



#### Main applications

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

#### 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 Vca
- Control voltage : 3...32Vcc and 20...260Vac/Vcc with connector
- Isolation ((input-output) 4000Vrms
- Red LED drive active signal
- Internal MOV (option)

#### 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-  $\leq 1/2$  ciclo GQ...-A-  $\leq 1$  ciclo  
 Deactivation time:  
 GQ...-D-  $\leq 1/2$  ciclo GQ...-A-  $\leq 1$  ciclo  
 Power factor:  $\geq 0,5$   
 Protection level: IP20

##### GQ .. 24 -

Nominal voltage: 24...230 Vca  
 (max range 20...253Vca)  
 Non-repetitive voltage:  $\geq 600$  Vp  
 Zero switching voltage:  $\leq 20$ V

##### GQ .. 48 -

Nominal voltage: 48...480 Vca  
 (max range 40...528Vca)  
 Non-repetitive voltage:  $\geq 1200$  Vp  
 Zero switching voltage:  $\leq 40$  V

##### GQ...- 60-

Nominal voltage: 48...600 Vca  
 (max range 40...660Vca)  
 Non-repetitive voltage:  $\geq 1200$  Vp  
 Zero switching voltage:  $\leq 40$ V

##### Control input A1 - A2

##### GQ..-D-

Control voltage: 3...32Vcc  
 Turn ON voltage:  $\geq 2,7$ Vc.c  
 Turn OFF voltage:  $\leq 1$ Vcc  
 Reverse voltage:  $< 36$ Vcc  
 Consumption:  $\leq 13$ mA@32V

##### GQ...-A-

Control voltage: 20...260Vac/Vcc  
 Turn ON voltage:  $\geq 15$ Vac/Vcc  
 Turn OFF voltage:  $\leq 6$ Vac/Vcc  
 Consumption:  $\leq 8$ mAac/cc@260Vac/Vcc  
 Series connection of control inputs:  
 max. no. GQ...-A in series =  $V_{control} - 10\% / 20$

##### Output

##### GQ - 15 -

Nominal current :  
 AC51: 15Arms; AC53: 3Arms  
 Min load current: 0,1Arms  
 Repetitive overcurrent  $t=1$  s:  $\leq 35$ Arms  
 Non-repetitive overcurrent  $t=20$ ms:200Ap  
 Current drop at nominal voltage and frequencies:  $\leq 8$ mArms  
 $I^2t$  for fusing  $t=1-10$ ms:  $\leq 200A^2s$   
 Critical  $di/dt$ :  $\geq 100A/\mu s$   
 Voltage drop at nominal current:  $\leq 1,45$ Vrms  
 Critical  $dV/dt$  off-state:  $\geq 1000V/\mu s$

##### GQ - 25 -

Nominal current :  
 AC51: 25Arms; AC53: 5Arms  
 Min load current: 0,3Arms  
 Repetitive overcurrent  $t=1$  s:  $\leq 60$ Arms  
 Non-repetitive overcurrent  $t=20$ ms: 300Ap  
 Current drop at nominal voltage and frequencies:  $\leq 8$  mArms  
 $I^2t$  for fusing  $t=1-10$ ms:  $\leq 450A^2s$   
 Critical  $di/dt$ :  $\geq 100A/\mu s$   
 Voltage drop at nominal current:  $\leq 1,45$ Vrms  
 Critical  $dV/dt$  off-state:  $\geq 1000V/\mu s$

### GQ - 50 -

Nominal current :

AC51: 50Arms; AC53: 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<sup>2</sup>t for fusing t=1-10ms: ≤ 1800A<sup>2</sup>s

Critical di/dt: ≥ 100A/μs

Voltage drop at nominal current: ≤ 1,35Vrms

Critical dV/dt off-state: ≥ 1000V/μs

### GQ - 90 -

Nominal current

AC51: 90Arms; AC53: 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<sup>2</sup>t for fusing t=1-10ms: ≤ 11200A<sup>2</sup>s

Critical di/dt: ≥ 100A/μs

Voltage drop at nominal current: ≤ 1,35Vrms

Critical dV/dt off-state: ≥ 1000V/μs

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

Maximum relative humidity: 50% a 40°C

Maximum installation height: 2000 slm

Pollution level : 3

### Thermal features

#### GQ - 15 -

#### GQ - 25 -

Junction Temperature: ≤ 125°C

Rth (temp.gradient) junction/case:

≤ 1,25 K/W

Rth (temp.gradient) junction/ambient:

≤ 12 K/W

#### GQ - 50 -

Junction Temperature: ≤ 125°C

Rth (temp.gradient) junction/case:

≤ 0,65 K/W

Rth (temp.gradient) junction/case:

≤ 12 K/W

#### GQ - 90 -

Junction Temperature: ≤ 125°C

Rth (temp.gradient) junction/case:

≤ 0,3 K/W

Rth (temp.gradient) junction/case:

≤ 12 K/W

### Solid State Relay Dissipated Power Calculation

Single phase state relay

P<sub>d</sub> GQ .. 15/25 = 1,45 \* I<sub>rms</sub> [W]

P<sub>d</sub> GQ .. 50/90 = 1,35 \* I<sub>rms</sub> [W]

IRMS = single-phase load current

### Heatsink Thermal Resistance Calculation

Rth = (90°C - max amb. T) / P<sub>d</sub>

where P<sub>d</sub> = 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.

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.

### Insulation

Nominal insulation voltage

Input/output: ≥ 4000 Vca

Nominal insulation voltage

Output/case: ≥ 2500 Vca

Insulation resistance

Input/output: ≥ 10<sup>10</sup>Ω

Insulation resistance

Output/case: ≥ 10<sup>10</sup>Ω

Insulation capacity

Input/Output: ≤ 8pF

Insulation capacity

Output/case: ≤ 100pF

### Ambient conditions

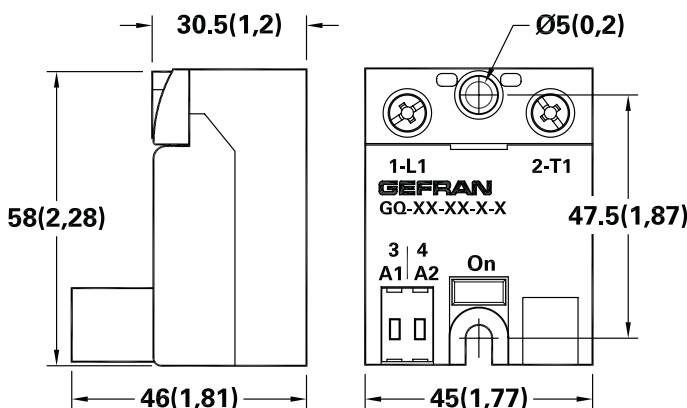
Ambient temperature: -25...+80°C

Storage Temperature: -55...+100°C

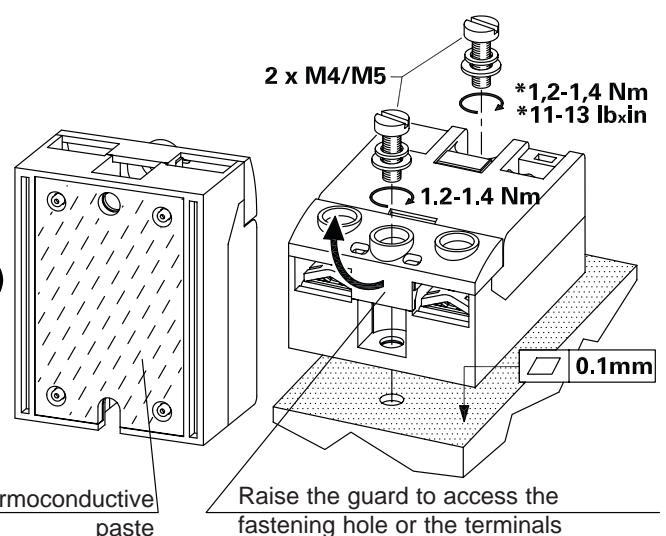
### DIMENSION

Dimensions in mm, (inc)

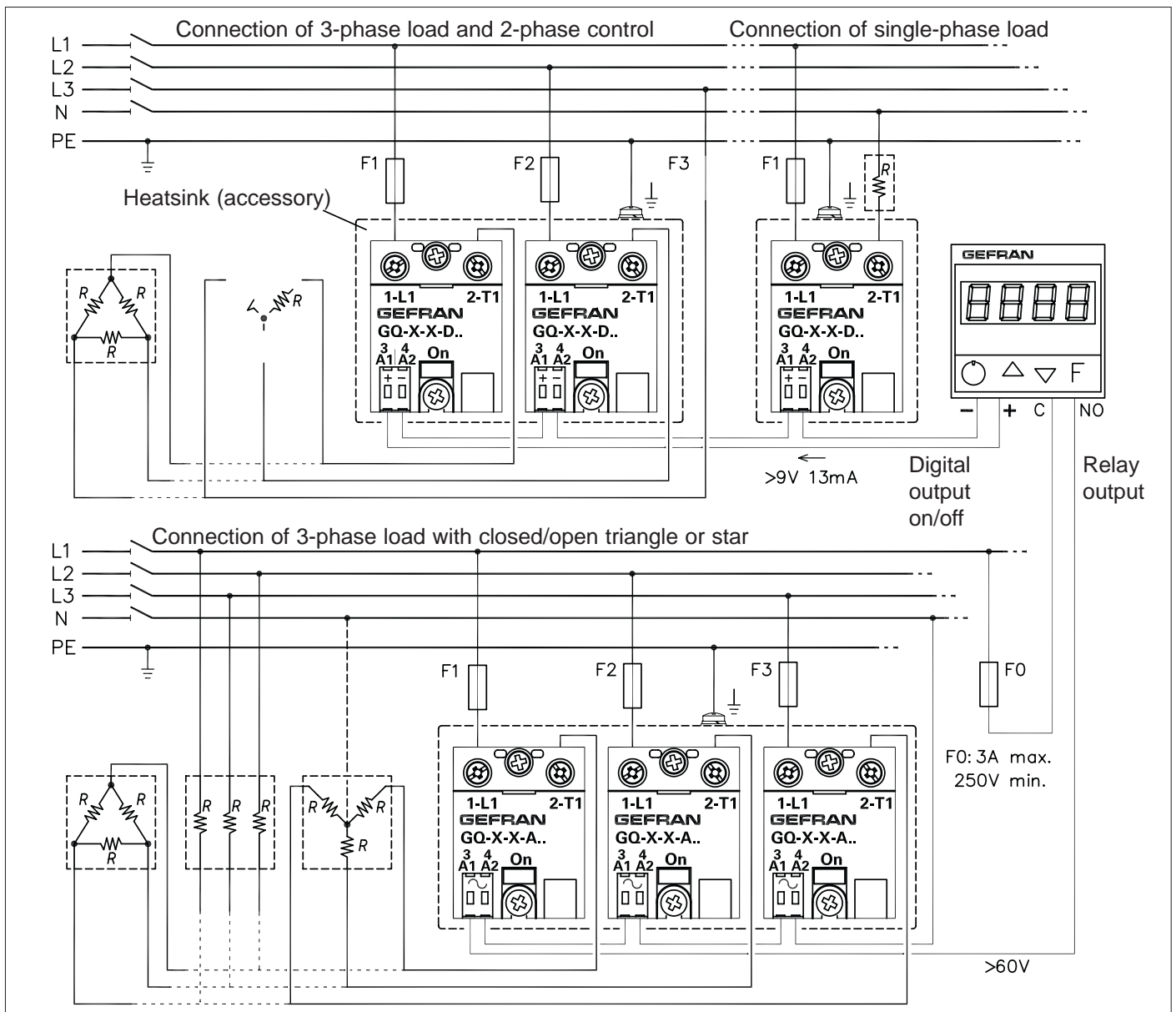
(\*) See installation notes






\*Apply thermoconductive paste



## ELECTRICAL CONNECTIONS



## TERMINALS AND LEADS: SPECIFICATIONS

	Power terminals 1-L1 2-T2	Extractable 2 poles command terminals 3-A1 / 4-A2 ( see accessories)		
Terminal type	screw (M4) contact area: (Lxp) 13x11mm	with self-locking spring <b>MORS1</b>	with spring double connection <b>MORS2</b>	with screw (M3) <b>MORS3</b>
Stripped wire	1x2,5...6mm <sup>2</sup> 2x1,5...2,5mm <sup>2</sup> 2x2,5...6mm <sup>2</sup> Stripped 11mm	1x0,2...2,5mm <sup>2</sup> 2x0,5...0,75mm <sup>2</sup> (#)	2x(1x0,2...2,5mm <sup>2</sup> ) 2x(2x0,2...0,75mm <sup>2</sup> ) (#)	1x0,25...2,5mm <sup>2</sup> 2x0,25...1mm <sup>2</sup> (#)
Prod cable	1x1,5...6mm <sup>2</sup> 2x1,5...2,5mm <sup>2</sup> 2x2,5...6mm <sup>2</sup>	stripped 10mm 1x0,2...1,5mm <sup>2</sup> 2x0,2...0,75mm <sup>2</sup> (#)	stripped 10mm 2x(1x0,25...2,5mm <sup>2</sup> ) 2x(2x0,25...0,75mm <sup>2</sup> ) (#)	stripped 7mm 1x0,25...2,5mm <sup>2</sup> 2x0,25...1mm <sup>2</sup> (#)
Prod cable with collar	1x1,5...10mm <sup>2</sup> 2x1,5...2,5mm <sup>2</sup> 2x2,5...6mm <sup>2</sup>	1x0,2...1,5mm <sup>2</sup>	1x0,25...1,5mm <sup>2</sup>	1x0,25...2,5mm <sup>2</sup> 2x0,25...1,5mm <sup>2</sup> (#)
Fork or eyelet cable	1x2,5...25mm <sup>2</sup>	-- --	-- --	-- --
Locking torque 1x5...6mm screwdriver type $\varnothing$ 5...6mm 2...2,4Nm	slot 1x5...6mm cross $\varnothing$ 5...6mm 2...2,4Nm	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 $\varnothing$ 3...3,8mm 0,5...0,6Nm
(#) 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. Note: Use an eye terminal to ground the heatsink.				

## FUSES/ FUSES HOLDER

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

## 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 60G	$R_{th} \geq 0,66 \text{ K/W}$
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 <sup>2</sup>
GQ25...	6mm <sup>2</sup>
GQ50...	12mm <sup>2</sup>
GQ90...	25mm <sup>2</sup>

(\*\*) 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 60947-4-3	Emissions conducted at radiofrequency Class A (Industrial devices)	
EN 60947-4-3	Emissions irradiated at radiofrequency Class A (Industrial devices)	
EMC Immunity		
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	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	

**ORDER CODE**

	GQ						
<b>MODEL</b>							
		GQ					
<b>NOMINAL CURRENT</b>				<b>CONNECTORS</b>			
15ACArms	15	0	Without connector				
25ACArms	25	1	(MORS1) Two-pin spring connector, enclosed				
50ACArms	50	2	(MORS2) Two-pin double spring connector, enclosed				
90ACArms	90	3	(MORS3) Two-pin screw connector, enclosed				
<b>NOMINAL VOLTAGE</b>				<b>OVERVOLTAGE PROTECTION</b>			
230VCArms	24	0	External				
480VCArms	48	1	Internal MOV				
600VCArms	60 (*)			<b>CONTROL VOLTAGE</b>			
		D	3...32Vc.c.				
		A	20...260Vac/Vcc				

(\*) Available only in versions GQ-XX-60-X-1-X (overloading protection always present)

Please, contact GEFRAN sales people for the codes availability.

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 unless the main supply is disconnected.
  - DO NOT open the cover if device is "ON"!  
(use the holes in the cover for eventual re-calibration).

**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.
- evitare la polvere, l'umidità, i gas corrosivi, le fonti di calore.
- keep away from dust, humidity, corrosive gases and heat sources.
- The connection cable must be shorter than 3 meters if the current transformer is used.

**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.

<b>CE</b>	In conformity to ECC 89/336/CEE and 2006/95/CE and following modification with reference to standards: EN 60947-4-3 (Low voltage equipment – Contactors and starters for different motor loads) EN 60947-4-2 (Low voltage equipment - AC Semiconductor starters and contactors)
<b>C UL US</b>	In Conformity with <b>UL508</b>