GEFRAN

GS 15 / 25 / 40 / 50 / 60 / 75 / 90 / 120A

SOLID STATE RELAYS WITH LOGIC CONTROL

Main applications

- *Plastics extrusion lines and injection moulding machines*
- *Packing and packaging machines*
- *Polymerization plant for synthetic fibre production*
- *Rubber moulding machinery*
- *Driers for ceramics and components for the building industries*
- *Chemical and pharmaceutical industries*
- *Industrial electric furnaces*
- *Food processing plants*

Main features

- *Alternating current solid state relay*
- *Zero crossing switching*
- *Control input from VDC/VAC logic signal*
- *Copper/semiconductor coupling technology*
- *10, 15, 20, 25, 40, 50, 60, 90, and 120 Arms nominal current*
- *Non-repetitive voltage: up to 1200Vp*
- *Nominal Voltage: up to 600Vac*
- *Integrated SCR thermal protection with LED signal (only for models with > 40A current)*
- *4000 Vrms optoinsulation (input-output)*
- *LED, drive input signal indicator*
- *MOV (varistors)*

PROFILE

Zero crossing relay with antiparallel thyristor output is the most used solid state relay in industrial applications.

"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.

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.

Use the relè with an opportune heatsink (see section accessories).

Varistors, fuses, thermostats and fans are available as fittings.

ALARM OPTION:
for models with AC control
(Input type = "A")

OPERATING DESCRIPTION

The alarm output option activates closing of an isolated contact when it detects the following fault conditions:

• Control signal active but no current on load (zero current, interrupted load)

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

• Control signal active but SCR / heatsink is in overtemperature (GS thermal protection)

NOTE: in the absence of the control, the alarm output is always open (the alarm memory latch function is not possible, as with GS with Type "D" input).

ALARM OPTION:
for models with DC control
(Input type "D")

OPERATING DESCRIPTION.

The alarm output option activates an isolated contact (or a PNP digital output) when it detects the following fault conditions:

• Control signal active but no current on load (Zero Current, Interrupted Load)

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

• Control signal active but SCR / heatsink is in overtemperature (GS thermal protection)

The alarm output is latched: its state is maintained even when the control signal is switched off.

The alarm output resets when load current is restored or when the 24V_supply of the GS is switched off and then on again (V_supply reset).

The alarm output option is available in the order code as an isolated contact Solid State Switch (or as a PNP digital output) with normally open contact (or normally deactivated PNP output), or with normally closed contact (or normally active PNP digital output).

TECHNICAL DATA

General features

Category of use: AC1
Nominal voltage
- 230Vac (max. range 24...280Vac)
- 480Vac (max. range 24...530Vac)
- 600Vac (max range 24 ... 660Vac)

Nominal frequency: 50/60Hz
Non-repetitive voltage:
- 500Vp for model with rated voltage 230Vac
- for model with rated voltage 480Vac
- 1400Vp for models with nominal voltage of 600VAC

Switching voltage for zero: < 20V
Activation time: ≤ 1/2 cycle
Deactivation time: ≤ 1/2 cycle
Potential drop at rated current: ≤ 1.4V
Power factor = 1

Control inputs

DC INPUT (Type "D"):
Max. input: < 10mA@32V
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

Alarm output option

Interruption of the load or of the line commands a contact (solid state switch or a PNP digital output (max 30V, 150mA resistance <15 ohm).
Maximum delay in tripping of load interrupt alarm < 400ms
Maximum length of wires between GS and load for correct operation of load diagnostics < 25m

OUTPUTS

GS 15
Nominal currents of the device with opportune heatsink in continuous work:15A
Non-repetitive overcurren t=20 ms: 400A
I^2t for blowout: ≤450A^2s
dV/dt critical with output deactivated: 1000V/μs

GS 25
Nominal currents of the device with opportune heatsink in continuous work: 25A
Non-repetitive overcurrent t=20 ms: 400A
I^2t for blowout: ≤645A^2s
dV/dt critical with output deactivated: 1000V/μs

GS 40
Nominal currents of the device with opportune heatsink in continuous work: 40A
Non-repetitive overcurrent t=20 ms: 600A
I^2t for blowout: ≤1010A^2s
dV/dt critical with output deactivated: 1000 V/μs

GS 50
Nominal currents of the device with opportune heatsink in continuous work: 50A
Non-repetitive overcurrent t=20 ms:1150A
I^2t for blowout: ≤6600A^2s
dV/dt critical with output deactivated: 1000 V/μs

GS 60
Nominal currents of the device with opportune heatsink in continuous work: 60A
Non-repetitive overcurrent t=20 ms:1150A
I^2t for blowout: ≤6600A^2s
dV/dt critical with output deactivated: 1000 V/μs

GS 75
Nominal currents of the device with opportune heatsink in continuous work: 75A
Non-repetitive overcurrent t=20 ms:1300A
I^2t for blowout: ≤8000A^2s
dV/dt critical with output deactivated: 1000 V/μs

GS 90
Nominal currents of the device with opportune heatsink in continuous work: 90A
Non-repetitive overcurrent t=20 ms:1500A
I^2t for blowout: ≤11200A^2s
dV/dt critical with output deactivated: 1000 V/μs

GS 120
Nominal currents of the device with opportune heatsink in continuous work: 120A
Non-repetitive overcurrent t=20 ms:1500A
I^2t for blowout: ≤11200A^2s
dV/dt critical with output deactivated: 1000V/μS

Thermal protection

(only on GS models with > 40A current):
The SCR module's temperature is constantly monitored inside the device. When the maximum temperature threshold (T=110°C) is exceeded, current flow to the load is interrupted and the condition is signaled by lighting of the yellow thermal protection LED.

Isolation

Rated isolation voltage input/output : 4000VAC rms SCR version

Thermal features

GS 15
Junction temperature: ≤ 125°C
Rth junction/case: ≤ 2.0 K/W
Rth junction/ambient: ≤ 12.5 K/W

GS 25
Junction temperature: ≤ 125°C
Rth junction/case: ≤ 1.25 K/W
Rth junction/ambient: ≤ 12 K/W

GS 40
Junction temperature: ≤ 125°C
Rth junction/case: ≤ 0.65 K/W
Rth junction/ambient: ≤ 12 K/W

GS 50
Junction temperature: ≤ 125°C
Rth junction/case: ≤ 0.35 K/W
Rth junction/ambient: ≤ 12 K/W

GS 60
Junction temperature: ≤ 125°C
Rth junction/case: ≤ 0.35 K/W
Rth junction/ambient: ≤ 12 K/W

GS 75
Junction temperature: ≤ 125°C
Rth junction/case: ≤ 0.3 K/W
Rth junction/ambient: ≤ 12 K/W

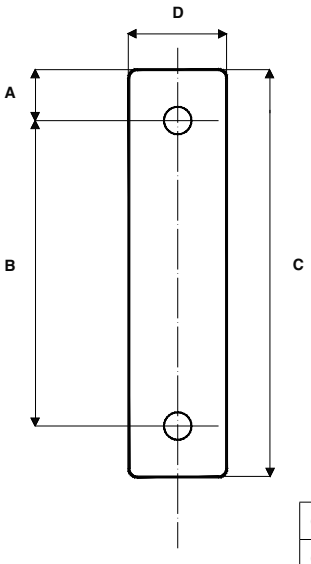
GS 90
Junction temperature: ≤ 125°C
Rth junction/case: ≤ 0.3 K/W
Rth junction/ambient: ≤ 12 K/W

GS 120
Junction temperature: ≤ 125°C
Rth junction/case: ≤ 0.25 K/W
Rth junction/ambient: ≤ 12 K/W

Solid State Relay Dissipated Power Calculation

Single-phase relay
Pd = 1.4 * IRMS [W] (for GS)
IRMS = single-phase load current

TEMPLATE DIMENSIONS



	A (mm)	B (mm)	C (mm)	D (mm)	
GS 15-25	18	47,5	100	24	M4
GS 40	20	47,5	100	35	M4
GS 50-60-75-90-120	26	47,5	100	60	M5

Heatsink Thermal Resistance Calculation

Rth = (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).

Ambient conditions

- ***Working temperature:*** 0 to 80°C.
- ***Max. relative humidity:*** 50% to 40°C
- ***Max. installation altitude:*** 2000m asl
- ***Pollution level*** 2
- ***Storage temperature:*** -20..85°C

Installation notes

- The heat sink must be grounded.
- The device must be protected by an appropriate high-speed fuse (accessory).
- 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.

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.
Alternately tighten the two fastening screws until reaching a torque of 0,60 Nm / 5,3 lb.in for the M4 screws and 0,75 Nm / 6,6 lb.in for the M5 screws.
Wait 30 minutes for any excess paste to drain.
Alternately tighten the two fastening screws until reaching a torque of 1,2 Nm / 10,6 lb.in for the M4 screws and 1,5 Nm / 13,3 lb.in for the M5 screws.
We advise you to randomly check for proper installation by dismantling the module to make sure there are no air bubbles under the copper plate.

Limits of use

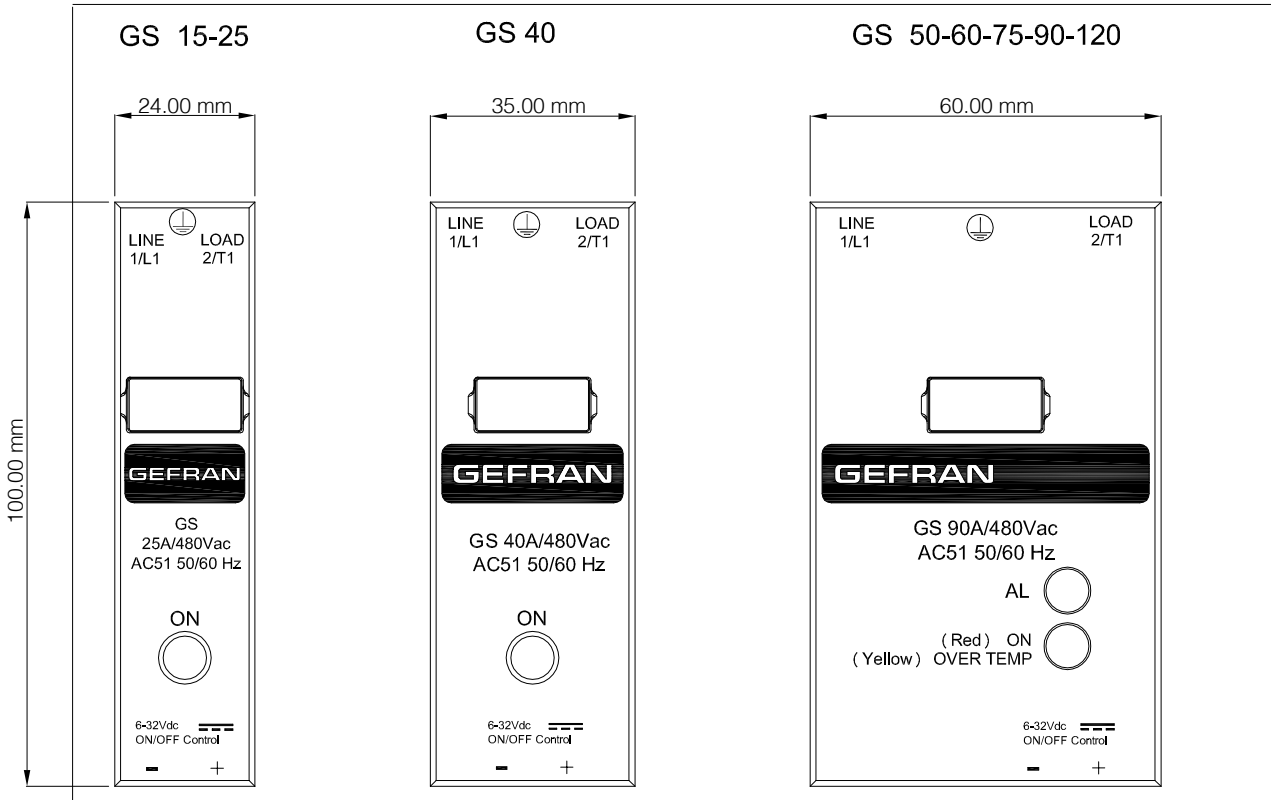
- dissipation of thermal power of device with restrictions on temperature of installation site.
- requires exchange with outside air or an air conditioner to transfer dissipated power outside the panel.
- installation restrictions (distances between devices to guarantee dissipation by natural convection).
- max. voltage limits and derivative of transients in line, for which the solid state unit has internal protection devices (depending on model).
- presence of dispersion current < 3mA for SCR version GS (max. value with rated voltage and junction temperature of 125°C).

Short circuit protection

The product variants listed in the table “SCCR Fuse protection table” 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.

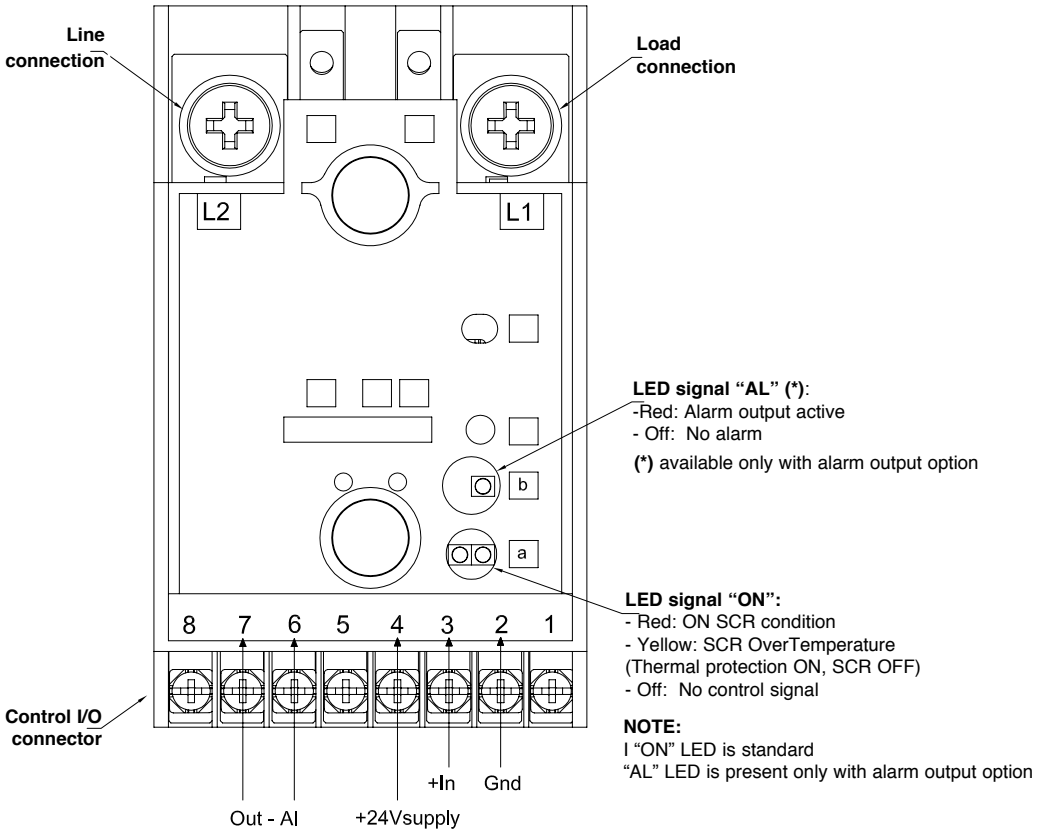
DIMENSIONS AND MOUNTING MEASUREMENTS



depth:	34 mm	depth:	34 mm	depth:	34 mm
weight:	90 gr.	weight:	115 gr.	weight:	200 gr.

FACEPLATE DESCRIPTION

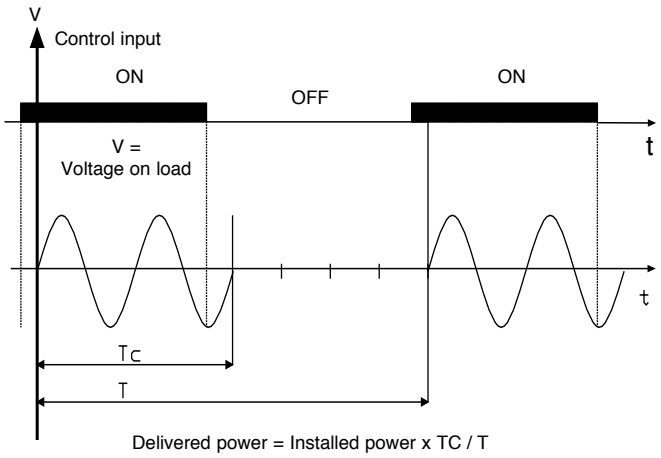
View of faceplate (Internal)
(Models with current >40A)



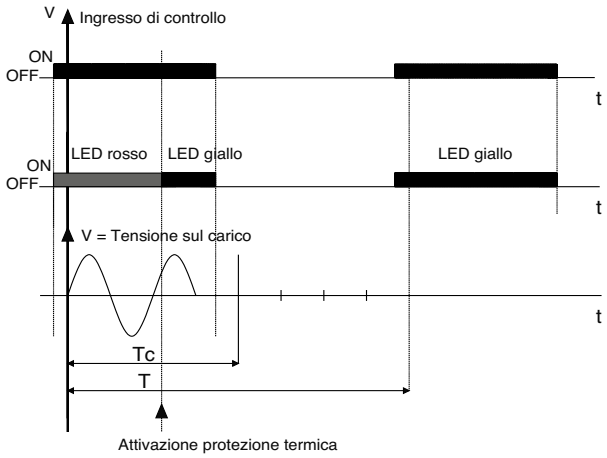
Description of I/O control terminals (GS > 40A)				
Rif.	**Description**	**Notes for type "D" input**		**Notes for type "A" input**
1	Not used			
2	Control input GND ON/OFF	VDC input GND (Supply GND in case of option)		Vac/Vdc Inputs (Range 20 to 260Vac, Imax < 8 mA)
3	+ Control input ON / OFF	Range da 6 a 32Vdc, Imax = 10 mA (1 mA with alarm option)		
4 (*)	Vdc_Supply	Supply of optional functions. (Range 6 to 32 Vdc, Imax < 15 mA)		Not used
5	Not used			
6 (*)	Alarm output	**With Options 1-2**: solid state contact Imax = 150 mA Vmax = 30 Vac/dc Z_closed < 15 Ω Z_open > 1 MΩ)	**With Options 3-4**: Terminal 6 is internally connected to terminal 4 (VDC_Supply)	**With Options1**: solid state contact Imax = 150 mA Vmax = 30 Vac/dc Z_closed < 15 Ω Z_open > 1 MΩ
7 (*)	Alarm output		**With Options 3-4**: Terminal 7 is PNP digital output (+) Imax = 150 mA	
8	Not used			
(*) Optional				

CONNECTION EXAMPLES

Control from logic output in voltage

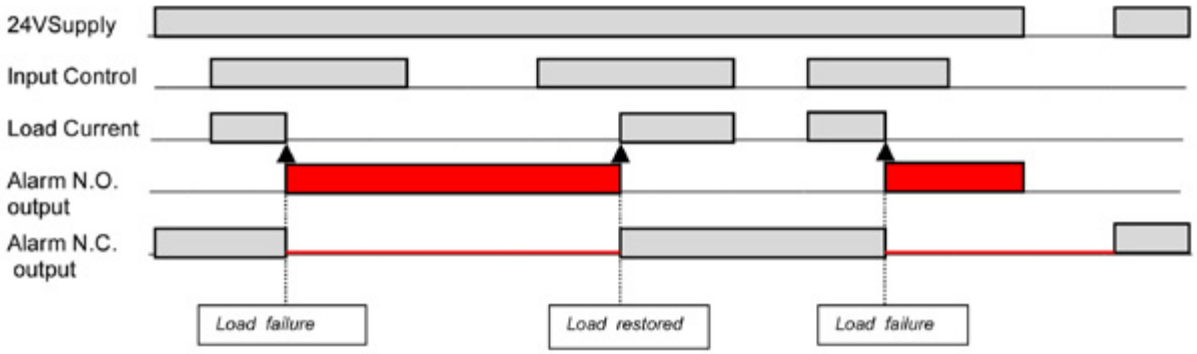


GS thermal protection
(only for models >= 50A)

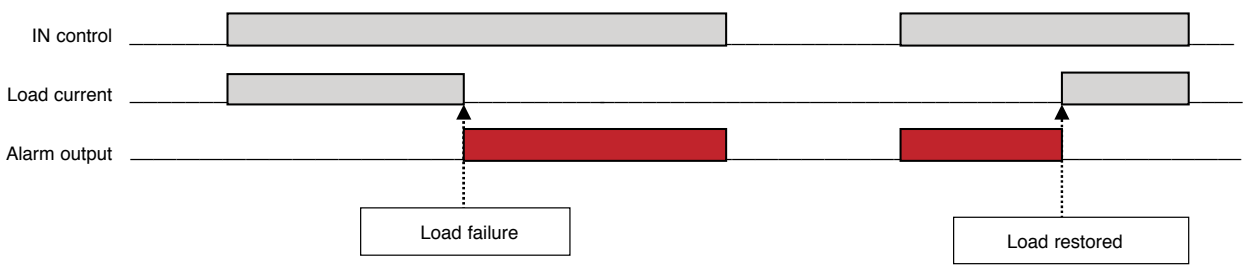


ALARM OPTION: FUNCTIONAL DIAGRAM

GS with VDC control (Control type "D")

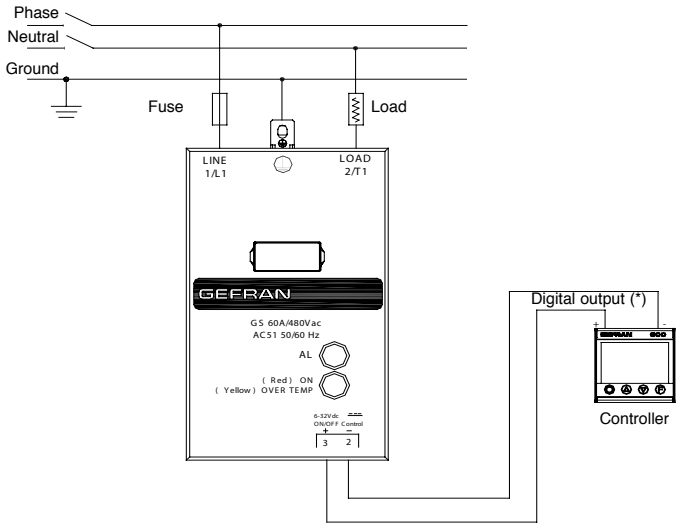


GS with VAC control (Control type "A")

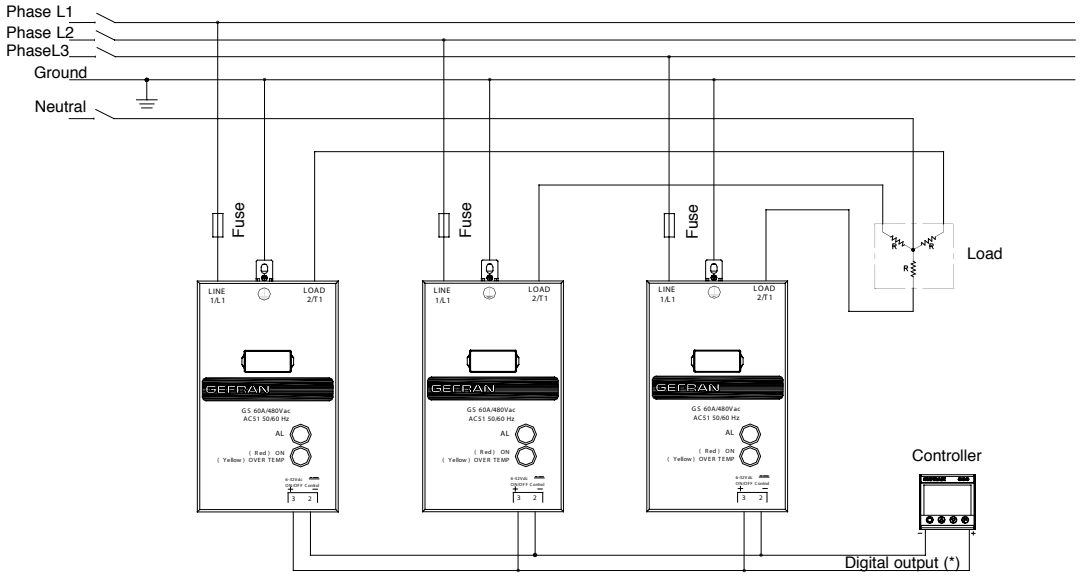


CONNECTION EXAMPLES

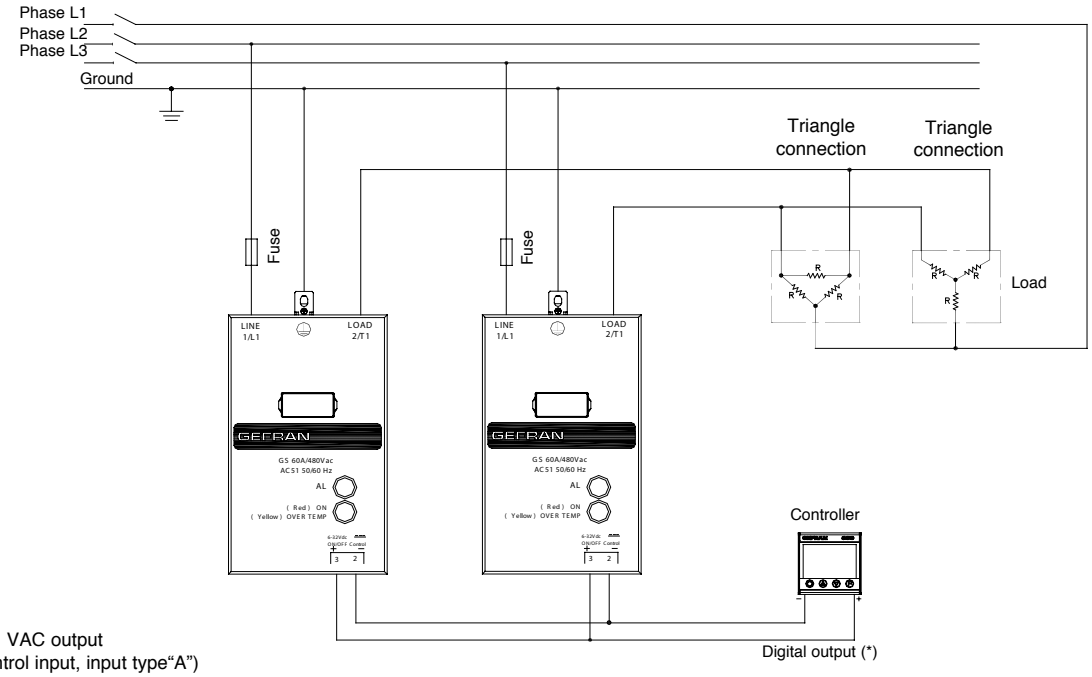
Single-phase connection



Three-phase Star connection with neutral- GS with VDC control input (Input type "D")



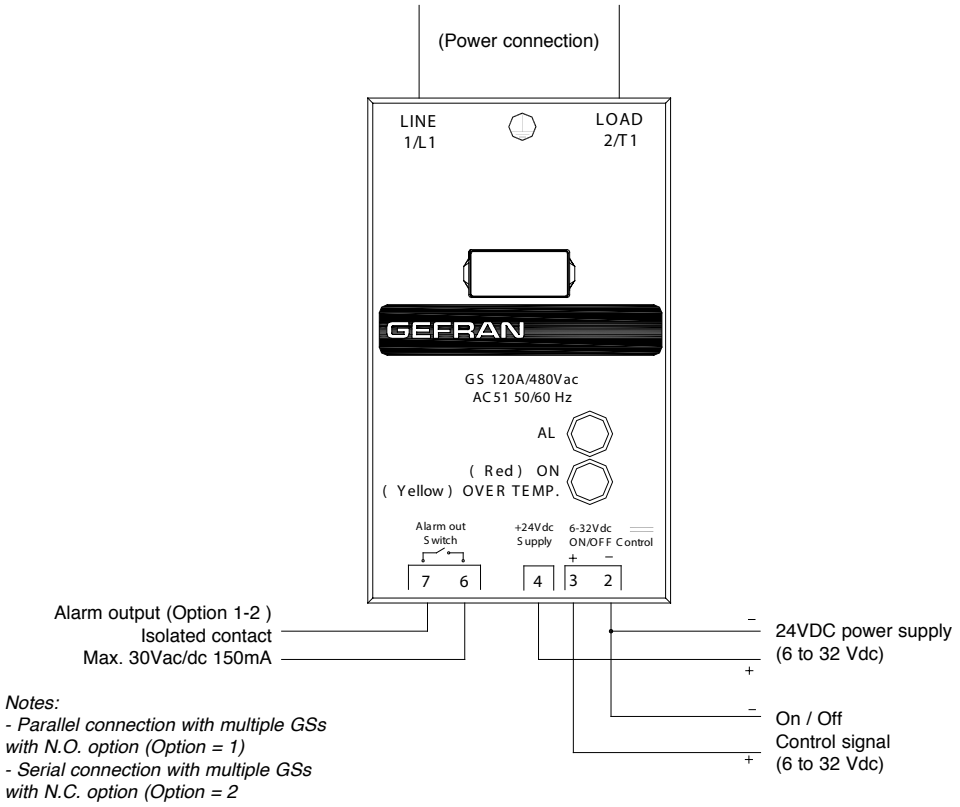
Three-phase Triangle or Star connection without neutral on two phases - GS with VDC control input (Input type "D")



(*) Or relay output with VAC output
(Use GS with VAC control input, input type"A")

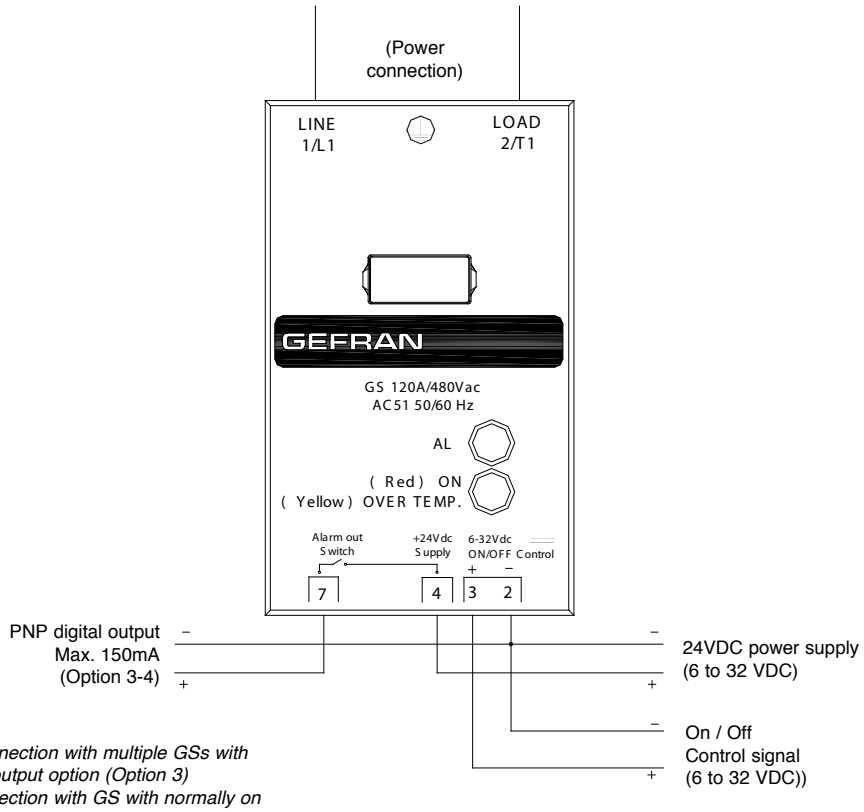
CONNECTION EXAMPLES

Connection example for GS with VDC control with isolated contact alarm output option (only Models GS-xx/xx-D-1 or GS-xx/xx-D-2)



Notes:
- Parallel connection with multiple GSs with N.O. option (Option = 1)
- Serial connection with multiple GSs with N.C. option (Option = 2

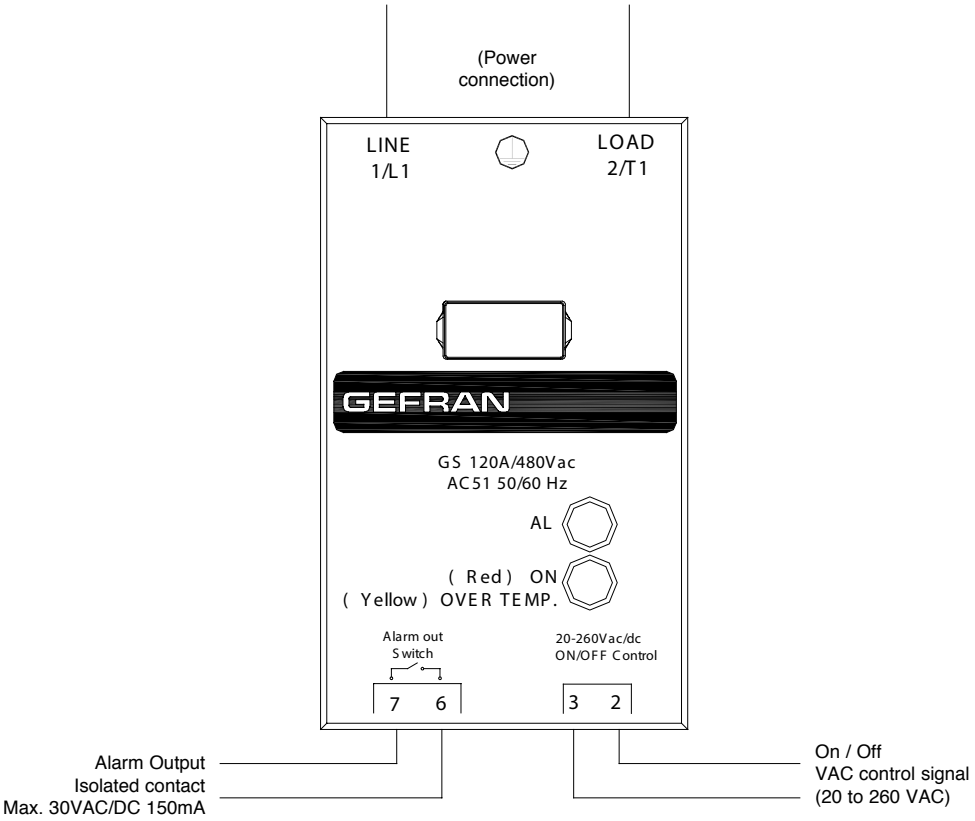
Connection example for GS with VDC control with PNP alarm output option (only Models GS-xx/xx-D-3 or GS-xx/xx-D-4)



Notes:
- Parallel connection with multiple GSs with normally off output option (Option 3)
- Single connection with GS with normally on output option (Option 4)

CONNECTION EXAMPLES

Connection example for GS with VDC control with alarm output option (Option 1)
(only Models GS-xx/xx-A-1)



Notes:
- Parallel connection with multiple GSs with N.O. option

TABLE OF TERMINALS AND CONDUCTORS

Size	CONTROL TERMINAL			POWER TERMINAL			FIXING SCREWS
	Contact area (WxD) screw	Type of pre-isolated wire terminal	Max Sect.** conductor tightening torque	Contact area (WxD) screw	Type of pre-isolated wire terminal	Max Sect.** conductor tightening torque	Contact area (WxD) screw
15A	6,4x9 M3	Eye/fork/conn. type Faston*	6mm² 5,3 lb.in (0,6Nm) Max	6,4x9 M3	Eye/fork/conn. type Faston*	6mm² 5,3 lb.in (0,4 - 0,6 Nm)	M4 10,6 lb.in (1,2 Nm)
25A	6,4x9 M3	Eye/fork/conn. type Faston*	6mm² 5,3 lb.in (0,6Nm) Max	6,4x9 M3	Eye/fork typ	6mm² 5,3 lb.in (0,4 - 0,6 Nm)	M4 10,6 lb.in (1,2 Nm)
40A	6,3x9 M3	Eye/fork typ	2,5mm² 5,3 lb.in (0,6Nm) Max	12x12 M5	Eye/fork typ	16mm² 19,5 lb.in (1,5 - 2,2 Nm)	M4 10,6 lb.in (1,2 Nm)
50/60A	6,3x9 M3	Eye/fork typ	2,5mm² 5,3 lb.in (0,6Nm) Max	16x18 M6	Eye/fork typ	50mm² 31 - 53,1 lb.in (3,5 - 6 Nm)	M5 13,3 lb.in (1,5 Nm)
75-90A	6,3x9 M3	Eye/fork typ	2,5mm² 5,3 lb.in (0,6Nm) Max	16x18 M6	Eye/fork typ	50mm² 31 - 53,1 lb.in (3,5 - 6 Nm)	M5 13,3 lb.in (1,5 Nm)
120A	6,3x9 M3	Eye/fork typ	2,5mm² 5,3 lb.in (0,6Nm) Max	16x18 M6	Eye/fork typ	50mm² 31 - 53,1 lb.in (3,5 - 6 Nm)	M5 13,3 lb.in (1,5 Nm)

(*) Female faston (for insertion, remove the M3 screw by making the nut re-enter the seat in the holder)
(**) The max. sections specified refer to unipolar copper wires isolated in PVC.

ACCESSORIES

A wide range of accessories is available (including fuses and fuse holders, heat sinks, ID plates and thermostats). To choose accessories, see the section “Solid state relays - Accessories”.

HEATSINKS

Model	Heatsink dimension [mm]	Heatsink rth [°c/w]
GS 15/25	100 x 65 x 24	3,12
GS 40	100 x 100 x 35	1,90
GS 50	100 x 100 x 60	0,83
GS 60	100 x 100 x 82	0,66
GS 75/90/120	100 x 100 x 127	0,56

EXTRARAPID FUSES

Model	Fuse manufacturer	Fuse Model size
GS 15/24, GS 15/48, GS 15/60	Bussmann Div Cooper (UK) Ltd	FWC16A10F 10x38
GS 25/24, GS 25/48, GS 25/60	Bussmann Div Cooper (UK) Ltd	FWC25A10F 10x38
GS 40/24, GS 40/48, GS 40/60	Bussmann Div Cooper (UK) Ltd	FWP40A14F 14x51
GS 50/24, GS 50/48, GS 50/60	Bussmann Div Cooper (UK) Ltd	FWP63A22F 22x58
GS 60/24, GS 60/48, GS 60/60, GS 75/24, GS 75/48, GS 75/60	Bussmann Div Cooper (UK) Ltd	FWP80A22F 22x58
GS 90/24, GS 90/48, GS 90/60	Bussmann Div Cooper (UK) Ltd	FWP100A22F 22x58
GS 120/24, GS 120/48, GS 120/60	Bussmann International Inc. USA	170M1418 000-TN/80

SCCR COORDINATION FUSES

Model	Short circuit current [Arms]	Max fuse size [A]	Bussmann Model Number	Max Voltage [VAC]
GS 15	100.000	40	DFJ-40	600
GS 25	100.000	40	DFJ-40	600
GS 40	100.000	40	DFJ-40	600
GS 50	100.000	80	DFJ-80	600
GS 60	100.000	80	DFJ-80	600
GS 75	100.000	125	DFJ-125	600
GS 90	100.000	125	DFJ-125	600
GS 120	100.000	125	DFJ-125	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

GS - [ ] / [ ] - [ ] - [ ]

Model	
Version with double SCR	**GS**

Rated current	
15Aac	**15**
25Aac	**25**
40Aac	**40**
50Aac	**50**
60Aac	**60**
75Aac	**75**
90Aac	**90**
120Aac	**120**

Rated voltage	V
230Vac	**24**
480Vac	**48**
600Vac	**60**

Input type	
6 ... 32 Vdc	**D**
20 ... 260 Vac / Vdc	**A**

Alarm Output Option	
Available only for GS rated current ≥ 50A	
0	None
1	Insulated switch output (normally open)
2 (**)	Insulated switch output (normally closed)
3 (**)	Digital PNP output (normally open)
4 (**)	Digital PNP output (normally active)

(**) available only for models with type “D” input

Please contact GEFRAN personnel for information on availability of codes.

•WARNINGS

WARNING: this symbol indicates danger.

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 be able to check alarm states during normal operation as well
• 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, 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 GST-GS group in the electrical panel containing the GST-GSs.
• respect the indicated dissipation curves
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.

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).
UL	In Conformity with **UL508 - File: E243386**
SCCR RMS SYM 100KA / 600V	100KA when protected by proper fuse

GEFRAN

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