

#### Main applications

- Thermoforming
- Plastic extrusion lines
- Industrial ovens and furnaces
- Heat treatments
- Control applications with high switching speed
- Mold heating/cooling

control units

- Refrigeration
- Air conditioning



#### Main features

- Control input from VDC/VAC logic signal
- 3-phase alternating current solid state relay
- Zero crossing switching
- 3-phase nominal current 3x10/25/40/55A
- Nominal voltage up to 600VCArms
- Integrated SCR thermal protection with LED signal
- Optional alarm output (for interrupted load diagnostics or for SCR overtemperature)
- Optoisolation (input/output) 4000Vrms
- Integrated overvoltage suppressor
- Non-repetitive voltage up to 1200Vp
- In Conformity with EN60947-4-3 and UL508

#### PROFILE

3-phase "zero crossing" solid state relay for control of resistive and inductive loads. Integrated device designed for industrial applications demanding control of high power levels and frequent switching, with loads up to 3 x 55A (AC51) at 400/480/600Vac.

Control is logic type (Vdc or Vac), signaled by LEDs. Each phase is controlled by means of semiconductors.

The constructive elements, special production process, and new, sturdy case, provide excellent reliability and continuity of service.

All versions are protected against overvoltages and against junction overtemperature, with signal LEDs and (optional) solid state alarm output.

An optional alarm output is available for interrupted load diagnostics.

The device is supplied complete with covers to protect against direct contacts (covers are removable for wiring).

Accessories available: heatsink, thermostats, fans, fuses and fuse holders.

**WARNING:** The GZ models must be used in conjunction with an appropriate heatsink (Accessory).

Installation must precisely observe the warnings contained in the installation notes.

#### TECHNICAL DATA

##### General features

Category of use:

AC51, AC53a

Nominal voltage (Ue):

400Vac (max. range 24...440Vac) (TRIAC)

480Vac (max. range 24...530Vac) (SCR)

600Vac (max. range 24...660Vac) (SCR)

Nominal frequency: 50/60Hz

Isolation nominal voltage (Ui): 600Vac

Peak voltage:

<800Vp for models with Ue=400Vac

<1200Vp for models with Ue=480Vac,

Ue=600Vac

Uninterrupted nominal service.

Critical dV/dt OFF-state:

500V/μs for models with Ue=400Vac

1000V/μs for models with Ue=480Vac,

Ue=600Vac

Switching voltage for zero: < 20V

Activation time: ≤1/2 cycle

Deactivation time: ≤1/2 cycle

Potential drop at rated current: ≤ 1,4Vrms

IP20 protection

Weight: 300g

#### Control inputs

- DC INPUT (Type "D"):

Voltage of command circuit (Uc): 5...32Vdc

Activation voltage: >4.5Vdc

Deactivation voltage: <3Vdc

Max. input: 18mA@5Vdc- 22mA@32Vdc

Max. reverse voltage: 36Vdc

- AC INPUT (Type "A"):

Control voltage: 20...260VAC/VDC

Activation voltage: > 15VAC /VDC

Deactivation voltage: < 6VAC/VDC

Current draw:

≤ 8 mAAC/DC@260VAC/VDC

Additional fuse (3A max) shall be installed on the control input circuit.

#### Outputs

##### GZ 10/...

Nominal current (Imax):

AC51: 3x10 A

AC53a: 3x2 A

##### GZ 25/...

Nominal current (Imax):

AC51: 3x25 A

AC53a: 3x5 A

##### GZ 40/...

Nominal current (Imax):

AC51: 3x40 A

AC53a: 3x8 A

##### GZ 55/...

Nominal current (Imax):

AC51: 3x55 A

AC53a: 3x15 A

### Thermal features

#### GZ 10,25

Junction temperature:  $\leq 125^{\circ}\text{C}$

Rth junction/case = 1.5 K/W

#### GZ 40

Junction temperature:  $\leq 125^{\circ}\text{C}$

Rth junction/case = 1 K/W

#### GZ 55

Junction temperature:  $\leq 125^{\circ}\text{C}$

Rth junction/case = 0.6 K/W

### Insulation

Nominal insulation voltage input/output:

2.5KV ac for models with Ue=400Vac

4KV ac for models with Ue=480Vac,

Ue=600Vac

Nominal impulse withstand voltage

(Uimp): 2500Vac

### Solid State Relay Dissipated Power Calculation

Three-phase relay

$P_d = 3 \times 1,4 \times I_{RMS} \text{ [W]}$

$I_{RMS}$  = three-phase load current

### Heatsink Thermal Resistance Calculation

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

$P_d$  = dissipated power

$T_{amb.max}$  = max air temperature inside the electrical cabinet.

Use a heatsink with thermal resistance inferior to the calculated one ( $R_{th}$ )

### Ambient conditions

- Working temperature:  $-20^{\circ}\text{C} \dots 80^{\circ}\text{C}$
- Max. relative humidity: 50% to 40°C
- Max. installation altitude: 2000 slm
- Pollution level : 2
- Storage temperature:  $-20 \dots 85^{\circ}\text{C}$
- Class: A (industrial device)
- Suitable for use in pollution degree 2 environmental

### Thermal protection

Junction temperature is constantly monitored inside the device.

If the maximum temperature limit is exceeded ( $T = 110^{\circ}\text{C}$ ), current to the load is interrupted and the yellow signal LED lights up.

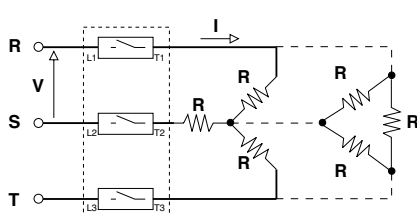
### Options

#### Option 1

(Thermal protection alarm output)

The alarm output option activates closing of an isolated contact (max 32VAC/VDC, 150mA, conducting resistance  $\leq 15 \text{ ohm}$ )

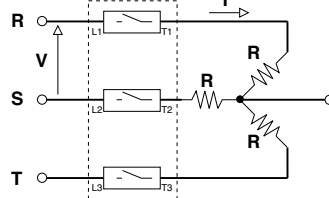
Three-phase Star or Triangle closed control



$V_{\text{nominal}} = V$

$I_{\text{nominal}} = \frac{P}{\sqrt{3} \cdot V} + 10\%$

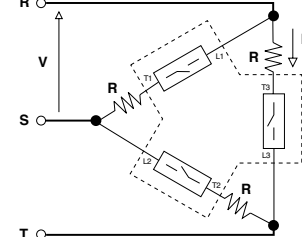
Three-phase Star control with neutral



$V_{\text{nominal}} = \frac{V}{\sqrt{3}}$

$I_{\text{nominal}} = \frac{P}{\sqrt{3} \cdot V} + 10\%$

Three-phase Triangle open control



$V_{\text{nominal}} = V$

$I_{\text{nominal}} = \frac{P}{3 \cdot V} + 10\%$

## TECHNICAL DATA OF THE MAIN CIRCUIT

Model	I <sub>max</sub> [Arms]	R <sub>th,heatsink</sub> @T <sub>a</sub> =40°C [K/W]	I <sub>e</sub> (*) [Arms]	R <sub>th,heatsink</sub> @T <sub>a</sub> =40°C [K/W]	Dimension heatsink (accessories)	Non-repetitive overcurrent t=20ms [A]	I <sup>2</sup> t [A²s]
GZ 10/400	3x10	1.78	3x10	1.19	100x127x80	120	100
GZ 25/400	3x25	0.57	3x25	0.38		250	450
GZ 25/480	3x25	0.57	3x25	0.38		400	645
GZ 40/480	3x40	0.36	3x40	0.24	100x127x100 (with fan)	600	1010
GZ 55/480	3x55	0.19	3x55	0.16		1150	6600
GZ 40/600	3x40	0.36	3x40	0.24		600	1010
GZ 55/600	3x55	0.19	3x55	0.16		1150	6600

(\*) I<sub>e</sub> = Nominal current (Standard CEI EN 60947-4-3)

when it detects the following condition:  
control signal active but SCR / heatsink  
is in overtemperature (GZ thermal  
protection)

#### Option 2

(Thermal protection alarm output and  
interrupted load).

Only for GZ with Type "A" input

The alarm output option activates closing  
of an isolated contact (max 32VAC/VDC,  
150mA, conducting resistance  $\leq 15 \text{ ohm}$ )

when it detects the following conditions:

- Control signal active but no current in at

least one three-phase branch (interrupted  
load)

- Control signal active but no power line  
voltage (no line)

- Control signal active but SCR / heatsink  
is in overtemperature (GZ thermal  
protection).

Maximum delay in tripping of load interrupt  
alarm < 400ms.

Maximum length of wires between GS  
and load for correct operation of load  
diagnostics < 25m

### Installation notes

Use the high speed fuses specified in  
the catalog according to the connection  
example provided.

Applications with solid state power units  
must also include an automatic safety  
switch to cut out the load power line.

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 (see  
the technical documentation).

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.

Spread 4 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.

Use 4 M4x10 or M5x10 screws with flexible washer for attachment.

Alternately tighten the fastening screws until reaching a torque of 0.60Nm.

Wait 30 minutes for any excess paste to drain.

Alternately tighten the four fastening screws until reaching a torque of 1.2 Nm for the M4 screws and 1.5 Nm for the M5 screws.

It is advisable to make random checks of correct installation by disassembling the module and checking that there are no air bubbles under the copper plate

Install the units cantilevered to the panel so that air can flow vertically over the heatsink without obstructions.

- Maximum surrounding air temperature 40°C (for UL).
- Open type equipment

#### Limits of use

- dissipation of thermal power of device with restrictions on temperature of installation site.

- requires exchange with outside air or an air conditioner to transfer dissipated power

outside the panel.

- max. voltage limits and derivative of transients in line, for which the solid state unit has internal protection devices.
- presence of dispersion current < 10mA (max. value with rated voltage and junction temperature of 125°C).

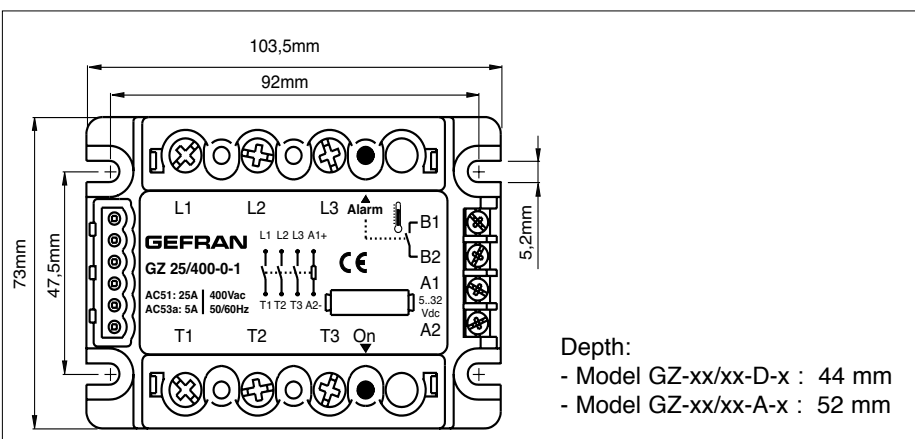
carrying parts and other components of the device should be examined and replaced if damaged. If burnout of the device occurs, the complete device must be replaced or equivalent.

#### Short circuit protection

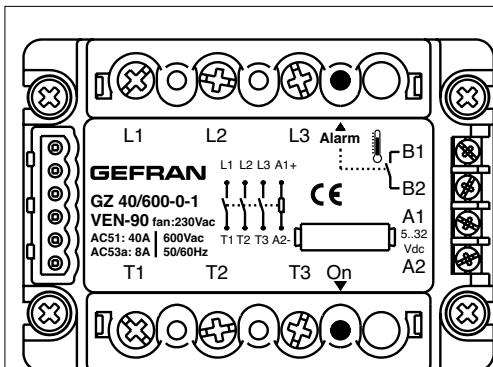
The product variants listed in the table "SCCR COORDINATION FUSES" are "Suitable For Use On A Circuit Capable Of Delivering Not More Than 100,000 A rms Symmetrical Amperes, 600 Volts Maximum when Protected by fuses.

**Attention:** the opening of the branch-circuit protective device may be an indication that a fault has been interrupted. To reduce the risk of fire or electric shocks, current-

#### DIMENSIONS

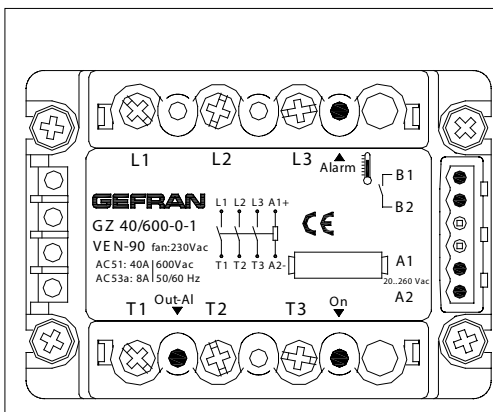


#### FACEPLATE DESCRIPTION GZ with DC control (Models GZ-xx/xx-D-x)



- |            |   |
|------------|---|
| L1 :       | Phase 1 input                               |
| L2 :       | Phase 2 input                               |
| L3 :       | Phase 3 input                               |
| T1 :       | Phase 1 output                              |
| T2 :       | Phase 2 output                              |
| T3 :       | Phase 3 output                              |
| A1 :       | Control signal (+)                          |
| A2 :       | Control signal (-)                          |
| B1 :       | Alarm output (option)                       |
| B2 :       | Alarm output (option)                       |
| Led ON:    | Red led signal indicator                    |
| Led Alarm: | Yellow led (alarm overtemperature junction) |

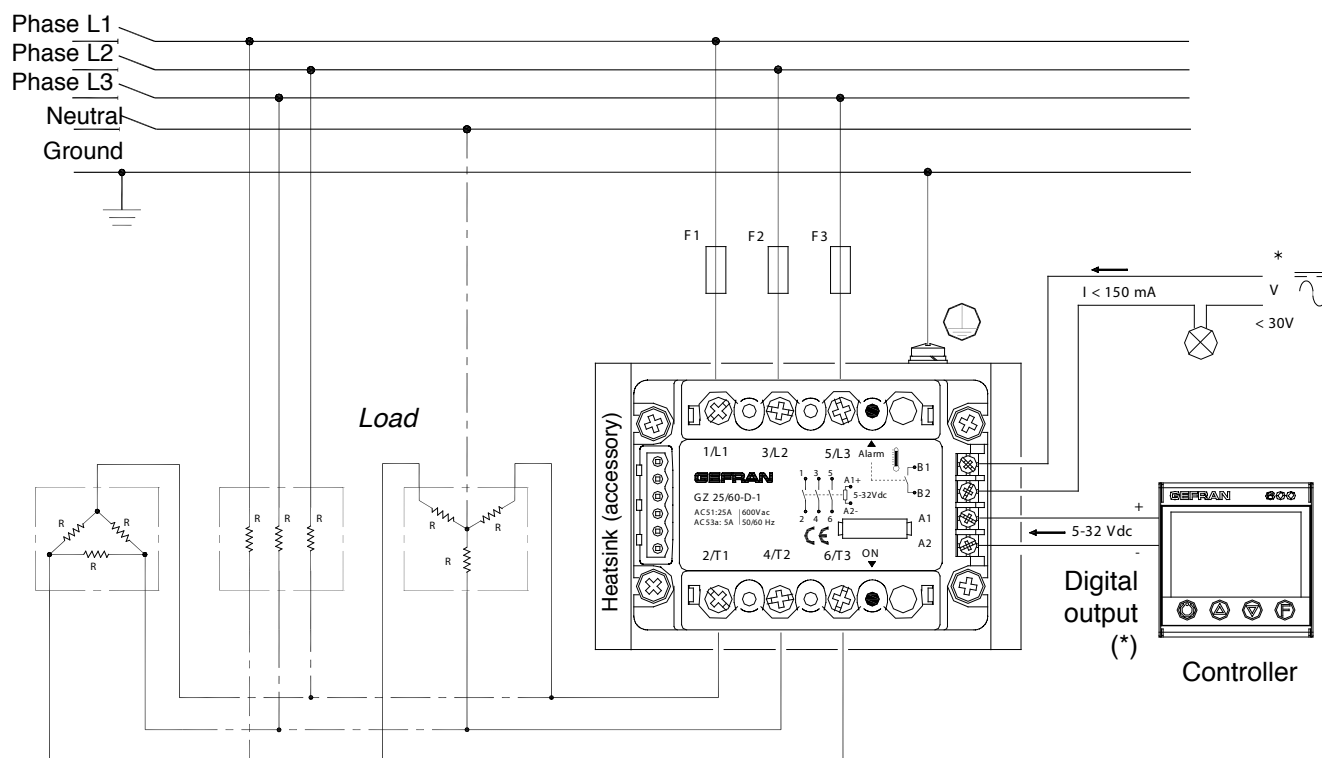
#### FACEPLATE DESCRIPTION GZ with AC control (Models GZ-xx/xx-A-x)



- |             |   |
|-------------|---|
| L1 :        | Phase 1 input                                       |
| L2 :        | Phase 2 input                                       |
| L3 :        | Phase 3 input                                       |
| T1 :        | Phase 1 output                                      |
| T2 :        | Phase 2 output                                      |
| T3 :        | Phase 3 output                                      |
| A1 :        | Control signal (AC)                                 |
| A2 :        | Control signal (AC)                                 |
| B1 :        | Alarm output (option)                               |
| B2 :        | Alarm output (option)                               |
| Led ON:     | Red led signal indicator                            |
| Led Alarm:  | Yellow led (alarm overtemperature junction)         |
| Led OUT-AL: | Red Led interrupted load alarm (with option 2 only) |

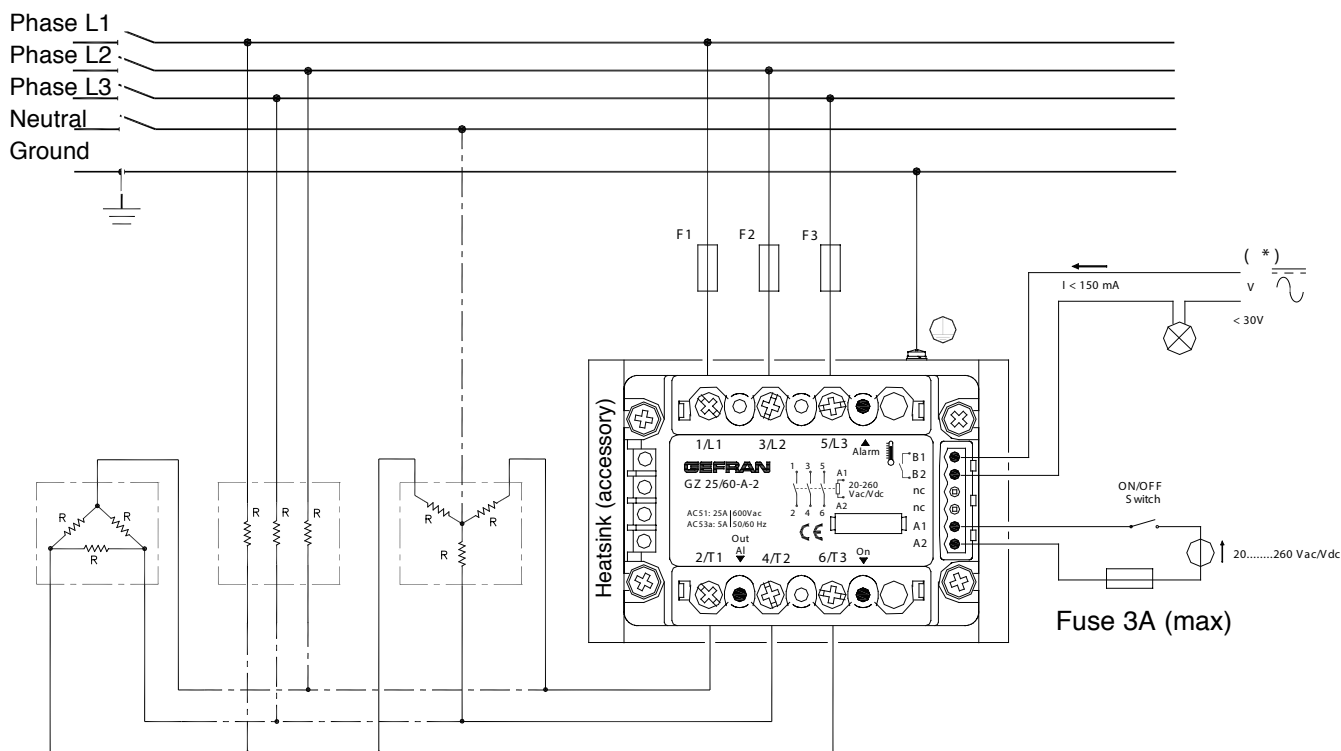
## CONNECTION EXAMPLES - GZ GZ with DC control (Models GZ-xx/xx-D-x)

Three-phase Triangle or Star connection (with and without neutral)



\* Only in the version with option overtemperature alarm output

## CONNECTION EXAMPLES - GZ with AC control (Models GZ-xx/xx-A-x)

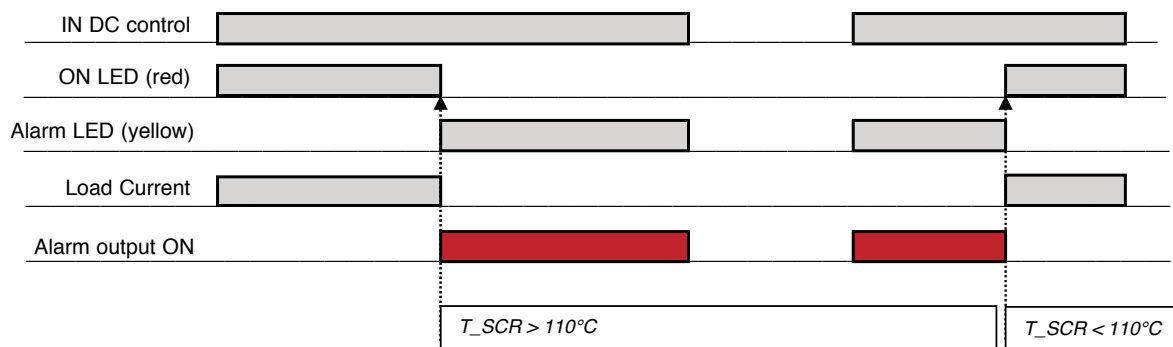


\* Only in the version with option alarm output

## TYPE OF OPERATION

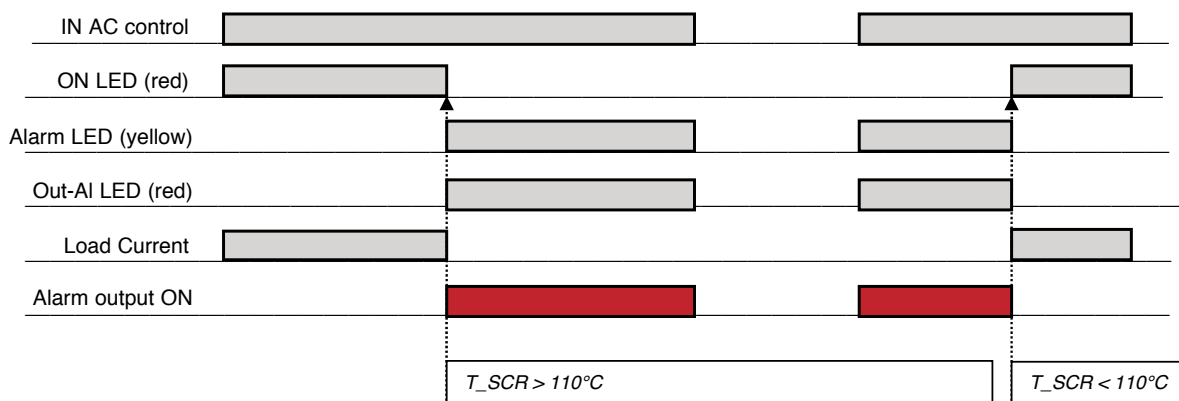
### ALARM OPTION – DC INPUT: FUNCTIONAL DIAGRAM:

#### THERMAL PROTECTION ALARM

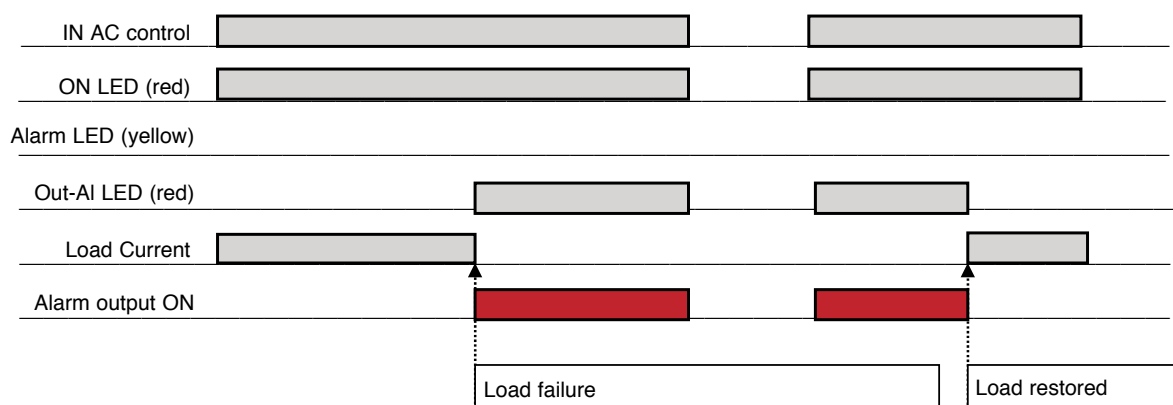


### ALARM OPTION – AC INPUT: FUNCTIONAL DIAGRAM:

#### THERMAL PROTECTION ALARM



#### INTERRUPTED LOAD ALARM



## TABLE OF TERMINALS AND CONDUCTORS

Model	I/O control terminal (A1, A2, B1, B2)			Power terminal (L1, L2, L3, T1, T2, T3)		
	Contact area (LxD) screw type	Type of pre-insulated crimp connector	Wire section (*)/ tightening torque	Contact area (LxD) screw type	Type of pre-insulated crimp connector	Wire section (*)/ tightening torque
GZ 10...55A with DC control	6,3x9 M3	eye / fork / tip	min. 0.35 mm <sup>2</sup> max. 2,5 mm <sup>2</sup> 0,6 Nm Max	12x12 M5	eye / fork / tip	min. 1 mm <sup>2</sup> max. 10 mm <sup>2</sup> (tip)
GZ 10...55A with AC control	Plug connec- tor 2/6 pins	Stripped wire or tip	min. 0.25 mm <sup>2</sup> max. 2,5 mm <sup>2</sup> 0,5 Nm Max			min. 1 mm <sup>2</sup> max. 16 mm <sup>2</sup> (eye / fork)  1,5 - 2,2 Nm

Model	Ground terminal (see note)	
	Contact area (LxD) screw type	Wire section (*)/ tightening torque
GZ 10...40A	Area: 7x12 mm <sup>2</sup> Screw: self-threading 3.9x12 DIN7981	min. 1 mm <sup>2</sup> max. 16 mm <sup>2</sup> 1,5-1,8 Nm
GZ 55A	Area: 12x12 mm <sup>2</sup> Screw: M5	min. 1 mm <sup>2</sup> max. 16 mm <sup>2</sup> 2 - 2,5 Nm

(\*) The max. sections specified refer to unipolar copper wires isolated in PVC.

Note: For the ground terminal, you have to use an eye wire terminal.

(LxP) = width x depth [mm]

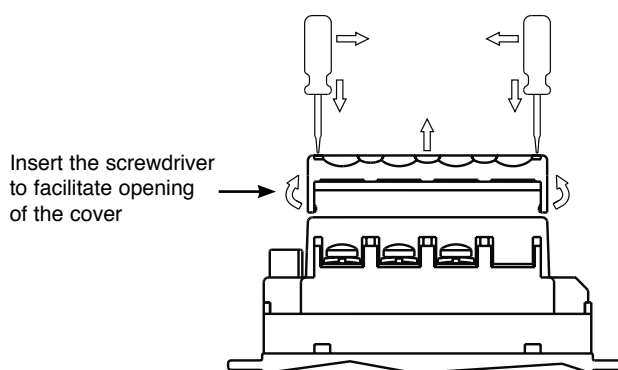
The minimum acceptable nominal section based on the nominal currents of the power solid state units is given below for copper conductors isolated in PVC, under continuous operating conditions and at 40°C ambient temperature according to standards CEI 44-5, CEI 17-11, IEC 408 in accordance with EN60204-1

Nominal current	Nominal section cable on mm <sup>2</sup>
10A	2,5
25A	6
40A	10
55A	16

### Terminal covers

If an eye terminal lug is used, the terminal covers can be removed more easily by inserting a Phillips screwdriver (max. width 3.5 mm) into the side slots.

With the point of the screwdriver, widen the side of the cover and raise it.



## ACCESSORIES

A wide range of accessories is available heatsink, fuses and fuse holders , current transformer, thermostats.  
To choose accessories, see the section "Solid state relays - Accessories".

## EXTRARAPID FUSES

Modell	i2t	Nennspannung	Baugröße	Abmessungen mm	Bestellnummer der Sicherung	Bestellnummer des Sicherungshalters	Notes
GZ 10A	100	400	10A	10x38	FUS-10-L	PF-10x38	herausziehbar.
GZ 25A	450	400	25A	12x32	FUS-025	PF-10x38	herausziehbar.
	645	480					
GZ 40A	1010	480	40A	14x51	FUS-040	PF-14x51	herausziehbar.
		600					
GZ 55A	6600	480	63A	22x58	FUS-063	PF-22x58	herausziehbar.
		600					

## SCCR COORDINATION FUSES

Model	Short circuit current [Arms]	Max fuse size [A]	Bussmann Model Number	Max Voltage [VAC]
GZ 25	100.000	25	DFJ-25	600
GZ 40	100.000	40	DFJ-40	600
GZ 55	100.000	80	DFJ-80	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

## ORDER CODE

<table border="1"> <tr> <th colspan="2">MODEL</th> </tr> <tr> <td></td> <td>GZ</td> </tr> </table>		MODEL			GZ	<table border="1"> <tr> <th colspan="2">NOMINAL CURRENT</th> </tr> <tr> <td>10Aac</td> <td>10</td> </tr> <tr> <td>25Aac</td> <td>25</td> </tr> <tr> <td>25Aac (*)</td> <td>25B</td> </tr> <tr> <td>40Aac</td> <td>40</td> </tr> <tr> <td>55Aac</td> <td>55</td> </tr> </table>		NOMINAL CURRENT		10Aac	10	25Aac	25	25Aac (*)	25B	40Aac	40	55Aac	55	<table border="1"> <tr> <th colspan="2">NOMINAL VOLTAGE</th> </tr> <tr> <td>400Vac (only for 25A models and only with type "D" input)</td> <td>40</td> </tr> <tr> <td>480Vac</td> <td>48</td> </tr> <tr> <td>600Vac</td> <td>60</td> </tr> </table>		NOMINAL VOLTAGE		400Vac (only for 25A models and only with type "D" input)	40	480Vac	48	600Vac	60	<table border="1"> <tr> <th colspan="2">OPTIONS</th> </tr> <tr> <td>0</td> <td>None</td> </tr> <tr> <td>1</td> <td>Alarm output thermal protection</td> </tr> <tr> <td>2</td> <td>Alarm output for interrupted load diagnostics and thermal protection. (Available ONLY with type "A" input)</td> </tr> </table>		OPTIONS		0	None	1	Alarm output thermal protection	2	Alarm output for interrupted load diagnostics and thermal protection. (Available ONLY with type "A" input)	<table border="1"> <tr> <th colspan="2">INPUT TYPE</th> </tr> <tr> <td>D</td> <td>5...32Vdc</td> </tr> <tr> <td>A</td> <td>20...260Vac/Vdc</td> </tr> </table>		INPUT TYPE		D	5...32Vdc	A	20...260Vac/Vdc
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(\*) Version with high melt energy ( $I^2t$ ) short circuit-proof using a specific circuit breaker.

Please contact GEFRA personnel for information on availability of codes.

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.

**Read the following warnings before installing, connecting or using the device:**

if the solid state relay is used in applications with risk of injury to people, machines, or materials, auxiliary alarm devices **MUST** be employed. It is also advisable to be able to check for tripping of alarms during normal operation;

- follow instructions precisely when connecting the heatsink;
- always use cables that are suitable for the voltage and current levels indicated in the technical specifications;
- **DO NOT** operate the device in rooms with dangerous (flammable or explosive) atmosphere;
- During continuous operation, the heat sink can reach up to 100°C, 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:**

- ground the heatsink connected to the power module;
- 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 GZ group in the electrical panel containing the GZs.;
- size the heatsink adequately according to the indicated parameters.

**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.

<b>SCCR RMS SYM</b> <b>100KA / 600V</b>	100KA when protected by proper fuse
<b>EAC</b>	Conformity N° TC RU C-IT.A/132.B.00422
<b>CSA</b>	Conformity C/CSA/US CoFC no. <b>70051156</b>
<b>CE</b>	In conformity to ECC 2014/30/EU and 2014/35/EU and following modification with reference to standard EN 60947-4-3 (Low voltage equipment - AC Semiconductor starters and contactors)
<b>UL</b>	In Conformity with <b>UL508 - File: E243386</b>