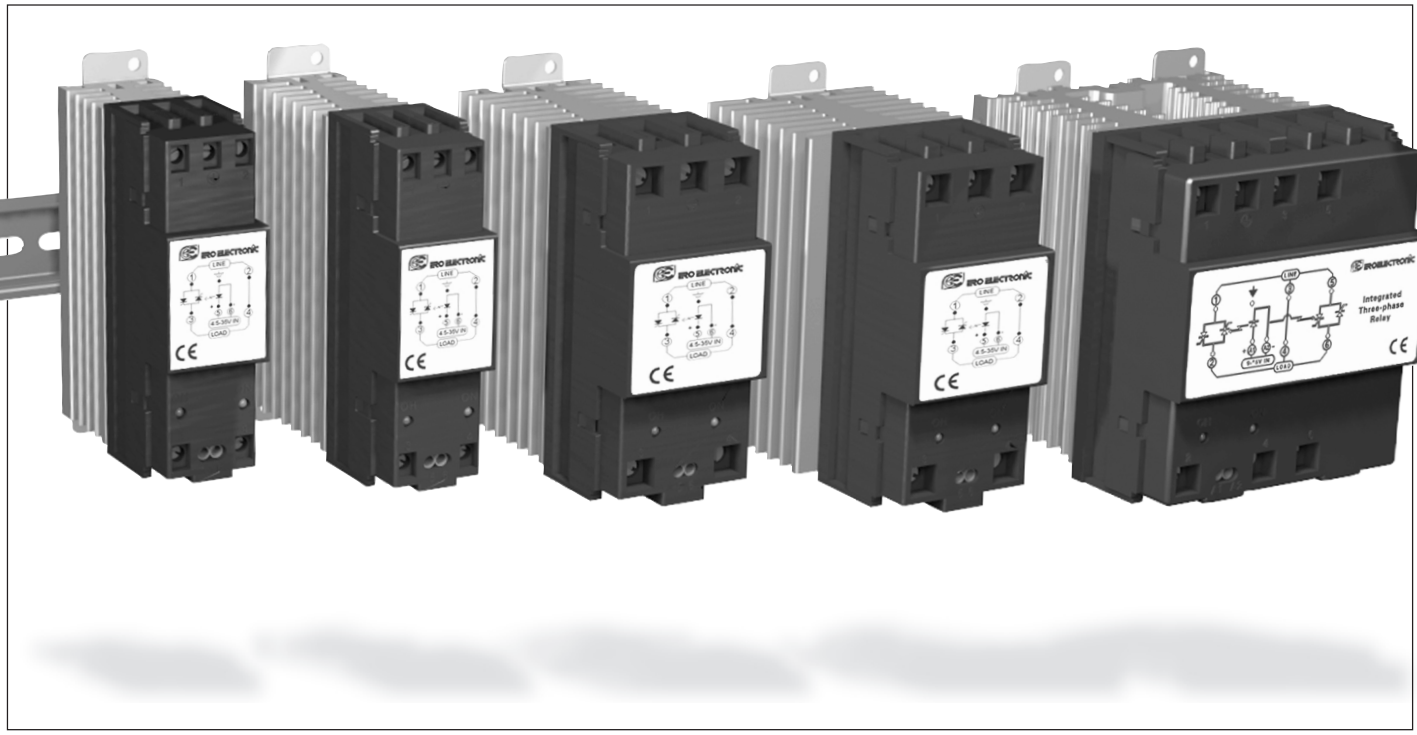
ERO ELECTRONIC



Industrial
Solid State Relay

ESR
ETR

ESR Enhanced single-phase version with AC or DC input

ETR Enhanced three-phase version with AC or DC input

ESR-T Enhanced single-phase version with TRIAC and DC input

PRELIMINARY

TECNICAL NOTES

often, electrical equipment connected an industrial power lines (e.g. electric motor with brushes) generate electric noise and spikes.

A spike is an over voltage impulse with a high rate of rise so that it may exceed the SCR blocking voltage or the SCR voltage speed (dV/dt).
In both cases the SCR will be damaged.

Snubbers
All SSR produced by ERO are equipped with an internal RC network (snubber) that helps in the slow down respons of dV/dt transient voltage. It deals effectively with two aspects of a voltage transient: not only does the network slows down the rate of rise as mentioned above on the output of the SCR and drive circuits, but it also limits the amplitude to which it can rise to. In the latter case, however, the protection is somewhat limited. In this event, a suppressor with a specific clamp voltage is suggested.

Clamping device
This is a technique which is adding a clamping device, across the SSR terminals, that will absorb the transient energy above a predetermined level. Over the years, the need for this type of devices to provide sustained voltage clipping has been filled by: spark gaps unit, selenium, gas-discharge devices and other devices called commonly metal oxide varistors (MOVs).
In all cases the activation voltage of the clamping device must be higher than the power line voltage but lower than the blocking voltage of the SCR.

The clamping devices can be divided in two families:
- FIRST- Suppression devices like spark gaps. When activated, its impedance will drop to a very low value thus transferring the transient to the load as if the SSR has turned ON. These devices are generally quite expensive.

- Second - Suppression devices like MOVs which will conduct only at the predetermined level and above, thereby sharing the transient with the load (which is the more popular approach). These devices are rated for a pre-determined energy level and when this energy has been reached, the unit will no longer work.
  Unfortunately, it is quite difficult to estimate the quantity of spikes and the energy of each spike than can be present on an industrial power line so it is advisable to replace all MOVs periodically.

Fuse
Mechanical circuit breakers are generally too slow to prevent damage to semiconductor device.
Standard cartridge fuses are also too slow to protect semiconductors when operating close to their maximum rating.
Semiconductor fuse insted, are capable to provide extremely fast opening, while restricting let-through current far below the available fault current that could destroy the semiconductor.
In order to coordinate the fuse rating with those of the SSR, the SSR data sheets generally use similar terms for fusing, such as I^2t, a common expression in defining fuse performance.
- For fuses, I^2t is the measure of the let-through energy in terms of current versus time (i.e. the RMS current flow from the beginning of the fault condition to the opening of the fuse).
- For SCR, I^2t is the maximum non-repetitive pulse current acceptable for the semiconductor.

Selecting a fuse, verify the following conditions:
- the fuse voltage rating must be **higher** than the power line voltage.
- the fuse current rating must be **higher** than the SSR current rating but it must be **close to it**.
- the I^2t of the fuse must be **quite lower** than the I^2t of the SSR. The lower is the I^2t of the fuse, the higher will be the protection given to the SCR.

ESR / ETR

ESR - Enhanced single-phase version with DC input

General specifications:

Command type: time proportioning.
Rated control voltage: OFF state = 0 to 2 V DC
ON state = 4.5 to 35 V DC
Input type: Constant current (15 mA).
Switching type: zero crossing.
Load type: resistive (min cosϕ = 0.9).
Min. holding current: 150 mA RMS.
Leakage current: 20 mA eff @ 600 V c.a.
Min. latching voltage: 40 V
Voltage drop on thyristors: 1.4 V.
Insulation: - between power circuit and earth: 2500 V RMS for 1 minute.
- between command and power circuits: 3500 V RMS for 1 minute.
- between command and earth: 1800 V RMS for 1 minute.
Insulation resistance: > 100 MΩ at 500 V DC.
Operational temperature: from 0 to 40 °C (from 32 to 104 °F).
Humidity: from 20 % to 85 % RH non condensing.
Storage temperature: from - 20 to + 70 °C (-4 to 158°F)
Protection: IP 20.
Approvals: UL and cUL pending.
For other details see TABLE 1

ETR - Enhanced three-phase version with DC input

General specifications:

Command type: time proportioning.
Rated control voltage: OFF state = 0 to 4 V DC
ON state = 9 to 35 V DC
Input type: Constant current (15 mA).
Switching type: zero crossing.
Load type: resistive (min cosϕ = 0.9).
Min. holding current: 150 mA RMS.
Leakage current: 20 mA eff. @ 600 V c.a.
Min. latching voltage: 40 V
Voltage drop on SCR: 1.4 V.
Insulation: - between power circuit and earth: 2500 V RMS for 1 minute.
- between command and power circuits: 3500 V RMS for 1 minute.
- between command and earth: 1800 V RMS for 1 minute.
Insulation resistance: > 100 MΩ at 500 V DC.
Operational temperature: from 0 to 40 °C (from 32 to 104 °F).
Humidity: from 20 % to 85 % RH non condensing.
Storage temperature: from - 20 to + 70 °C (-4 to 158°F)
Protection: IP 20.
Approvals: UL and cUL pending.

For other details see TABLE 1

TABLE 1

MODEL	ESR-ETR Amp. - V 25 - 400	ESR-ETR Amp. - V 40 - 400	ESR-ETR Amp. - V 60 - 400	ESR Amp. - V 80 - 400	ESR-ETR Amp. - V 25 - 600	ESR-ETR Amp. - V 40 - 600	ESR-ETR Amp. - V 60 - 600	ESR Amp. - V 80 - 600
Nominal voltage (max +10%)	400 V	400 V	400 V	400 V	600 V	600 V	600 V	600 V
Nominal current(@ 40°C)	25 A	40 A	60 A	80 A	25 A	40 A	60 A	80 A
Non-rep. surge current	380 A	900 A	1350 A	1350 A	380 A	900 A	1350 A	1350 A
I^2t for fusing (10 ms)	720	4000	9100	9100	720	4000	9100	9100
Non-rep. peak voltage	1300 V	1300 V	1300 V	1300 V	1700 V	1700 V	1700 V	1700 V
$\Delta V/\Delta t$	1000 V/µs	1000 V/µs	1000 V/µs	1000 V/µs	1000 V/µs	1000 V/µs	1000 V/µs	1000 V/µs
PRV	1200 V	1200 V	1200 V	1200 V	1600 V	1600 V	1600 V	1600 V
ESR - Power dissipation ($I = I_{nom}$)	35 W	56 W	84 W	112 W	35 W	56 W	84 W	112 W
ETR - Power dissipation ($I = I_{nom}$)	70 W	112 W	168 W	--	70 W	112 W	168 W	--
ESR - Weight	630 g	900 g	1400 g	2000 g	630 g	900 g	1400 g	2000 g
ETR - Weight	1800 g	1950 g	1950 g	--	1800 g	1950 g	1950 g	--

ESR T - ETR AC

ESR T - Enhanced single-phase version with TRIAC and DC input

General specifications:

Command type: time proportioning.
Rated control voltage: OFF state = 0 to 2 V DC
ON state = 4.5 to 35 V DC
Input type: Constant current (15 mA).
Switching type: zero crossing.
Load type: resistive (min cosϕ = 0.9).
Min. holding current: 150 mA RMS.
Leakage current: max 20 mA RMS @ 250 V AC.
Min. latching voltage: 20 V
Voltage drop on triac: 1.8 V.
Insulation: - between power circuit and earth: 2500 V RMS for 1 minute.
- between command and power circuits: 3500 V RMS for 1 minute.
- between command and earth: 1800 V RMS for 1 minute.
Insulation resistance: > 100 MΩ at 500 V DC.
Operational temperature: from 0 to 40 °C (from 32 to 104 °F).
Humidity: from 20 % to 85 % RH non condensing.
Storage temperature: from - 20 to + 70 °C (-4 to 158°F)
Protection: IP 20.
Approval: UL and cUL pending.

For other details see TABLE 2

ETR AC - Enhanced three-phase version with AC input

General specifications:

Command type: time proportioning.
Rated control voltage: - for 240 VAC models: OFF state = 0 to 10 V AC
ON state = 100 to 240 V AC
- for 24 VAC models: OFF state = 0 to 4 V AC.
ON state = 24 V AC (± 15%).
Input type: Constant current (15 mA).
Switching type: zero crossing.
Load type: resistive (min cosϕ = 0.9).
Min. holding current: 150 mA RMS
Leakage current: max 20 mA RMS @ 600 V AC.
Min. latching voltage: 40 V
Voltage drop on SCR: 1.4 V.
Insulation: - between power circuit and earth: 2500 V RMS for 1 minute.
- between command and power circuits: 3500 V RMS for 1 minute.
- between command and earth: 1800 V RMS for 1 minute.
Insulation resistance: > 100 MΩ at 500 V DC.
Operational temperature: from 0 to 40 °C (from 32 to 104 °F).
Humidity: from 20 % to 85 % RH non condensing.
Storage temperature: from - 20 to + 70 °C (-4 to 158°F)
Protection: IP 20.
Approval: UL and cUL pending.

For other details see TABLE 2

TABLE 2

MODEL	ESR T Amp. - V 12 - 240	ESR T Amp. - V 18 - 240	ETR AC Amp. - V 25 - 400	ETR AC Amp. - V 40 - 400	ETR AC Amp. - V 60 - 400	ETR AC Amp. - V 25 - 600	ETR AC Amp. - V 40 - 600	ETR AC Amp. - V 60 - 600
Nominal voltage (max +10%)	240 V	240 V	400 V	400 V	400 V	600 V	600 V	600 V
Nominal current(@ 40°C)	12 A	18 A	25 A	40 A	60 A	25 A	40 A	60 A
Non-rep. surge current	160 A	208 A	380 A	900 A	1350 A	380 A	900 A	1350 A
I^2t for fusing (10 ms)	128	259	720	4000	9100	720	4000	9100
Non-rep. peak voltage	900 V	900 V	1300 V	1300 V	1300 V	1700 V	1700 V	1700 V
$\Delta V/\Delta t$	250 V/μs	250 V/μs	1000 V/μs	1000 V/μs	1000 V/μs	1000 V/μs	1000 V/μs	1000 V/μs
PRV	800 V	800 V	1200 V	1200 V	1200 V	1600 V	1600 V	1600 V
Power dissipation ($I = I_{nom}$)	18 W	27 W	70 W	112 W	168 W	70 W	112 W	168 W
Weight	510 g	510 g	1800 g	1950 g	1950 g	1800 g	1950 g	1950 g

ESR AC - Enhanced single-phase version with AC input

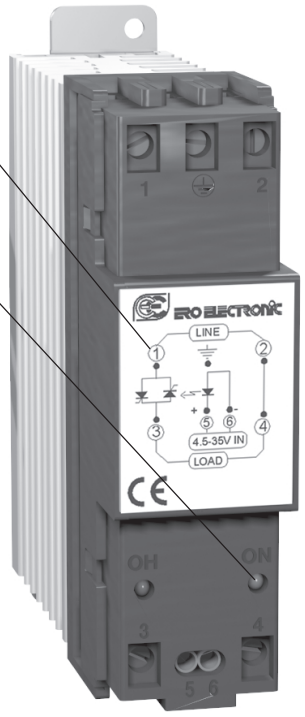
General specifications:

Command type: time proportioning.
Rated control voltage: - for 240 VAC models: OFF state = 0 to 10 V AC
ON state = 100 to 240 V AC
- for 24 VAC models: OFF state = 0 to 4 V AC.
ON state = 24 V AC (± 15%).
Input type: Constant current (15 mA).
Switching type: zero crossing.
Load type: resistive (min cosϕ = 0.9).
Min. holding current: 150 mA RMS
Leakage current: 20 mA RMS @ 600 V AC.
Min. latching voltage: 40 V
Voltage drop on thyristors: 1.4 V.
Insulation: - between power circuit and earth: 2500 V RMS for 1 minute.
- between command and power circuits: 3500 V RMS for 1 minute.
- between command and earth: 1800 V RMS for 1 minute.
Insulation resistance: > 100 MΩ at 500 V DC.
Operational temperature: from 0 to 40 °C (from 32 to 104 °F).
Humidity: from 20 % to 85 % RH non condensing.
Storage temperature: from - 20 to + 70 °C (-4 to 158°F)
Protection: IP 20.
Approvals: UL and cUL pending.

For other details see TABLE 3

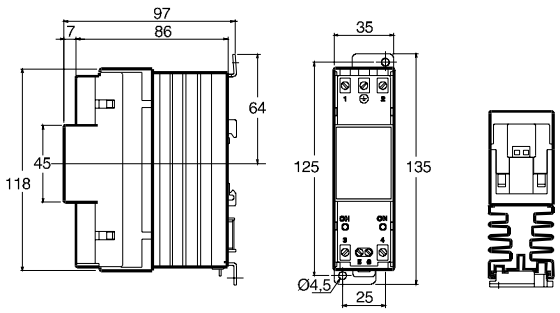
TABLE 3

MODEL	ESR AC Amp. - V 25 - 400	ESR AC Amp. - V 40 - 400	ESR AC Amp. - V 60 - 400	ESR AC Amp. - V 80 - 400	ESR AC Amp. - V 25 - 600	ESR AC Amp. - V 40 - 600	ESR AC Amp. - V 60 - 600	ESR AC Amp. - V 80 - 600
Nominal voltage (max +10%)	400 V	400 V	400 V	400 V	600 V	600 V	600 V	600 V
Nominal current(@ 40°C)	25 A	40 A	60 A	80 A	25 A	40 A	60 A	80 A
Non-rep. surge current	380 A	900 A	1350 A	1350 A	380 A	900 A	1350 A	1350 A
I^2t for fusing (10 ms)	720	4000	9100	9100	720	4000	9100	9100
Non-rep. peak voltage	1300 V	1300 V	1300 V	1300 V	1700 V	1700 V	1700 V	1700 V
$\Delta V/\Delta t$	1000 V/µs	1000 V/µs	1000 V/µs	1000 V/µs	1000 V/µs	1000 V/µs	1000 V/µs	1000 V/µs
PRV	1200 V	1200 V	1200 V	1200 V	1600 V	1600 V	1600 V	1600 V
Power dissipation ($I = I_{nom}$)	35 W	56 W	84 W	112 W	35 W	56 W	84 W	112 W
Weight	630 g	900 g	1400 g	2000 g	630 g	900 g	1400 g	2000 g

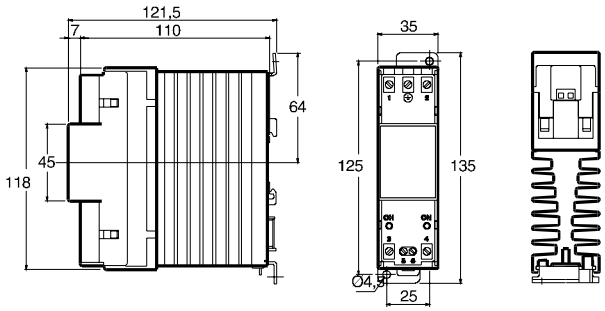


Dimensions

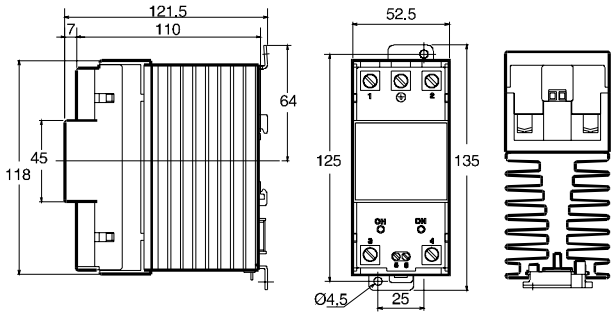
ESR T



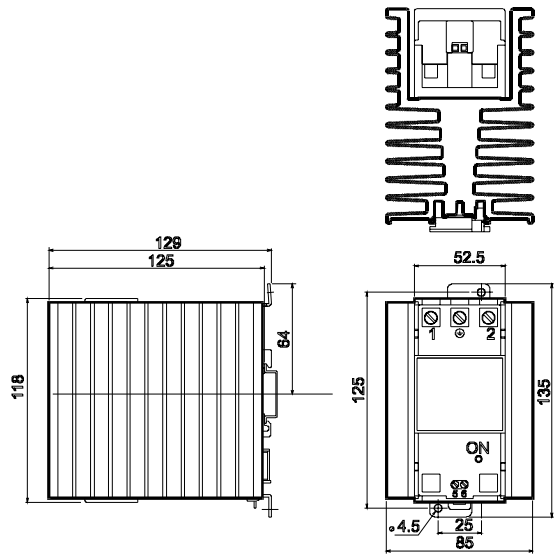
ESR 25 A



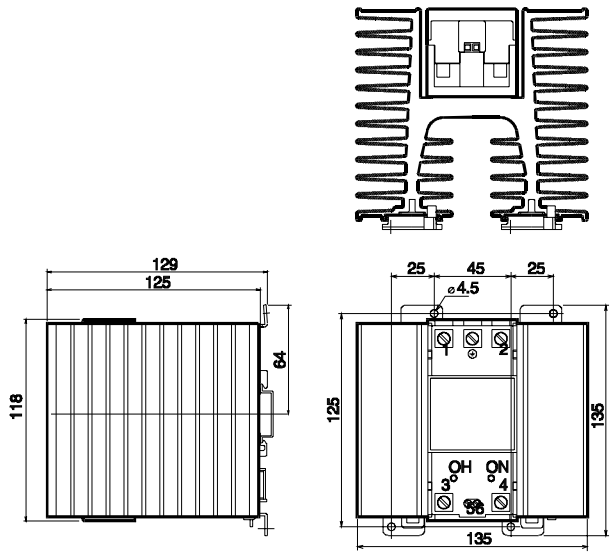
ESR 40 A



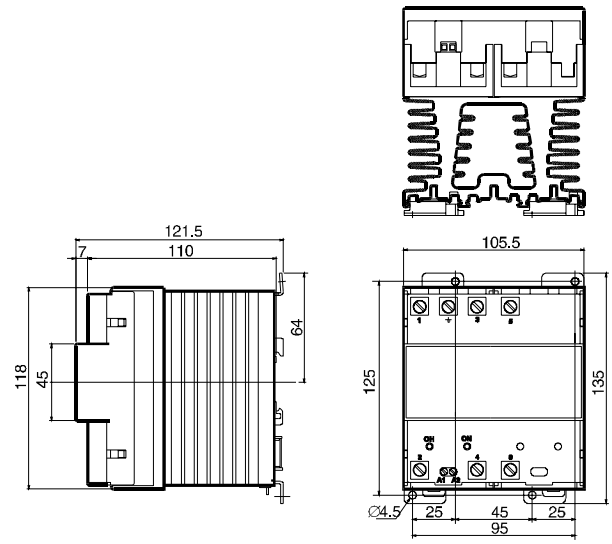
ESR 60 A



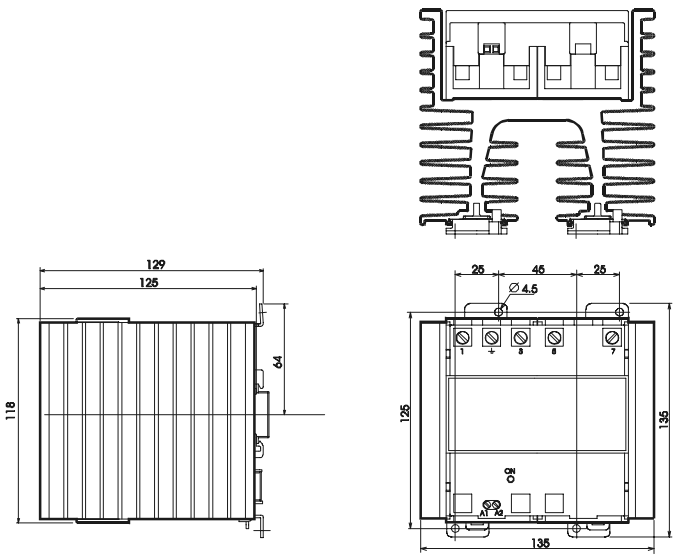
ESR 80 A

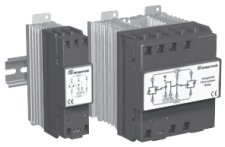


ETR 25 A



ETR 40/60 A





HOW TO ORDER

MODEL
ESR T = SSR with TRIAC

NOMINAL CURRENT
12 = 12 A
18 = 18 A

NOMINAL VOLTAGE
240 = 240 V RMS

OPTION
0 = No option

E S R T [ ] 2 4 0 0 0 0

MODEL
ESR = Single-phase with DC input

NOMINAL CURRENT
025 = 25 A
040 = 40 A
060 = 60 A
080 = 80 A

NOMINAL VOLTAGE
400 = 400 V RMS
600 = 600 V RMS

OPTION
0 = No option

E S R [ ] [ ] [ ] [ ] [ ] [ ] [ ] 0 0

MODEL
ETR = Tree-phase with DC input

NOMINAL CURRENT
025 = 2 x 25 A
040 = 2 x 40 A
060 = 2 x 60 A

NOMINAL VOLTAGE
400 = 400 V RMS
600 = 600 V RMS

OPTION
0 = No option

E T R [ ] [ ] [ ] [ ] [ ] [ ] [ ] 0 0 0

MODEL
ESRAC = Single-phase with AC input

NOMINAL CURRENT
25 = 25 A
40 = 40 A
60 = 60 A
80 = 80 A

NOMINAL VOLTAGE
40 = 400 V RMS
60 = 600 V RMS

RATED CONTROL VOLTAGE
1 = 100 - 240 V AC
2 = 24 V AC

E S R A C [ ] [ ] [ ] [ ] [ ] [ ] [ ] 0 0

MODELLO
ETR AC = Tree-phase with AC input.

NOMINAL CURRENT
25 = 2 x 25 A
40 = 2 x 40 A
60 = 2 x 60 A

NOMINAL VOLTAGE
40 = 400 V eff.
60 = 600 V eff.

RATED CONTROL VOLTAGE
1 = 100 - 240 V AC
2 = 24 V AC

E T R A C [ ] [ ] [ ] [ ] [ ] [ ] [ ] 0 0

Solid state ralay

ISO 9001
CERTIFICATE no. 9115.EROE

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