

Panel Mount "Hockey Puck" Solid State Relays up to 90 Amps



- ❶ Finger Safe Protection Covers
- ❷ AC or DC Input Connections
- ❸ AC Output Connection Models
- ❹ LED Status Indicator
- ❺ Internal MOV protection
- ❻ Integrated or optional heatsinks
- ❼ cURus, CE



With over forty years of experience, Gefran is the world leader in the design and production of solutions for measuring, controlling, and driving industrial production processes. Gefran's know-how and experience guarantee continuity and tangible solutions. Gefran's line of solid state relays are the ideal solution for applications where high speed switching and long life are essential. In specific applications, solid state relays offer many advantages over electromechanical devices including no moving parts or contact arcing. In addition, solid state relays are directly compatible with logic components such as microprocessors and PLCs.

feature is important in certain medical, residential and industrial applications. The Gefran solid state relays also include built-in metal oxide varistor (MOV) protection to protect against internal damage to the solid state relay.

Common Applications

- Heating controls
- Injection molding machines
- Semiconductor manufacturing equipment
- Glass processing
- Welding controls
- Food processing
- Industrial & commercial ovens
- Soldering machines
- Medical equipment
- Office machinery
- Robotics

Broad selection for many applications

The Gefran GQ solid state relays are available in the popular single phase "hockey puck" models up to 90 amps.

Opto-isolated input limits current leakage

All Gefran solid state relays feature opto-isolated inputs where an internal LED signals a photosensitive element when output switching is to occur. This provides up to 4,000V isolation between the input voltage and the output voltage and also limits current leakage. This

Output Circuit Features

The Gefran solid state relays feature zero voltage turn-on, which means they are designed to turn on at the next zero crossover after application of the control voltage. This limits electromagnetic interference, reducing the chance of damage to downstream equipment. A built-in MOV reduces the likelihood of damage to the relay from rapid changes in voltage (dv/dt) and transient voltages.

Many safety and convenience features

All Gefran solid state relays come standard with an LED to indicate when the relay is in an operational state. This increases safety and speeds troubleshooting. All GQ hockey puck type relays come standard with a load side cover that provides touch protection.

Approvals

The Series GQ solid state relays are cURus approved and CE marked.

Catalog Number Quick Guide

	GQ- 15		- 24		- D		- 1		- 4	
	Nominal Current		Nominal Voltage		Control Voltage		Overvoltage		Connectors	
Hockey Puck	15	15A AC	24	230V AC	D	3...32V DC	1	Internal protection	4	Two-pin screw connector, low profile enclosed
1-Phase	25	25A AC	60	600V AC	A	20...260V AC				
Panel Mount	50	50A AC								
	90	90A AC								

1 Pole Panel Mount Relay, 3-32V DC Control, 230V AC Output



Specifications	15 Amp	25 Amp	50 Amp	90 Amp
	Catalog Number	Catalog Number	Catalog Number	Catalog Number
	GQ-15-24-D-1-4	GQ-25-24-D-1-4	GQ-50-24-D-1-4	GQ-90-24-D-1-4
Input				
Voltage Range	3 - 32V DC	3 - 32V DC	3 - 32V DC	3 - 32V DC
Turn-on Voltage (min.)	≥ 2.7V DC	≥ 2.7V DC	≥ 2.7V DC	≥ 2.7V DC
Turn-off Voltage (max.)	≤ 1V DC	≤ 1V DC	≤ 1V DC	≤ 1V DC
Consumption	≤ 13mA @ 32V	≤ 13mA @ 32V	≤ 13mA @ 32V	≤ 13mA @ 32V
Reverse Voltage	< 36V DC	< 36V DC	< 36V DC	< 36V DC
Output				
Amp Rating AC51	15	25	50	90
Nominal Voltage	24...230V AC	24...230V AC	24...230V AC	24...230V AC
Maximum Voltage	20...253V AC	20...253V AC	20...253V AC	20...253V AC
Zero Switching Voltage	≤ 20V	≤ 20V	≤ 20V	≤ 20V
Frequency Range	45...65 Hz	45...65 Hz	45...65 Hz	45...65 Hz
Dimension (mm)	58 (H) x 45 (W) x 30.5 (D), from base to top of control terminal 45 (D)			

1 Pole Panel Mount Relay, 20-260V AC Control, 230V AC Output



Specifications	15 Amp	25 Amp	50 Amp	90 Amp
	Catalog Number	Catalog Number	Catalog Number	Catalog Number
	GQ-15-24-A-1-4	GQ-25-24-A-1-4	GQ-50-24-A-1-4	GQ-90-24-A-1-4
Input				
Voltage Range	20...260V AC	20...260V AC	20...260V AC	20...260V AC
Turn-on Voltage (min.)	≥ 15V AC	≥ 15V AC	≥ 15V AC	≥ 15V AC
Turn-off Voltage (max.)	≤ 6V AC	≤ 6V AC	≤ 6V AC	≤ 6V AC
Consumption	≤ 8mA @ 260V AC	≤ 8mA @ 260V AC	≤ 8mA @ 260V AC	≤ 8mA @ 260V AC
Output				
Amp Rating AC51	15	25	50	90
Nominal Voltage	24...230V AC	24...230V AC	24...230V AC	24...230V AC
Maximum Voltage	20...253V AC	20...253V AC	20...253V AC	20...253V AC
Zero Switching Voltage	≤ 20V	≤ 20V	≤ 20V	≤ 20V
Frequency Range	45...65 Hz	45...65 Hz	45...65 Hz	45...65 Hz
Dimension (mm)	58 (H) x 45 (W) x 30.5 (D), from base to top of control terminal 45 (D)			

G5

Gefran Solid State Relays

1 Pole Panel Mount Relay, 3-32V DC Control, 600V AC Output



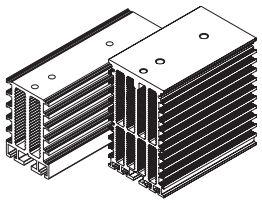
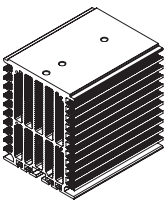
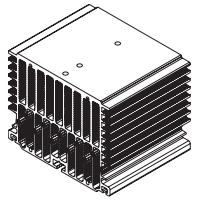


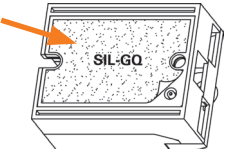
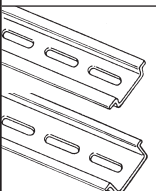
Specifications	50 Amp	90 Amp
	Catalog Number	Catalog Number
	GQ-50-60-D-1-4	GQ-90-60-D-1-4
Input		
Voltage Range	3 - 32V DC	3 - 32V DC
Turn-on Voltage (min.)	≥ 2.7V DC	≥ 2.7V DC
Turn-off Voltage (max.)	≤ 1V DC	≤ 1V DC
Consumption	≤ 13mA @ 32V	≤ 13mA @ 32V
Reverse Voltage	< 36V DC	< 36V DC
Output		
Amp Rating AC51	50	90
Nominal Voltage	48...600V AC	48...600V AC
Maximum Voltage	40...660V AC	40...660V AC
Zero Switching Voltage	≤ 40V	≤ 40V
Frequency Range	45...65 Hz	45...65 Hz
Dimension (mm)	58 (H) x 45 (W) x 30.5 (D), from base to top of control terminal 45 (D)	

1 Pole Panel Mount Relay, 20-260V AC Control, 600V AC Output



Specifications	50 Amp	90 Amp
	Catalog Number	Catalog Number
	GQ-50-60-A-1-4	GQ-90-60-A-1-4
Input		
Voltage Range	20...260V AC	20...260V AC
Turn-on Voltage (min.)	≥ 15V AC	≥ 15V AC
Turn-off Voltage (max.)	≤ 6V AC	≤ 6V AC
Consumption	≤ 8mA @ 260V AC	≤ 8mA @ 260V AC
Output		
Amp Rating AC51	50	90
Nominal Voltage	48...600V AC	48...600V AC
Maximum Voltage	40...660V AC	40...660V AC
Zero Switching Voltage	≤ 40V	≤ 40V
Frequency Range	45...65 Hz	45...65 Hz
Dimension (mm)	58 (H) x 45 (W) x 30.5 (D), from base to top of control terminal 45 (D)	

Accessories

Heatsinks	Description	Catalog Number
 <p>DIS-25GD DIS-50G</p>	<p>Heatsink – Extruded aluminum DIN-rail mount for mounting one GQ relay. Includes PAN-1 kit attachment for panel mounting.</p> <ul style="list-style-type: none"> - For use with GQ 15A & 25A relays - 100 x 24 x 65mm - Thermal Resistance Rth > 2.8 K/W 	DIS-25GD
	<ul style="list-style-type: none"> - For use with GQ 25A & 50A relays - 100 x 60 x 100mm - Thermal Resistance Rth > 8.3 K/W 	DIS-50G
	<p>Heatsink – Extruded aluminum DIN-rail mount for mounting one GQ relay. Includes PAN-1 kit attachment for panel mounting.</p> <ul style="list-style-type: none"> - For use with GQ 50A relays - 100 x 80 x 100mm - Thermal Resistance Rth > 0.66 K/W 	DIS-60G
	<p>Heatsink – Extruded aluminum DIN-rail mount for mounting one GQ relay. Includes PAN-1 kit attachment for panel mounting.</p> <ul style="list-style-type: none"> - For use with GQ 90A relays - 100 x 126 x 100mm - Thermal Resistance Rth > 0.56 K/W 	DIS-90G
	<p>Kit Attachment – Allows for panel mounting the GQ Series and DIS heat sinks. Includes 2 plastic supports, 2 screws, and 2 washers.</p>	PAN-1
	<p>Silicone thermoconductive paste – for coupling the GQ Relay power module to the heat sink. 100 g tube.</p>	SIL-1
	<p>Graphite Film – 35 x 55 mm graphite film for GQ relays.</p> <ul style="list-style-type: none"> - 0.12 mm thick, 2.1 W (m*K). - 200 x 240 mm sheet with 25 adhesives 	SIL-GQ
Accessory	Description	Catalog Number
	<p>DIN-rail - 2 meter lengths (6'6") Top Hat, low profile (price per rail) Top Hat, high profile (package of 20, price per rail)</p>	3F 3AF

G5
Gefran Solid State Relays

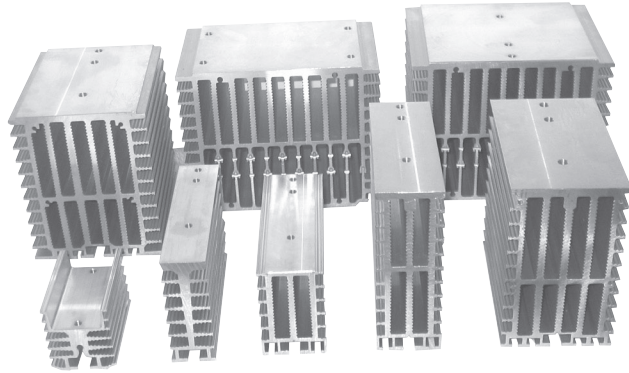
Cross Reference Series SAR/SAS to Gefran Solid State Relays

Sprecher+Schuh Catalog Number	Gefran Catalog Number
SAS Series Panel Mount	
SAS3-10-1D	GQ-15-24-D-1-4
SAS3-10-1	GQ-15-24-A-1-4
SAS3-25-1D	GQ-25-24-D-1-4
SAS3-25-1	GQ-25-24-A-1-4
SAS3-50-1D	GQ-50-24-D-1-4
SAS3-50-1	GQ-50-24-A-1-4
SAS3-75-1D	GQ-90-24-D-1-4
SAS3-75-1	GQ-90-24-A-1-4
SAS6-50-1D	GQ-50-60-D-1-4
SAS6-50-1	GQ-50-60-A-1-4
SAS6-75-1D	GQ-90-60-D-1-4
SAS6-75-1	GQ-90-60-A-1-4

* Suffix code for selected fan voltage

General Application Notes

Heatsinks



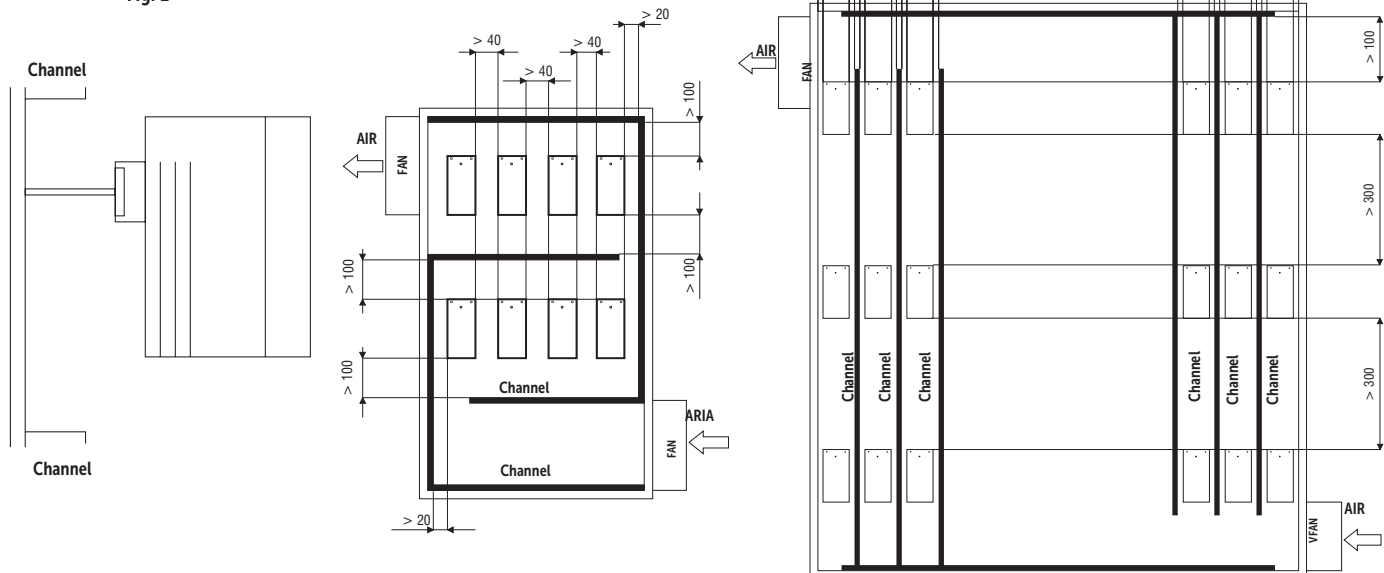
Different models of heatsinks have been designed and tested to meet size and dimension needs.

G5

How to choose a heatsink

- Set max. air temperature inside the panelboard (T_{max_a})
- Set max. operating current: $I_{max} = I_{nom} \text{ load} + 10\%$
- Draw on the “graphs” T_{max_a} , I_{max} points.
- Choose the smallest heatsink (starting from upwards), which point [T_{max_a} , I_{max}] is in the gray working area of dissipation curves
- Respect installation distances

Fig. 1



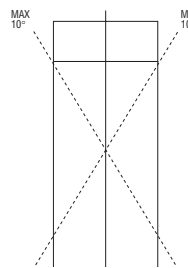
Installation

In order to obtain best reliability, it is important to install a heatsink correctly inside the panel, to reach an adequate thermal exchange between the device and the surrounding air in natural convection conditions.

How to install it correctly:

Mount it vertically (max. 10° inclination from the vertical axis)

- Vertical distance between a heatsink and the panel wall: 100 mm at least.
- Horizontal distance between a heatsink and the panel wall: 20 mm at least.
- Vertical distance between two heatsinks: 300 mm at least.
- Horizontal distance between two heatsinks: 40 mm at least.

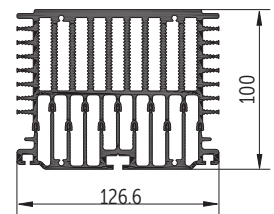
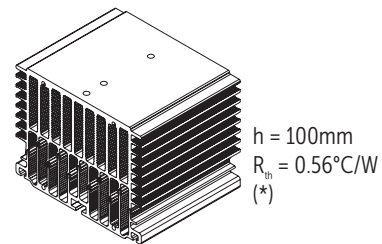
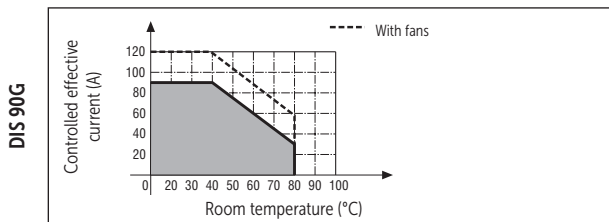
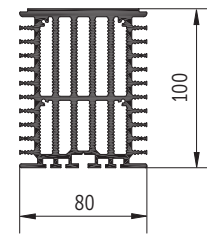
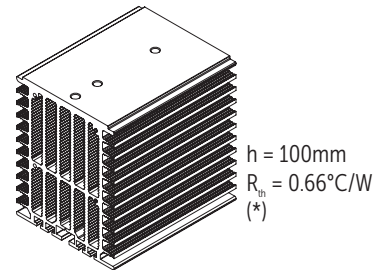
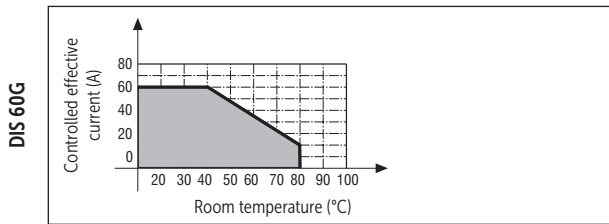
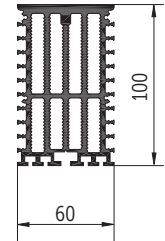
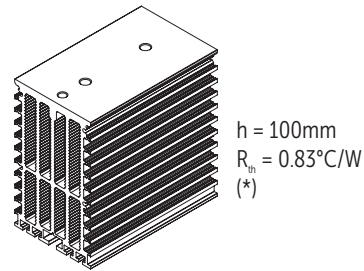
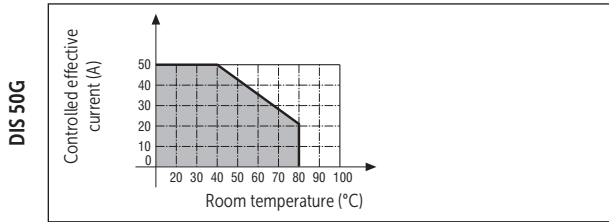
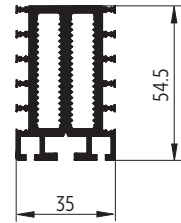
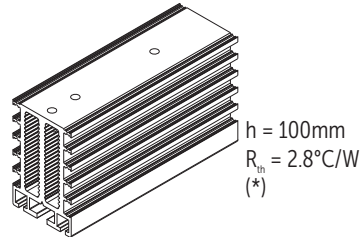
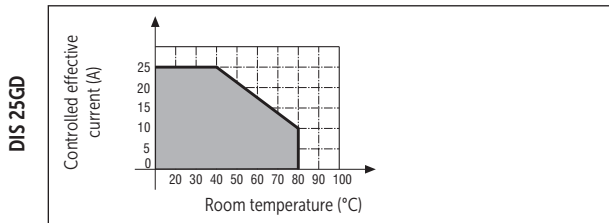


Check that cable channels do not reduce these distances; should it happen, mount the relays overhanging from the panel, so that the air can flow vertically on the heatsink without obstacles (see Fig.1).

General Application Notes *(continued)*

Dissipation Curves

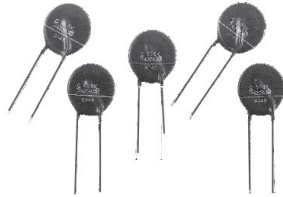
Effective current controllable based on room temperature



General Application Notes *(continued)*

Varistors (MOV)

If your application is located near inductive loads, or shares power sources with large inductive loads that are creating transients in excess of the blocking voltage of the Gefran solid state relay, then you must install a metal oxide varistor (MOV) to protect the solid state relay. It is up to the installation company to properly size the MOV to the application! Ideally, the MOV protection is near the noise generating inductive load (such as a motor, drive, or other large inductive coil) or you can place MOVs directly across the output terminals of the SSR.



Fuses and Fuse Holders

These fuses ensure the maximum safety in solid state relay applications. Fuses with a very high cutoff power are used for this kind of applications. See Table 1.



Table 1.

Recommended Fuses (by others) for GQ, GTS & GTZ Relays					
Type relay	i ² t	Nominal voltage	Size	Dimensions (mm)	Bussman Part No.
GQ 15A	450	230 480	16A	10x38	FWC16A10F
GTS 25A GQ 25A	645 450	230 480 600	25A	10x38	FWC25A10F
GTS 40A	1010	230 480	40A	14x51	FWP40A14
GTS 50A GQ 50A	6600	230 480 600	63A	22x58	FWP63A22F
GTS 60A	6600	230 480 600	80A	22x58	FWP80A22F
GTS 75A	8000	230 480	80A	22x58	FWP80A22F
GTS 90A GQ 90A	11200	230 480 600	100A	22x58	FWP100A22F
GTS 120A	11200	230 480 600	125A	0-0-0-TN/80 100x51x30	17OM1418000-TN/80
GTZ 25A	450 645	400 480	25A	12x32	FWC25A10F
GTZ 40A	1010	480 600	40A	14x51	FWP40A14
GTZ 55A	6600	480 600	63A	22x58	FWP63A22F

(*) PF for fuseholders: LEGRAND, PFI for fuseholders: ITALWEBER

Recommended MOVs from EPCOS:

Part Number	Working Voltage (V)
S20K300	120-290 V AC
S20K420	291-400 V AC
S20K510	401-500 V AC

The Gefran solid state relays include technology that dramatically reduces your need to install an external MOV except in extremely noisy environments or inductive load applications.

G5
Gefran Solid State Relays

General Application Notes *(continued)*

Series GQ Installation notes

- The heat sink must be grounded.
- Power controllers are designed to assure a switching function that does not include protection of the load line or of devices connected to it. The customer must provide all necessary safety and protection devices in conformity to current electrical standards and regulations.
- Protect the solid state relay by using an appropriate heat sink (accessory). The heat sink must be sized according to room temperature and load current.

Dissipated Power Calculation

Single-phase relay

$$Pd \text{ GQ..15/25} = 1.45 * IRMS \text{ [W]}$$

$$Pd \text{ GQ..50/90} = 1.35 * IRMS \text{ [W]}$$

IRMS = single-phase load current

Heatsink Thermal Resistance Calculation

$$R_{th} = (90^{\circ}\text{C} - \text{max amb. T}) / Pd$$

- 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 suitable for use in pollution degree 2 or better.

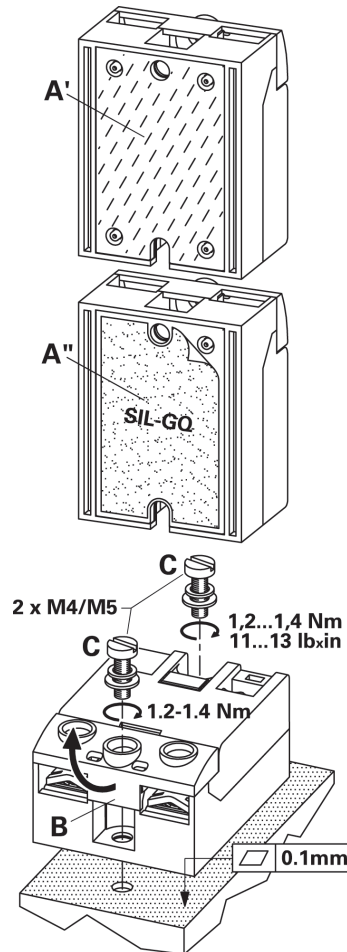
Procedure for mounting on heat sink:

The module-heat sink contact surface must have a maximum planarity error of 0.05mm, and maximum roughness of 0.02mm. The fastening holes on the heat sink must be threaded and countersunk.

Attention: spread 1 gram of thermoconductive silicone (we recommend DOW CORNING 340 HeatSink) on the dissipative metal surface of the module. The surfaces must be clean and there must be no impurities in the thermoconductive paste. As alternative it is also possible to use the graphite film SIL-GQ available as accessory.

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

Installation on heatsink:



Technical Information

			GQ-15-24-...	GQ-25-24-...	GQ-50-24-...	GQ-90-24-...	GQ-50-60-...	GQ-90-60-...
Amp Rating	AC51	[A rms]	15	25	50	90	50	90
	AC53	[A rms]	3	5	15	20	15	20
Min. load current		[A rms]	0.1	0.3	0.3	0.5	0.3	0.5
Repetitive overcurrent (t = 1s)		[A rms]	≤ 35	≤ 60	≤ 125	≤ 150	≤ 125	≤ 150
Non-repetitive overcurrent (t = 20 s)		[A p]	200	300	600	1500	600	1500
Current drop at nominal voltage and frequencies		[mA rms]	≤ 8	≤ 8	≤ 8	≤ 10	≤ 8	≤ 10
I ² t for fusing (t = 1-10 ms)		[A ² s]	≤ 200	≤ 450	≤ 1,800	≤ 11,200	≤ 1,800	≤ 11,200
Critical di/dt		[A/μs]	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100
Voltage drop at nominal current		[V rms]	≤ 1.45	≤ 1.45	≤ 1.35	≤ 1.35	≤ 1.35	≤ 1.35
Critical dV/dt off state		[V/μs]	≥ 1000	≥ 1000	≥ 1000	≥ 1000	≥ 1000	≥ 1000
I _{th}		[A]	15	25	50	90	50	90

Input

DC Control	Voltage Range	3 - 32V DC	
	Turn-on Voltage (min.)	≥ 2.7V DC	
	Turn-off Voltage (max.)	≤ 1V DC	
	Consumption	≤ 13mA @ 32V	
	Reverse Voltage	< 36V DC	

AC Control	Voltage Range	20...260V AC/V DC	
	Turn-on Voltage (min.)	≥ 15V AC/V DC	
	Turn-off Voltage (max.)	≤ 6V AC/V DC	
	Consumption	≤ 8mA ac/cc @ 260V AC/V DC	

Output	Nominal Voltage	24...230V AC	48...600V AC
	Maximum Voltage	20...253V AC	40...660V AC
	Non-repetitive Voltage	600Vp	1200Vp
	Zero Switching Voltage	≤ 20V	≤ 40V
	Frequency Range	45...65 Hz	45...65 Hz

Insulation

Nominal voltage	input/output	[V ac]	≥ 4000	
	output/case	[V ac]	≥ 2500	
Resistance	input/output	[Ω]	≥ 10 ¹⁰	
	output/case	[Ω]	≥ 10 ¹⁰	
Capacity	input/output	[pF]	≤ 8	
	output/case	[pF]	≤ 100	

Ambient Conditions

Ambient temperature	-25...+80°C [-13...176°F]	
Storage temperature	-55...+100°C [-67...212°F]	
Maximum relative humidity	50% at 40°C	
Maximum installation altitude	2000 m above sea level	
Pollution level	3	

Thermal Features

Junction temperature	≤ 125°C [257°F]							
R _{th}	junction/ambient	[K/W]	≤ 12	≤ 12	≤ 12	≤ 12	≤ 12	≤ 12
	junction/case	[K/W]	≤ 1.25	≤ 1.25	≤ 0.65	≤ 0.30	≤ 0.65	≤ 0.30

Heatsink

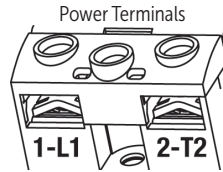
$$R_{th} = (90^\circ\text{C} - \text{max amb. } T / Pd)$$

Where Pd = dissipated power

Max. amb. T = max. air temperature inside the electrical cabinet

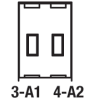
Use a heatsink with thermal resistance less than the calculated R_{th} value

Terminals and Leads



Screw (m4) contact area (LxP) 13 x 11 mm

Command Terminals



screw M2.5 MORS4 (22...16 AWG)

Terminal Type

1(L1) 2(T1)		3(A1) 4(A2)		
	1x 2,5...6 mm ² 1x 14...10 AWG 2x 1,5...2,5 mm ² 2x 16...14 AWG 2x 2,5...6 mm ² 2x 14...10 AWG		1x 0,2...2,5 mm ² 1x 24...14 AWG 2x 0,2...1,5 mm ² 2x 24...16 AWG	
	1x 1,5...6 mm ² 1x 16...10 AWG 2x 1,5...6 mm ² 2x 16...10 AWG		1x 0,25...2,5 mm ² 1x 23...14 AWG 2x 0,25...1 mm ² 2x 23...18 AWG	
	1x 2,5...25 mm ² 1x 14...4 AWG			
	2...2,4 Nm 18...21 lbf·in			
	GQ..15.. 2,5 mm ² 14 AWG	GQ..25.. 6 mm ² 10 AWG	GQ..50.. 12 mm ² (2x6) 7 AWG (2x10)	GQ..90.. 25 mm ² 4 AWG

Recommended Fuses (by others)

HIGH SPEED FUSES			
Model	Size I ² T	Bussman Part No.	Dissipated power @ I _n
GQ15...	16A 150A ² S	FWC16A10F 338470	3,5W
	25A 390A ² S	FWC25A10F 338474	6W
GQ25...	375A ² S	FWC25A14F 338130	7W
	50A 1800A ² S	FWC50A14F 338079	9W
GQ50...	50A 1600A ² S	FWC50A22F 338127	9,5W
	80A 6600A ² S	FWP80A22F 338199	14W
GQ90...	100A 12500A ² S	FWP100A22F 338478	16W

Heatsink / Thermal Resistance

Model	Gefran Heatsink (see accessories)	Thermal Resistance
GQ15... GQ25...	DIS 25GD DIS 50G	$R_{th} \geq 2,8 \text{ K/W}$ $R_{th} \geq 0,83 \text{ K/W}$
GQ50...	DIS 50G	$R_{th} \geq 0,83 \text{ K/W}$
GQ90...	DIS 90G	$R_{th} \geq 0,56 \text{ K/W}$

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 / 14 AWG
GQ25...	6mm ² / 10 AWG
GQ50...	12mm ² / 7 AWG
GQ90...	25mm ² / 4 AWG

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

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 Test level 3. 0.15-80MHz	Performance criterion 1
EN 61000-4-3	Electromagnetic field at radiofrequency Test level 10V/m. 80-1000MHz	Performance criterion 1
EN 61000-4-4	Immunity to burst	Test 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

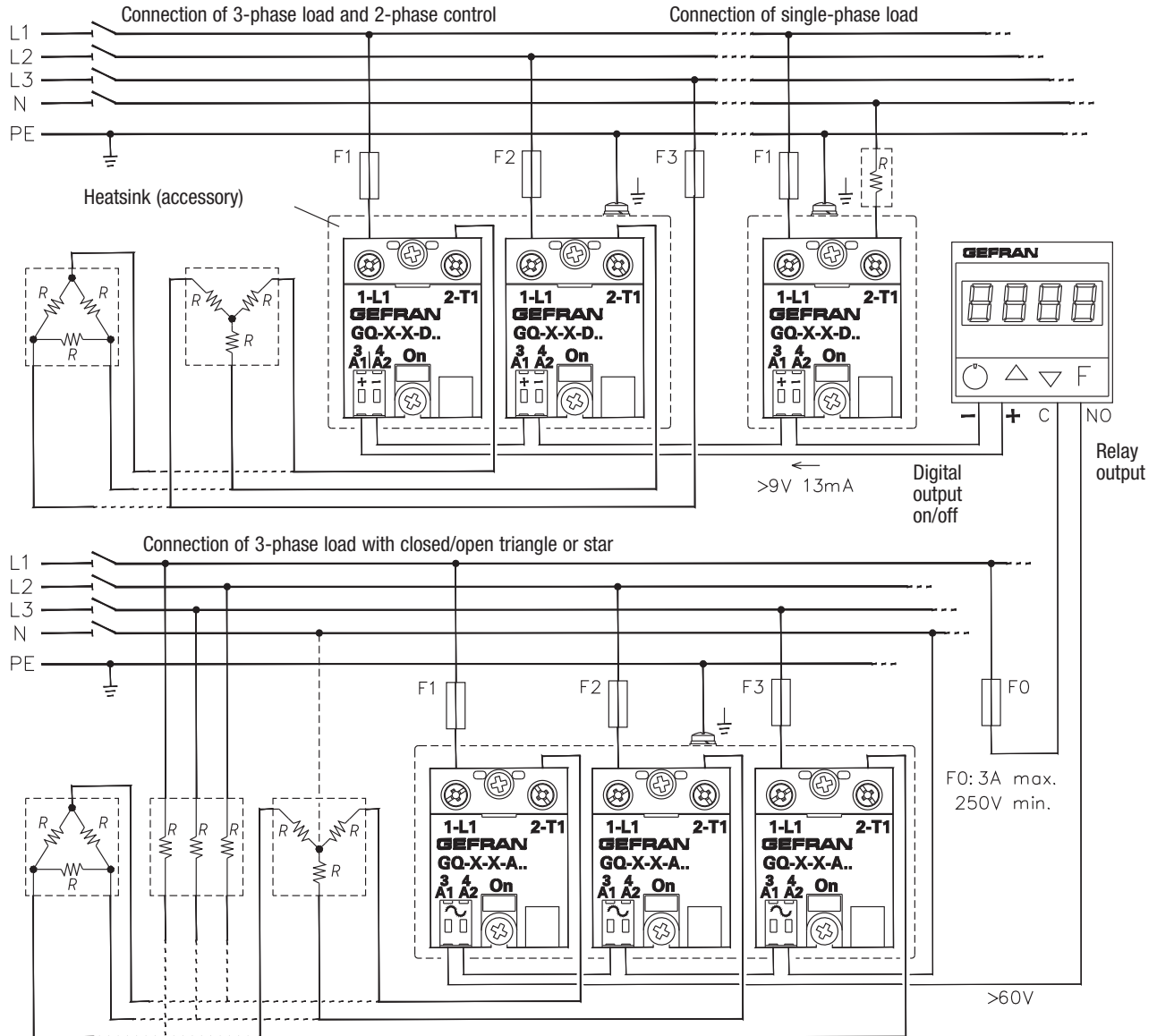
Safety

EN 61010-1	Safety requirements
------------	---------------------

G5

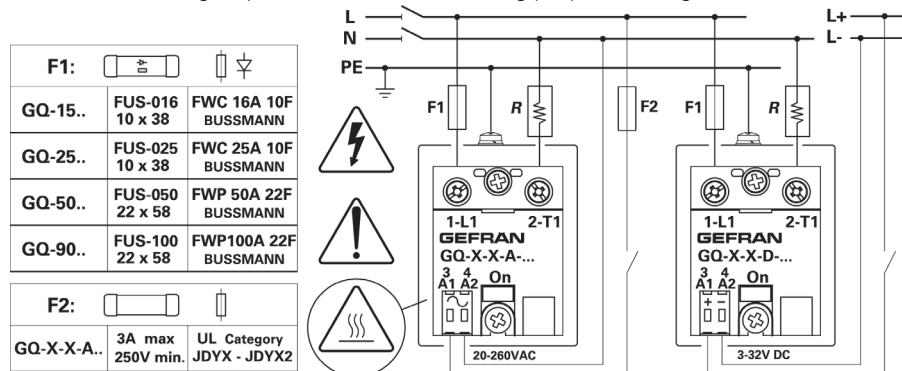
Gefran Solid State Relays

Series GQ Solid State Relays



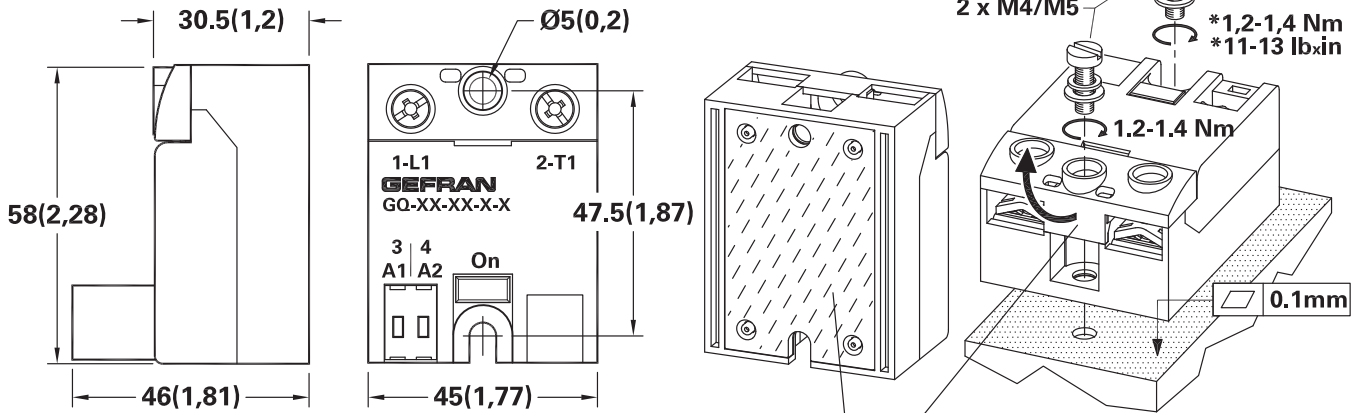
Series GQ Fuse Connections

The solid state group must be connected using proper fuses against short circuits



GQ Panel Mount Relays

Dimensions are in millimeters (inches). Dimensions not intended for manufacturing purposes.



(*) See installation notes

*Apply thermoconductive paste

Raise the guard to access the fastening hole or the terminals