

## How to Reach Us

To be automatically connected to the nearest North American Technical and Sales Office call:

1-800-WATLOW2

International Technical and Sales Offices:

**Australia** +61-3-9335-6449  
**China** +86-21-3950-9510  
**France** +33 (01) 3073-2425  
**Germany** +49 (0) 7253-9400-0  
**Italy** +39 (02) 458-8841  
**Japan** +81-3-3518-6630  
**Korea** +82-2-575-9804  
**Malaysia** +60-3-7980-7741  
**Mexico** +52 (442) 217-6235  
**Singapore** +65-6777-1266  
**Spain** +34 916 751 292  
**Sweden** +46 35-27-11-66  
**Taiwan** +886-7-288-5168  
**United Kingdom** +44 (0) 115-964-0777

Your Authorized Watlow Distributor:

For other product information:

Watlow FAX REPLY: +1 (732) 885-6344, outside the U.S.; or +1 (800) 367-0430, inside the U.S.

## About Watlow

Watlow Electric Mfg. Co., has been manufacturing industrial electric heating products since 1922 and is located in St. Louis, Missouri. Watlow products include electric heaters, sensors, controllers and switching devices. Watlow's facility in Winona, Minnesota has been designing solid-state electronic control devices since 1962, and has earned the reputation as an excellent supplier to original equipment manufacturers. These OEMs and end users depend upon Watlow to provide compatibly engineered controls that they can incorporate into their products with confidence. The controls operation resides in a 100,000-square-foot marketing, engineering and manufacturing facility in Winona, Minnesota.

## Warranty

The Watlow ESAFE® II Hybrid Power Switch is warranted to be free of defects in material and workmanship for 24 months after delivery to the first purchaser for use, providing that the units have not been misapplied. Since Watlow has no control over their use, and sometimes misuse, we cannot guarantee against failure. Watlow's obligations hereunder, at Watlow's option, are limited to replacement, repair or refund of purchase price, and parts which upon examination prove to be defective within the warranty period specified. This warranty does not apply to damage resulting from transportation, alteration, misuse, or abuse.

## Returns

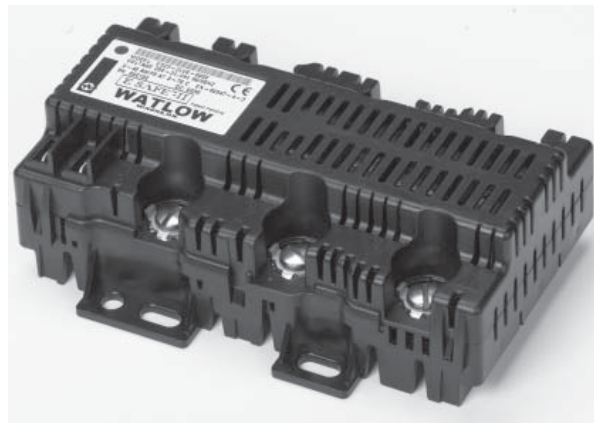
- Call or fax your distributor or the nearest Watlow sales office for best information about returns. (See outside back cover.)
- To return directly to Watlow in the U.S., first call or fax Customer Service for a Return Material Authorization (RMA) number (telephone: +1 (507) 454-5300; fax: +1 (507) 452-4507).
- Put the RMA number on the shipping label, along with a written description of the problem.
- A restocking charge of 20% of the net price is charged for all standard units returned to stock.

## Quality and Mission Statement:

*Watlow will be the world's best supplier of superior thermal solutions by exceeding the expectations of our customers, shareholders, and employees.*

# E-SAFE® II Hybrid Power Switch

## User's Manual



1241 Bundy Boulevard, Winona, Minnesota USA 55987-5580

Phone: +1 (507) 454-5300 Fax: +1 (507) 452-4507

Internet: <http://www.watlow.com>

English

0600-0055-0001 Rev C

June 2008

Multiple U.S. and international patents pending.




## Safety Information


We use note, caution and warning symbols throughout this book to draw your attention to important operational and safety information.

A "NOTE" marks a short message to alert you to an important detail.

A "CAUTION" safety alert appears with information that is important for protecting your equipment and performance. Be especially careful to read and follow all cautions that apply to your application.

A "WARNING" safety alert appears with information that is important for protecting you, others and equipment from damage. Pay very close attention to all warnings that apply to your application.

The safety alert symbol, , precedes a general CAUTION or WARNING statement.

The electrical hazard symbol, , precedes an electric shock hazard CAUTION or WARNING safety statement.

## Technical Assistance

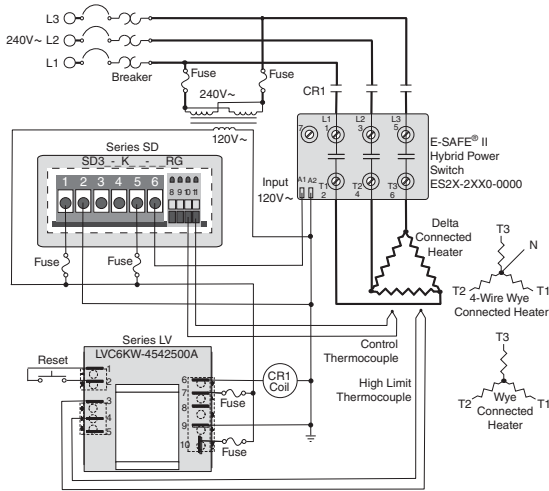
If you encounter a problem with your Watlow controller, review your configuration information to verify that your selections are consistent with your application: inputs; outputs; alarms; limits; etc. If the problem persists after checking the configuration of the controller, you can get technical assistance from your local Watlow representative (see back cover), or in the U.S., dial +1 (507) 494-5656.

Please have the following information available when calling:

- Complete model number
- User's Manual

## Your Comments

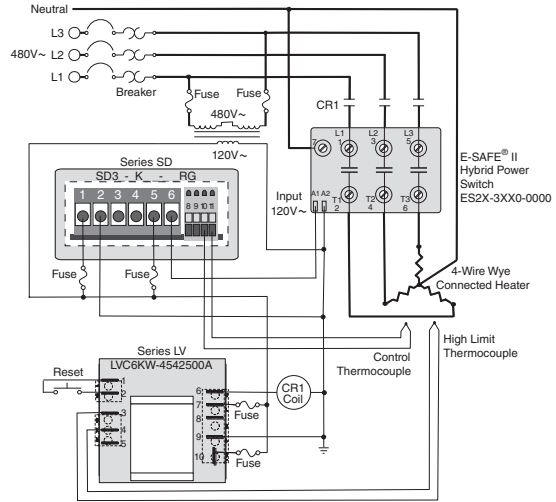
We welcome your comments or suggestions on this user's manual. Please send them to: Technical Writer, Watlow, 1241 Bundy Blvd., P.O. Box 5580, Winona, Minnesota, USA 55987-5580; telephone: +1 (507) 454-5300; fax: +1 (507) 452-4507. © Copyright 2007 by Watlow, Inc. All rights reserved.



**System Wiring Example** 240 volt, 3-phase, 3 pole with ac input control

**Note:**

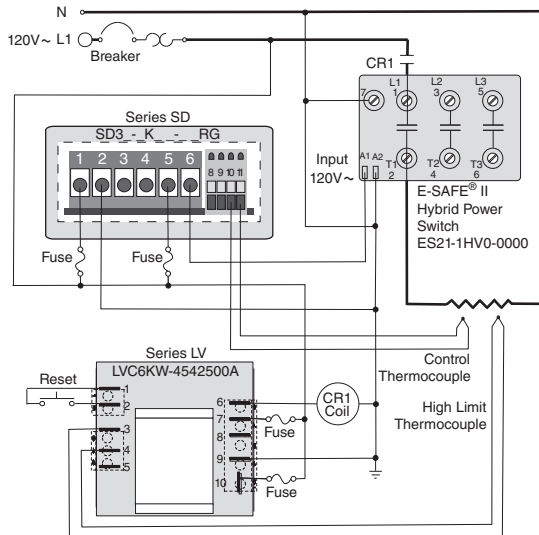
ES2X-2XX0-0000 is powered via L1, L2



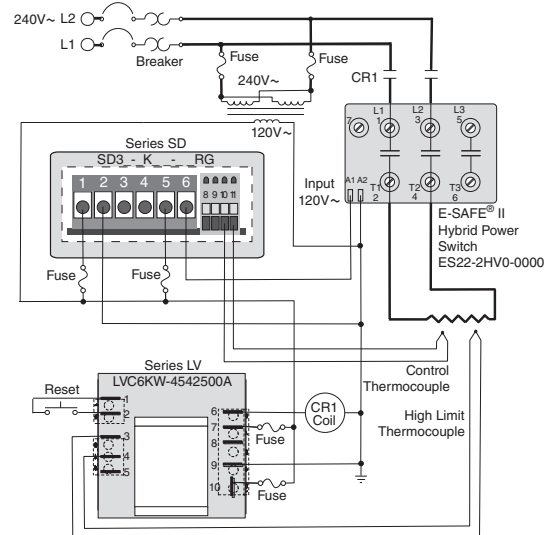
**System Wiring Example** 277/480 volt, 3-phase, 3 pole with ac input control, 4-wire Wye connected heater only

**Note:**

ES2X-3XX0-0000 is powered via terminal (7) and L1



**System Wiring Example** 120 volt, single-phase, 1 pole with ac input control



**System Wiring Example** 240 volt, single-phase, 2 pole with ac input control



**WARNING:**

Wiring must conform to National Electric Code (NEC) safety standards, as well as locally applicable codes. Failure to do so could result in personal injury or loss of life. See the product rating curve for wire gauge selection, ambient temperature and current restrictions.



**WARNING:**

Only authorized and qualified personnel should install and service the E-SAFE II Hybrid Power Switch. Failure to comply with these recommendations may result in damage to equipment and property and injury to personnel.

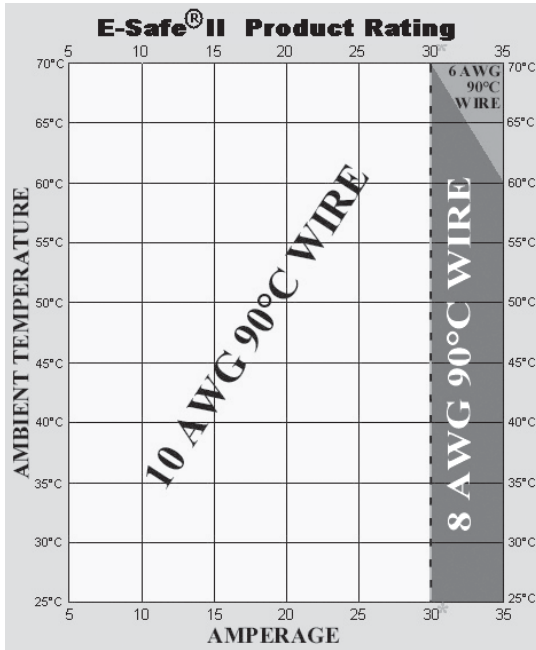
**Torque Guidelines:**

Properly torque line and load terminals to 2.25 nm (20 in-lbs).

**NOTE:**

Do not use an RC snubber on the temperature control command signal output. The leakage current through a snubber circuit can turn the E-SAFE II relay on, even when the command signal is off.





These ratings apply to 3-phase units with cycle times of 30 seconds or more. Consult the factory for 1- and 2-phase unit ratings.

**U.L. Conditions of Acceptability**

Applications must be tested as described below for specific wire insulation or specific wire gauge sizes. Tests shall be performed in the end application under worst-case operating conditions.

**Test Procedure**

- A. Monitor the temperature of terminals, using thermocouples between the ring terminal and connectors L1, L2 or L3. The temperature must not exceed 95°C.
- B. Monitor the temperatures of wire insulation, using a thermocouple located 3 inches from the connector. The temperature must not exceed the insulation rating of the wire.



**WARNING:** Thermocouples attached to terminals will be at load voltage potential, measurements need to be taken with isolated equipment or isolate the sensor from the terminal with suitable insulation.



**WARNING:** Wiring must conform to National Electric Code (NEC) safety standards, as well as locally applicable codes. Failure to do so could result in personal injury or loss of life.

See the product rating curve for wire gauge selection, ambient temperature and current restrictions.



**WARNING:** Only authorized and qualified personnel should install and service the E-SAFE II Hybrid Power Switch. Failure to comply with these recommendations may result in damage to equipment and property and injury to personnel.



**WARNING:** Do not use an ungrounded wye- or delta-wired heater configuration at 400 or 480V~ (ac).

Failure to follow all specifications and wiring instructions may result in property damage, personal injury and/or loss of life.

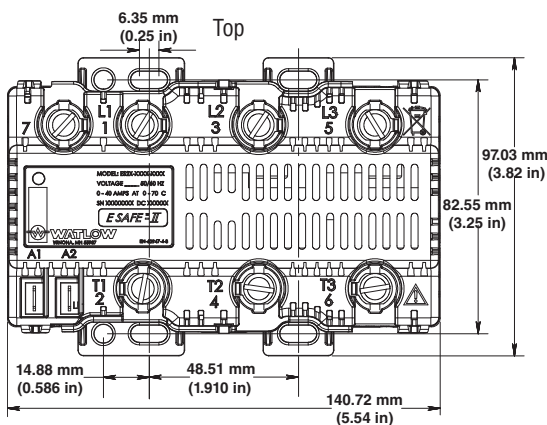


**CAUTION:** Provide proper enclosure ventilation to maintain an operating environment less than 70°C (158°F) maximum ambient rating. Failure to do so could cause damage to equipment and property.

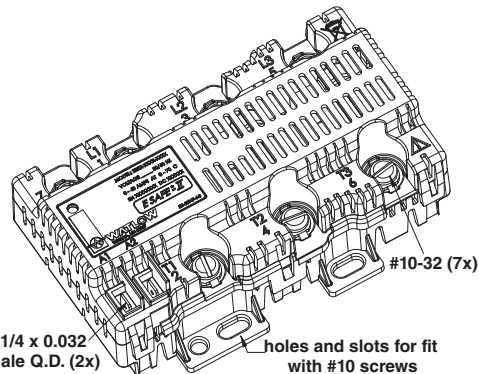
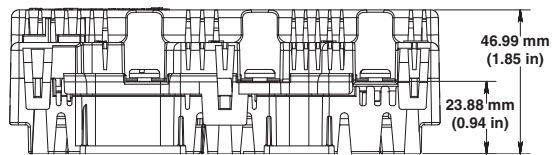
**Torque Guidelines:**

Properly torque line and load terminals to 2.25 nm (20 in-lbs).

**Unit Dimensions**



**Side**



**Specifications**

**Output voltage**

- 100/120V~ (ac) +10/-15 percent, 50/60Hz
- 200/240V~ (ac) +10/-15 percent, 50/60Hz
- 230/277V~ (ac) +10/-15 percent, 50/60Hz

**Output amperage**

- Up to 35 amperes single, dual and three-phase
- 30 A @ 277V~ (ac)

**Operating environment**

- 0 to 70°C (32 to 158°F) operating temperature
- 0 to 90 percent RH, non-condensing
- Operational life: Four million switching cycles
- Installation category III, Pollution degree 2

**Control mode**

- "No-arc" hybrid contactor

**Input command signal**

- 3 to 32V= (dc), 24V~ (ac) +20/-20 percent
- 100 to 240V~ (ac) +10/-15 percent, [85 to 264V~ (ac)]

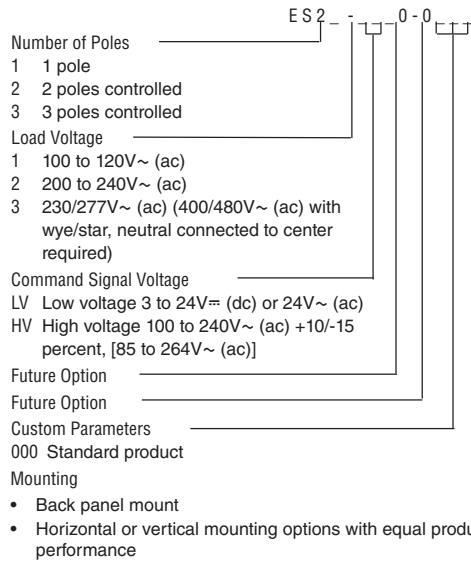
**Input command signal terminals**

- 1/4 inch fast on appliance

**Line and load terminals**

- No. 10 screw will accept ring terminals, locking fork terminals or block fork terminals, 1/4 in. (6.35 mm) by 10-32
- Wire insulation temperature can be determined through testing described in the U.L. Conditions of Acceptability.

**Ordering Information**



**NOTE:**

**Do not use an RC snubber on the temperature control command signal output. The leakage current through a snubber circuit can turn the E-SAFE II relay on, even when the command signal is off.**



**Declaration of Conformity**

**Series Esafe II Relay**

Watlow Winona, Inc.  
1241 Bundy Blvd.  
Winona, MN 55987 USA



Declares that the following product:

Designation:  
Model Numbers:  
Classification:

**Series Esafe II Relay**

ES2 (1, 2 or 3) – (1, 2 or 3)(LV or HV)0 – 0 (any three letters or numbers)  
AC51 Semiconductor Direct-on-line contactor,  
Installation Category III, Pollution degree 2, IP00  
100-120 Vac, 200-240 Vac, 230-277 Vac\*  
\*Star or Wye with Center connected Neutral required.  
35A Resistive Load Maximum

Rated Voltage and Frequency:

Rated Power Consumption:

Meets the essential requirements of the following European Union Directives by using the relevant standards show below to indicate compliance.

<b>2004/108/EC Electromagnetic Compatibility Directive</b>			
EN 60947-4-1	2004	CRGD,	Low-Voltage switchgear and controlgear Part 4-3: Contactors and motor-starters AC semiconductor controllers and contactors for non-motor loads. Class B Emissions
EN 60947-4-3	2000	2005	
EN 61000-4-2	1996	A2, 2001	Electrostatic Discharge Immunity
EN 61000-4-3	2002		Radiated Field Immunity
EN 61000-4-4	2004		Electrical Fast-Transient / Burst Immunity
EN 61000-4-5	1995	A2, 2001	Surge Immunity
EN 61000-4-6	1996	A3, 2005	Conducted Immunity
EN 61000-4-8	1994	A1, 2001	Magnetic Field Immunity
EN 61000-4-11	2004		Voltage Dips, Short Interruptions and Voltage Variations Immunity
IEC 61000-3-12	2004		Harmonic Current Emissions > 16A < 75A
IEC 61000-3-11 <sup>2</sup>	2000		Voltage Fluctuations and Flicker > 16A < 75A

<sup>2</sup>NOTE 1: To comply with flicker requirements cycle time may need to be greater than 12 seconds if Load Power is = 16A to comply with standard, or the maximum source impedance needs to be determined. Source impedance shall meet EN 61000-3-11 requirements for load currents > 16A.

<b>2006-95-EC Low-Voltage Directive</b>			
EN 60947-1	2004	CRGD,	Low-Voltage switchgear and controlgear Part 4-3: Contactors and motor-starters AC semiconductor controllers and contactors for non-motor loads.
EN 60947-4-3	2000	2005	

**Compliant with 2002/95/EC RoHS Directive**

**2002/96/EC WEEE Directive  Equipment Requires Recycling**

Raymond D. Feller III  
Name of Authorized Representative

Winona, Minnesota, USA  
Place of Issue

General Manager  
Title of Authorized Representative

February 2008  
Date of Issue

  
Signature of Authorized Representative