GEFRAN

GQ 15 / 25 / 50 / 90 A

SINGLE PHASE SOLID STATE RELAYS

Main features

- *Alternating current solid state relay*
- *Zero crossing switching*
- *Copper/semiconductor coupling technology*
- *15, 25, 50 and 90Arms nominal current*
- *Non-repetitive voltage: up to 1600Vp*
- *Nominal Voltage: up to 600 Vac*
- *Control voltage : 3...32Vcc and 20...260Vac/Vcc with connector*
- *Isolation ((input-output) 4000Vrms*
- *Red LED drive active signal*
- *Internal MOV (option)*

Main applications

- *Packaging Machinery*
- *Thermoforming*
- *Plastic extrusion lines*
- *Industrial ovens and furnaces*
- *Control application with high switching speed*

PROFILE

Zero crossing relay with antiparallel thyristor output is the most used solid state relay in industrial applications.
In fact, it can be used for resistive, inductive and capacity loads.
"Zero crossing" relay is energised when voltage meets the zero point and disenergised when current meets the zero point, depending on the signal control on the input circuit.
This relay has been designed to stand high-value transitory applications .
When the relay has to stand high currents for a long period, it is necessary to grant a proper dissipation and an adequate electrical connection between relay terminals and the load.
Varistors, fuses, thermostats and fans are available as fittings.
Use the relay with an opportune heatsink (see section accessories).

TECHNICAL DATA

General features

Rated frequency: 45...65Hz
Activation time:
GQ...-D- ≤1/2 cicle GQ...-A- ≤1 cicle
Deactivation time:
GQ...-D- ≤1/2 cicle GQ...-A- ≤1 cicle
Power factor: ≥0,5
Protection level: IP20
• U_{imp} = 4,8KV
• U_i = 660V
• Overload current profile = 10
• Conditional short circuit current = 5KA with type 1 coordination and respective fuse protections.

GQ15/25	fuse type	aM6A
GQ50	fuse type	aM16A
GQ90	fuse type	aM20A

GQ...- 24-
Nominal voltage: 24...230 Vac
(max range 20...253Vac)
Non-repetitive voltage: ≥ 600 Vp
Zero switching voltage: ≤ 20V

GQ...- 48-
Nominal voltage: 48...480 Vac
(max range 40...528Vac)
Non-repetitive voltage: ≥ 1200 Vp
Zero switching voltage: ≤ 40 V

GQ...- 60-
Nominal voltage: 48...600 Vac
(max range 40...660Vac)
Non-repetitive voltage: ≥ 1200 Vp
Zero switching voltage: ≤ 40V

Control input A1 - A2

GQ...-D-
Control voltage: 3...32Vcc
Turn ON voltage: ≥ 2,7Vc.c
Turn OFF voltage: ≤ 1Vcc
Reverse voltage: < 36Vcc
Consumption: ≤ 13mA@32V

GQ...-A-
Control voltage: 20...260Vac/Vcc
Turn ON voltage: ≥ 15Vac/Vcc
Turn OFF voltage: ≤ 6Vac/Vcc
Consumption: ≤ 8mAac/cc@260Vac/Vcc
Series connection of control inputs: max. no. GQ...-A in series = Vcontrol -10% / 20

Output L1 - T1

GQ - 15 -
Nominal current: AC51: 15Arms;
AC53A (*): 3Arms
Min load current: 0,1Arms
Repetitive overcurrent t=1 s: ≤ 35Arms
Non-repetitive overcurrent t=20ms:200Ap
Current drop at nominal voltage and frequencies: ≤ 8mArms
I^2t for fusing t=1-10ms: ≤ $200A^2s$
Critical dI/dt: ≥ 100A/μs

Voltage drop at nominal current: ≤1,45Vrms
Critical dV/dt off-state: ≥ 1000V/µs
I_{th} = 15A

GQ - 25 -
Nominal current :
AC51: 25Arms; AC53A (*): 5Arms
Min load current: 0,3Arms
Repetitive overcurrent t=1 s: ≤ 60Arms
Non-repetitive overcurrent t=20ms: 300Ap
Current drop at nominal voltage and frequencies: ≤ 8 mArms
I^2t for fusing t=1-10ms: ≤ $450A^2s$
Critical dI/dt: ≥ 100A/µs
Voltage drop at nominal current: ≤1,45Vrms
Critical dV/dt off-state:≥ 1000V/µs
I_{th} = 25A

GQ - 50 -
Nominal current :
AC51: 50Arms; AC53A (*): 15Arms
Min load current: 0,3Arms
Repetitive overcurrent t=1 s: ≤ 125Arms
Non-repetitive overcurrent t=20ms: 600Ap
Current drop at nominal voltage and frequencies: ≤ 8mArms
I^2t for fusing t=1-10ms: ≤ $1800A^2s$
Critical dI/dt: ≥ 100A/µs
Voltage drop at nominal current: ≤1,35Vrms
Critical dV/dt off-state: ≥ 1000V/µs
I_{th} = 50A

GQ - 50B -
(with high I^2t fusing current)
Nominal current : AC51: 50Arms;
AC53A (*): 18Arms
Min load current: 0,4Arms
Repetitive overcurrent t=1 s: ≤ 140Arms
Non-repetitive overcurrent t=20ms: 1150Ap
Current drop at nominal voltage and frequencies: ≤ 10mArms
I^2t for fusing t=1-10ms: ≤ $6600A^2s$
Critical dI/dt: ≥ 100A/µs
Voltage drop at nominal current: ≤1,2Vrms
Critical dV/dt off-state: ≥ 1000V/µs
I_{th} = 50A

GQ - 90 -
Nominal current AC51: 90Arms;
AC53A (*): 20Arms
Min load current: 0,5Arms
Repetitive overcurrent t=1 s: ≤ 150Arms
Non-repetitive overcurrent t=20ms: 1500 Ap
Current drop at nominal voltage and frequencies: ≤ 10mArms
I^2t for fusing t=1-10ms: ≤ $11200A^2s$
Critical dI/dt: ≥ 100A/µs
Voltage drop at nominal current:≤ 1,35Vrms
Critical dV/dt off-state: ≥ 1000V/µs
I_{th} = 90A

(*) Only versions: GQ-XX-24-X-1
GQ-XX-48-X-1

Insulation

Nominal insulation voltage Input/output: ≥ 4000 Vac
Nominal insulation voltage Output/case: ≥ 2500 Vac
Insulation resistance Input/output: ≥ $10^{10}\Omega$
Insulation resistance Output/case: ≥ $10^{10}\Omega$
Insulation capacity Input/Output: ≤ 8pF
Insulation capacity Output/case: ≤ 100pF

Ambient conditions

- Ambient temeparure: -25...+80°C
- Storage Temperature: -55...+100°C
- Maximum relative humidity: 50% a 40°C
- Maximum installation height: 2000 slm
- Pollution level: 2

Thermal features

GQ - XX -
Junction Temperature: ≤ 125°C
Rth junction/ambient: ≤ 12 K/W

GQ - 15 - / GQ - 25 -
Rth junction/case: ≤ 1,25 K/W

GQ - 50 -
Rth junction/case: ≤ 0,65 K/W

GQ - 50B -
Rth junction/case: ≤ 0,33 K/W

GQ - 90 -
Rth junction/case: ≤ 0,3 K/W

Solid State Relay Dissipated Power Calculation

Single phase state relay
Pd GQ .. 15/25 = 1,45 . Irms [W]
Pd GQ .. 50/90 = 1,35 . Irms [W]
Pd GQ .. 50B = 1,2 . Irms [W]
IRMS = single-phase load current

Heatsink Thermal Resistance Calculation

Rth = (90°C - T.amb. max) / 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).

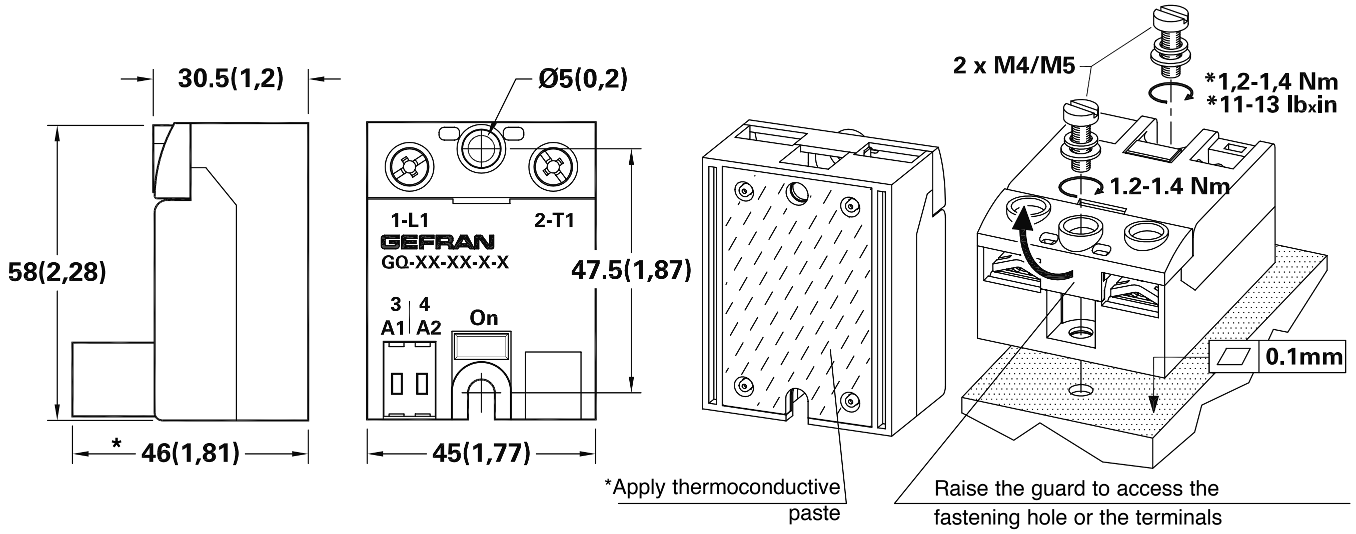
Installation notes

The device must be protected by a high speed fuse (accessory).
Applications with power solid state relays must also have a switch to isolate the power line.
Protect the solid state relay against overheating by using a heatsink (accessory).
The heatsink must be sized according to room temperature and load current (see technical data).
Heatsink installation procedure:
spread 1 gram of thermoconductive silicone paste (we recommend DOW CORNING 340) on the dissipative metal surfaces of the module.
The surfaces must be clean and the thermoconductive paste must not contain any impurities. As alternative it is also possible to use the slide SIL-GQ available as accessory.

DIMENSIONS

Dimensions in mm, (inc)

(*) See installation notes



* 30.5 (1.2) with option “command signal Terminal” = 4

Alternately tighten the two fastening screws until reaching a torque of 0.4…0.6 Nm.
Wait 5 minutes for any excess paste to run off.
Alternately tighten the two fastening screws until reaching a torque of 1.2…1.4 Nm.

Attention

The contact surface of the heatsink module may have a maximum planarity error of 0.1 mm and maximum roughness of 0.02 mm. The fastening holes on the heatsink must be threaded and countersunk.
The heatsink must be grounded.

Short circuit protection

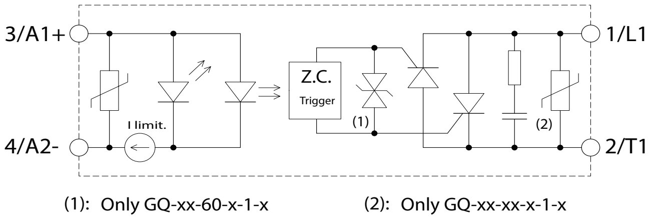
The product variants listed in the table "SCCR COORDINATION FUSES" are "Suitable For Use On A Circuit Capable Of Delivering Not More Than 100,000 A rms Symmetrical Amperes, 600 Volts Maximum when Protected by fuses.

Attention: the opening of the branch-circuit protective device may be an indication tha a fault has been interrupted. To reduce the risk of firee or electric shocks, current-carryng parts and other components of the device should be examinated and replaced if damaged. If burnout of the device occurs, the complete device must be replaced or equivalent.

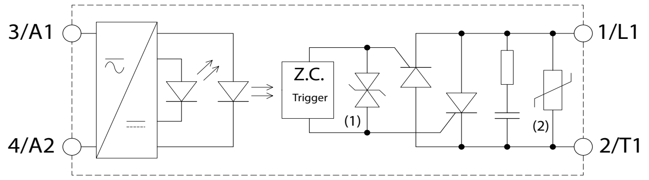
ELECTRICAL CONNECTIONS

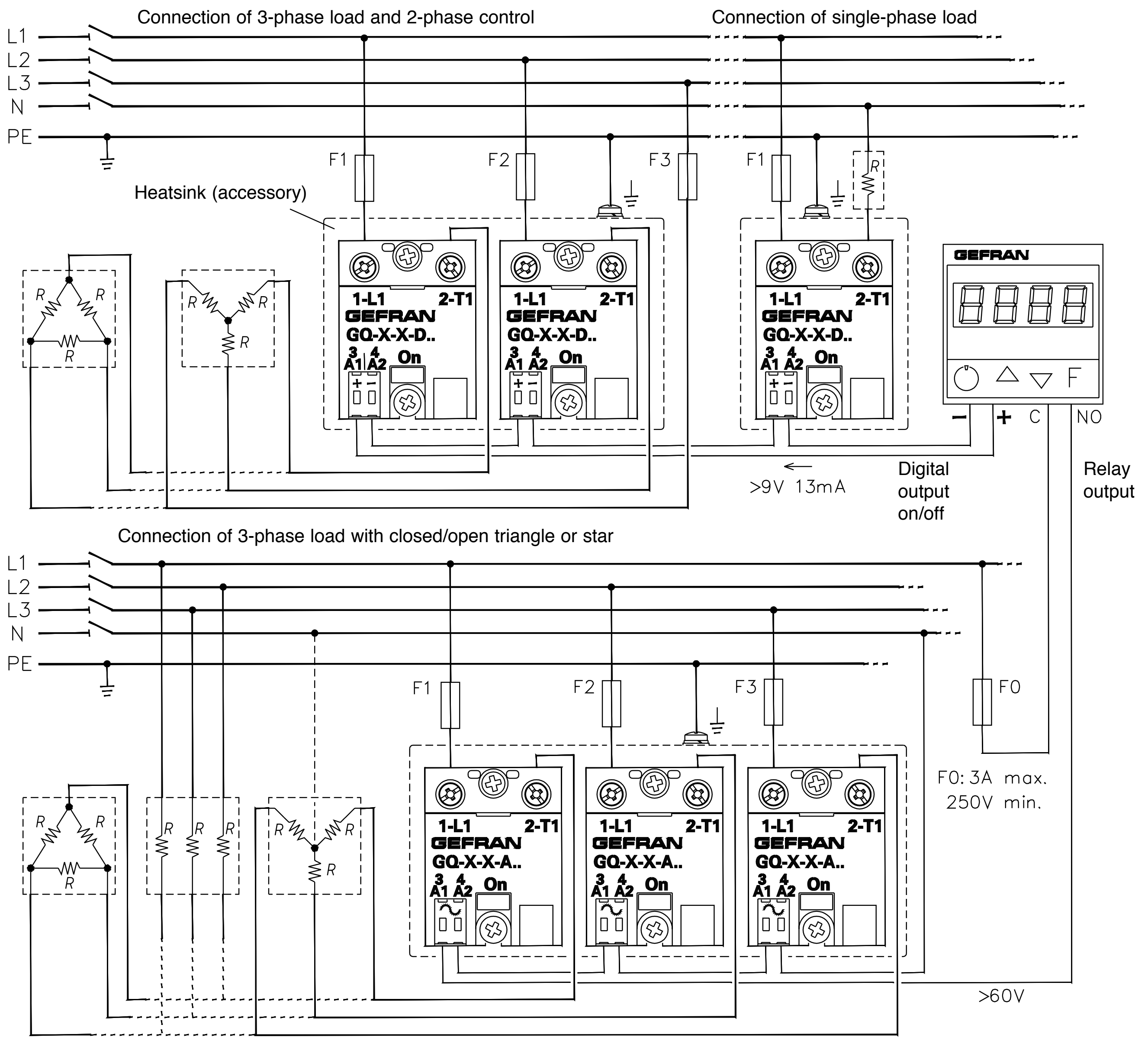
Functional Diagram

GQ-xx-xx-D-x-x

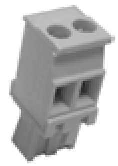


GQ-xx-xx-A-x-x





TERMINALS AND LEADS: SPECIFICATIONS

Description	Power terminals 1-L1 2-T2	2 poles command terminals 3-A1 / 4-A2			
Terminal type	screw (M4) contact area (LxP) 13x11mm	with self-locking spring **MORS1** extractable	with spring double connection **MORS2** extractable	with screw M3 **MORS3** extractable	with screw M3 **MORS4** not extractable
Stripped wire	1x2.5...6mm^2 2x1.5...2.5mm^2 2x2.5...6mm^2 Stripped 11mm	1x0.2...2.5mm^2 2x0.5...0.75mm^2 (#) Stripped 10mm	2x(1x0.2...2.5mm^2) 2x(2x0.2...0.75mm^2)(#) Stripped 10mm	1x0.25...2.5mm^2 2x0.25...1mm^2 (#) Stripped 7mm	1x0.5...1.5mm^2 Stripped 6mm
Prod cable	1x1.5...6mm^2 2x1.5...2.5mm^2 2x2.5...6mm^2	1x0.2...1.5mm^2 2x0.2...0.75mm^2 (#)	2x(1x0.25...2.5mm^2) 2x(2x0.25...0.75mm^2)(#)	1x0.25...2.5mm^2 2x0.25...1mm^2 (#)	---
Prod cable with collar	1x1.5...10mm^2 2x1.5...2.5mm^2 2x2.5...6mm^2	1x0.2...1.5mm^2	1x0.25...1.5mm^2	1x0.25...2.5mm^2 2x0.25...1.5mm^2 (#)	---
Fork or eyelet cable	1x2.5...25mm^2	---	---	---	---
Locking torque / screwdriver type	slot 1x5...6mm cross ø 5...6mm 2 - 2,4 Nm (18 - 21,3 lb.in)	with slot 0,6x3,5mm for contact opening thrust	with slot 0,6x3,5mm for contact opening thrust (with flexible stripped cable)	with slot 0,6x3,5mm with cross ø 3...3,8mm 0,5 - 0,6 Nm (4,4 - 5,3 lb.in)	with slot 0.6x3.5mm 0,4 Nm (3,5 lb.in)
(#) When inserting two leads in the same terminal they must have the same cross-section Note: The minimum and maximum sections shown refer to unipolar copper wires isolated in PVC.					

FUSES/ FUSES HOLDER

HIGH SPEED FUSES					FUSE HOLDER		
Model	**Size I^2T**	**Code Format**	**Model Code**	**Dissipated power @ In**	**Model Code Approval**	**Max power dissipated**	**Max continuative current**
GQ15...	16A 150A^2S	FUS-016 10x38	FWC16A10F 338470	3,5W	**PFI-10x38 337134 UR 30A@690V**	3W	13A
GQ25...	25A 390A^2S	FUS-025 10x38	FWC25A10F 338474	6W			13A
	375A^2S	FUS-026 14x51	FWC25A14F 338130	7W	**PFI-14x51 337503 UR 50A@600V**	5W	18A
GQ50...	50A 1800A^2S	FUS-051 14x51	FWC50A14F 338079	9W			27A
	50A 1600A^2S	FUS-050 22x58	FWC50A22F 338127	9,5W	**PFI-22x58 337223 UR 80A@600V**	9,5W	50A
GQ90...	80A 6600A^2S	FUS-080 22x58	FWP80A22F 338199	14W			50A
	100A 12500A^2S	FUS-100 22X58	FWP100A22F 338478	16W			60A

SCCR COORDINATION FUSES

SCCR COORDINATION FUSES				
Model	**Short circuit current [Arms]**	**Max fuse size [A]**	**Bussmann Model Number**	**Max Voltage [VAC]**
GQ 15	100.000	25	DFJ-25	600
GQ 25	100.000	25	DFJ-25	600
GQ 50	100.000	50	DFJ-50	600
GQ 90	100.000	100	DFJ-100	600

The fuses on the above table are representative of all the Bussmann DFJ fuses with lower current ratings
The devices protected with the fuses reported above, still be functional after the short circuit

HEATSINK/ THERMAL RESISTANCE

Model	GEFRAN HEATSINK (see accessories)	THERMAL RESISTANCE
GQ15... GQ25...	DIS 25GD DIS 50G	$R_{th} \geq 2,8$ K/W $R_{th} \geq 0,83$ K/W
GQ50...	DIS 50G	$R_{th} \geq 0,83$ K/W
GQ90...	DIS 90G	$R_{th} \geq 0,56$ K/W

Data relating to 40°C ambient temperature, heatsink in vertical position with 15 cm of free air above and below.

SECTION CABLE

Model	Section
GQ15...	2,5mm^2
GQ25...	6mm^2
GQ50...	12mm^2
GQ90...	25mm^2

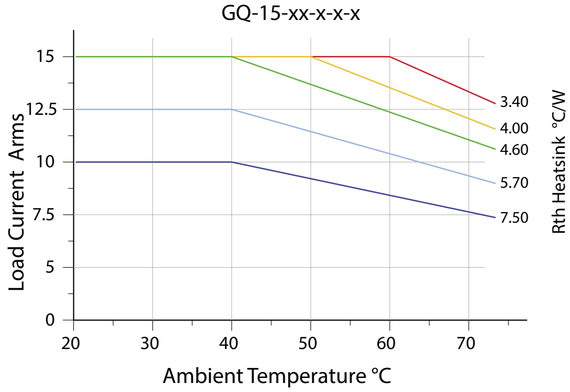
Minimum allowed rated section based on the rated currents of the power solid state relays, for copper leads isolated in PVC in continuous use and at room temperature of 40°C, according to standards CEI 44-5, CEI 17-11, IEC 408 pursuant to standard EN60204-1.
Power terminals in compliance with standard EN60947-1

REFERENCE NORMS

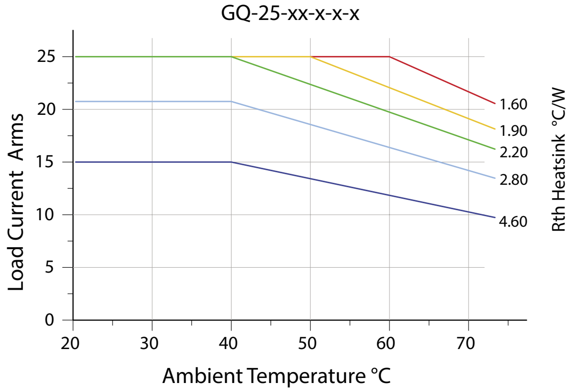
EMC Emission		
EN 61000-6-4	Emissions conducted at radiofrequency	Class A (Industrial devices)
EN 61000-6-4	Emissions irradiated at radiofrequency	Class A (Industrial devices)
The product is designed for type A environments. Use of the product in type B environments may cause undesired electromagnetic noise. In this case, the user should take appropriate steps for improvement.		
EMC Immunity		
EN 61000-6-2	Immunity for industrial environments	
EN 61000-4-2	Electrostatic discharges	4kV by contact; 8 kV in air. Performance criterion 2.
EN 61000-4-6	Electromagnetic field at radiofrequency 0,15-80MHz	Test level 3. Performance criterion 1.
EN 61000-4-3	Electromagnetic field at radiofrequency 80-1000MHz	Test level 10V/m. Performance criterion 1.
EN 61000-4-4	Immunity to burst	LTest level 2kV/100 KHz. Performance criterion 2.
EN 61000-4-5	Immunity to surge	Test level: 2kV (Phase-ground); 1kV (Phase-phase). Performance criterion 2.
Safety		
EN 61010-1	Safety requirements	

DISSIPATION CURVES

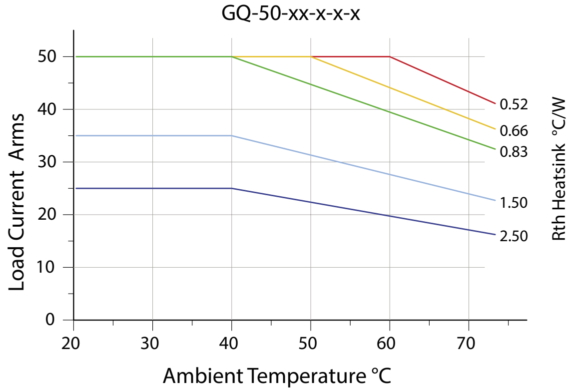
GQ-15-xx-x-x-x



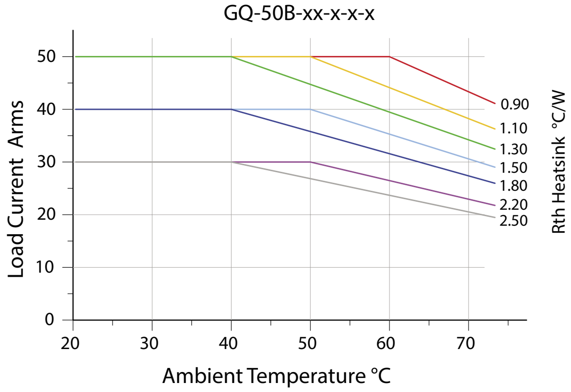
GQ-25-xx-x-x-x



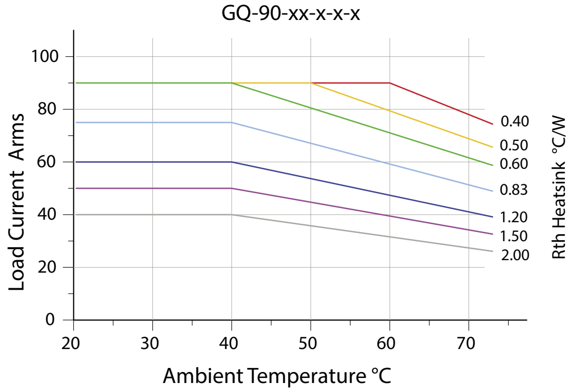
GQ-50-xx-x-x-x



GQ-50B-xx-x-x-x



GQ-90-xx-x-x-x



ORDER CODE

GQ | | | | |

MODEL	
	GQ

NOMINAL CURRENT	
15ACArms	**15**
25ACArms	**25**
50ACArms	**50**
50ACArms (*)	**50B**
90ACArms	**90**

NOMINAL VOLTAGE	
230VACrms	**24**
480VACrms	**48**
600VACrms (**)	**60**

(*) Version with high I^2t fusing current (short-circuit proof, using a specific magnetothermic switch)

(**) Available only in versions GQ-XX-60-X-1-X (overloading protection always present
Please, contact GEFRAN sales people for the codes availability

CONNECTORS	
0	Without connector
1	(MORS1) Two-pin spring connector,enclosed
2	(MORS2) Two-pin double spring connector, enclosed
3	(MORS3) Two-pin screw connector, enclosed
4	(MORS4) Two-pin screw connector, low profile enclosed

OVERVOLTAGE PROTECTION	
0	External
1	Internal

CONTROL VOLTAGE	
D	3...32Vc.c.
A	20...260Vac/Vcc

GEFRAN spa reserves the right to make any kind of design or functional modification at any moment without prior notice

•WARNINGS

WARNING: this symbol indicates danger.

Before installation, please read the following advices:

- follow the indications of the manual scrupulously when making the connections to the instrument.
- use a cable that is suitable for the ratings of voltage and current indicated in the technical specifications.
- if the instrument is used in applications where there is risk of injury to persons and damage to machines or materials, it is essential that it is used with an auxiliary alarm device.
- It is advisable to verify frequently that the alarm device is functional even during the normal operation of the equipment.
- The instrument must NOT be used in environments where there could be the presence of dangerous atmospheres (inflammable or explosive)
- During continuous operation, the heatsink may reach 100°C and remain at a high temperature due to thermal inertia even after the device is switched off. Therefore, DO NOT touch the heat sink or the electrical wires.
- do not operate on the power circuit untless the main supply is disconnected.
- DO NOT open the cover if device is “ON”!

Installation:

- connect the device to the ground using the proper ground terminal;
- the power supply wiring must be kept separate from that of inputs and outputs of the instrument; always check that the supply voltage corresponds to that indicated on the instrument cover;
- keep away from dust, humidity, corrosive gases and heat sources;
- is recommended in the electrical panel containing the GQ, install a fan near the group of GQ that keep air in movement.

Maintenance

- Check the correct operation of the cooling fans at regular intervals; clean the ventilation air filters of the installation at regular intervals
- Repairs must be performed only by specialized or appropriately trained personnel. Cut off 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 mechanical reliability of the device. To clean external plastic parts, use a clean cloth wet with ethyl alcohol or water

Technical service:

GEFRAN has a technical service department. Defects caused by use not conforming to the instructions are excluded from the warranty.

CE	In conformity to ECC 2014/30/EU and 2014/35/EU and following modification with reference to standard EN 60947-4-2 (Low voltage equipment - AC Semiconductor starters and contactors)
UL	In Conformity with **UL508 - File: E243386**
CSA	Conformity C/CSA/US CoFC no **70047999**
SCCR RMS SYM 100KA / 600V	100KA when protected by proper fuse

GEFRAN

GEFRAN spa
via Sebina, 74 - 25050 Provaglio d’Iseo (BS)
Tel. +39 030 9888.1 - fax +39 030 9839063 Internet: http://www.gefran.com