

Power-IO™

C Family of Solid State Contactors
Up to 100 Amps per channel
Universal 120 to 480 VAC switched
2 DC Control Inputs OR 1 Analog Input

- High density POWER-IO, up to two 100 amps channels per unit.
- 2 power channels for: 2 independent single phase loads, 2-leg break single phase loads, or 2-leg break 3 phase delta loads
- OR one 0-10 VDC ANALOG input for dual channel switching
- The analog input can generate ON/OFF/ON/OFF time proportional switching on a 1 second cycle time OR it can generate ON/OFF/ON/OFF based upon half sine waves. Half sine wave switching is used for fast responding loads, such as medium wave IR lamps, while still providing zero-crossing control for electronic noise free switching without expensive CE noise filters.
- Advanced diagnostics and ALERT output
- For 3 leg break 3 phase applications, install two units and achieve up to 100 amp switching on each leg in less than a 7x7x 8 inch cube.
- Replaces DC activated contactors
- Optically isolated for 4000 volt isolation
- International green input status LEDs for each channel
- Red LEDs for problem conditions
- International terminal markings
- 1400 volt transient blocking voltage
- Precise zero voltage turn-on for low EMI (electronic noise)
- Shorted SCR detection, even when the SCR is in the "OFF state" or "ON" state*
- Fourth generation **Maximum Surge Survival™** technology for triple-layer surge protection
- The integral Ultra Power Cooler™ heat sink offers optimum thermal performance in a minimum space (only 3.15 inches wide)
- Internal, oversized components + advanced design engineering capability = increased reliability, less thermal rise, and longer life
- Internal, rugged, snubber circuit and internal power MOVs for robust performance on all channels
- CE marked, RoHS lead free compliant, designed and manufactured in the USA
- Updated heat sink design, in 2023, is 18% more efficient



The C family is a **modular, intelligent power controller** that is designed to easily integrate into existing control systems. With flow-through power wiring and an overall, width of only 80 mm (3.15 inches), you have 2 power switching channels in less width than a typical 2 pole contactor. Large power terminals accept up to a 2 AWG wire while protecting your operators from exposed power connections. The 2 power channels offer 4000 volt isolation from each other, from each control input, and from the aluminum heat sink base.

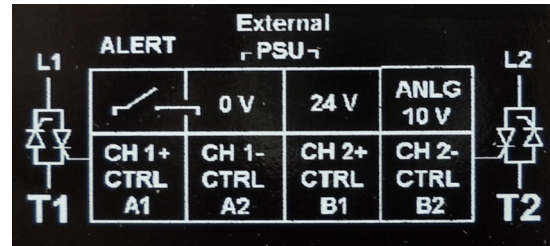
The internal diagnostic circuit continuously monitors the health condition of the contactor. An ALERT output is generated whenever a problem occurs so the operator or control system can take preventative measures immediately.

The C family has a bolt-on installation bracket, and a din rail clip can be added as needed. The integral Ultra Power Cooler™ heat sink is fan assisted in order to achieve maximum performance, even when installed in tightly packed electrical cabinets or warm industrial environments. The industry-standard 24 VDC fan is part of an internal temperature monitoring system that activates the fan as needed and provides a thermal shutdown of the inputs in case of excessive temperatures.

For applications requiring a heat sink outside of the electrical enclosure, the Ultra Power Cooler heat sink can be installed outside the cabinet, directly behind the Power-IO's modular contactor unit; such as in food processing facilities, PVC plastic manufacturing facilities, military or medical applications.

Control Input Wiring:

For two independent DC control input signals, the bottom four position terminal block accepts control input #1 and control input #2. Control signals are between 3-32 VDC and greater than 2 mA. The low mA requirement is very beneficial with smaller control systems, PLCs, and USB outputs from a PC based control system. Terminals A1 and A2 are the control inputs for Channel 1 (L1 to T1 switching). Terminals B1 and B2 are the control inputs for Channel 2 (L2 to T2 switching).



The upper 4 position terminal block is used for the external 24 VDC power supply connection, using screw terminals 2 and 3. The power supply powers the fan and Alert diagnostics. The fan is activated by an internal temperature measurement circuit, as needed. In case of thermal overload, the inputs will be disabled and a red LED will illuminate until the condition is corrected.

The diagnostics are always active, even when the two control inputs are “OFF”. The ALERT output can be used independently or connected in parallel with other C Family units. The ALERT can be connected to a Power-IO HDA “hockey puck” solid state relay; or connected to a PLC as a “sinking” control input; or to a PC based application. When the Alert is active, screw terminal 1 sinks to zero.

For 3 phase applications or any other “simultaneous multi-leg switching application”, you can install external jumper wires so that control #1 and control #2 activate and deactivate at the same time.

If the internal jumper is set for analog input, the software ignores A1, A2, B1 and B2. A 0-10 VDC analog input + is connected to ANLG 10V. Analog 0 VDC is connected to 0V.

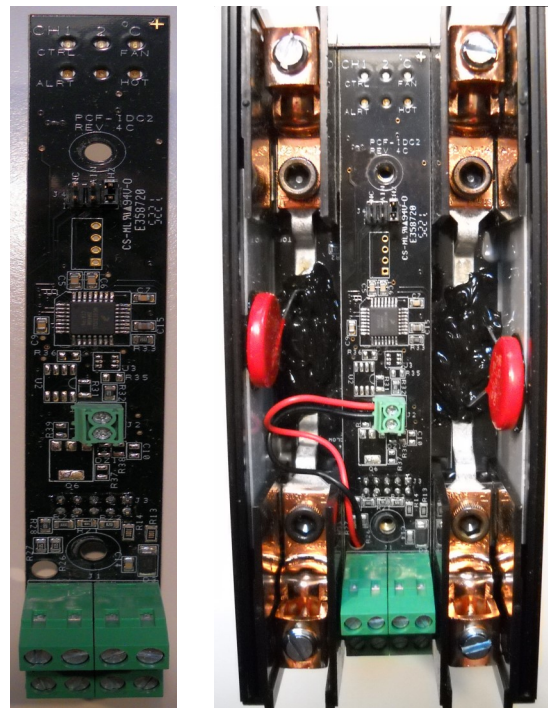
Do not use the control input terminals for other purposes. Either use ON/OFF inputs on A1, A2, B1 and B2 or use an analog input on ANLG 10V.

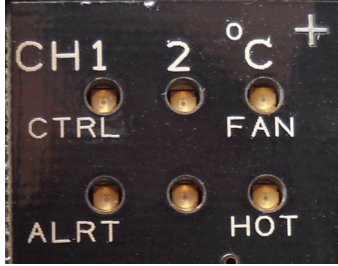
Internal Construction:

The safety cover should ONLY be removed by Power-IO trained and authorized personnel.

The control input board is field replaceable as an IDC2 (Input DC, 2 Channel), IAC2, and other input combinations. The fan wiring is factory installed to the mid-board, 2 position connector. The DC activated fan is a standard 80mm size fan.

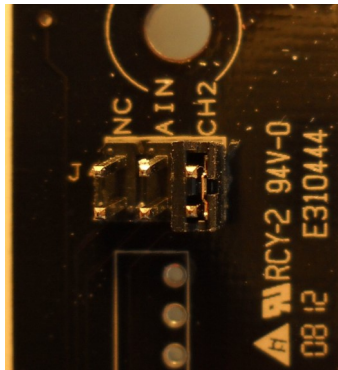
The red MOVs are standard but they can be removed for 600 VAC Canadian installations.





6 Diagnostic LEDs:

- GREEN Channel 1 control input “ON”
- GREEN Channel 2 control input “ON”
- GREEN Internal temperature measurement requests fan “ON”
- RED Channel 1 Alert, problem with channel 1
- RED Channel 2 Alert, problem with channel 2
- RED Hot, unit in thermal shutdown, inputs disabled until cooled down

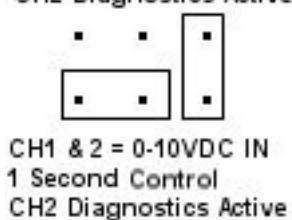
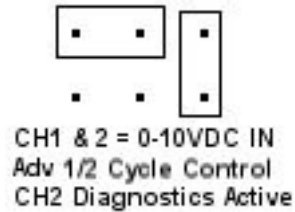
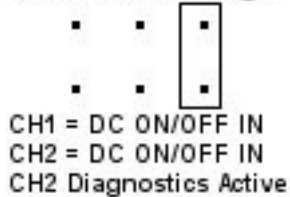


Jumper Selection:

The factory default is shown. This provides:
 Channel 1 is accepting a 3-32 VDC ON/OFF/ON/OFF signal
 Channel 2 is accepting a 3-32 VDC ON/OFF/ON/OFF signal
 The ALERT diagnostics are active on both channels.

If you are not using channel 2 (such as a spare channel), remove the default jumper from pins 3 and 6. The channel 2 alert diagnostics will be disabled, since the channel is unused.

Default Config:



Analog Input Jumper Selection:

To convert the CZ2H-IDC2 to accept one analog 0-10 VDC signal, insert a jumper on either pins 1 & 2 or pins 4 & 5. By selecting the analog input feature, both power switching channels will follow the requested output % level. The ON/OFF/ON/OFF PWM output is zero-crossing for electrically noise free performance.

For very fast responding loads, IR lamps, reduced flicker loads:

Pins 1 & 2 will provide an ultra high speed power switching capability, based upon half sine wave calculations. For example:

- 3.3 V control signal = 33% = 1 half sine wave ON, 2 half sine waves OFF
- 5 V control signal = 50% = 2 half sine wave ON, 2 half sine waves OFF
- 6.0 V control signal = 60% = 3 half sine wave ON, 2 half sine waves OFF

For traditional loads, simple resistive heater loads:

Pins 4 & 5 will provide power switching capability based upon a 1 second overall cycle time. For example:

- 3.3 V control signal = 33% = 0.33 seconds ON, 0.66 seconds OFF
- 5 V control signal = 50% = 0.5 seconds ON, 0.5 seconds OFF
- 6.0 V control signal = 60% = 0.6 seconds ON, 0.4 seconds OFF

In a 60 Hz power line, there are 120 half sine waves per second, that can be turned ON/OFF/ON/OFF cleanly at the zero crossing mark. The Power-io analog input switching algorithm calculates this amount.

For the “one second” cycle option; 5V = 30 sine waves ON, 30 sine waves OFF, 30 ON, 30 OFF,

For the ultra, high speed, half sine wave method, the Power-io delta-sigma algorithm also monitors the accumulated energy supplied to the load. Additional half sine wave ON or OFF pulses can be added to the output in order to achieve the most accurate power percentage output, with the highest level of power precision, while using the fewest number of half sine waves. The algorithm alternates the first half sine wave of conduction compared to the polarity of the previous half sine wave, in order to reduce “DC Component” on the power line. This Power-io method provides performance that is “near phase angle” in power control performance but no phase angle noise, phase angle noise filters, or other expensive problems.

Model Numbers	DC Control input	CZ2H-IDC2
Number of Power Switching Channels		2

Output Specifications (All shown at 40°C)

Operating Voltage (47-63 Hz) [Vrms]	24-480 volts switched, nominal
Max Load Current [Arms]	100 amps/channel
Min Load Current [Arms]	0.25 amps
Maximum Motor Starter Size, Single Phase * (< 30 FLA / Leg)	2 HP @120vac, 5 HP@230vac, 8HP @460vac,
Maximum Motor Starter Size, 3 Phase, Using 2 of CZ2H Models *	4 HP@120vac, 7.5 HP @230vac, 15HP @460vac
* Confirm The Maximum Motor Inrush, <180 Amps for 2 Seconds	
Transient Overvoltage [Vpk]	1400 volts
Max Surge Current for 16.7ms [Apk]	1510 amps
Max On-State Voltage Drop @ Rated Current [Vpk]	1.2
Max I ² T Per Channel	9,800 Itsm ² x 10mSec
To protect SCR from most shorts, use fuse with an I ² T clearing specification less than 25% of the SCR	
Max. Off-State Leakage @ Rated Voltage [mArms]	15mA
Min Off-State dv/dt @ Max Rated Voltage [V/μsec] *	>3000
* High dv/dt values = better false triggering protection	
Max Turn-On Time	1 sinewave, max imbalance = 1/2 sinewave
Max Turn-Off Time	1 sinewave, max imbalance = 1/2 sinewave
Recommended I ² T fuse (AC-1, resistive loads)*	Power-io FUSE-EXT-22-100, FWP-100A22F, or equivalent
* Contact Power-io for I ² T fuses for AC-3, high inrush, or inductive loads	

Input Specifications (All shown at -40°C to +85°C)

DC Control Input Voltage Range	3-32 VDC, 2mA each
Min Turn-Off Voltage	1 VDC / 0.5mA
Control inputs are current limited (consistent mA) and include the green "input status" LED requirements	
Analog input	0-10 VDC, 48k ohms typical
Input Thermal Shutdown Temperature	105C Typical
Input Thermal Shutdown Recovery Temperature	90C Typical

Alert Output Specifications

Open Collector	32 V Max, -8mA max
Onstate Saturation Voltage (Vdrop)	<2 volts
Compatible with Power-IO Products Such As:	Models HDA, or HDD SSRs: OR a PLC sinking input card

External Power Supply Specifications

	Standard 24 VDC Power Supply, +/- 15%
For example: www.power-io.com/products/powersupply.htm	This 75 watt unit is ideal for up to 25 CZ2H contactors

Fan Specifications (Premium, Dual Ball Bearing Fan)

Standard Fan Voltage Requirement *	24 VDC +/- 15%, 150mA
* contact Power-io for other voltage fans	
Size	Industry Standard, 80 x 80 x 25mm, Field Replaceable
L 10 rating	100,000 hours, 40 degrees C intake temperature
MTBF	300,000 hours

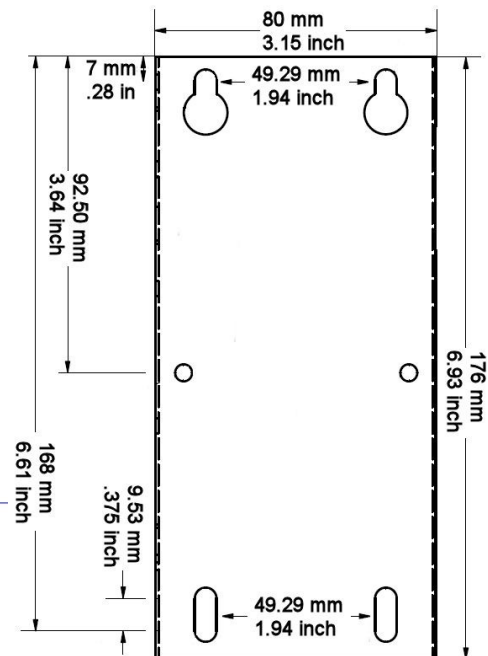
General Specifications

Dielectric Strength: Inputs-Output 1-Output 2-Base	4000 Vrms
Dielectric Strength: Inputs 1-Input 2-Power Supply	1500 Vrms
Ambient Operating Temperature Range	-40°C to 85°C, when used with unrestricted air flow
Ambient Storage Temperature Range	-40°C to 125°C
Power Terminal Wire Size (Copper Wire Only)	2-8 AWG, torque to 40-50 in/lbs
Control Input or Fan Wire Size	12-24 AWG, torque to 3-6 in/lbs
Approvals, Country of Origin	CE, RoHS, Made in the USA
Shipping	3.8 lbs weight typical.

Power-IO™

C Family of Solid State Contactors
Up to 100 Amps per channel
Up to 480 Vac switched

Recommended mounting:



For surface mounting installations: drill and tap for # 10 screws.

For standard 35mm din rail installations: firmly attach the din rail to the sub-plate every 100-150mm. Clip the CZ2H-IDC2 on the top of the din rail, push down on the unit, and push in, to clip the bottom of the din rail. The din rail clip adds 9.5 mm (.375 inches) to the total depth dimension.

Leave a minimum of three inches above and below the unit for air circulation and wire routing. If multiple C Family units are installed next to each other, the horizontal spacing requirement is one inch for those units. Using the din rail clip provides additional air-flow cooling capability.

FAQ answers:

- 1) The power switching channels are totally independent. They do not have to be wired to any particular phase.
- 2) The power connection terminals are standard, copper, Panduit electrical connectors for 2-8 AWG wire. The wire should be prepared in accordance with all recommendations from Panduit. Only use copper wire for connections.
- 3) All systems require fuses or circuit breakers in accordance with local electrical codes. In addition, an I²T fuse is a special, high speed semiconductor fuse that protects the solid state contactor.

Custom products:

Power-IO is also able to produce solid state relays for other amperage ranges, control inputs, line frequencies, or voltage ranges.

Precautions:

The products that are designed, manufactured, or sold by POWER-IO are intended to be installed and serviced by trained personnel. In addition, there are local, national, factory, and other regulations (sometimes referred to as the National Electrical Code, NEC, OSHA, or equivalent) that must be strictly followed during the installation and use of any POWER-IO product. Failure to follow all of these regulations can result in downtime, damage, injury, or death. It is important that the customer anticipate the temperature requirements of the product. To ensure the longest possible life, it is customary that the electrical design not exceed 80% of the max amperage for relays, circuit breakers, fuses, wiring and other electronic components in an installation, when at the full operating temperature. Power-IO warrants its products for a period of 1 year from the date of manufacture to be free from defects in both workmanship and materials. See www.power-io.com for further information.