Solid-State Contactors
SCD1-NR Series



Description

The SCD1-NR series are multipurpose solid-state contactors that come with everything you need to ensure better uptimes, while allowing a fast, safe and easy installation. Designed in a slim 17.5 mm housing for DIN rail mounting, these contactors offer a compact, ready-to-use solution.

- Overvoltage protection is ensured through the use of Littelfuse SMBJ Series TVS Diodes, inside, for overvoltage protection to safeguard the contactor's operation even in the event of electrical spikes within the network.
- The IP20 removable terminal covers provide finger-safe protection for the user by preventing accidental contact with live parts.
- The integrated high-efficiency heatsink enables excellent heat dissipation, supporting reliable performance in a compact package.

Using the latest manufacturing techniques in Direct Bonding Technology and featuring high-end power semiconductors (Littelfuse proprietary IXYS Technology) this contactor provides maximum quality, reliability, and longevity even under tough conditions compared to any other contactor in the market.

Features & Benefits

FEATURES	BENEFITS
High-Endurance Design	Provides enhanced operational reliability and extended service life, ensuring consistent performance even in demanding conditions
Integrated Protection & Installation Features	Incorporates IP20 finger-safe protection and overvoltage TVS protection, with a pre-mounted heatsink and DIN rail format for fast and clean installation
Broad Application Spectrum	Engineered to accommodate a diverse range of applications and load types, offering flexibility and utility in various engineering projects

Applications

- Plastic molding and packaging machinery
- Industrial heating and drying systems
- Automation equipment and process control
- Cooking ovens, food warmers & beverage dispensers
- Commercial fryers and professional kitchen equipment
- Air handling units and HVAC systems

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Ordering Information

FOR HEATING CONTROL

CATALOG NUMBER	OUTPUT MAX CURRENT	OUTPUT VOLTAGE	OUTPUT SWITCHING STYLE	OUTPUT OVERVOLTAGE PROTECTION	INPUT VOLTAGE RANGE	COMPLIANCE
SCD1-NRDZL-010TC-N	10 A	24-240 V ac	Zero Cross	TVS	4-32 V dc	cULus, CE
SCD1-NRUZL-010TC-N	10 A	24-240 V ac	Zero Cross	TVS	18-36 V dc 18-280 V ac	cULus, CE
SCD1-NRDZL-020TC-N	20 A	24-240 V ac	Zero Cross	TVS	4-32 V dc	cULus, CE
SCD1-NRUZL-020TC-N	20 A	24-240 V ac	Zero Cross	TVS	18-36 V dc 18-280 V ac	cULus, CE
SCD1-NRDZH-020TC-N	20 A	48-600 V ac	Zero Cross	TVS	4-32 V dc	cULus, CE
SCD1-NRUZH-020TC-N	20 A	48-600 V ac	Zero Cross	TVS	18-36 V dc 18-280 V ac	cULus, CE
SCD1-NRDZL-030TC-N	30 A	24-240 V ac	Zero Cross	TVS	4-32 V dc	cULus, CE
SCD1-NRUZL-030TC-N	30 A	24-240 V ac	Zero Cross	TVS	18-36 V dc 18-280 V ac	cULus, CE
SCD1-NRDZH-030TC-N	30 A	48-600 V ac	Zero Cross	TVS	4-32 V dc	cULus, CE
SCD1-NRUZH-030TC-N	30 A	48-600 V ac	Zero Cross	TVS	18-36 V dc 18-280 V ac	cULus, CE

Input/Control Specifications[1]

GENERAL DATA

SYMBOL	PARAMETER	RANGE	VALUE	UNIT	VALUE FOR AC INPUT VERSIONS	UNIT
Uc	Input (Control) Voltage	Maximum	32	V dc	280	V ac
		Nominal	5 – 12 – 24	V dc	120-240	V ac
		Minimum	4	V dc	90	V ac
Urv	Reverse Voltage	Maximum	-32	V dc	-	-
Uc on	Turn-On Voltage (Pick-up/Engage/Activation Voltage)	Minimum	4.0	V dc	18	V ac
Uc off	Turn-Off Voltage (Drop Out/Release/Deactivation Voltage)	Nominal	1.0	V dc	7	V ac
Ic	Input (Control) Current	Maximum	12	mA	25	mA
		Minimum	7	mA	16	mA
-	Input Impedance	Nominal	Current Regulated	-	Current Regulated	-
Ton	Turn-On Time (Ue typ, 50Hz)	Maximum	½ (20 us for instant on)	Cycle	20	ms
Toff	Turn-Off Time (Ue typ, 50Hz)	Maximum	½	Cycle	20	ms

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Output/Load Specifications[1]

GENERAL DATA

SYMBOL	PARAMETER	CONDITION	RANGE	VALUE FOR 10A VERSIONS	VALUE FOR 20A VERSIONS	VALUE FOR 30A VERSIONS	UNIT
-	Output Configuration	-	-	SPST-NO	SPST-NO	SPST-NO	-
f	Operating Frequency	-	Minimum Nominal Maximum	47 50-60 63	47 50-60 63	47 50-60 63	Hz
Ue	Operating Voltage	For Low-Voltage Versions	Minimum Nominal Maximum	24 120-240 280	24 120-240 280	24 120-240 280	Vrms
Ue	Operating Voltage	For High-Voltage Versions	Minimum Nominal Maximum	24 120-240 280	24 120-240 280	24 120-240 280	Vrms
Uclamp	Clamping Voltage (TVS Overvoltage Protection Self-trigger)	At Ue Nominal	Maximum Minimum	1200 900	1200 900	1200 900	Vpk Vpk
V	On-State Voltage Drop	At Rated Current	Maximum	0,85 + 0,035 x Ie	0,85 + 0,016 x Ie	0,85 + 0,0095 x Ie	Vrms
Vto	Threshold Voltage (Power Loss Calculations only)	Tvj = 150 °C	Maximum	0.85	0.85	0.85	V
rt	On state dynamic resistance (Power Loss Calculations only)	Tvj = 150 °C	Maximum	35.0	16.0	9.5	mΩ
Up	Transient Over-Voltage (Peak/Blocking/Non-Repetitive Voltage)	-	Maximum	600	600	1200	Vpk
Itsm	Transient Over-Current (Surge/Overload/Non-Repetitive Current)	Max 1 Cycle Tp = 10ms	Minimum Nominal	120 160	260 300	320 420	Apk
Ilk	Leakage Current (Off-State)	At Rated Voltage	Maximum	1	1	1	mArms
dv/dt	Critical dV/dt (Off-State)	At Maximum Rated Voltage	Minimum	500	500	500	V/µsec
I^2t	I^2t Value for Fusing	½ Cycle at 50/60Hz (Tvj=45 °C)	Minimum Nominal	72 128	340 450	512 882	A^2 sec
Pf	Minimum Power Factor	At Maximum Load	Minimum	0.8	0.8	0.8	-
Rthj/c	Thermal Resistance Junction to Case (Rjc)	-	Maximum	2.5	1.7	0.9	°C/W

The maximum continuous current value given in this datasheet is only for resistive loads (specifically AC-1 type), which are mainly used for heating control.

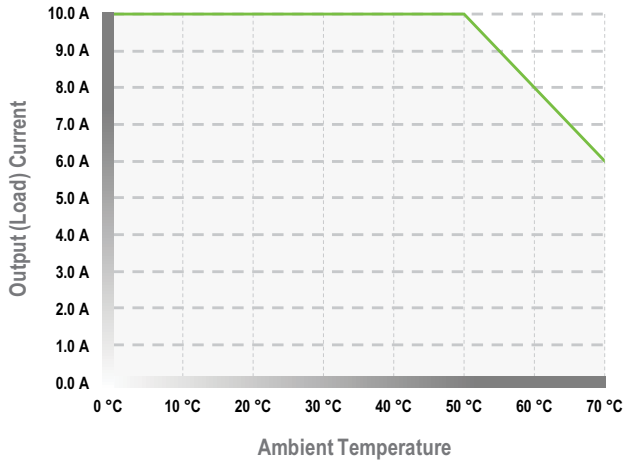
SYMBOL	PARAMETER	CONDITION	RANGE	VALUE FOR 10A VERSIONS	VALUE FOR 20A VERSIONS	VALUE FOR 30A VERSIONS	UNIT
Ie (AC-51)	Load Current (Continuous) – Heating Elements (AC-1)	At 40 °C	Maximum	10	20	30	Arms
			Minimum	0.15	0.15	0.15	Arms

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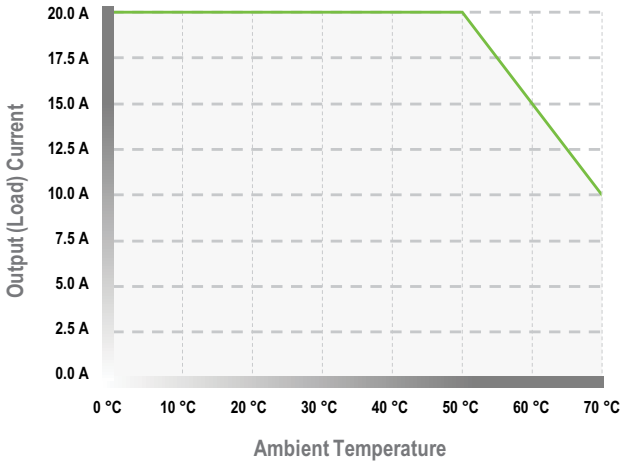
Thermal Derating Curves (To Determine Maximum Load At Different Temperatures)

The following thermal derating curves show the maximum continuous load current the Solid-State Contactor (SSC) can manage at different ambient temperatures with its factory-installed heatsink. These curves help ensure correct application and reliable operation.

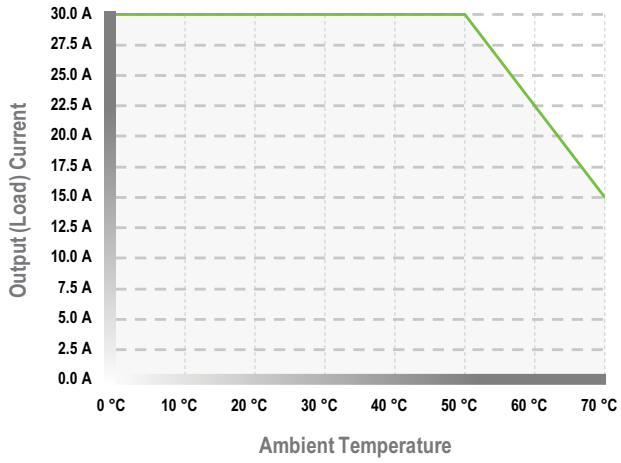
10A Versions:



20A Versions:



30A Versions:



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Considerations – Switching Type

In applications requiring precise temperature management, solid-state contactors (SSCs) play a crucial role. Specifically, the Zero Cross Switching type of SSC is commonly employed to regulate heaters based on signals from a temperature controller.

This technology proves particularly valuable in scenarios where high-frequency switching occurs—such as when a heater cycles on and off frequently over short intervals for extended periods.

Considerations – Inrush Current

It's essential to recognize that variations exist between different types of heating elements, especially in hot or cold conditions. While it is generally expected that heating elements exhibit no inrush current, in certain heating elements cold conditions can lead to an inrush current equivalent to 1.4 times the nominal current. To mitigate this, we highly recommend oversizing the current rating. Doing so improves the contactor's thermal endurance and extends its operational lifespan.

So, when selecting an SSC, consider using one with a capacity approximately 1.4 times that of the heater or operating the SSC at only 75%-80% of its maximum capacity. The following table provides guidance for choosing the right SSC for a specific heater load.

NOMINAL SSC CURRENT RATING	MAXIMUM RECOMMENDED HEATER CURRENT	HEATER POWER AT 120 VAC	HEATER POWER AT 240 VAC	HEATER POWER AT 400 VAC	HEATER POWER AT 480 VAC	HEATER POWER AT 600 VAC
10 A	8 A	0.96 kW	1.9 kW	-	-	-
20 A	16 A	1.8 kW	3.6 kW	6.4 kW	7.7 kW	9.6 kW
30 A	24 A	2.9 kW	5.8 kW	9.6 kW	11.5 kW	14.4 kW

General Specifications[1]

GENERAL DATA					
SYMBOL	PARAMETER	CONDITION	RANGE	VALUE	UNIT
-	LED for Input (Control) Status Indicator	-	-	Continuously ON Green LED, when control input is applied	-
Ui	Isolation (Dielectric Strength)	Input to Output (50/60 HZ) Input/Output to Ground (50/60 HZ)	Nominal Nominal	4 000 4 000	Vrms
Ri	Insulation Resistance	@ 500 VDC	Minimum	1	GΩ
-	Coupling Capacitance	Input/Output	Maximum	8	pF
-	Endurance according to American Standard UL508	-	Typical	100 000	Cycles

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General Specifications[1] (Continued)

ENVIRONMENTAL DATA

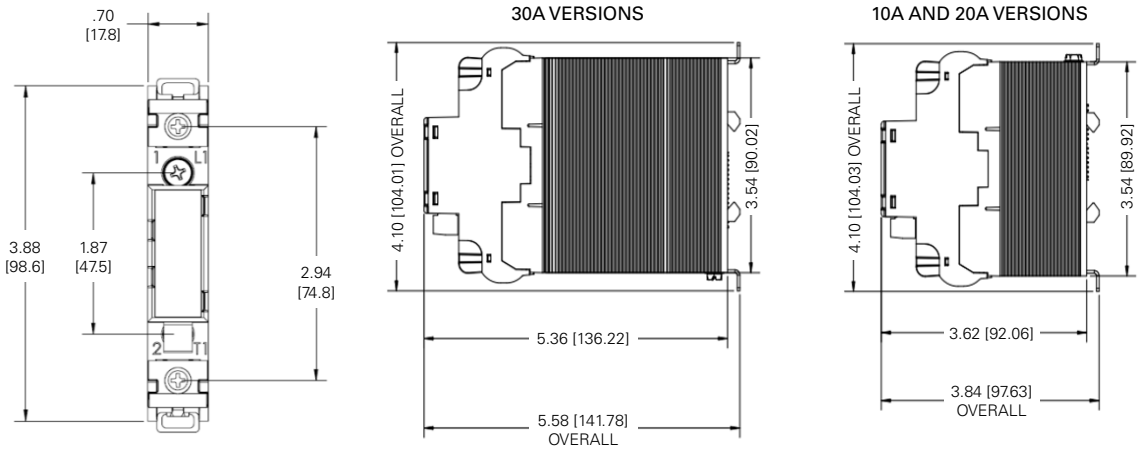
SYMBOL	PARAMETER	CONDITION	RANGE	VALUE	UNIT
-	Vibration (Test conducted in accordance with the Vibration Environmental Testing Guidelines of the International Standard IEC 60068-2-6)	5-100Hz	Nominal	10	g
-	Shock (Test conducted in accordance with the Shock Environmental Testing Guidelines of the International Standard IEC 60068-2-27)	11ms	Nominal	50	g
-	Ambient Temperature - Operating (Working)	No icing, no condensation	Maximum Minimum	70 (158) -40 (-40)	°C (°F) °C (°F)
-	Ambient Temperature - Storage	No icing, no condensation	Maximum Minimum	70 (158) -40 (-40)	°C (°F) °C (°F)
HR	Relative Ambient Humidity (Per international standard IEC/EN 60068-2-78)	Non-condensing @ 40 °C	Nominal	93	%
-	Pollution Degree	Non-conductive pollution with condensation possibilities	Nominal	2	kA

MECHANICAL DATA

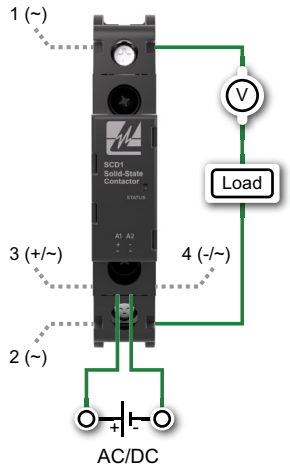
SYMBOL	PARAMETER	CONDITION	RANGE	VALUE	UNIT
-	Product Weight	-	Typical	375 (0.82)	g (lbs)
-	Housing Material (In accordance with the American Standard UL- 94 for Safety of Flammability of Plastic Materials for Parts in Devices and Appliances)	-	-	Plastic UL 94 V-0	-
-	Heatsink Material	-	-	Aluminum	-
-	Touch Protection Level (Test conducted in accordance with the IP Code of Degrees of Protection Testing Guidelines of the International Standard IEC 60529)	-	-	IP20	-
-	Screw Torque Range	Input (Control) Terminals Output (Load) Terminals	Minimum Maximum Minimum Maximum	0.14 (1.2) 0.2 (1.8) 2 (18) 2.2 (20)	Nm (in-lb) Nm (in-lb)
-	Screw Thread Size	Input Terminals Output Terminals SSC Mounting	- - -	Pluggable M5 x 0.8 DIN Rail	- - -

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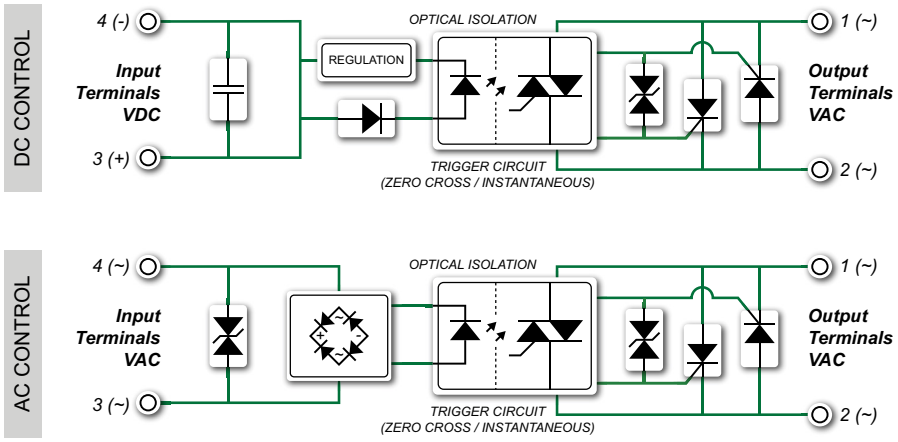
Dimensions Inches [Millimeters]



Wiring Diagram



Equivalent Circuit Block



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Short-Circuit Protection by Fuse

To safeguard solid-state Contactors (SSCs) against load short circuits, the use of fuses is essential, especially fast-acting ones. Here are the key considerations:



- Fuse Selection: The I²t value (energy withstand capability) of the fuse should be less than half of the I²t value of the contactor. Standard fuses are inadequate because they cannot react swiftly enough to prevent fault currents from exceeding the maximum levels that thyristors (used in SSCs) can handle. Therefore, we strongly recommend employing ultra-fast fuses.
- Fuse Placement: Position the fuse in front of the SSC in the circuit. This strategic placement ensures that if the contactor must unexpectedly break the earth insulation (due to overheating, case damage, or leakage with the heatsink), the fuse will protect the entire circuit from firing.
- Resource for Fuse Options: For the most suitable fuse options, consider checking the Littelfuse website.

Standards Conformity & Certifications

Product Safety Certifications

Products tested, compliant and certified to the following standards that states the requirements for electrical products to ensure they are safe for consumers to use.

CERTIFICATION BODY MARK	CERTIFICATION BODY NAME	CERTIFICATION DESCRIPTION	STANDARDS COVERED BY THE CERTIFICATION
c UL us LISTED	cULus	North American certificate of compliance with the Safety requirements for Industrial Control Equipment.	**UL508** American Standard of Safety for Industrial Control Equipment. **CAN/CSA C22.2 No.14-18** Canadian Standard of Safety for Industrial Control Equipment.
CE	CE	Conformity with the European safety, health, and environmental protection requirements.	**LVD Directive 2014/35/EU** EU Directive of Safety for Low Voltage Gear Equipment. In accordance with the Low Voltage Gear Testing Guidelines of the International Standard IEC 60947-4-3 **EMC Directive 2014/30/EU** EU Directive of Electromagnetic Compatibility. In accordance with the Low Voltage Gear Testing Guidelines of the International Standard IEC 60947-4-3 **RoHS Directive 2015/863/EU** EU Directive of Hazardous Substances Restriction. In accordance with the Assessment of electrical and electronic products with respect to the restriction of Hazardous substances Guidelines of the International Standard IEC 63000

EMC Compliance (Electro-Magnetic Compatibility)

Radiated Emissions

-	STANDARD NAME	STANDARD DESCRIPTION	STANDARD NUMBER
IEC	Radiated RF	Radio interference field emission (radiated)	International Standard CISPR 11
IEC	Conducted RF	Radio interference voltage emissions (conducted)	International Standard CISPR 11

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EMC Compliance (Electro-Magnetic Compatibility) (Continued)

Immunity

-	STANDARD NAME	STANDARD DESCRIPTION	STANDARD NUMBER
IEC	ESD	Immunity to Electrostatic Discharge (ESD)	International Standard IEC 61000-4-2
IEC	Radiated RF	Immunity to Radiated Radio Frequency	International Standard IEC 61000-4-3
IEC	Burst	Immunity Electrical Fast Transients (Burst)	International Standard IEC 61000-4-4
IEC	Surge	Immunity to Electrical Surges	International Standard IEC 61000-4-5
IEC	Conducted RF	Immunity to Conducted Radio Frequency	International Standard IEC 61000-4-6
IEC	Dips	Immunity to Voltage Dips	International Standard IEC61000-4-11
IEC	Interruptions	Immunity to Voltage Interruptions	International Standard IEC 61000-4-11

While these products are designed to meet high industrial standards for Class A equipment, ensuring robust performance in demanding environments, they may cause radio interference when used in domestic settings. To mitigate this, additional noise reduction measures, such as filters or shielding, may be necessary. Ensure that the entire setup where the SSR is installed complies with all relevant EMC regulations required by the application.

Environmental Compliance

Products comply to the following environmental standard requirements for electrical products to ensure they are safe for consumers to use.

-	STANDARD NAME	STANDARD DESCRIPTION	STANDARD NUMBER
RoHS	RoHS	Conformity with the European Restriction of Hazardous Substances in electrical and electronic products	European Directive 2015/863/EU (IEC 63000)
REACH	REACH	Conformity with the Registration, Evaluation, Authorization and Restriction of Chemicals regulation to ensure safe use of chemicals	European Directive 1907/2006
WEEE	WEEE	Conformity with the Waste Electrical and Electronic Equipment regulation to ensure proper disposal and recycling of e-waste	Regulation 2002/96/EC

Notes:

[1]All parameters at 25 °C unless otherwise specified.

Warning Information

Caution: Material Damage, Electric Shock, and Arc Flash Hazard. Before installing or working with this equipment, take the following precautions:

1. **Disconnect all power:** Ensure that all power sources are disconnected.
2. **Verify connections:** Double-check all connections.

Failure to adhere to these instructions may lead to **serious injury or damage** of equipment.

Disclaimer Notice – Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at **www.littelfuse.com/product-disclaimer.**

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