

## 1-phase solid state soft starters



### ► Benefits

- **Long lifetime.** Wire bonding technology reduces thermal and mechanical stresses of the output chips resulting in a larger number of possible operational cycles compared to other assembly technologies.
- **Ease of use.** The RGTS is a very simple soft starter requiring just 2 user adjustments.
- **Conforms to UL508A requirements for Industrial Control Panels.** The RGTS range is certified as a listed product. All models carry a 100 kAmps Short Circuit Current Rating.
- **Wide supply voltage range.** The RGTS has 2 control voltage ranges: 24 VAC/DC or 100 - 240 VAC. This wide range ensures that the product works well even in installations with a weak power supply.
- **Fast wiring.** The RGTS does not require additional wires for the start/stop signal. It will start ramp-up function as soon as mains voltage is applied.

### ► Description

**RGTS** is a compact and easy to use soft starter for single phase two wire AC induction motors. **RGTS** is a fully solid state solution.

Motor ramp-up time as well as initial torque can be independently adjusted through the built-in potentiometers.

A green LED gives indication of control voltage presence. Ramp-up and full-voltage indication are provided through an orange LED.

### ► Applications

1-phase AC induction motors used in: pumps, compressors, fans, conveyors

### ► Main features

- Fully solid state solution
- Wide supply voltage range: 100 - 240 VAC 50/60 Hz
- Voltage ramp soft start

 Order code

 RGTS 24  0  V00

Enter the code entering the corresponding option instead of .

| Code                     | Option | Description                                 | Comments                       |
|--------------------------|--------|---|--------------------------------|
| R                        | -      |   |                                |
| G                        | -      | Solid state soft starter                    |                                |
| T                        | -      |   |                                |
| S                        | -      | Single-pole switching                       |                                |
| 24                       | -      | 100 - 240 VACrms +10%, -15%                 | Operational Voltage (Ue)       |
| <input type="checkbox"/> | 12     | 12 A  | Rated Operational Current (Ie) |
|                          | 16     | 16 A  |                                |
|                          | 25     | 25 A  |                                |
| 0                        | -      | Automatic start on presence of mains supply | Control Voltage (Uc)           |
| <input type="checkbox"/> | F      | 24 VAC/DC                                   | Supply Voltage (Us)            |
|                          | G      | 100 – 240 VAC                               |                                |
| V00                      | -      | No auxiliary relay output                   |                                |

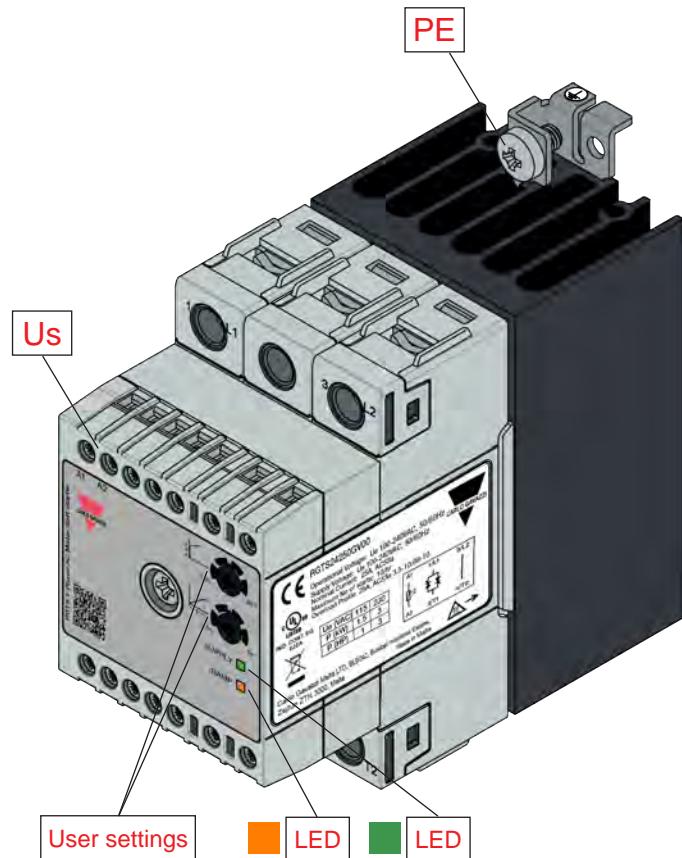
 Selection guide

| Rated operational current (Ie) | External Supply Voltage (Us) | Rated Operational Current (Arms) |
|--------------------------------|------------------------------|----------------------------------|
| 12 Arms                        | 24 VAC/DC                    | RGTS24120FV00                    |
|                                | 100 - 240 VAC                | RGTS24120GV00                    |
| 16 Arms                        | 24 VAC/DC                    | RGTS24160FV00                    |
|                                | 100 - 240 VAC                | RGTS24160GV00                    |
| 25 Arms                        | 24 VAC/DC                    | RGTS24250FV00                    |
|                                | 100 - 240 VAC                | RGTS24250GV00                    |

 Further reading

| Information                       | Where to find it  |
|-----------------------------------|---|
| RGTS instruction manual           | <a href="https://www.gavazziautomation.com/fileadmin/images/PIM/MANUALS/ENG/MC_RGTS_IL.pdf">https://www.gavazziautomation.com/fileadmin/images/PIM/MANUALS/ENG/MC_RGTS_IL.pdf</a>   |
| CAD drawings (RGTS2412)           | <a href="https://www.gavazziautomation.com/fileadmin/images/PIM/DRAWING/STEPP/MC_RGTS2412_CGI1364-00-3D.stp">https://www.gavazziautomation.com/fileadmin/images/PIM/DRAWING/STEPP/MC_RGTS2412_CGI1364-00-3D.stp</a>       |
| CAD drawings (RGTS2416, RGTS2425) | <a href="https://www.gavazziautomation.com/fileadmin/images/PIM/DRAWING/STEPP/MC_RGTS24_16_25CGI1365-00-3D.stp">https://www.gavazziautomation.com/fileadmin/images/PIM/DRAWING/STEPP/MC_RGTS24_16_25CGI1365-00-3D.stp</a> |

## Structure



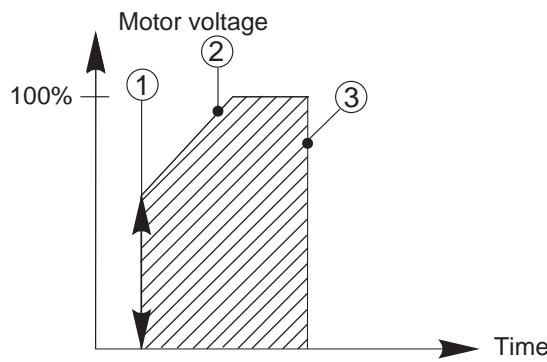
| Element                  | Component                       | Function   |
|--------------------------|---------------------------------|--|
| <b>1/L1, 3/L2</b>        | Power connections               | Mains connections – L1 for live and L2 for Neutral (or L2) connection  |
| <b>2/T1, 2/T2</b>        | Power connections               | Load connections - T1 for live and T2 for Neutral (or L2) connection   |
| <b>Us</b>                | Supply connection               | Terminals for supply voltage   |
| <b>Green LED</b>         | Supply voltage indication       | Indicates presence of supply voltage   |
| <b>Orange LED</b>        | Ramp-up/Full-voltage indication | Indicates status of RGTS   |
| <b>PE</b>                | Protective Earth                | Connection for protective earth  |
| <b>User settings (1)</b> | Initial torque setting          | Sets the initial torque at which RGTS will start the ramp-up sequence. A lower initial torque results in a lower starting current.           |
| <b>User settings (2)</b> | Ramp-up time setting            | Sets the time at which the RGTS will reach full voltage at its output. Set the ramp-up time slightly longer than actual motor starting time. |

## Mode of operation

The RGTS series of soft starters works on a voltage ramp algorithm.

The user can adjust two independent settings: Initial torque (10% to 80%) and Ramp-up (0.5 to 5 sec)

- (1) Initial torque setting: The initial torque may be be adjusted from 10% to 80%. A lower setting of the initial torque will result in a lower voltage at the output terminals of the RGTS when mains is applied to L1, L2.
- (2) Ramp-up time setting: This ramp-up time may be adjusted from 0.5 to 5 sec. This time is equivalent to the time that the RGTS will take to go from the output voltage corresponding to the initial torque setting to full voltage.
- (3) Ramp-down: The RGTS does not have ramp-down function. As soon as the mains is removed the RGTS will switch OFF its output and the motor will coast to stop.



- ① Initial torque (10% - 80%): Voltage at the start of the ramp-up function.
- ② Ramp-up time 0.5 to 5 sec. Time from zero load voltage to full load voltage.
- ③ Coast to stop.

## Features

### General data

|                             |                           |
|-----------------------------|---------------------------|
| <b>Material</b>             | PA66 (UL94 V0), RAL7035   |
| <b>Assembly</b>             | DIN rail                  |
| <b>Touch protection</b>     | IP20                      |
| <b>Weight</b>               | approx. 660 g             |
| <b>Overvoltage category</b> | III (Fixed installations) |

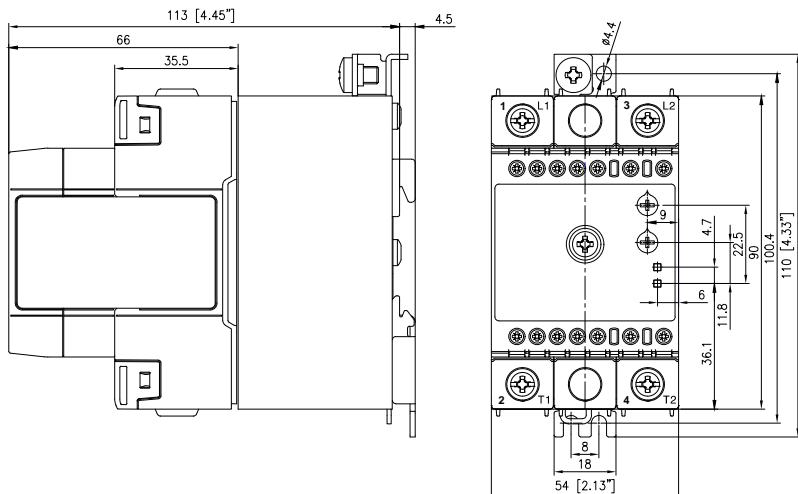


Fig. 1 RGTS2412

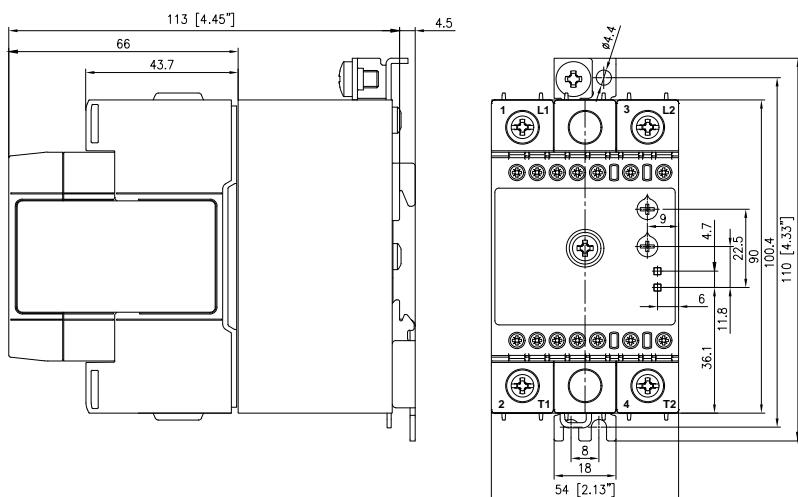


Fig. 2 RGTS2416, RGTS2425

### Settings

|                       |                |
|-----------------------|----------------|
| <b>Ramp-up time</b>   | 0.5 - 5 sec    |
| <b>Ramp-down time</b> | Not applicable |
| <b>Initial torque</b> | 10% - 80%      |

## ▶ Power supply (Us)

|                                 | RGTS24..0FV00                         | RGTS24..0GV00 |
|---------------------------------|---------------------------------------|---------------|
| <b>Supply voltage range, Us</b> | 24VDC, -15%/+20%,<br>24VAC, -15%/+15% | 90 – 265VAC   |
| <b>Isolation</b>                |                                       |               |
| <b>Input to Output</b>          | 2.5 kVrms                             |               |
| <b>Output to Case</b>           | 4 kVrms                               |               |
| <b>Input to Case</b>            | 4 kVrms                               |               |
| <b>Max. supply current</b>      | 80 mA                                 | 60 mA         |

## ▶ Environmental

|                              |  |
|------------------------------|--|
| <b>Working temperature</b>   | -40°C to +60°C (-40°F to +140°F)                       |
| <b>Storage tempreature</b>   | -40°C to +100°C (-40°F to +212°F)                      |
| <b>Relative humidity</b>     | <95% non condensing @ 40°C                             |
| <b>Pollution degree</b>      | 2  |
| <b>Installation category</b> | III (Fixed installations)                              |
| <b>Installation altitude</b> | 0 - 1000 m   |
| <b>Vibration resistance</b>  | 2g / axis (2 - 100 Hz, IEC60068-2-6, EN50155, EN61373) |
| <b>Impact resistance</b>     | 15/11 g/ms (EN50155, EN61373)                          |
| <b>EU RoHS compliant</b>     | Yes  |

## ▶ Inputs

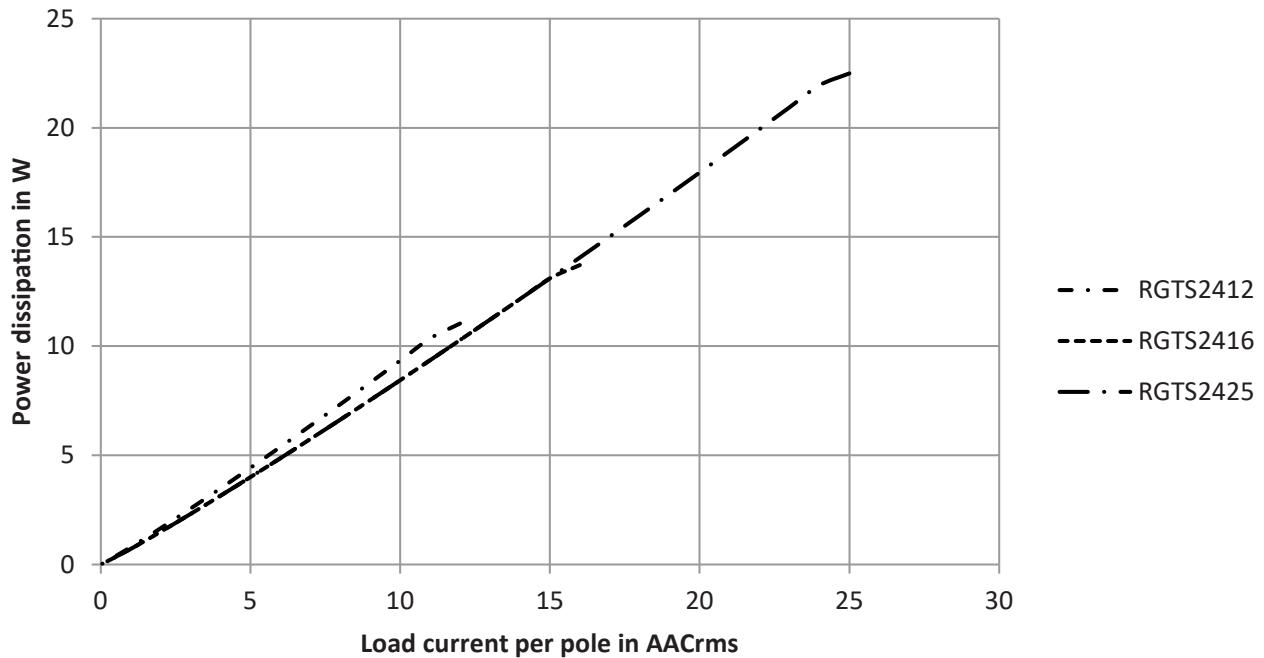
|                             |  |
|-----------------------------|--|
| <b>Control voltage (Uc)</b> | Not required. The RGTS shall be wired in series with a motor starter or contactor. Upon the presence of the mains supply voltage, the RGTS will start ramp-up function.<br><br>Note: A1-A2 supply voltage has to be present. |
|-----------------------------|--|

## ▶ Outputs

|  | RGTS..12              | RGTS..16              | RGTS..25              |
|--|-----------------------|-----------------------|-----------------------|
| <b>Overload cycle @ 40°C surrounding temperature (acc. to IEC/EN 60947-4-2)</b>          | AC53a:3.5-10:99-10    |                       |                       |
| <b>Maximum number of starts/hr @ rated overload cycle @ 40°C surrounding temperature</b> | 10                    | 10                    | 10                    |
| <b>Rated operational current @ 40°C</b>  | 12 AAC                | 16 AAC                | 25 AAC                |
| <b>Minimum operational current</b>   | 250 mA                | 400 mA                | 400 mA                |
| <b>I<sup>2</sup>t for fusing</b>   | 1800 A <sup>2</sup> s | 6600 A <sup>2</sup> s | 6600 A <sup>2</sup> s |

# Outputs

## ▶ Output power dissipation



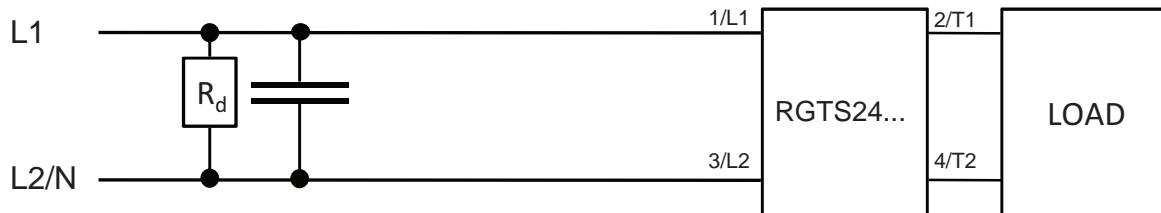

**Compatibility and conformance**

|  |   |
|--|---|
| <b>Conformance</b>                     | LVD: EN/IEC 60947-4-2, EMCD: EN/IEC 60947-4-2<br>UL: UL508, E172877, cUL: C22.2 No.14-13, E172877   |
| <b>Approvals</b>                       |   |
| <b>UL short circuit current rating</b> | 100 kArms (refer to short circuit current section, Type 1 - UL508)  |

| <b>Electromagnetic compatibility (EMC) - immunity</b> |  |
|---|--|
| <b>Electrostatic discharge (ESD)</b>                  | EN/IEC 61000-4-2<br>8 kV air discharge, 4 kV contact (PC2)   |
| <b>Radiated radio frequency</b>                       | EN/IEC 61000-4-3<br>10 V/m, from 80 MHz to 1 GHz (PC1)<br>10 V/m, from 1.4 to 2 GHz (PC1)<br>10 V/m, from 2 to 2.7 GHz (PC1)                                       |
| <b>Electrical Fast Transient (Burst)</b>              | EN/IEC 61000-4-4<br>Output: 2 kV, 5 kHz (PC1)<br>Input: 1 kV, 5 kHz (PC1)  |
| <b>Conducted Radio Frequency</b>                      | EN/IEC 61000-4-6<br>10 V/m, from 0.15 to 80 MHz (PC1)  |
| <b>Electrical Surge</b>                               | EN/IEC 61000-4-5<br>Output, line to line: 1 kV (PC2)<br>Output, line to earth: 2 kV (PC2)<br>Input, line to line: 500 V (PC2)<br>Input, line to earth: 500 V (PC2) |
| <b>Voltage Dips</b>                                   | EN/IEC 61000-4-11<br>0% for 0.5, 1 cycle (PC2)<br>40% for 10 cycles (PC2)<br>70% for 25 cycles (PC2)<br>80% for 250 cycles (PC2)                                   |
| <b>Voltage interruptions</b>                          | EN/IEC 61000-4-11<br>0% for 5000 ms (PC2)  |

| <b>Electromagnetic compatibility (EMC) - emissions</b> |  |
|--|--|
| <b>Radio Interference field emission (Radiated)</b>    | EN/IEC 55011<br>Class A: from 30 to 1000 MHz   |
| <b>Radio interference field emissions (conducted)</b>  | EN/IEC 55011<br>Class A: from 0.15 to 30 MHz<br>(External filter may be required - refer to Filtering section) |

## Filter Connection Diagram



$R_d = 1M\Omega, 0.5W$

Filter has to be connected across both LOAD and the RGTS device

### ► Filtering

| Cat. No. | Suggested filter for compliance | Max. Motor current [A] |
|----------|---------------------------------|------------------------|
| RGTS     | No filter required              | Up to 5 A              |
|          | 10 nF / 275 V / X1              | > 5 A to 10 A          |
|          | 100 nF / 275 V / X1             | > 10 A to 25 A         |

#### Note:

- Control input lines must be installed together to maintain products' susceptibility to Radio Frequency interference.
- Use of AC solid state relays may, according to the application and the load current, cause conducted radio interferences. Use of mains filters may be necessary for cases where the user must meet E.M.C requirements. The capacitor values given inside the filtering specification tables should be taken only as indications, the filter attenuation will depend on the final application.
- This product has been designed for Class A equipment. Use of this product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.
- Surge tests on RGTS models were carried out with the signal line impedance network. In case the line impedance is less than  $40\Omega$ , it is suggested that AC supply is provided through a secondary circuit where the short circuit limit between conductors or between conductors and ground is 1500 VA or less.
- Performance Criteria 1 (PC1): No degradation of performance or loss of function is allowed when the product is operated as intended.
- Performance Criteria 2 (PC2): During the test, degradation of performance or partial loss of function is allowed. However when the test is complete the product should return operating as intended by itself.
- Performance Criteria 3 (PC3): Temporary loss of function is allowed, provided the function can be restored by manual operation of the controls.

## Performance

### ▶ Current / power ratings: kW and HP @ 40°C

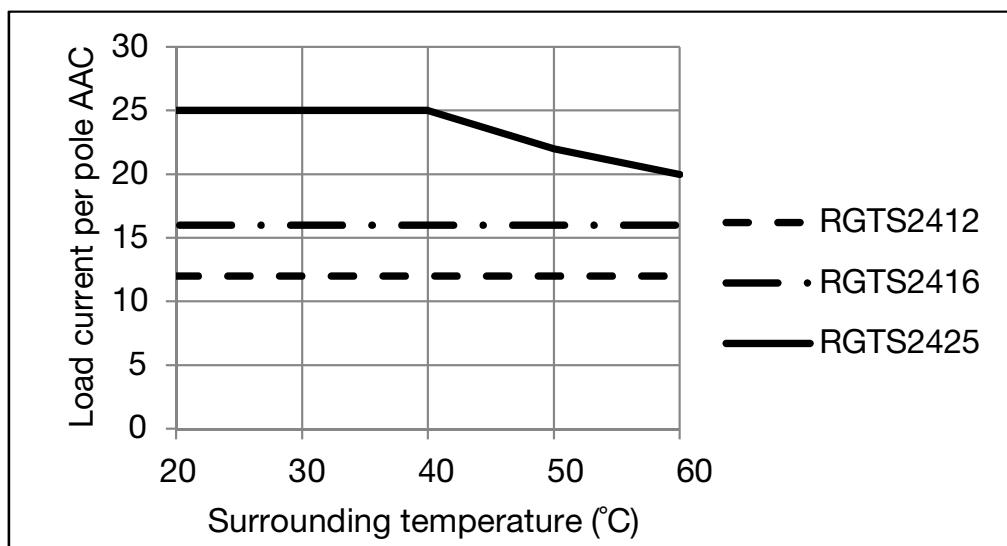
| Model     | IEC rated current | 110 – 120 VAC   | 220 – 240 VAC |
|-----------|-------------------|-----------------|---------------|
| RGTS24... | 12 Arms           | 0.55kW / 0.5 HP | 1.1 kW / 2 HP |
|           | 16 Arms           | 0.55kW / 0.5 HP | 1.5 kW / 2 HP |
|           | 25 Arms           | 1.5 kW / 1 HP   | 3 kW / 3 HP   |

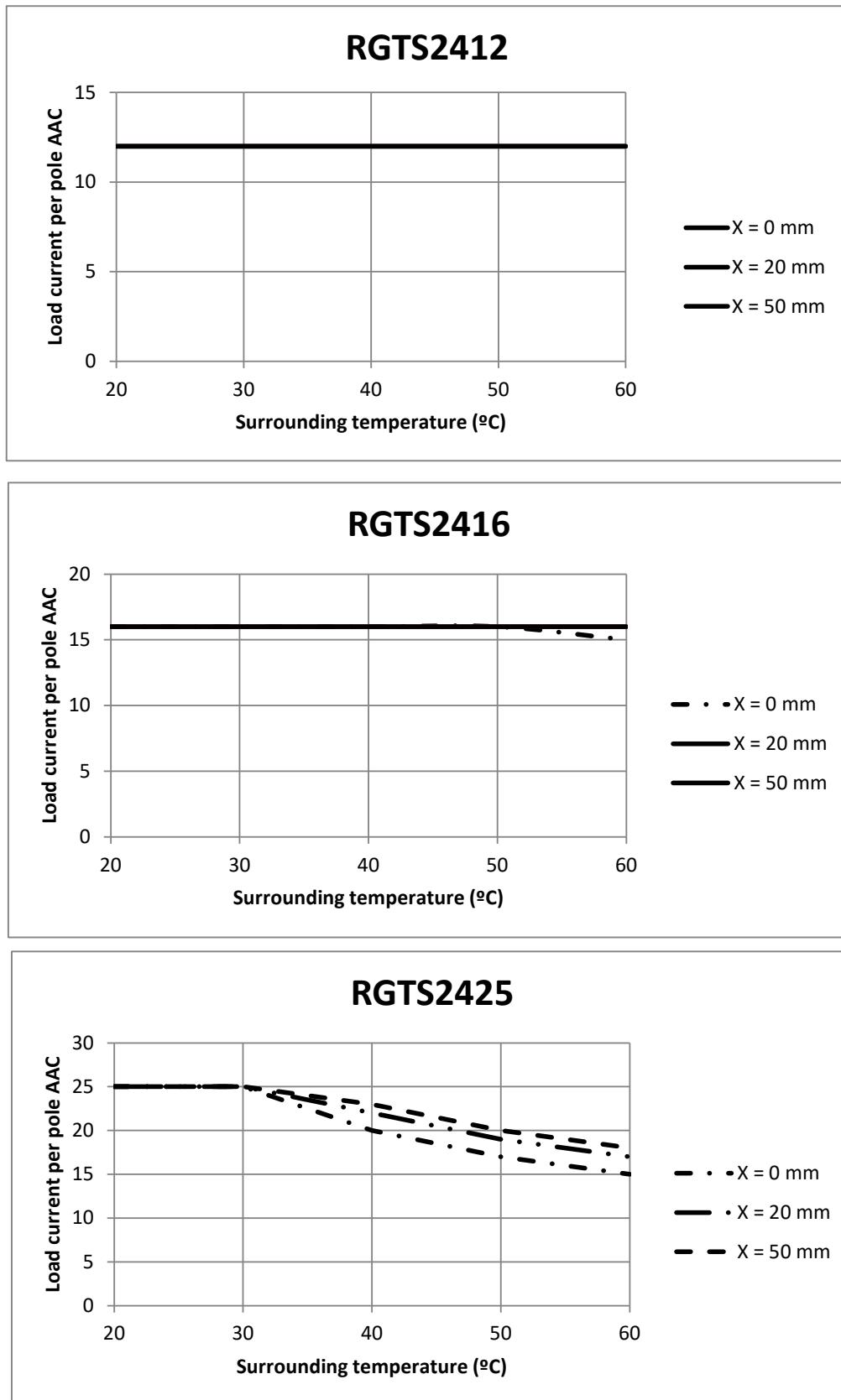
Ratings:

kW rating according to IEC/EN 60947-4-2

HP rating according to UL60947-4-2

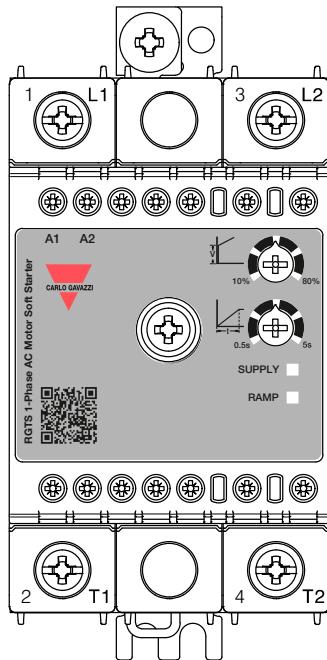
### ▶ Current derating curves (by temperature)



 Derating vs Spacing Curves

# Connection diagrams

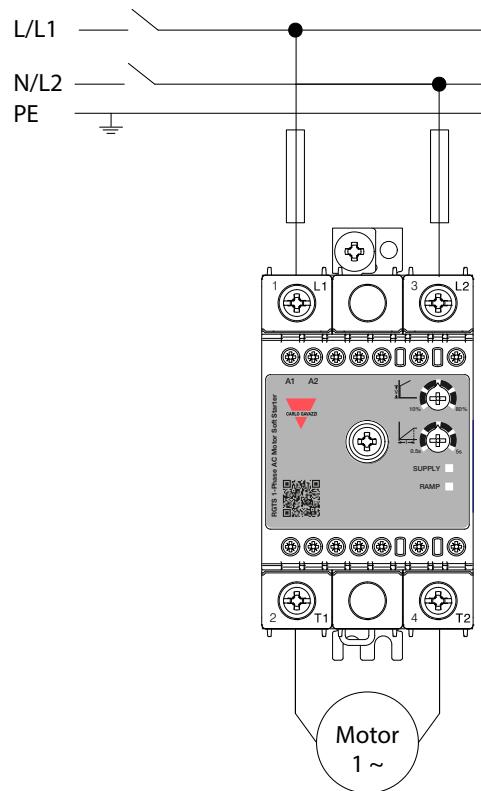
## ► Connection configuration



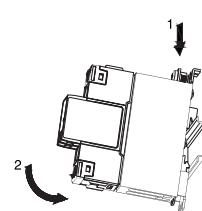
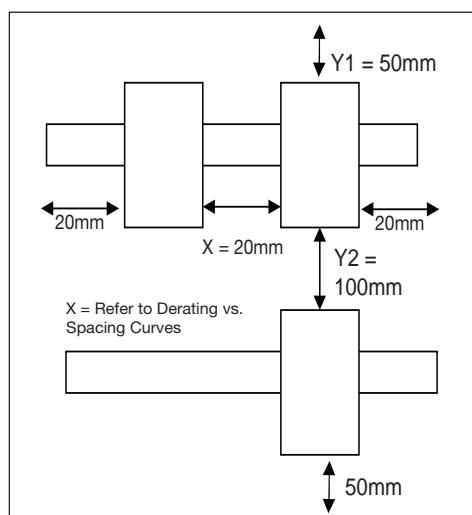
## ► Terminal markings

| Marking    |                                  |
|------------|----------------------------------|
| 1L1, 3/L2  | Line connections (L2 or Neutral) |
| 2/T1, 4/T2 | Load connections                 |
| A1, A2     | Supply voltage                   |
| PE         | Protective earth connection      |

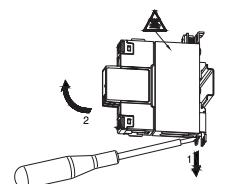
## ► Connection diagrams



## ► Installation



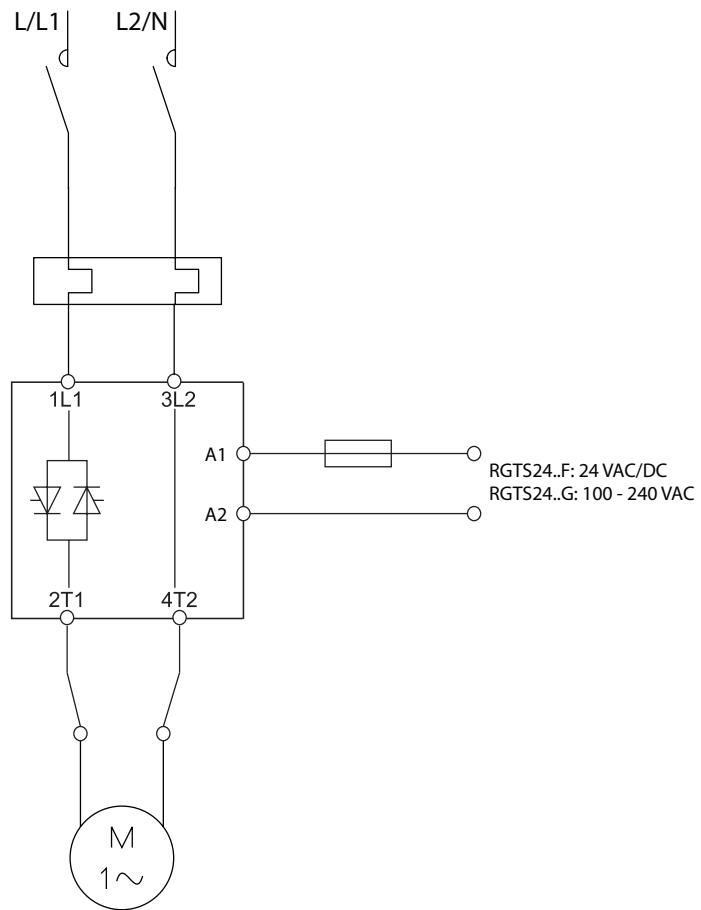
**HOT**  
WARM  
CHAUD  
HEISS  
CALDO  
CALENTE



- Mounting on DIN rail
- Montage på DIN-skinne
- Montage sur rail DIN
- Befestigung auf der DIN-Schiene
- Montaje a carril DIN
- Montaggio su guida DIN

- Dismounting from DIN rail
- Dismounting from DIN rail
- Dépose d'un RGTS monté sur rail DIN
- Demontage von der DIN-Schiene
- Desmontaje a carril DIN
- Smontaggio da guida DIN

## Wiring Diagrams



 **Connection Specifications**

| Power Connections<br>(1/L1, 3/L2, 2/T1, 4/T2)             | RGTS...12   | RGTS...16 – RGTS...25   |
|---|---|---|
| <b>Stripping length</b>                                   | 12 mm   | 11 mm   |
| <b>Connection type</b>                                    | M4 screw with captivated washer   | M5 screw with Box Clamp   |
| <b>Rigid (Solid &amp; Stranded)<br/>UL/cUL rated data</b> | 1 x 2.5 - 6 mm <sup>2</sup><br>1x 14 - 10 AWG                           | 1 x 2.5 - 25 mm <sup>2</sup><br>1x 14 - 3 AWG                         |
| <b>Flexible with end sleeve</b>                           | 1x 1.0 – 4.0 mm <sup>2</sup><br>1X 18 - 12 AWG                          | 1x 2.5 - 16 mm <sup>2</sup><br>1x 14 - 6 AWG                          |
| <b>Flexible without end sleeve</b>                        | 1x 1.0 – 6.0 mm <sup>2</sup><br>1X 18 - 10 AWG                          | 1 x 4.0 - 25 mm <sup>2</sup><br>1x 12 - 3 AWG                         |
| <b>Torque Specifications</b>                              | Pozidriv 2<br>UL: 2 Nm (17.7 lb-in)<br>IEC: 1.5-2.0 Nm (13.3-17.7lb.in) | Pozidriv 2<br>UL: 2.5 Nm (22 lb-in)<br>IEC: 2.5-3.0 Nm (22-26.6lb-in) |
| <b>Protective Earth Connection</b>                        | M5, 1.5 Nm (13.3 in-lb)   |   |

Note: Use 75°C Copper (Cu) conductors

Note: Protective earth connection must be connected whenever the product is intended to be used in Class 1 applications according to EN/IEC 61140

| Secondary conductors<br>(A1, A2)                          | RGTS...12  | RGTS...16 – RGTS...25 |
|---|--|-----------------------|
| <b>Stripping length</b>                                   | 8 mm   |                       |
| <b>Connection type</b>                                    | M3 screw with Box Clamp  |                       |
| <b>Rigid (Solid &amp; Stranded)<br/>UL/cUL rated data</b> | 1x 1.0...2.5 mm <sup>2</sup><br>1x 18...12 AWG                     |                       |
| <b>Flexible with end sleeve</b>                           | 1x 0.5...2.5 mm <sup>2</sup><br>1x 20...12 AWG                     |                       |
| <b>Torque Specifications</b>                              | Pozidriv 1<br>UL:0.5 Nm (4.4lb-in), IEC: 0.4-0.5 Nm (3.5-4.4lb-in) |                       |

# Troubleshooting

## ► LED Status indications

| State    | Supply<br>(Green LED) | Ramp/Full-voltage<br>(Orange LED) |
|----------|-----------------------|-----------------------------------|
| Idle     | ON                    | OFF                               |
| Ramping  | ON                    | Flashing                          |
| Fully ON | ON                    | ON                                |

## ► Short circuit protection

### Protection Co-ordination, Type 1 vs Type 2:

Type 1 protection implies that after a short circuit, the device under test will no longer be in a functioning state. In Type 2 co-ordination the device under test will still be functional after the short circuit. In both cases, however the short circuit has to be interrupted. The fuse between enclosure and supply shall not open. The door or cover of the enclosure shall not be blown open. There shall be no damage to conductors or terminals and the conductors shall not separate from terminals. there shall be no breakage or cracking of insulating bases to the extent that the integrity of the mounting of live parts is impaired. Discharge of parts or any risk of fire shall not occur.

The product variants listed in the table hereunder are suitable for use on a circuit capable of delivering not more than 100,000A rms Symmetrical Amperes, 600 Volts maximum when protected by fuses. Tests at 100,000A were performed with Class J fuses, fast acting; please refer to the table below for maximum allowed ampere rating of the fuse. Use fuses only.

Tests with Class J fuses are representative of Class CC fuses.

| Protection co-ordination Type 1 according to UL 508 |   |                   |         |               |
|---|---|-------------------|---------|---------------|
| Part No.  | Prospective short circuit current [kArms] | Max fuse size [A] | Class   | Voltage [VAC] |
| RGTS2412  | 100                                       | 30                | J or CC | Max. 600 VAC  |
| RGTS2416  |   |                   |         |               |
| RGTS2425  |   |                   |         |               |

| Part No. | Prospective short circuit current [kArms] | Ferraz Shawmut (Mersen) |             | Siba              |               | Voltage [VAC] |
|----------|---|-------------------------|-------------|-------------------|---------------|---------------|
|          |   | Max fuse size [A]       | Part number | Max fuse size [A] | Part number   |               |
| RGTS2412 | 100                                       | 40                      | A70QS40-4   | 50                | 50 142 06 50  | Max. 600 VAC  |
| RGTS2416 |   | 60                      | A70QS60-4   | 80                | 50 194 20 80  |               |
| RGTS2425 |   | 90                      | A70QS90-4   | 100               | 50 194 20 100 |               |



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