# GEFRAN

# GTT  25 / 40 / 50 / 60 / 75 / 90 / 120A
## *POWER SOLID STATE RELAYS WITH ANALOG CONTROL*

## Main applications

- *Plastics extrusion lines and injection moulding 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 ovens*
- *Food processing plants*

## Main features

- *Command input from analogue voltage or current signal or potentiometer.*
- *Switching at voltage zero crossing.*
- *Partialization of wave train power with dynamically optimized time cycle.*
- *Antiparallel double SCR*
- *2 led for supply indication, "ON" state, 1 optional LED for load interrupt alarm*
- *4000V isolation between input circuit and power output*
- *MOV (varistor)*
- *Optional monitoring of interrupted load*
- *DIN rail mounting (standard); Panel mounting (optional)*

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## *PROFILE*

*The GTT family of solid-state relays has been designed with the aim of providing very accurate control of the load thanks to an analog control input, in voltage at 0…5V; 0…10V or in current at 0…20/4…20mA or a potentiometer (from 1KΩ to 10 KΩ).*

*The electronic design ensures that the cycle time for proportioning the power is automatically optimized.*

*The number of cycles that the GTT supplies to the load (wave trains) for a given input signal is calculated to be the minimum possible to maintain the necessary accuracy.*

*This guarantees a very fast and accurate control loop that enables the GTT, driven by a controller or a PLC with analogue output, to obtain very precise control.*

*The GTT can be used in three phase systems, using master-slave control architecture in which the control signal drives only one GTT (master) and this unit supplies the synchronized signals to the other GTT slaves.*

*Two GTS modules can also be used as slaves.*

*A load interrupt control option (HB) is available without having to use an external current transformer; alarm limit is settable with trimmer and yellow LED signal, with voltage-free contact, normally open.*

*The GTT solid-state relay has a green LED to indicate the presence of the 24Vac power supply and a red LED to indicate the switching based on the analog control input signal.*

*The LED signal will be continuous (off at minimum, on at maximum) at the ends of the scale, pulsing for intermediate values. The units offer optional accessoires for panel mounting, fuses and fuseholders, current transformer, isolation transformers*

## *TECHNICAL DATA*

### *General features*
Category of use AC1
Nominal voltage
- 480Vac (max. range 24...530Vac)
Nominal frequency: 50/60Hz
Non-repetitive voltage: 1200Vp
Zero switching voltage: ≤ 20V
Voltage drop at nominal current ≤ 1,4Vrms
Power factor = 1

### *Control inputs*

Voltage: 0...5Vdc, 0...10Vdc
(impedance ≥100KΩ)
Current: 0...20mA, 4...20mA
(impedance 125Ω)
Potentiometer: from 1K to 10KΩ
(auto-fed by GTT)

### *OUTPUTS*

### GTT 25 (SCR version)
Nominal current:
25A@40°C in continuous service
Non-repetitive overcurrent t=20 ms: 400A
I²t for blowout ≤ 645A²s
dV/dt critical with output deactivated: 1000V/µs

**GTT 40 (SCR version)**
Nominal current:
40A@40°C in continuous service
Non-repetitive overcurrent t=20 ms:
600A
I²t for blowout: ≤ 1010A²s
dV/dt critical with output deactivated:
1000V/µs

**GTT 50 (SCR version)**
Nominal current:
50A@40°C in continuous service
Non-repetitive overcurrent t=20 ms:
1150A
I²t for blowout: ≤ 6600A²s
dV/dt critical with output deactivated:
1000V/µs

**GTT 60 (SCR version)**
Nominal current:
60A@40°C in continuous service
Non-repetitive overcurrent t=20 ms:
1150A
I²t for blowout: ≤ 6600A²s
dV/dt critical with output deactivated:
1000V/µs

**GTT 75 (SCR version)**
Nominal current:
75A@40°C in continuous service
Non-repetitive overcurrent t=20 ms:
1300A
I²t for blowout: ≤ 8000A²s
dV/dt critical with output deactivated:
1000V/µs

**GTT 90 (SCR version)**
Nominal current:
90A@40°C in continuous service
Non-repetitive overcurrent t=20 ms:
1500A
I²t for blowout: ≤ 11200A²s
dV/dt critical with output deactivated:
1000V/µs

**GTT 120 (versione SCR)**
Nominal current:
120A@40°C in continuous service
(complete with fan and standard
thermostat).
Non-repetitive overcurrent t=20 ms:
1500A
I²t for blowout: ≤ 11200A²s
dV/dt critical with output deactivated:
1000V/µs

*Isolation*
Rated isolation voltage input/output:
4000Vac

*Ambient conditions*

· **Working temperature**:
  0 to 80°C  (see the dissipation
  curves)
· **Max. relative humidity**:
  50%...40°C

· **Max. installation altitude**:
  2000m asl

· **Pollution level**: 3

· **Storage temperature**:
  -20..+85°C

*Power supply*:
24Vac ±10%, 50/60 Hz
Absorptioni: 1.5VA
Max. isolation voltage: 300Vdc

*Options:*
Interrupted HB load alarm.
Controls the load by measuring
current on a shunt inside the device.
The alarm limit is set with a multirev
monorev trimmer.
The alarm output is obtained by
means of a solid state relay. The
contact is normally open (max. 30V,
150mA, conduction resistance 15
Ohm).

*Installation notes*

Use the high-speed fuse specified
in the catalog according to the
connection example given.
- Applications with solid state power
units must also include an automatic
safety switch to cut out the load
power line.
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.
Mount it vertically (max. 10°
dinclination from the vertical axis)
· Vertical distance between a device
and the panel walls >100mm
· Horizontal distance between a
device and the panel walls: at least
20mm
· Vertical distance between devices:
at least 300mm.
· Horizontal distance between
devices: at least 20 mm. Make sure
that the wire raceways do not reduce
such distances: if they do, install the
groups cantilevered to the panel so
that air can flow vertically over the
heat sink without obstructions.

**Attention**:
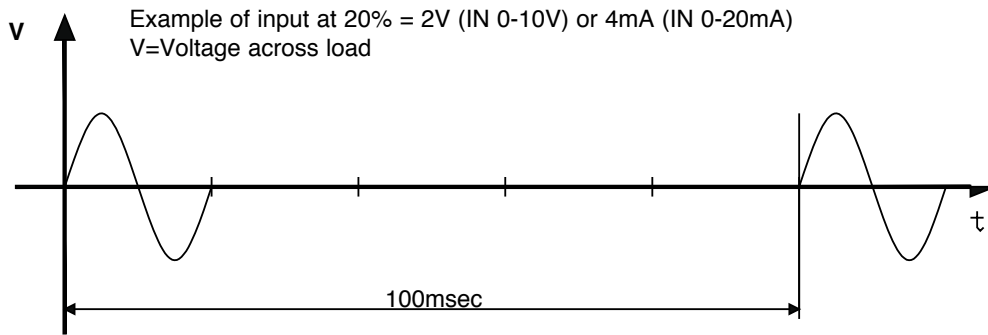if you replace a GTT from an earlier
series, note the following:
- the GTT cannot be used as a slave
of a master GTT from a previous
series;
- the GTT can drive a slave from
a previous series only if a 10kΩ
resistance is connected in series to
the master/slave connection
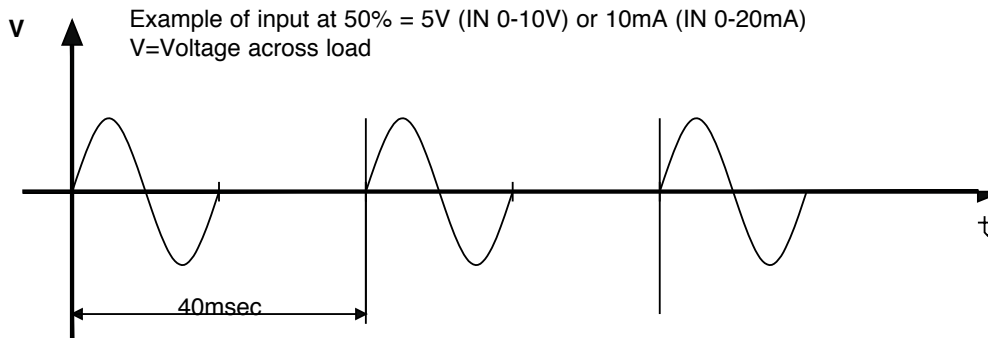- see the connection examples.

*Limits of use*

· Dissipation of thermic power on the
device with restraints on the ambient
temperature of the installation.
· Equip the cabinet with an external
air change or air-condition it, to put
out dissipated power.
· Installation restraints (distances to
be respected to grant dissipation with
natural convection).
· Line transistor max. voltage and
derivative limits, for which the
solid state relay is equipped with
inside safety devices (based on the
models).
· Leakage current < 3mA for SCR
version GTTs.
(max. value with rated voltage and
junction temperature of 125°C)
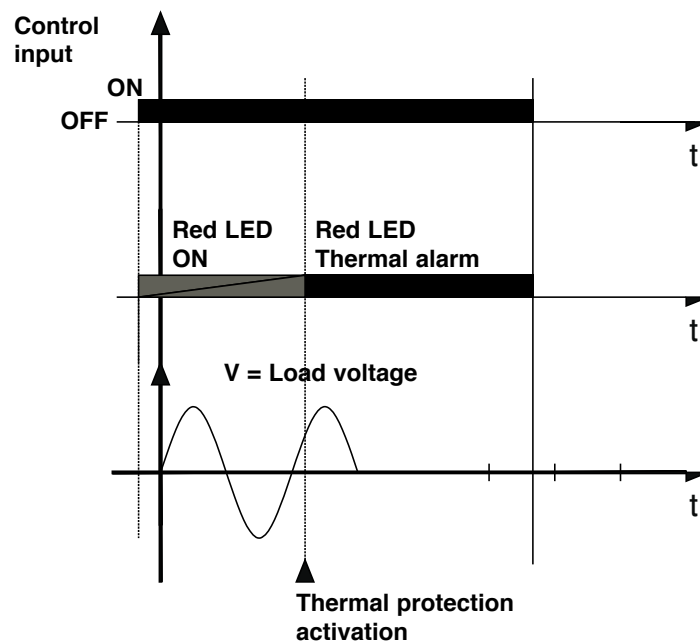
**"Zero crossing" with variable cycle time**

Examples of the operation of the GTT for different values of the input drive signal and the consequent different cycle times (100msec and 40msec respectively)

V

Example of input at 20% = 2V (IN 0-10V) or 4mA (IN 0-20mA)
V=Voltage across load

t

100msec

Logic output control for GTT

V

Example of input at 50% = 5V (IN 0-10V) or 10mA (IN 0-20mA)
V=Voltage across load

t

40msec

**GTT thermal protection**

**Control input**

**ON**

**OFF**

t

**Red LED ON**

**Red LED Thermal alarm**

t

**V = Load voltage**

t

**Thermal protection activation**

## FACEPLATE DESCRIPTION

Synchronism signal for Master/Slave connection

- control signal

+ control signal

Reference voltage for potentiometer power supply (+ 10V)

24 V ac 50/60 Hz power terminal

Alarm output (solid state relay, HB option)

Green LED (power on), Red LED (GTT running)

Red LED (thermal alarm), yellow LED (load interrupt alarm, HB option)

NOT use

Dip switch for selection of input signal (S1, S2, S3)

Monorev trimmer for minimum calibration of input signal

Monorev trimmer for maximum calibration of load signal

Monorev trimmer for calibration of load interrupt (HB) alarm limit

LINE connection

LOAD connection

Reference connection of 230V line voltage (HB option with 150V to 300V load)

Reference connection of 480V line voltage (HB option with 300V to 530V load)

## CALIBRATION PROCEDURE OF THE INPUT SIGNAL

The solid-state power unit, GTT, is supplied factory calibrated for 0..5V, 0..10V, 0..20mA, 4..20mA inputs, 10Kohm potentiometer. Minimum and maximum values are adjusted with two monorev trimmers (d,e).
Input signal type is selected with the f adjustment dip switches (S1,S2,S3).

| Control signal | Dip Switch Position | | |
|---|---|---|---|
| | **S1** | **S2** | **S3** |
| 0...5Vdc | OFF | OFF | ON |
| 0...10Vdc | ON | OFF | ON |
| 0...20mA | OFF | ON | ON |
| 4...20mA | OFF | ON | OFF |

| V/mA In === | V/mA In === | **f** S1-S3 | Rin |
|---|---|---|---|
| 0-5V | On / Off | | 100KΩ |
| 0-10V | | | 100KΩ |
| 0-20mA | | | 125Ω |
| 4-20mA | | | 125Ω |

**e** 96% / 82%

**d** 18% / 4%

Minimum adjustment trimmer (d) turned fully counterclockwise sets the start conducting limit at 4% of the signal; turned fully clockwise, the minimum conducting limit is set at 18% of the input signal.

Maximum adjustment trimmer (e) turned fully clockwise sets the full conducting limit at 96% of the signal; turned fully counterclockwise, the full conducting limit is set at 82% of the input signal<

## INTERRUPTED LOAD ALARM

The interrupted load alarm function enables the GTT to diagnose a variation of the load current (compared to a set limit), distinguishing it from one caused by a change in grid voltage. e. The solid state power unit must therefore be supplied with the voltage applied to the load terminals, i.e.: LOAD (L2): already connected internally;
LINE (**h** or **i**): connect terminal **h** for voltages from 150 to 300V; connect terminal **i** for voltages from 300 to 530V.
The alarm activates (relay closed and yellow alarm LED on) when the current, during the conduction of the device, falls below a preset level that may be adjusted using the trimmer on the faceplate.

Calibratio procedure (refer to the faceplate description drawing)
1) Use the adjustment system (or a calibrator) in order to supply the maximum signal (100% conduction or thered "ON" LED

   always illuminated). As an alternative, you can configure the GTT to 0-10 V DC input configuration and connect terminals 5 and 6.
2) Use a current sensing pliers to check that the load current is at rated level.
3) Turn alarm limit adjustment trimmer (g) fully clockwise. Check that yellow alarm LED (b) turns on.
4) Slowly turn trimmer (g) counterclockwise until the alarm LED turns off.
5) Turn the trimmer counterclockwise another 1/10 of a turn (1 notch on the scale).
   In this way, the alarm limit is set below 10% of the rated load current.

N.B:
the partial load break alarm function operates with power partialization exceeding 15%. For partializations below 20%, tripping times increase due to the reduced load activation time. For correct operation of the option, the load current has to exceed 30% of rated current for the GTT.


### Notes on use of the GTT with the digital On/Off control

- The logic control signal has to be connected with the correct polarities to terminals 4 and 5 of the analog input.
- Turn minimum adjustment trimmer (d) fully counterclockwise and maximum adjustment trimmer (e) fully clockwise.
- Set the 3 dip switches (f) to off.
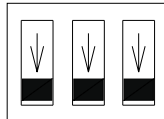
For applications with a very short work cycle, you can drive the solid state group by means of the Master/Slave signal by driving it with a digital signal (OFF = 0 V dc; ON = from 4 V dc to 10 V dc)


### Inhibiting the GTT

You can inhibit operation of the GTT by means of the Master/Slave signal.
To inhibit, connect control signal - (4) with the synchronism signal for Master/Slave connection (3).


### Notes on use of the GTT in Master/Slave configuration

The GTT can be used as a master to drive other solid state groups (slaves). With Master/Slave signal (3), you can drive up to 9 GTTs (see connection examples for GTT solid state power relays with three-phase load). You can also use a GTT to drive GTS solid state power relays (maximum of 2), as shown in the connection diagrams for GTT/GTS solid state power relays with three-phase load (attention: the HB option cannot be used for a three-phase application with neutral).
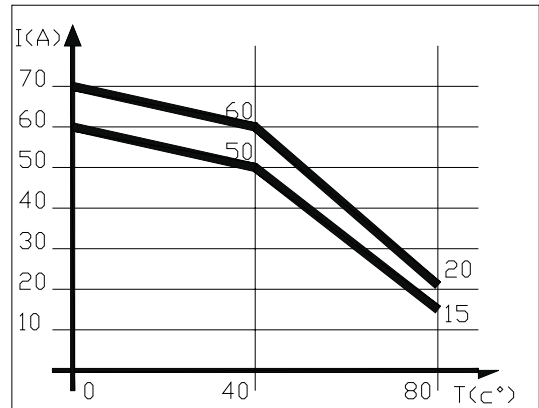
## DISSIPATION CURVES
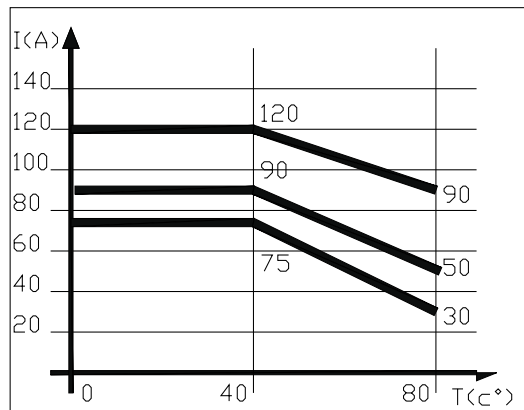
Rated current curves based on room temperature.

**GTT 25 / 40**
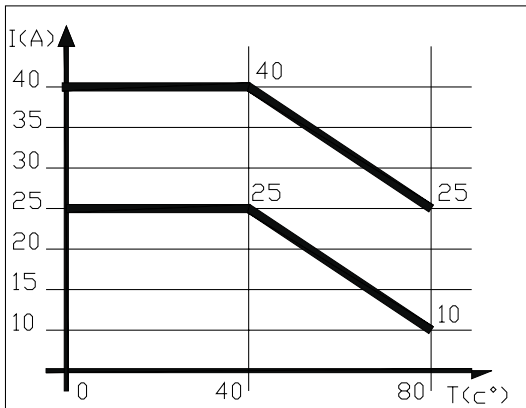


**GTT 50 / 60**



**GTT 75 / 90 / 120**



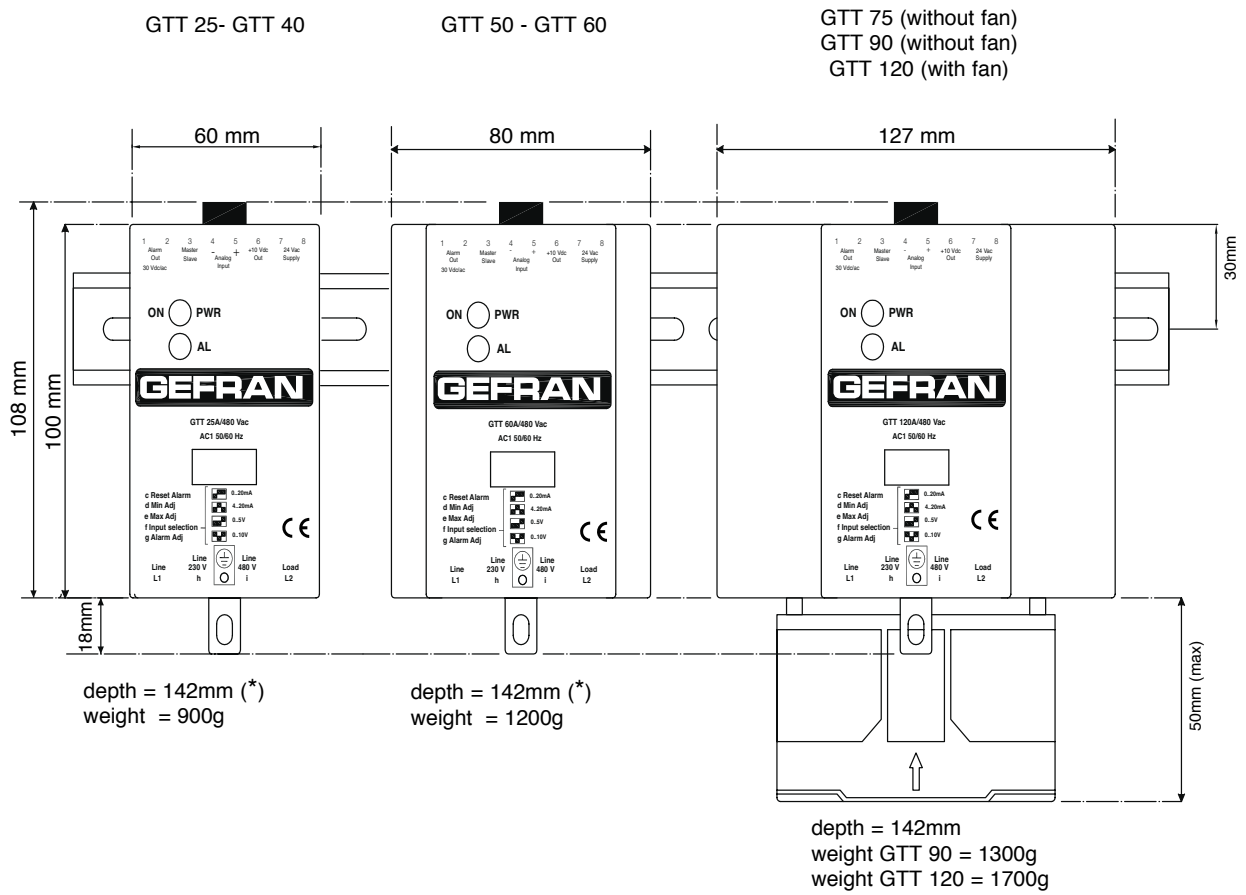The GTT 120 curves refer to the device complete with standard fan running.

## TABLE FOR TERMINAL CHOICE OF POWER TERMINAL BOARD

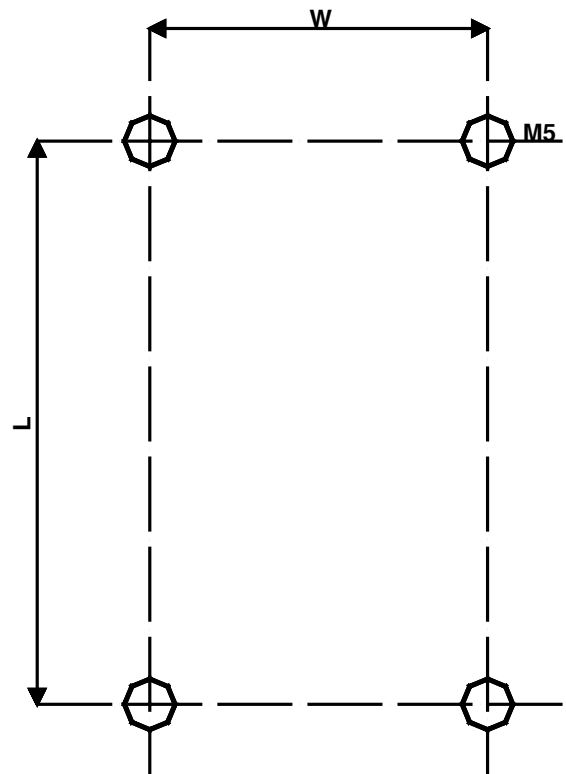| Size | CONTROL TERMINAL | | | POWER TERMINAL | | | GROUND TERMINAL * | |
|---|---|---|---|---|---|---|---|---|
| | Contact area (WxD) screw type | Pre-isolated wire terminal | Max. section ** conductor tightening torque | Contact area (WxD) screw type | Pre-isolated wire terminal | Max. section ** conductor tightening torque | Contact area (WxD) screw type | Max. section ** conductor tightening torque |
| 25/40A 50/60A | 6,3X9 M3 | Eye/fork tip | 2,5mm² 0,6Nm Max | 16x18 M6 | Eye/fork | 50mm² 3,5-0,6Nm | 14x16 M5 | 50mm² 1,8-2,5Nm |
| 75-90A | 6,3X9 M3 | Eye/fork tip | 2,5mm² 0,6Nm Max | 16x18 M6 | Eye/fork | 50mm² 3,5-0,6Nm | 14x16 M5 | 50mm² 1,8-2,5Nm |
| 120A | 6,3X9 M3 | Eye/fork tip | 2,5mm² 0,6Nm Max | 16x18 M6 | Eye/fork | 50mm² 3,5-0,6Nm | 14x16 M5 | 50mm² 1,8-2,5Nm |

(**)The maximum sections indicated refer to unipolar copper wires with PVC insulation.
- Note: you have to use an eye terminal for the ground connection.
  (WxD) = width x depth

GTT 25- GTT 40

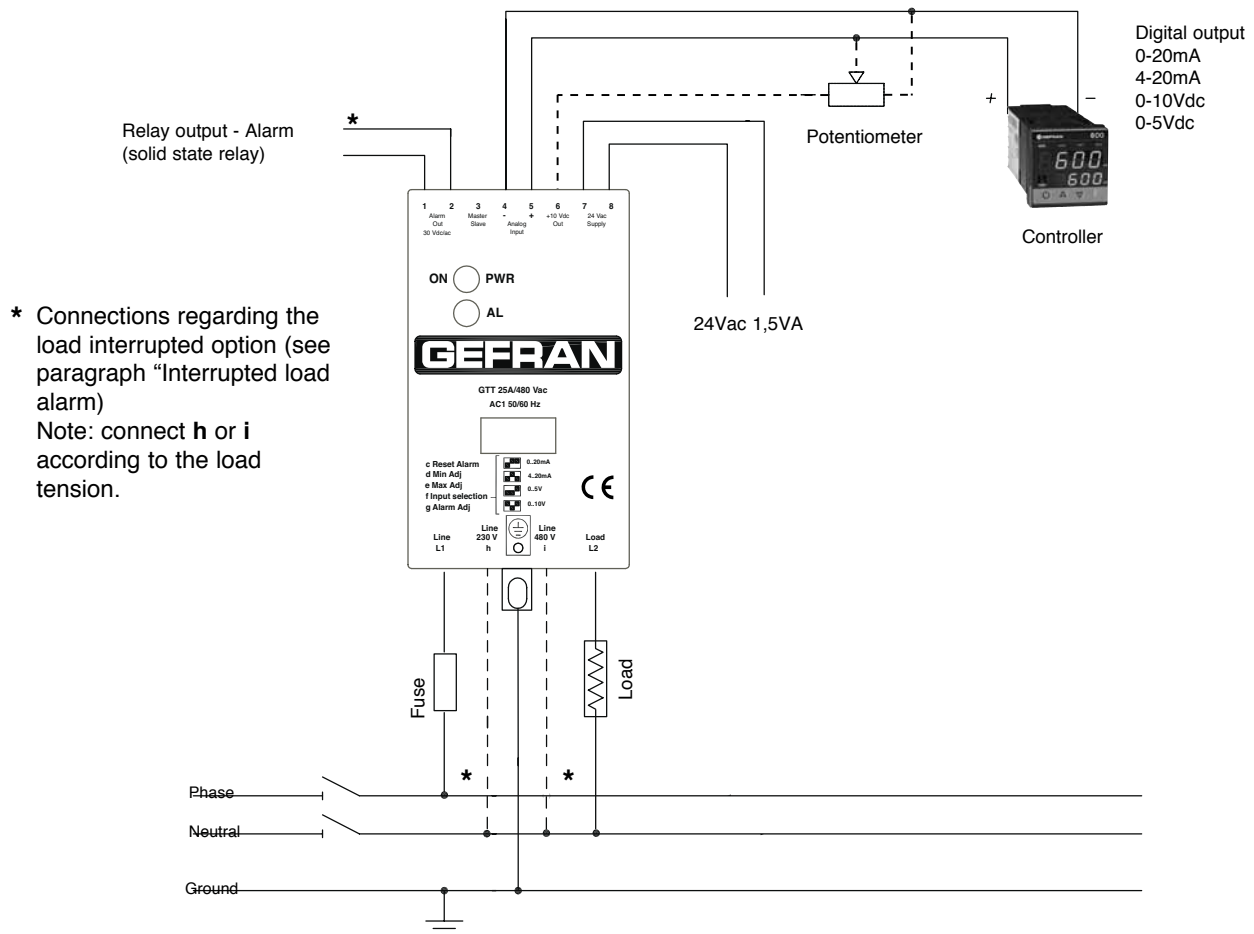GTT 50 - GTT 60

GTT 75 (without fan)
GTT 90 (without fan)
GTT 120 (with fan)

60 mm

80 mm

127 mm

30mm

108 mm
100 mm

**GTT 25A/480 Vac**
AC1 50/60 Hz

ON ( ) PWR
( ) AL

**GEFRAN**

1  2  3  4  5  6  7  8
Alarm  Master  –  +  +10 Vdc  24 Vac
Out  Slave  Analog  Out  Supply
30 Vdc/ac  Input

c Reset Alarm    0...20mA
d Min Adj        4...20mA
e Max Adj        0..5V
f Input selection 0..10V
g Alarm Adj

Line    Line    Line    Load
L1      230 V   480 V   L2
        h       i

CE

18mm

depth = 142mm (*)
weight = 900g

**GTT 60/480 Vac**
AC1 50/60 Hz

ON ( ) PWR
( ) AL

**GEFRAN**

1  2  3  4  5  6  7  8
Alarm  Master  –  +  +10 Vdc  24 Vac
Out  Slave  Analog  Out  Supply
30 Vdc/ac  Input

c Reset Alarm    0...20mA
d Min Adj        4...20mA
e Max Adj        0..5V
f Input selection 0..10V
g Alarm Adj

Line    Line    Line    Load
L1      230 V   480 V   L2
        h       i

CE

depth = 142mm (*)
weight = 1200g

**GTT 120/480 Vac**
AC1 50/60 Hz

ON ( ) PWR
( ) AL

**GEFRAN**

1  2  3  4  5  6  7  8
Alarm  Master  –  +  +10 Vdc  24 Vac
Out  Slave  Analog  Out  Supply
30 Vdc/ac  Input

c Reset Alarm    0...20mA
d Min Adj        4...20mA
e Max Adj        0..5V
f Input selection 0..10V
g Alarm Adj

Line    Line    Line    Load
L1      230 V   480 V   L2
        h       i

CE

50mm (max)

depth = 142mm
weight GTT 90 = 1300g
weight GTT 120 = 1700g

W

M5

L

|                       | L (mm) | W (mm) |
|-----------------------|--------|--------|
| GTT 25 - 40 - 50 - 60 | 112    | 44     |
| GTT 75 - 90 - 120     | 112    | 113    |

Single-phase connection with optional monitoring of interrupted load (command input from analog signal or potentiometer)

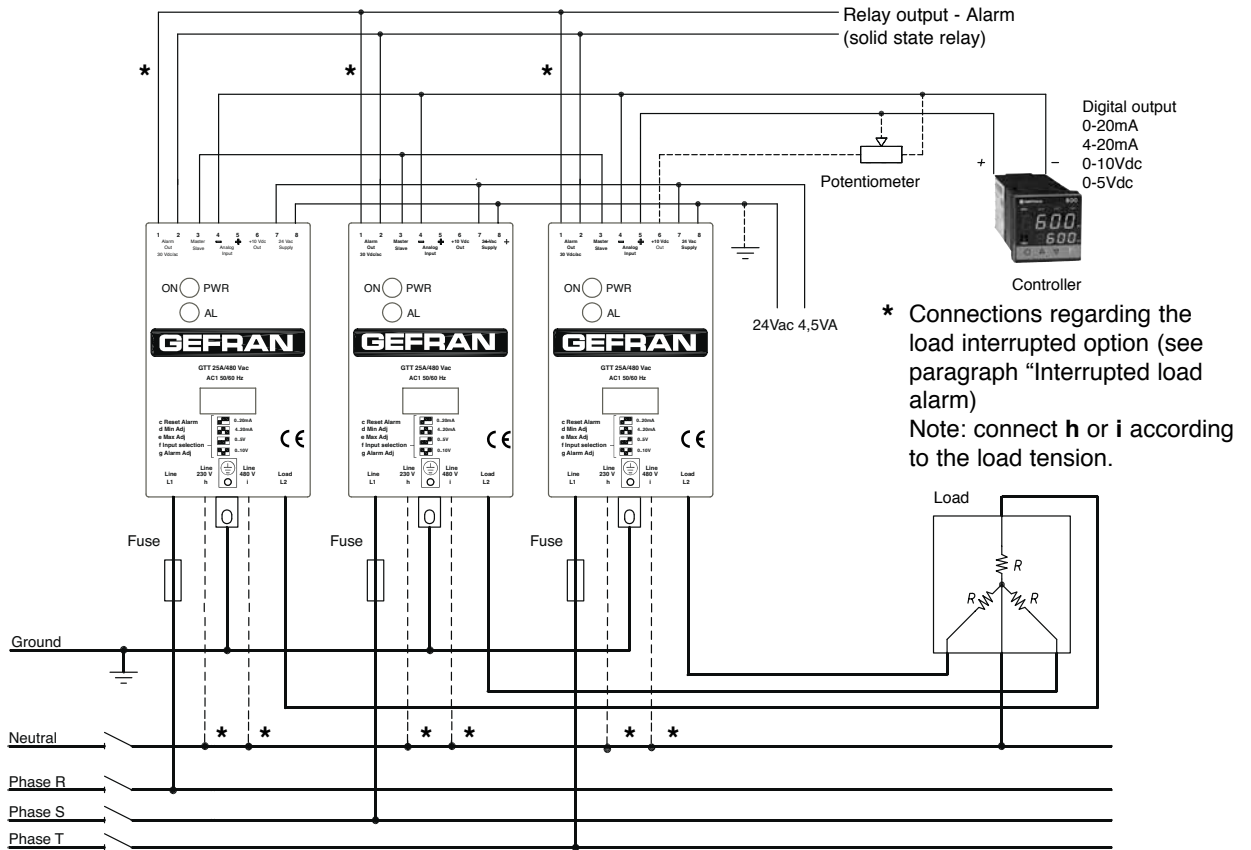* Connections regarding the
  load interrupted option (see
  paragraph "Interrupted load
  alarm)
  Note: connect **h** or **i**
  according to the load
  tension.



Star or delta three-phase connection without neutral, with control of two phases.

* Connections regarding
  the load interrupted
  option (see paragraph
  "Interrupted load alarm)
  Note: connect **h** or **i**
  according to the load
  tension.

Three-phase star connection with neutral.



* Connections regarding the load interrupted option (see paragraph "Interrupted load alarm)
Note: connect **h** or **i** according to the load tension.

Digital output
0-20mA
4-20mA
0-10Vdc
0-5Vdc

Relay output - Alarm (solid state relay)

24Vac 4,5VA

Controller

Star or delta three-phase connection without neutral, with control of three phases.



* Connections regarding the load interrupted option (see paragraph "Interrupted load alarm)
Note: connect **h** or **i** according to the load tension.

Relay output - Alarm (solid state relay)

Digital output
0-20mA
4-20mA
0-10Vdc
0-5Vdc

24Vac 4,5VA

Controller
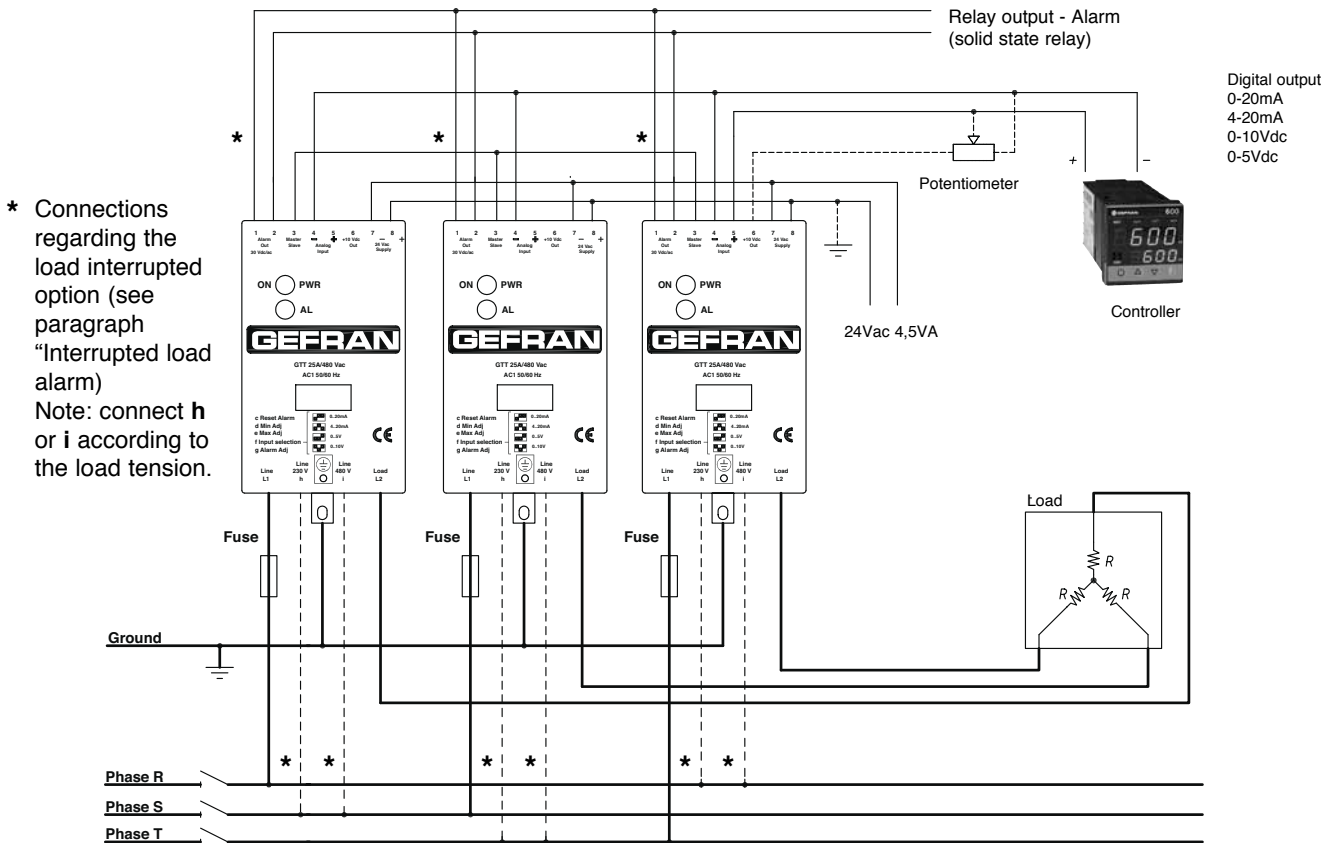
## CONNECTION EXAMPLES

Three-phase connection (triangle or star) without neutral, with control of two phases using one GTT in Master configuration and one GTS in Slave configuration.



* Connections regarding the load interrupted option (see paragraph "Interrupted load alarm) Note: connect **h** or **i** according to the load tension.
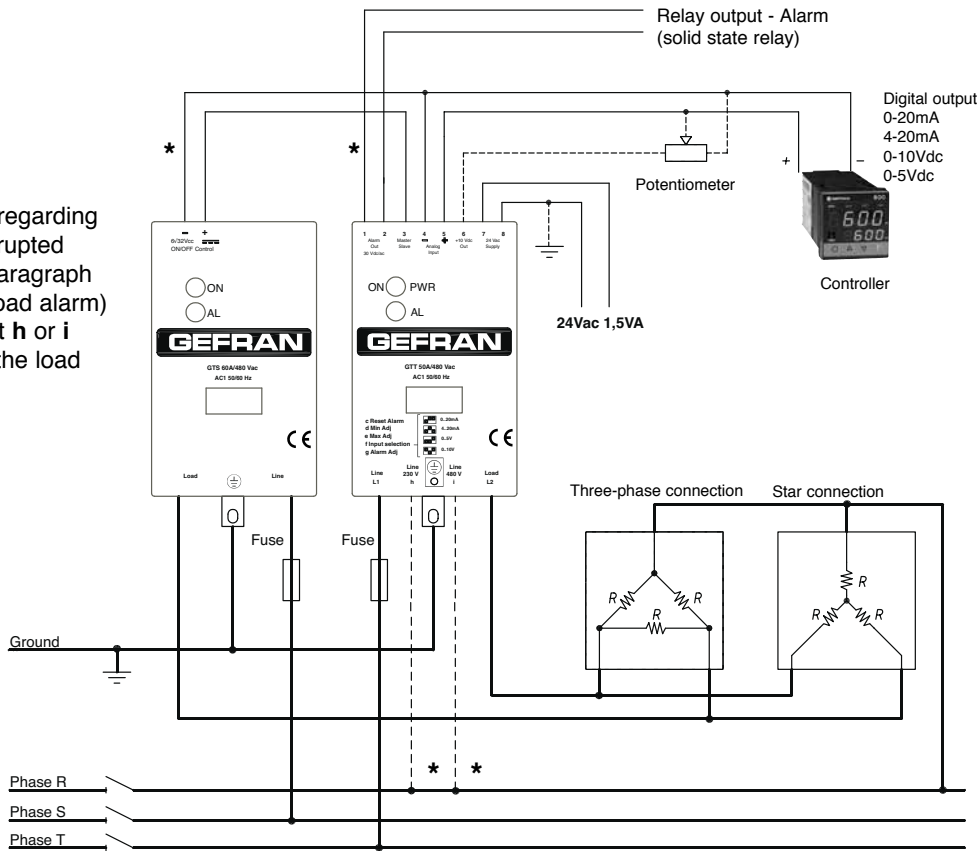
Three-phase star connection with neutral using one GTT in Master configuration and two GTSs in Slave configuration.
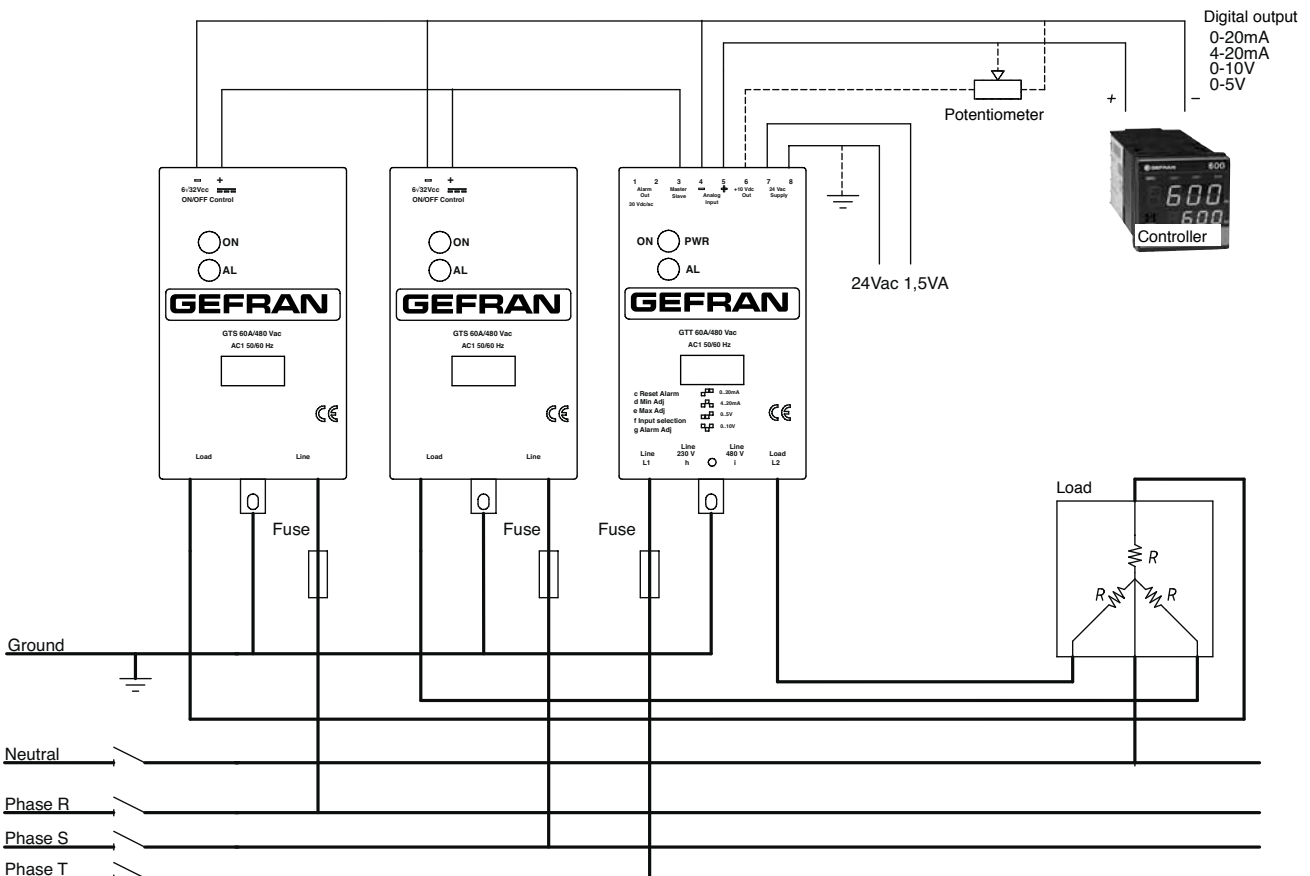
## ACCESSORIES

A wide range of accessories is available (including fuses and fuse holders, supports for fastening DIN bar, ID plates, thermostats, current transformers and isolation transformers). To choose accessories, see the section "Solid state relays - Accessories."

## ORDER CODE

| GTT | | / | 480 | - | | - | |

| Model | |
|---|---|
| | GTT |

| Nominal current | |
|---|---|
| 25Aac | 25 |
| 40Aac | 40 |
| 50Aac | 50 |
| 60Aac | 60 |
| 75Aac | 75 |
| 90Aac | 90 |
| 120Aac (*) | 120 |

(*) Specify fan supply: 115Vac or 230Vac

| Nominal voltage | |
|---|---|
| 480Vac | 480 |

| Load interrupt (HB) option | |
|---|---|
| Without option | 0 |
| With load interrupt option | 1 |

| Fan (for model 120A only) | |
|---|---|
| Fan 80x80x40 230V 14W | VEN90 |
| Fan 80x80x40 115V 14W | VEN91 |

Please contact GEFRAN personnel for information on availability of codes.

## ·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.

| CE | This device conforms to European Union Directive 2004/108/CE and 2006/95/CE 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** |