E-SAFE® II Hybrid Power Switch

User’s Manual

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, ç (an exclamation point in a triangle) precedes a general CAUTION or WARNING statement.

The electrical hazard symbol, ó (a lightning bolt in a triangle) 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.
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.

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.

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

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.

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.
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

Number of Poles
1. 1 pole
2. 2 poles controlled
3. 3 poles controlled

Load Voltage
1. 100 to 120V~ (ac)
2. 200 to 240V~ (ac)
3. 230/277V~ (ac) (400/480V~ (ac) with wye/star, neutral connected to center required)

Command Signal Voltage
LV: Low voltage 3 to 24V= (dc) or 24V= (ac)
HV: High voltage 100 to 240V= (ac) +10/-15 percent, [85 to 264V= (ac)]

Future Option
- Custom Parameters

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.

Declaration of Conformity

Series Esafe II Relay
Watlow Winona, Inc.
1241 Bundy Blvd.
Winona, MN 55987 USA

Declares that the following product:

Designation: Series Esafe II Relay
Model Numbers: ES2 (1, 2 or 3) – (1, 2 or 3)(LV or HV)(x0-0 – any three letters or numbers)
Classification: AC51 Semiconductor Direct-on-line contactor, Installation Category III, Pollution degree 2, IP00
Rated Voltage and Frequency: 100-120 Vac, 200-240 Vac, 230-277 Vac*
*Star or Wye with Center connected Neutral required.
Rated Power Consumption: 35A Resistive Load Maximum

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

EN 60947-4-1 2004 CRGD, 2005 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 61000-4-2 1996 A2, 2001 Electrostatic Discharge Immunity
EN 61000-4-4 2004 Electrical Fast-Transient / Burst Immunity
EN 61000-4-5 1995 A1, 2001 Magnetic Field Immunity
EN 61000-4-11 2004 Voltage Dips, Short Interruptions and Voltage Variations Immunity

2006-95-EC Low-Voltage Directive
EN 60947-1 2004 CRGD, 2005 Low-Voltage switchgear and controlgear Part 4-3: Contactors and motor-starters AC semiconductor controllers and contactors for non-motor loads.
IEC 60947-3-12 2004 Harmonic Current Emissions > 16A < 75A
IEC 60947-3-11 2000 Voltage Fluctuations and Flicker > 16A < 75A

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.

2002/96/EC WEEE Directive Equipment Requires Recycling

Compliant with 2002/95/EC RoHS Directive

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