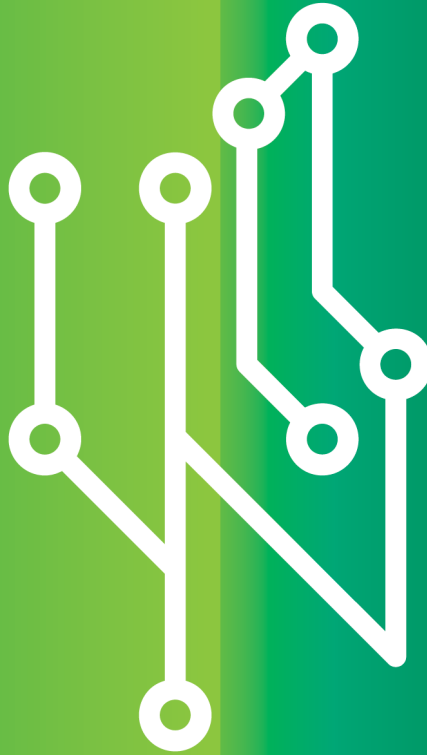


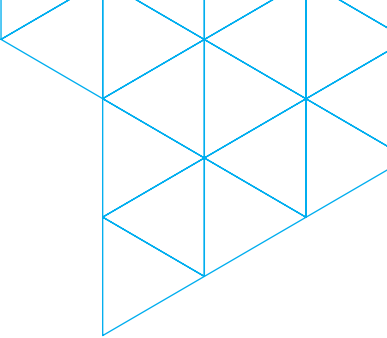
CRISTAL

Power Control



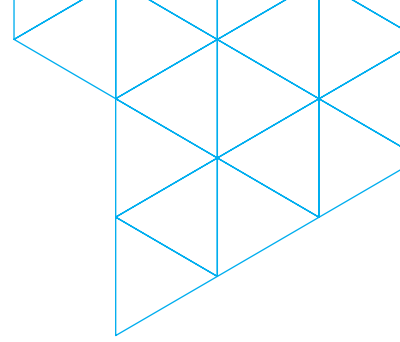
Smart
Energy
Solutions

cristalcontrols.com



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How to reach us

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CANADA

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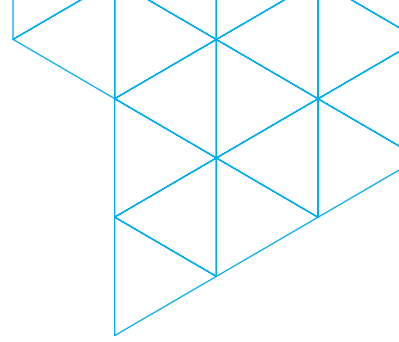
info@cristalcontrols.com

www.cristalcontrols.com

Toll free :

1-800-681-9590 (Canada & USA)

Company Profile



Company Profile

Mission and Profile

Cristal Controls designs and manufactures customized energy management systems for commercial, industrial and multi-unit residential use. With a focus on energy efficiency and cost savings, the company develops made-to-measure software and networking solutions that allow building owners and operators to monitor and control lighting, heating, air conditioning and ventilation systems from anywhere in the world thanks to the latest in addressable technology.

Cristal Controls is also a leading manufacturer and reseller of SCR, Triac and step power controllers, thermostats, dimmers, and sensors specially designed to conserve energy, reduce operating costs and carbon emissions.

Cristal Controls smart energy solutions are complemented with exceptional customer care and service. From design and manufacturing through to installation, rigorous quality control ensures optimal performance of all systems and components.

History

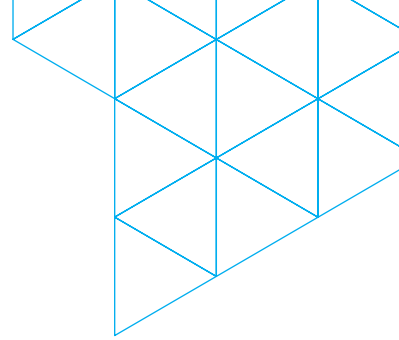
Cristal Controls was established in Quebec, Canada, in 1991. It began manufacturing SCR, Triac and step power controllers, but has since added the design and development of commercial lighting control systems and complete energy management solutions that meet the growing need for improved energy efficiency in commercial and residential buildings across North America and Europe. Thanks to its commitment to product innovation and quality, the company has enjoyed steady growth and currently employs 30 people.

Gamme de contrôles

Cristal Controls designs energy management systems specifically adapted to the technical requirements of its commercial clients. Over the years, the company has gained considerable expertise in the design and manufacturing of the following products:

- ▶ SCR modulating energy controllers
- ▶ Triac modulating energy controllers
- ▶ Linear step controllers
- ▶ Bacnet control modules
- ▶ Bacnet energy management systems
- ▶ Bacnet low-voltage lighting control systems
- ▶ DALI lighting control systems
- ▶ Bacnet automation systems (BAS)

All Cristal Controls products are CSA and CUS certified.



Company Profile

Areas of Expertise

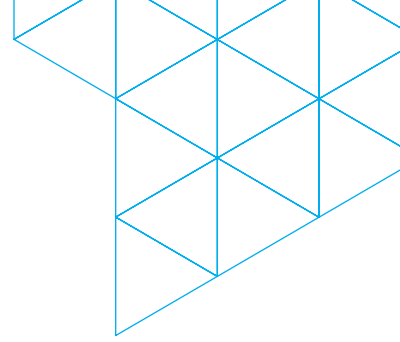
Cristal Controls specializes in the manufacturing of SCR, Triac and step-controller power control modulators, all of which are designed in-house by a dedicated team of engineers. Each product comes with detailed specifications sheets and a complete technical data package when required. Cristal Controls also offers technical assistance and customer support to ensure optimal product performance and complete customer satisfaction.

Clients and Projects

The following is a list of products and solutions Cristal Controls has designed in recent years for a number of well-known companies.

- ▶ **CCI Thermal** is a manufacturer of industrial electrical coils and electric boilers. CCI uses SCR and Triac controllers for most of its products.
- ▶ **Accent Technology** has developed a salt-and-brine mixture-spreading management system for road maintenance equipment. Cristal Controls designed, developed and scripted the electronic-map application codes. Echelon® technology was used in the design process.
- ▶ **Heaters & Controls** is a company based in Ontario that manufactures industrial furnaces. The company uses a number of Cristal Controls product components in the manufacturing of its own products.
- ▶ **Johnson Controls** Cristal Controls designs and manufactures electronic relay panels used to control lighting sequences for commercial buildings in partnership with Johnson Controls.
- ▶ **Dectron International** is a major manufacturer of air-conditioning and de-humidification systems, among other products. Dectron contracted Cristal Controls to design and manufacture energy control systems for a number of different applications.
- ▶ **SPAQ (Société Parc Auto du Québec)** Cristal Controls recently designed and is presently producing collection and parking-space management modules on the company's behalf.
- ▶ **FHP** is an American geo-thermal heat-pump manufacturer for whom Cristal Controls produced an energy control system.

All Cristal Controls products fully comply with prescribed or generally recognized industry standards in Canada, the United States and Europe.



Company Profile

Management

Cristal Controls' greatest asset is the combined experience of its upper management throughout their long and successful careers. Upper management executives closely monitor growth, carefully select the projects they undertake, and make absolutely sure to follow through in precise accordance with any given mandate.

Over the years, Cristal Controls has always remained abreast of the latest breakthroughs in technology and production techniques. For example, the Altium computer-assisted design and drafting system is used for maximum efficiency and precision in both the design and manufacture of all of its products.

Cristal Controls has acquired a solid reputation built on its capacity to design and manufacture high-quality products for a wide range of commercial applications. Cristal Controls expects to continue to improve and grow its line of energy management products and solutions to meet increasing global demand for higher energy efficiency and environmental sustainability.

Resources

Cristal Controls has a 700 sq. meter production facility in Quebec City that houses an engineering department (comprised of three full-time engineers and four full-time technicians), an administrative department, a manufacturing department, a quality-assurance department, and a testing lab complete with the latest computer-assisted technology.

Production Equipment

- ▶ Surface mount assembly line (SMT)
- ▶ Specialized oscillators
- ▶ Thru hole manual assembly line
- ▶ Low-voltage test set
- ▶ Program test set

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SCR CONTROLLERS (ZERO CROSSING) (SCR/CCT)

CRISTAL CONTROLS has changed the SCR world by making SCR's that are smaller and easier to install. No more oversize holes into your control panel, only a few ventilating louvers, no more heat sink outside the control panel. All SCR's are opto-isolated from high voltage and can receive a multiple control signal such as 0-135 Ohms, 0-10 Volts, 4-20 mA, 0-5 Volts. SCR's are also available for pneumatic controls, thermally protected, surge protected and are built for 1200 Volts surge including an exclusive 2 year warranty.

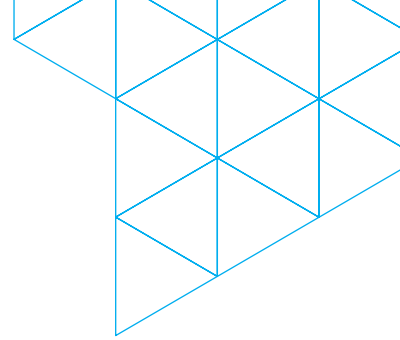
CRISTAL CONTROLS. Manufactures SCR's up to 1000 Amps up to 600-3 phases, with or without enclosure. CRISTAL CONTROLS also manufactures TRIAC (ssr) , STEP CONTROLLERS, THERMOSTATS and LOAD SHEDDER CONTROL all SCR's are available with NEMA-1 enclosure or ventilated enclosure for remote installation.

CRISTAL CONTROLS SCR's POWER CONTROLLERS are ZERO-CROSS FIRED and ideal for the control of purely resistive loads that can accommodate fast, full power, ON-OFF cycling. CRISTAL CONTROLS Zero-cross fired SCR's do not create RFI (radio frequency interference) and will not adversely affect sensitive electronic equipment, logic controllers, computer, etc.) located in the same building or area. CRISTAL CONTROLS SCR's are protected from line voltage transients, making them more reliable in a variety of applications.



ZERO-CROSS FIRED SCR'S when coupled with a time proportioning control, operate in a series of full ON-OFF cycles known as time proportioning burst firing. The time proportional control accepts the control output signal and converts it into a time proportional signal determining the amount ON and full OFF cycles produces a smooth power output to the load (heater) and stabilizes temperature.



An SCR POWER SWITCH differs from other switches in fast action. For example, while a contactor may cycle 3 times per minute, a CRISTAL CONTROLS SCR may cycle approximately once per second. This fast SCR cycle time results in a final temperature much closer to the desired set point and reduces energy costs. The SCR modulates small increments of power to the load, unlike traditional mechanical control, and eliminates the overshoot and undershoot associated with contactor's control.

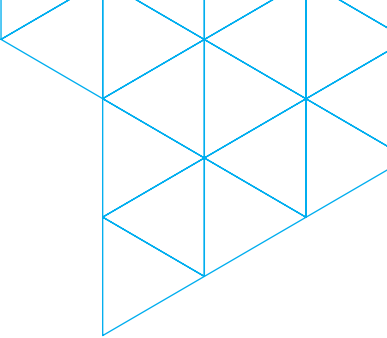


SCR CONTROLLERS (ZERO CROSSING) (SCR/CCT)

Summary SCR or SSR (ZERO CROSSING)

SCR : (SILICONE CONTROLLED RECTIFIER) SSR : (SOLID STATE RELAY)

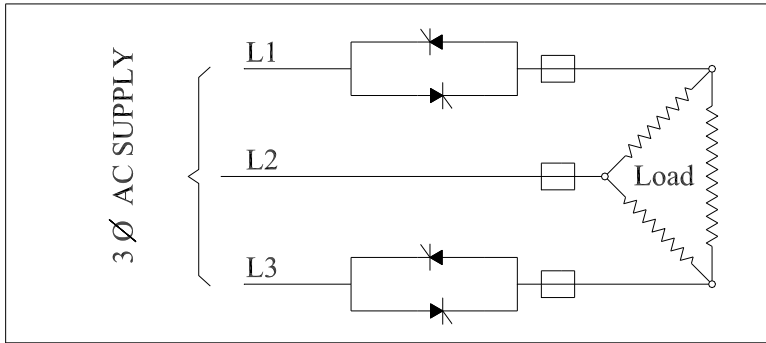
- ▶ Modulates the power nearest to the demand and reduces energy costs and power consumption.
- ▶ Keeping the temperature closer to the desired set point for best comfort.
- ▶ Higher precision, superior than contactors.
- ▶ Fast adjustment and installation.
- ▶ Zero-crossing operation eliminates the thermal shocks overshoot and undershoot.
- ▶ Cycles once per second, very fast and quiet.
- ▶ No maintenance, due to less mechanical parts failure.
- ▶ Life expectancy higher than 1 000 000 000 operations
- ▶ Does not create RFI (radio frequency interference) and will not adversely affect sensitive electronic equipment.
- ▶ Epoxy thermally protected, for humidity, protection, overheat or contaminated environment.
- ▶ Accept input signal: 0-135 Ohms, 0-10 Volts, 4-20 mA, 0-5 Volts.
- ▶ Security factory 2, I.E. 600 Volts surge protected and built for 1200 Volts.
- ▶ 2 year warranty.
- ▶ Manufactures products up to 1000 Amps at one or three phases
- ▶ Our products are  and 



SCR CONTROLLERS (ZERO CROSSING) (SCR/CCT)

ZERO-CROSS FIRED CONTROL

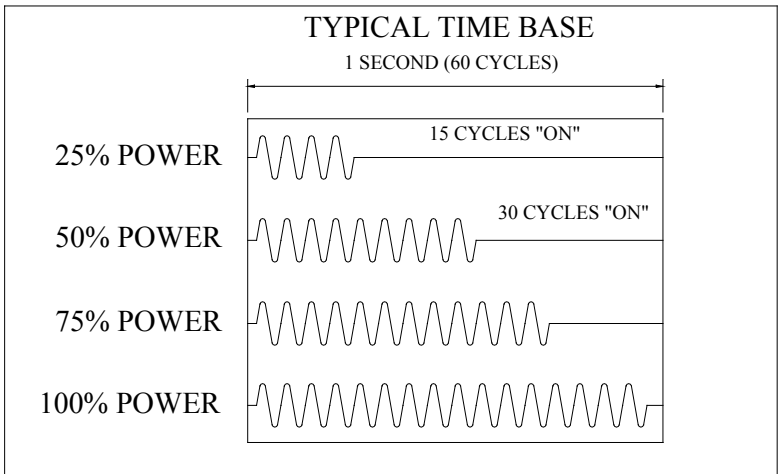
Description :



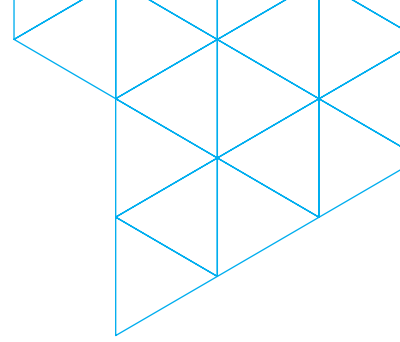
Zero-Cross fired SCR's are used to control nickel / chromium resistance heaters. Two legs of the three phases supply are controlled by the SCR and the third phase is connected directly to the heater. The Thyristors fire as the voltage crosses zero and therefore RFI interference is eliminated.

Three legs models also available.

Operating curve :



The rate at which the SCR's are fired is directly proportional to the signal received from a thermostat or temperature controller. The ON time is a percentage of the time base or cycle rate.



SCR CONTROLLERS (ZERO CROSSING) (SCR/CCT) Applications

The technology of Cristal SCR electronic controls ensures a sustained energy and a constant heat load ideal for the majority of commercial and industrial electric heaters, such as :

- ▶ Duct heaters
- ▶ Electronic boilers
- ▶ Electric humidifiers
- ▶ Industrial & commercial ovens and furnaces
- ▶ Mine heaters
- ▶ Integrated circuit processing equipment
- ▶ Temperature control
- ▶ And any electrical resistance
- ▶ Energy management system & Load shedding system

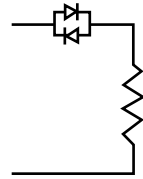
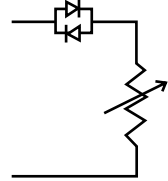
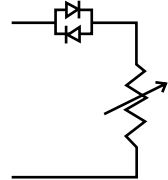
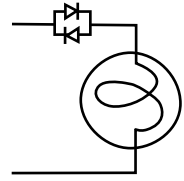
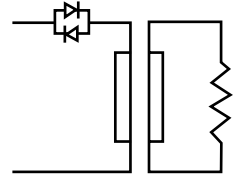
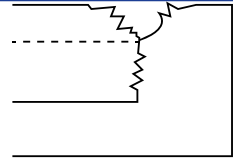
Available options :

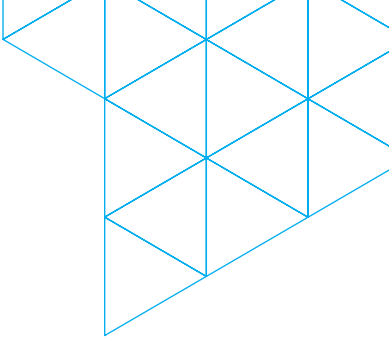
- ▶ 3 legs power control on request
- ▶ Semi conductor fuses
- ▶ Panel mounting on request

Which type to select?



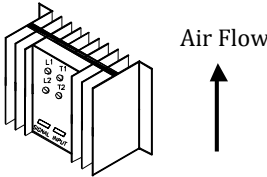
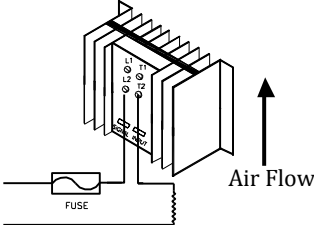
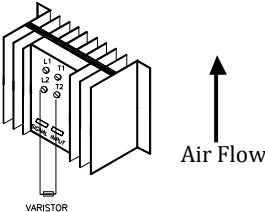
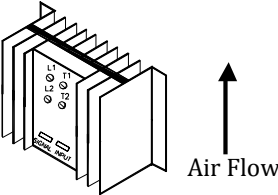
SCR SELECTION GROUP

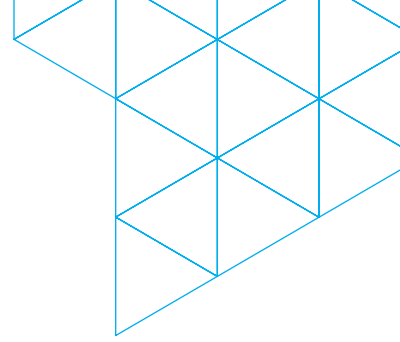
<p>Single phase resistive elements whose ohmic value does not change greatly over their temperature range.</p> <p>Low temperature coefficient of resistance e.g. Austenitic alloys (NiCr, NiCrFe). Example trade name is Nikrothal. Typical resistance change of 7 %.</p>	→ Go to Single Phase Control Zero crossing SCR	
<p>Single phase resistive elements whose ohmic value change with time</p> <p>They may also have a temperature change of resistance e.g. Silicone Carbide. Example trade name is Hot Rod. Typical resistance increase 2 to 3 times with time (and temperature).</p>	→ Go to Single Phase angle Control	
<p>Single phase resistive elements whose ohmic value change with temperature.</p> <p>Especially elements with large positive temperature coefficients of resistance, e.g. Tungsten (W), Molybdenum (Mo), or Molybdenum disilicide (MoSi₂). Trade name for latter is Kanthal Super. Resistance of 20:1 on start-up.</p>	→ Go to Single Phase angle Control	
<p>Single phase infrared Heaters</p> <p>This will depend on the wavelength of the heaters, inrush current and process speed.</p> <p>Long Wave Medium Wave Short Wave</p>	→ Go to Single Phase angle Control	
<p>Single phase transformer loads or Resistive elements that are connected via a transformer</p> <p>(Inductive Loads)</p>	→ Go to Single Phase angle Control	
<p>Three phase loads</p> <p>Resistive or complex loads</p>	→ Go to Three Phase Zero crossing SCR	



SCR CONTROLLERS (ZERO CROSSING) (SCR/CCT)

IMPORTANT MATTERS TO BE OBSERVED WHEN INSTALLING CRISTAL CONTROLS PRODUCTS
SCR/CCT

	<p>In general :</p> <p>Current, voltage, temperature and load type are crucial factors when mounting SCR or Triac SSR. This applies to 1 as well as 3 phases relays.</p>
	<p>Optional protection against overload</p> <p>The relay is protected against overload and short circuit by means of semiconductor fuse on each phase.</p>
	<p>Protection against voltage transients :</p> <p>The relay must be protected against voltage transient by mounting a varistor across the semiconductor on each phase.</p>
	<p>Protection against excessive heating :</p> <p>All Cristal products have proper heat sink as part of their SCR or TRIAC (SSR)</p>



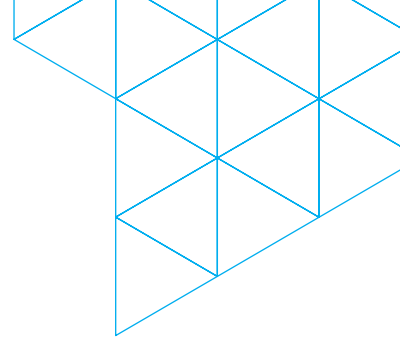
CCS or CCT heat dissipation calculation

Basic formula

1,5(constant number) x number of Amps x number of poles= heat un watts.

Exemple :

- ▶ 1 CCS-30-1 (1pole) switching 23 Amps of load will generate 34,5 watts.
(1,5 x 23 A x 1 pole= 34,5 W)
- ▶ 1 CCS-75-3 (2 poles) switching 72 Amps of load will generate 216 watts.
(1,5 x 72 A x 2 poles= 216 W)
- ▶ 1 x CCS-135-3Y (3 poles) switching 125 Amps of load will generate 562,5 watts.
(1,5 x 125 A x 3 poles =562,5W)



How to select an SCR or SSR

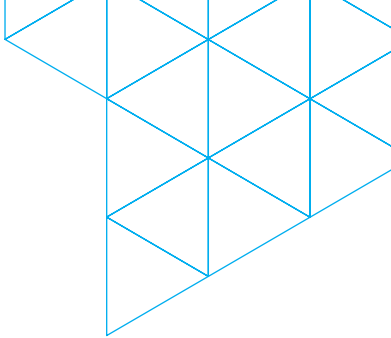
At 1 Phase

- ▶ Application 120-1 Watts / Voltage = Amp ($1000 \text{ Watts} / 120 = 8.33 \text{ Amp}$)
- ▶ Application 208-1 Watts / Voltage = Amp ($1000 \text{ Watts} / 208 = 4.81 \text{ Amp}$)
- ▶ Application 240-1 Watts / Voltage = Amp ($1000 \text{ Watts} / 240 = 4.17 \text{ Amp}$)
- ▶ Application 277-1 Watts / Voltage = Amp ($1000 \text{ Watts} / 277 = 3.61 \text{ Amp}$)
- ▶ Application 347-1 Watts / Voltage = Amp ($1000 \text{ Watts} / 347 = 2.88 \text{ Amp}$)
- ▶ Application 480-1 Watts / Voltage = Amp ($1000 \text{ Watts} / 480 = 2.08 \text{ Amp}$)
- ▶ Application 600-1 Watts / Voltage = Amp ($1000 \text{ Watts} / 600 = 1.67 \text{ Amp}$)

At 3 Phases

- ▶ Application 208-3 Watts / (Voltage x 1,73) = Amp ($1000 \text{ Watts} / 360 = 2.77 \text{ Amp}$)
- ▶ Application 416-3 Watts / (Voltage x 1,73) = Amp ($1000 \text{ Watts} / 720 = 1.39 \text{ Amp}$)
- ▶ Application 480-3 Watts / (Voltage x 1,73) = Amp ($1000 \text{ Watts} / 830 = 1.20 \text{ Amp}$)
- ▶ Application 600-3 Watts / (Voltage x 1,73) = Amp ($1000 \text{ Watts} / 1038 = 0.93 \text{ Amp}$)

Reference / Référence : <http://www.the12volt.com/ohm/ohmslawcalculators.asp>

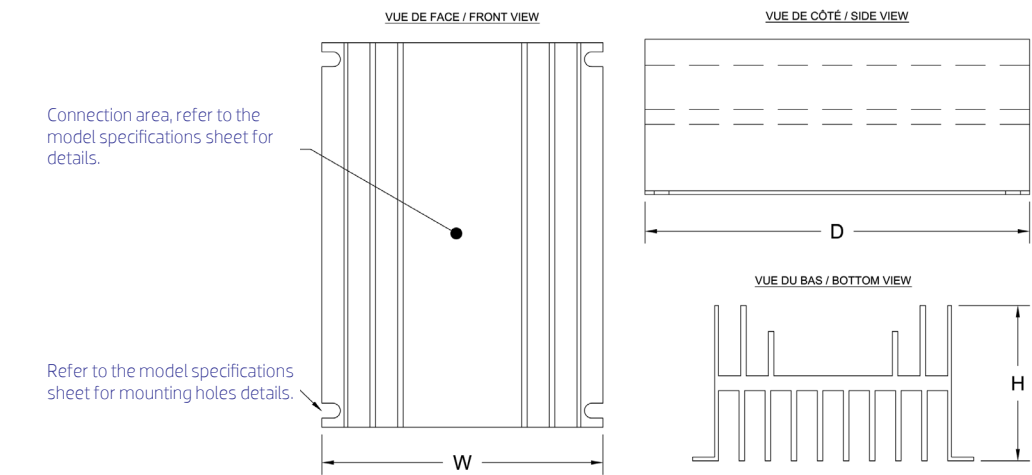


How to select an SCR or SSR

Groups and dimensions :

Notes : refer to the detailed design of each model on the technical specifications.

CCS : <http://www.cristalcontrols.com/scr-power-controllers/zero-crossing-scr-controllers/?lang=fr#spec>



CCT : <http://www.cristalcontrols.com/scr-power-controllers/triac-ssr-controllers/?lang=fr#spec>

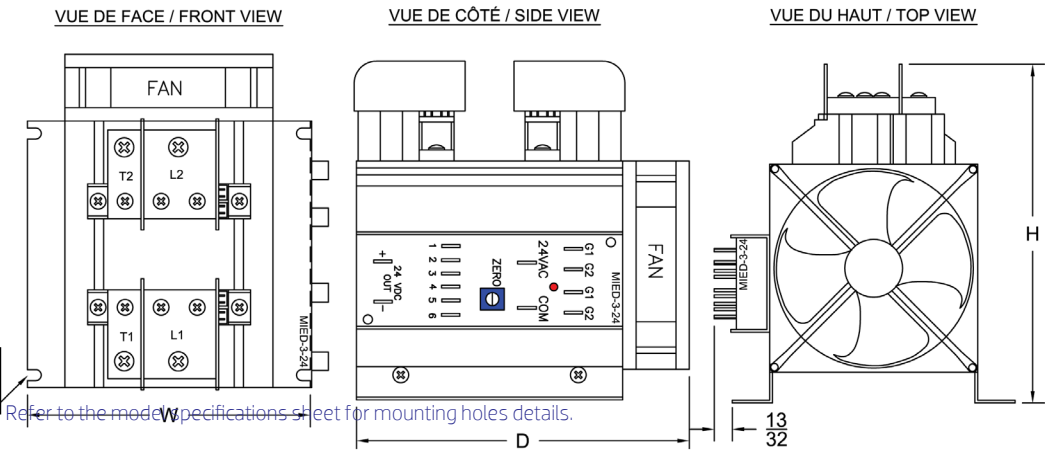
Group A

SKU	H	W	D
CCT-10-1	2 5/8	4 3/4	2 1/8
CCT-15-1	2 5/8	4 3/4	2 1/8
CCS-15-1	2 5/8	4 3/4	4 3/8
CCT/CCS-15-3	2 5/8	4 3/4	6 1/2
CCT/CCS-15-3Y	2 5/8	4 3/4	8 1/2
CCT-25-1	2 5/8	4 3/4	2 1/8
CCT-30-1	2 5/8	4 3/4	3 1/2
CCS-30-1	2 5/8	4 3/4	4 3/8
CCT/CCS-30-3	2 5/8	4 3/4	6 1/2
CCT/CCS-30-3Y	2 5/8	4 3/4	8 1/2
CCT/CCS-40-1	2 5/8	4 3/4	6
CCT/CCS-40-3	2 5/8	4 3/4	8
CCT/CCS-40-3Y	2 5/8	4 3/4	10
CCT/CCS-50-1	3	4 3/4	6
CCT/CCS-50-3	3	4 3/4	10
CCT/CCS-75-1	3	4 3/4	6
CCT/CCS-75-3	3	4 3/4	10
CCT/CCS-90-1	3	4 3/4	6
CCT/CCS-90-3	3	4 3/4	10

All dimensions
in inches.

How to select an SCR or SSR

Notes : refer to the detailed design of each model on the technical specifications.



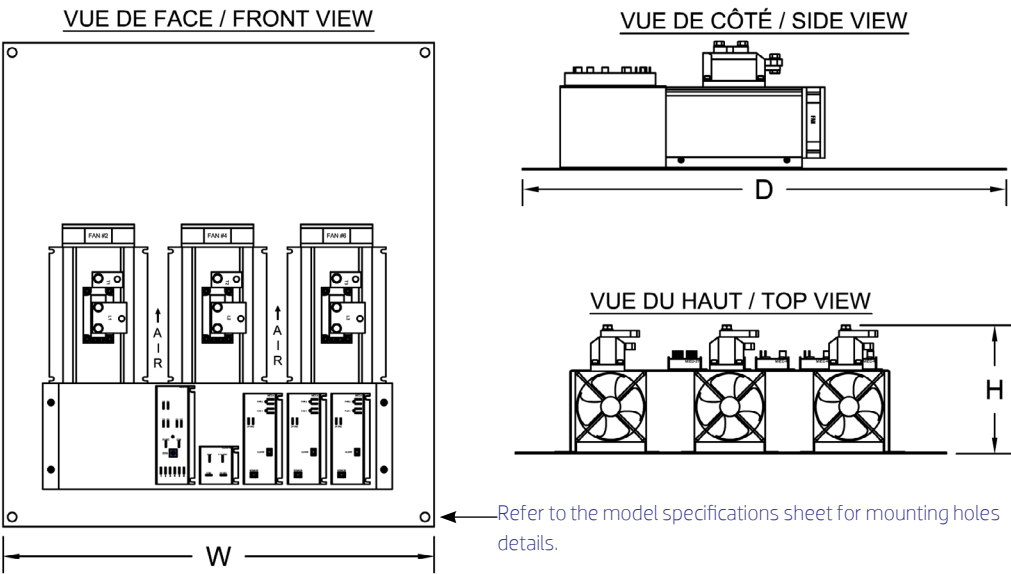
Group B :

SKU	H	W	D
CCT/CCS-50-3Y	7 21/32	6 3/8	10 1/2
CCT/CCS-75-3Y	7 21/32	6 3/8	10 1/2
CCT/CCS-90-3Y	7 21/32	6 3/8	10 1/2
CCT/CCS-135-1	7 21/32	6 3/8	7 1/2
CCT/CCS-135-3	7 21/32	6 3/8	7 1/2
CCT/CCS-135-3Y	7 21/32	6 3/8	12 1/2
CCT/CCS-165-1	7 21/32	6 3/8	7 1/2
CCT/CCS-165-3	7 21/32	6 3/8	12
CCT/CCS-165-3Y	7 21/32	6 3/8	15
CCT/CCS-200-1	7 21/32	6 3/8	7 1/2
CCT/CCS-200-3	7 21/32	6 3/8	12
CCT/CCS-200-3-Y	7 21/32	6 3/8	15
CCT/CCS-250-1	8 1/16	6 3/8	12
CCT/CCS-250-3	8 1/16	6 3/8	15
CCT/CCS-300-1	8 1/16	6 3/8	12
CCT/CCS-300-3	8 13/16	28 1/2	32
CCT/CCS-350-1	8 1/16	6 3/8	12
CCT/CCS-400-1	9 1/2	6 3/8	15
CCT/CCS-500-1	9 1/2	6 3/8	15

All dimensions
in inches.

How to select an SCR or SSR

Notes : refer to the detailed design of each model on the technical specifications.



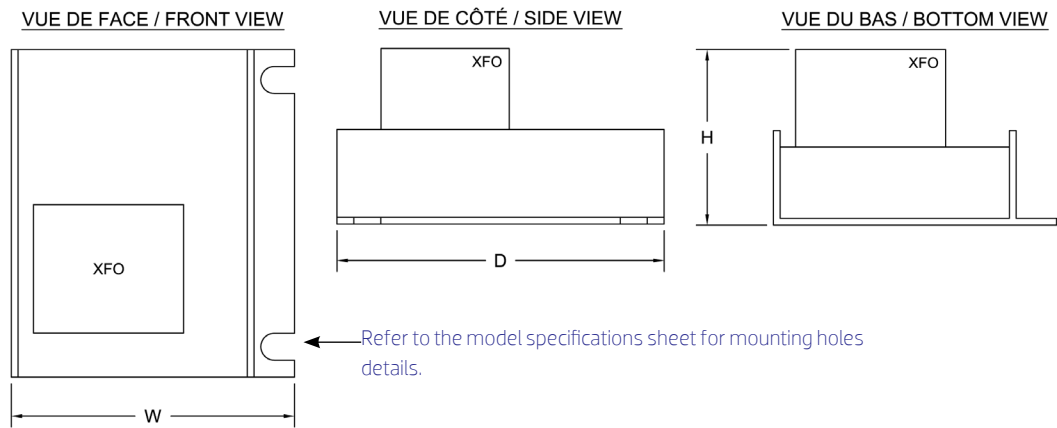
Groupe C :

SKU	H	W	D
CCT/CCS-250-3Y	8 3/8	28 1/2	32
CCT/CCS-300-3Y	8 3/8	28 1/2	32
CCT/CCS-350-3	8 3/8	28 1/2	32
CCT/CCS-350-3Y	8 3/8	28 1/2	32
CCT/CCS-400-3	9 5/8	28 1/2	32
CCT/CCS-400-3Y	9 5/8	28 1/2	32
CCT/CCS-500-3	9 5/8	28 1/2	32
CCT/CCS-500-3Y	9 5/8	28 1/2	32
CCT/CCS-600-3	10 21/32	33	39
CCT/CCS-750-3	10 21/32	33	39
CCT/CCS-1000-3	10 21/32	33	39

All dimensions
in inches.

How to select an SCR or SSR

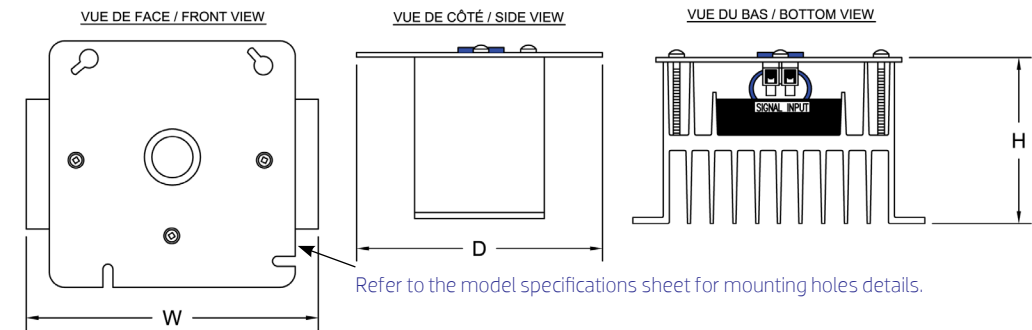
Notes : refer to the detailed design of each model on the technical specifications.



Group D :

SKU	H	W	D	All dimensions in inches.
CCT-06-1-S	3 1/32	2 5/8	7/8	
CCT-15-1-S	2 9/16	2 5/8	7/8	
CCT-15-1-S-T	3 1/32	2 5/8	1 5/8	
CCT-15-1-S-T-240	3 1/32	2 5/8	1 5/8	

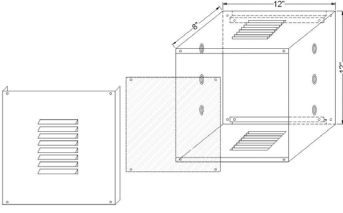
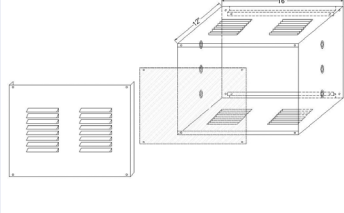
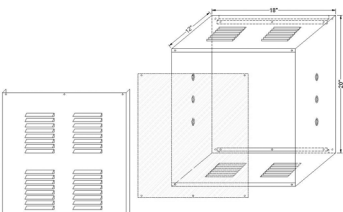
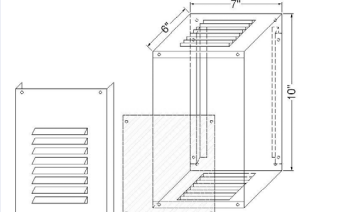
Notes : refer to the detailed design of each model on the technical specifications.



Group E :

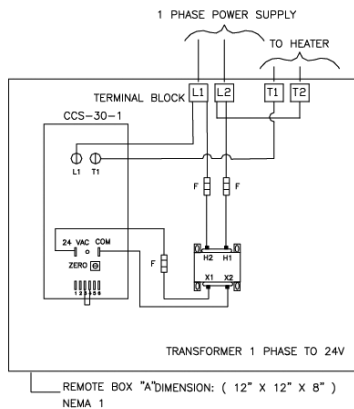
SKU	H	W	D	All dimensions in inches.
CCT-10-1-C1	2 5/8	4 3/4	4	
CCT-15-1-C1	2 5/8	4 3/4	4	
CCT-25-1-C	2 5/8	4 3/4	4	
CCT-25-1-C1-T	3 15/32	4 3/4	4	
CCT-25-1-C2-T	3 15/32	4 3/4	4 11/16	
CCT-30-1-C2	2 5/8	4 3/4	4 11/16	
CCT-45-1-C2	2 5/8	4 3/4	4 11/16	

Galvanized Ventilated enclosure for CCS/CCT

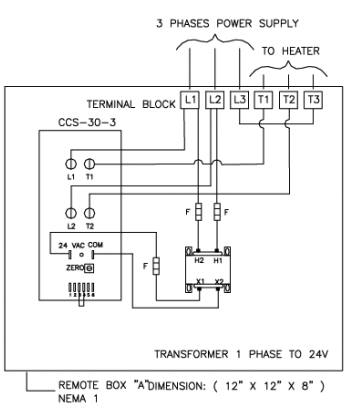
<p>Type A</p> <p>For:</p>  <p>CCS-15-1 CCS-15-3 CCS-30-1 CCS-30-3 CCS-40-1 CCS-50-1 CCS-75-1</p> <p>CCT-15-3 CCT-30-1 CCT-30-3 CCT-40-1 CCT-50-1 CCT-75-1</p>	<p>Type B</p> <p>For:</p>  <p>CCS-40-3 CCS-50-3 CCS-75-3 CCS-90-1 CCS-135-1 CCS-165-1</p> <p>CCT-40-3 CCT-50-3 CCT-75-3 CCT-90-1 CCT-135-1 CCT-165-1</p>
<p>Type C</p> <p>For:</p>  <p>CCS-90-3 CCS-135-3 CCS-165-3 ... & +</p> <p>CCT-90-3 CCT-135-3 CCT-165-3 ... &</p>	<p>Type D</p> <p>For:</p>  <p>CCT-10-1 CCT-15-1 CCT-25-1</p>

Typical connections for SCR

1 phase



3 phases (2 legs)





Troubleshooting procedure for 50A and over SCRs

Adjustment procedure

- ▶ Check the 24Vac supply.
- ▶ Make sure the control signal is well connected and adjusted. Jumper and input signal must be at proper pins.
- ▶ On the power module make sure the G1 and G2 connections are properly connected on power module and match G1 and G2 on firing module (see drawing on the power module's side).

If the previous steps fail to solve the problem, you can manually test each power module. **This must be done with the power module disconnected from firing unit.** Simply apply a 180 ohms resistor between G1 and G2. When resistor is in contact with G1 and G2 you should have continuity on the power side, otherwise the power module is defective. When resistor is NOT in contact with G1 and G2 you should NOT have continuity on the power side of the module, otherwise the module is defective.

SRC adjustment procedure (CCT do not have adjustment)

All CRISTAL CONTROLS SCRs are pre-adjusted for 0-135 ohms with a T-991 thermostat. If another control signal is required, use the following steps:

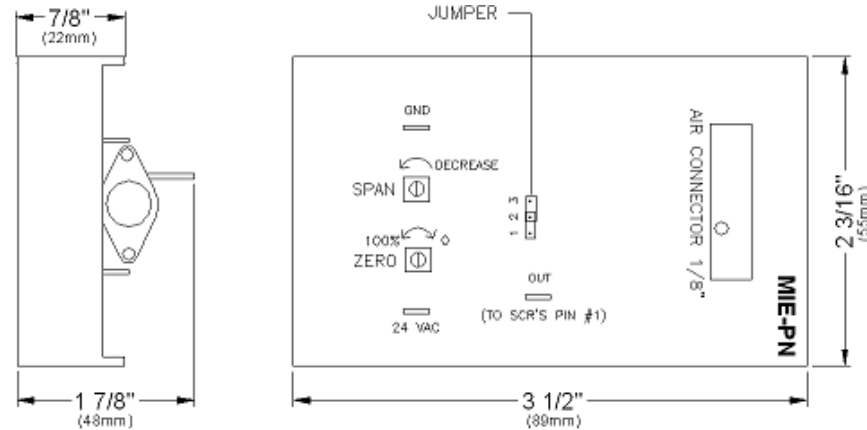
- Step 1)** Adjust the temperature controller at it's minimum.
- Step 2)** Very slowly, turn the SCR potentiometer until the L.E.D. light is on.
- Step 3)** Very very slowly, turn the SCR potentiometer in the opposite direction until the L.E.D. is completely off.

Your SCR is now adjusted to be compatible with your thermostat.

N.B. The SCR controllers must be installed in a ventilated box to ensure proper performance and warranty.

Control input for pneumatic SCRs

Typical connections for SCR (ZERO CROSSING)



To be used with Cristal SCRs

When a 0-15 PSI control drives the SCR the MIEPN is then needed, this transducer accepts 0-15 PSI with a direct or indirect action.

Choose the right action.

- ▶ DA = jumper 1-2 = direct acting (heating if the temperature drops, pressure drops)
- ▶ RA = jumper 2-3 = reverse acting (cooling if the temperature drops, pressure rise)
- ▶ The SCR ZERO must be at the middle position (horizontal)
- ▶ Adjust the ZERO of the transducer at the starting pressure.
Ex.: 3 PSI or 0 PSI = ZERO MODULATION = FULL OFF
- ▶ Adjust the SPAN of the transducer at the starting pressure.

Operation band: 4 PSI (Min.) to 15 PSI (Max.)

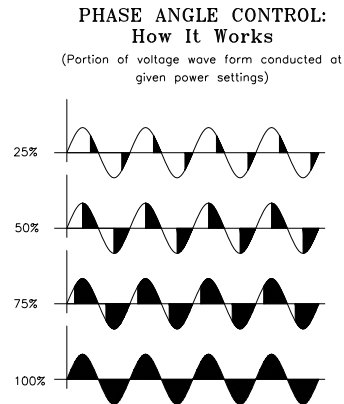
Note: When SPAN is used counter clock wise, it reduces the band. The direction of ZERO depends on the acting position.

****IMPORTANT**** to order, specify the adjustment : "FULL ON" AT _____ PSI et "FULL OFF" AT _____ PSI

(Reference: Ashrae handbook 1995, HVAC applications P.42.9)

Phase angle SCR (Analogic control) CCPA series

Operating curve :



Phase Angle

Advantages:

- ▶ Long life more than 109 operations
- ▶ No contact arcing
- ▶ High resistance to shocks and vibrations
- ▶ High resistance to aggressive chemical and dust
- ▶ No electromechanical noise
- ▶ Logic compatibility
- ▶ Fast switching

Applications :

- ▶ Quartz lamps
- ▶ Tungsten lamps
- ▶ Wire annealing
- ▶ Ovens & Furnaces Control
- ▶ Kantal, Infrared or Silicon Carbide heating elements

CRISTAL CONTROLS' phase angle controls provide smooth proportional output from 0 to 100%. The CRISTAL CONTROLS SCRs are designed to make available low cost high quality SCR phase control. This series offers variable voltage outputs for many applications.

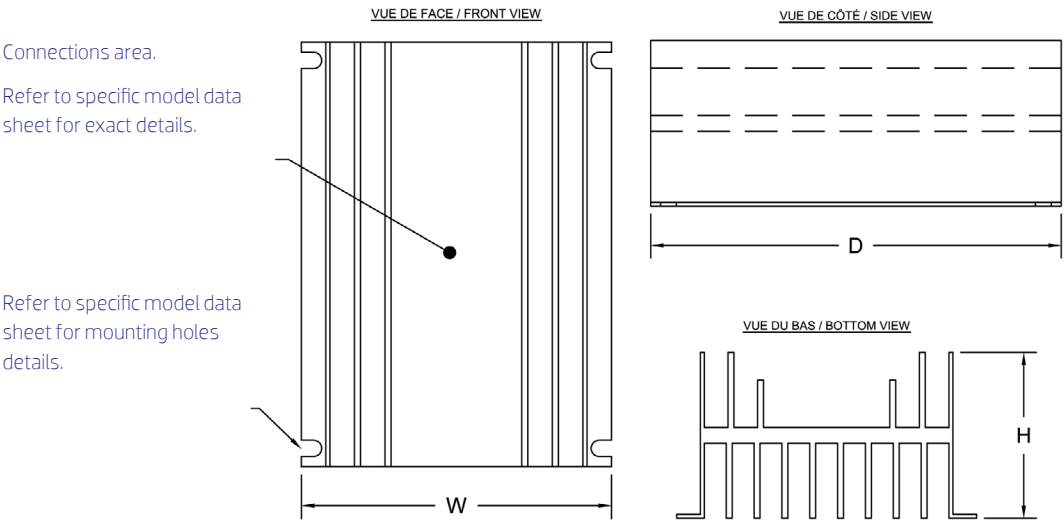
We control load current from 15 amps to 1000 amps at line voltage from 48 to 600 VAC.

Custom programming is available. Consult factory for more information.

Phase angle SCR (Analogic control)
CCPA series

Models and dimensions CCPA :

Notes : refer to the detailed design of each model on the technical specifications.



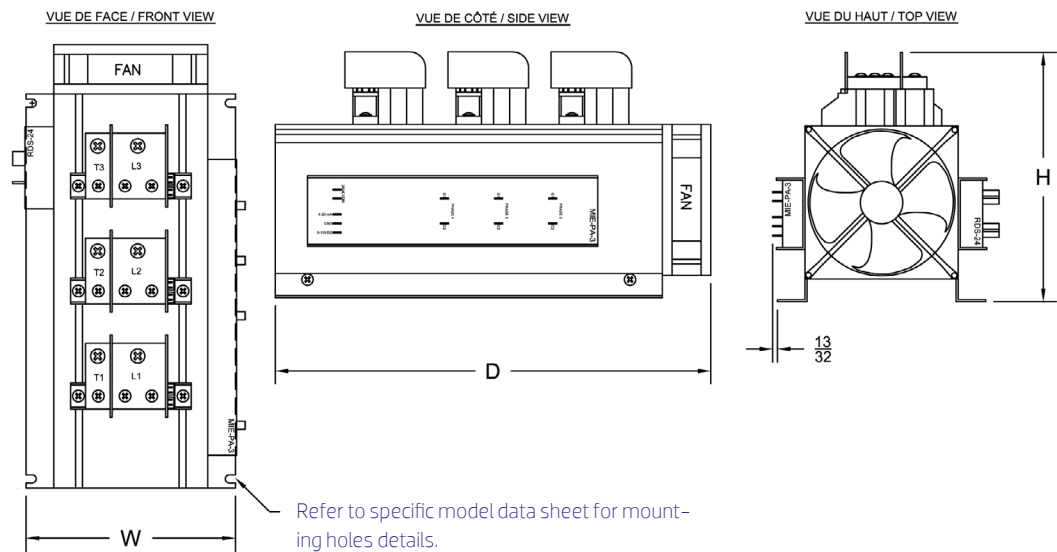
Type A :

Model	H	W	D
CCPA-15-1	2 5/8	4 3/4	5
CCPA-15-3	2 5/8	4 3/4	8 1/4
CCPA-30-1	2 5/8	4 3/4	5
CCPA-30-3	2 5/8	4 3/4	8 1/4
CCPA-40-1	2 5/8	4 3/4	6
CCPA-40-3	2 5/8	4 3/4	10
CCPA-50-1	3	4 3/4	6
CCPA-50-3	7 21/32	6 3/8	13 1/2
CCPA-75-1	3	4 3/4	6

All dimensions
in inches.

Phase angle SCR (Analogic control)
CCPA series

Note: Refer to specific model data sheet for exact details.



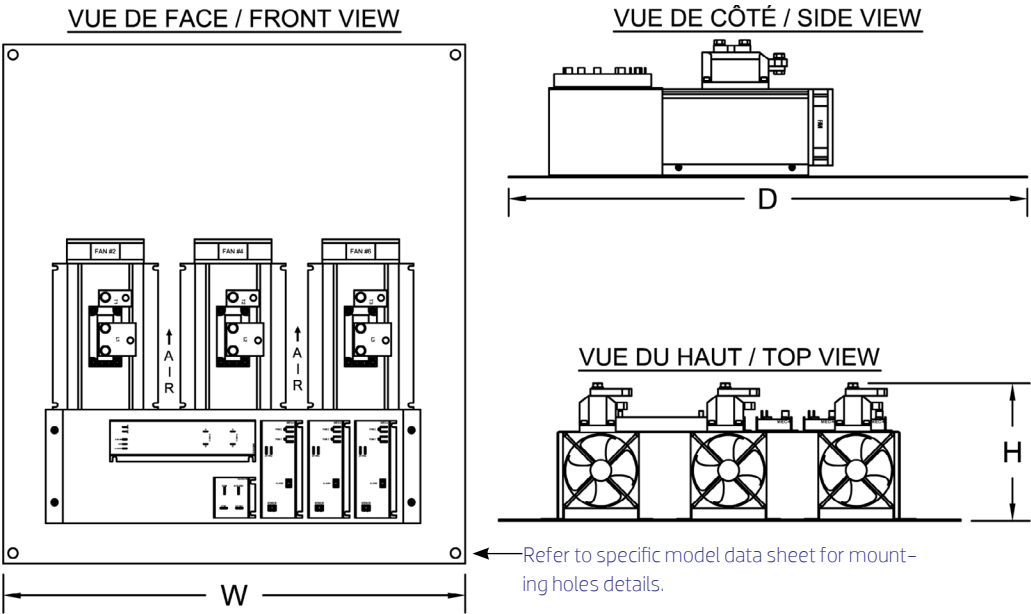
Type B :

Modèle	H	W	D
CCPA-50-3	7 21/32	6 3/8	13 1/2
CCPS-75-3	7 21/32	6 3/8	13 1/2
CCPA-100-1	7 21/32	6 3/8	7 1/2
CCPA-100-3	7 21/32	6 3/8	13 1/2
CCPA-135-1	7 21/32	6 3/8	7 1/2
CCPA-135-3	7 21/32	6 3/8	15
CCPA-165-1	7 21/32	6 3/8	7 1/2
CCPA-165-3	7 21/32	6 3/8	15
CCPA-200-1	7 21/32	6 3/8	7 1/2
CCPA-200-3	7 21/32	6 3/8	15
CCPA-250-1	8 1/16	6 3/8	12
CCPA-300-1	8 1/16	6 3/8	12
CCPA-350-1	8 1/16	6 3/8	12
CCPA-400-1	9 1/2	6 3/8	15
CCPA-500-1	9 1/2	6 3/8	15

All dimensions
in inches.

Phase angle SCR (Analogic control)
CCPA series

Note: Refer to specific model data sheet for exact details.



Type C :

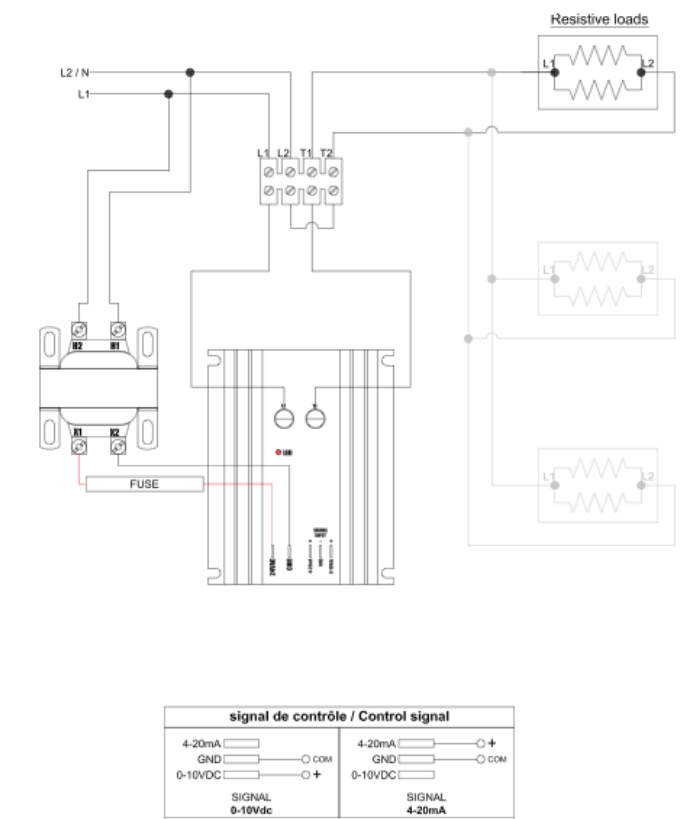
Modèle	H	W	D
CCPA-250-3	8 1/16	28 1/2	32
CCPA-300-3	8 1/16	28 1/2	32
CCPA-350-3	8 1/16	28 1/2	32
CCPA-400-3	9 1/2	28 1/2	32
CCPA-500-3	9 1/2	28 1/2	32

All dimensions
in inches.

Typical connections

CCPA-XX-1 Typical connections

WIRING DIAGRAM CCPA-XX-1



The Control XF0 always need to be installed between L1 and L2 to ensure proper phases.

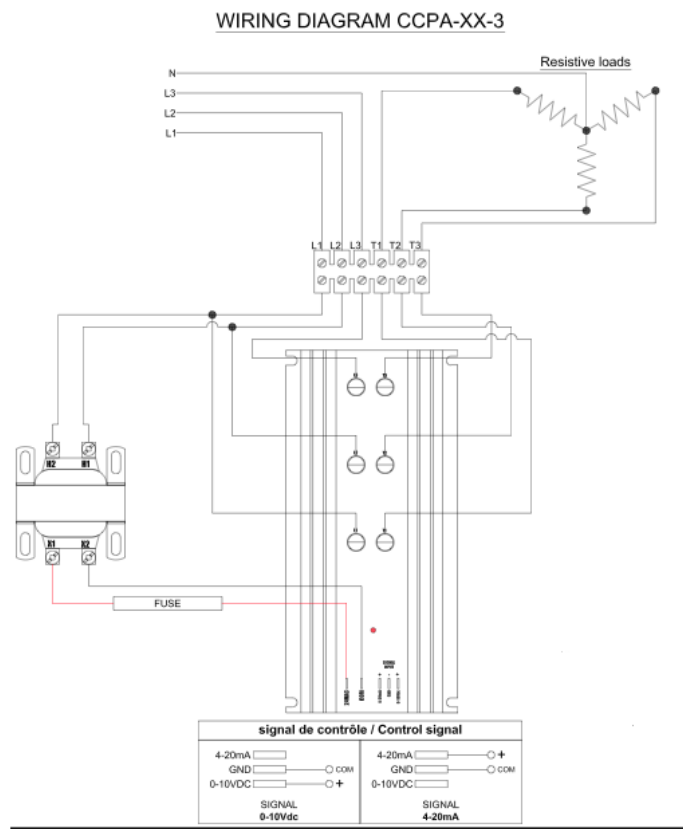
Synchronization.

The best way to ensure proper phases identification is to use a phase sequence detector.

Suggested model MTP-8010.

Typical connections

CCPA-XX-3 Typical connections



The Control XFO always need to be installed between L1 and L2 to ensure proper phases. Synchronization.

The best way to ensure proper phases identification is to use a phase sequence detector. Suggested model MTP-8010.

Step controller

Models and specifications

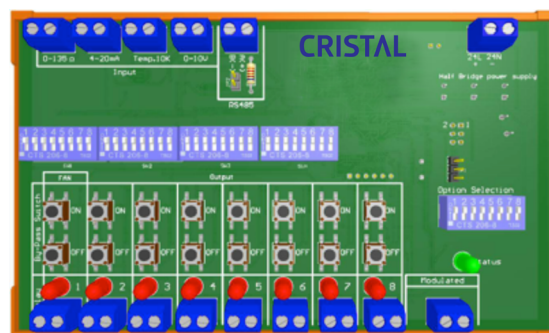
CCE-08

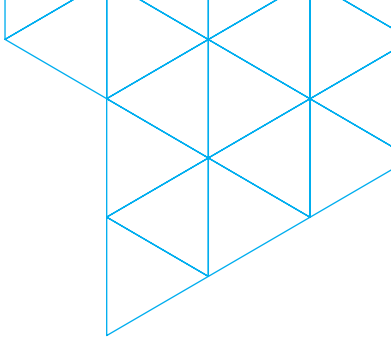
- ▶ 8 (ON-OFF) steps + 1 modulating (Use a CCT)
- ▶ Dimensions; 4" X 6 1/2" X 1 3/16"
- ▶ Enclosure Din Rail of 35mm
- ▶ Up to 4 x CCE-08 can be stack together (mounted on a Din rail or a Steel back plate)

Use "CCT" specifications for modulating stage

Specifications :

- ▶ Input Signal : (10K , 0-10 Vdc, 4-20mA, 0-1350hms)
- ▶ Outputs (ON-OFF stages) : 8 x 1A @ 24 Vac, dry contact
- ▶ Modulating output : 20mA maximum (for / pour CCT-xx-x)
- ▶ Power supply : 24Vac, 100mA
- ▶ Cycle type: LIFO, FIFO and binary.
- ▶ OPERATION TEMPERATURE : - 40 @ +160 °F (- 40 @ +72 °C)
- ▶ STORAGE TEMPERATURE : - 40 @ +160 °F (- 40 @ +72 °C)
- ▶ DIMENSIONS CCE-08 : 101.6 MM X 165 MM X 30 MM OU 4" X 6 1/2" X 1 3/16"





Step controller

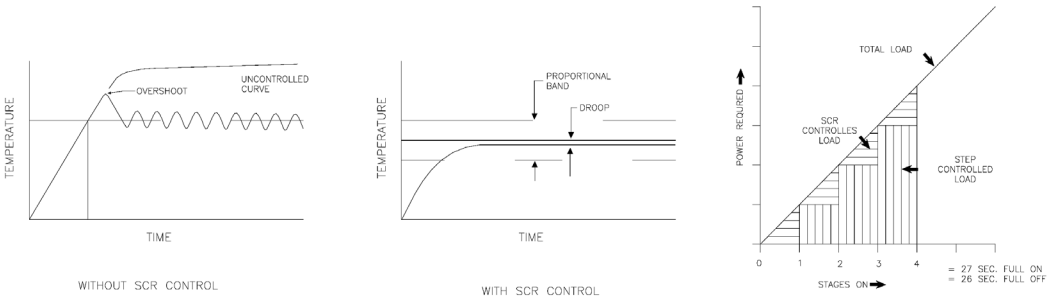
Step controllers operation

On large KW custom heaters, a CRISTAL CONTROLS electronic step controller offers the full advantages of both the SSR and step controller and can be obtained with maximum economy. In this system, normally recommended for precise temperature control on heaters drawing more than 100 amps, on "SSR" heating stage, usually 25% larger than other heating stages, is proportionally controlled with CRISTAL CONTROLS "SSR's".

The other heating stages are controlled by the electronic step controller. The "SSR" stage automatically fills the gaps between step controlled stages, thus providing fully proportional control over the entire heater KW range. This scheme is far more economical than using "SSR" controllers to carry the entire heater load, yet is entirely equivalent in operation. We have step controllers from 8 to 32 stages.

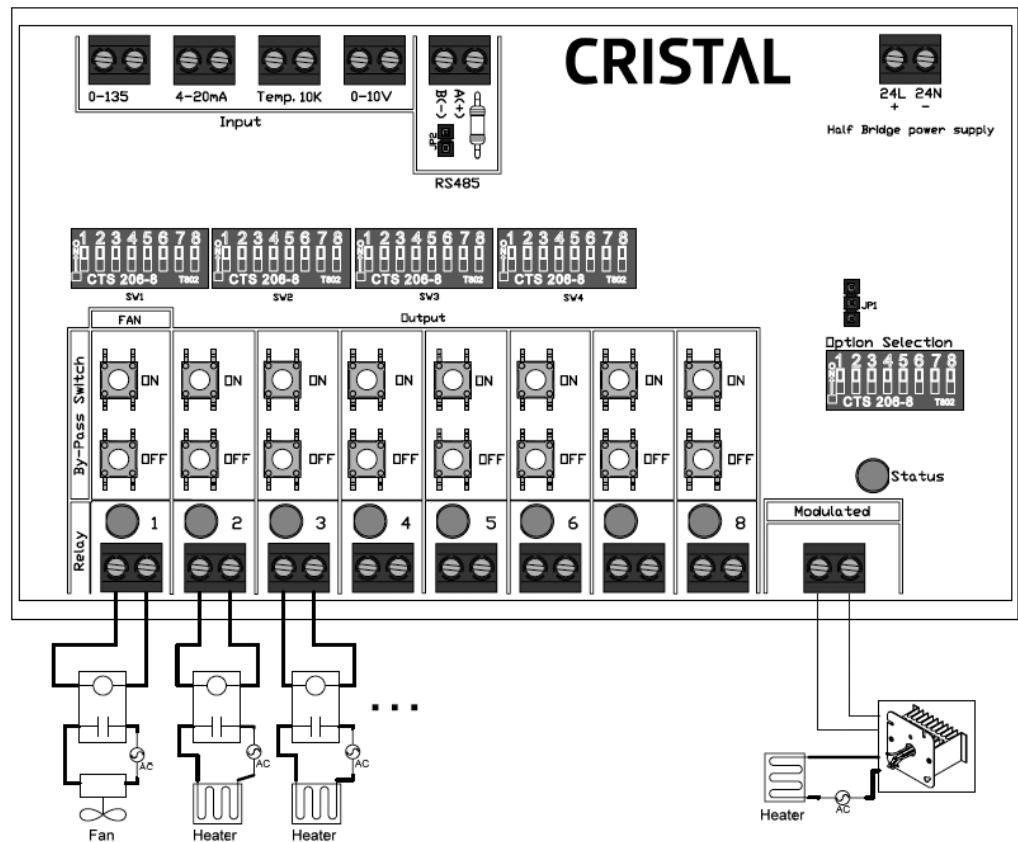
OPERATING CURVE

Without modulating output	With modulating	CCE-08 + modulating
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Step controller

Connection Diagram :



Adjustment procedure

For a proper set up of the CCE-08 look at :

http://www.cristalcontrols.com/produits_controle_controleur.html

Room thermostat BACnet MSTP

Room thermostat

Description

The Cristal Controls' CCTHV-407 is a thermostat that operates in standalone mode and also has an RS-485 communication port that supports the protocol BACnet MS/TP.

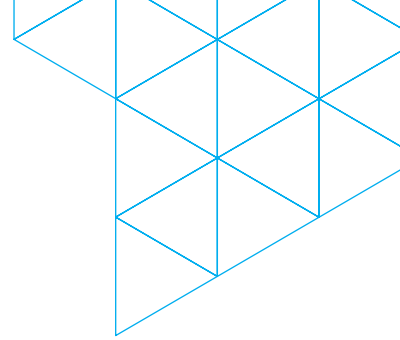
In standalone mode, the thermostat operates as a standard electronic thermostat (modulation of a 24 VAC output according to ambient temperature). A very complete algorithm can be fine tuned through a lot of configurations, which makes the CCTHV-407 a thermostat that adapts to all kinds of situations.

Features

- ▶ 4 dry contact outputs
- ▶ 2 triac outputs 24VAC
- ▶ 1 analog output 0-10 VDC
- ▶ 2 dry contact inputs
- ▶ 1 analog inputs 0-10 VDC
- ▶ 1 remote sensor input 10K
- ▶ 24 VAC low voltage supply
- ▶ RS-485 network communication
- ▶ Backlight on LCD display



CCTHV-407 Thermostat



Room thermostat

Models

Model number	Description
CCTHV-407-BAC	Thermostat supporting the BACnet MS/TP communication protocol
CCTHV-407-RS485	Lighter version of CCTHV-407 thermostat without relays output. Triac or 0-10VDC output only.
CCTHV-407-NC	Thermostat software controlling a local zone and another zone in a remote room.
CCTHV-407-A	Thermostats firmwares are available with the ModBus protocol. Contact your sales representative for details.

Technical specifications

Supply

- ▶ 18 – 24 VAC
- ▶ Consumption : 45mA typical, 80mA max.

Outputs

- ▶ 4 X contact type, 1A to 24 VAC
- ▶ 2 X triac type (500mA max. fuse limited)
- ▶ 1 X analog type 0-10 VDC (5mA max. fuse limited)

Inputs

- ▶ 2 X dry contact type (1 shared common)
- ▶ 1 X analog type 0-10 VDC (30K impedance)
- ▶ 1 X temperature input for 10K sensor (WS-100 of Cristal Controls)
- ▶ 1 X 0-10VDC input configurable to wide temperature reading ranges (0°C to 100°C or -50°C to 50°C).

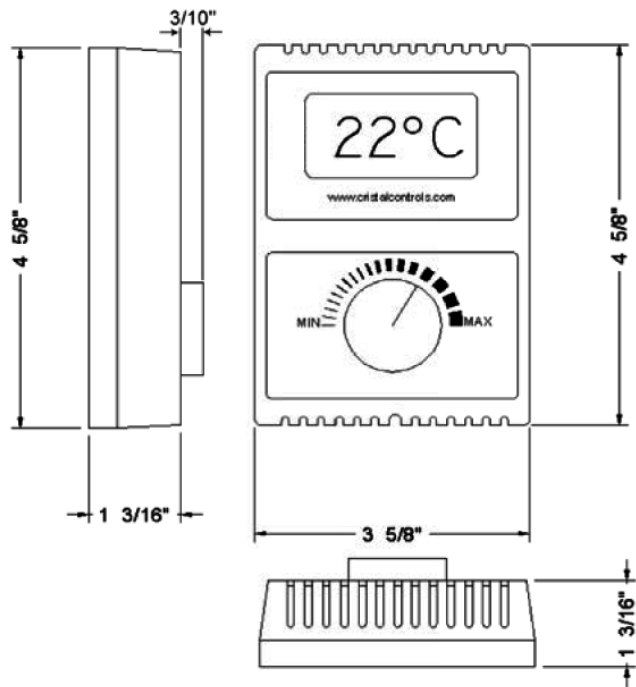
Environnement

- ▶ Operating temperature: 0°C to 40°C (32°F to 104°F)
- ▶ 0% to 95% RH noncondensing
- ▶ Storing temperature: -40°C to 85°C (-40°F to 185°F)
- ▶ Temperature reading's resolution: +/- 0,1°C (+/-0,2°F)
- ▶ Temperature setpoint's adjustable range: 15°C to 30°C (59°F to 86°F)

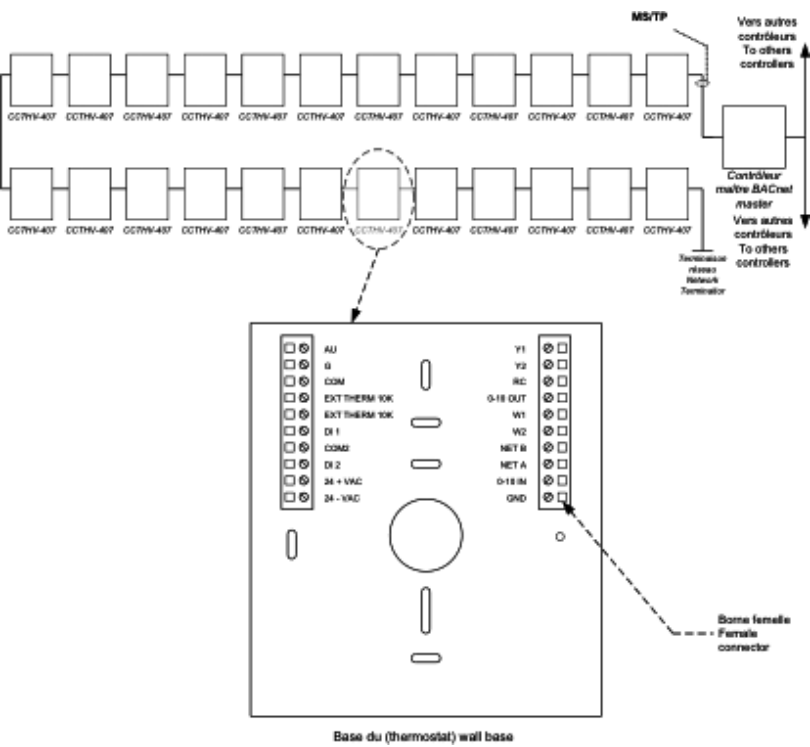
Programming

- ▶ Use BACnet Browser :
<http://www.cristalcontrols.com/download/file.php?id=BACnetBrowser&lang=fr>

Dimensions



Typical RS-485 MSTP network installation (model CCTHV-407)



NOTE : Typical installation of a CCTHV-407 thermostats' network (maximum of 31 per sub network) connected to a master controller.

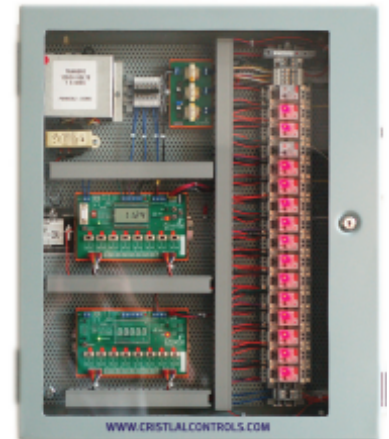
Peak Control Manager

LS-100 affordable peak control system

Description

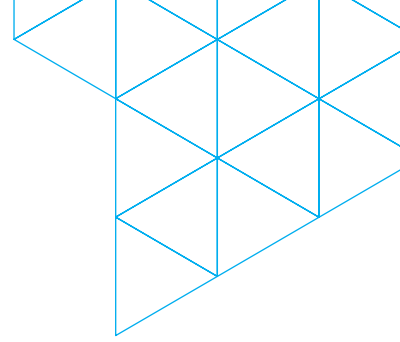
The LS-100 is a simple peak control manager. The LS-100 can be programmed using the master card buttons or using a PC. Once fully programmed the LS-100 controls the outputs in order to respect the desired set point.

- ▶ 8 outputs (Dry Contact)
- ▶ RS/232 Modbus communication
- ▶ Integrated time clock
- ▶ (AUTO/ON/OFF) by pass switch
- ▶ Load cycling 4 modes
- ▶ 12 set points (1 per month)
- ▶ Set point adjustment according to outdoor temperature
- ▶ Expandable to 16 outputs
- ▶ Models : Ls-100-08= 8 outputs
Ls-100-16= 16 outputs



Applications

- ▶ The LS-100 has been designed to monitor and control a building's maximum consumption. The LS-100 will shed the necessary loads in order to respect the desired consumption.
- ▶ In order to offer a maximum control over the shedding, the LS-100 offers 3 outputs selections: priority, cyclic, or not used.
- ▶ The LS-100 also offers a shedding pattern that takes into consideration the outdoor temperature. For example, when it is colder than a preselected outdoor temperature, the LS-100 will increase the allowed consumption level in order to accept new heating load into the management strategy.
- ▶ The LS-100 has an integrated calendar in order to use 12 different consumption set points (1 per month)
- ▶ The basic LS-100 has 8 outputs but can be expanded up to 16 outputs by adding an 8 outputs control card.



Peak Control Manager

Technical specifications

Power supply

- ▶ Dedicated 120-1-60 circuit

Inputs

- ▶ Outdoor sensor
(10K @ 25 °C, reference temp curve #1 of Dale, or #12 of Mamac, #2 of Bapi, #2 of Greystone)
- ▶ Working range : -44 °C to 35 °C, 1°C resolution
- ▶ One 0-5 Vdc current transformer for each phase

Outputs

- ▶ 8 or 16 x 1A @ 24 Vac, dry contact

Communication

- ▶ RS-232 modbus RTU .

Panel size

- ▶ Nema 1 24 x 20 x 4,62 Nema 1

LS2010 Energy management system

Description

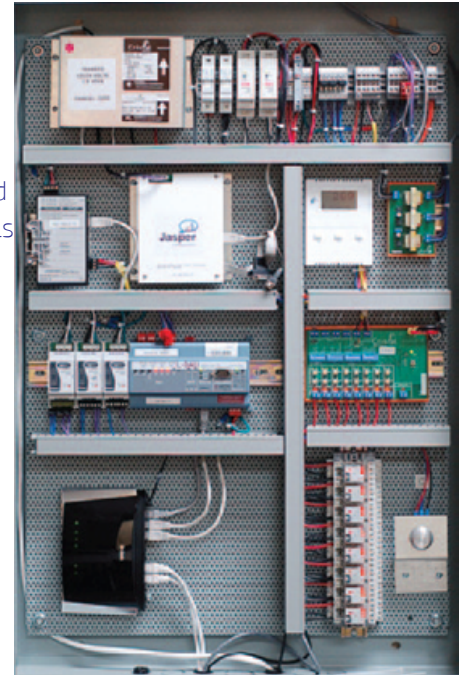
LS-2010 is Cristal Controls' most advanced peak and energy control manager. The LS-2010 is programmed with a Web application using Explorer, Safari or any recognized Web access. Once fully programmed the LS-2010 controls the outputs in order to respect the desired consumption set point, local temperature and schedules

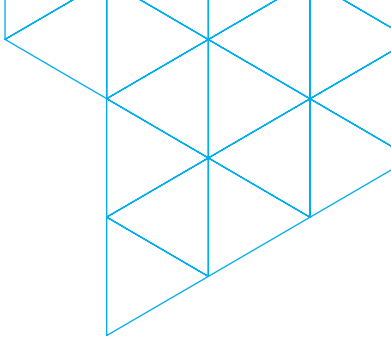
- ▶ Up to thousands outputs (Dry Contact or Pulse)
- ▶ Internet/Ethernet communication
- ▶ Integrated time scheduler
- ▶ Load cycling
- ▶ 12 set points (1 per month)
- ▶ Set point and pulse adjustment according to outdoor temperature
- ▶ Unlimited outputs
- ▶ Ready for wireless controls Winet®
- ▶ Models: LS-2010-XXX (XXX= number of outputs)

Applications

- ▶ LS-2010 has been designed to monitor and control a building's maximum consumption.
- ▶ LS-2010 will shed the necessary loads in order to respect the desired consumption.
- ▶ In order to offer maximum control over shedding, the LS-2010 offers output selections
- ▶ (refer to technical documentation).
- ▶ LS-2010 also offers a shedding pattern that takes into consideration the outdoor temperature. For example, when it is colder than a pre-selected outdoor temperature the LS-2010 will increase the allowable consumption level in order to accept new heating load into the energy management strategy.
- ▶ LS-2010 has an integrated calendar in order to use 12 different consumption set points (1 per month).
- ▶ Basic LS-2010 has 8 outputs but can also be expanded by increments of 8.
- ▶

Call us for more informations or specific applications





CCTMR

Gaz Fire Place Timer

Cristal Controls Electronic Timer benefits

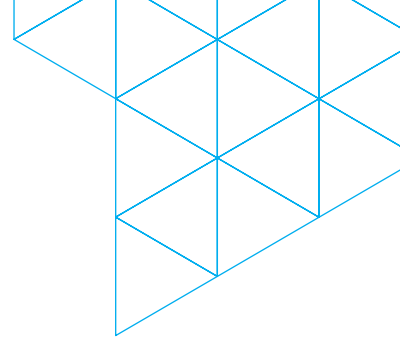
- ▶ Wall battery-powered timer
- ▶ To be used with thermopile gas control fire place
- ▶ No more forgotten on switch
- ▶ Save energy
- ▶ Battery Level Monitoring
- ▶ Easy to install
- ▶ Only two(2) wires to connect
- ▶ Use as a timed switch
- ▶ No noise
- ▶ Dimensions: 35/8 x 45/8 x 11/8 (inches)
- ▶ Use 3 x 1.5 volt AA batteries (included)
- ▶ Simply push the button to activate your fireplace

Fits a standard one gang electrical box

Selection	Duration
None	30 secondes (mode test)
J3	20 mins
J2	30 mins
J2 + J3	1 hour



Replace existing On-Off wall switches and noisy mechanical timers with this new state-of-the electronic timer.



CCTMR Gaz Fire Place Timer

Fireplace timer – Instructions

(updated : june 2009)

CCTMR V3.0 Operation

CCTMR Power consumption

- ▶ Current on Idle = 0.01 mA (monitored using a FLUKE 175 tester)
- ▶ Current on Idle using jumpers = 0.01 mA (monitored using a FLUKE 175 tester)
- ▶ Current with relay ON and LED ON = 3.70 mA
- ▶ Current with relay ON and LED OFF = 0.97 mA

Battery installation

- ▶ 3 x 1.5V (AA) alkaline Energizer industrial batteries recommended
- ▶ Follow installation steps indicated directly on the battery holder

Jumper selection chart

Selection	Duration
None	30 secondes (mode test)
J3	20 mins
J2	30 mins
J2 + J3	1 hour
J1	2 hours
J1 + J3	3 hours
J1 + J2	4 hours
J1 + J2 + J3	Manual

Operation Modes: Manual or Timed

Manual

Once the button is pressed :

- ▶ The relay contact closes and the GREEN LED will stay ON for 3 seconds.
- ▶ To shut off the CCTMR, press the button again. The relay will open (goes to OFF position) and the GREEN LED will blink 3 times.

Note: There is no time limit on manual mode..

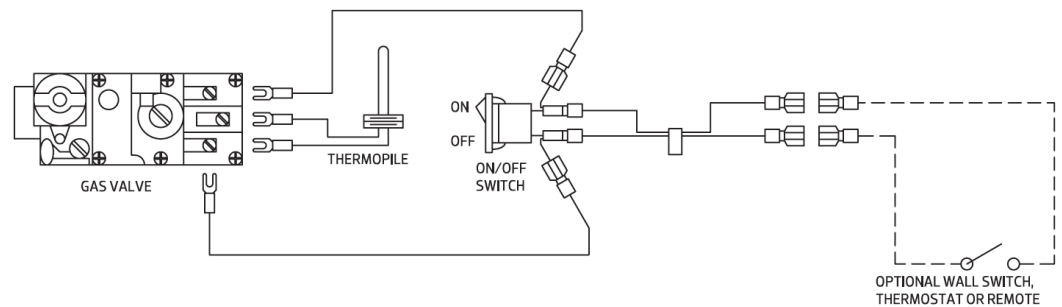
CCTMR Gaz Fire Place Timer

Timed

Once the button is pressed :

- ▶ The CCTMR timer start counting base on the jumper selection (see chart on previous page), the GREEN LED will illuminate for 3 seconds.
- ▶ If the button is pressed when the timer is in action, the relay will open (to OFF position) and the GREEN LED will blink for 3 times. This terminates the timing cycle.
- ▶ 10 minutes before the last count, the GREEN LED will start blinking steadily (one blink each second) until the unit goes to OFF position. If the button is pressed again during this time period, the unit overrides the remaining minutes and a new timing cycle will start –the relay will remain closed (ON position).

When the timer has expired (1 hour, 2 hours, 3 hours), the GREEN LED will go OFF. The relay will then open (going to OFF Position).



Battery conditions are displayed by the DUAL COLOR LED

GREEN – solid = Normal battery operating conditions – power level is fine

RED – solid = Low level (3.4v) – batteries will soon need to be replaced

RED – blinking = Low level (3.2v) – the device is automatically turned OFF

Battery conditions are displayed by the DUAL COLOR LED

Normal = Power level is fine, Led operate in GREEN

Low (<3.4V) = Batteries will soon need to be replaced, Led operate in RED

To Low (<3.2V) = The relay is automatically turned OFF, Led blinks for 5 times in RED

Battery Life Expectancy:

- ▶ Approximately 4.5 months, using alkaline Energizer industrial AA batteries (based on 4 x 1-hour cycles per day, 7 days a week)

2 Year Limited Warranty

Cristal Controls is committed to achieving the highest standards of quality for every lighting control and energy management product and system it makes. As such, it warrants to the original user that its products will be free from defects in materials and workmanship for a period of two years following the date Cristal Controls ships the product.

If any Cristal Controls product is found to be defective in material or workmanship during the applicable warranty period, Cristal Controls' liability shall be to repair or replace or refund the purchase price, at Cristal Controls' discretion. Cristal Controls' shall not be held liable for any costs or expenses, whether direct or indirect, associated with the installation, removal or re-installation of any defective product.

Cristal Controls' limited warranty shall not be effective unless there has been compliance with all installation and operating instructions furnished by Cristal Controls, or if the products have been modified or altered without the written consent of Cristal Controls, or if such products have been subject to accident, misuse, mishandling, tampering, negligence, or improper maintenance. Any warranty claim must be submitted to Cristal Controls in writing within the stated warranty period.

Cristal Controls' limited warranty is made in lieu of, and Cristal Controls disclaims all other warranties, whether expressed or implied, including, but not limited to, any implied warranty of the products.

Cristal Controls shall under no circumstances be liable for any direct, indirect, accidental, special, or consequential damage (including but not limited to, loss of profits, revenues, or business opportunities) or damage or injury to persons or property in any way related to the manufacture or the use of its products. The exclusion applies regardless of whether such damages are sought based on breach of warranty, breach of contract, negligence, strict liability in tort, or any other legal theory, even if Cristal Controls was notified of the possibility of such damages.

By purchasing Cristal Controls products, the purchaser agrees to the terms and conditions of this limited warranty.

