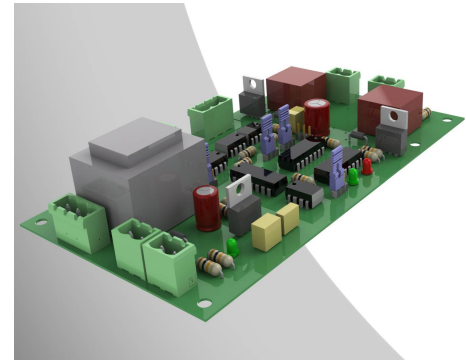


PRELIMINARY TECHNICAL INFORMATION

HIGHLIGHTS

- zero crossing voltage network detection
- available in 2 versions
 - SC1010 up to 400V_{RMS}
 - SC1010H up to 700V_{RMS}
- enable & disable state control LED indication
- configurable trigger mode
- modular system.
- ready to use.



non-contractual photo

GENERAL DESCRIPTION

SC1010 is a solid state relay controller card. It is intended to be used in applications where high reliability is needed. This card is configurable to trigger SCR's with pulse trains synchronized with mains voltage, or in permanent mode. It can be configured to start at zero crossing or random phase. Control signal can be a logic level referred to card reference (high input impedance) or floating optocoupled input (low input impedance). Built in power supply is feed directly from the mains either 230 V or 400 V, 50/60Hz.

ABSOLUTE MAXIMUM RATINGS

description	symbol	conditions & notes	min	max	units
continuous working AC voltage	V_{K1K2}	SC1010		440	V _{AC}
		SC1010H		770	V _{AC}
maximum AC peak voltage	$V_{K1K2 \text{ peak}}$	SC1010		1200	V _{PEAK}
		SC1010H		1800	V _{PEAK}
control trigger voltage	V_{CTL}	See CONTROL SIGNAL & VOLTAGE LEVELS (page 5)			
zero cross signal voltage	V_{ZC}	See SYNCHRONISM SIGNALS (page 5)			
synchronism voltage	V_{SYNC}	See SYNCHRONISM SIGNALS (page 5)			
control to output isolation voltage	V_{ISO}		5000		V _{AC}

RECOMMENDED OPERATION CONDITIONS

description	symbol	conditions & notes	min	typ	max	units
continuous working AC voltage	V_{K1K2}	network freq. 42 to 63Hz	SC1010	100	400	V _{AC}
			SC1010H	200	700	
control trigger voltage	V_{CTL}	Optocoupled mode & logic level mode		12		V
control current consumption	I_{CTL}	Optocoupled mode			6	mA

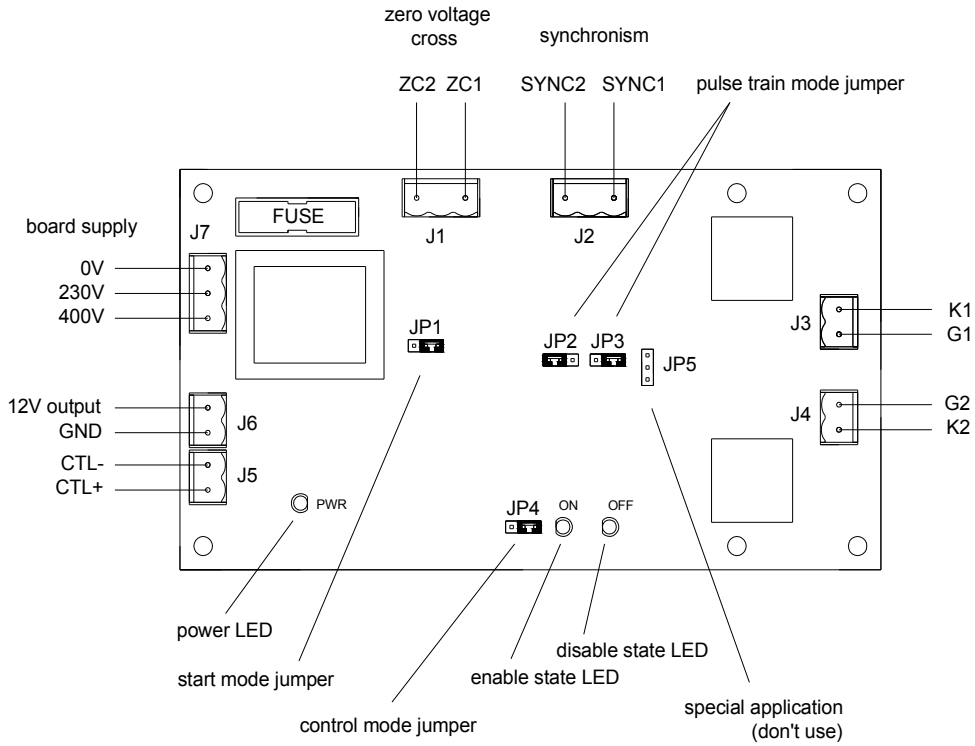
MECHANICAL SPECIFICATIONS

description	symbol	units
dimensions	HxBxT	151x84x29 mm
Weight	W	215 gr
control and power terminals		extractable plug (pitch 5mm)
module fixation		6 Holes Ø4mm

ENVIRONMENTAL SPECIFICATIONS

description	units
protection grade	IP-00
maximum humidity	50% Rh @ 35°C / 70% RH @ 20°C
pollution grade	III

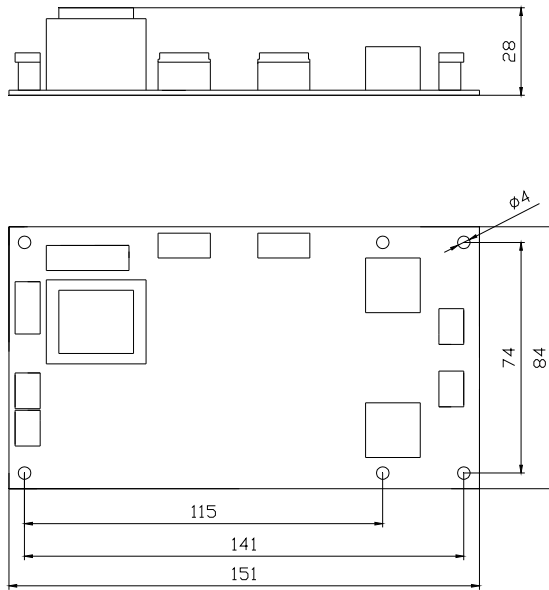
ELECTRICAL CONNECTIONS



connector	designation	function
J1	ZC1	positive pin for zero cross voltage detection
	ZC2	negative pin for zero cross voltage detection
J2	SYNC1	positive pin for current synchronism through thyristor
	SYNC2	negative pin for current synchronism through thyristor
J3	G1	thyristor 1 gate connection
	K1	thyristor 1 cathode connection
J4	G2	thyristor 2 gate connection
	K2	thyristor 2 cathode connection
J5	CTL+	negative control signal
	CTL-	positive control signal
J6	12V	12V output
	GND	ground for control signal
J7	0V	0V supply voltage connection
	230V	230VAC supply voltage connection
	400V	400VAC supply voltage connection

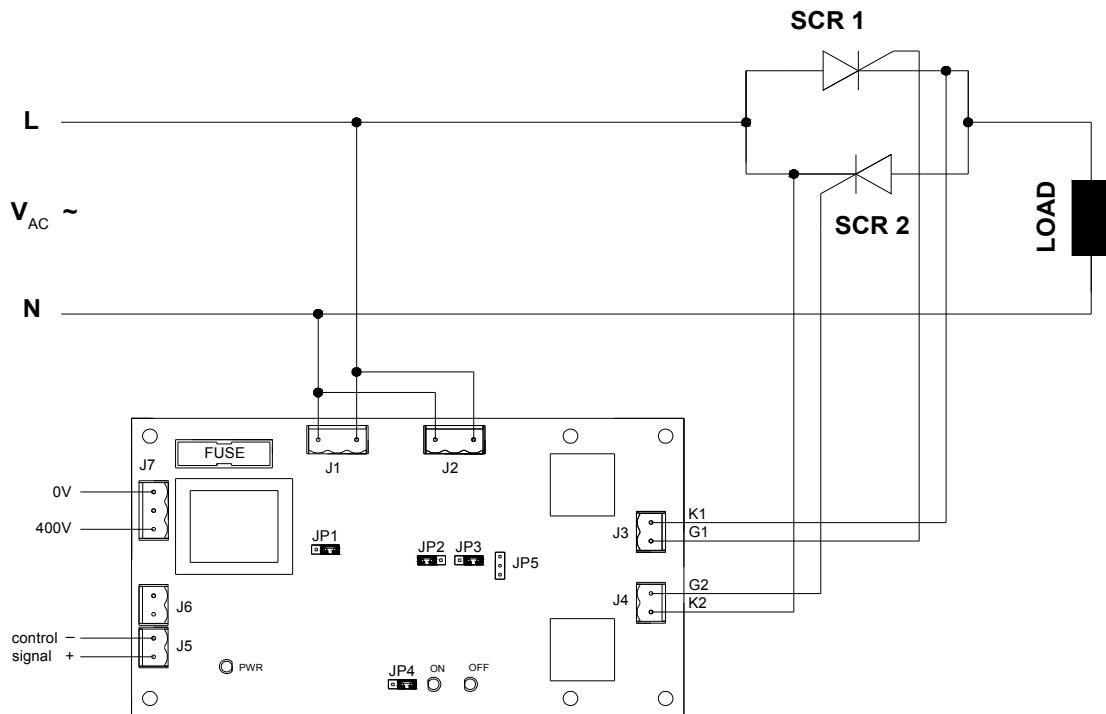
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DIMENSIONS DRAWING



all dimensions are in milimeters

TYPICAL APPLICATION



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CONFIGURATION

GATE SIGNAL MODE

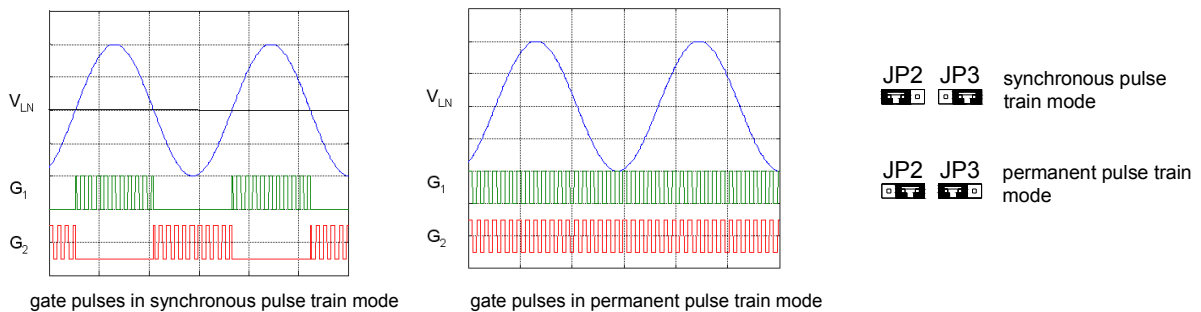
Regarding gate signals, the board can operate in two different modes; «Synchronous Pulse Train» or «Permanent Pulse Train». Operation mode is jumper selectable by means of JP1 and JP2.

- Synchronous pulse train mode (JP2 right connected; JP3 left connected)

In synchronous pulse train mode the board produces synchronized pulse trains and in phase with the mains voltage for each SCR. This operation mode is recommended since commutation and gate losses are reduced.

- Permanent pulse train mode (JP2 left connected; JP3 right connected)

In permanent pulse train mode the board produces a pulse signal for each SCR. Gate losses are higher than for «synchronous pulse train» mode.



START MODE

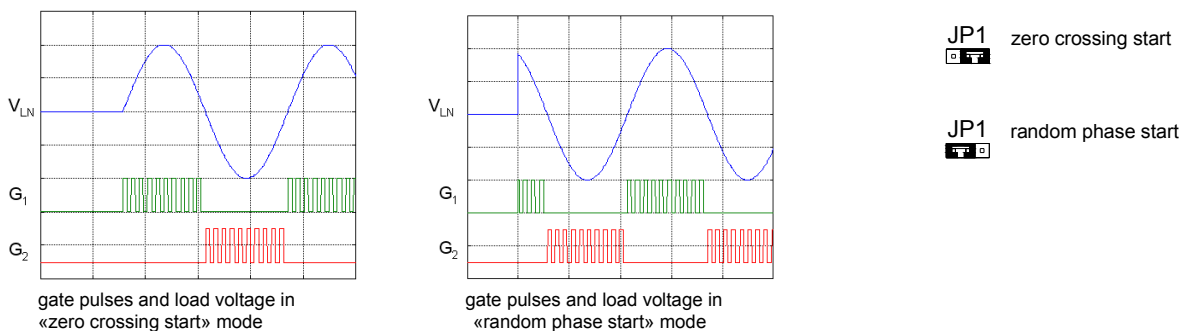
Regarding the start up, the board can operate in two different modes; «zero crossing start» or «random phase start». Start mode is jumper selectable by means of JP1. Starting mode only affects at the first cycle after a start control signal is applied.

- Zero crossing start mode.

In zero crossing start mode, first cycle of load voltage always start at zero cross of the mains voltage.

- Random phase start mode

In random phase start mode, voltage is applied to the load at the moment that control signal is applied.

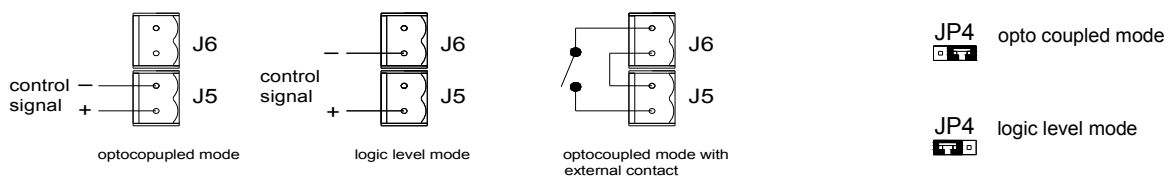


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CONTROL SIGNAL & VOLTAGE LEVELS

Input type of control signal is jumper selectable between «logic level» or opto-isolated. Logic level input is intended to be controlled directly from a logic signal source (PLC, microcontroller, etc.). It is advised logic level circuits are high impedance, so attention must be paid to avoid undesirable interference. Shielded lines must be used for control signals. Opto-isolated mode requires a control signal source capable of deliver at least 5mA at 15V. In this mode 5.22kΩ input impedance helps to prevent interference influence, nevertheless shielding is suggested.

A mechanical external switch can be used but opto-coupled input mode must be selected since a high impedance open circuit can produce undesirable operation. Since the switch is fed from internal power supply, isolation is not achievable in this mode.



control signal	optocoupled mode	logic level mode
enable	6-30V	9-12V
disable	0-3V	0-3V

SYNCHRONISM SIGNALS

The SC1010 card uses 2 signals for synchronize the gate pulses with the network.

-Zero voltage cross

This signal is used to determine the time when the voltage across the thyristors is zero (zero crossing). When the SC1010 is enabled by control signal, the first of the gate pulse trains not appears in the output until this signal isn't in zero crossing. This way the thyristor always turns-on at zero voltage (It not applies in random start mode).

-Synchronism

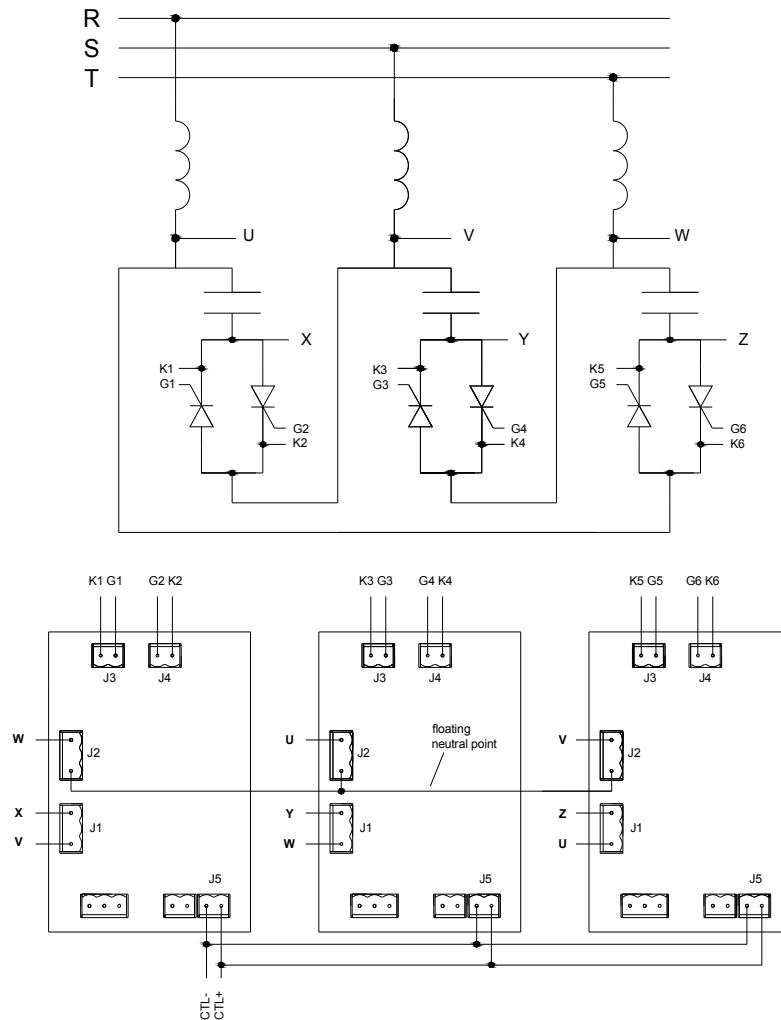
This signal is used to synchronize the width and timing of gate train pulses with the current through the thyristors (it not applies in permanent pulse train mode).

Signal	SC1010	SC1010H
Zero voltage cross	400V _{RMS} max	700V _{RMS} max
synchronism	400V _{RMS} max	700V _{RMS} max

Note that in resistive loads, the current and the voltage waves are in phase, then the ZC and the SYNC signals are the same. Also in applications where the $\cos \Phi$ is near 1 (motors, inductive loads) the same signal for ZC and SYNC could be used. For applications where the voltage and current are strongly out of phase, then different signals for ZC and SYNC should be used, for example in reactive compensation (LC filtering) applications (see **REACTIVE COMPENSATION** page 6).

REACTIVE COMPENSATION

SC1010 may be used in reactive energy compensation control, connecting the AC switches inside the delta connection formed by capacitors. The connection of the zero voltage cross signal (J1) and the synchronism signal (J2) should be as the following figure:



Note that for the most thyristor modules, the auxiliary cathode is galvanically united with power cathode; then it is possible to reduce the number of wires from cards SC1010 to power stack, only large wires for K and G connections from J3 and J4 are required. J1 and J2 connections may be plugged to J3 and J4 following this table.

J3/J4	J1/J2
K1	X
K2	V
K3	Y
K4	W
K5	Z
K6	U

NOTES & RECOMMENDATIONS

The card has an internal power supply, that could be fed at 230 or 400Vac. Its mandatory that the supply of the SC1010, and of its controllers (PLC, micro-controller, etc) will be ready, almost 100mS, before the activation of the control signals (enable). If not, a non correct working of the card could be produced. This could cause potentially dangerous failures if the power stack is fed.

Be careful with the continuity in the supplying of the card. An interruption couldn't be permitted whenever the card is connected to power stack, and the stack is working.

The gate and cathode wires between the card and the thyristor must be twisted pair, in order to avoid external interferences. Wires must be short as possible.

Cost Effective Products

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