

# POWERPLUS DC SERIES | 60 VDC

PANEL MOUNT SOLID STATE RELAYS



## Features

- Ratings from 10 A to 100 A @ 60 VDC
- LED Status Indicator
- Relays are easily paralleled for higher-current applications
- UL Approved, CE Compliant to EN60950-1
- Improved SEMS screw and washer
- Redesigned housing with anti-rotation barriers
- MOSFET Output
- DC control
- EMC Compliant to Level 3
- Epoxy Free Design
- Optional IP20 Cover
- PWM up to 1 kHz

## PRODUCT SELECTION

| Control Voltage | 10 A    | 20 A    | 40 A    | 60 A    | 80 A    | 100 A    |
|-----------------|---------|---------|---------|---------|---------|----------|
| 4-32 VDC        | DC60D10 | DC60D20 | DC60D40 | DC60D60 | DC60D80 | DC60D100 |

## SPECIFICATIONS

### Output Voltage <sup>(1)</sup>

| Description                                                  | 10 A | 20 A | 40 A | 60 A | 80 A | 100 A |
|--------------------------------------------------------------|------|------|------|------|------|-------|
| Recommended Operating Voltage [Vdc]                          | 1-48 | 1-48 | 1-48 | 1-48 | 1-48 | 1-48  |
| Absolute Maximum Rating [Vdc]                                | 60   | 60   | 60   | 60   | 60   | 60    |
| Maximum Off-State Leakage Current @ Rated Voltage [mA]       | 0.1  | 0.1  | 0.1  | 0.1  | 0.1  | 0.1   |
| Maximum Load Current [Adc] <sup>(2)(3)</sup>                 | 10   | 20   | 40   | 60   | 80   | 100   |
| Minimum Load Current [mA] <sup>(4)</sup>                     | 2.5  | 2.5  | 2.5  | 2.5  | 2.5  | 2.5   |
| Maximum Surge Current (10 msec) [Adc]                        | 78   | 108  | 163  | 200  | 258  | 326   |
| Maximum On-State Voltage Drop @ Rated Current [Vdc]          | 0.17 | 0.30 | 0.36 | 0.51 | 0.46 | 0.56  |
| Maximum On-State Resistance [RDS-ON] [mΩ]                    | 17   | 15   | 9    | 8.5  | 5.8  | 5.6   |
| Thermal Resistance Junction to Case (Rjc) [°C/W]             | 1.6  | 1.6  | 0.74 | 0.74 | 0.51 | 0.51  |
| Minimum Heat Sink for Rated Current @ 40°C [°C/W]            | 5    | 5    | 2    | 1    | 0.5  | 0.5   |
| Maximum Pulse Width Modulation Frequency [Hz] <sup>(5)</sup> | 1000 | 1000 | 900  | 900  | 700  | 700   |

## Input <sup>(1)</sup>

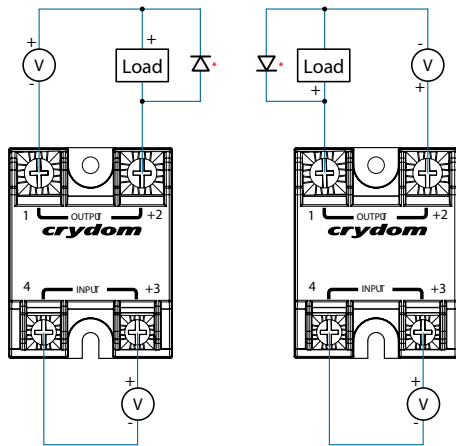
| Description                            | DC Control        |
|----------------------------------------|-------------------|
| Control Voltage Range                  | 4-32 VDC          |
| Maximum Reverse Voltage                | -32 VDC           |
| Minimum Turn-On Voltage <sup>(6)</sup> | 4 VDC             |
| Must Turn-Off Voltage                  | 1 VDC             |
| Minimum Input Current (for on-state)   | 11 mA             |
| Maximum Input Current                  | 14 mA             |
| Nominal Input Impedance                | Current Regulated |
| Maximum Turn-On Time [μsec]            | 75                |
| Maximum Turn-Off Time [μsec]           | 150               |

## General <sup>(1)</sup>

| Description                                                                  | Parameters                     |
|------------------------------------------------------------------------------|--------------------------------|
| Dielectric Strength, Input/Output/Base (50/60 Hz)                            | 3750 Vrms                      |
| Minimum Insulation Resistance (@ 500 VDC)                                    | 10 <sup>9</sup> Ohms           |
| Maximum Capacitance, Input/Output                                            | 8 pF                           |
| Ambient Operating Temperature Range <sup>(7)</sup>                           | -40 to 100 °C                  |
| Ambient Storage Temperature Range                                            | -40 to 125 °C                  |
| Weight (typical)                                                             | 2.53 oz (72 g)                 |
| Housing Material                                                             | UL94 V-0                       |
| Hardware Finish                                                              | Nickel Plating                 |
| Baseplate Material                                                           | Aluminum                       |
| Input Terminal Screw Torque Range (lb-in/Nm)                                 | 13-15 / 1.5-1.7                |
| Load Terminal Screw Torque Range (lb-in/Nm)                                  | 18-20 / 2-2.2                  |
| SSR Mounting Screw Torque Range (lb-in/Nm)                                   | 18-20 / 2-2.2                  |
| Input/Load Terminal Screw Torque Range (lb-in/Nm) <sup>(2)</sup>             | w/"K" option 8-10 / 0.9-1.13   |
| Input/Output Terminal Screw Thread Size                                      | #6-32 UNC / #8-32 UNC          |
| Humidity per IEC60068-2-78                                                   | 93% non-condensing             |
| LED Input Status Indicator                                                   | Green                          |
| MTBF (Mean Time Between Failures) at 40°C ambient temperature <sup>(8)</sup> | 21,395,130 hours (2,441 years) |
| MTBF (Mean Time Between Failures) at 60°C ambient temperature <sup>(8)</sup> | 11,545,504 hours (1,317 years) |

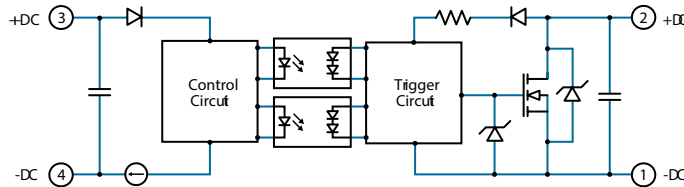
## WIRING DIAGRAM

\* Inductive loads must be diode suppressed.

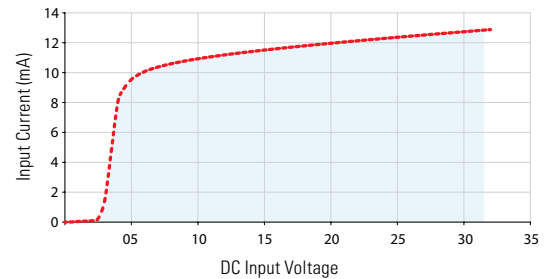


| Recommended Wire Sizes |                                                   |                                |
|------------------------|---------------------------------------------------|--------------------------------|
| Terminals              | Wire Size (Solid / Stranded)                      | Wire Pull-Out Strength (lb)[N] |
| Input                  | 24 AWG (0.2 mm <sup>2</sup> ) / 0.2 [minimum]     | 10 [44.5]                      |
|                        | 2 x 12 AWG (3.3 mm <sup>2</sup> ) / 3.3 [maximum] | 90 [400]                       |
| Output                 | 20 AWG (0.5 mm <sup>2</sup> ) / 0.518 [minimum]   | 30 [133]                       |
|                        | 2 x 10 AWG (5.3 mm <sup>2</sup> ) / 5.3           | 110 [490]                      |
|                        | 2 x 8 AWG (8.4 mm <sup>2</sup> ) / 8.4 [maximum]  | 90 [400]                       |

## EQUIVALENT CIRCUIT BLOCK DIAGRAMS



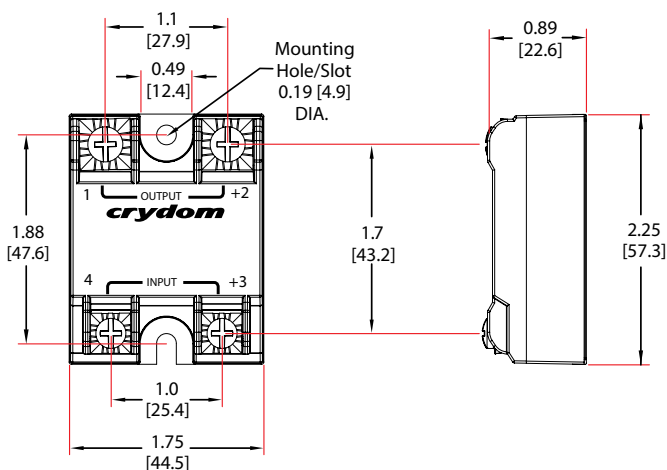
Input Current vs Input Voltage  
Standard Regulated "DC" Inputs



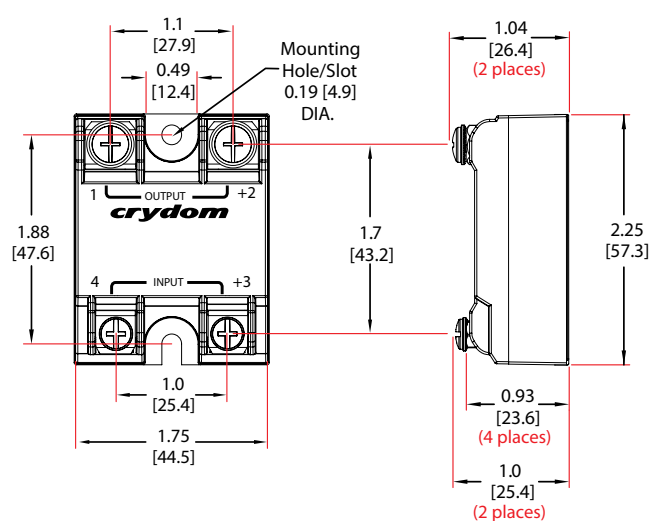
## MECHANICAL SPECIFICATIONS <sup>(1)</sup>

\*Tolerances:  $\pm 0.02$  in / 0.5 mm All dimensions are in: inches [millimeters]

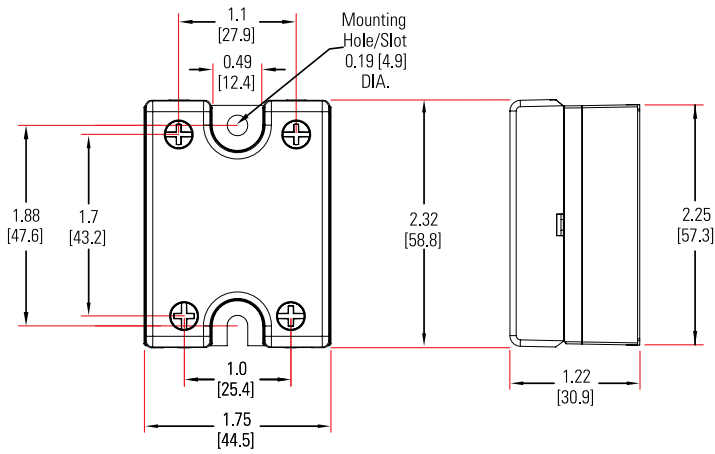
### Screw Termination



### Hex Standoff Termination ("K" Option) <sup>(2)</sup>

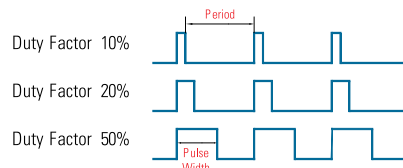
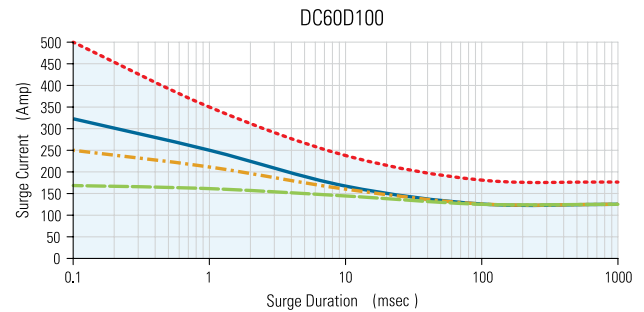
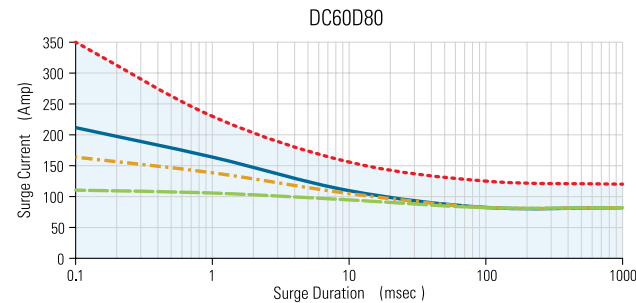
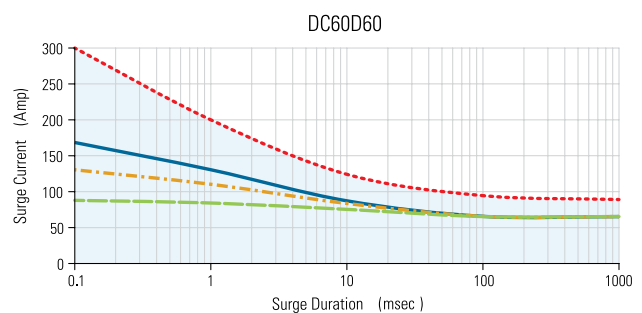
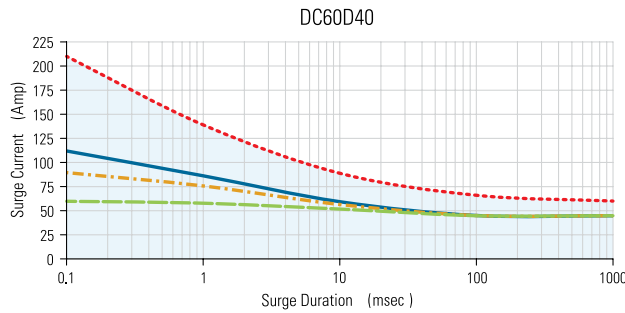
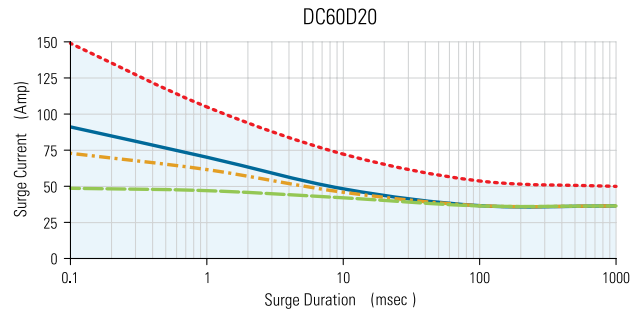
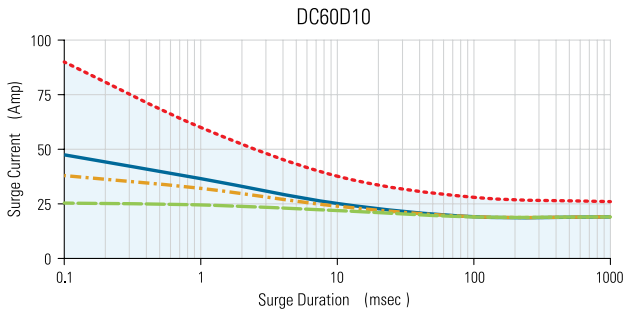


## Screw Termination, IP20



## SURGE CURRENT INFORMATION

--- Single Pulse (i) — Duty Factor (10%) (ii) - - - Duty Factor (20%) (ii) — Duty Factor (50%) (ii)



For Pulse Width Modulation applications select the curve according duty factor and pulse duration as following.

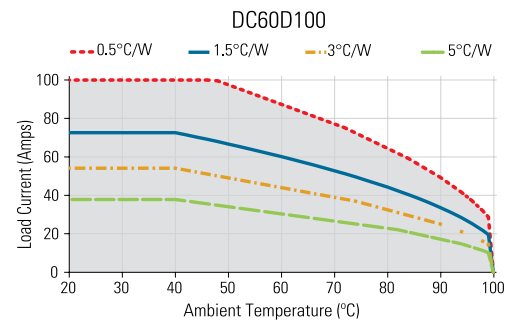
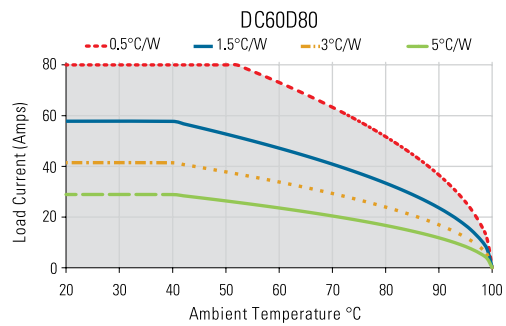
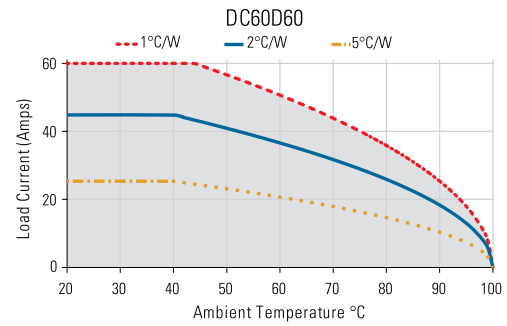
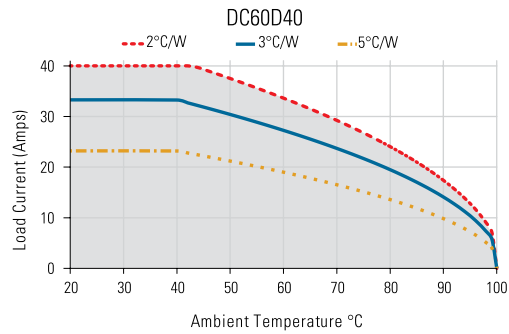
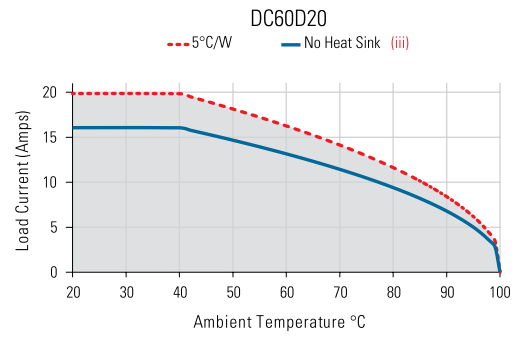
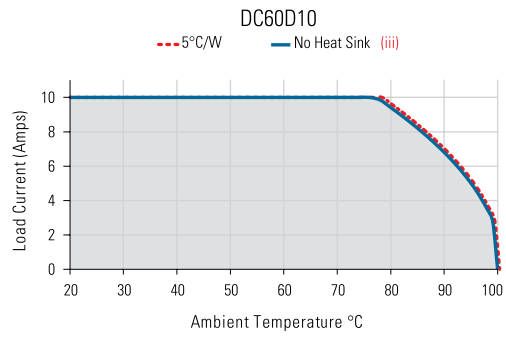
$$\text{Duty Factor} = \frac{\text{Pulse Width}}{\text{Period}} \times 100 (\%)$$

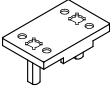
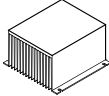
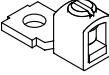
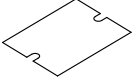
(i) for Single Surge Pulse  $T_c=40^\circ\text{C}; T_j 175^\circ\text{C}$   
(ii) for Repetitive Surge Pulse  $T_c=40^\circ\text{C}; T_j 130^\circ\text{C}$



## THERMAL DERATE INFORMATION

(iii) SSR metal base plate acting as heat sink, it must be exposed to free ambient air.



| Recommended Accessories                                                           |                                                                                   |                                                                                                                                                                                                   |                                                                                                         |                                                                                     |                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |                                                                                                                  |                                                                                                         |  |  |
| Cover                                                                             | Hardware Kit                                                                      | Heat Sink Part No.                                                                                                                                                                                | Thermal Resistance [°C/W]                                                                               | Lug Terminal                                                                        | Thermal Pad                                                                         |
| KS101                                                                             | HK1<br>HK4                                                                        | HS501DR<br>HS301 / HS301DR<br>HS251<br>HS201 / HS201DR<br>HS202 / HS202DR<br>HS172<br>HS151 / HS151DR<br>HS122 / HS122DR<br>HS103 / HS103DR<br>HS101<br>HS073<br>HS072<br>HS053<br>HS033<br>HS023 | 5.0<br>3.0<br>2.5<br>2.0<br>2.0<br>1.7<br>1.5<br>1.2<br>1.0<br>1.0<br>0.7<br>0.7<br>0.5<br>0.36<br>0.25 | TRM1<br>TRM6                                                                        | HSP-1<br>HSP-2                                                                      |

Not all part number combinations are available.  
Contact Technical Support for information on the availability of a specific part number.

|                                                                                     | DC | 60 | D | 40 | K | C | H |
|-------------------------------------------------------------------------------------|----|----|---|----|---|---|---|
| Series                                                                              |    |    |   |    |   |   |   |
| DC                                                                                  |    |    |   |    |   |   |   |
| Operating Voltage                                                                   |    |    |   |    |   |   |   |
| 60: 1-60 VDC                                                                        |    |    |   |    |   |   |   |
| Control Voltage                                                                     |    |    |   |    |   |   |   |
| D: 4-32 VDC                                                                         |    |    |   |    |   |   |   |
| Rated Load Current                                                                  |    |    |   |    |   |   |   |
| 10: 10 Amps                                                                         |    |    |   |    |   |   |   |
| 20: 20 Amps                                                                         |    |    |   |    |   |   |   |
| 40: 40 Amps                                                                         |    |    |   |    |   |   |   |
| 60: 60 Amps                                                                         |    |    |   |    |   |   |   |
| 80: 80 Amps                                                                         |    |    |   |    |   |   |   |
| 100: 100 Amps                                                                       |    |    |   |    |   |   |   |
| Termination                                                                         |    |    |   |    |   |   |   |
| Blank: Screws & clamps                                                              |    |    |   |    |   |   |   |
| K: Installed standoffs with <sup>(2)</sup> screws for PC Board mounting (IP00 only) |    |    |   |    |   |   |   |
| Cover                                                                               |    |    |   |    |   |   |   |
| Blank: Not Included (IP00)                                                          |    |    |   |    |   |   |   |
| C: Included (IP20)                                                                  |    |    |   |    |   |   |   |
| Thermal Pad                                                                         |    |    |   |    |   |   |   |
| Blank: Not Included                                                                 |    |    |   |    |   |   |   |
| H: Included                                                                         |    |    |   |    |   |   |   |

Required for valid part number

For options only and not required for valid part number

## GENERAL NOTES

- (1) All parameters at  $T_c=25^{\circ}\text{C}$  unless otherwise specified.
- (2) Option "K" is designed and tested for use with printed circuit boards or ring/fork terminals having a thickness between 0.031 and 0.093 inches (0.79 to 2.36 mm), and loads rated up to 50 Amps.  
For higher load currents, the "K" standoff temperature must not exceed  $105^{\circ}\text{C}$ . For additional application assistance please contact Crydom Technical Support.
- (3) Heat sinking required, see derating curves.
- (4) Low current loads and high ambient temperature can affect turn-on time.
- (5) 8 VDC Minimum control voltage. Resistive loads only. Consider switching losses; at maximum frequency reduce to 75% output current.
- (6) Increase minimum voltage by 1V for operations from  $-20$  to  $-40^{\circ}\text{C}$ .
- (7) Decrease maximum control voltage  $1.35\text{V}/^{\circ}\text{C}$  above  $80^{\circ}\text{C}$  ambient temperature.
- (8) All parameters at 50% power rating and 100% duty cycle.

For additional information or specific questions, contact Technical Support

## AGENCY APPROVALS & CERTIFICATIONS

EN60950-1: Meets the requirements of sections 1.5: 1.7: 2.9: 2.10.5.3: 4.2: 4.5: 4.7:

IEC 61000-4-2 Electrostatic Discharge Level 3

IEC 61000-4-4 Electrically Fast Transients Level 3

IEC 61000-4-5 Electrical Surges Level 3



## WARNINGS



### RISK OF MATERIAL DAMAGE AND HOT ENCLOSURE

- The product's side panels may be hot, allow the product to cool before touching
- Follow proper mounting instructions including torque values
- Do not allow liquids or foreign objects to enter this product

**Failure to follow these instructions can result in serious injury, or equipment damage.**



### HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power before installing or working with this equipment
- Verify all connections and replace all covers before turning on power

**Failure to follow these instructions will result in death or serious injury.**

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