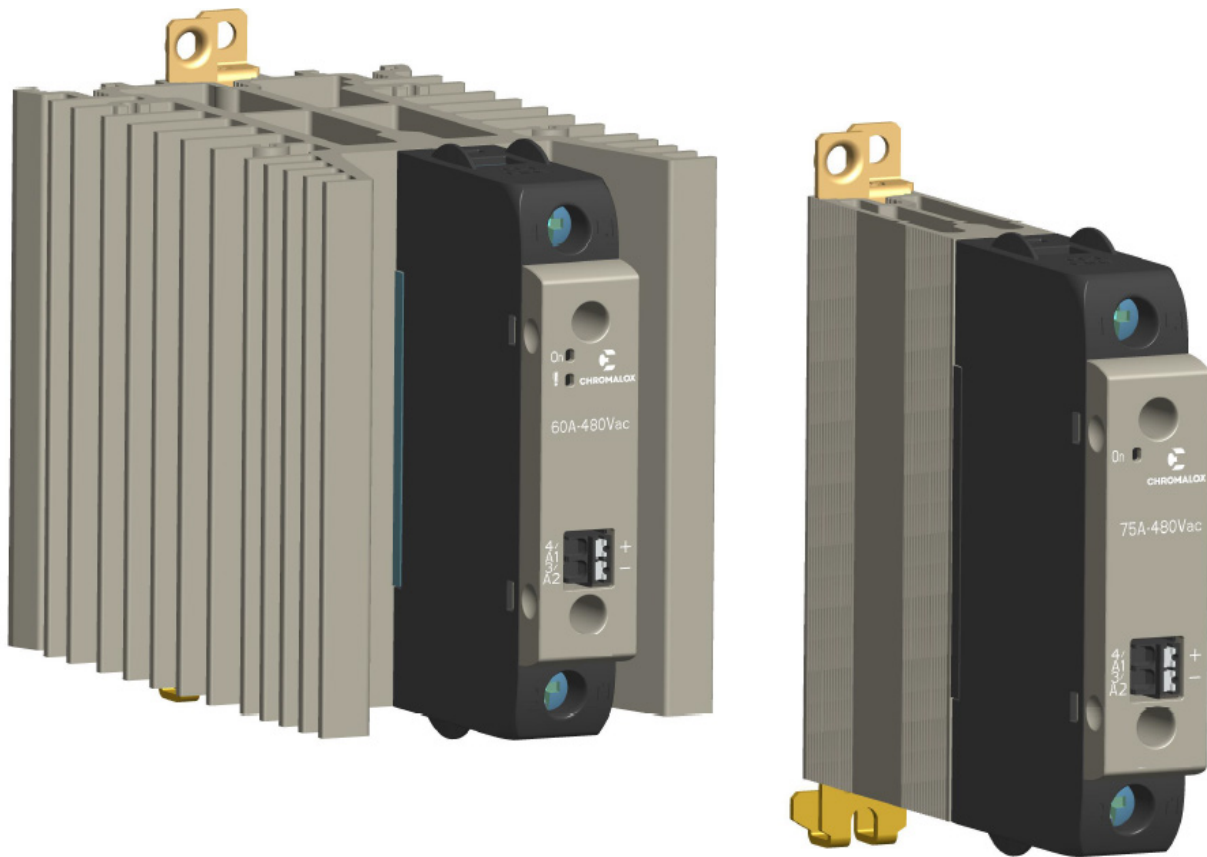


Installation & Operation Manual

C1ZF Series Single Phase Solid State Relays



| <u>Section</u> | <u>Page</u> |
|--|-------------|
| Important Safeguards | 2 |
| General | 6 |
| Installation & Operation | 6 |
| Dimensions & Weights .. | 8 |
| Connections & Descriptions..... | 9 |
| LED Status Description..... | 11 |
| Connection Examples | 12 |
| Single Phase Load..... | 12 |
| Controlling 2 Phases (Legs) of a Three Phase (no Neutral), Wye(Star)orDeltaLoadConfiguration..... | 12 |
| Three Phase Load in a Wye or Star Connection with Neutral..... | 13 |
| Optional Alarm Wiring (Alarms available on C1ZF Models > 40 Amps) | 13 |
| Specifications..... | 15 |
| General..... | 15 |
| Inputs..... | 15 |
| Outputs..... | 16 |
| Environment Conditions..... | 16 |
| Alarm Output..... | 16 |
| Alarm Behavior..... | 16 |
| IntegratedThermalProtection..... | 16 |
| DeratingCurves..... | 17 |
| Table of Terminals & Conductors..... | 18 |
| Ordering Information..... | 19 |
| Service Contact Information | 20 |

Safety Precautions

IMPORTANT SAFEGUARDS



Safety precautions should always be followed to reduce the risk of fire, electrical shock, injury and even death to persons.

Please read all instructions before operating the Control Panel.



To avoid electrical shock or injury, always remove power before servicing a circuit. Personnel working with or near high voltages should be familiar with modern methods of resuscitation. Contact an area supervisor or safety personnel for more information.

⚠️ WARNING



HIGH VOLTAGE is used in the operation of this equipment; DEATH ON CONTACT may result if personnel fail to observe safety precautions.

Learn the areas containing high-voltage connections when installing or operating this equipment.

Be careful not to contact high-voltage connections when installing or operating this equipment.

Before working inside the equipment, turn power off and ground all points of high potential before touching them.

⚠️ WARNING



ELECTRIC SHOCK HAZARD. Any installation involving control equipment must be performed by a qualified person and must be effectively grounded in accordance with the National Electrical Code to eliminate shock hazard.

Before Powering Up

Chromalox takes great pride in knowing that we have provided to you a product of premium quality and workman-ship. We have taken every precaution to ensure that your equipment arrives safe and secure.

However, vibration and temperature changes during shipping can cause some components to become loose. Additionally, throughout the life span of this product, other environmental and application conditions may have affected the mechanical and electrical continuity of several internal components. Therefore, for your safety and overall product performance, please take the time to familiarize yourself with the **MAINTENANCE, OPERATION, AND INSTALLATION INSTRUCTIONS** technical manual that was shipped with your panel.

Since it is not uncommon for electrical wiring and mechanical connections to become slightly loosened during shipment, we ask that you pay particular attention to the section titled Wiring and Connections:

WIRING AND CONNECTIONS



Check wiring and connections as follows:

- a. Inspect wiring for wear, fraying, chipping, nicks, and evidence of overheating. Repair minor defects with a good grade of electrical tape, or replace if needed.
- b. Inspect for loose electrical and mechanical connections. Tighten or replace defective crimp-style lugs. Re-solder loose solder connections. Tighten or replace all loose or missing hardware.

C1ZF - Single Phase Solid State Relay Power Controller

PLEASE READ THIS MANUAL AND THE SAFETY WARNINGS CAREFULLY BEFORE INSTALLING AND USING THE CONTROLLER AND SAVE IT FOR FUTURE USE.

General

The C1ZF Series of solid state relays are an ideal, low cost power control solution for switching resistive loads found applications in such as furnaces, ovens, heat treating, injection molding, thermoforming, press platens, commercial food equipment, semiconductor, lighting and drying, just to name a few.

Installation & Operation

⚠WARNING

The owner/installer must provide all necessary safety and protection devices and follow all current electrical wiring standards and regulations. Failure to do so may compromise the integrity of the controller and /or cause product failure resulting in a safety risk to operational and service personnel.

⚠WARNING

This controller utilizes a heat sink which is designed to cool the unit during operation. Under no circumstance should air flow around the controller be compromised in any way. Failure to do so may result in the overheating of the controller, product failure, product temperatures and even fire.

⚠WARNING

During continuous operation, the heat sink can reach very high temperatures, and keeps a high temperature even after the unit is turned off due to its high thermal inertia.

Higher voltages may be present. DO NOT work on the power section without first cutting out electrical power to the panel. Failure to do so may cause serious injury or death.

The C1ZF Series power controllers feature:

- The C1ZF Series power controllers feature:
- Rugged, industrial design & touch-safe exterior
 - Conservative, continuous service ratings at 40°C
 - Up to 120 Amps and up to 600 VAC
 - AC and DC Voltage command signals
 - Zero cross firing
 - Integrated heat sink
 - SCR thermal protection with LED indication
 - Optional over temperature alarm
 - Optional load / line interrupt alarm
 - USA & Canadian UL component recognition
 - CE conformity

Ground Fault Equipment Protector (GFEP)

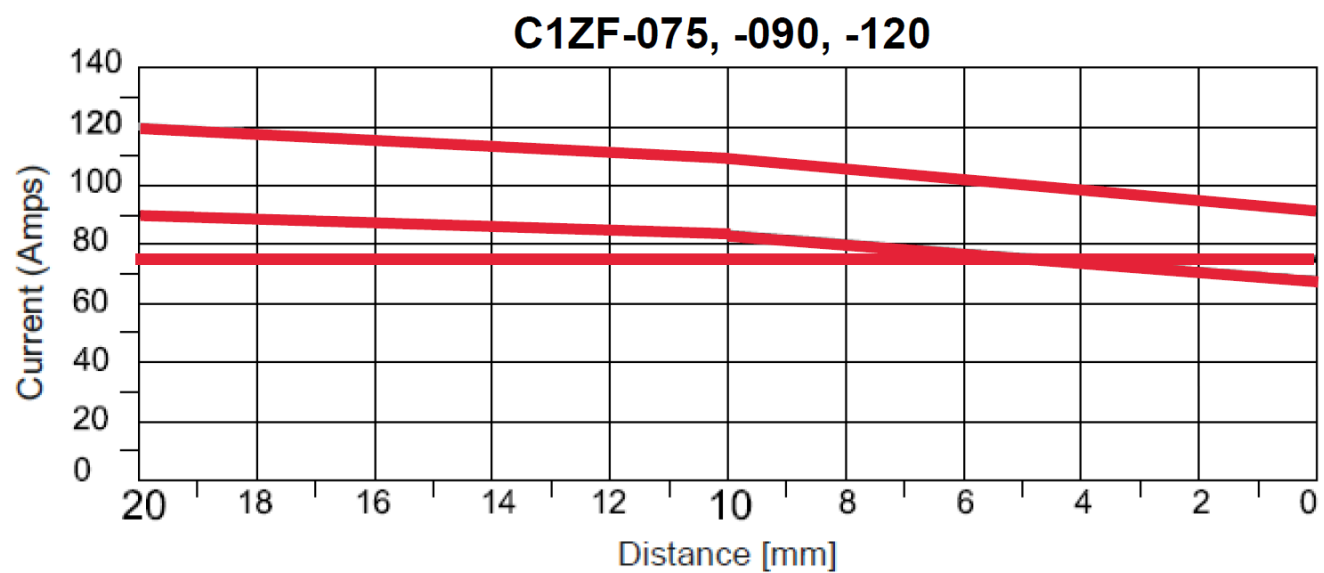
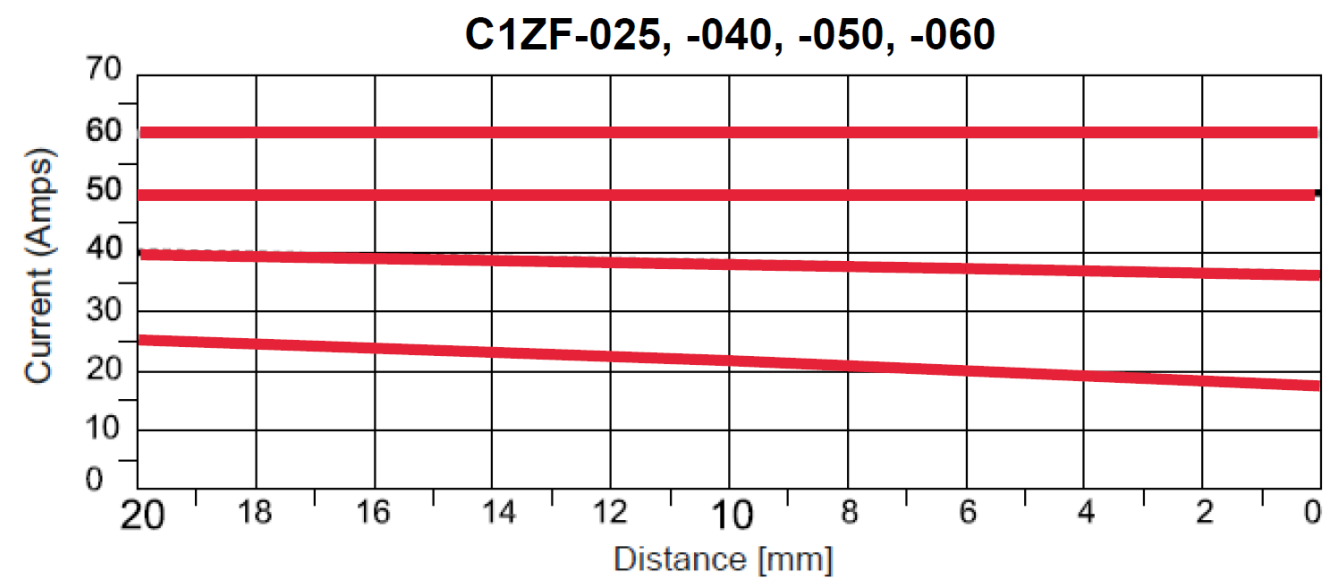
To ensure proper performance, maximum safety and reliability, it is essential to install the unit correctly. This includes proper mounting, spacing, hardware and wiring. See below:

1. Maximum surrounding air temperature is 40°C in “Open Type Equipment” which is suitable for use in pollution degree 2.
2. Install the unit vertically (max 10° inclination from vertical axis).

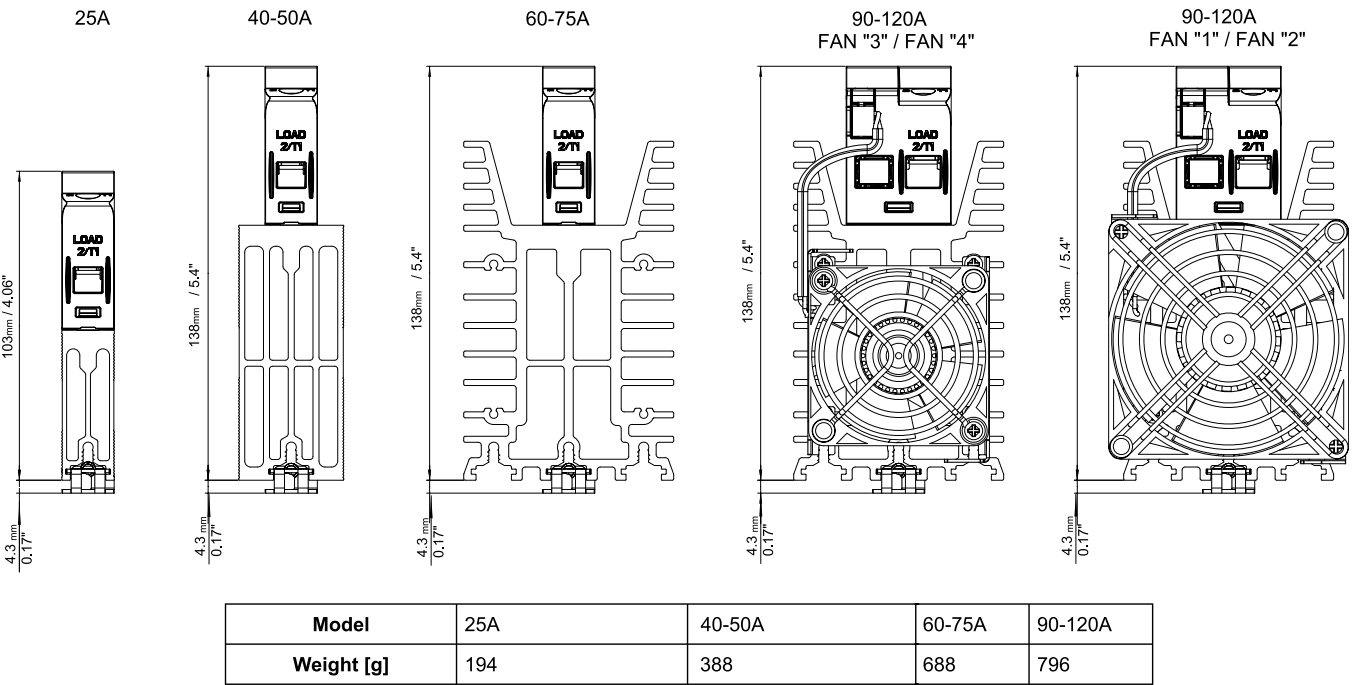
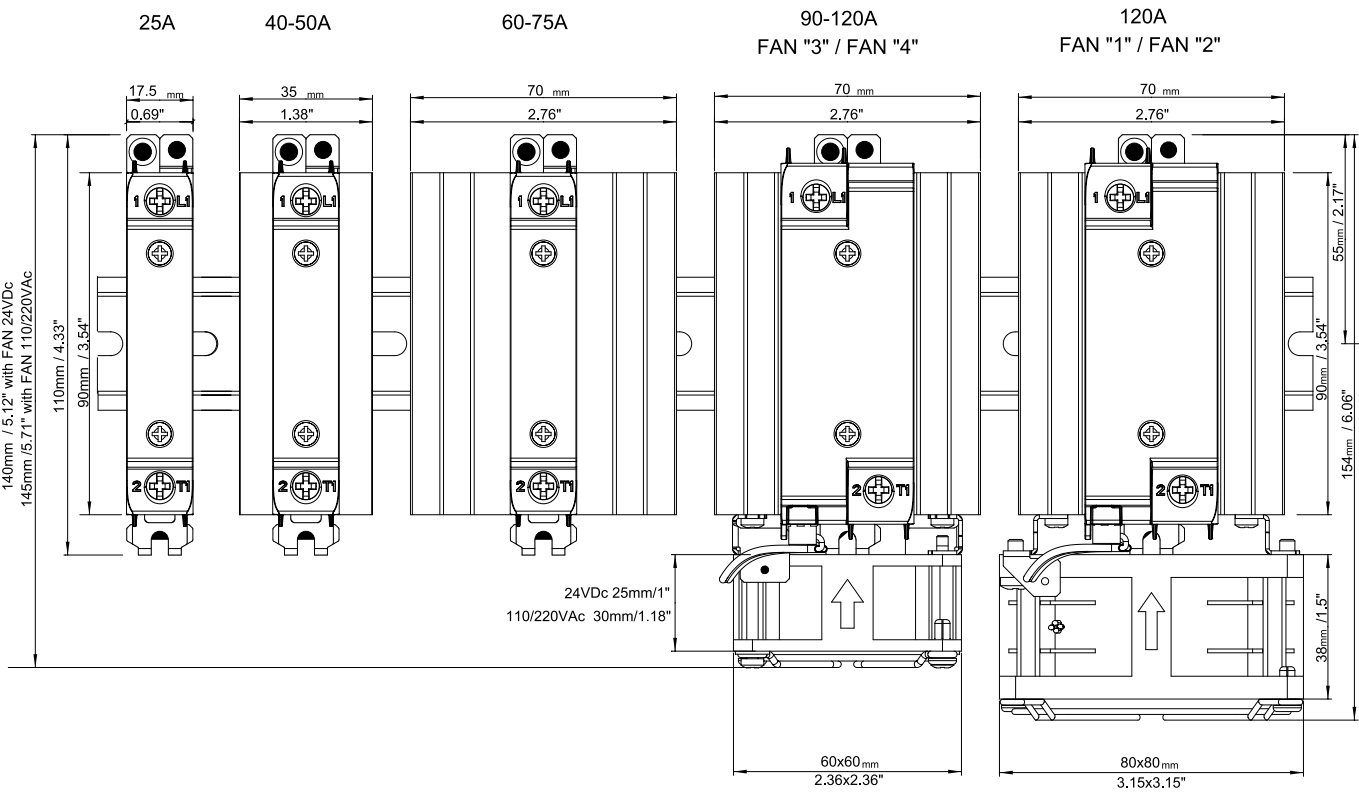
Spacing:

- Minimum vertical distance between unit and panel wall: 3.94” (100 mm)
- Minimum horizontal distance between unit and panel wall: .79” (20 mm)
- Minimum vertical distance between adjacent power control units: 3.94” (100 mm)
- Minimum horizontal distance between adjacent power control units: .79” (20 mm)

Derating by Installation Distance:

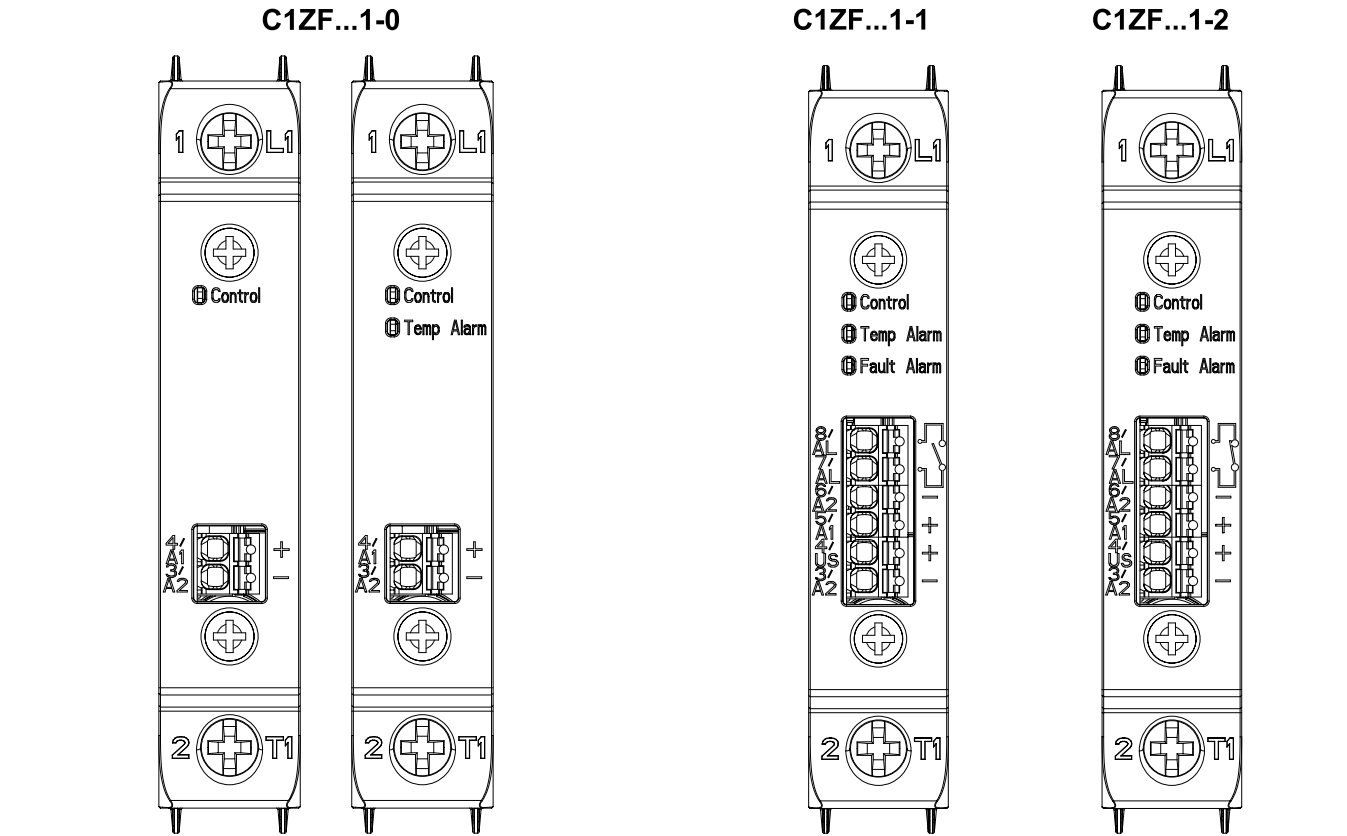


Dimensions & Weight



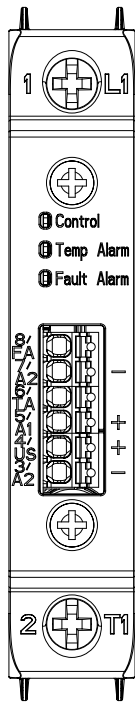
Notes:
The dimensions are representative of all models of the series
(command “1” type, “2” type and with options)

Connections & Descriptions

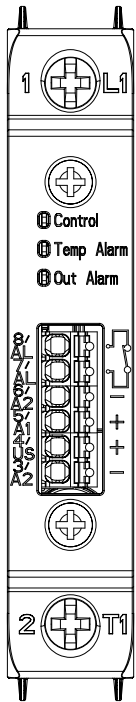


| Description of terminal/connector versions with type “1” input | | | |
|--|---|--|---|
| Power terminals (common to all versions) (Overvoltage Category III) | | | |
| Rif. | Description | Notes | |
| 1/L1 | Line Connection | | |
| 2/T1 | Load Connection | | |
| Signal connector version without options (C1ZF...1-0) (Overvoltage Category II o III) | | | |
| 3/A2- | GND Control input ON/OFF | Control input ground | |
| 4/A1+ | Vdc control input ON/OF | Range from 6 to 32 Vdc, Imax <9 mA a 32V | |
| Signal connector version with options “1” and “2” type (C1ZF...1-1/2) (Overvoltage Category II o III) | | | |
| 3/A2- | GND for power supply and control input ON/OFF | Ground for power supply and control input ON/OFF | |
| 4/Us | Vdc power suppl | Power supply C1ZF (Range from 6 to 32 V DC, Imax < 14 mA at 32V C1ZF 90..120A-..FAN "4": Power supply C1ZF Fan (Range from 20 to 27 V DC, Imax <150 mA at 24V with Fan active) | |
| 5/A1+ | Vdc control input ON/OFF | Range: ON from 5 to 32Vdc, Imax <0,5 mA a 32V OFF< 1,8V | |
| 6/A2- | GND Control input ON/OFF (common to terminal 3/A2-) | Additional connection to be used only as GND for the control signal | |
| | | Version with option 1 | Version with option 2 |
| 7/AL | Alarm output: - Interrupted load - Line voltage absent - Overtemperature | Solid state N.O. contact Imax =150mA Vmax = 30 V DC/25V AC Z closed < 1 Z open > 1 M | Solid state N.C. contact Imax = 50mA Vmax = 30 Vdc/25Vac Z closed < 15 Z open > 1 M |
| 8/AL | | | |
| Note: The connections are also representative of 90-120A models For terminals and conductors to be used, see the table on page 14 | | | |

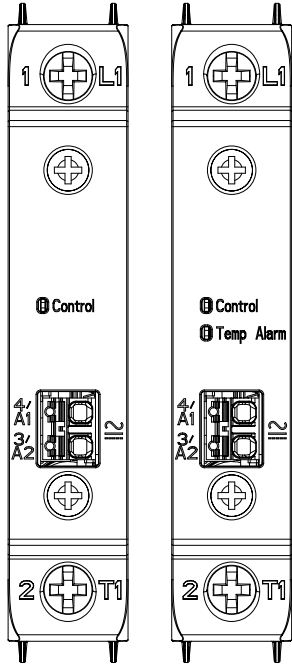
C1ZF...1-3



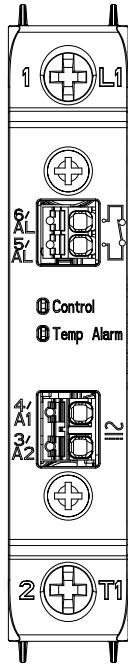
C1ZF...1-5



C1ZF...2-0



C1ZF...2-5

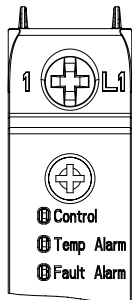


| Description of terminal/connector versions with type “1” input | | |
|--|---|--|
| Signal connector version with option type “3” (C1ZF...1-3) (Overvoltage Category II o III) | | |
| Rif. | Description | Notes |
| 3/A2- | GND for power supply and control input ON/OFF | Ground for power supply and control input ON/OFF |
| 4/US | Vdc power suppl | Power supply C1ZF (Range from 10 to 32 Vdc, I _{max} < 14 mA a 32V) C1ZF 90..120A-..FAN "4": Power supply C1ZF Fan (Range from 20 to 27 V DC, I _{max} <150 mA at 24V with Fan active) |
| 5/A1+ | Vdc control input ON/OFF | Range: ON da 5 a 32Vdc, I _{max} <0,5 mA a 32V OFF< 1,8V |
| 6/TA | Overtemperature alarm output | PNP output normally not active (1) I _{max} =150mA Vout: V DC power supply -1V |
| 7/FA | Alarm output: interrupted load or line voltage absent | PNP output normally not active (1) I _{max} =150mA Vout: V DC power supply -1V |
| 8/A2- | GND Control input ON/OFF (common to terminal 3/A2-) | Additional connection to be used only as GND for the control signal |
| Alarm output connector version with type “5” option (C1ZF...1-5) (Overvoltage Category II o III) | | |
| 3/A2- | GND for power supply and control input ON/OFF | Ground for power supply and control input ON/OFF |
| 4/Us | Vdc power suppl | Power supply C1ZF (Range from 6 to 32 V DC, I _{max} < 14 mA at 32V) C1ZF 90..120A-..FAN "4": Power supply C1ZF Fan (Range from 20 to 27 V DC, I _{max} <150 mA at 24V with Fan active) |
| 5/A1+ | Vdc control input ON/OFF | Range: ON from 5 to 32Vdc, I _{max} <0,5 mA a 32V OFF< 1,8V |
| 6/A2- | GND Control input ON/OFF (common to terminal 3/A2-) | Additional connection to be used only as GND for the control signal |
| 7/AL | Overtemperature alarm output | Solid state N.C. contact I _{max} = 50mA V _{max} = 30 Vdc/25Vac Z closed < 15 Z open > 1 M |
| 8/AL | | |

(1): The normally inactive PNP outputs can be connected to each other and obtain a single alarm output

Note:
The connections are also representative of 90-120A models
For terminals and conductors to be used, see the table on page 14

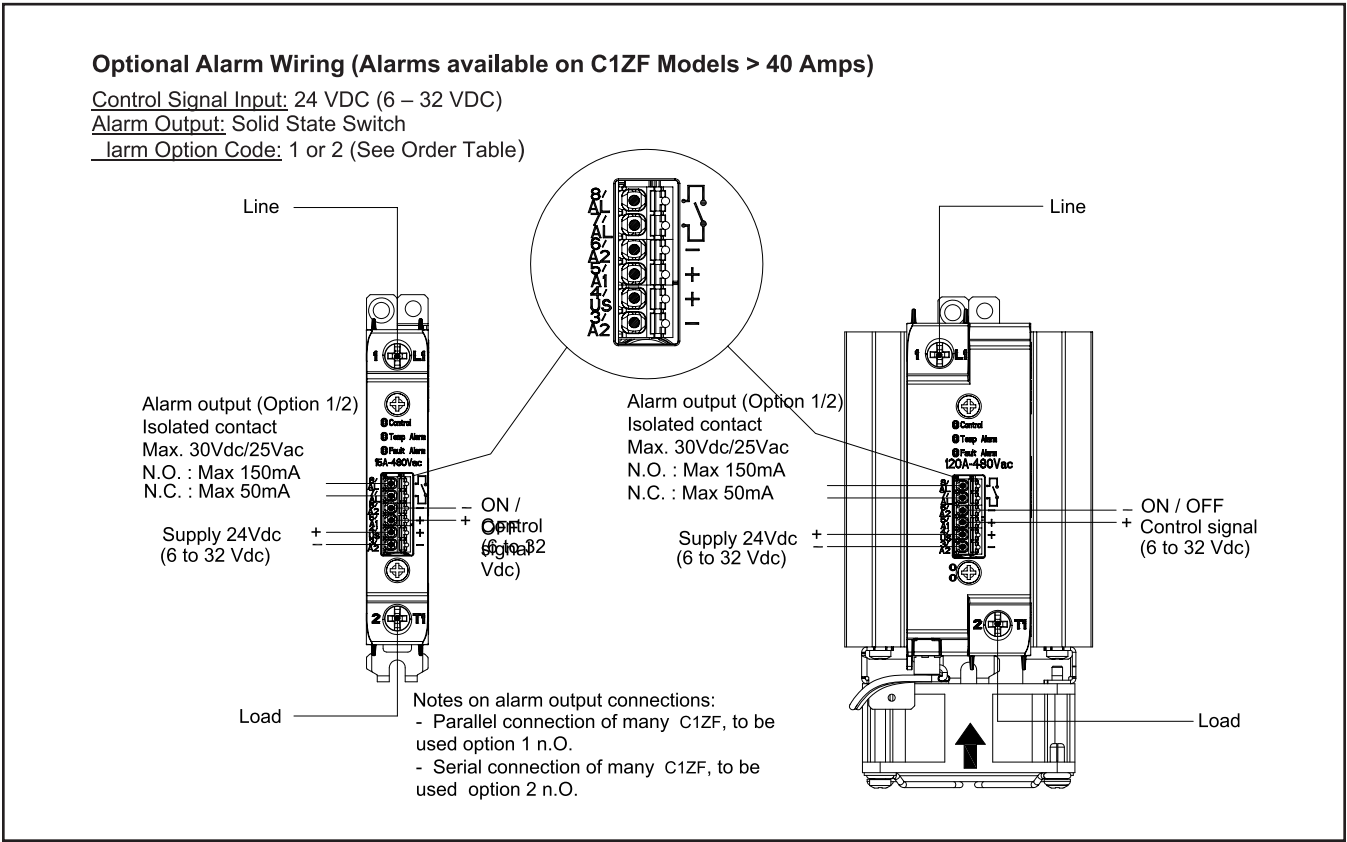
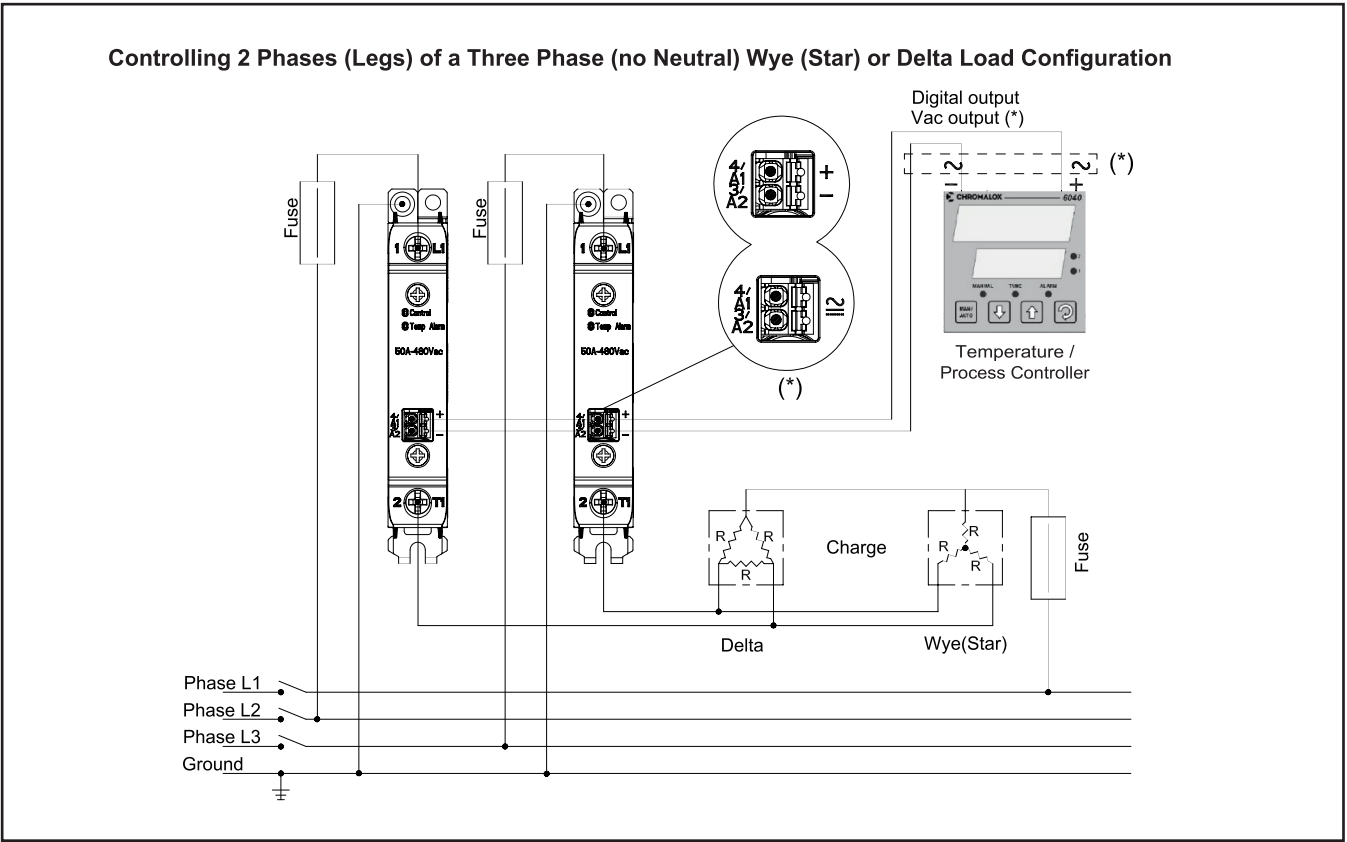
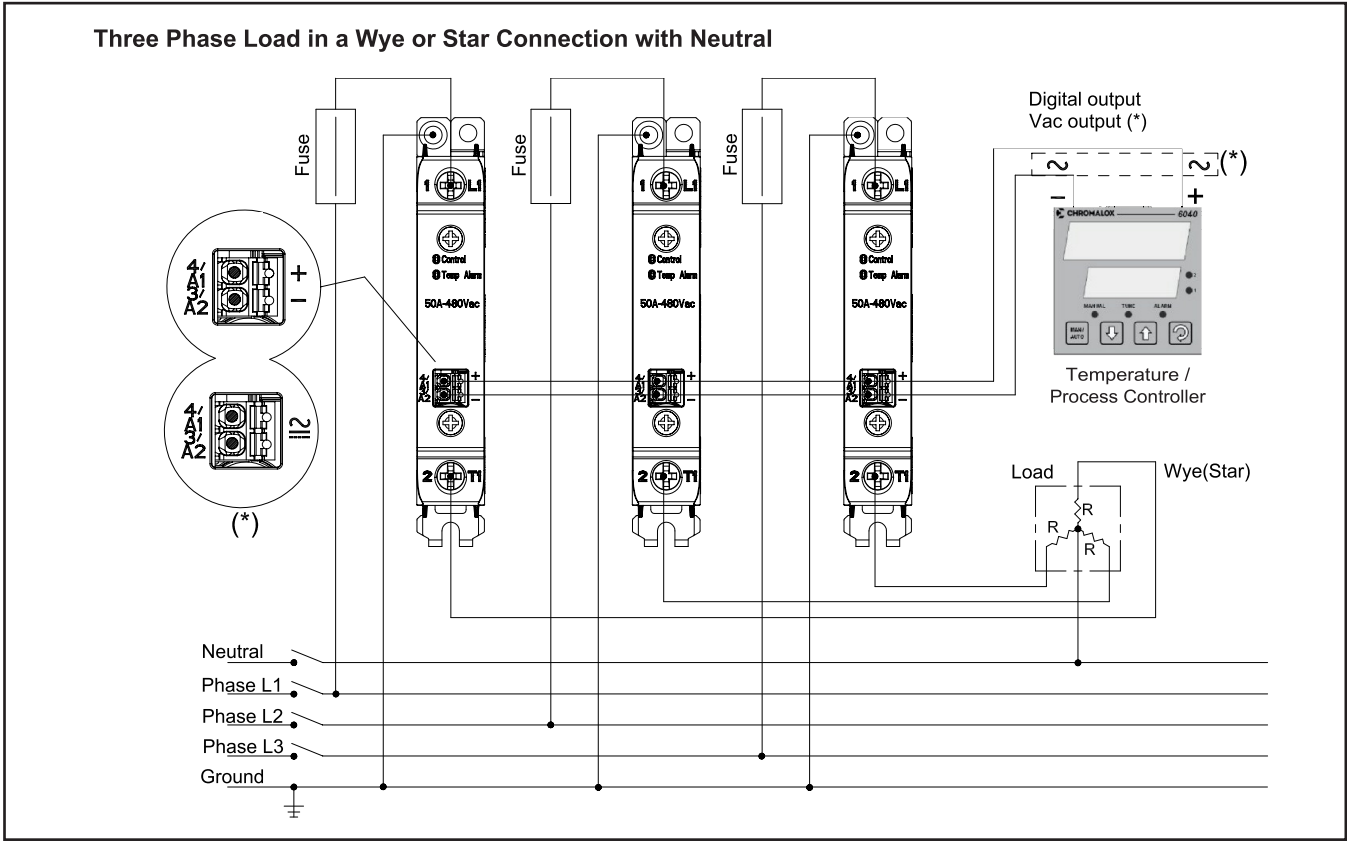
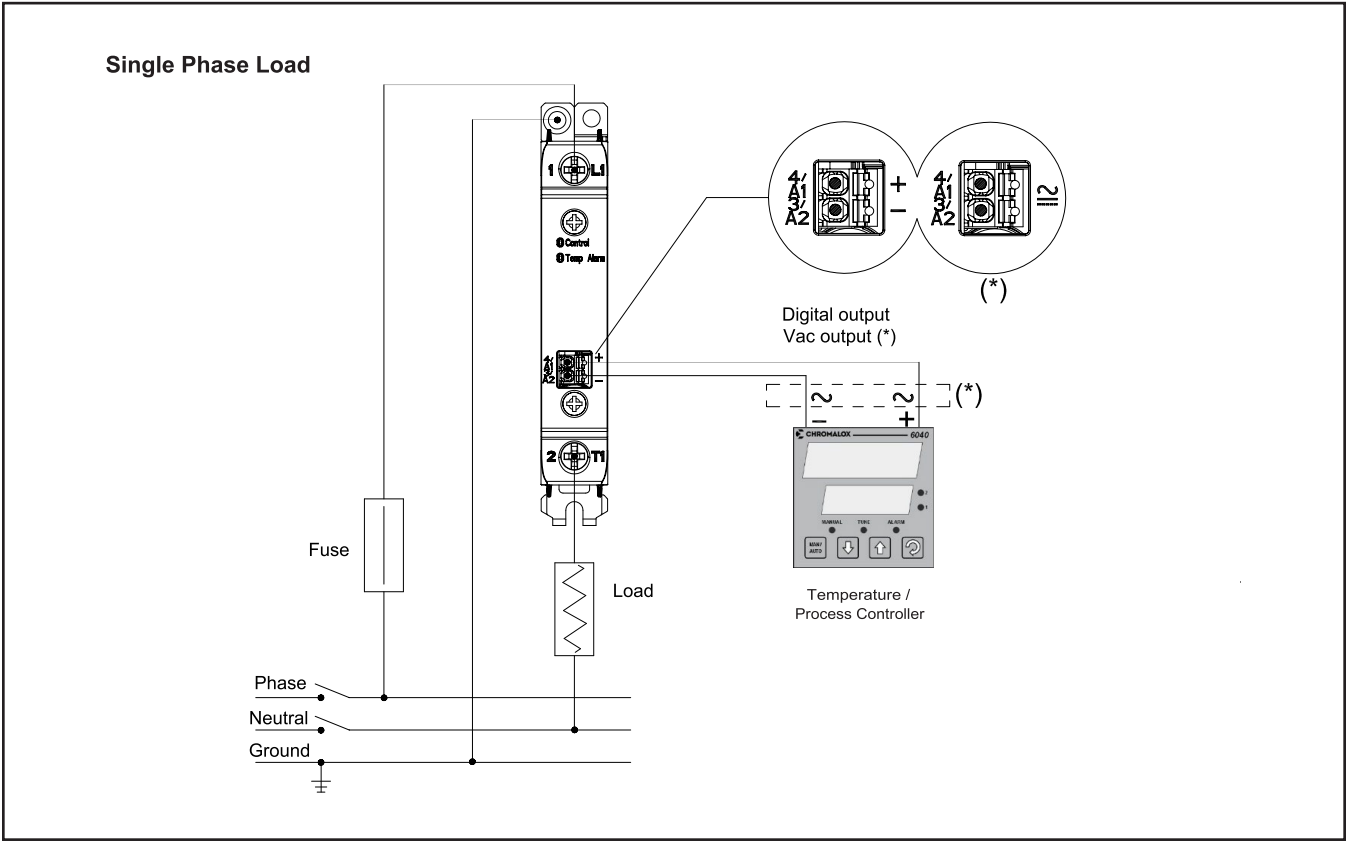
| Description of terminal versions with type “2”input | | |
|--|------------------------------|---|
| Power terminals (common to all versions) (Overvoltage Category III) | | |
| Rif. | Description | Notes |
| 1/L1 | Line Connection | |
| 2/T1 | Load Connection | |
| “Control connector” (Overvoltage Category II) | | |
| 3/A2 | Control input ON/OFF in AC | Vac/Vdc input (Range 20 to 260Vac/Vdc, I _{max} < 8 mA) Overvoltage Category II) |
| 4/A1 | | |
| Alarm output connector version with type “5” option (C1ZF...2-5) (Overvoltage Category II o III) | | |
| 5/AL | Overtemperature alarm output | Solid state N.C. contact I _{max} = 150 mA Z closed < 1 |
| 6AL | | |

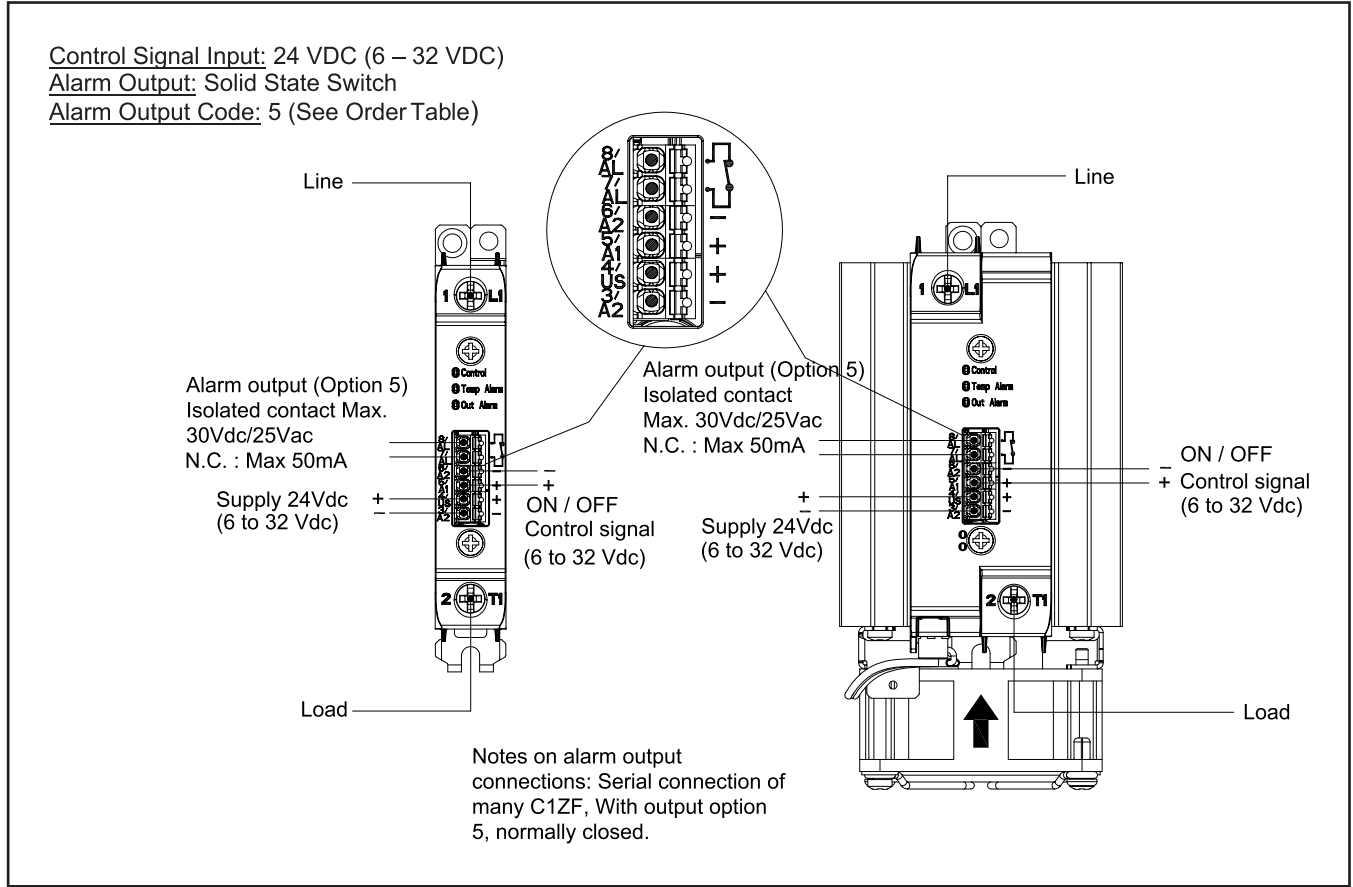
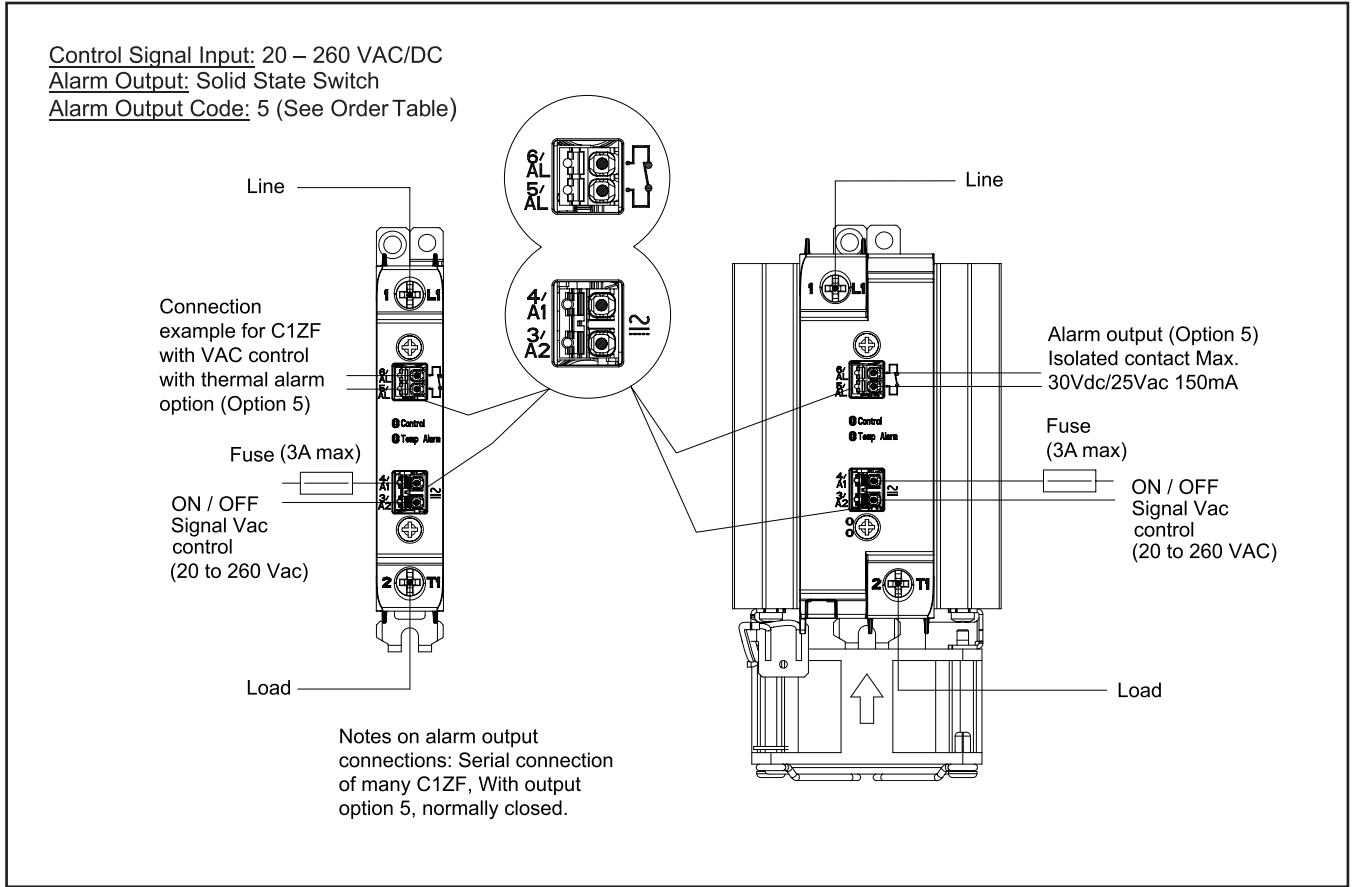
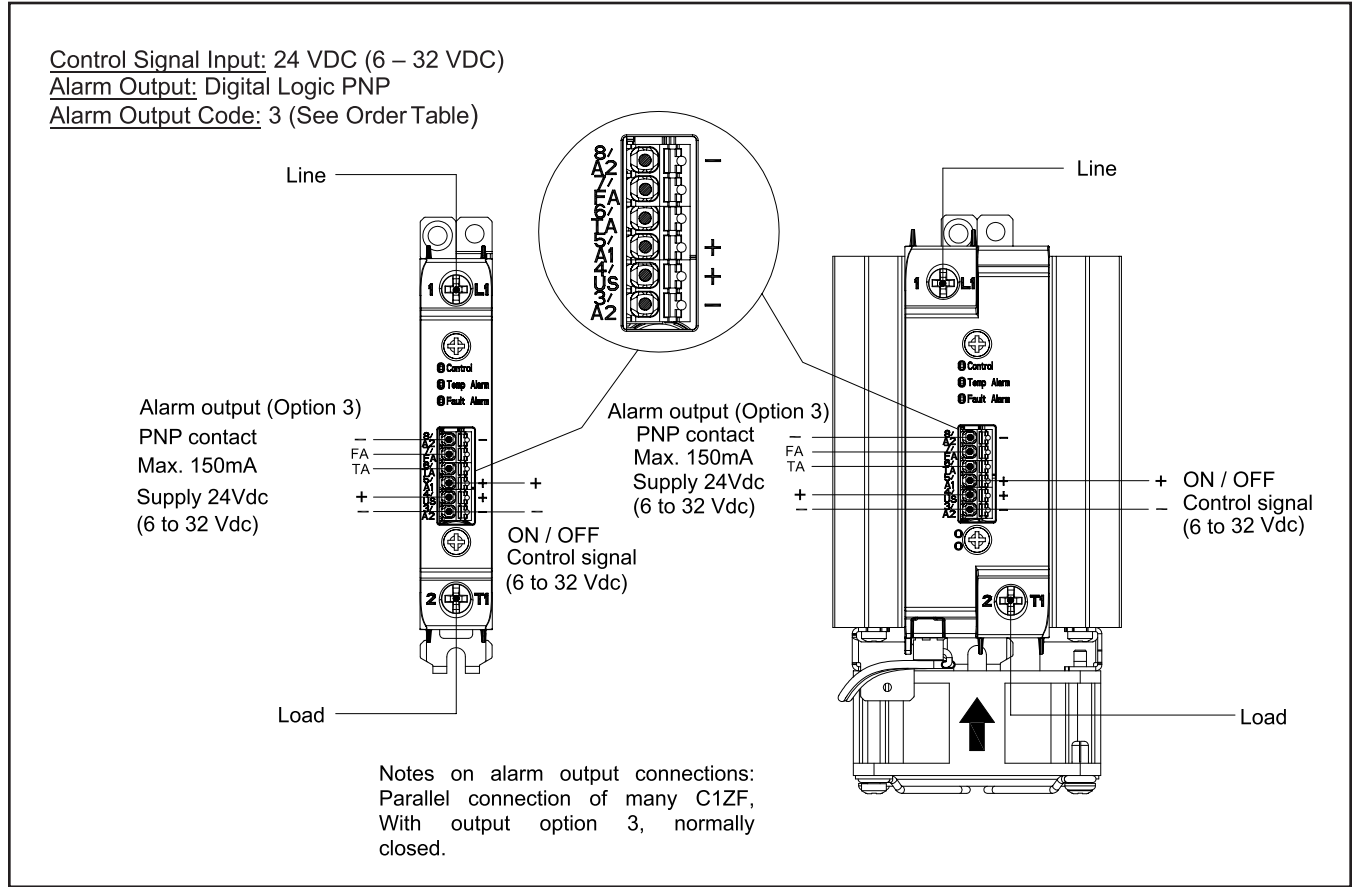


LED Status Descriptions

| STATUS | LED Control (Green) | LED Temp Alarm (Yellow) | LED Fault Alarm/Out Alarm (Alarm:Red) |
|---|---------------------|-------------------------|---------------------------------------|
| SCR OFF, no alarm | OFF | OFF | OFF |
| SCR ON, no alarm | ON | OFF | OFF |
| SCR ON, Alarm output active | ON | OFF | ON |
| Control signal active, SCR forced off for overtemperature protection | OFF | ON | OFF |
| Control signal active, SCR forced off for overtemperature protection, Alarm output active | OFF | ON | ON |
| SCR off, Alarm output active for interrupted load (alarm is stored, Status only possible with C1ZF with Type 1 input and options 1/2/3) | OFF | OFF | ON |

Connection Examples





Specifications

General

Category of use:AC51
Switching Mode:Zero Cross
Input/Output Isolation Voltage:....4,000 VAC RMS
Operational Voltage Range
• 480 VAC models:24 - 530 VAC
• 600 VAC models:24 - 660 VAC
Operational frequency:45 - 65 Hz
Non-repetitive peak voltage
• 480 VAC models: 1200 Vp
• 600 VAC models: 1400 Vp
Zero Voltage Turn-on:..... ≤20 V
Activation time:.....= 1/2 cycle
Deactivation time:.....= 1/2 cycle
Potential drop at rated current: = < 1.2 Vrms
Power factor: = 1

Inputs

VDC Input (Type “1”)
Control voltage: 6 - 32 VDC
Maximum input:..... < 10 mA @32 V
Maximum reverse voltage: 36 VDC
Activation voltage: > 5.1 VDC
Deactivation voltage:..... < 3 VDC
VAC Input (Type “2”)
Control voltage: 20 - 260 VAC/DC
Activation voltage: > 15 VAC/DC
Deactivation voltage:..... < 6 VAC/DC
Current draw:..... 8 mAac/dc @ 260 VAC/DC

Specifications (cont.)

Outputs

| Specification | C1ZF-025 | C1ZF-040 | C1ZF-050 | C1ZF-060 | C1ZF-075 | C1ZF-090 | C1ZF-120 |
|--|------------|----------|------------|----------|----------|------------|----------|
| Rated Current (@ 40°C continuous service) | 25 A | 40 A | 50 A | 60 A | 75 A | 90 A | 120 A |
| Max. Surge Current (t=20 ms) | 620 A | | 1,600 A | | | 1,500 A | |
| Max. I²t for fusing (blowout) | 1800 A²s | | 12,800 A²s | | | 11,250 A²s | |
| Critical dV/dt Off-state (min.) | 1,000 V/µs | | | | | | |
| Off-state Leakage Current (@ Rated Voltage) | < 3 mA | | | | | | |

Environment Conditions

Operating Temperature Range:.....0°C to 80°C
Maximum Relative Humidity:.....90% @ 40°
Max. Installation Altitude: 6600 ft above sea level
Pollution Level: 2
Storage Temperature:..... -20°C to +85°C
Junction Temperature:.....125°C

This device conforms to European Union Directive 2004/108/CE and 2006/95/CE as amended with reference to generic standards:

- EN 61000-6-2 (immunity in industrial environment)
- EN 61000-6-4 (emission in industrial environment)
- EN 61010-1 (safety regulations).

Alarm Outputs

The alarms are only available only on models rated at 50 Amps and greater.

There are two types of alarm outputs:

1. Solid State Switch – Controls a connected device for an alarm event, such as a horn or light.
 - a. Requires external 24 VAC/DC power supply
 - b. Ratings: I_{max} = 150 mA
V_{max} = 30 VAC/DC
Z close <15 Ω (impedance)
Z open >1 MΩ (impedance)
2. Digital Logic – PNP output signal for logic gated devices, such as PLCs
 - a. Requires external 24 VDC (6-32 VDC) power supply
 - b. Ratings: I_{max} = 150 mA, V_{max} = 30 VAC/DC

Alarm Behavior

The functionality of the alarm switching varies depending on the type of gating signal.

For Models with 24 VDC Input Control Signal

The alarm output function actuates (opens or closes) the isolated solid state output switch (or digital output signal) when it detects any of the following fault conditions:

- There is no current on the load (zero current or interrupted load)
- There is no line voltage power supply
- The internal temperature limit of the SSR has been exceeded

Integrated Thermal Protection

The SSR temperature is constantly monitored. If the maximum temperature limit (230°F/110°C) is exceeded, current to the load is interrupted and the YELLOW over-temperature condition LED illuminates.

Derating Curves

Rated Current versus Ambient Temperature for each C1ZF Model.
(These curves reflect units tested complete with approved heat sinks and fans, if applicable).

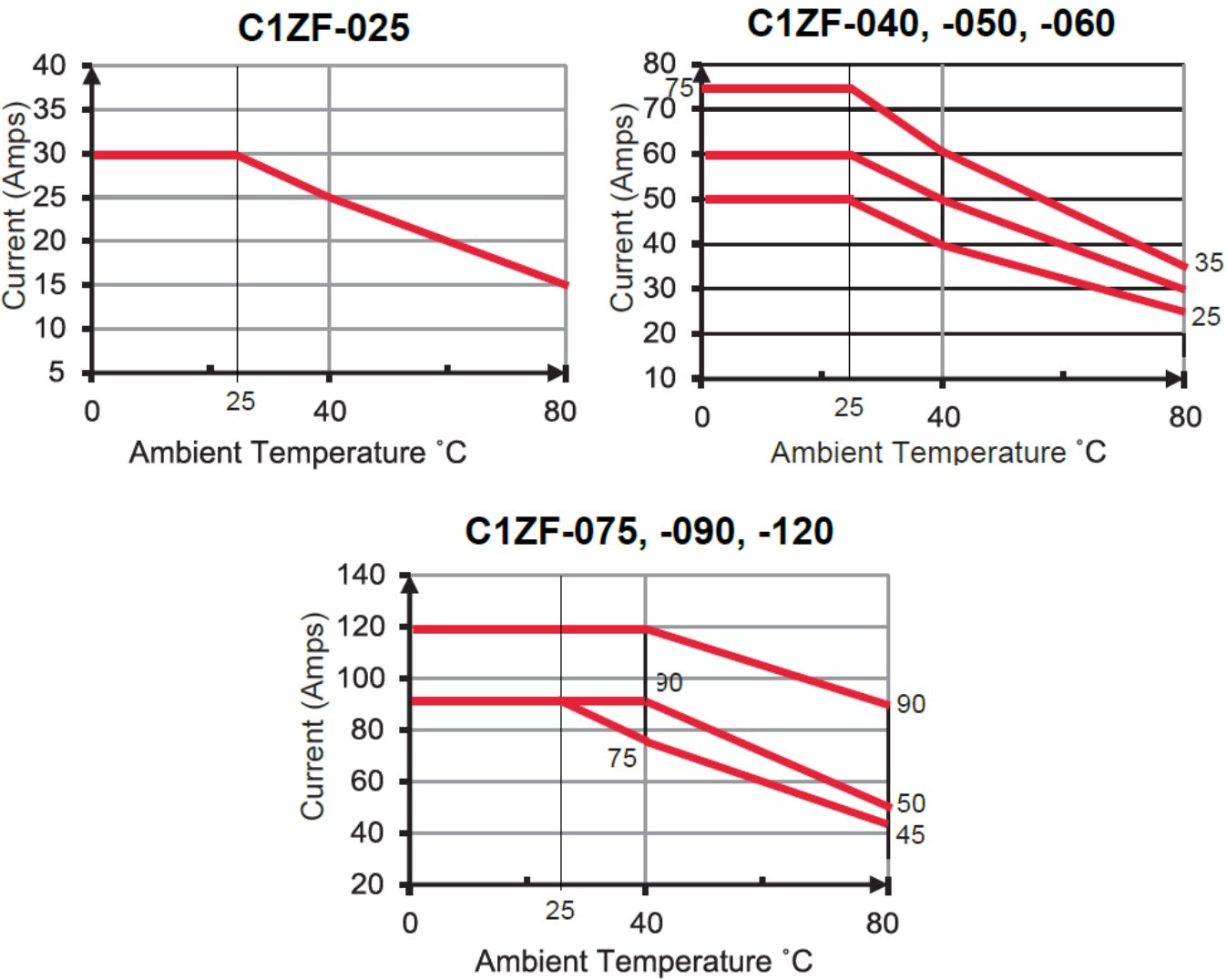


Table of Terminals & Conductors

| CONTROL/SIGNAL TERMINALS | | | POWER TERMINALS | | | GROUND TERMINAL | |
|---|--|---|---|--|---|-------------------------------|------------------------------------|
| Size | Type of connection | Conductor section / Stripping length | Contact area (WxD) screw type | Type of connection | Conductor section / Tightening torque / Stripping length | Contact area (WxD) screw type | Tightening torque |
| 25A | Rigid/flexible/cable lug conductor cross section | 1 x 0.2-1.5 mm2 / 2 x 0.1-0.75 mm2 1 x 24-16 AWG / 2 x 27-19 AWG | 9,2 x 8 mm M5 | Rigid/flexible/ferrule conductor cross section | 1 x 10 AWG / 2 x 12 AWG 2,5-3 Nm (22-26,6lb-in) | 9 x 9 mm M5 | 1,5-2,5 Nm (13.3 lb-in – 22 lb-in) |
| | Stripping length | 8 mm | | Stripping length | 11 mm | | |
| 40A | Rigid/flexible/cable lug conductor cross section | 1 x 0.2-1.5 mm2 / 2 x 0.1-0.75 mm2 1 x 24-16 AWG / 2 x 27-19 AWG | 9,2 x 8 mm M5 | Rigid/flexible/ferrule conductor cross section | 1 x 10 mm2 / 2 x 6 mm2 1 x 8 AWG / 2 x 10 AWG 2,5-3 Nm (22-26,6lb-in) | 9 x 9 mm M5 | 1,5-2,5 Nm (13.3 lb-in – 22 lb-in) |
| | Stripping length | 8 mm | | Stripping length | 11 mm | | |
| 50A | Rigid/flexible/cable lug conductor cross section | 1 x 0.2-1.5 mm2 / 2 x 0.1-0.75 mm2 1 x 24-16 AWG / 2 x 27-19 AWG | 9,2 x 8 mm M5 | Rigid/flexible/ferrule conductor cross section | 1 x 16 mm2 / 2 x 10 mm2 1 x 6 AWG / 2 x 8 AWG 2,5-3 Nm (22-26,6lb-in) | 9 x 9 mm M5 | 1,5-2,5 Nm (13.3 lb-in – 22 lb-in) |
| | Stripping length | 8 mm | | Stripping length | 11 mm | | |
| 60A | Rigid/flexible/cable lug conductor cross section | 1 x 0.2-1.5 mm2 / 2 x 0.1-0.75 mm2 1 x 24-16 AWG / 2 x 27-19 AWG | 9,2 x 8 mm M5 | Rigid/flexible/ferrule conductor cross section | 1 x 25 mm2 / 2 x 16 mm2 1 x 4 AWG / 2 x 6 AWG 2,5-3 Nm (22-26,6lb-in) | 9 x 9 mm M5 | 1,5-2,5 Nm (13.3 lb-in – 22 lb-in) |
| | Stripping length | 8 mm | | Stripping length | 11 mm | | |
| 75A | Rigid/flexible/cable lug conductor cross section | 1 x 0.2-1.5 mm2 / 2 x 0.1-0.75 mm2 1 x 24-16 AWG / 2 x 27-19 AWG | 9,2 x 8 mm M5 | Rigid/flexible/ferrule conductor cross section | 1 x 25 mm2 / 2 x 16 mm2 1 x 3 AWG / 2 x 6 AWG 2,5-3 Nm (22-26,6lb-in) | 9 x 9 mm M5 | 1,5-2,5 Nm (13.3 lb-in – 22 lb-in) |
| | Stripping length | 8 mm | | Stripping length | 11 mm | | |
| 90A | Rigid/flexible/cable lug conductor cross section | 1 x 0.2-1.5 mm2 / 2 x 0.1-0.75 mm2 1 x 24-16 AWG / 2 x 27-19 AWG | 10,5 mm x 10,7 mm M5 | Rigid/flexible/ferrule conductor cross section | 35 mm2 2 AWG 2,5-3 Nm (22-26,6lb-in) | 9 x 9 mm M5 | 1,5-2,5 Nm (13.3 lb-in – 22 lb-in) |
| | Stripping length | 8 mm | | Stripping length | 13 mm | | |
| 120A | Rigid/flexible/cable lug conductor cross section | 1 x 0.2-1.5 mm2 / 2 x 0.1-0.75 mm2 1 x 24-16 AWG / 2 x 27-19 AWG | 9,2 x 8 mm M5 | Rigid/flexible/ferrule conductor cross section | 1 x 50 mm2 / 2 x 25 mm2 1 x 1/0 AWG / 2 x 3 AWG 2,5-3 Nm (22-26,6lb-in) | 9 x 9 mm M5 | 1,5-2,5 Nm (13.3 lb-in – 22 lb-in) |
| | Stripping length | 8 mm | | Stripping length | 13 mm | | |
| Note: Use 60/75°C copper (CU), solid or multi-stranded conductors | | | Note: Use 75°C copper (CU), multi-stranded conductors | | | | |

(*) The screw terminals are only suitable for on-site wiring connection when the wire is equipped with a tube terminal with eyelet.

It is possible to make ground connection using a copper bar suitably ground connected and fixed to the heatsink of more C1ZF

(WxD) = Width x depth

Note:

For Canadian end-use applications only, an R/C VZCA/7 (or CSA-approved) surge protector is required to be installed in the end-use as shown below:

- Maximum clampin voltage 800V, for the control input of Type “1” devices.
- Maximum clampin voltage 2500V, for control input of “2” type devices.
- Maximum clampin voltage 800V, for the auxiliary output of type “1” and “2” devices.

Ordering Information

| Model Single Phase, Solid State Relay Power Controller - DIN Rail Mount | | | | | | |
|---|--|--|---|---|---|----------------------|
| C1ZF | The C1ZF Series are DIN Rail mounted, single-phase solid state relays with integrated heatsink for switching resistive loads in industrial applications. Standard features: Zero-voltage turn-on, LED input status indicator, internal over voltage protection (MOV), integrated SCR thermal protection with LED indication ¹ , two logic input control signals, operating voltage up to 600 VAC. Optional features: ¹ Solid state switch or PNP Digital Signal alarm output during over-heated or interrupted line/load condition. Approvals: CE, UL, cUL | | | | | |
| | Code Current @ 104°F (40°C) Ambient, continuous service | | | | | |
| | 025 | 25 Amps | | | | |
| | 040 | 40 Amps | | | | |
| | 050 | 50 Amps | | | | |
| | 060 | 60 Amps | | | | |
| | 075 | 75 Amps | | | | |
| | 090 | 90 Amps | | | | |
| | 120 | 120 Amps (requires fan choice from below) | | | | |
| | Code Nominal Voltage | | | | | |
| | 48 | 480 VAC (Range: 24 - 530 VAC) | | | | |
| | 60 | 600 VAC (Range: 24 - 660 VAC) | | | | |
| Code Input Control Signal | | | | | | |
| | 1 | 6 - 32 VDC | | | | |
| | 2 | 20 - 260 VAC/DC | | | | |
| Code Alarm Outputs (Note: Alarms only available on ≥ 50 Amp Models) | | | | | | |
| | 0 | None | | | | |
| | 1* | Solid State Relay switch (normally open) | | | | |
| | 2* | Solid State Relay switch (normally closed) | | | | |
| | 3* | Digital Logic PNP Output (normally open) | | | | |
| | 5 | Solid State Relay switch (normally closed) | | | | |
| Code Fan (120 Amp Version Only), Inches (mm) | | | | | | |
| | 0 | No Fan (select for all models < 120 Amp) | | | | |
| | 1 | **Fan (230 VAC Power Supply Requirement) | | | | |
| | 2 | **Fan (120 VAC Power Supply Requirement) | | | | |
| | 3 | **Fan (24 VDC Power Supply Requirement) | | | | |
| | 4 | Fan (24 VDC Internally Supplied) | | | | |
| C1ZF - | 050 | 48- | 1 | 1 | 0 | Typical Model Number |

²External 24 VDC Power Supply is Required to Power the Alarms

Notes:

1 Available only on models 50 Amps

2 Some models may accept 24 VDC or 24 VAC. See optional Alarm Wiring details in manual.

* Available only for models with 6-32 VDC input control signal

** Fan requires customer supplied voltage.

The following Chromalox Temperature Controllers offer a suitable 24VDC power supply for the alarm option:

40 Series: 6040 / 8040 / 4040; 50 Series: 6050 / 4050; 60 Series: 6060 ;

80 Series: 4080 / 4081 / 4082

Limited Warranty:

Please refer to the Chromalox limited warranty applicable to this product at
<http://www.chromalox.com/customer-service/policies/termsofsale.aspx>.

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