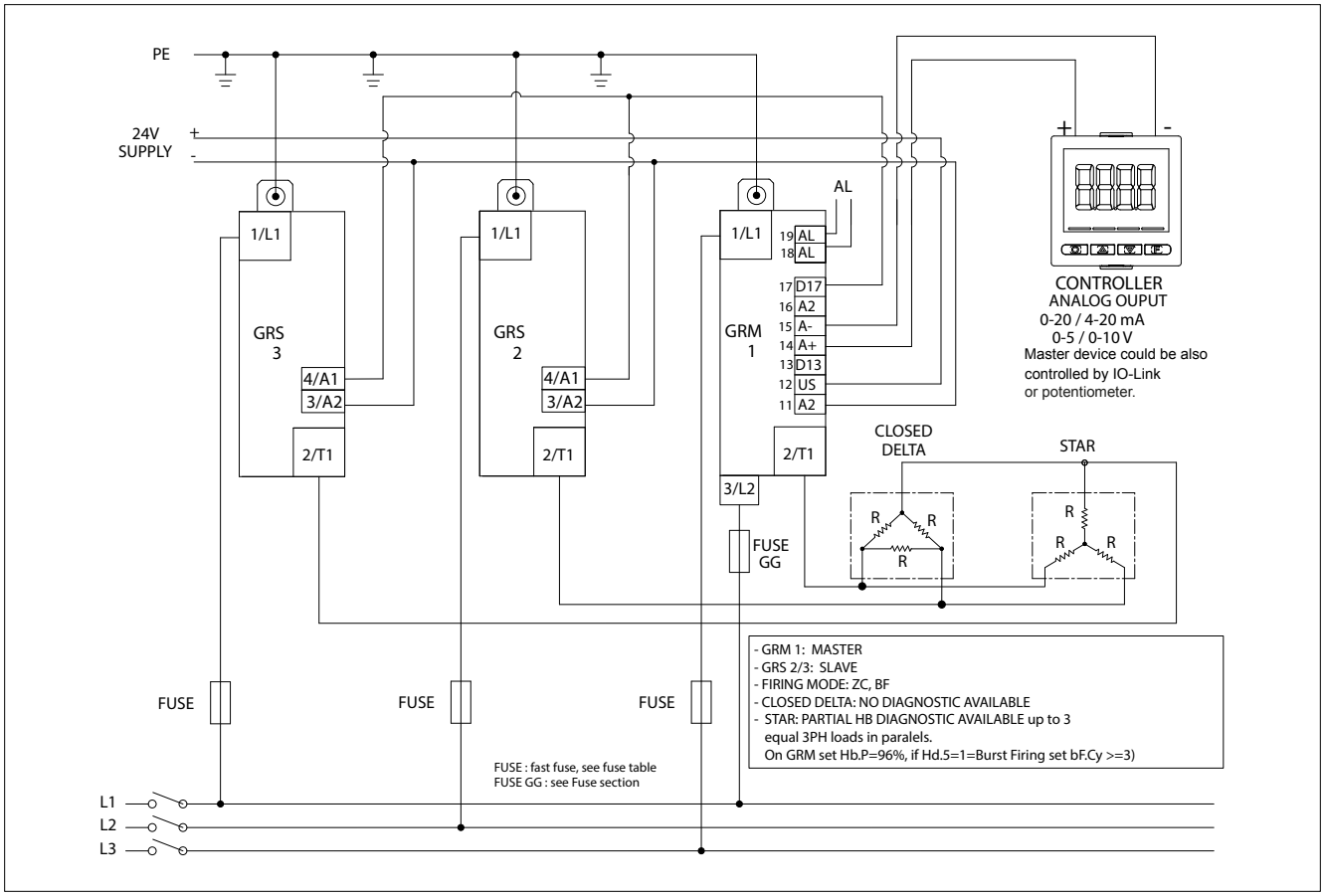
2.7.6. GRM Master + 1 GRM Slave for Star/Delta with analog control



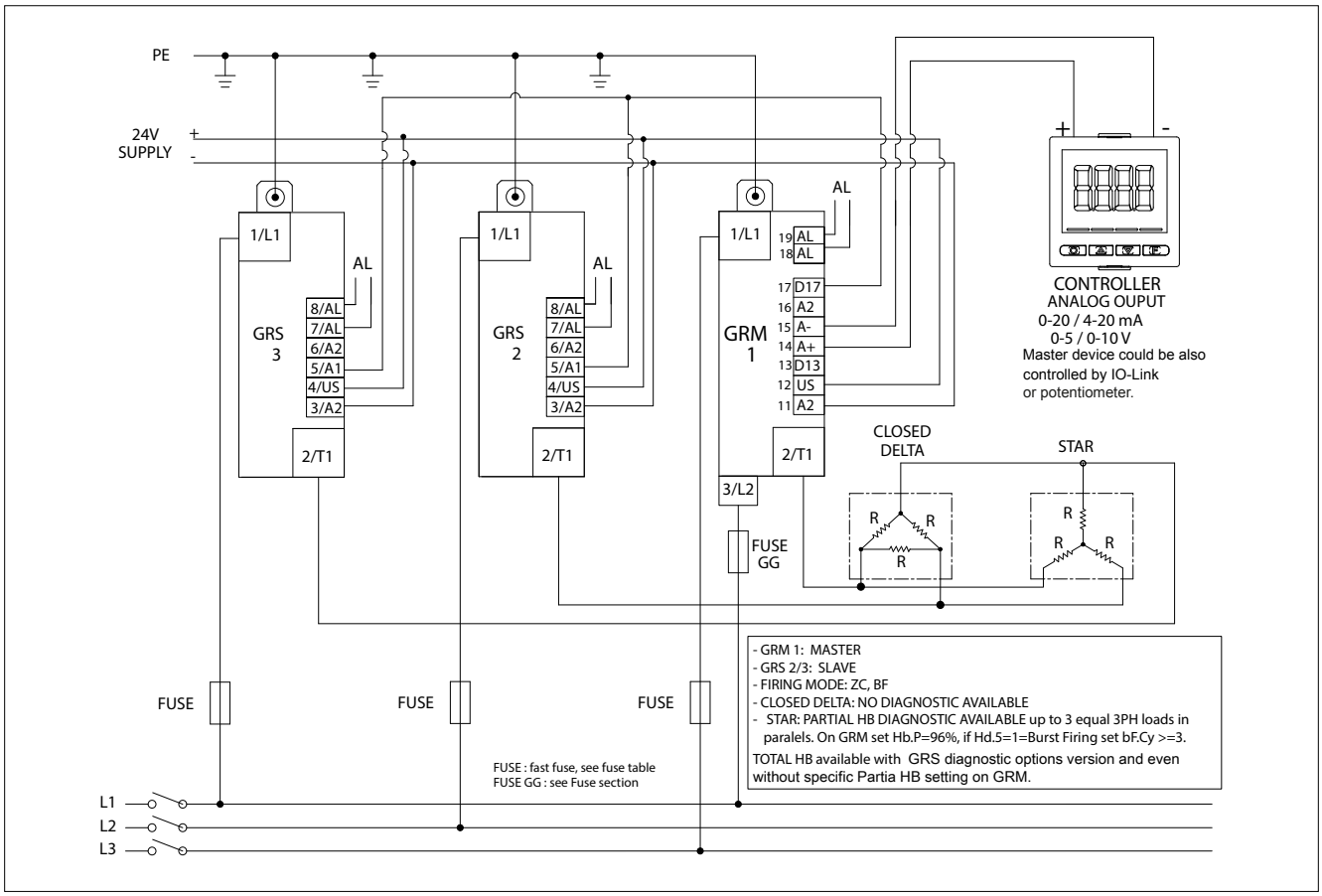
2.7.7. GRM Master + 1 GRM Slave for Star/Delta with IO-Link



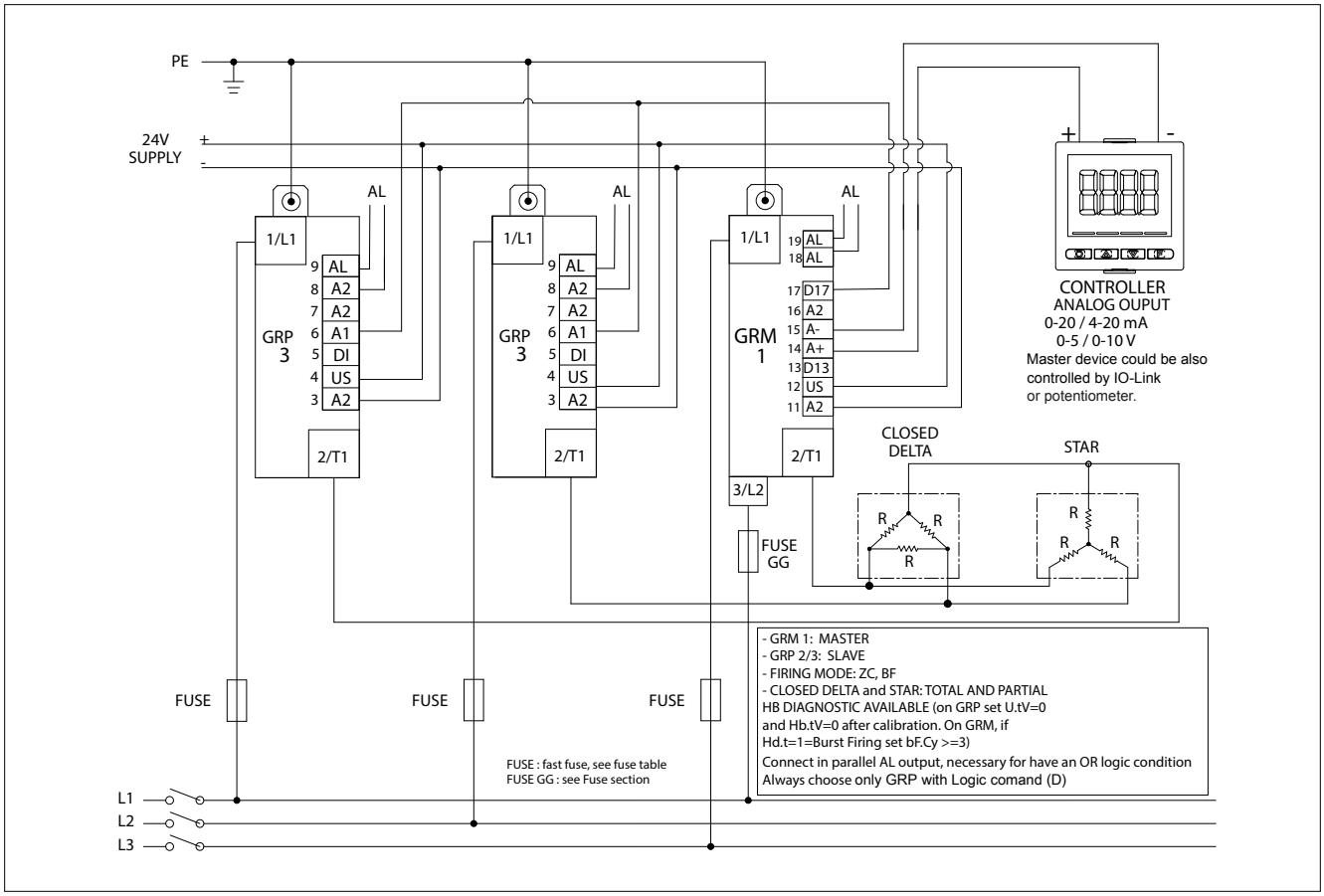
2.7.8. GRM Master + 2 GRS (GRS without diagnostic) Slave for Star/Delta



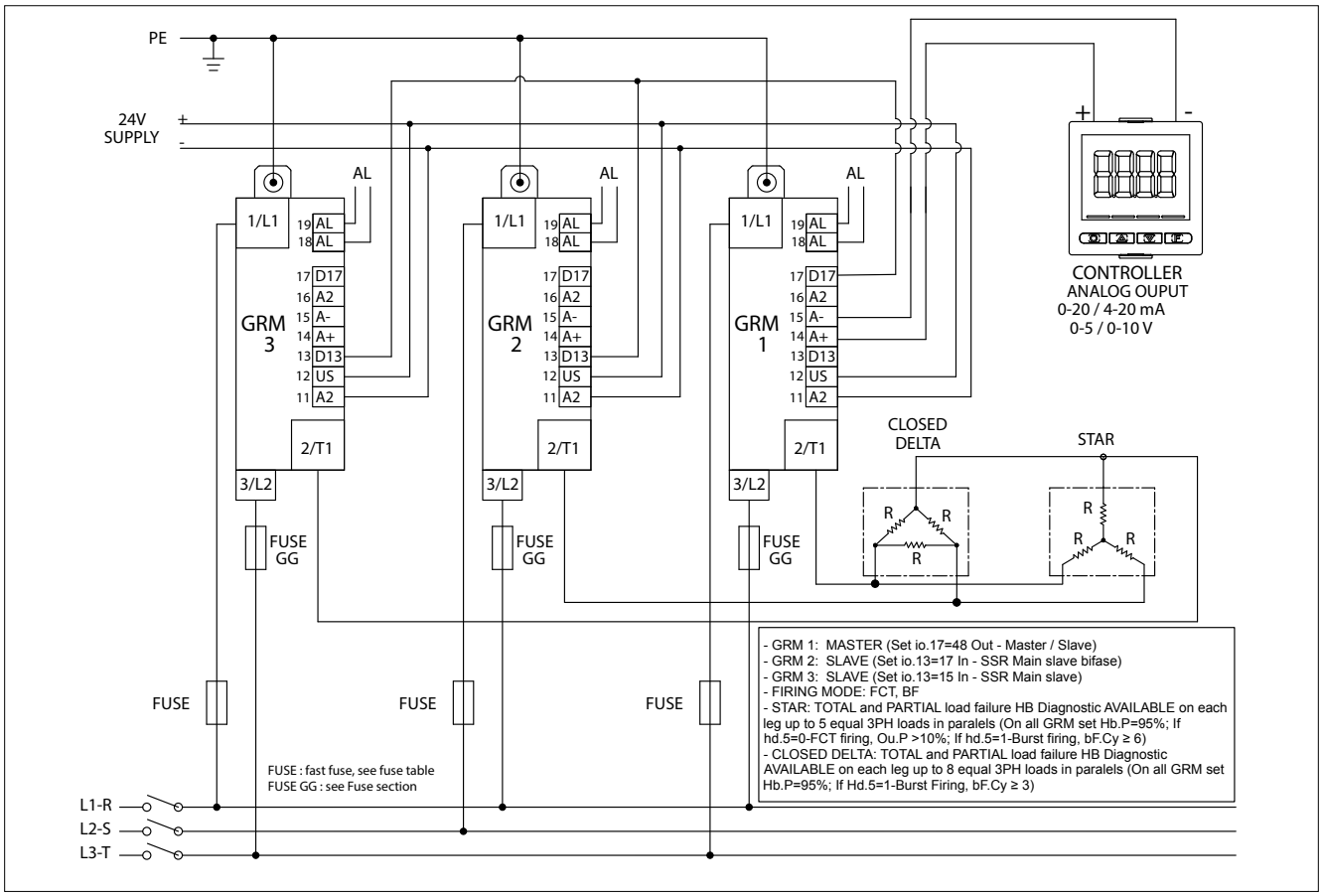
2.7.9. GRM Master + 2 GRS (GRS with diagnostic) Slave for Star/Delta



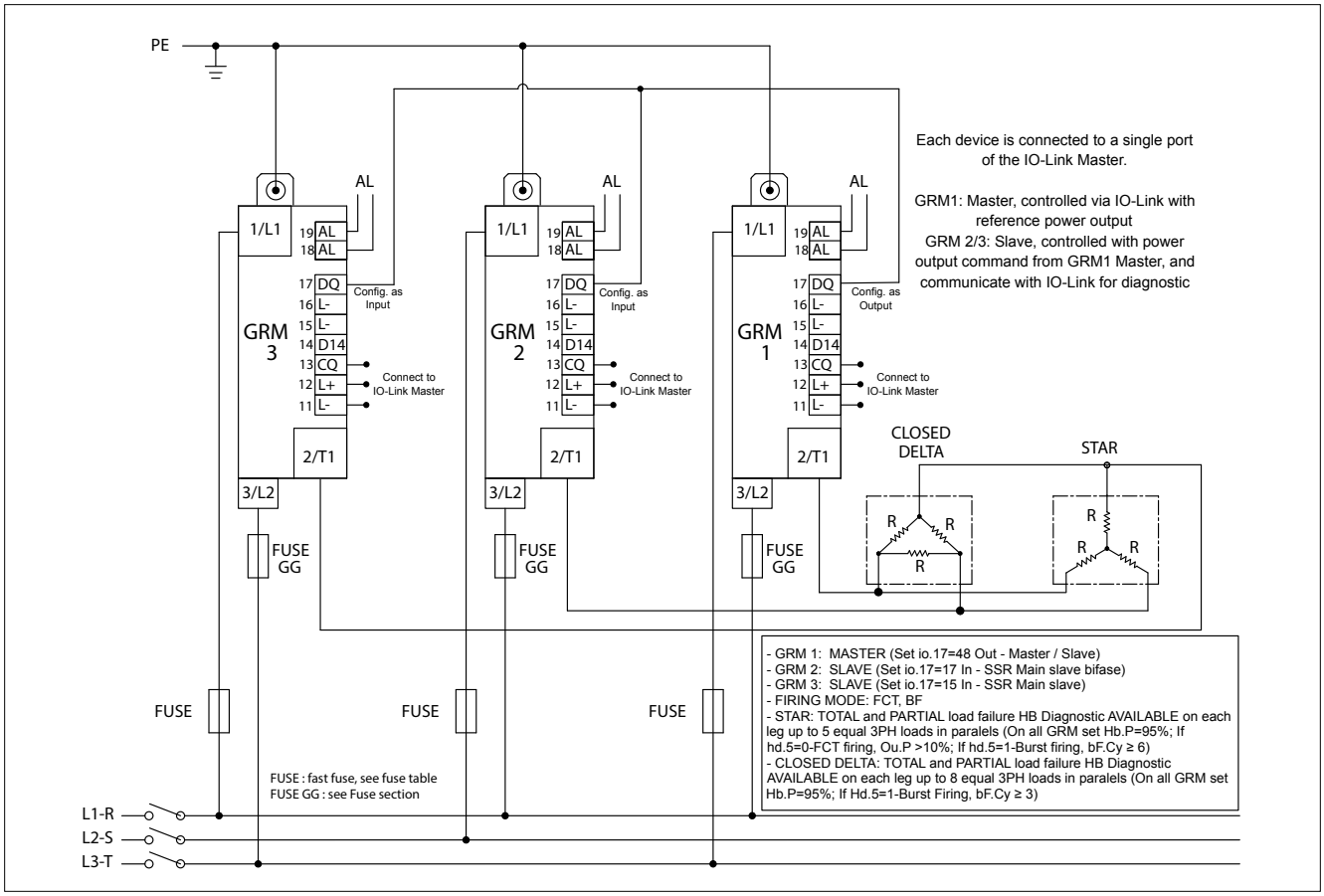
2.7.10. GRM Master + 2 GRP Slave for Star/Delta



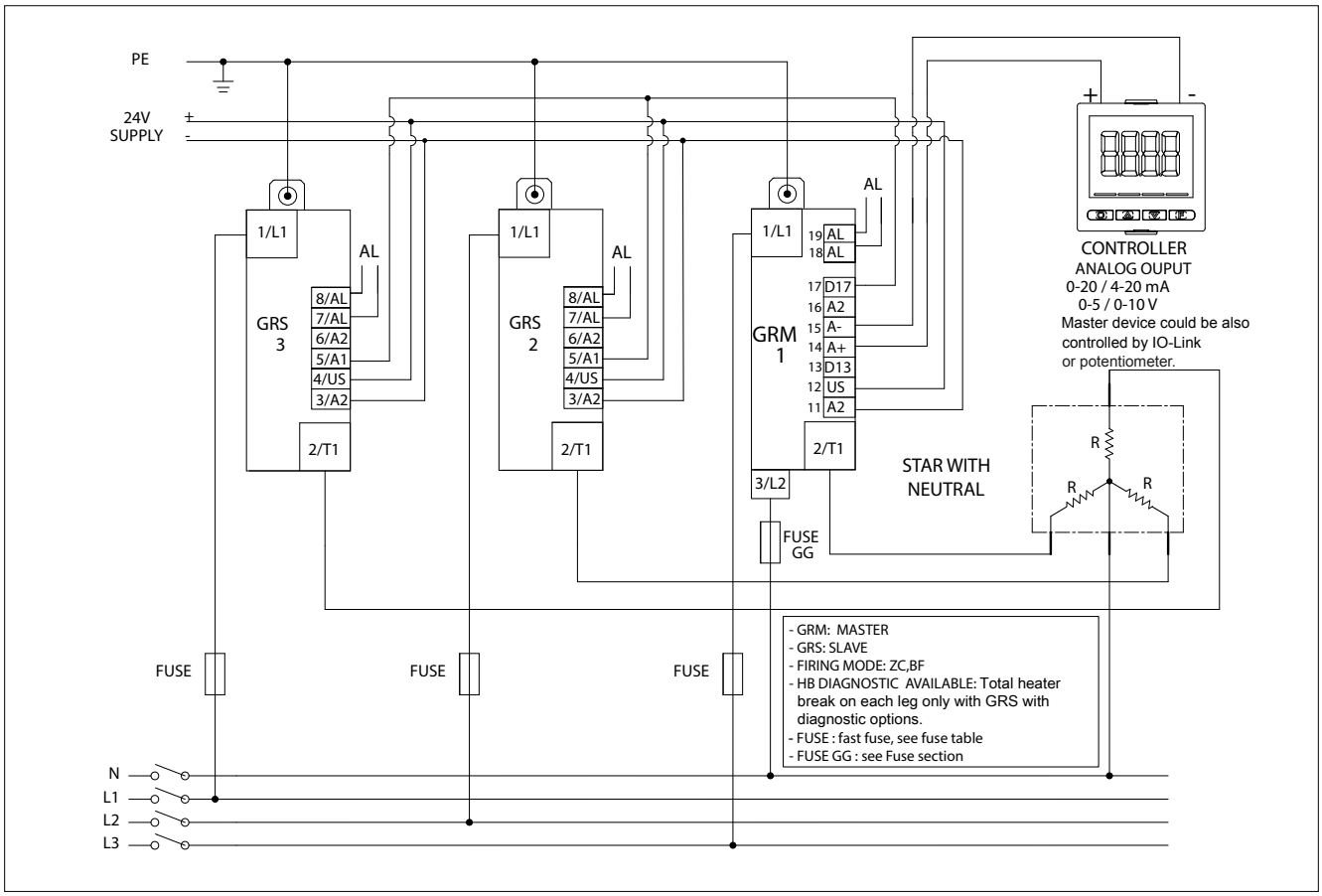
2.7.11. GRM Master + 2 GRM Slave for Star/Delta with analog control



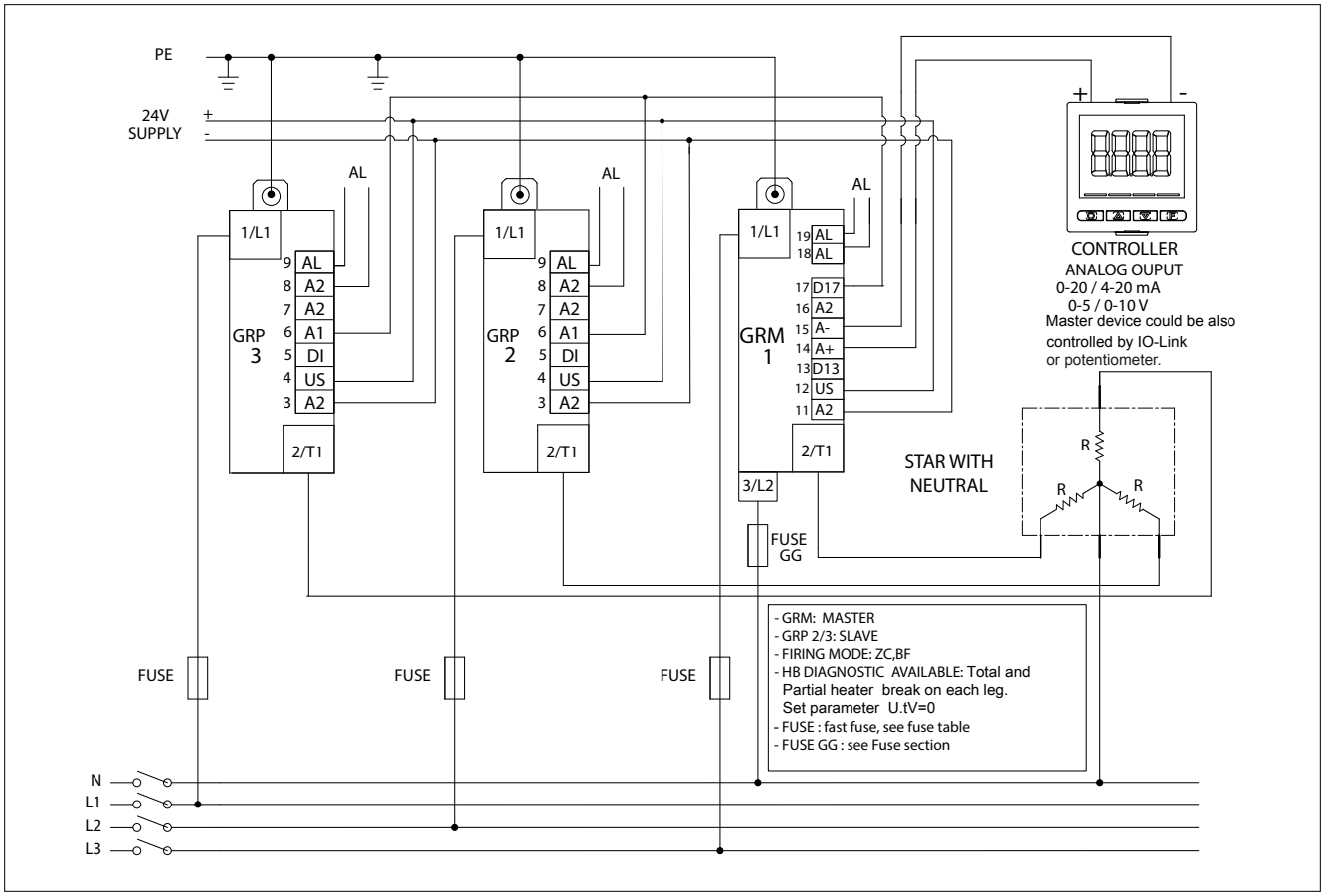
2.7.12. GRM Master + 2 GRM Slave for Star/Delta with IO-Link



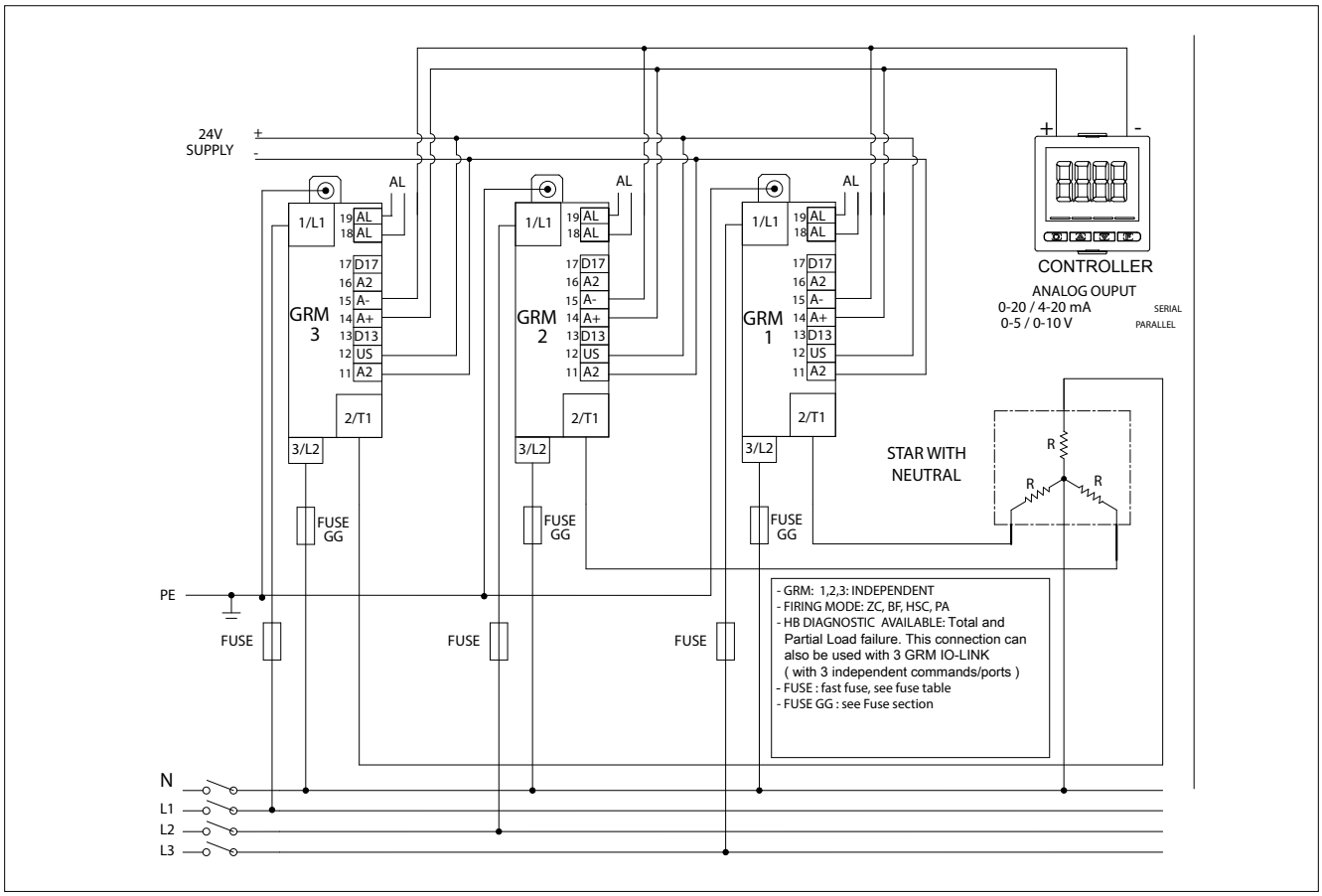
2.7.13. GRM Master + 2 GRS Slave for Star with Neutral load



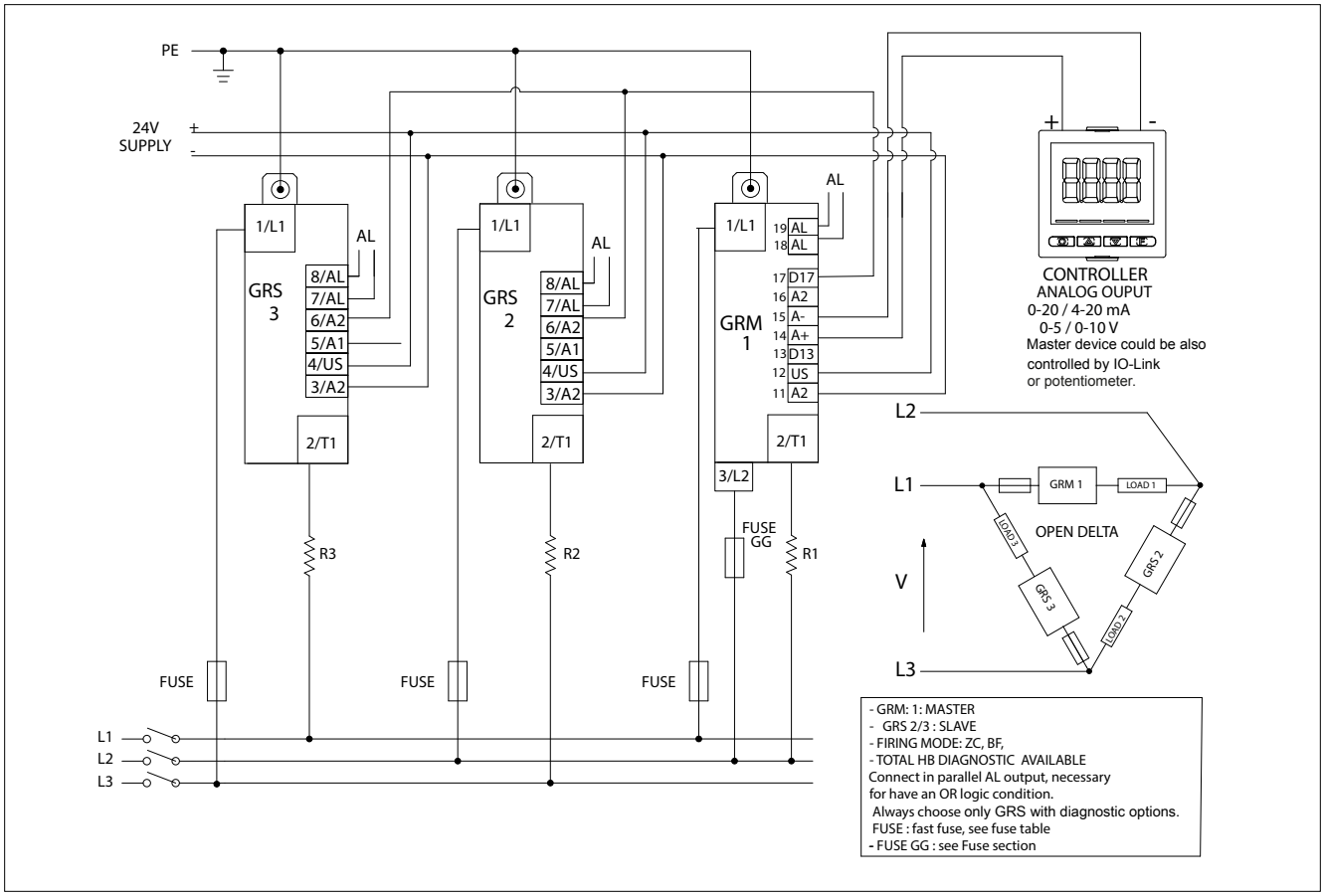
2.7.14. GRM Master + 2 GRP Slave for Star with Neutral load



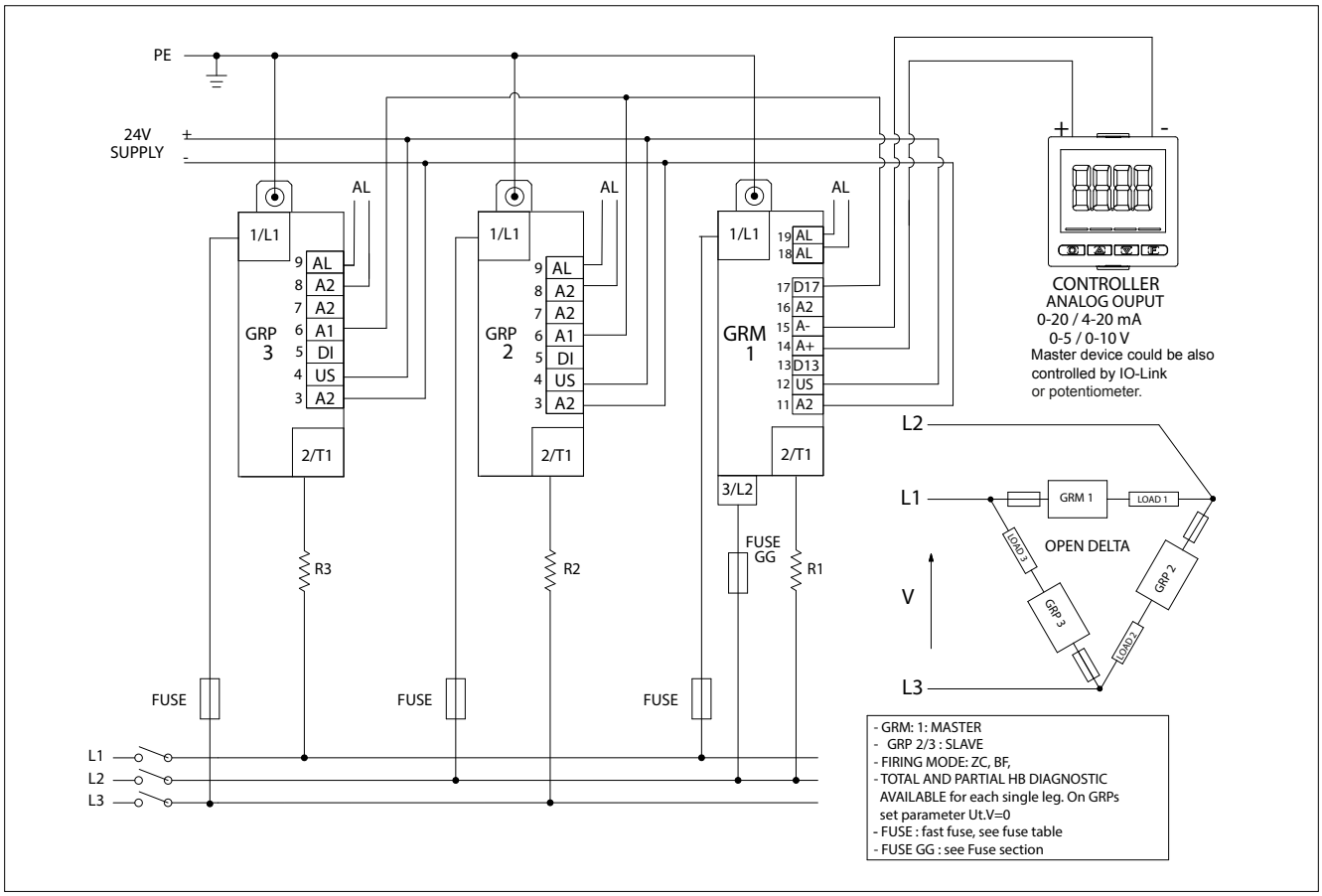
2.7.15. 3 GRM for Star with Neutral load



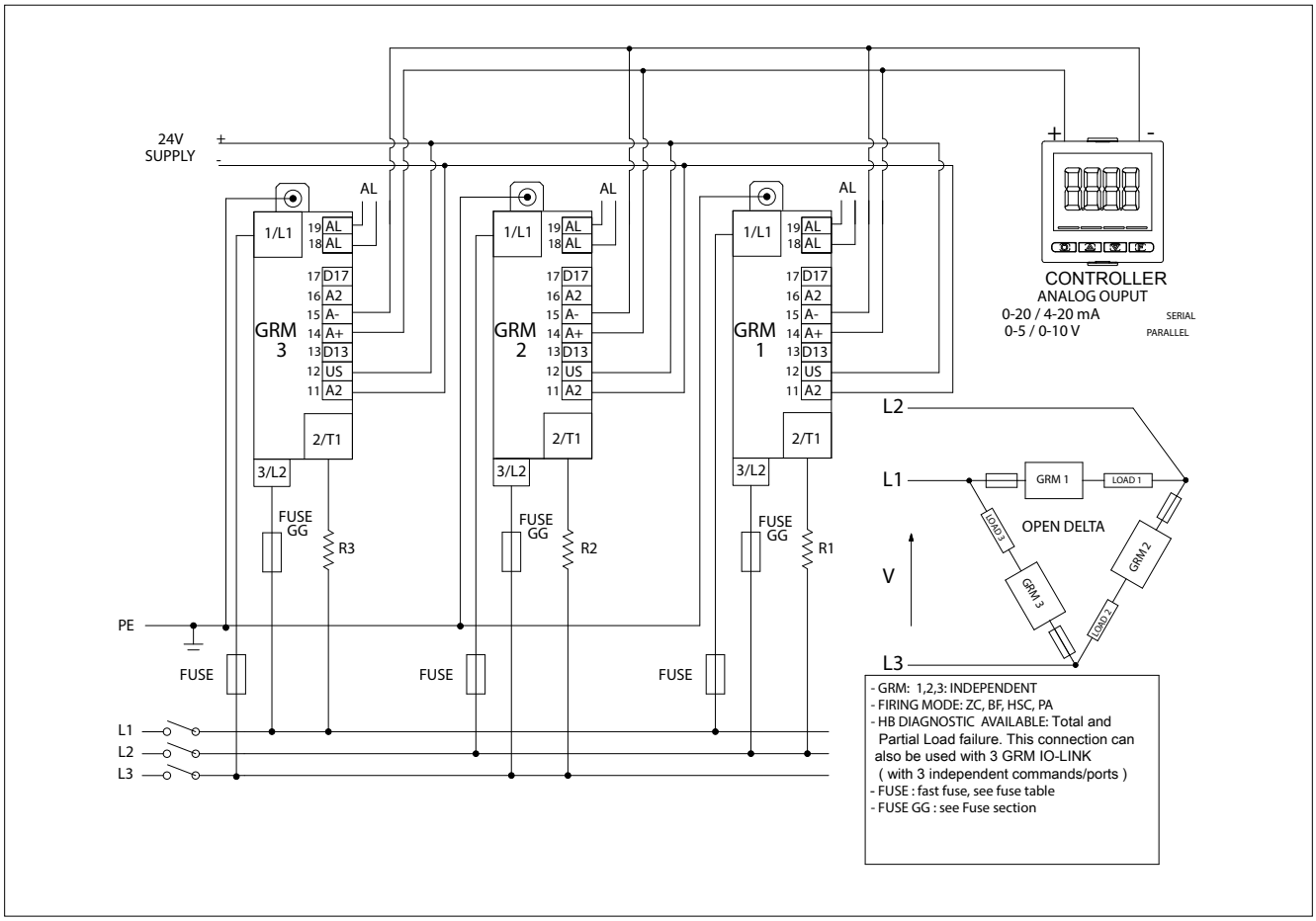
2.7.16. GRM Master + 2 GRS Slave for Open Delta load



2.7.17. GRM Master + 2 GRP Slave for Open Delta load



2.7.18. 3 GRM for Open Delta load



2.8. Terminal and conductor table

POWER TERMINALS									
Rated load current	**10A /15A**	**25A**	**30A**	**40A**	**50A**	**60A**	**75A**	**90A**	**120A**
Contact area (WxD)	10,5 x 10,7 mm								
Stripping length	13 mm								
1 Conductor section **2 Conductors section** *(minimum section)*	1 x 2.5 mm² / 2 x 1.5 mm²	1 x 6 mm² / 2 x 4 mm²		1 x 10 mm² / 2 x 6 mm²	1 x 16 mm² / 2 x 10 mm²	1 x 25 mm² / 2 x 16 mm²		35 mm²	1 x 50 mm² / 2 x 25 mm²
	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 50 mm2 /2 x 25 mm2 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 mm² / 2 x 0.1-0.75 mm²
	1 x 24-16 AWG 2 x 27-19 AWG
Stripping length	8 mm
Note: Use rigid or multiwire copper conductors (CU) 60/75°C (140/167°F)	

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

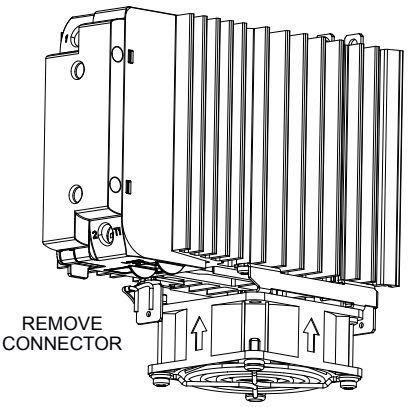
VLINE TERMINAL	
1 Conductor section **2 Conductors section**	1 x 0.2 - 2.5 mm² / 2 x 0.5 - 1.5 mm²
	1 x 24 – 12 AWG 2 x 20 - 16 AWG
Stripping length	10 mm

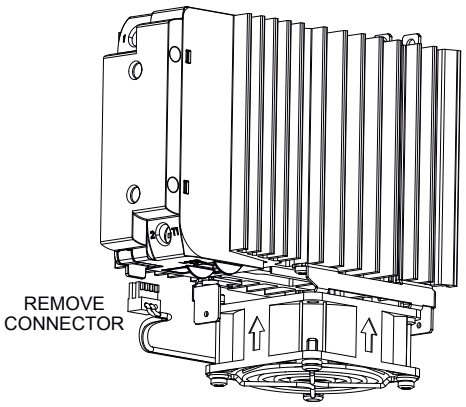
(*) It is possible to make ground connection using a copper bar suitably ground connected and fixed to the heatsink of more GRM-H.

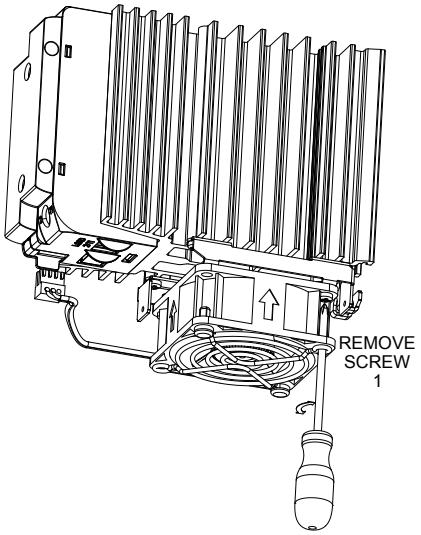
MODBUS RTU COMMUNICATION PORT CONNECTION (MR OPTION)	
Rigid/flexible / cable lug conductor cross section	
Wire section	1 x 0,2-0,5mm2
	1 x 24 - 20 AWG
Stripping length	6 mm (0.24inc)
Note: - Shield cable recommended to improve EMC disturbance immunity. - Use rigid or multiwire copper conductors (CU) 60/75°C (140/167°F)	

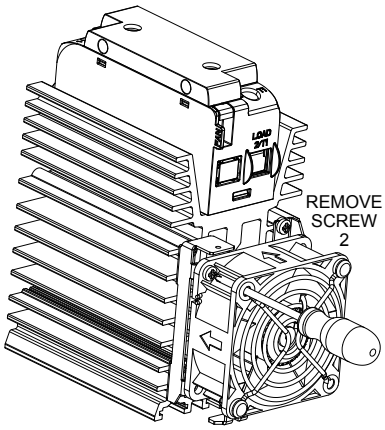
2.9. Fan maintenance

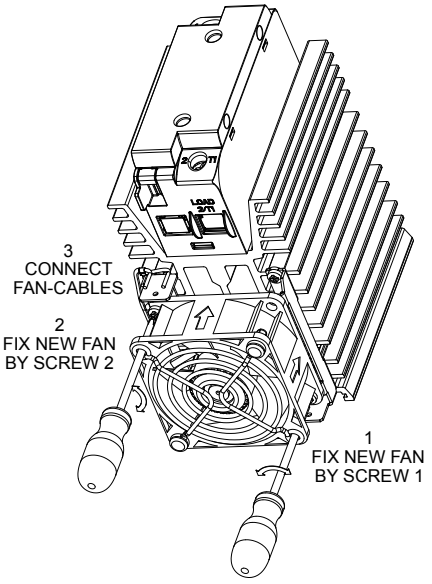
Caution: make sure that the arrow showing the direction of the air flow on the fan is pointing toward the dissipater

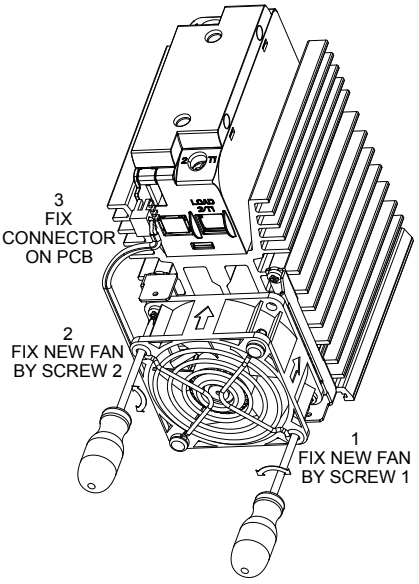












Use a Phillips screwdriver with a MAX 3.5mm diameter.

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 <- -> GRM-H), 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 **"8.5. GG fuses" on page 112**).

The NFC Dongle must be inserted into the microUSB port on the front of the device. All GRM-H devices are enabled to read and write data via NFC Dongle. The dongle can be ordered as an accessory or directly in the GRM-H 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 GRM-H memory during NFC connection. Recipes are written on a GRM-H 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 GRM-H 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 GRM-H and the information within it are protected. If the check fails, the transmitted data is ignored and the GRM-H 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 **"4. LED" on page 30**.

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”.

NOTE:
From FW 1.06 GRM-H and GRM products with IO-Link communication do not support NFC function.

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 GRM-H 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 GRM-H 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 GRM-H device so that it meets the application needs.

Caution! Before commissioning the GRM-H 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

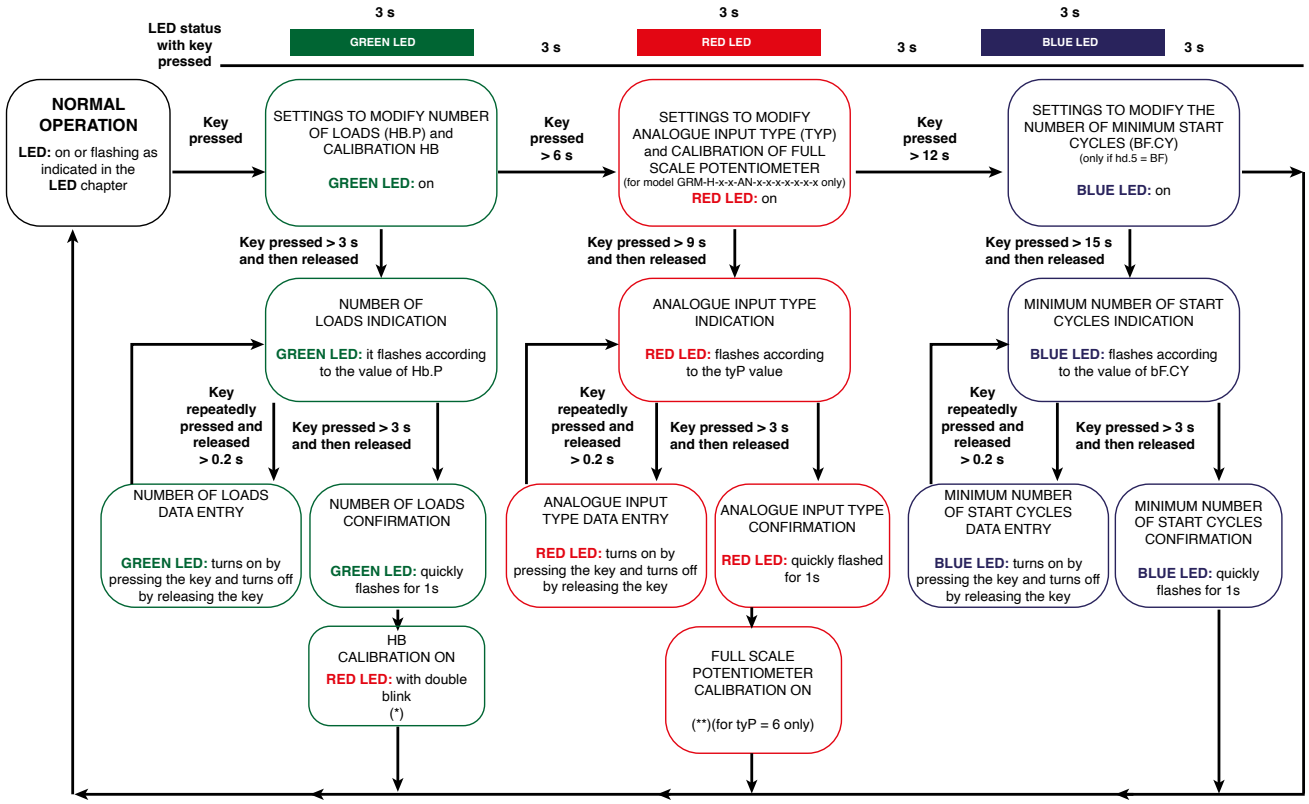
The GRM-H device can be fully configured, controlled and monitored via the IO-Link point-to-point communication protocol. The IODD files characteristic of the device can be downloaded from www.gefran.com, from the page dedicated to the GRM-H device. For details of all parameters and commands available in IO-Link, refer to section **"6. IO-Link" on page 81**

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) →"5.2.1.1. HB alarm threshold teach-in/calibration function" on page 37** on the Manual (for GRM-H-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)
- Type of analogue input (see tyP parameter) (for GRM-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
- Alarm reset SHORT_CIRCUIT_CURRENT

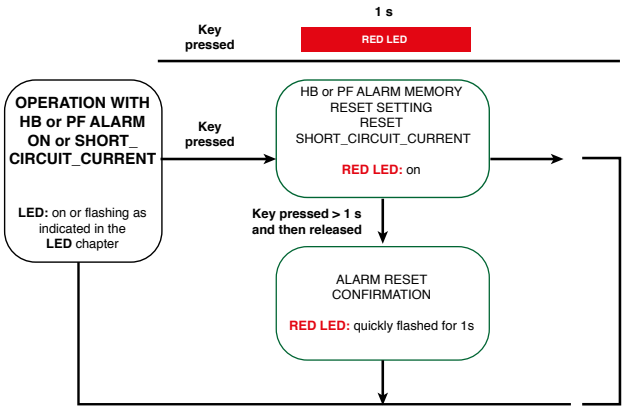
Below are the instructions to change settings via key and feedback from the front LED.
With the key released for at least 30 s (15 s if you are in the phase of indicating the setting to be modified) you return to normal operation.



* After activating the HB calibration, the device automatically activates the power output ONLY in the case of HSC / PA firing with PS.E = 3 (Softstart for IR lamps). In all other conditions the device waits for the command signal (digital ON, analog or IO-Link signal 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.

** Custom calibration of the potentiometer is useful if the potentiometer used does not reach the end of its stroke or you don't want to use it to the end of its stroke. The device will save the value read by the analog input in real-time and will save it as upper full scale with Custom calibration.
Example, if you want to manage the potentiometer input with a signal ranging from 0 to 4.5V (and not up to 5V), position the potentiometer so that it generates 4.5V.
The 4.5V value will be saved as the upper limit.
At 0V, the power delivered will be 0.0%, at 4.5V 100.0%.

In HB (Heater Break) alarm conditions with memory or PF (Power Fault) with memory or with SHORT_CIRCUIT_ CURRENT alarm active, by pressing the key according to the flow illustrated below, it is possible to reset the HB or PF alarm memory or reset the SHORT_CIRCUIT_CURRENT alarm:

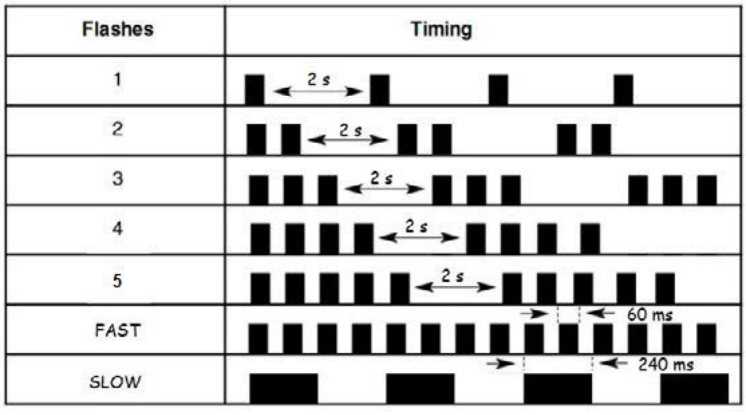


4. LED

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 28**)						
NFC connection: field detection on					■	
NFC connection: recipe processing phase received						■ fast
NFC connection: recipe saving error received						■3
Autobaud configuration in progress		■ fast				
Thermal alarm (SSR_over_heat or SSR_temperature_sensor_ broken)				■ fast		
SSR_SHORT alarm				■ slow		
ROTATION (only for Slave Bi-phase)				■ 6		
SHORT_CIRCUIT_CURRENT alarm				■ 5		
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 GRM-H-x-x-AN-x-x-x-x-x-x models
(**) Only for GRM-H-x-x-I-x-x-x-x-x-x models



5. PARAMETER DESCRIPTIONS

5.1. Inputs

5.1.1. Analog input

Available only for GRM-H-x-x-x-AN-x-x-x-x-x-x model

Settings

5.1.1.1. Analog 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 analog input.

Options:

0	Input disabled
1	0...10V
2	0...5V
3	0...20mA
4	4...20mA
5	Potentiometer
6	Potentiometer with custom calibration (*)

(*) full scale calibration only, activated by key

5.1.1.2. Analog 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

5.1.1.3. Analog 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

5.1.1.4. Analog 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					

5.1.1.5. 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 analog input signal. *min...max:* 0.0 ...20.0 s					

5.1.1.6. 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 analog 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:* 0.0...100.0 %					

Status

5.1.1.7. Analog input value (process variable)

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

5.1.1.8. Analog input status

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

Analog 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.

5.1.2. Load current value

Settings

5.1.2.1. 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 / 0.00 (**)

Current reading correction offset.
Format ###.# / ##.## (**)

min...max: -99.9 ...99.9 A / -9.99 ...9.99 A (**)
(**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model

5.1.2.2. 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

5.1.2.3. 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 / 0.00 (**)
Current reading scale minimum limit. Format ###.# / ##.## (**) (**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model					

5.1.2.4. 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.
Format ###.# / ##.## (**)
(*)

Model	Default
10 A	15.0
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

(**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model

5.1.2.5. 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. Format ###.# / ##.## (**) (**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model					

5.1.2.6. 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). Format ###.# / ##.## (**) (**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model					

5.1.2.7. 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					

5.1.3. Line voltage value

Settings

5.1.3.1. 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					

5.1.3.2. 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					

Status

5.1.3.3. 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.					

5.1.3.4. 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

5.1.3.5. 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.

5.1.3.6. Voltage reading input value

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

Filtered voltage reading value.

5.1.3.7. Mains voltage frequency

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

Mains voltage frequency.

5.1.3.8. 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)

5.1.4. Values on load

Status

5.1.4.1. RMS load current

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ld.A	Status	R	-	A	-
RMS load current. Format ###.# / ##.## (**) (**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model					

5.1.4.2. Load voltage

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

5.1.4.3. Power on load

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ld.P	Status	R	-	kW / W (**)	-
Power on load. Format ###.# / ##.## (**) (**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model					

5.1.4.4. Load impedance

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

5.1.4.5. 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.					

5.1.4.6. 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

5.1.4.7. 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
9	Ld.E1 reset
10	Ld.E2 reset

5.1.5. Key

Settings

5.1.4.8. 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 28"** you can set:

- The number of loads in parallel 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 analog input (for GRM-H-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 28"**

5.2. Alarms

5.2.1. HB (Heat Break) Alarm

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.

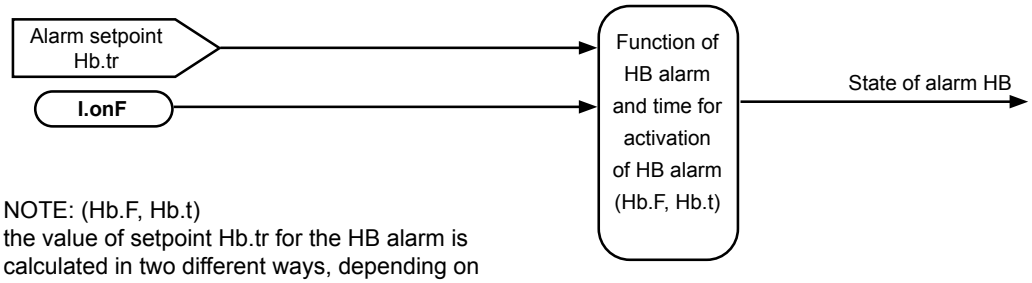
5.2.1.1. HB alarm threshold teach-in/calibration function

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 digital input, by serial command (Modbus bit 14), IO-Link, (see **Inputs → "Table 1 System command values" on page 84)** or to key (see **Inputs →"3.1.4. Key" on page 28**).
The function isn't executed during Dryout phase.
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 GRM-Hxx-AN-xxx-xx-x with digital input function set as Main SSR) or switched on with power, recommended greater than 50% (for models GRM-H-x-x- AN-x-x-x-x-x-x e GRM-H-x-x-I-x-x-x-x-x-x).
The measured current threshold will be written automatically in the A.Hb parameter.

In the case of HSC or PA mode for infrared lamps (see parameter PS.E=3) the function activates automatic power/current curve reading, useful for determining the HB alarm threshold.
Automatic reading of the power/current curve takes place in the following sequence:
- ssoftstart at maximum power (default 100%), 5 second delay;
- power reduction to 50%, 30%, 20%, 15%, 10%, 5%, 3%, 2%, 1% between each value 5 sec delay
- return to normal operation.

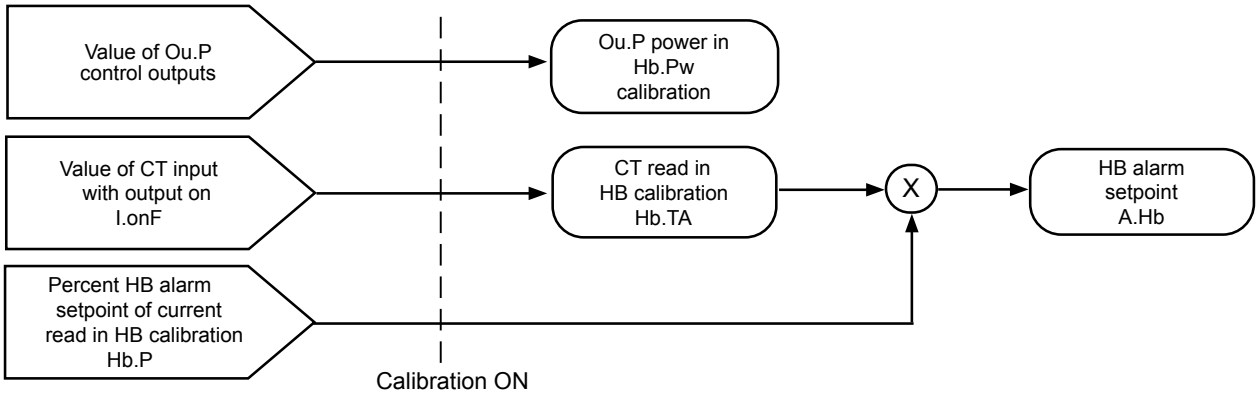
Maximum conduction value in this phase can be limited by means of the parameter Hb.Pm
In HSC mode, the HB alarm threshold teach-in function does NOT calibrate at 5%, 3%, 2%, 1% to avoid high peak currents due to low impedance for the low temperature of the IR lamp filament.

5.2.1.2. Functional diagram

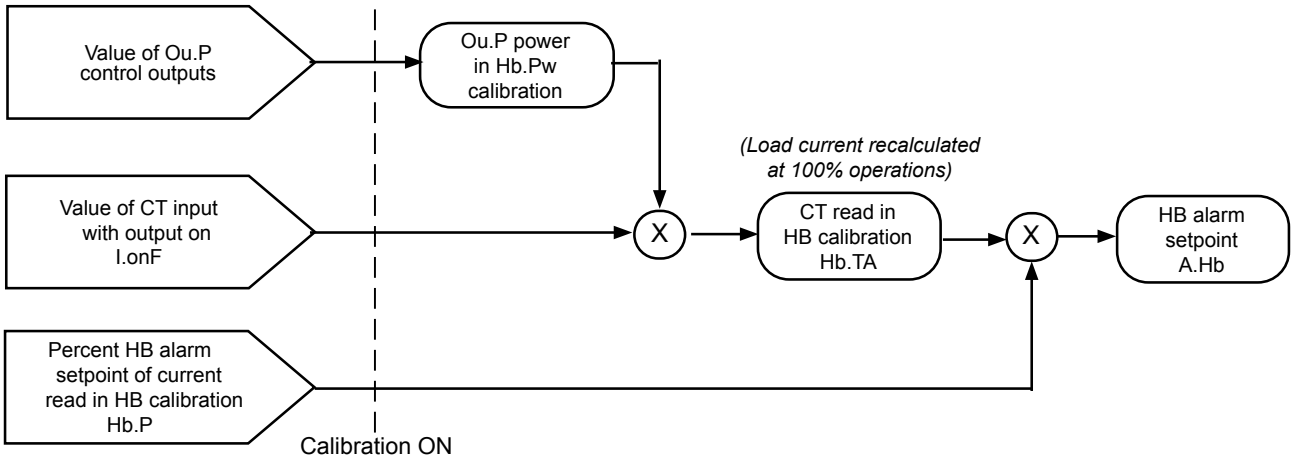


NOTE: (Hb.F, Hb.t)
the value of setpoint Hb.tr for the HB alarm is calculated in two different ways, depending on the selected function mode:
if ZC, BF, HSC mode: ..... Hb.tr = A.Hb
if PA mode: Hb.tr = A.Hb * $\sqrt{(Ou.P)}$

HB Calibration in modes FCT - BF - HSC



HB Calibration in mode PA



Settings

5.2.1.3. 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

5.2.1.4. 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, IO-Link, or restarting the device.

Options:

0	Disabled
1	Enabled

5.2.1.5. 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).

5.2.1.6. 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

5.2.1.7. HB alarm threshold

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
A.Hb	Alarms → HB Alarm	R/W	■	A	0.0 / 0.00 (**)

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)
Format ###.# / ##.## (**)
min...max: L.tA ...H.tA A
(**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model

5.2.1.8. 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
Format ###.# / ##.## (**)
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)
(**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model

5.2.1.9. 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

5.2.1.10. 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

5.2.1.11. 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

5.2.1.12. Calibration command

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

Power value read during the HB calibration procedure.

Bit	Meaning
6	HB alarm threshold calibration

5.2.1.13. 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%

5.2.1.14. 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 / 0.00 (**)

Current value read during the HB calibration procedure.
Format ###.# / ##.## (**)
(**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model

5.2.1.15. 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.

5.2.1.16. 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.

5.2.1.17. Current reading in HB calibration for IR lamps

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ir.tA.0	Alarms → HB Alarm	R/W	■	A	0.0 / 0.00 (**)
Ir.tA.1	Alarms → HB Alarm	R/W	■	A	0.0 / 0.00 (**)
Ir.tA.2	Alarms → HB Alarm	R/W	■	A	0.0 / 0.00 (**)
Ir.tA.3	Alarms → HB Alarm	R/W	■	A	0.0 / 0.00 (**)
Ir.tA.4	Alarms → HB Alarm	R/W	■	A	0.0 / 0.00 (**)
Ir.tA.5	Alarms → HB Alarm	R/W	■	A	0.0 / 0.00 (**)
Ir.tA.6	Alarms → HB Alarm	R/W	■	A	0.0 / 0.00 (**)
Ir.tA.7	Alarms → HB Alarm	R/W	■	A	0.0 / 0.00 (**)
Ir.tA.8	Alarms → HB Alarm	R/W	■	A	0.0 / 0.00 (**)
Ir.tA.9	Alarms → HB Alarm	R/W	■	A	0.0 / 0.00 (**)
Current value read during the HB calibration procedure for IR lamps (settable via parameter PS.E = 3) with output power at 100% (Ir.tA.0), 50% (Ir.tA.1), 30 % (Ir.tA.2), 20% (Ir.tA.3), 15% (Ir.tA.4), 10% (Ir. tA.5), 5% (Ir.tA.6), 3 % (Ir.tA.7), 2% (Ir.tA.8), 1% (Ir.tA.9). NOTES - Maximum conduction value can be limited by means of the parameter Hb.Pm - The values at 5%, 3%, 2%, 1% are acquired only for hd.5 = 3 = PA trigger Format ###.# / ##.## (**) (**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model					

5.2.1.18. Voltage reading in HB calibration for IR lamps

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Ir.tV.0	Alarms → HB Alarm	R/W	■	V	0.0
Ir.tV.1	Alarms → HB Alarm	R/W	■	V	0.0
Ir.tV.2	Alarms → HB Alarm	R/W	■	V	0.0
Ir.tV.3	Alarms → HB Alarm	R/W	■	V	0.0
Ir.tV.4	Alarms → HB Alarm	R/W	■	V	0.0
Ir.tV.5	Alarms → HB Alarm	R/W	■	V	0.0
Ir.tV.6	Alarms → HB Alarm	R/W	■	V	0.0
Ir.tV.7	Alarms → HB Alarm	R/W	■	V	0.0
Ir.tV.8	Alarms → HB Alarm	R/W	■	V	0.0
Ir.tV.9	Alarms → HB Alarm	R/W	■	V	0.0
Voltage value read during the HB calibration procedure for IR lamps (settable via parameter PS.E = 3) with output power at 100% (Ir.tV.0), 50% (Ir.tV.1), 30 % (Ir.tV.2), 20% (Ir.tV.3), 15% (Ir.tV.4), 10% (Ir. tV.5), 5% (Ir.tV.6), 3 % (Ir.tV.7), 2% (Ir.tV.8), 1% (Ir.tV.9). NOTES - Maximum conduction value can be limited by means of the parameter Hb.Pm - The values at 5%, 3%, 2%, 1% are acquired only for hd.5 = 3 = PA trigger					

5.2.1.19. Max HB IR Calibration power

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Hb.Pm	Alarms → HB Alarm	R/W	■	%	100.0
Maximum power during HB calibration (for IR lamps only)					

Commands

5.2.1.20. 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
3	Reset allarmi SSR_SHORT / NO_VOLTAGE / NO_CURRENT / **AL.HB**

5.2.2. Allarme di Power Faut

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 < 4% product current size, e.g. for GRM-H-25-x-x-0-x-x-x-x-x the alarm is triggered with load current lower than 1A.

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

Alarms are reset during the Softstart ramp-up phase, including those with memory.

Settings

5.2.2.1. 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**

5.2.2.2. 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

5.2.2.3. 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

5.2.2.4. 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

5.2.2.5. 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

Commands

5.2.2.6. 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
3	Reset allarmi SSR_ SHORT / NO_VOLTAGE / NO_CURRENT / **AL.HB**

5.2.3. 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

5.2.3.1. SSR temperature

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

5.2.3.2. SSR temperature derivative

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

5.2.3.3. 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

5.2.4. SHORT_CIRCUIT_CURRENT alarm

The SHORT_CIRCUIT_CURRENT alarm trips when the peak current on the load exceeds the maximum valueallowed during the softstart ramp or at first power-on (with the softstart ramp disabled).
If configured (parameter Fr.n other than zero), the device restarts automatically in softstart for a maximum Fr.n number of attempts, beyond which it remains off awaiting manual reset via the front key or via the command via serial or IO-Link.

The number of trips to switch off the overcurrent protection device is shown in FO.c1 and FO.c2.
FO.c1 and FO.c2 are updated 30 s after a successful restart.
The FO.c1 count can be reset by command via serial or IO-Link.

The SHORT_CIRCUIT_CURRENT alarm is disabled for IR lamps (see parameter PS.E).

5.2.4.1. Number of restarts in case of SHORT_CIRCUIT_CURRENT

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Fr.n	Controls	R/W	■	-	0
The parameter sets the number of automatic restarts in case of SHORT_CIRCUIT_CURRENT alarm. min...max: 0…20					

5.3. Inputs/Outputs

5.2.4.2. Function for pin13 input/output

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
io.13	Inputs/Outputs	R/W	■		1

Function for input or reference for output relative to pin13 (for GRM-Hxx-AN-xx-xx-xxx models only). In the case of potentiometer input, digital input 1 operations have no effect and the terminal on the connector is used as the potentiometer power supply output.

Options:

Value	Function	Notes
0	I/O disabled	
1	In - HB calibration	Rising edge
2	In – Feedback Calibration	Rising edge
3	In – Software OFF	In=1: Software Off , In=0: Software On
4	IN - HB and PF alarm memory reset	In=1: Alarms reset, In=0: Normal alarm status
5	In – Dryout restart	Rising edge
6	In – Dryout end	Rising edge
14	In – MAN/AUTO control	In=1: MAN, In=0: Auto
15	In – SSR Main (slave)	In=1: SSR ON, In=0: SSR OFF
16	In – PMW Control (Ou.P)	See parameter PWM.t and PWM.f
17	In - SSR Main (slave bi-phase)	In=1:SSR ON, In=0: SSR OFF
32	Out – HB or PF alarms	
33	Out – HB alarm	
34	Out – PF alarms	
35	Out - SSR overtemperature	
36	Out – HB or PF alarms or Overtemperature	
37	Out – HB alarm or SSR overtemperature	
38	Out – PF alarms or SSR overtemperature	
39	Out – Dryout status	
40	Out – Communication error	
47	Out – POT Power	Forced to 47 if tyP=5 or 6

5.2.4.3. Pin 13 input/output type

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
io.13.t	Inputs/Outputs	R/W	■		0

Pin 13 input/output type (for GRM-H-x-x-AN-x-x-x-x-x-x-x models only).

Options:

0	Direct (if output, normally off)
1	Reverse (if output, normally on)

5.2.4.4. Function for pin14 input

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
i.14	Inputs/Outputs	R/W	■		0

Function for input relative to pin14 (for GRM-H-x-x-I-x-x-x-x-x-x models only).

Options:

Value	Function	Notes
0	Digital input off	
1	HB calibration	Rising edge
2	Feedback calibration	Rising edge
3	Software OFF	In=1: Software Off , In=0: Software On
4	HB and PF alarm memory reset	In=1: Alarms reset, In=0: Normal alarm status
5	Dryout restart	Rising edge
6	Dryout end	Rising edge

5.2.4.5. Pin 14 input type

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
i.14.t	Inputs/Outputs	R/W	■		0

Tipologia dell’ingresso pin 14 (solo per modelli GRM-H-x-x-I-x-x-x-x-x-x).

Options:

0	Direct
1	Reverse

5.2.4.6. Function for pin17 input/output

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
io.17	Inputs/Outputs	R/W	■		48

Function for input or reference for output relative to pin17.

Options:

Value	Function	Notes
0	I/O disabled	
1	In - HB calibration	Rising edge
2	In – Feedback Calibration	Rising edge
3	In – Software OFF	In=1: Software Off , In=0: Software On
4	IN - HB and PF alarm memory reset	In=1: Alarms reset, In=0: Normal alarm status
5	In – Dryout restart	Rising edge
6	In – Dryout end	Rising edge
14	In – MAN/AUTO control	In=1: MAN, In=0: Auto
15	In – SSR Main (slave)	In=1: SSR ON, In=0: SSR OFF
17	In - SSR Main (slave bi-phase)	In=1:SSR ON, In=0: SSR OFF
32	Out – HB or PF alarms	
33	Out – HB alarm	
34	Out – PF alarms	
35	Out - SSR overtemperature	
36	Out – HB or PF alarms or SSR overtemperature	
37	Out – HB alarm or SSR overtemperature	
38	Out – PF alarms or SSR overtemperature	
39	Out – Dryout status	
40	Out – Communication error	
48	Out – Master/Slave output	Signal retransmission for 2PH and 3PH to other SSRs

5.2.4.7. Pin 17 input/output type

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
io.17.t	Inputs/Outputs	R/W	■		0

Pin 17 input/output type.

Options:

0	Direct (if output, normally off)
1	Reverse (if output, normally on)

5.2.4.8. Function for pin19 output

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
o.19	Inputs/Outputs	R/W	■		36

Reference for output relative to pin19.

Options:

Value	Function
0	Output disabled
32	HB or PF alarms
33	HB alarm
34	PF alarms
35	SSR overtemperature
36	HB or PF alarms or SSR overtemperature
37	HB alarm or SSR overtemperature
38	PF alarms or SSR overtemperature
39	Dryout status
40	Communication error

5.2.4.9. Pin 19 output type

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
o.19.t	Inputs/Outputs	R/W	■		0

Pin 19 output type.

Options:

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

5.2.4.10. PWM input timeout

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
PWM.t	Inputs/Outputs	R/W	■	s	1.00

The parameter sets the timeout time relative to the digital input configured with PWM function.
NOTE:
If the digital input is used to control the power % (Ou.P) to be delivered on the load (PWM input function), it is important to set the Timeout parameter PWm.t to a value equal to or greater than the period of the PWM control signal used, in order to guarantee a reaction time even in static conditions of low (Ou.P = 0%) or high (Ou.P = 100%) input.

min...max: 0.01 ...10.00 s

5.2.4.11. Digital filter for PWM input

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
PWM.F	Inputs/Outputs	R/W	■	s	0.1
The parameter sets the time of the low pass filter on the digital PWM input signal. min...max: 0.0 20.0 s					

Status

5.2.4.12. Digital input status

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

Status read by the digital inputs.

Bit	Meaning
0	Status dIG.13
1	Status dIG.14
2	Status dIG.17

5.2.4.13. Status outputs

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

State of the outputs.

Bit	Meaning
0	State Out.SSr (Main)
1	State Out.17
2	State Out.19
3	State Out.13

5.4. Counters

5.4.4.1. 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.					

5.4.4.2. 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.					

5.4.4.3. 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
11	Hb.c1 count reset

5.4.4.4. 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 **(resettable)**. The counters are saved in the retentive memory every hour and when the line voltage is switched off.					

5.4.4.5. 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.					

5.4.4.6. 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
12	SH.c1 count reset

5.4.4.7. SHORT_CIRCUIT_CURRENT event counter 1

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
FO.c1	Counters	R	■	-	0
SHORT_CIRCUIT_CURRENT event counter 1 **(resettable)**.					

5.4.4.8. SHORT_CIRCUIT_CURRENT event counter 2

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
FO.c2	Counters	R	■	-	0
SHORT_CIRCUIT_CURRENT event counter 2 **(not resettable)**.					

5.4.4.9. Counter reset

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

SHORT_CIRCUIT_CURRENT counter 1 reset command.

Bit	Meaning
7	FO.c1 count reset

5.4.4.10. 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.					

5.4.4.11. 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.					

5.4.4.12. 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
8	Maximum value reset Ntc.SSR.Max1

5.4.4.13. Number of hours of SSR operation

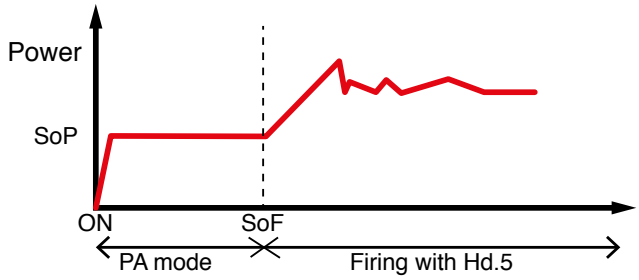
Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
OH.c	Counters	R	■	h	0
Number of device operating hours with SSR on (digital input present or POWER > 0). The counters are saved in the retentive memory every hour and when the line voltage is switched off.					

5.5. Controls

5.5.1. Dryout

For GRM-H-x-x-x-AC-x-x-x-x-x and GRM-Hx-x-x-FB-x-x-x-x-x models only.

The DryOut function allows for load drying for a time dry.t at constant power dry.P delivered with PA firing mode, regardless of the value set in hd.5.



The option is enabled with the dry.E parameter.
The drying phase is entered at the time of power-ON or ON-Software of the instrument.

Once the dry.P power supply in PA mode has been completed, it switches to the firing required by hd.5 and to the power managed automatically/manually (without ramps).
The drying phase ends with total execution for the set dry.t time, but can be completed earlier with:
-DRYOUT_END command (available as digital input or via serial or IO-LINK)
-manual override;
These conditions, in addition to ending the drying phase, inhibit the execution of the procedure.
Dryout will not run until there is another power-ON or ON-Software, unless specifically called up by DRYOUT_RESTART.
With this command, the Dryout phase restarts if there are no conditions that inhibit it.
As long as the instrument remains in the Dryout phase, it is indicated in the DRYOUT_STATUS state.
It is also possible to associate the signal to attribute it to the physical outputs.
If the softstart ramp is enabled, the time taken to run the ramp is included in the Dryout time.

5.5.1.1. Dryout enable

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

Enable Dryout function.

Options:

0	Disabled
1	Enabled

5.5.1.2. Dryout time

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Dry.t	Controls	R/W	■	min	0.0

Duration of the Dryout phase.

min...max: 0.0 500.0 min

5.5.1.3. Dryout power

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

Power delivered during the Dryout phase.

Attention! by setting a value > 0.0 the device provides power even in the absence of an Analog/ IO-LINK command

min...max: 0.0 100.0 %

Commands

5.5.1.4. Dryout phase restart command

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

Forcing command to restart the Dryout phase.

bit	Meaning
13	Ripartenza Dryout

5.5.1.5. Dryout phase end command

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

Forcing command to end of the Dryout phase.

bit	Meaning
14	Fine Dryout

Status

5.5.1.6. Dryout phase status

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
STATUS3	Expert → Status → Diagnostics	R/W	-	-	0

Dryout phase status.

bit	Meaning
14	Dryout status

5.5.1.7. 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 GRM-H-x-x-AN-x-x-x-x-x-x-x models is activated in the absence of the Modbus serial communication while in the GRM-H-x-x-I-x-x-x-x-x-x-x models in the absence of IO-Link communication

Options:

0	Disabled
1	Power is forced to C.E.P.
2	The power is forced to C.E.P. and copied to Man.P (*)

(*) In GRM-H-x-x-I-x-x-x-x-x-x-x models, it is not copied to Man.P.

5.5.1.8. 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

5.5.1.9. 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 %

5.5.1.10. ìInductive load on

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

Inductive load control on..

Options:

0	Disabled
1	Enabled

5.5.1.11. Start modes

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
P.On.t	Controls	R/W	■	-	0

This parameter sets the mode in which the device turns on when power is supplied.
(for GRM-H-x-x-AN-x-x-x-x-x models only).

Options:

0	Controller operations resume with the same modes as the last state (STATUS) prior to shutdown. (*)
1	Software OFF
2	Software ON

(*) The status of the digital inputs set as "Software Off" always has priority.

GRM-H-x-x-I-x-x-x-x-x-x models always turn on in ON software and in manual status).

5.5.1.12. Manual power saving

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Man.L	Controls	R/W	■	-	0

Man.P manual power saving enabled for reset at power on
(for GRM-H-x-x-AN-x-x-x-x-x-x models only).

Options:

0	Disabled
1	Enabled

GRM-H-x-x-I-x-x-x-x-x-x models do not store manual power.

5.5.1.13. Automatic/Manual status and ON/OFF software

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

Device status to set Automatic/Manual mode and ON/OFF software.

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

When switched on, the following is set:
- GRM-H-x-x-AN-x-x-x-x-x-x models: Automatic/Manual mode and software ON/OFF according to the P.On.t. parameter. Normally the power value to be supplied is selected from the analog input value or from the digital input status set as PWM. In case of digital input set as direct command to the SSR, the status of the SSR output is selected by the status of the command input. It is possible to switch to Manual mode to deliver the power value from the Man.P. parameter.

- GRM-H-x-x-I-x-x-x-x-x-x models: Manual mode and software ON: the power value to be delivered is selected from the value of the Man.P. parameter. If you switch to Automatic mode, a fixed power value = 0.0 % is delivered.

(*)

Model	Default
GRM-H-x-x-AN-x-x-x-x-x-x	0
GRM-H -x-x-I-x-x-x-x-x-x	16

5.5.1.14. Auto/Manual and ON/OFF software status only reading

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

Auto/Manual and ON/OFF software status only reading.

bit	Meaning
13	ON (0) / OFF (1)
14	Automatic (0) / Manual (1)

5.5.1.15. 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%

5.5.1.16. 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.					

5.6. Power control

5.6.1.1. Trigger modes

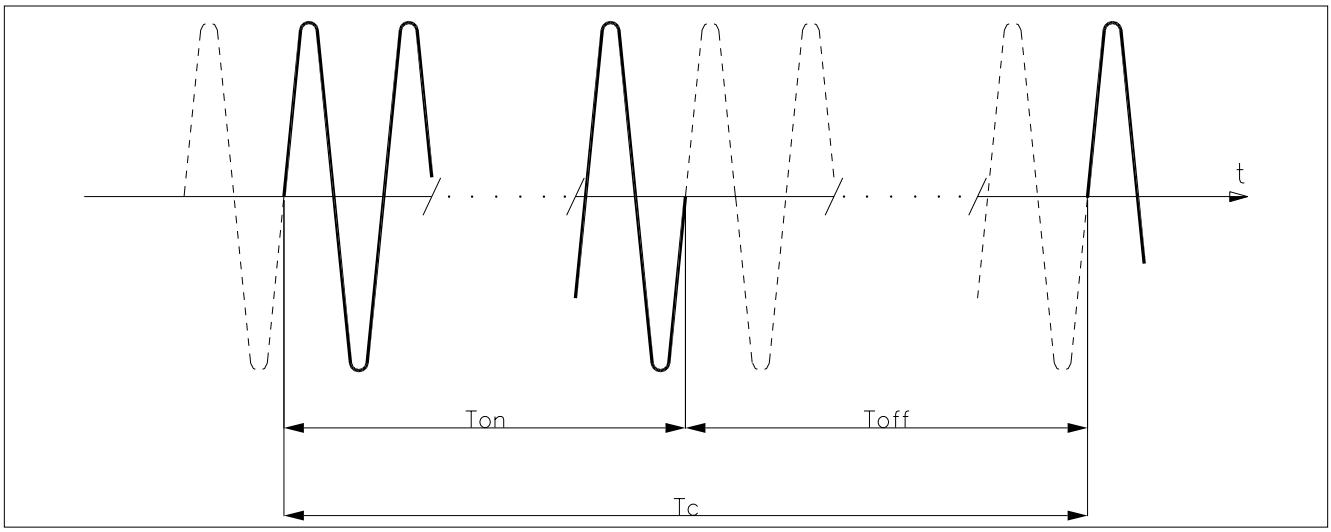
In power control, the GRM-H provides the following modes:

- modulation by varying the number of operating cycles with "zero crossing" (ZC, BF, HSC mode)
- triggering
- modulation by changing the phase angle (PA mode)

"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.



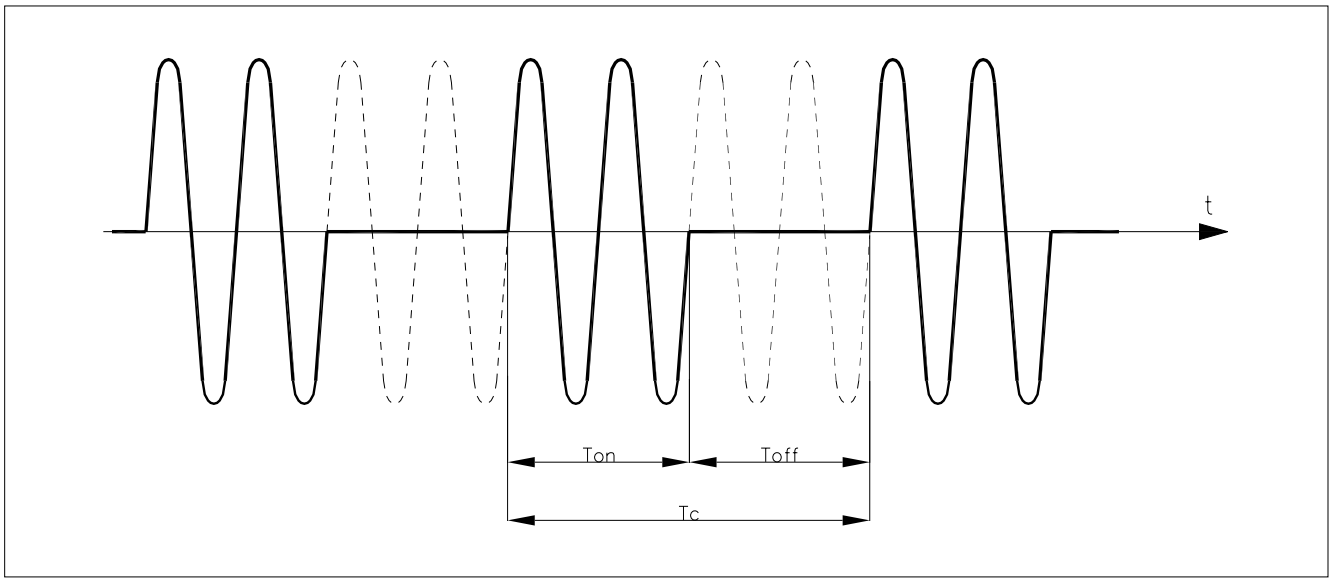
For example if Tc = 10sec, if 20% power value we will have operating for 2 sec (100 operating cycles @ 50Hz) and non-operating for 8 sec (400 non-operating cycles @ 50Hz).

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).

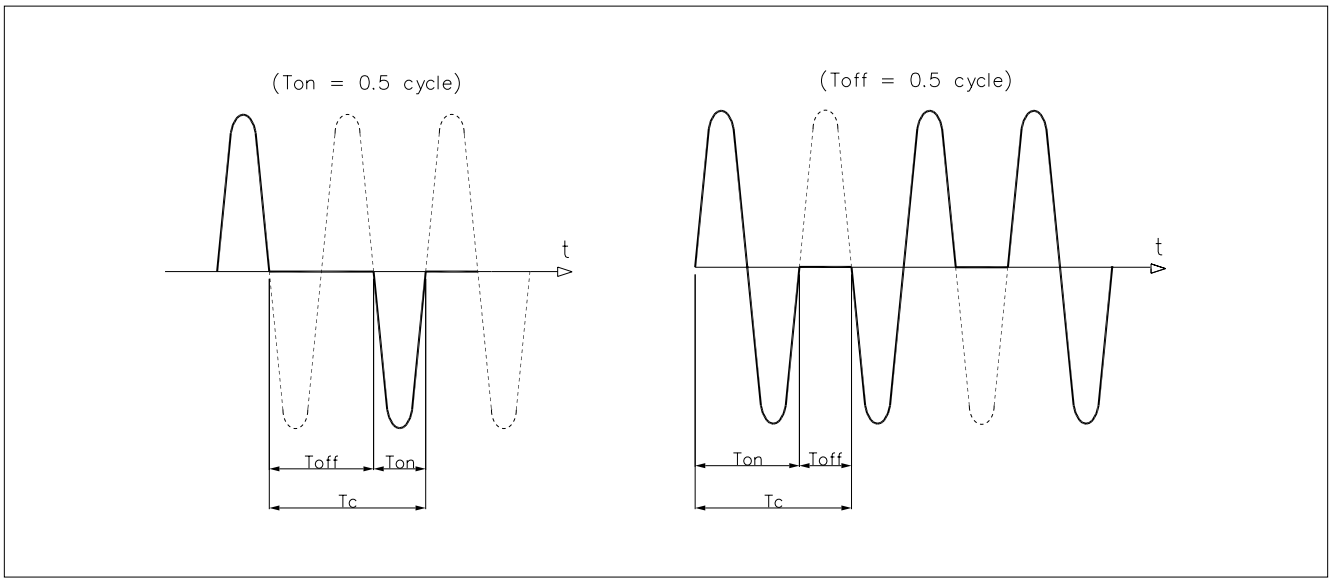
The parameter bF.Cy defines the minimum number of operating cycles, which can be set from 1 to 10.



Example of operation in BF mode at 50% power

In the example shown in the figure, this parameter is = 2.

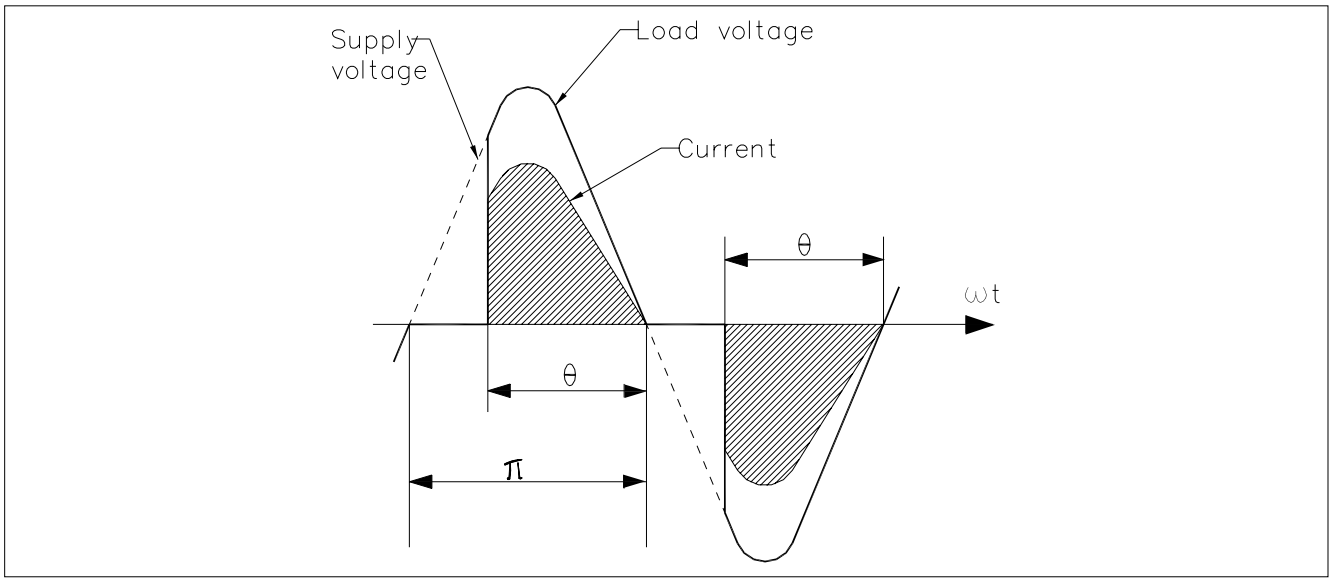
HSC Half single cycle
This mode corresponds to Burst Firing, which handles on/off semi-cycles.
It is useful to reduce the flickering of the filaments with short / medium wave IR lamp loads, with such loads, to limit the steady state current with low power, it is useful to set a minimum power limit (e.g.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



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

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

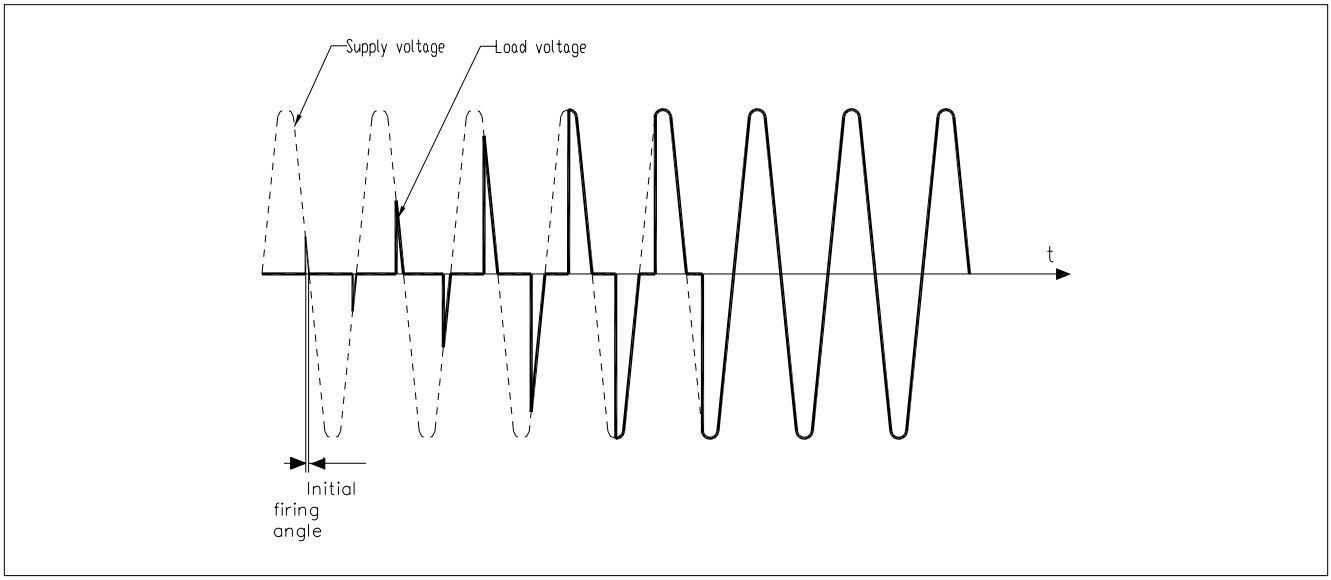
Example:
if the power to be transferred to the load is 100%, θ = 180°, or if the power to be transferred to the load is 50%, θ = 90°



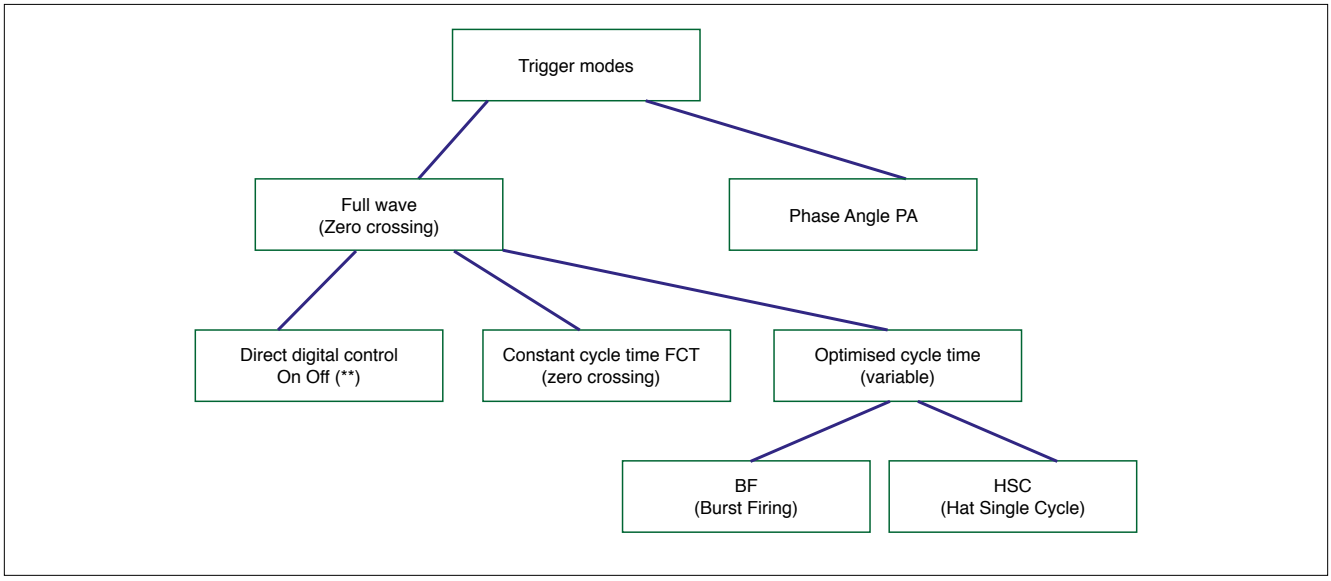
Resistive load

5.6.1.3. 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



5.6.1.4. Trigger modes

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
hd.5	Power Control	R/W	■	-	1

Trigger mode selection.

Options:

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

5.6.1.5. 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

5.6.1.6. 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

5.6.1. Soft start ramp settings

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 analog 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).

5.6.1.1. 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	Ramp disabled
1	Ramp enabled (linear in angle)
2	Ramp enabled (linear in power)
3	Ramp enabled (for IR lamps)

5.6.1.2. 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

5.6.1.3. 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

5.6.1.4. Enabling softstart at shutdown

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
PS.S.E	Power Control	R/W	■	-	0

Enabling softstart ramp at shutdown in ON/OFF software switching.

Options:

0	Shutdown ramp disabled
1	Shutdown ramp enabled

Status

5.6.1.5. 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

5.6.2. Current limit settings

For GRM-H-x-x-x-AC-x-x-x-x-x and GRM-Hx-x-x-FB-x-x-x-x-x models only
It is possible to limit the peak current during the softstart ramp or the RMS current during steady state operations (when any softstart ramp is finished).

5.6.2.1. Peak current limiter during softstart

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Cu.S.E	Power Control	R/W	■	-	0

Peak current limitation enabled during the softstart phase.

Options:

0	Disabled
1	Enabled

5.6.2.2. Maximum peak current during softstart

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
PS.tA	Power Control	R/W	■	A peak	(*)

Maximum peak current during softstart
min...max: 0.0 ... 999.9 A peak
Format ###.# / ##.## (**)
(*)

Model	Default
10 A	21.00
15 A	35.0
25 A 25I A	55.0
30 A 30I A	70.0
40 A	85.0
50 A	110.0
60 A	140.0
75 A	170.0
90 A	210.0
120 A	280.0

(**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model

5.6.2.3. RMS steady state current control

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Cu.F.E	Power Control	R/W	■	-	0

RMS current limit enabled in steady state.

Options:

0	Disabled
1	Enabled

5.6.2.4. Maximum RMS current at steady state

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Fu.tA	Power Control	R/W	■	A	(*)

The parameter sets the maximum limit of the RMS current at steady state.
The default value depends on the size of the controller:
Format ###.# / ##.## (**)
min...max: 0.0 ... 999.9 A
(*)

Model	Default
10 A	21.00
15 A	15.0
25 A 25I A	25.0
30 A 30I A	30.0
40 A	40.0
50 A	50.0
60 A	60.0
75 A	75.0
90 A	90.0
120 A	120.0

(**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model

5.6.3. Triggering delay settings (triggering delay)

Triggering delay is a function that inserts a trigger delay on the first cycle with inductive loads in start modes ZC and BF. The startup delay is expressed in degrees and can be set in the dL.t parameter).

5.6.3.1. Enable triggering delay

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
dL.E	Power Control	R/W	■	-	0

Enable triggering delay.

Options:

0	Disabled
1	Enabled

5.6.3.2. Triggering delay

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
dL.t	Power Control	R/W	■	°	60

Triggering delay

min...max: 0 ... 90 °

5.6.3.3. Minimum non-conduction time to reactivate triggering delay

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
dL.oF	Power Control	R/W	■	ms	5
Minimum non-conduction time to reactivate triggering delay. min...max: 0 ... 10000 ms					

5.6.3.4. Minimum trigger power

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Lo.P	Power Control	R/W	■	%	0.0
Minimum output power for triggering. Below this % power value, the device does not deliver power. min...max: 0.0 ... 50.0 %					

5.6.3.5. Control output gradient

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
G.Out	Power Control	R/W	■	%/s	0.0
Gradient for the control output, i.e., how quickly the final value is reached. The gradient is defined as a percentage increment per second in relation to the final value to be achieved. Set the parameter to 0 to disable the gradient. min...max: 0.0 ... 200.0 % Example: By setting the gradient to 50%/s the Ou.P output is not implemented instantaneously but gradually. If the power goes from 0% to 100%, actuation occurs in a linear ramp of 2 seconds duration.					

5.6.4. Feedback mode

The GRM-H offers the following possibilities to control power through feedback:
•V voltage;
• V2 Quadratic voltage;
• I Current;
• I2 Quadratic current;
• P Power.
• Z Impedance
Enabling of the control mode is set via parameter hd.6

Voltage feedback (V)
This is used to maintain a constant load voltage. It compensates possible variations in line voltage from the rated voltage (value stored in the parameter riF.V, expressed in Vrms).
The voltage value maintained on the load is equal to the result of the formula

rif.V × (Ou.P [%] / 100)

and is contained in parameter Fb.r1.

Quadratic voltage feedback (V^2)
This is used to maintain a constant load voltage. It compensates possible variations in line voltage from the rated voltage (value stored in the parameter riF.V, expressed in Vrms).
The voltage value maintained on the load is equal to the result of the formula

rif.V × sqrt(Ou.P [%] / 100)

and is contained in parameter Fb.r1.

Current feedback (I)
This is used to maintain a constant load current. It compensates possible variations in line voltage and/or load impedance with respect to the rated current (value stored in the riF.I parameter, expressed in Arms).
The current value maintained on the load is equal to the result of the formula

rif.A × (Ou.P [%] / 100)

and is contained in parameter Fb.r1.

Quadratic current feedback (I^2)
This is used to maintain a constant load current. It compensates possible variations in line voltage and/or load impedance with respect to the rated current (value stored in the riF.I parameter, expressed in Arms).
The current value maintained on the load is equal to the result of the formula

rif.A × sqrt(Ou.P [%] / 100)

and is contained in parameter Fb.r1.

Power feedback (P)
This is used to keep the load power constant. It compensates possible variations in line voltage and/or load impedance with respect to the rated power (value stored in riF.P, expressed in kWatts).
The power value maintained on the load is equal to the result of the formula

rif.P × (Ou.P [%] / 100)

and is contained in parameter Fb.r2 or Fb.r0 (**).

Impedance Feedback (Z)
This is used to keep the load impedance constant. It compensates possible variations in line impedance with respect to the rated impedance (value stored in riF.P, expressed in ohm).
The impedance value maintained on the load is equal to the result of the formula

rif.I × (Ou.P [%] / 100)

and is contained in parameter Fb.r2.

IMPORTANT!
Feedback calibration can be activated by digital input or by serial command (Modbus bit 15) or IO-Link.

If required, calibration MUST only be activated after first setting parameter hd.6 = 0 and preferably under conditions of maximum power on the load (e.g., Ou.P [%] at 100%).
Only after calibration has been carried out can the parameter hd.6 be set to the desired value.

If the operating mode is changed (PA, ZC, BF, HSC), the feedback calibration procedure outlined above must be repeated.

For non-linear loads (e.g. Super Kanthal or Silicon Carbide type) the automatic calibration procedure IS NOT NEEDED
but the value of parameters riF.V, riF.I, riF.P must be set directly based on the rated specification of the load shown in the data sheet

(**) Only GRM-H-10-x-x-x-x-x-x-x High Accuracy model

5.6.4.1. Enabling feedback mode

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
hd.6	Power Control	R/W	■	-	0

The parameter sets enabling of the feedback mode.

Options:

0	**No feedback enabled**
1	V2 (quadratic voltage feedback)
2	I2 (quadratic current feedback)
3	P (power feedback)
4	Z (impedance feedback)
5	V (linear voltage feedback)
6	I (linear current feedback)

5.6.4.2. Voltage feedback reference

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
riF.V	Power Control	R/W	■	V	0.0

The parameter sets the voltage feedback reference.

min...max: 0.0 ...999.9 V

5.6.4.3. Current feedback reference

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
riF.A	Power Control	R/W	■	A	0.0 / 0.00 (**)

The parameter sets the current feedback reference.
Format ###.# / ##.## (**)
min...max: 0.0 ...999.9 A
(**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model

5.6.4.4. Power feedback reference

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
riF.P	Power Control	R/W	■	kW / W (**)	0.00

The parameter sets the power feedback reference.
Format ###.# / ##.## (**)
min...max: 0.00 ...150.00 kW
(**) Only GRM-H-10-x-x-x-x-x-x-x-x High Accuracy model

5.6.4.5. Impedance feedback reference

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
riF.I	Power Control	R/W	■	ohm	0.00
The parameter sets the power feedback reference. min...max: 0.00 ...650.00 ohm					

5.6.4.6. Feedback response speed

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Fb.It	Power Control	R/W	■	%/60ms	0.3
The parameter sets the feedback response speed. Speed is expressed as a percent change of output power calculated every 60 ms. min...max: 0.1 ...5.0 %/60ms					

Calibration

5.6.4.7. Feedback calibration command

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

Feedback calibration command.

Bit	Meaning
5	Feedback calibration

Status

5.6.4.8. Feedback reference

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Fb.r	Power Control	R/W	-	-	0
Feedback reference. The same value is reported in two distinct parameters Fb.r1 and Fbr2 represented with 1 or 2 decimal points Fb.r1 reference with 1 decimal point: for voltage or current feedback Fb.r2 reference with 2 decimal points: for power or impedance feedback					

5.6.4.9. Power correction for feedback

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Fb.c	Power Control	R/W	-	%	0.0
The parameter shows the power correction due to feedback..					

5.7. Hardware and Software Information

5.7.4.1. Software version

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

5.7.4.2. Manufacturer identifier

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

5.7.4.3. Model identifier

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

5.7.4.4. 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					

5.7.4.5. 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)					

5.7.4.6. 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

5.7.4.7. Hardware card recognition

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

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

Parameters that depend on the order code

5.7.4.8. 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

5.7.4.9. 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)
1	Advanced control option (Dryout function and current limitation)
2	Advanced control option + Feedback

6. IO-LINK

6.1. IO-Link

The power controller GRM (-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 power controller GRM) 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

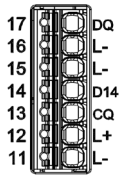
The IO-Link standard requires the use of a description file called IODD (IO Device Description).
This file allows the correct identification of the device and the interpretation of the data sent and exchanged with the master. Please consult the Gefran website to download the IODD files.

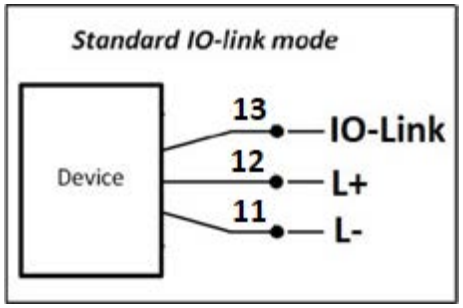
6.2. IO-LINK INSTALLATION AND ELECTRICAL CONNECTIONS

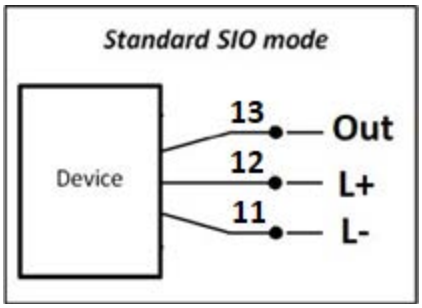
6.2.1. Electrical installation

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

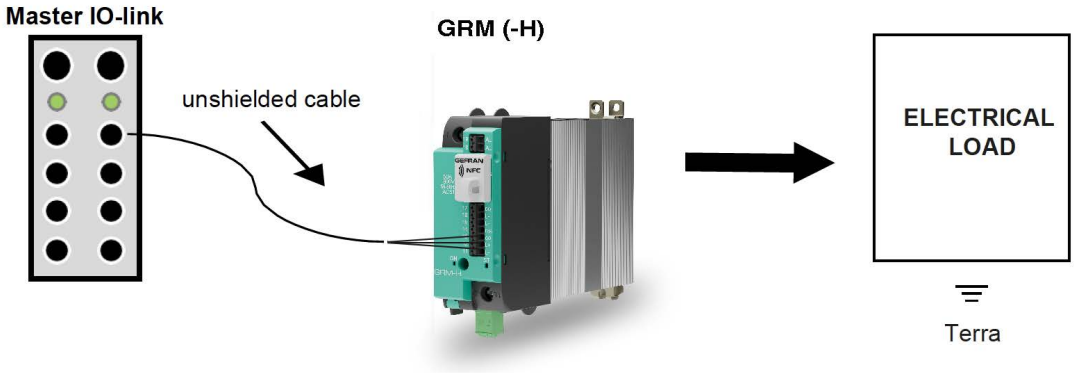
- CQ (IO-Link / Out) = digital communication pin or digital output (IO-Link or SIO mode)
- L + = Power supply + (rated 24 Vdc)
- L- = Power supply - (0 Vdc)
- 2 poles are instead dedicated to a PNP type digital alarm output. This can be intercepted by the IO-Link master itself (if digital inputs are 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 **"5.2. Alarms" on page 39** and **"5.3. Inputs/Outputs" on page 51**)
- L- = Power supply - (0 Vdc) (common to pin 3)

Push-in connector	IO-Link Output	
	17	DQ
	16	L-
	15	
	13	CQ (IO-Link / Out)
	12	L+
	11	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).



6.3. CONTROL MODE

6.3.1. 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 byte)	14 bytes
Process data output length (2 byte)	2 Bytes
Min cycle time	20ms
SIO mode	Supported
ISDU	Supported
Database	Supported

6.3.2. SIO mode and IO-Link mode

The power controller supports both SIO mode and IO-Link mode.
In SIO mode the static group behaves like an actuator: the status of the HB alarm is available on pin 13.
In **IO-Link** mode the power controller communicates with a standard IO-Link master on pin 13 of the push-in connector.
Pins 14,17,18/19 str available as a configurable auxiliary alarm outputs (see chapters Alarms and Outputs) or as auxiliary input.
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 13/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).

6.3.3. 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 15= Not used Bit 14= STATUS2_AUTO_MAN Bit 13= STATUS2_ON_OFF Bit 6..12= (*) 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 15= Not used Bit 14=STATUS3_DRYOUT Bit 13=STATUS3_CURRENT_SENSOR_BROKEN Bit 9...11= Not used Bit 8=STATUS3_OVER_RMS_CURRENT Bit 7=STATUS3_OVER_PEAK_CURRENT Bit 6=STATUS3_SHORT_CIRCUIT_CURRENT Bit 5=STATUS3_60HZ Bit 4=STATUS3_FREQUENCY_WARNING Bit 3=STATUS3_SOFTSTART_END Bit 2=STATUS3_SOFTSTART_ACTIVE 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)
Bit 6...12 internal use reserved

(**) 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 power controller GRM 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%).

6.3.4. Setting data

This paragraph includes the list and explanation of the relevant parameters available for the power controller GRM, 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			Command	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
0xAA	-	W	W	TeachFeedback	UInt8	Feedback calibration
0xAB	-	W	W	ResetNtcSSRMax1	UInt8	Resets the value of Ntc.SSR.Max1
0xAC	-	W	W	RestartDryout	UInt8	Restart Dryout
0xAD	-	W	W	EndDryout	UInt8	End Dryout
0xAE	-	W	W	ResetShortCircuitCurrent	UInt8	Clears the SHORT_CIRCUIT_CURRENT alarm state
0xAF	-	W	W	RestorePartialConfiguration	Uint8	Reset settings to default value - Deep reset that requires power to be turned back on
0xB0	-	W	W	ResetFoc1	UInt8	Resets the value of FO.c1
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	GRM-120-48-I-1-x-x-x-x-x	Full product description
0x0013	0x00	ProductID	RO	RO	RO	12	String	GRM-xxxxxxxxx	Model type
0x0014	0x00	ProductText	RO	RO	RO	Max30	String	Single-phase Power controller	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	1.0	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	*** (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	*** (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
0x8CAA	SHORT_CIRCUIT_ CURRENT alarm	Warning	Maintenance required	SHORT_CIRCUIT_ CURRENT 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 0.01 (**)	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 0.01 (**)	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	1 (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, 2, 3	1	0	-	Softstart ramp 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	0.0 (default)	0.0…100.0	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	-	Analog input type (*)
0x0050	0x00	**Lo.S**	RO	R/W	R/W	2	Int16	0 (default)	-100.0… 200.0	0.1	0	-	Analog input scale minimum limit (*)
0x0051	0x00	**HI.S**	RO	R/W	R/W	2	Int16	1000 (default)	Lo.S…200.0	0.1	0	-	Analog 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	Int16	0 (default)	-99.9…99.9	0.1	0	-	Analog input correction offset
0x0056	0x00	**o.tA**	RO	R/W	R/W	2	Int16	0 (default)	-99.9...99.9 -9.99...9.99 (**)	0.1 0.01 (**)	0	A	Current reading correction offset
0x0057	0x00	**o.tV**	RO	R/W	R/W	2	Int16	0 (default)	-99.9…99.9	0.1	0	V	Voltage reading correction offset
0x005B	0x00	**o.19**	RO	R/W	R/W	2	UInt16	36 (default)	0, 1	1	0	-	Reference for output pin 19 (*)
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
0x0062	0x00												(*)

0x0063	0x00	**i.14**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1, 2, 3, 4, 5, 6	1	0	-	Pin 14 digital input function
0x0064	0x00												(*)
0x0065	0x00	**i.14.t**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Pin 14 digital input pin type
0x0066	0x00												(*)
0x0067	0x00	**dry.E**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Dryout enable
0x0068	0x00	**dry.t**	RO	R/W	R/W	2	UInt16	0.0 (default)	0.0…500.0	0.1	0	min	Dryout time
0x0069	0x00	**dry.P**	RO	R/W	R/W	2	UInt16	0.0 (default)	0.0…100.0	0.1	0	%	Dryout power
0x006A	0x00	**io.13**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1, 2, 3, 4,5, 6, 14, 15, 16, 32, 33, 34, 35, 36, 37, 38, 39, 40, 47	1	0	-	Pin 13 input/output function
0x006B	0x00	**io.13.t**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Pin 13 input/output type
0x006C	0x00	**io.17**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1, 2, 3, 4, 5, 6, 14, 15, 32, 33, 34, 35, 36, 37, 38, 39, 40, 48	1	0	-	Pin 17 input/output function
0x006D	0x00	**io.17.t**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Pin 17 input/output type
0x006E	0x00	**Ir.tA.0**	RO	R/W	R/W	2	UInt16	0 (default)	L.tA…H.tA	0.1 0.01 (**)	0	A	Current reading in HB calibration for IR lamps
0x006F	0x00	**Ir.tA.1**	RO	R/W	R/W	2	UInt16	0 (default)	L.tA…H.tA	0.1 0.01 (**)	0	A	Current reading in HB calibration for IR lamps
0x0070	0x00	**Ir.tA.2**	RO	R/W	R/W	2	UInt16	0 (default)	L.tA…H.tA	0.1 0.01 (**)	0	A	Current reading in HB calibration for IR lamps
0x0071	0x00	**Ir.tA.3**	RO	R/W	R/W	2	UInt16	0 (default)	L.tA…H.tA	0.1 0.01 (**)	0	A	Current reading in HB calibration for IR lamps
0x0072	0x00	**Ir.tA.4**	RO	R/W	R/W	2	UInt16	0 (default)	L.tA…H.tA	0.1 0.01 (**)	0	A	Current reading in HB calibration for IR lamps
0x0073	0x00	**Ir.tA.5**	RO	R/W	R/W	2	UInt16	0 (default)	L.tA…H.tA	0.1 0.01 (**)	0	A	Current reading in HB calibration for IR lamps
0x0074	0x00	**Ir.tA.6**	RO	R/W	R/W	2	UInt16	0 (default)	L.tA…H.tA	0.1 0.01 (**)	0	A	Current reading in HB calibration for IR lamps
0x0075	0x00	**Ir.tA.7**	RO	R/W	R/W	2	UInt16	0 (default)	L.tA…H.tA	0.1 0.01 (**)	0	A	Current reading in HB calibration for IR lamps
0x0076	0x00	**Ir.tA.8**	RO	R/W	R/W	2	UInt16	0 (default)	L.tA…H.tA	0.1 0.01 (**)	0	A	Current reading in HB calibration for IR lamps
0x0077	0x00	**Ir.tA.9**	RO	R/W	R/W	2	UInt16	0 (default)	L.tA…H.tA	0.1 0.01 (**)	0	A	Current reading in HB calibration for IR lamps
0x0078	0x00	**Ir.tV.0**	RO	R/W	R/W	2	UInt16	0 (default)	L.tV…H.tV	0.1	0	V	Voltage reading in HB calibration for IR lamps
0x0079	0x00	**Ir.tV.1**	RO	R/W	R/W	2	UInt16	0 (default)	L.tV…H.tV	0.1	0	V	Voltage reading in HB calibration for IR lamps
0x007A	0x00	**Ir.tV.2**	RO	R/W	R/W	2	UInt16	0 (default)	L.tV…H.tV	0.1	0	V	Voltage reading in HB calibration for IR lamps
0x007B	0x00	**Ir.tV.3**	RO	R/W	R/W	2	UInt16	0 (default)	L.tV…H.tV	0.1	0	V	Voltage reading in HB calibration for IR lamps
0x007C	0x00	**Ir.tV.4**	RO	R/W	R/W	2	UInt16	0 (default)	L.tV…H.tV	0.1	0	V	Voltage reading in HB calibration for IR lamps
0x007D	0x00	**Ir.tV.5**	RO	R/W	R/W	2	UInt16	0 (default)	L.tV…H.tV	0.1	0	V	Voltage reading in HB calibration for IR lamps
0x007E	0x00	**Ir.tV.6**	RO	R/W	R/W	2	UInt16	0 (default)	L.tV…H.tV	0.1	0	V	Voltage reading in HB calibration for IR lamps
0x007F	0x00	**Ir.tV.7**	RO	R/W	R/W	2	UInt16	0 (default)	L.tV…H.tV	0.1	0	V	Voltage reading in HB calibration for IR lamps

0x0080	0x00	**Ir.tV.8**	RO	R/W	R/W	2	UInt16	0 (default)	L.tV…H.tV	0.1	0	V	Voltage reading in HB calibration for IR lamps
0x0081	0x00	**Ir.tV.9**	RO	R/W	R/W	2	UInt16	0 (default)	L.tV…H.tV	0.1	0	V	Voltage reading in HB calibration for IR lamps
0x0082	0x00	**PS.S.E**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Phase softstart at ON/OFF software switching shutdown
0x0083	0x00	**Cu.S.E**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Peak current limiter during softstart
0x0084	0x00	**PS.tA**	RO	R/W	R/W	2	UInt16	70.0 (default) 21.00 (**)	0.0…999.9 0.0...99.99 (**)	0.1 0.01 (**)	0	A	Maximum peak current during the softstart phase
0x0085	0x00	**Cu.F.E**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	RMS steady state current control
0x0086	0x00	**Fu.tA**	RO	R/W	R/W	2	UInt16	25.0 (default) 10.00 (**)	0.0…999.9 0.0...99.99 (**)	0.1 0.01 (**)	0	A	Maximum RMS current at steady state
0x0087	0x00	**dly.E**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Enable triggering delay
0x0088	0x00	**dly.t**	RO	R/W	R/W	2	UInt16	60 (default)	0…90	1	0	°	Triggering delay
0x0089	0x00	**dly.Of**	RO	R/W	R/W	2	UInt16	5 (default)	0…10000	1	0	ms	Minimum non-conduction time to reactivate triggering delay
0x008A	0x00	**ind.E**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Inductive load on
0x008B	0x00	**hd.6**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1, 2, 3, 4, 5, 6	1	0	-	Feedback mode configuration
0x008C	0x00	**rIF.V**	RO	R/W	R/W	2	UInt16	0.0 (default)	0.0…999.9	0.1	0	V	Voltage feedback reference
0x008D	0x00	**rIF.A**	RO	R/W	R/W	2	UInt16	0.0 (default) 40	0.0…999.9 0.0...99.99 (**)	0.1 0.01 (**)	0	A	Current feedback reference
0x008E	0x00	**rIF.P**	RO	R/W	R/W	2	UInt16	0.00 (default) 0 (**)	0.00…150.00 0...15000 (**)	0.01 1 (**)	0	kW W (**)	Power feedback reference
0x008F	0x00	**rIF.I**	RO	R/W	R/W	2	UInt16	0.00 (default)	0.00…650.00	0.01	0	ohm	Impedance feedback reference
0x0090	0x00												(*)
0x0091	0x00	**Fb.It**	RO	R/W	R/W	2	UInt16	0.3 (default)	0.1…5.0	0.1	0	%/60ms	Feedback response speed
0x0092	0x00	**Lo.P**	RO	R/W	R/W	2	UInt16	0.0 (default)	0.0…50.0	0.1	0	%	Minimum trigger output power
0x0093	0x00	**P.On.t**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1, 2	1	0	-	Start modes (*)
0x0094	0x00	**G.Out**	RO	R/W	R/W	2	UInt16	0.0 (default)	0.0…200.0	0.1	0	%/s	Power output gradient
0x0095	0x00	**Man.L**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Manual power storage (*)
0x0096	0x00	**Fr.n**	RO	R/W	R/W	2	UInt16	0 (default)	0…20	1	0		Number of restarts in case of SHORT_CIRCUIT_CURRENT
0x0097	0x00	**C.E.m**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1, 2	1	0	-	Communication error mode
0x0098	0x00	**C.E.t**	RO	R/W	R/W	2	UInt16	0 (default)	0…999	1	0	s	Communication error timeout
0x0099	0x00	**C.E.P**	RO	R/W	R/W	2	UInt16	0.0 (default)	0.0…100.0	0.1	0	%	Output power with communication error
0x009A	0x00	**Hb.Pm**	RO	R/W	R/W	2	UInt16	100.0 (default)	0.0…100.0	0.1	0	%	Maximum power during HB calibration (for IR lamps only)
0x009B	0x00	**PWM.t**	RO	R/W	R/W	2	UInt16	1.00 (default)	0.01…10.00	0.01	0	s	PWM input timeout
0x009C	0x00	**PWM.F**	RO	R/W	R/W	2	UInt16	0.1 (default)	0.0…20.0	0.1	0	s	Digital filter for PWM input
0x009D	0x00	**o.19.t**	RO	R/W	R/W	2	UInt16	0 (default)	0, 1	1	0	-	Pin 19 output type

(*) settings for future developments

Index	Sub-index	Name of the object	Access			Length	Data type	Value (example)	Range of values	Scale factor	Offset	Unit	Description
			U	M	S								
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
0x00BE	0x00	**FO.c1**	RO	RO	RO	2	Uint16	0	0…65535	1	0	-	SHORT_CIRCUIT_ CURRENT event counter 1
0x00BF	0x00	**FO.c2**	RO	RO	RO	2	Uint16	0	0…65535	1	0	-	SHORT_CIRCUIT_ CURRENT event counter 2
0x0100	0x00	**Hb.tr**	RO	RO	RO	2	Uint16	0.0 0.00 (**)	0.0…6553.5 0.00...655.35 (**)	0.1 0.01 (**)	0	A	Current HB alarm threshold
0x0101	0x00	**ALSTATE_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	0.0…6553.5	0.1	0	Hz	Mains voltage frequency
0x0105	0x00	**FAD_ SELECT1**	RO	RO	RO	2	Uint16	0	0…65535	1	0	-	Recognition 1
0x0106	0x00	**FAD_ SELECT2**	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	0.0…6553.5	0.1	0	°C	SSR temperature
0x010C	0x00	**Ntc.SSr.der**	RO	RO	RO	2	Int16	0.0	-32768… 32767	0.1	0	°C/12s	SSR temperature derivative
0x010D	0x00	**P.V.**	RO	RO	RO	2	Uint16	0	0…65535	0.1	0	-	Analog input value (process variable)
0x010E	0x00	**Errr**	RO	RO	RO	2	Uint16	0	0…65535	1	0	-	Analog input status
0x010F	0x00	**I.tA**	RO	RO	RO	2	Uint16	0.0 0.00 (**)	0.0…6553.5 0.00...655.35 (**)	0.1 0.01 (**)	0	A	Real-time current reading input value
0x0110	0x00	**I.tV**	RO	RO	RO	2	Uint16	0.0	0.0…6553.5	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 0.00 (**)	0.0…6553.5 0.00...655.35 (**)	0.1 0.01 (**)	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 0.00 (**)	0.0…6553.5 0.00...655.35 (**)	0.1 0.01 (**)	0	A	Current reading input value
0x0118	0x00	**IN_TA_ON_ DIAG**	RO	RO	RO	2	Uint16	0.0 0.00 (**)	0.0…6553.5 0.00...655.35 (**)	0.1 0.01 (**)	0	A	
0x0119	0x00	**IN_TA_OFF_ DIAG**	RO	RO	RO	2	Uint16	0.0 0.00 (**)	0.0…6553.5 0.00...655.35 (**)	0.1 0.01 (**)	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	0.0…6553.5	0.1	0	V	
0x011D	0x00	**I.tVF**	RO	RO	RO	2	Uint16	0.0	0.0…6553.5	0.1	0	V	Voltage reading input value
0x011E	0x00	**Pw.PA**	RO	RO	RO	2	Uint16	0.0	0.0…6553.5	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 0.00 (**)	0.0…6553.5 0.00...655.35 (**)	0.1 0.01 (**)	0	A	Current reading scale minimum limit
0x0153	0x00	**H.tA**	RO	RO	RO	2	Uint16	0.0 0.00 (**)	0.0…6553.5 0.00...655.35 (**)	0.1 0.01 (**)	0	A	Current reading scale maximum limit
0x0154	0x00	**L.tV**	RO	RO	RO	2	Uint16	0.0	0.0…6553.5	0.1	0	V	Voltage reading scale minimum limit
0x0155	0x00	**H.tV**	RO	RO	RO	2	Uint16	0.0	0.0…6553.5	0.1	0	V	Voltage reading scale maximum limit

0x0156	0x00	**STATUS**	RO	RO	RO	2	Uint16	0	0…65535	1	0	-	Status
0x0157	0x00	**In.PWM**	RO	RO	RO	2	Uint16	0.0	0.0…100.0	0.1	0	%	PWM input value
0x0158	0x00	**Fu.c**	RO	RO	RO	2	Int16	0.0	-100.0…100.0	1	0	%	Power orrection for current limitation
0x0159	0x00	**Fb.c**	RO	RO	RO	2	Int16	0.0	-100.0…100.0	0.1	0	%	Power correction for feedback
0x015A	0x00	**Fb.r1**	RO	RO	RO	2	Uint16	0.0	0.0…999.9	0.1	0	-	Feedback reference (with 1 decimal point)
0x015B	0x00	**Fb.r2**	RO	RO	RO	2	Uint16	0.00	0.00…655.35	0.01	0	-	Feedback reference (with 2 decimal points)
0x015C	0x00	**Fb.r0**	RO	RO	RO	2	Uint16	0	0…65535	1	0	-	Feedback reference (without decimal point)

(*) settings for future developments
(**) Only GRM-H-10-x-x-x-x-x-x-x High Accuracy model
U = User, M = Maintenance technician, S = Specialist

7. RS485 SERIAL LINE

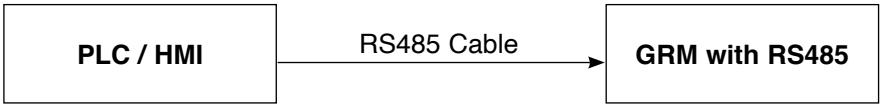
7.1. RS485 serial line configuration

In a Modbus serial line communication there is a Master object that "manages" communication through "commands" and Slaves that execute these commands.
The GRM is to be considered as a Slave device conncted to a Master, which is usually a supervisor panel or a PLC. The GRM is identified through a node address (ID) set on the frontal rotary switches (tens + units).
A maximum of 99 GRM modules can be installed a common serial network, with node address configurable from "01" to "99." GRMs have an RS485 serial port (optional) with Modbus RTU slave protocol.
The Modbus RTU port has the following factory settings (default):

Parameter	Default	Range
ID	1	1...99
BaudRate	115200 bit/s	1200...115200 bit/s
Parity	None	odd/even/none
StopBits	1	-
DataBits	8	-

To use the Modbus RTU interface correctly, the following procedure must be performed. Configure the rotary switches to the "0+0" position, enabling the AutoBaud function. For wiring connection and pinout, see the chapter "2.6.2. Analog control with MR option (Modbus RTU)"

Parameter	Rotary switches configuration		Range
	tens	unit	
AutoBaud	0	0	Allows the configuration of correct comunication value for Baud Rate and Parity detecting automatically the frequency transmission of the modbus Master device



7.2. Serial communication AutoBaud sequence

7.2.1. Function

Adjust automatically the data transmission speed and parity of the GRM to be connected to the supervisor panel or PLC master device.

7.2.2. Procedure

1) Connect the modbus slaves serial wires to the master modbus device.

2) Configure the rotary switch of new GRM to be install or in case of first installation for all the GRM's in "0+0" position.

3) Power ON the GRM

4) Verify that the GREEN led flashes at a high frequency (10Hz).

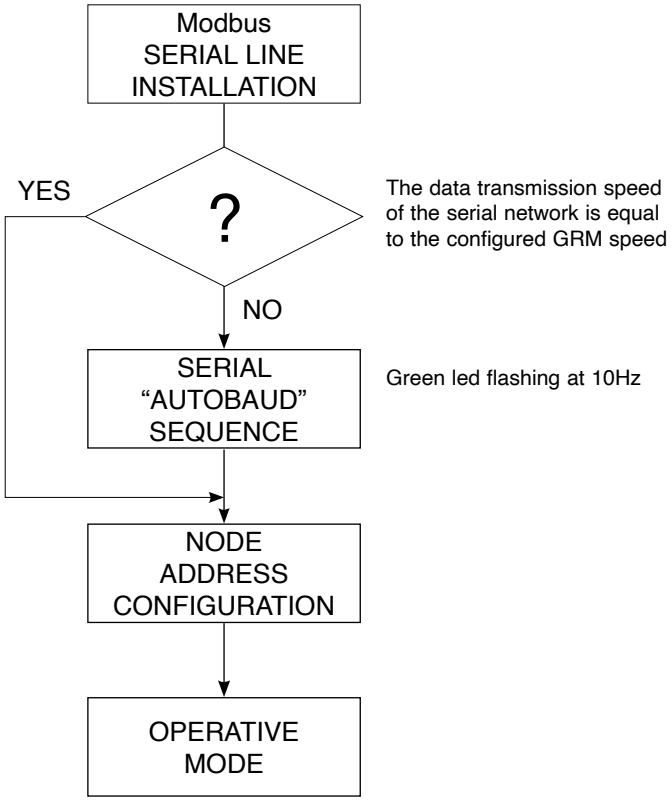
5) The master device need to send a sequence of generic MODBUS reading request.

6) The procedure is completed when all the GRM led flash at normal frequency (2Hz) or as indicated in section 4

7) Power OFF the GRM.

8) Configure the node address of each GRM using the two rotary switch.

9) Power ON the GRM.



The aquired data transmissin speed and parity parameter are stored on each GRM memory, so at the next power ON it will no longer be necessary to enable the "AUTOBAUD SERIAL" procedure.

7.3. Configuration parameters

Cod parameter (only reading value) shows the node address configured by rotary switch from 00 to 99 and loaded at power-on.

Changing the configuration of the parameter bAu (Baudrate) and PAr (Parity) can interrupt normal communication to the Master.

Automatic configuration of bAu and PAr paramenters can be done by running the Autobaud procedure.

7.3.1. Modbsu slave node number

Acronym	App / GF_eXpress menu	Attribute	Retentive	U.M.	Default
Description					
Cod	Serial	R	■	-	1

The parameter shows the node address configured by rotary switch and loaded at power-on.

min...max: 1...99

NOTE:
- The identification code 0 is reserved for Autobaud function
- The identification code is related to the rotary switches position loaded at power-on

7.3.2. Serial line data transmission speed

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

This parameter configure the RS485 data transmission speed.

Option :

bit	Significato
0	Data transmission speed 1.2 kbit/s
1	Data transmission speed 2.4 kbit/s
2	Data transmission speed 4.8 kbit/s
3	Data transmission speed 9.6 kbit/s
4	Data transmission speed 19.2 kbit/s
5	Data transmission speed 38.4 kbit/s
6	Data transmission speed 57.6 kbit/s
7	Data transmission speed 115.2 kbit/s

7.3.3. RS485 serial line data transmission parity

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

IThis parameter configure the RS485 data transmission parity.

Option :

0	No parity
1	Odd
2	Even

7.4. Modbus RTU map

Address	Name	Unsigned Signed	Num of bit	Decimal points	Attribute	Default	Min	Max	UdM	Description	Valore parametro di configurazione
0	**P.V.**	Uns	16	1	R	0.0	0.0	0.0	s.p.	Process Variable. Analog input value	
2	**Ou.P**	Uns	16	1	R	0.0	0.0	0.0	%	Actual output power	
3	**Hb.F**	-	16	-	R/W	0	0	3		HB alarm function	0 = Alarm active on (current lower than Hb.tr) during ON 1 = Alarm active on (current higher than Hb.tr) during OFF 2 = Alarm active on (current lower than Hb.tr) during ON OR (current higher than Hb.tr) during OFF
4	**A.Hb**	Uns	16	1 2 (*)	R/W	0.0 0.00(*)	L.tA	H.tA	A	Heater break alarm point	
5	**Hb.t**	Uns	16	0	R/W	10	0	999	s	Waiting time for HB alarm trip	
6	**Hb.P**	Uns	16	1	R/W	90.0	0.0	100.0	%	Current threshold percentage of the HB alarm	
7	**Hb.tA**	Uns	16	1 2 (*)	R/W	0.0 0.00(*)	L.tA	H.tA	A	CT input at HB calibration	
8	**Hb.tV**	Uns	16	1	R/W	0.0	0.0	530	V	TV input at HB calibration	
9	**Hb.Pw**	Uns	16	1	R/W	0.0	0.0	100.0	%	Power at HB calibration	
10	**Ir.tA.0**	Uns	16	1 2 (*)	R/W	0.0 0.00(*)	L.tA	H.tA	A	TA input at HB calibration phase 0 at 100.0% (only for IR lamps)	
11	**Ir.tA.1**	Uns	16	1 2 (*)	R/W	0.0 0.00(*)	L.tA	H.tA	A	TA input at HB calibration phase 1 at 50.0% (only for IR lamps)	
12	**Ir.tA.2**	Uns	16	1 2 (*)	R/W	0.0 0.00(*)	L.tA	H.tA	A	TA input at HB calibration phase 2 at 30.0% (only for IR lamps)	
13	**Ir.tA.3**	Uns	16	1 2 (*)	R/W	0.0 0.00(*)	L.tA	H.tA	A	TA input at HB calibration phase 3 at 20.0% (only for IR lamps)	
14	**hd.5**	-	16	-	R/W	1	0	4		Firing mode configuration	0 = FCT=Fixed Cycle Time 1 = BF=Burst Firing 2 = HSC=Half Single Cycle 3 = PA=Phase Angle
15	**bF.Cy**	Uns	16	0	R/W	1	1	10		Minimum cycles number of load firing in BF mode	
16	**PS.tm**	Uns	16	1	R/W	10.0	0.1	60.0	s	Softstart ramp time	
17	**PS.oF**	Uns	16	0	R/W	2	0	999	s	Minimum no-conduction time for restart the phase softstart	
18	**PS.tA**	Uns	16	1 2 (*)	R/W	70.0 21.00(*)	0.0 0.00(*)	999.9 99.99(*)	A	Max peak current during phase softstart	
19	**Fu.tA**	Uns	16	1 2 (*)	R/W	25.0 10.00(*)	0.0 0.00(*)	999.9 99.99(*)	A	Max RMS current during full working	
20	**dL.t**	Uns	16	0	R/W	60	0	90	°	Delay triggering	
21	**dL.oF**	Uns	16	0	R/W	5	0	10000	ms	Minimum non-conduction time to reactivate delay triggering	
22	**Lo.P**	Uns	16	1	R/W	0.0	0.0	50.0	%	Minimun firing output power	
23	**Cod**	Uns	16	0	R	1	1	99		Code for serial communication	
24	**bAu**	-	16	-	R/W	7	0	7	kbit/s	Baudrate for serial communication	0 = 1.2 1 = 2.4 2 = 4.8 3 = 9.6 4 = 19.2 5 = 38.4 6 = 57.6 7 = 115.2
25	**PAr**	-	16	-	R/W	0	0	2		Parity for serial communication	0 = None 1 = Odd 2 = Even
27	**tyP**	-	16	-	R/W	1	0	6		Type of analog input	0 = Input disabled 1 = 0...10V 2 = 0...5V 3 = 0...20mA 4 = 4...20mA 5 = POT 6 = POT (custom calib)
28	**FLt**	Uns	16	1	R/W	0.1	0	20.0	s	Digital filter of analog input	
29	**Lo.S**	Sig	16	1	R/W	0.0	-100.0	200.0	s.p.	Minimum limit of analog input scale	
30	**Hl.S**	Sig	16	1	R/W	100.0	0	200.0	s.p.	Maximum limit of analog input scale	
31	**oFS**	Sig	16	1	R/W	0.0	-99.9	99.9	s.p.	Offset correction of analog input	
32	**F.tA**	Uns	16	1	R/W	0.1	0.0	20.0	s	Digital filter of TA input	
33	**L.tA**	Uns	16	1 2 (*)	R	0.0 0.00(*)	0.0 0.00(*)	0.0 0.00(*)	A	Minimum limit of TA input scale	
34	**H.tA**	Uns	16	1 2 (*)	R	(**)	(**)	(**)	A	Maximum limit of TA input scale	
35	**o.tA**	Sig	16	1 2 (*)	R/W	0.0 0.00(*)	-99.9 -9.99(*)	99.9 9.99(*)	A	Offset correction of TA input	
36	**F.tV**	Uns	16	1	R/W	2.0	0.0	20.0	s	Digital filter of TV input	
37	**L.tV**	Uns	16	1	R	0.0	0.0	0.0	V	Minimum limit of TV input scale	
38	**H.tV**	Uns	16	1	R	530.0	0.0	0.0	V	Maximum limit of TV input scale	
39	**o.tV**	Sig	16	1	R/W	0.0	-99.9	99.9	V	Offset correction of TV input	

Address	Name	Unsigned Signed	Num of bit	Decimal points	Attribute	Default	Min	Max	UdM	Description	Valore parametro di configurazione
41	**Ct**	Uns	16	1	R/W	2.0	0.1	30.0	s	Cycle time of load firing in FCT mode	
43	**hd.2**	-	16	-	R/W	7	0	7		Enable power fault alarms	0 = PF alarms disabled 1 = SSR_SHORT 2 = NO_VOLTAGE 3 = SSR_SHORT+NO_ VOLTAGE 4 = NO_CURRENT 5 = SSR_SHORT+NO_ CURRENT 6 = NO_VOLTAGE+NO_ CURRENT 7 = SSR_SHORT+NO_ VOLTAGE+NO_CURRENT
44	**dG.t**	Uns	16	1	R/W	10	1	999	s	Diagnostics frequency of SCR_SHORT	
45	**dG.F**	Uns	16	1	R/W	10	0	99	s	Time filter for NO_VOLTAGE and NO_CURRENT alarms	
46	**hd.6**	-	16	-	R/W	0	0	6		Feedback mode configuration	0 = Feedback disabled 1 = V² voltage feedback 2 = I² current feedback 3 = P power feedback 4 = Z impedance feedback 5 = V voltage feedback 6 = I current feedback
47	**riF.V**	Uns	16	1	R/W	0.0	0.0	999.9	V	Feedback voltage reference	
48	**riF.A**	Uns	16	1 2 (*)	R/W	0.0 0.00(*)	0.0 0.00(*)	999.9 99.99(*)	A	Feedback current reference	
49	**riF.P**	Uns	16	2 0 (*)	R/W	0.0 0(*)	0.0 0(*)	150.00 65000(*)	kW W(*)	Feedback power reference	
52	**P.On.t**	-	16	-	R/W	0	0	2		Switch-on mode	0 = Status from last STA-TUS latched 1 = OFF software 2 = ON software
53	**G.oUt**	Uns	16	1	R/W	0	0.0	200.0	%/s	Gradient for power output	
55	**STATUS**	Uns	16	0	R/W	0	0	65535		STATUS	
56	**Man.P**	Uns	16	1	R/W	0	0.0	100.0	%	Output power in Manual mode	
57	**Ntc. SSR. Max1**	Uns	16	1	R	0	0.0	6553.5	°C	Max 1 SSR temperature	
58	**OPTION**	-	16	-	R	(**)	0	65535		Option configuration	0 = NFC 1 = HB_ALARM+NFC 2 = ADVANCED_CON-TROL+NFC 3 = HB_ALARM+ADVAN-CED_CONTROL+NFC 4 = FEEDBACK+NFC 5 = HB_ALARM+FEE-DBACK+NFC 6 = ADVANCED_CON-TROL+FEEDBACK+NFC 7 = HB_ALARM+ADVAN-CED_CONTROL+FEE-DBACK+NFC 16 = NFC+HI-RES 17 = HB_ALARM+N-FC+HI-RES 18 = ADVANCED_CON-TROL+NFC+HI-RES 19 = HB_ALARM+AD-VANCED_CONTROL+N-FC+HI-RES 20 = FEEDBACK+N-FC+HI-RES 21 = HB_ALARM+FEE-DBACK+NFC+HI-RES 22 = ADVANCED_CON-TROL+FEEDBACK+N-FC+HI-RES 23 = HB_ALARM+ADVAN-CED_CONTROL+FEE-DBACK+NFC+HI-RES
59	**CAL_ 10VL**	Uns	16	0	R	0	0	65535		CAL_10VL	
60	**CAL_ 10VH**	Uns	16	0	R	0	0	65535		CAL_10VH	
61	**CAL_ 5VL**	Uns	16	0	R	0	0	65535		CAL_5VL	
62	**CAL_ 5VH**	Uns	16	0	R	0	0	65535		CAL_5VH	
63	**CAL_ 020MAL**	Uns	16	0	R	0	0	65535		CAL_020MAL	
64	**CAL_ 020MAH**	Uns	16	0	R	0	0	65535		CAL_020MAH	
65	**CAL_ 420MAL**	Uns	16	0	R	0	0	65535		CAL_420MAL	

Address	Name	Unsigned Signed	Num of bit	Decimal points	Attribute	Default	Min	Max	UdM	Description	Valore parametro di configurazione
66	**CAL_ 420MAH**	Uns	16	0	R	0	0	65535		CAL_420MAH	
67	**CAL_ TAL**	Uns	16	0	R	0	0	65535		CAL_TAL	
68	**CAL_ TAH**	Uns	16	0	R	0	0	65535		CAL_TAH	
69	**CAL_ TVL**	Uns	16	0	R	0	0	65535		CAL_TVL	
70	**CAL_ TVH**	Uns	16	0	R	0	0	65535		CAL_TVH	
71	**CAL_ NTC**	Uns	16	0	R	0	0	65535		CAL_NTC	
72	**Ir.tV.0**	Uns	16	1	R/W	0.0	0.0	530	V	TV input at HB calibration phase 0 at 100.0% (only for IR lamps)	
73	**Ir.tV.1**	Uns	16	1	R/W	0.0	0.0	530	V	TV input at HB calibration phase 1 at 50.0% (only for IR lamps)	
74	**Ir.tV.2**	Uns	16	1	R/W	0.0	0.0	530	V	TV input at HB calibration phase 2 at 30.0% (only for IR lamps)	
75	**Ir.tV.3**	Uns	16	1	R/W	0.0	0.0	530	V	TV input at HB calibration phase 3 at 20.0% (only for IR lamps)	
76	**Ir.tV.4**	Uns	16	1	R/W	0.0	0.0	530	V	TV input at HB calibration phase 4 at 15.0% (only for IR lamps)	
77	**Ir.tV.5**	Uns	16	1	R/W	0.0	0.0	530	V	TV input at HB calibration phase 5 at 10.0% (only for IR lamps)	
78	**Ir.tV.6**	Uns	16	1	R/W	0.0	0.0	530	V	TV input at HB calibration phase 6 at 5.0% (only for IR lamps in PA mode)	
79	**Ir.tA.4**	Uns	16	1 2 (*)	R/W	0.0 0.00(*)	L.tA	H.tA	A	TA input at HB calibration phase 4 at 15.0% (only for IR lamps)	
80	**Ir.tA.5**	Uns	16	1 2 (*)	R/W	0.0 0.00(*)	L.tA	H.tA	A	TA input at HB calibration phase 5 at 10.0% (only for IR lamps)	
81	**Ir.tA.6**	Uns	16	1 2 (*)	R/W	0.0 0.00(*)	L.tA	H.tA	A	TA input at HB calibration phase 6 at 5.0% (only for IR lamps in PA mode)	
82	**Hb.Pm**	Uns	16	1	R/W	100.0	0.0	100.0	%	Max power during HB calibration (only for IR lamps)	
83	**PWM.t**	Uns	16	2	R/W	1.00	0.01	10.00	s	PWM timeout	
84	**but but**	- -	16	-	R/W	1	0	1		Button configuration	0 = Button disabled 1 = Button enabled
85	**FAD_PV**	Uns	16	0	R	0	0	65535	adc	FAD_PV	
86	**FAD_TA**	Uns	16	0	R	0	0	65535	adc	FAD_TA	
87	**I.tA**	Uns	16	1 2 (*)	R	0.0 0.00(*)	0.0 0.00(*)	6553.5 655.35(*)	A	Instantaneous TA input value	
88	**I.onF**	Uns	16	1 2 (*)	R	0.0 0.00(*)	0.0 0.00(*)	6553.5 655.35(*)	A	Filtered TA input value	
89	**inta_ counter**	Uns	16	0	R	0	0	65535		inta_counter	
90	**I.onADC**	Uns	16	0	R	0	0	65535	adc	I.onADC	
91	**IN_TA_ ON_ DIAG**	Uns	16	1 2 (*)	R	0.0 0.00(*)	0.0 0.00(*)	6553.5 655.35(*)	A	IN_TA_ON_DIAG	
92	**IN_TA_ OFF_ DIAG**	Uns	16	1 2 (*)	R	0.0 0.00(*)	0.0 0.00(*)	6553.0 655.35(*)	A	IN_TA_OFF_DIAG	
93	**inta_ adc_ peak**	Uns	16	0	R	0	0	65535	adc	inta_adc_peak	
94	**I.tAP**	Uns	16	1 2 (*)	R	0.0 0.00(*)	0.0 0.00(*)	6553.5 655.35(*)	A	Peak current during phase softstart	
95	**FAD_TV**	Uns	16	0	R	0	0	65535	adc	FAD_TV	
96	**I.tV**	Uns	16	1	R	0	0.0	6553.5	V	TV input value	
97	**I.tVF**	Uns	16	1	R	0	0.0	6553.5	V	Filtered TV input value	
98	**IN_TV_ ON_ DIAG**	Uns	16	1	R	0	0.0	6553.5	V	IN_TV_ON_DIAG	
99	**IN_TV_ OFF_ DIAG**	Uns	16	1	R	0	0.0	6553.5	V	IN_TV_OFF_DIAG	
100	**FAD_ NTC**	Uns	16	0	R	0	0	65535	adc	FAD_NTC	
101	**Ntc.SSR**	Uns	16	1	R	0	0.0	6553.5	°C	SSR temperature	
102	**Ntc. SSR. der**	Sig	16	1	R	0	0.0	6553.5	°C/12s	SSR temperature derivative	
103	**FrEq**	Uns	16	1	R	0.0	0.0	6553.5	Hz	Voltage frequency	
104	**Ld.A**	Uns	16	1 2 (*)	R	0.0 0.00(*)	0.0 0.00(*)	999.9 99.99(*)	A	Load current	
105	**Ld.V**	Uns	16	1	R	0.0	0.0	999.9	V	Load voltage	
106	**Ld.P**	Uns	16	2 0 (*)	R	0.00 0(*)	0.00 0(*)	150.00 65000(*)	kW W(*)	Load power	
107	**Ld.I**	Uns	16	2	R	0.00	0.00	650.00	ohm	Load impedance	

Address	Name	Unsigned Signed	Num of bit	Decimal points	Attribute	Default	Min	Max	UdM	Description	Valore parametro di configurazione
108	**Fb.r1**	Uns	16	1	R	0.0	0.0	999.9		Feedback reference (with 1 decimal point)	
109	**Fb.c**	Sig	16	1	R	0.0	-100.0	100.0	%	Feedback power correction	
110	**Fu.c**	Sig	16	1	R	0.0	-100.0	100.0	%	Current limit power correction	
111	**Hb.tr**	Uns	16	1 2 (*)	R	0.0 0.00(*)	0.0 0.00(*)	999.9 99.99(*)	A	Current threshold for HB alarm	
112	**Pw.PA**	Uns	16	1	R	0.0	0.0	100.0	%	Phase angle power	
113	**ALSTATE_HB**	Uns	16	0	R	0	0	65535		ALSTATE_HB	
115	**STATUS2**	Uns	16	0	R	0	0	65535		STATUS2	Bit 15= Not used Bit 14= AUTO_MAN Bit 13= ON_OFF Bit 6...12 Not used Bit 5= NO_CURRENT Bit 4= NO_VOLTAGE Bit 3= SSR_SHORT Bit 2 Power Fault (OR di Bit 3,4,5) Bit 1= STATUS2_HB Bit 0 OR di Bit 1, Bit 2
116	**Fb.r2**	Uns	16	2	R	0.00	0.00	650.00		Feedback reference (with 2 decimal points)	
117	**STATUS3**	Uns	16	0	R	0	0	65535		STATUS3	Bit 15= Not used Bit 14=DRYOUT Bit 13=CURRENT_SENSOR_BROKEN Bit 9...11= Not used Bit 8=OVER_RMS_CURRENT Bit 7=OVER_PEAK_CURRENT Bit 6=SHORT_CIRCUIT_CURRENT Bit 5=60HZ Bit 4=FREQUENCY_WARNING Bit 3=SOFTSTART_END Bit 2=SOFTSTART_ACTIVE Bit 1=SCR_OVER_HEAT Bit 0=SCR_TEMP_SENSOR_BROKEN
118	**INPUT_DIG**	Uns	16	0	R	0	0	65535		INPUT_DIG	
119	**MASKOUT**	Uns	16	0	R	0	0	65535		MASKOUT	
120	**mtmID**	Uns	16	0	R	5000	0	65535		Manufactor Trade Mark	
121	**deviceID**	Uns	16	0	R	222	0	65535		Instrument Device Identification	
122	**UPd**	Uns	16	2	R	1.00	0.00	655.35		Software version	
123	**CHE**	Uns	16	0	R	0	0	65535		Software checksum	
139	**Fb.r0**	Uns	16	0	R	0	0	65535		Feedback reference (with no decimal points)	
143	**TA_OFFSET**	Uns	16	0	R	0	0	65535		TA_OFFSET	
146	**bEt**	Uns	16	0	R	0	0	65535		Beta release	
147	**STATUS11**	Uns	16	0	R/W	0	0	65535		STATUS11	

Address	Name	Unsigned Signed	Num of bit	Decimal points	Attribute	Default	Min	Max	UdM	Description	Valore parametro di configurazione
148	**C.Hd**	-	16	-	R	1	0	65535		Hardware configuration	1 = GRM+SSR_RANDOM 3 = GRM+DIGITAL_CONTROL+SSR_RANDOM 5 = GRM+ANALOG_CONTROL+SSR_RANDOM 9 = GRM+IO_LINK_CONTROL+SSR_RANDOM 17 = GRM+RS485+SSR_RANDOM 19 = GRM+DIGITAL_CONTROL+RS485+SSR_RANDOM 21 = GRM+ANALOG_CONTROL+RS485+SSR_RANDOM 25 = GRM+IO_LINK_CONTROL+RS485+SSR_RANDOM 33 = GRM+SSR_ZC 35 = GRM+DIGITAL_CONTROL+SSR_ZC 37 = GRM+ANALOG_CONTROL+SSR_ZC 41 = GRM+IO_LINK_CONTROL+SSR_ZC 49 = GRM+RS485+SSR_ZC 51 = GRM+DIGITAL_CONTROL+RS485+SSR_ZC 53 = GRM+ANALOG_CONTROL+RS485+SSR_ZC 57 = GRM+IO_LINK_CONTROL+RS485+SSR_ZC

Address	Name	Unsigned Signed	Num of bit	Decimal points	Attribute	Default	Min	Max	UdM	Description	Valore parametro di configurazione
149	**C.Hd1**	-	16	-	R	0	0	65535		Hardware configuration 1	0 = NOMINAL_CURRENT_NONE+VOLTAGE_480V 1 = NOMINAL_CURRENT_15A+VOLTAGE_480V 2 = NOMINAL_CURRENT_25A+VOLTAGE_480V 4 = NOMINAL_CURRENT_30A+VOLTAGE_480V 8 = NOMINAL_CURRENT_40A+VOLTAGE_480V 16 = NOMINAL_CURRENT_50A+VOLTAGE_480V 32 = NOMINAL_CURRENT_60A+VOLTAGE_480V 64 = NOMINAL_CURRENT_75A+VOLTAGE_480V 128 = NOMINAL_CURRENT_90A+VOLTAGE_480V 256 = NOMINAL_CURRENT_120A+VOLTAGE_480V 512 = NOMINAL_CURRENT_10A+VOLTAGE_480V 32768 = NOMINAL_CURRENT_NONE+VOLTAGE_600V 32769 = NOMINAL_CURRENT_15A+VOLTAGE_600V 32770 = NOMINAL_CURRENT_25A+VOLTAGE_600V 32772 = NOMINAL_CURRENT_30A+VOLTAGE_600V 32776 = NOMINAL_CURRENT_40A+VOLTAGE_600V 32784 = NOMINAL_CURRENT_50A+VOLTAGE_600V 32800 = NOMINAL_CURRENT_60A+VOLTAGE_600V 32832 = NOMINAL_CURRENT_75A+VOLTAGE_600V 32896 = NOMINAL_CURRENT_90A+VOLTAGE_600V 33024 = NOMINAL_CURRENT_120A+VOLTAGE_600V 33280 = NOMINAL_CURRENT_10A+VOLTAGE_600V
150	**Ir.tV.7**	Uns	16	1	R/W	0.0	0.0	530.0	V	TV input at HB calibration phase 7 at 3.0% (only for IR lamps in PA mode)	
151	**Ir.tV.8**	Uns	16	1	R/W	0.0	0.0	530.0	V	TV input at HB calibration phase 8 at 2.0% (only for IR lamps in PA mode)	
152	**Ir.tV.9**	Uns	16	1	R/W	0.0	0.0	530.0	V	TV input at HB calibration phase 9 at 1.0% (only for IR lamps in PA mode)	
153	**Ir.tA.7**	Uns	16	1 2 (*)	R/W	0.0 0.00(*)	L.tA	H.tA	A	TA input at HB calibration phase 7 at 3.0% (only for IR lamps in PA mode)	
154	**Ir.tA.8**	Uns	16	1 2 (*)	R/W	0.0 0.00(*)	L.tA	H.tA	A	TA input at HB calibration phase 8 at 2.0% (only for IR lamps in PA mode)	
155	**Ir.tA.9**	Uns	16	1 2 (*)	R/W	0.0 0.00(*)	L.tA	H.tA	A	TA input at HB calibration phase 9 at 1.0% (only for IR lamps in PA mode)	
157	**Fb.It**	Uns	16	1	R/W	0.3	0.1	5.0	%/60ms	Feedback speed response	
158	**Fr.n**	Uns	16	0	R/W	0	0	20		Number of restarts in case of SHORT_CIRCUIT_CURRENT	
159	**FO.c1**	Uns	16	0	R	0	0	65535		SHORT_CIRCUIT_CURRENT counter 1	
160	**FO.c2**	Uns	16	0	R	0	0	65535		SHORT_CIRCUIT_CURRENT counter 2	
161	**OH.c**	Uns	16	0	R	0	0	65535	h	Operating hours counter	

Address	Name	Unsigned Signed	Num of bit	Decimal points	Attribute	Default	Min	Max	UdM	Description	Valore parametro di configurazione
162	**C.E.m**	-	16	-	R/W	0	0	2		Mode for communication error	0 = Communication error disabled 1 = Force C.E.P power 2 = Force C.E.P power and copy it to Man.P
163	**C.E.t**	Uns	16	0	R/W	0	0	99	s	Timeout for communication error	
164	**C.E.P**	Uns	16	1	R/W	0	0.0	100.0	%	Output power when communication error is active	
165	**Ld.E1**	Uns	16	0	R	0	0	65535	kWh	Load energy 1	
167	**Ld.E2**	Uns	16	0	R	0	0	65535	kWh	Load energy 2	
169	**Ntc. SSR. Max2**	Uns	16	1	R	0	0.0	6553.5	°C	Max 2 SSR temperature	
171	**FAD_INTERNAL_TEMP**	Uns	16	0	R	0	0	0	adc	FAD_INTERNAL_TEMP	
173	**Hb.c1**	Uns	16	0	R	0	0	65535		HB alarm counter 1	
174	**Hb.c2**	Uns	16	0	R	0	0	65535		HB alarm counter 2	
175	**SH.c1**	Uns	16	0	R	0	0	65535		SSR overheating counter 1	
176	**SH.c2**	Uns	16	0	R	0	0	65535		SSR overheating counter 2	
177	**o.19**	-	16	-	R/W	36	0	40		Function of output pin 19	0 = Output disabled 32 = HB or PF alarms 33 = HB alarm 34 = PF alarms 35 = SSR Over Heating 36 = HB or PF alarms or SSR Over Heating 37 = HB alarm or SSR Over Heating 38 = PF alarms or SSR Over Heating 39 = Dryout status 40 = Communication error
178	**i.14**	-	16	-	R/W	0	0	6		Function of digital input pin 14	0 = Digital input disabled 1 = HB calibration 2 = Feedback calibration 3 = ON/OFF software 4 = HB and PF alarms memory reset 5 = Dryout restart 6 = Dryout end
179	**FAD_SELECT1**	Uns	16	0	R	0	0	65535	adc	FAD_SELECT1	
180	**FAD_SELECT2**	Uns	16	0	R	0	0	65535	adc	FAD_SELECT2	
193	**Err**	Uns	16	0	R	0	0	4		Analog input status	
194	**STATUS_IO-LINK**	Uns	16	0	R	0	0	65535		IO-LINK status	
195	**Int. Temp**	Uns	16	1	R	0	0.0	0.0	°C	Internal temperature	
197	**In.PWM**	Uns	16	1	R	0.0	0.0	0.0	%	PWM input value	
200	**Hb.E**	-	16	-	R/W	1	0	1		HB alarm enable	0 = HB disabled 1 = HB enabled
201	**Hb.m**	-	16	-	R/W	0	0	1		HB alarm memory	0 = Without memory 1 = With memory
202	**FA.P**	Uns	16	1	R/W	0.0	0.0	100.0	%	Fault Action power when analog input in error	
204	**PS.E**	-	16	-	R/W	0	0	3		Softstart ramp enable	0 = Ramp disabled 1 = Ramp enabled (linear in angle) 2 = Ramp enabled (linear in power) 3 = Ramp enabled (for IR lamps)
205	**io.13.t**	-	16	-	R/W	0	0	1		Type of input/output pin 13	0 = Direct 1 = Inverse
206	**io.17.t**	-	16	-	R/W	0	0	1		Type of input/output pin 17	0 = Direct 1 = Inverse
208	**PF.m**	-	16	-	R/W	0	0	1		PF alarms memory	0 = Without memory 1 = With memory
209	**SAP.C**	Uns	32	0	R	0	0	-		SAP order code	
211	**SEr.n**	Uns	32	0	R	0	0	-		Serial number: yywwpppp (year week prog)	
213	**CAL_GAIN**	Uns	16	0	R	0	0	65535		CAL_GAIN	
214	**TEST_DATE**	Uns	32	0	R	0	0	-		Production test date	
216	**TEST_TIME**	Uns	32	0	R	0	0	-		Production test time	
218	**CAL_POTL**	Uns	16	0	R	0	0	65535		CAL_POTL	
219	**CAL_POTH**	Uns	16	0	R	0	0	65535		CAL_POTH	

Address	Name	Unsigned Signed	Num of bit	Decimal points	Attribute	Default	Min	Max	UdM	Description	Valore parametro di configurazione
220	**CAL_INTER-NAL_ TEMP**	Uns	16	0	R	0	0	65535		CAL_INTERNAL_TEMP	
221	**USER_1**	Uns	16	0	R	18277	0	65535		User of the last recipe	
222	**USER_2**	Uns	16	0	R	26226	0	65535		User of the last recipe	
223	**USER_3**	Uns	16	0	R	24942	0	65535		User of the last recipe	
224	**USER_4**	Uns	16	0	R	0	0	65535		User of the last recipe	
225	**USER_5**	Uns	16	0	R	0	0	65535		User of the last recipe	
226	**USER_6**	Uns	16	0	R	0	0	65535		User of the last recipe	
227	**USER_7**	Uns	16	0	R	0	0	65535		User of the last recipe	
228	**USER_8**	Uns	16	0	R	0	0	65535		User of the last recipe	
229	**dry.E** **dry.E**	- -	16 16	-	R/W	0	0	1		Dryout enable	0 = Dryout disabled 1 = Dryout enabled
230	**dry.t**	Uns	16	1	R/W	0.0	0.0	500.0	min	Dryout time	
231	**dry.P**	Uns	16	1	R/W	0.0	0.0	100.0	%	Dryout power	
232	**PS.S.E**	-	16	-	R/W	0	0	1		Phase softstart for shutdown in software ON/OFF switching	0 = Shutdown ramp disabled 1 = Shutdown ramp enabled
233	**Cu.S.E**	-	16	-	R/W	0	0	1		Peak current limiter during softstart	0 = Peak limiter disabled 1 = Peak limiter enabled
234	**Cu.F.E**	-	16	-	R/W	0	0	1		RMS current control during full working	0 = RMS control disabled 1 = RMS control enabled
235	**dL.E**	-	16	-	R/W	0	0	1		Delay triggering enable	0 = Delay triggering disabled 1 = Delay triggering enabled
236	**ind.E**	-	16	-	R/W	0	0	1		Inductive load enable	0 = Inductive load disabled 1 = Inductive load enabled
237	**riF.I**	Uns	16	2	R/W	0.00	0.00	650.00	ohm	Feedback impedance reference	
238	**Man.L**	-	16	-	R/W	0	0	1		Manual power latching	0 = Man.P latching disabled 1 = Man.P latching enabled
239	**io.13**	-	16	-	R/W	1	0	47		Function of input/output pin 13	0 = I/O disabled 1 = In - HB calibration 2 = In - Feedback calibration 3 = In - ON/OFF software 4 = In - HB and PF alarms memory reset 5 = In - Dryout restart 6 = In - Dryout end 14 = In - MAN/AUTO controller 15 = In - Main SSR 16 = In - PMW control (Ou.P) 32 = Out - HB or PF alarms 33 = Out - HB alarm 34 = Out - PF alarms 35 = Out - SSR Over Heating 36 = Out - HB or PF alarms or SSR Over Heating 37 = Out - HB alarm or SSR Over Heating 38 = Out - PF alarms or SSR Over Heating 39 = Out - Dryout status 40 = Out - Communication error 47 = Out - POT power supply

Address	Name	Unsigned Signed	Num of bit	Decimal points	Attribute	Default	Min	Max	UdM	Description	Valore parametro di configurazione
240	**io.17**	-	16	-	R/W	48	0	48		Function of input/output pin 17	0 = I/O disabled 1 = In - HB calibration 2 = In - Feedback calibration 3 = In - ON/OFF software 4 = In - HB and PF alarms memory reset 5 = In - Dryout restart 6 = In - Dryout end 14 = In - MAN/AUTO controller 15 = In - Main SSR 32 = Out - HB or PF alarms 33 = Out - HB alarm 34 = Out - PF alarms 35 = Out - SSR Over Heating 36 = Out - HB or PF alarms or SSR Over Heating 37 = Out - HB alarm or SSR Over Heating 38 = Out - PF alarms or SSR Over Heating 39 = Out - Dryout status 40 = Out - Communication error 48 = Out - Master/Slave
241	**PWM.F**	Uns	16	1	R/W	0.1	0	20.0	s	Digital filter of PWM input	
242	**i.14.t**	-	16	-	R/W	0	0	1		Type of digital input pin 14	0 = Direct 1 = Inverse
243	**o.19.t**	-	16	-	R/W	0	0	1		Type of output pin 19	0 = Direct 1 = Inverse
0	**BIT_ON_OFF**	-	1	-	R/W	0	0	1		On/Off software	
1	**BIT_AUTO_MAN**	-	1	-	R/W	0	0	1		Auto/Manual	
2	**BIT_OUT_SCR**	-	1	-	R	0	0	1		SSR output status	
3	**BIT_OUT_17**	-	1	-	R	0	0	1		Output status pin 17	
4	**BIT_AL_HB_OR_PF**	-	1	-	R	0	0	1		HB alarm or Power Fault status	
5	**BIT_DIG_13**	-	1	-	R	0	0	1		Digital input status pin 13	
6	**BIT_AL_HB**	-	1	-	R	0	0	1		HB alarm status	
7	**BIT_AL_SSR_SHORT**	-	1	-	R	0	0	1		SSR_SHORT alarm status	
8	**BIT_AL_NO_VOLTAGE**	-	1	-	R	0	0	1		NO_VOLTAGE alarm status	
9	**BIT_AL_NO_CURRENT**	-	1	-	R	0	0	1		NO_CURRENT alarm status	
10	**BIT_SOFTSTART_ACTIVE**	-	1	-	R	0	0	1		Phase softstart active	
11	**BIT_SOFTSTART_END**	-	1	-	R	0	0	1		Phase softstart ended	
12	**BIT_AL_RESET**	-	1	-	R/W	0	0	1		SSR_SHORT/NO_VOLTAGE/ NO_CURRENT/HB alarms reset	
13	**BIT_SOFTSTART_RESTART**	-	1	-	R/W	0	0	1		Phase softstart restart	
14	**BIT_HB_CAL**	-	1	-	R/W	0	0	1		Calibration of HB alarm threshold	
15	**BIT_FEEDBACK_CAL**	-	1	-	R/W	0	0	1		Calibration of the feedback references	
16	**BIT_RESET_SHORT_CIRCUIT_CURRENT**	-	1	-	R/W	0	0	1		SHORT_CIRCUIT_CURRENT reset	

Address	Name	Unsigned Signed	Num of bit	Decimal points	Attribute	Default	Min	Max	UdM	Description	Valore parametro di configurazione
17	**BIT_RESET_FOC1**	-	1	-	R/W	0	0	1		Reset of FO.c1	
20	**BIT_RESET_LDE1**	-	1	-	R/W	0	0	1		Reset of Ld.E1	
21	**BIT_RESET_LDE2**	-	1	-	R/W	0	0	1		Reset of Ld.E2	
22	**BIT_RESET_HBC1**	-	1	-	R/W	0	0	1		Reset of HB.c1	
24	**BIT_RESET_SHC1**	-	1	-	R/W	0	0	1		Reset of SH.c1	
26	**BIT_RESET_NTCSSRMAX1**	-	1	-	R/W	0	0	1		Reset of Ntc.SSR.Max1	
28	**BIT_DIG_14**	-	1	-	R	0	0	1		Digital input status pin 14	
29	**BIT_DIG_17**	-	1	-	R	0	0	1		Digital input status pin 17	
30	**BIT_OUT_19**	-	1	-	R	0	0	1		Output status pin 19	
31	**BIT_OUT_13**	-	1	-	R	0	0	1		Output status pin 13	
32	**BIT_AL_SHORT_CIRCUIT_CURRENT**	-	1	-	R	0	0	1		SHORT_CIRCUIT_CURRENT alarm status	

8. TECHNICAL SPECIFICATIONS

8.1. Technical specifications

INPUTS	
Analogue command input (Versions with AN input type)	
Function	Proportional power control signal
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 GRM, max 10mA)
Linear input reading scale	0 ... 100.0 %
Common mode immunity	-60V, +60V
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: Yes Auxiliary output: Pin 17/ 18-19 Alarm output Auxiliary input: Pin 14
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
Configurable I/O	
I/O pin 13 configurable (only with Analog version)	
Function	Configurable as digital output or input
Output Function	Configurable alarm output functions (partial / total load break, line fault, thermal alarm) Potentiometer power supply 5V (max 10mA)
Output type	Output Type Digital output normally off (configurable as normally active). PNP type, output voltage: 5Vdc, Iout max = 10mA (not protected against short circuit)
Function Input (default)	Teach In HB partial breakage alarm threshold calibration (default), SCR logic control, Proportional control via PWM, On / Off Software, Reset alarms
Input voltage range	5-30V (max 3 mA)
Voltage reading status "0"	< 2 V
Voltage reading status "1"	> 5 V
Input impedance	17 KΩ
PWM input	Max frequency: (1, ..., 100 Hz) Max resolution 1% (0.1ms)
Configurable pin 14 input (only with IO-Link version)	
Function	Configurable digital input
Function Input	Teach In HB partial breakage alarm threshold calibration, Feedback Calibration, On / Off Software, Reset alarms, Dry out start / restart, disabled (default).
Input voltage range	5-30V (max 3 mA)
Voltage reading status "0"	< 2 V
Voltage reading status "1"	> 5 V
Input impedance	17 KΩ
I/O pin 17 (D17 / DQ)	
Function	Configurable as digital output or input
Function Output (default)	SSR output retransmission (default, for two-phase / three-phase slave control) Configurable alarm (partial / total load break, line fault, thermal alarm)

Output type	Output Type Digital output normally off (configurable as normally active). PNP type, output voltage: Us(24Vdc)-0.7Vdc, Iout max = 30mA (not protected against short circuit)	
Function Input	Teach In HB partial breakage alarm threshold calibration, SCR logic command, Software On / Off, Alarm reset	
Input voltage range	5-30V (max 3 mA)	
Voltage reading status "0"	< 2 V	
Voltage reading status "1"	> 5 V	
Input impedance	17 KΩ	
OUTPUTS		
Alarm output (pin 18 19)		
Function	Configurable alarm output (default): Partial load break, line fault, thermal alarm	
Type	Voltage free contact (solid state N.O.) max characteristics: 30V-150mA conduction resistance: ≤ 1Ω	
COMMUNICATIONS		
Porta microUSB di servizio		
Functions with TTL serial cable	Only for initial product configuration, via PC. Use a PC connected to the GRM, ONLY via the Gefran adapter cable. The adapter powers the GRM. Cod. F060800 (PC with USB).	
Type	Micro USB type B connector	
Insulation	TTL serial NOT isolated	
Funzione Dongle NFC:	Available for configuration, reading Product Information and diagnostic data. Use App downloadable from PlayStore and AppleStore and NFC Dongle (see accessories table) **NOTE:** From FW 1.06 GRM-H and GRM products with IO-Link communication do not support NFC function.	
Modbus RS485 (Option)		
Function	Serial line communication	
Protocol	ModBus RTU	
Type	RS485	
Baudrate	Configurable 1200 …115200bit/s (default 115,2Kbit/s)	
Node address	Configurable by two rotary switch (rotary-switches)	
Insulation	500V	
Parity	None/Odd/Even (default "none")	
StopBits	1	
DataBits	8	
POWER (STATIC GROUP)		
CATEGORY OF USE (Tab. 2 EN60947-4-3)	AC 51: resistive or low-inductance loads AC 55b: infrared lamps AC56a transformers, resistive loads with high temperature coefficient	
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 short-wave infrared loads. **Softstart** ramp in Phase Angle configurable with any configured Firing mode **Delay triggering**: First cycle start-up delay (only for ZC, BF, single phase control mode) Can be set from 0 ° to 90 °. It is useful for inductive loads (primary transformer) to avoid the current peak that could in some cases trigger the ultra-rapid fuses for the protection of SCRs.	
Feedback and Limit functions (optional)	Peak current or RMS limiting algorithms available. Feedback in **current** (I, I^2), **voltage** (V, V^2) or power.	
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	

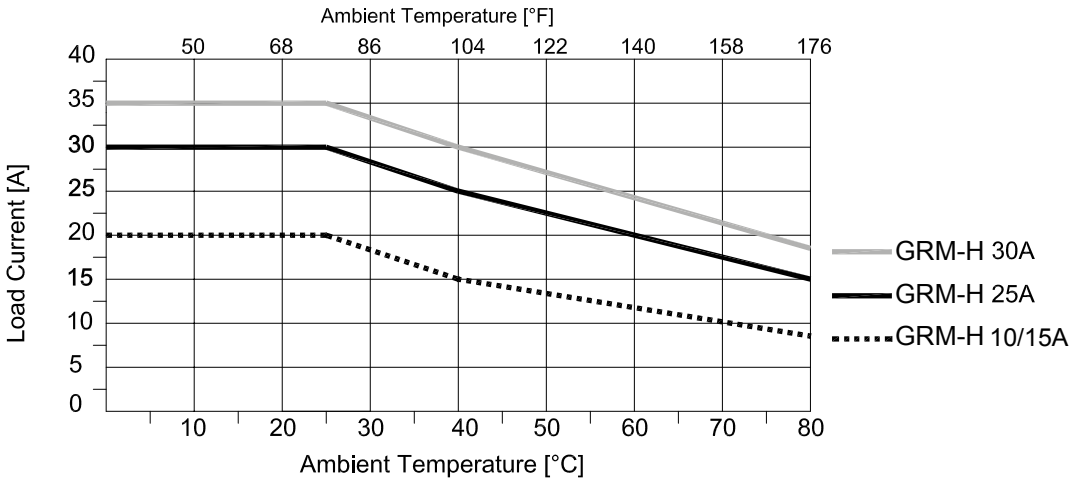
Rated current	GRM Model											
	10	15	25	25I	30	30I	40	50	60	75	90	120
	10A	15A	25A	25A	30A	30A	40A	50A	60A	75A	90A	120A
Non-repetitive over-current, (t=20 msec)	620A	620A	620A	1600A	620A	1600A	620A	1600A	1600A	1600A	1500A	1500A
I2t for melting (t = 1… 10msec) A^2s	1800	1800	1800	12800	1800	12800	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:	150 mA											
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)											
Dissipated power	Calculation of power dissipated by the solid state relay Pd [W] = 1,2 * Irms Irms = single-phase load current Example: load current = 20Arms, Dissipated thermal power: Pd = 20 * 1.2 = 24W											
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. Example: Thermal power dissipated: Pd=20*1,2= 24 W T.amb.max = 40°C Rth = (90-40)/24=2,08[°C/W]											
INTEGRATED DIAGNOSTICS												
Advanced Diagnostics	- 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 default, alarm threshold equal to 90% of the current read during calibration, recommended value for diagnosing a maximum of 5 equal loads in parallel). So, if the device is left at factory settings, it can manage 2, 3, 4 or 5 loads in parallel without reconfiguration. **Note 1**: with Digital command turn ON minimum time = 50 ms to detect broken load. **Note 2**: For the proper operation of the partial load break alarm even in the most critical conditions (8 equal loads in parallel), it is necessary that the total current of the load (not faulty) is at least 30% of the rated current of the GRM (on a GRM from 15A -> 4.5A) Example: a nominal size 15A GRM commands 8 equal resistors in parallel. To have an alarm of failure of only one of the 8 loads in parallel, the single load must have absorption of at least 0.56A, the total load must absorb at least 4.5A (0.56A * 8 loads).											

GENERAL CHARACTERISTICS		
Power supply	12 - 30 Vdc Imax 20mA @ 24Vdc	
Power supply with GRM-H-90/120A-.. FAN63 option	Power supply GRM-H + Fan (Range from 20 to 27 Vdc, Imax <150 mA to 24V with fan running)	
Indications	2 leds: ON (Green LED): Control status SCR 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 GRM-..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	GRM-H 10, 15, 25A, 25I	388 g / 16.69 Oz
	GRM-H 30A, 30I	388 g / 16.69 Oz
	GRM-H 40, 50A	388 g / 16.69 Oz
	GRM-H 60, 75A	688 g / 24.27 Oz
	GRM-H 90A	796 g / 28.09
	GRM-H 120A	796 g / 28.09
	GRM 10A ...120A	156 g / 5,50 Oz

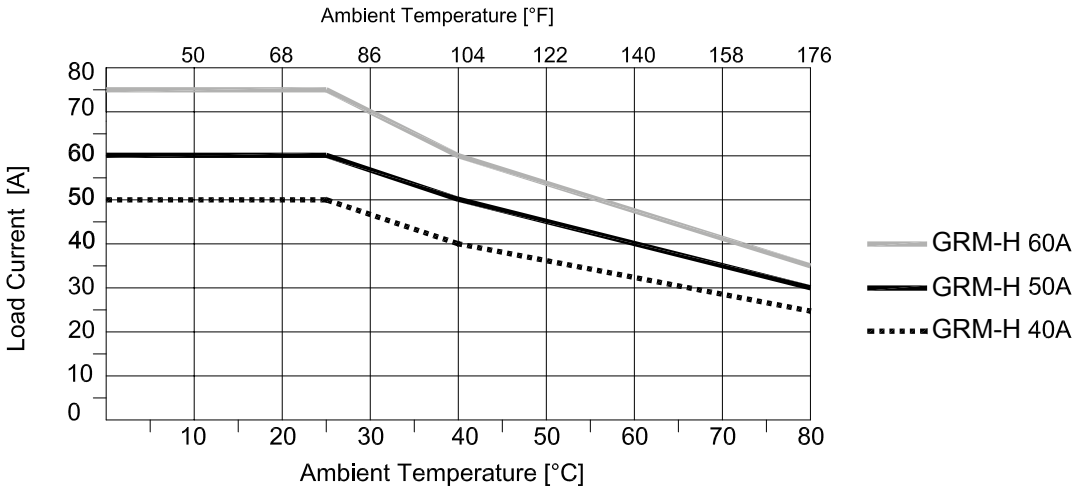
8.2. Derating curves

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

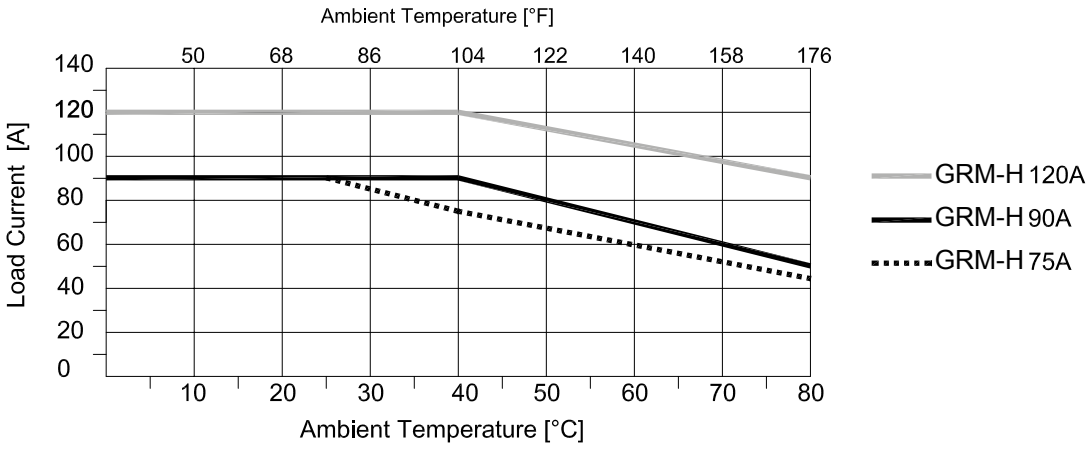
DERATING CURVES GRM-H 15 ÷ 30A



DERATING CURVES GRM-H 40 ÷ 60A



DERATING CURVES GRM-H 75 ÷ 120A

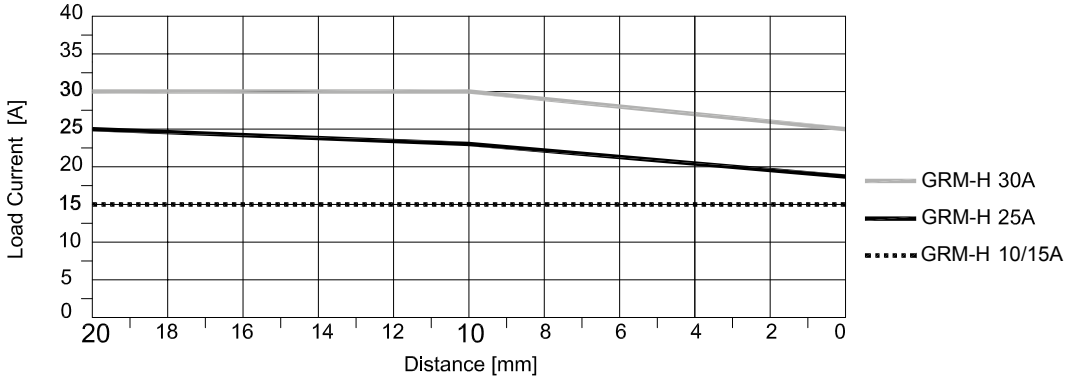


N.B: The curves of the GRM-H 90/120 refer to the device complete with a working specified fan.

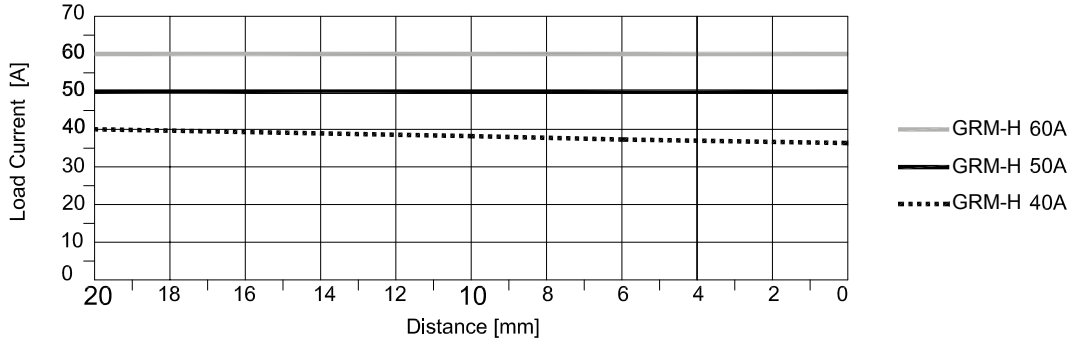
8.3. Downgrade with installation distance

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

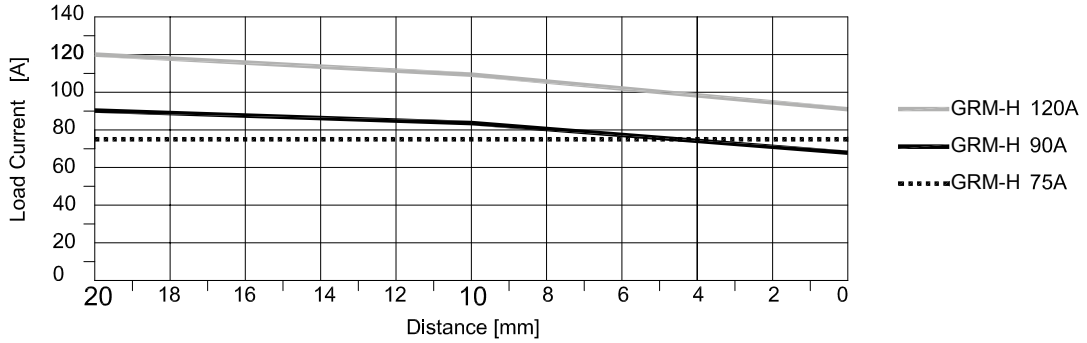
DERATING CURVES GRM-H 15 ÷ 30A



DERATING CURVES GRM-H 40 ÷ 60A



DERATING CURVES GRM-H 75 ÷ 120A



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

8.4. 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.

8.5. 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).

8.6. 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
F098343	24Vac to 24Vdc converter for DIN rail mounting to replace old GTT and GTF series. Dimensions 54x96x34mm

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

Model	*Code*	*Type*	*Supply*
90A FAN60	F083747	230 Vac 60mm x 60mm x 30mm for 90A models	Separate power supply
120A FAN60	F083750	230Vac 80mm x 80mm x 38 mm for 120A models	Separate power supply
90A FAN61	F083751	115Vac 60mm x 60mm x 30 mm for 90A models	Separate power supply
120A FAN61	F083752	115Vac 80mm x 80mm x 38 mm for 120A models	Separate power supply
FAN62	F083753	24 Vdc 60mm x 60mm x 25mm	Separate power supply
FAN63	F083754	24 Vdc 60mm x 60mm x 25mm	Internally powered by GRM-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 heatsink (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 GRM-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

8.8. Protection with MCB

Protection co-ordination (Type 2) with Siemens Miniature Circuit Breaker (MCB / Thermal-Magnetic) 5SY4 series, curve A, 1P and 2P						
Current size model (I^2t)	**1P MCB model (MCB Nominal current in A) at 230Vac ***	**Wire cross sectional area (mm^2)**	**Minimum length ***of copper wire conductor (m)**	**2P MCB model (MCB Nominal current in A) at 400Vac ****	**Wire cross sectional area (mm^2)**	**Minimum length*** of copper wire conductor (m)**
GRM(-H)-10,15, 25, 30, 40 (1800 A2s)	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		-	-
	For MCBs smaller than those indicated in the lines below, there are no section and length constraints					
GRM(-H)-25I, 30I, 50, 60, 75 (12800 A2s)	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
	For MCBs smaller than those indicated in the lines below, there are no section and length constraints					
GRM(-H)-90,120 (11250 A2s)	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
*** Between MCB and Load plus return path which goes back to the lines/neutral

The use of MCBs with a **nominal size smaller** than the smallest ones associated with a specific GRM in the table, is allowed without restrictions on the length and section of the cables.
For example, a 25I size GRM can be coupled to a 5SY4116-5 (16) MCB with any cable length or section.

Example, for a GRM-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).

8.9. Order code

For integrated heatsink version

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

Rated current	
10Aac High Accuracy	**10**
15Aac	**15**
25Aac	**25**
25Aac I2t++	**25I**
30Aac	**30**
30Aac I2t++	**30I**
40Aac	**40**
50Aac	**50**
60Aac	**60**
75Aac	**75**
90Aac (Fan needed)	**90**
120Aac (Fan needed)	**120**

Rated voltage	
480Vac (60Vac…530Vac)	**48**
600Vac (60Vac…660vac)	**60**

Control type	
Analogue (0..10V,4..20mA, PWM, Logic OnOff)	**AN**
IO-Link (***)	**I**

Control Options	
Open Loop	**OL**
Advanced Control (Current limit/ DryOut)	**AC**
AC + Feedback (V,I,V²,I²,P,Z)	**FB**

0	

NFC Dongle accessory	
0	Absent
1	NFC Dongle included in the packaging (***)

Options	
0	None
MR	Modbus RTU RS485 (*)

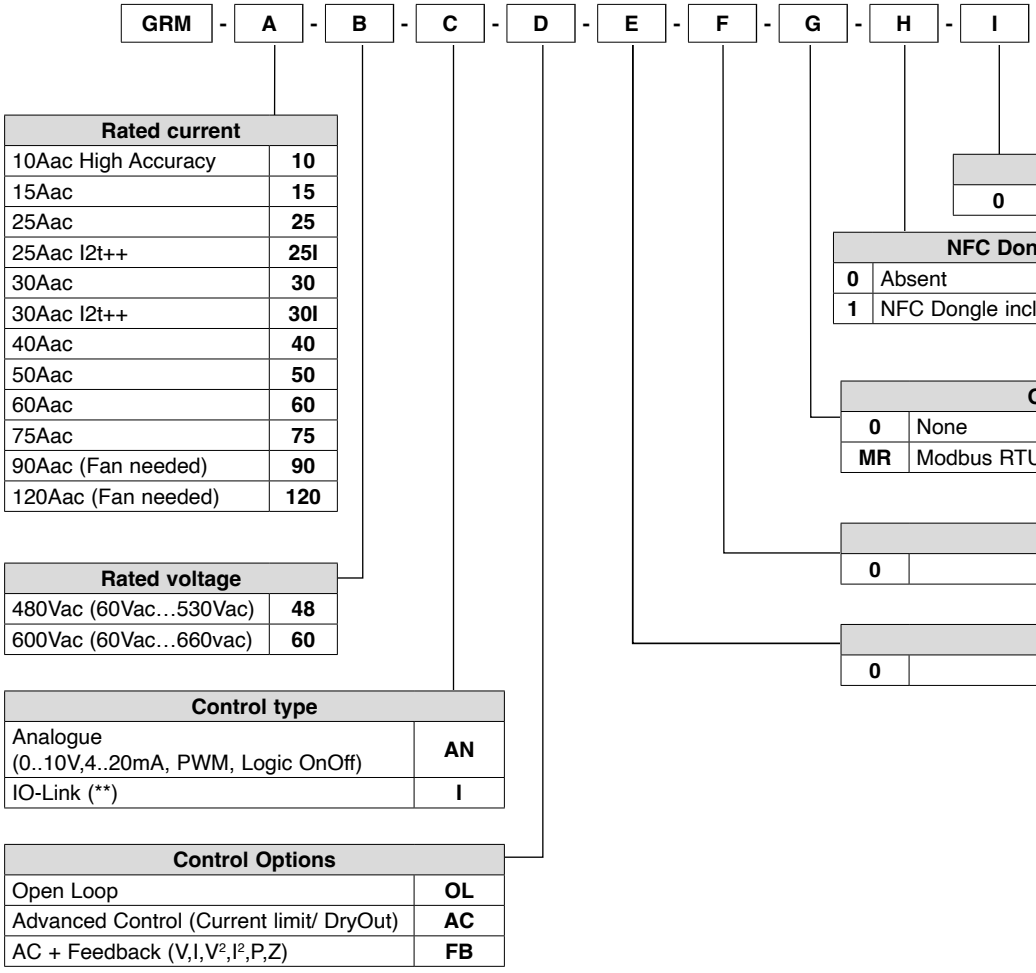
0	

Fan	
	for nominal current from 15A to 75A
0	No needed
	for 90/120A nominal current models
FAN60	230V AC 60x60x30mm for 90A models 230V AC 80x80x38mm for 120A models
FAN61	115V AC 60x60x30mm for 90A models 115V AC 80x80x38mm for 120A models
FAN62	24Vdc 60x60x25mm
FAN63	24V DC 60x60x25mm integrated power supply

(*) Not available with IO-link control type option
(**) Not available with MR option
(***) NFC function not available with Control type I (IO-Link communication)

NOTE:
Advanced Diagnostic always inluded: Thermal protection, Thermal Alarm, Total and Partial heater break, No-line, Current reading.

For version without integrated heatsink



(*) Not available with IO-link control type option
(**) NFC function not available with Control type I (IO-Link communication)

NOTE:
Advanced Diagnostic always inluded: Thermal protection, Thermal Alarm, Total and Partial heater break, No-line, Current reading.

8.10. EMC standards

EMC emissions

AC semiconductor motor controllers and conductors for non-motor loads	EN 60947-4-3	Class A Group 2
Emission enclosure Cl 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 GRM(-H).

8.11. 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 GRM(-H) group in the electrical panel containing the GRM(-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.

9. CERTIFICATIONS

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

GEFRAN

GEFRAN spa
via Sebina, 74
25050 Provaglio d'Iseo (BS) Italy
Tel. +39 0309888.1
Fax +39 0309839063
info@gefran.com
http://www.gefran.com