

## 1-phase solid state relays for resistive loads



### Description

The RL Lite slimline series is the ideal solution when multiple solid state relays need to fit in a constrained space. The RL is intended for use with resistive loads.

The **RLS** variants do not have an integrated heatsink. An additional heatsink may be required based on the application conditions (load current and operating temperature). All variants of the RLS family are provided in a product width of 17.8 mm. The maximum rating of the **RLS** is 50 AAC.

Power terminals are touch protected and allow for easy and safe looping of cables. The removable IP20 covers allow wiring of ring lug terminated cables. The control is provided through a spring pluggable terminal.

The **RLS** has a TRIAC output, whereas the **RLS..H** has a back-to-back thyristor output. All variants are protected against overvoltages by means of integrated protection. Control ON indication is provided through a green LED.

Specifications are at a surrounding temperature of 25°C unless otherwise specified.

### Applications

Plastic injection machines, extrusion machines, blow moulding machines, thermoformers, dryers, electrical ovens, fryers, shrink tunnels, climatic chambers, ovens and furnaces, reflow ovens.

### Main features

- Voltage ratings up to 530 VAC; 660 VAC for the RLS..H version
- Current ratings up to 50 AAC in 17.8mm wide footprint
- DC or AC control voltage
- Integrated overvoltage protection

### Benefits

- **Panel space savings.** The RL solid state relay occupies a width of only 17.8 mm. Compared to traditional solid state relay packages with a 45 mm width, the RLS offers up to 60% potential space savings.
- **Trouble free operation over millions of cycles.** Wire bonding technology reduces thermal and mechanical stresses on the output chips, resulting in a larger number of fault free operational cycles compared to other assembly technologies.
- **Low machine downtime.** Integrated overvoltage protection prevents the output of the solid state relay from breaking down in case of uncontrolled transients that may occur on the lines.
- **Touch safe.** The RL output terminals are touch protected. The touch protection cover is removable to allow connection of ring lug terminated cables.
- **Fast wiring.** Spring control terminals help to reduce installation time. The pluggable control terminal allows for fast and easy replacement.
- **Certifications ready.** The RLS conforms to applicable EU directives, UK regulations and is certified by Underwriters Laboratory.

**Order code**

 **RLS1A**

Enter the code option instead of . Refer to the selection guide section for valid part numbers.

Code	Option	Description	Comments
RL	-	Solid State Relay (RL)	
S	-	Without heatsink	
1	-	1-pole switching	
A	-	Zero Cross switching (ZC)	
<input type="checkbox"/>	40	Rated voltage: 24-440 VAC, 600 Vp	
	48	Rated voltage: 42-530 VAC, 1200 Vp	
	60	Rated voltage: 42-660 VAC, 1200 Vp	Available only with RLS..50H
<input type="checkbox"/>	D	Control voltage: 4-32 VDC	
	A	Control voltage: 80-250 VAC	
<input type="checkbox"/>	25	Rated current: 25 AAC	
	50	Rated current: 50 AAC	
	50H	Rated current: 50 AAC	Available only with RLS1A60D..
<input type="checkbox"/>	-		No additional options
	HT	Pre-attached thermal pad	Optional
	X40	Bulk packaging of 40 pcs.	Optional

**Selection guide**

Rated voltage, Switching mode	Control voltage	Max. rated operational current (I <sup>2</sup> t)		
		25 AAC (225 A <sup>2</sup> s)	50 AAC (1250 A <sup>2</sup> s)	50 AAC (1800 A <sup>2</sup> s)
400 VAC, ZC	4 - 32 VDC	RLS1A40D25	RLS1A40D50	-
480 VAC, ZC	4 - 32 VDC	RLS1A48D25	RLS1A48D50	-
	80 - 250 VAC	RLS1A48A25	RLS1A48A50	-
600 VAC, ZC	4 - 32 VDC	-	-	RLS1A60D50H

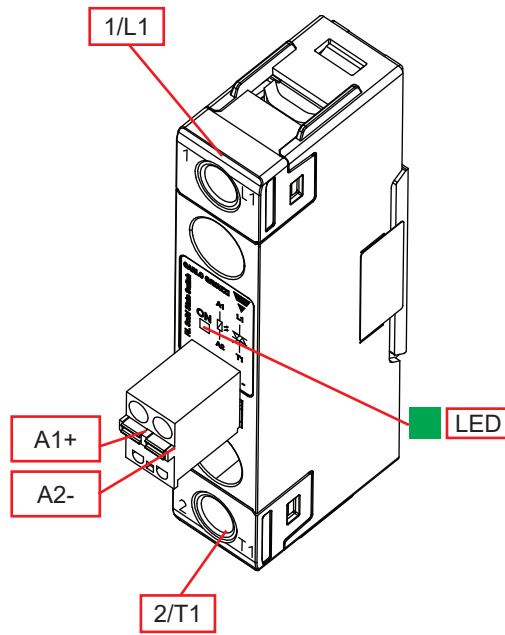
**Selection guide - Bulk packaging by 40 pcs.**

Rated voltage, Switching mode	Control voltage	Max. rated operational current (I <sup>2</sup> t)		
		25 AAC (225 A <sup>2</sup> s)	50 AAC (1250 A <sup>2</sup> s)	50 AAC (1800 A <sup>2</sup> s)
400 VAC, ZC	4 - 32 VDC	RLS1A40D25X40	RLS1A40D50X40	-
600 VAC, ZC	4 - 32 VDC	-	-	RLS1A60D50HX40

**Carlo Gavazzi compatible components**

Description	Component code	Notes
Control plugs	RGM25	Pack of 10 spring loaded control plugs. 1x control plug is provided with the RL.
Screw kits	SRWKITM5X30MM	- Screw kit for mounting solid state relay to heatsink - Screw type: Torx T20, size M5 x 30 mm - Packing quantity: 20 pcs.
Thermal pads	RGHT	Pack of 10 thermal pads with size 34.6 x 14mm
DIN clip	RGS1DIN	DIN clip accessory for mounting RLS on DIN rail
Heatsinks	RHS	Heatsink and accessories

# Structure



Element	Component	Function
1/L1	Power connection	Mains connection
2/T1	Power connection	Load connection
A1+, A2-	Control connection	Terminals for control voltage
LED	ON indicator	Indicates presence of control voltage

# Features

## General data

<b>Material</b>	PA66 or PA6 (UL94 V0), RAL7035 Glow wire ignition temperature and Glow wire flammability index conforming to EN 60335-1 requirements.
<b>Mounting</b>	Panel mount
<b>Touch protection</b>	IP20
<b>Overvoltage category</b>	III, 6 kV (1.2/50 $\mu$ s) rated impulse withstand voltage
<b>Isolation</b>	Input and Output to Case: 4000 Vrms Input to Output: 4000 Vrms
<b>Weight (including packaging)</b>	approx. 103 g

# Performance

## Output specifications

	RLS..25	RLS..50	RLS..50H
<b>Max. operational current<sup>1</sup>: AC-51</b>	25 AAC	50 AAC	50 AAC
<b>Operational frequency range</b>	45 to 65 Hz		
<b>Output protection</b>	Integrated overvoltage protection		
<b>Leakage current @ rated voltage</b>	<5 mAAC		
<b>Minimum operational current</b>	100 mAAC	150 mAAC	350 mAAC
<b>Repetitive overload current UL508: Ta=40°C, t<sub>ON</sub>=1 s, t<sub>OFF</sub>=9 s, 50 cycles</b>	37.5 AAC	75 AAC	75 AAC
<b>Non-repetitive surge current (I<sub>TSM</sub>), t=10 ms</b>	212 Ap	500 Ap	600 Ap
<b>I<sup>2</sup>t for fusing (t=10 ms), minimum</b>	225 A <sup>2</sup> s	1250 A <sup>2</sup> s	1800 A <sup>2</sup> s
<b>Power factor</b>	>0.9 at rated voltage		
<b>Critical dV/dt (@Tj init = 40°C)</b>	1000 V/ $\mu$ s		

1. Refer to Heatsink selection tables

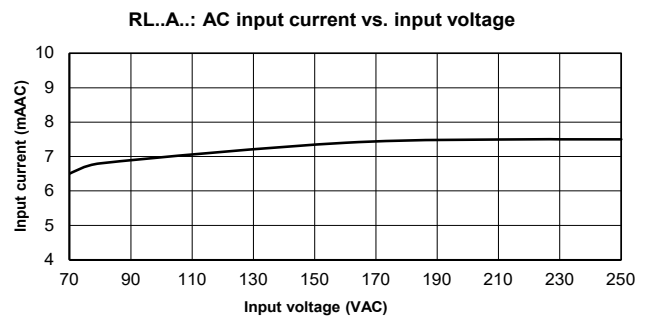
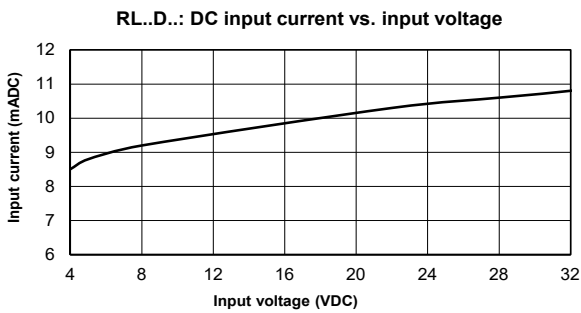
## Output voltage specifications

	RLS..40..	RLS..48..	RLS..60..
<b>Operational voltage range</b>	24 - 440 VAC	42 - 530 VAC	42 - 660 VAC
<b>Blocking voltage</b>	600 Vp	1200 Vp	1200 Vp

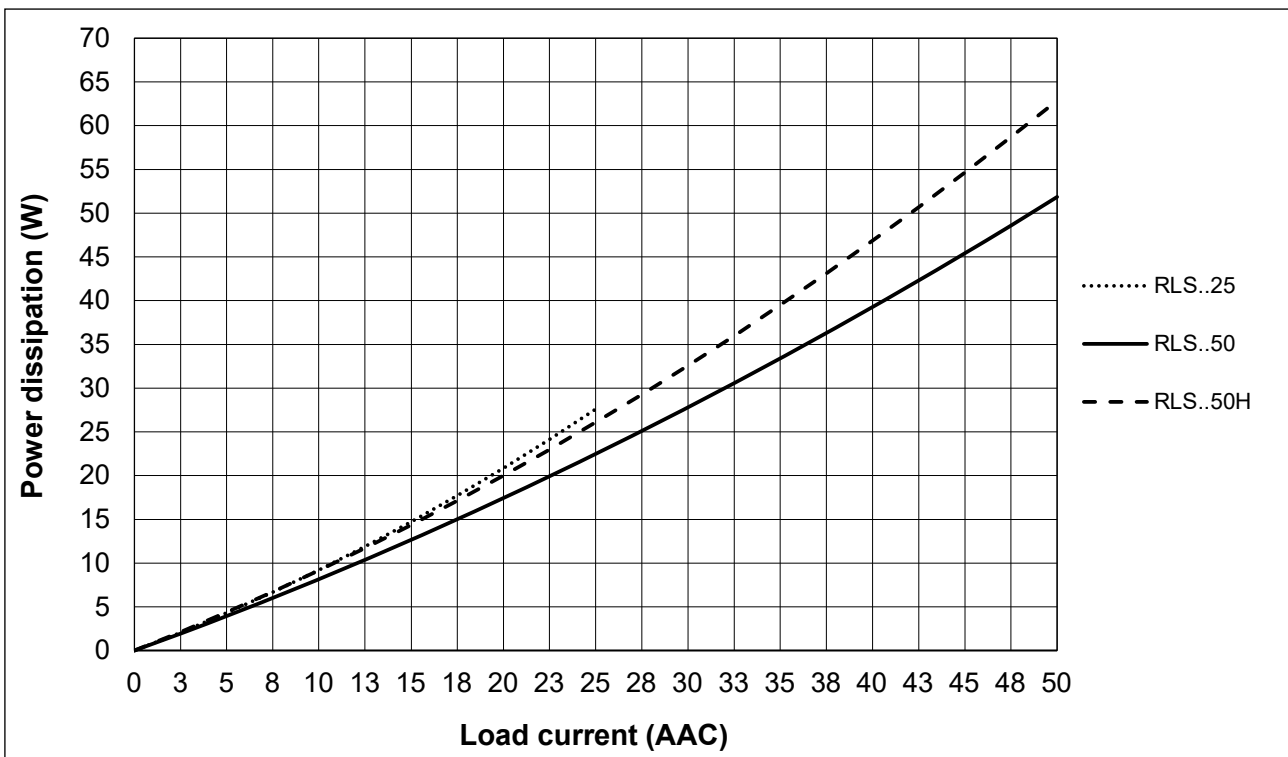
**Input specifications**

	RLS..D..	RLS..A..
Control voltage range <sup>2</sup>	4 - 32 VDC	80-250 VAC
Pick-up voltage	4.0 VDC	70 VAC
Drop-out voltage	1.2 VDC	10 VAC <sup>3</sup>
Maximum reverse voltage	32 VDC	-
Maximum response time	½ mains cycle	52 ms @ 50 Hz
Response time drop-out	½ mains cycle	40 ms @ 50 Hz
Input current @ 40°C	See diagrams below	

- 2. DC control to be supplied by class 2 power source according to UL1310
- 3. RL output is OFF @ 10 VAC but LED may still be ON in the range 4-10 VAC



**Output power dissipation**



**Heatsink selection for RLS..**

Thermal resistance [°C/W] of RLS1..25

Load current [A]	Surrounding ambient temperature [°C]						
	20	30	40	50	60	70	80
25.0	2.46	2.01	1.57	1.15	0.73	0.33	-
22.5	3.14	2.61	2.09	1.60	1.11	0.64	0.18
20.0	4.02	3.38	2.77	2.17	1.60	1.04	0.51
17.5	5.23	4.44	3.68	2.95	2.25	1.58	0.93
15.0	6.97	5.93	4.96	4.03	3.15	2.31	1.51
12.5	9.65	8.22	6.90	5.66	4.49	3.39	2.36
10.0	14.3	12.1	10.1	8.33	6.66	5.12	3.69
7.5	nh	nh	16.6	13.5	10.7	8.29	6.09
5.0	nh	nh	nh	nh	nh	15.9	11.6
2.5	nh	nh	nh	nh	nh	nh	nh

Thermal resistance [°C/W] of RLS1..50

Load current [A]	Surrounding ambient temperature [°C]						
	20	30	40	50	60	70	80
50.0	1.07	0.82	0.58	0.35	0.13	-	-
45.0	1.43	1.14	0.86	0.59	0.33	0.08	-
40.0	1.92	1.57	1.23	0.90	0.59	0.29	-
35.0	2.58	2.14	1.72	1.32	0.94	0.58	0.23
30.0	3.53	2.96	2.42	1.91	1.43	0.97	0.54
25.0	5.03	4.22	3.48	2.79	2.15	1.55	0.99
20.0	7.69	6.42	5.28	4.26	3.33	2.48	1.70
15.0	13.7	11.1	8.99	7.17	5.59	4.22	3.00
10.0	nh	nh	nh	15.5	11.6	8.53	6.04
5.0	nh	nh	nh	nh	nh	nh	nh

Thermal resistance [°C/W] of RLS1..50H

Load current [A]	Surrounding ambient temperature [°C]						
	20	30	40	50	60	70	80
50.0	1.10	0.91	0.72	0.53	0.35	0.18	-
45.0	1.41	1.18	0.95	0.74	0.53	0.32	0.12
40.0	1.81	1.53	1.26	1.00	0.75	0.51	0.27
35.0	2.36	2.02	1.68	1.36	1.05	0.75	0.46
30.0	3.16	2.71	2.27	1.86	1.47	1.09	0.73
25.0	4.40	3.77	3.17	2.62	2.09	1.60	1.13
20.0	6.57	5.58	4.69	3.87	3.11	2.41	1.76
15.0	11.2	9.38	7.73	6.30	5.03	3.91	2.89
10.0	nh	nh	16.8	13.0	10.0	7.55	5.52
5.0	nh	nh	nh	nh	nh	nh	17.9

Notes:

- The 60 - 80°C surrounding ambient temperature range is applicable only to the DC control versions, RL..D..
- 'nh' means no heatsink necessary. The SSR should still be tightened to a surface to ensure optimal thermal dissipation.
- The indicated thermal resistance values are applicable only with the HTS thermal paste as the thermal interface material.

**Heatsink selection for RLS..HT**

Thermal resistance [°C/W] of RLS1..25HT

Load current [A]	Surrounding ambient temperature [°C]						
	20	30	40	50	60	70	80
25.0	1.46	1.01	0.57	0.15	-	-	-
22.5	2.14	1.61	1.09	0.60	0.11	-	-
20.0	3.02	2.38	1.77	1.17	0.60	0.04	-
17.5	4.23	3.44	2.68	1.95	1.25	0.58	-
15.0	5.97	4.93	3.96	3.03	2.15	1.31	0.51
12.5	8.65	7.22	5.90	4.66	3.49	2.39	1.36
10.0	13.3	11.1	9.15	7.33	5.66	4.12	2.69
7.5	nh	19.2	15.6	12.5	9.75	7.29	5.09
5.0	nh	nh	nh	nh	nh	14.9	10.6
2.5	nh	nh	nh	nh	nh	nh	nh

Thermal resistance [°C/W] of RLS1..50HT

Load current [A]	Surrounding ambient temperature [°C]						
	20	30	40	50	60	70	80
50.0	0.12	-	-	-	-	-	-
45.0	0.48	0.19	-	-	-	-	-
40.0	0.97	0.62	0.28	-	-	-	-
35.0	1.63	1.19	0.77	0.37	-	-	-
30.0	2.58	2.01	1.47	0.96	0.48	0.02	-
25.0	4.08	3.27	2.53	1.84	1.20	0.60	0.04
20.0	6.74	5.47	4.33	3.31	2.38	1.53	0.75
15.0	12.7	10.2	8.04	6.22	4.64	3.27	2.05
10.0	nh	nh	19.9	14.6	10.6	7.58	5.09
5.0	nh	nh	nh	nh	nh	nh	nh

Thermal resistance [°C/W] of RLS1..50HHT

Load current [A]	Surrounding ambient temperature [°C]						
	20	30	40	50	60	70	80
50.0	0.71	0.52	0.33	0.14	-	-	-
45.0	1.02	0.79	0.56	0.35	0.14	-	-
40.0	1.42	1.14	0.87	0.61	0.36	0.12	-
35.0	1.97	1.63	1.29	0.97	0.66	0.36	0.07
30.0	2.77	2.32	1.88	1.47	1.08	0.70	0.34
25.0	4.01	3.38	2.78	2.23	1.70	1.21	0.74
20.0	6.18	5.19	4.30	3.48	2.72	2.02	1.37
15.0	10.9	8.99	7.34	5.91	4.64	3.52	2.50
10.0	nh	nh	16.4	12.6	9.61	7.16	5.13
5.0	nh	nh	nh	nh	nh	nh	17.5

Notes:

- The 60 - 80 °C surrounding ambient temperature range is applicable only to the DC control versions, RL..D..
- The indicated thermal resistance values are applicable only with the graphite pad as the thermal interface material.


**Thermal data**

	RLS..25	RLS..50	RLS..50H
Max. junction temperature	125°C	125°C	125°C
Junction to case thermal resistance, $R_{thjc}$	<1.5°C/W	<0.95°C/W	<0.48°C/W
Case to heatsink thermal resistance, $R_{thcs}^4$	<0.25°C/W	<0.25°C/W	<0.25°C/W
Case to heatsink thermal resistance (RLS..HT), $R_{thcs\_HT}^5$	<1.25°C/W	<1.2°C/W	<0.64°C/W

4. Case to heatsink thermal resistance values are applicable upon application of a fine layer of silicon based thermal paste HTS02S between SSR and heatsink.

5. Case to heatsink thermal resistance values for RLS..HT are applicable for the 'RGHT' thermal pad.

**Compatibility and conformance**

<b>Approvals</b>	
<b>Standards compliance</b>	LVD: EN 60947-4-3 EMCD: EN 60947-4-3 EE: EN 60947-4-3 EMC: EN 60947-4-3 UR: UL508 Recognised (E80573), NRNT cUR: C22.2 No. 14 (E80573), NRNT7

**Electromagnetic compatibility (EMC) - Immunity**

<b>Electrostatic discharge (ESD)</b>	EN/IEC 61000-4-2 8 kV air discharge (PC2) 4 kV contact (PC1)
<b>Radiated radio frequency</b>	EN/IEC 61000-4-3 10 V/m, from 80 MHz to 1 GHz (PC1) 10 V/m, from 1.4 to 2 GHz (PC1) 10 V/m, from 2 to 2.7 GHz (PC1)
<b>Electrical fast transient (burst)</b>	EN/IEC 61000-4-4 Output: 2 kV, 5 kHz (PC2) Input: 1 kV, 5 kHz (PC1)
<b>Conducted radio frequency</b>	EN/IEC 61000-4-6 10 V/m, from 0.15 to 80 MHz (PC1)
<b>Electrical surge</b>	EN/IEC 61000-4-5 Output, line to line: 1 kV (PC2) Output, line to earth: 2 kV (PC2) Input, line to line, 1 kV (PC2) Input, line to earth, 2 kV (PC2)
<b>Voltage dips</b>	EN/IEC 61000-4-11 0% for 0.5, 1 cycle (PC2) 40% for 10 cycles (PC2) 70% for 25 cycles (PC2) 80% for 250 cycles (PC2)
<b>Voltage interruptions</b>	EN/IEC 61000-4-11 0% for 5000 ms (PC2)

**Electromagnetic compatibility (EMC) - Emissions**

<b>Radio interference field emission (radiated)</b>	EN/IEC 55011 Class A: from 30 to 1000 MHz
<b>Radio interference voltage emissions (conducted)</b>	EN/IEC 55011 Class A: from 0.15 to 30 MHz (External filter may be required - refer to Filtering section)

Notes:

- 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.
- 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.

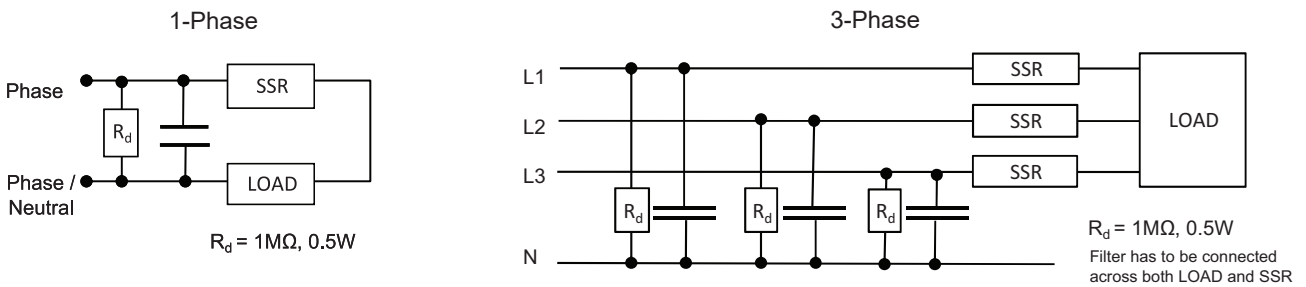


**Filtering**

Part number	Suggested filter for EN 55011 Class A compliance	Maximum heater current
RLS..25	220 nF / xx V / X1	25 AAC
RLS..50	220 nF / xx V / X1	50 AAC
RLS..50H	220 nF / xxV / X1	50 AAC

xx represents the voltage rating of the capacitor. This shall not be lower than the mains supply voltage to which it will be connected.


**Filter connection diagram**



**Short circuit protection, co-ordination type 2**

Part No.	Prospective short circuit current [kArms]	Ferraz Shawmut (Mersen)		Siba	
		Max fuse size [A]	Part number	Max fuse size [A]	Part number
RLS..25	10	20	6.921 CP GR 22x58 /20 FR22GR69V20T	20	50 124 06.20
RLS..50	10	40	6.921 CP GR 22x58 /40 FR22GR69V40T	40	50 124 06.40
RLS..50H					

**Environmental specifications**

<b>Operating temperature</b>	-30°C to +80°C (-22°F to +176°F) max. +55°C (+131°F) for RL..A..
<b>Storage temperature</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 altitude</b>	0-1000 m. Above 1000 m derate linearly by 1% of FLC per 100 m up to a maximum of 2000 m
<b>Vibration resistance</b>	2g / axis (2-100Hz, IEC 60068-2-6, EN 50155, EN 61373)
<b>Impact resistance</b>	15/11 g/ms (EN50155, EN61373)
<b>EU RoHS compliant</b>	Yes
<b>China RoHS</b>	

The declaration in this section is prepared in compliance with People's Republic of China Electronic Industry Standard SJ/T11364-2014: Marking for the Restricted Use of Hazardous Substances in Electronic and Electrical Products.

Part Name	Toxic or Harardous Substances and Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
<b>Power Unit Assembly</b>	x	0	0	0	0	0

O: Indicates that said hazardous substance contained in homogeneous materials for this part are below the limit requirement of GB/T 26572.

X: Indicates that said hazardous substance contained in one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.

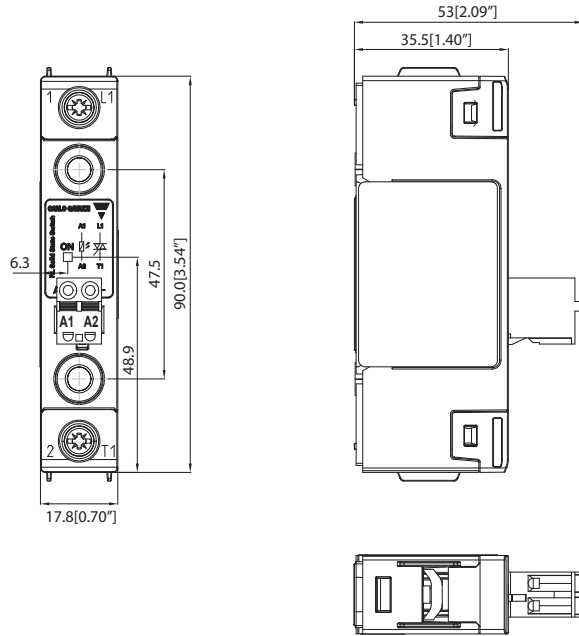
这份申明根据中华人民共和国电子工业标准 SJ/T11364-2014：标注在电子电气产品中限定使用的有害物质

零件名称	有毒或有害物质与元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴化联苯 (PBB)	多溴联苯醚 (PBDE)
功率单元	x	0	0	0	0	0

O:此零件所有材料中含有的该有害物低于GB/T 26572的限定。

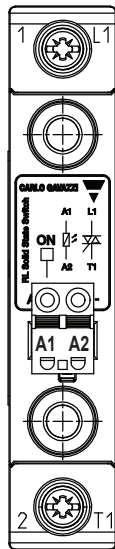
X: 此零件某种材料中含有的该有害物高于GB/T 26572的限定。

**Dimensions**



Housing width tolerance +0.5mm, -0mm as per DIN 43880. All other tolerances +/- 0.5mm. Dimensions in mm.

**Terminal layout**

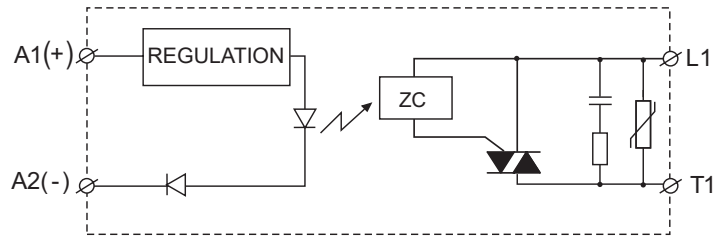


- 1/L1: Mains supply connection
- 2/T1: Load connection
- A1(+): Positive control signal
- A2(-): Control ground

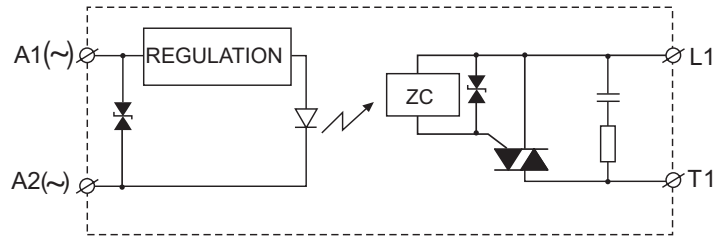
▶ Functional diagram

RLS..

DC control

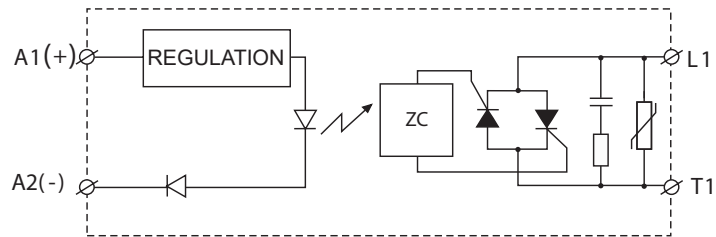


AC control

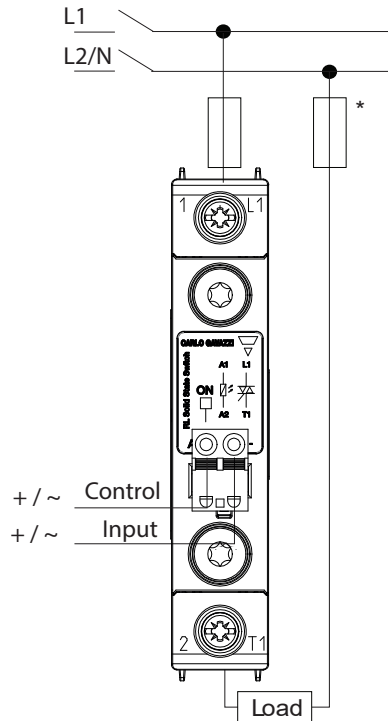


RLS..H

DC control



**Connection diagram**

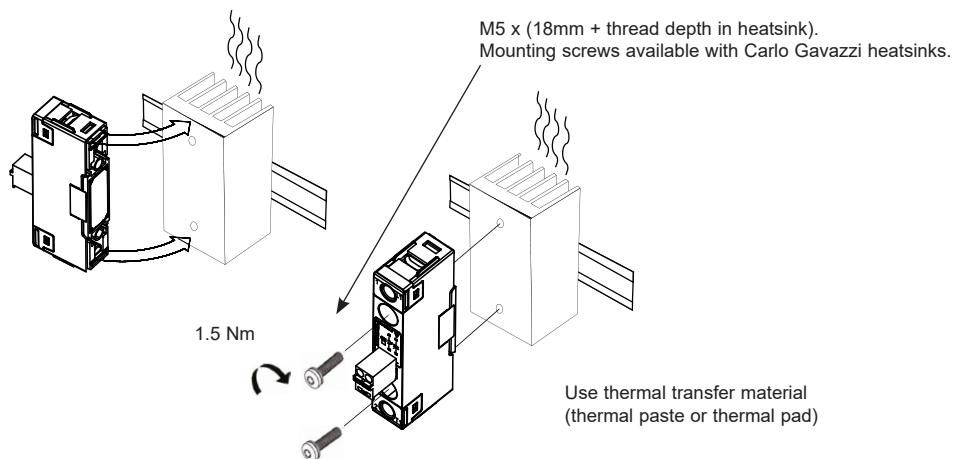


\* depends on system requirements

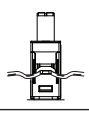
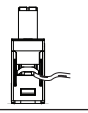
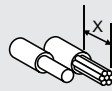



**RLS to heatsink mounting instructions**


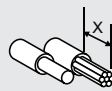
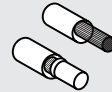
Thermal stress will reduce the lifetime of the SSR. Therefore it is necessary to select the appropriate heatsinks, taking into account the surrounding temperature, load current and the duty cycle. A fine layer of thermally conductive silicone paste must be evenly applied to the back of the SSR. The **RLS** should be mounted on the heatsink with two M5 screws (for ex. **SRWKITM5X30MM**). Each screw shall be gradually tightened (alternating between the two) until both are tightened with a torque of 0.75 Nm. Both screws are then tightened to their final mounting torque of 1.5 Nm.

In case of a thermal pad attached to the back of the SSR, no thermal paste is required. The RLS is gradually tightened (alternating between the 2 screws) to a maximum torque of 1.5 Nm.



# Connection specifications

Power connections		
Terminals	1/L1, 2/T1	
Conductors	Use 75°C copper (Cu) conductors	
		
Connection type	M4 screw with captivated washer	
Stripping length	X = 12 mm	
Rigid (solid & stranded) UL/cUL rated data		2x 2.5 – 6.0 mm <sup>2</sup> 2x 14 – 10 AWG
		1x 2.5 – 6.0 mm <sup>2</sup> 1x 14 – 10 AWG
Flexible with end sleeve		2x 1.0 – 2.5 mm <sup>2</sup> 2x 2.5 – 4.0 mm <sup>2</sup> 2x 18 – 14 AWG 2x 14 – 12 AWG
Flexible without end sleeve		2x 1.0 – 2.5 mm <sup>2</sup> 2x 2.5 – 6.0 mm <sup>2</sup> 2x 18 – 14 AWG 2x 14 – 10 AWG
Torque specifications		Posidrive bit 2 UL: 2.0 Nm (17.7 lb-in) IEC: 1.5 – 2.0 Nm (13.3 – 17.7 lb-in)
Aperture for termination lug (fork or ring)	12.3 mm	

Control connections		
Terminals	A1+, A2-	
Conductors	Use 60/75°C copper (Cu) conductors	
		
Connection type	Spring loaded	
Stripping length	X = 12-13 mm	
Rigid (solid & stranded) UL/cUL rated data		1x 0.2 - 2.5 mm <sup>2</sup> 1x 24 - 12 AWG
Flexible with or without end sleeve		1x 0.2 - 2.5 mm <sup>2</sup> 1x 24 - 12 AWG
Flexible with end sleeve using TWIN ferrules		2x 0.2 - 1.0 mm <sup>2</sup> 2x 24 - 18 AWG

## Bulk packaging option



- Packing quantity: 40 pcs.
- Total weight (including packaging): approx. 3.2 kg



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