Introduction

ES reverse power relays can prevent damage due to reverse power flow such as generator motoring caused by a loss of prime mover torque. The ES-32 relay achieves this by monitoring the direction of real power flow. If current flow from the source becomes reversed and exceeds the adjustable setting, the ES 32 relay will trip. ES-32 relays may be specified for use in single-phase applications or three-phase applications.

Microprocessor-based circuitry enhances functionality and improves performance. Internal diagnostics annunciate when relay function or accuracy is compromised.

Warning!

READ THIS MANUAL. Read this manual before installing or operating your ES series relay. Note all warnings, cautions, and notes in this manual as well as on the product. Failure to follow warning and cautionary labels may result in personal injury or property damage. Exercise caution at all times.

It is the responsibility of the user to ensure that this product is installed, operated, and used for its intended function in the manner specified by this manual or any protection provided by this product may be impaired.

Voltage and Current Sensing

ES-32 relays operate on only the fundamental component of the sensed voltage and current, rejecting all harmonic components. The ES-32 relay is available with single-phase current sensing and either single-phase voltage sensing or three-phase, three-wire voltage sensing. Units with three-phase, three-wire voltage sensing utilize the positive sequence voltage component (V1) to improve phasor representation when sensing a single-phase current on a three-phase system.

Relay Adjustments

ES-32 relays are equipped with a Set adjustment and a Delay adjustment. The Set adjustment is based on a percentage of the relay's nominal sensing current rating (5 Aac). The Delay adjustment controls the amount of time between when the Set adjustment is exceeded and the ES-32 relay trips.

Relay Output Contacts and Indicators

ES-32 relays come equipped with output contacts and LED indicators. Dual form-C output contacts change state and the red Relay LED lights when reverse power is detected. A continuously lit green Power LED indicates the presence of adequate generator sensing voltage. A flashing Power LED annunciates any relay fault detected by internal diagnostics.

Special Symbols

Special symbols are located on the ratings label on your ES series relay. These symbols are illustrated and described in Table 1.

Table 1. Special Symbol Descriptions

Symbol	Description
	Caution, Refer to Instructions
	Caution, Risk of Electric Shock

Specifications

Inputs

All units are self-powered.

Voltage Input

Nominal Voltage: 120 Vac, 208 Vac, 240 Vac, 380 Vac, 415 Vac, or 480 Vac
Operating Range: ±25% of nominal rating
Frequency: 50 or 60 Hz

(For other nominal voltage, contact Basler Electric.)

Current Input

Current Sensing: 5 Aac nominal

Burden

Voltage Input: <2.5 VA
Current Input: <0.2 VA at nominal current

Overload Withstand

Voltage: 2 times nominal for 3 s
Current: 2 times nominal continuous, 10 times nominal for 3 s

Setpoints

Range: Adjustable 2 to 20% of nominal rated power
Repeatability: ±3% or ±2 W whichever is greater
Time Delay: Adjustable 0 to 20 sec
Dropout (Reset): 1% of nominal rated power

Outputs

Output contact trip performance is in accordance with IEEE Std C37.90™-2005 and IEC 60255-1

Contact Type: Two form-C contacts per protective function

Make and Carry for Tripping Duty

30 A, 250 Vdc for 0.2 seconds per IEEE Std C37.90-2005 - *IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus*; 7 A continuous ac or dc

Break Resistive or Inductive

0.3 A at 125 or 250 Vdc (L/R = 0.04 maximum)

Environment

Temperature

Operating: –40 to 70°C (–40 to 158°F)
Storage: –40 to 85°C (–40 to 185°F)
Coefficient: 0.02% of nominal per °C (200 ppm/°C)
Relative Humidity: ≤95%, non-condensing
Ingress Protection: IP50 Case, IP20 Terminals
Pollution: Degree 1
Insulation: Class II
Overvoltage: Category III

Physical

Terminals

Type:	Compression screw
Wire Size:	0.5-3.3 mm2/20-12 AWG
Screw Torque:	4.4 to 5.3 in-lb (0.5 to 0.6 N•m)
Mounting (HxD):	DIN rail 1.38 x 0.29 inches (35 x 7.5 mm) complies with IEC 60715

Size (WxHxD)

All ES-32 models are supplied in a wide case.

Wide Case:	3.93 x 2.75 x 4.38 inches (100 x 70 x 111 mm)

Weight

Wide Case:	1.10 lb. (0.50 kg)

Applicable Standards

IEC

IEC 60255-1 Measuring relays and protection equipment – Part 1: Common requirements (includes all referenced/normative IEC standards)

IEEE

IEEE Std C37.90™-2005 – *IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus*

IEEE Std C37.90.1™-2012 – *IEEE Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus*

IEEE Std C37.90.2™-2004 – *IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers*

IEEE Std C37.90.3™-2001 – *IEEE Standard for Electrostatic Discharge Tests for Protective Relays*

Agency Compliance

UL

This product is listed to applicable Canadian and US safety standards and requirements by UL.

- UL 508
- UL 94 V-0
- CSA C22.2 No. 0
- CSA C22.2 No. 14

CE and UKCA Compliance

This product has been evaluated and complies with the relevant essential requirements set forth by the EU legislation and UK Parliament.

EU directives:

- Low Voltage Directive (LVD) 2014/35/EU
- Electromagnetic Compatibility (EMC) 2014/30/EU
- Hazardous Substances (RoHS 2) 2011/65/EU

Harmonized standards used for evaluation:

- EN 50178
- EN 50581
- EN 60255-1
- EN 60255-26
- EN 60255-27
- IEC 61000-6-4

FCC Requirements

This product complies with FCC 47 CFR Part 15.

China RoHS

The following table serves as the declaration of hazardous substances for China in accordance with PRC standard SJ/T 11364-2014. The EFUP (Environment Friendly Use Period) for this product is 40 years.

PRODUCT:	ES-32									
零件名称 Part Name	有害物质 Hazardous Substances									
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr^{6+})	多溴联苯 Polybrominated Biphenyls (PBB)	多溴二苯醚 Polybrominated Diphenyl Ethers (PBDE)	邻苯二甲酸二丁酯 Dibutyl Phthalate (DBP)	邻苯二甲酸丁苄酯 Benzyl butyl phthalate (BBP)	邻苯二甲酸二酯 Bis(2-ethylhexyl) phthalate (BEHP)	邻苯二甲酸二异丁酯 Diisobutyl phthalate (DIBP)
金属零件 Metal parts	O	O	O	O	O	O	O	O	O	O
聚合物 Polymers	O	O	O	O	O	O	O	O	O	O
电子产品 Electronics	X	O	O	O	O	O	O	O	O	O
电缆和互连配件 Cables & interconnect accessories	X	O	O	O	O	O	O	O	O	O
绝缘材料 Insulation material	O	O	O	O	O	O	O	O	O	O

本表格依据 SJ/T11364 **的**规定编制。

O: **表示**该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

X: **表示**该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

This form was prepared according to the provisions of standard SJ/T11364.

O: Indicates that the hazardous substance content in all homogenous materials of this part is below the limit specified in standard GB/T 26252.

X: Indicates that the hazardous substance content in at least one of the homogenous materials of this part exceeds the limit specified in standard GB/T 26572.

Operation

Reverse power protection in ES-32 relays is adjusted by controls marked Set and Delay.

Set Control

The Set control adjusts the reverse power trip point. When the monitored reverse power remains above the trip point by the percentage established by the Set control for the duration of the time delay, a relay trip occurs. This condition energizes the relay output and lights the red Relay LED. The reverse power trip point is adjustable from 2 to 20% of the nominal rated power (5 Aac at nominal input voltage).

Delay Control

This control adjusts the amount of time that the sensed input exceeds the pickup level before a relay trip occurs. The delay is adjustable from 0 to 20 seconds.

Single-Phase Setting Example

A single-phase ES-32 relay with a nominal input rating of 120 Vac, which results in 600 W rated power at 5 Aac (P_(1-phase)=V_LN I_L), has the following settings:

- Set - 10%
- Delay - 10 seconds

A trip occurs when the reverse power flow remains above 60 W for 10 seconds. Dropout occurs when the reverse power flow decreases below 54 W (1% of nominal rated power). The output relay de-energizes and the red Relay LED extinguishes.

Three-Phase, Three-Wire Setting Example

A three-phase, three-wire ES-32 relay with a nominal input rating of 120 Vac L-L (balanced), which results in 1,039 W rated power at 5 Aac $\left(P_{3-phase} = \sqrt{3}V_{LL}I_L\right)$, has the following settings:

- Set - 10%
- Delay - 10 seconds

A trip occurs when the reverse power flow remains above 103.9 W for 10 seconds. Dropout occurs when the reverse power flow decreases below 93.5 W (1% of nominal rated power). The output relay de energizes and the red Relay LED extinguishes.

Installation

ES relays should be installed in a dry location where the ambient temperature remains within the operating temperature range.

ES reverse power relays mount on standard DIN rails that comply with IEC 60715. Mounting involves hooking the top edge of the cutout on the base of the case over one edge of the DIN rail. The opposite side of the cutout containing the release clip is then pushed over the opposite side of the DIN rail. To remove or reposition the relay, pull the release clip downward and move the relay as required. Figure 1 shows the dimensions for the ES-32 relay.

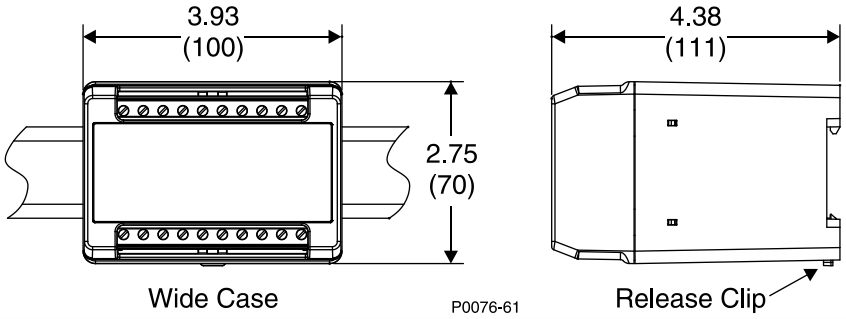

Figure 1. Relay Dimensions

Relay connections should be made using wire that meets applicable codes and is properly sized for the application.

Warning!

When working on relay current inputs, CT circuits should first be shorted. An open CT secondary may contain high voltages when current is present on the CT primary.

Caution

Before commissioning, check the equipment ratings, operating instructions, and installation instructions.

Note

When contact outputs are used to apply dc control voltage to inductive windings, such as relay coils, a flyback diode in parallel with the winding is recommended for EMI suppression. Failure to add such EMI suppression can result in circuit damage.

Figure 2 shows the sensing connections for the ES-32 relay.

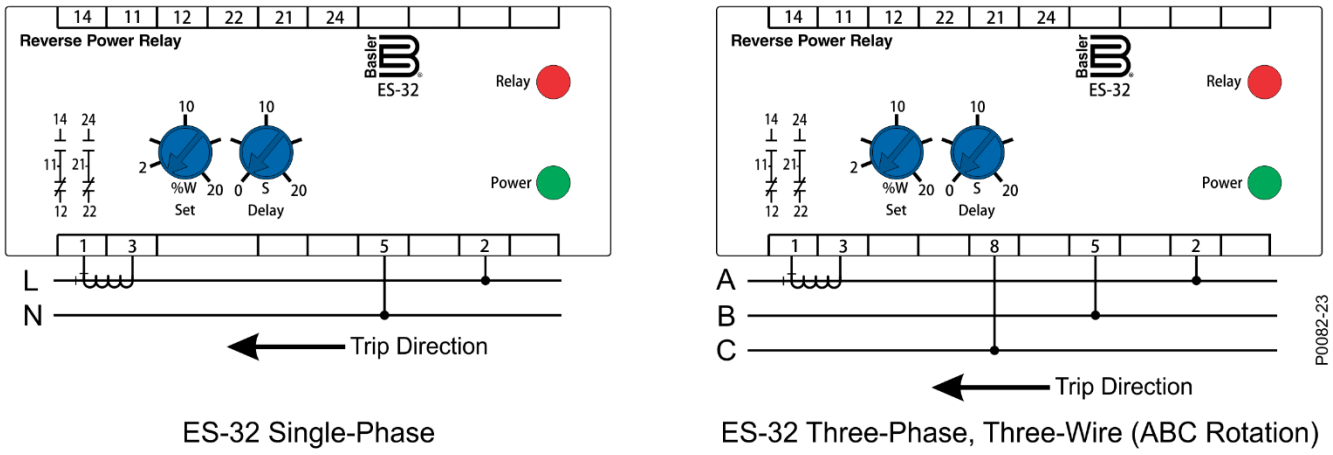

Figure 2. ES-32-1, ES-32-3 Reverse Power Relay Sensing Connections

Calibration

The calibration marks on the faceplate are provided only as guides. Proper calibration requires using an accurate meter to monitor the current. Use the following procedure to calibrate your relay.

1. Adjust the Set control fully clockwise (CW) and the Delay control fully counterclockwise (CCW).
2. Reverse the current input connections (terminals 1 and 3) to simulate reverse power.
3. Apply the desired trip level of real power to the relay. To do this, apply nominal input voltage and the appropriate magnitude and phase of current to the relay to achieve the desired level of real power.
4. Adjust the Set control CCW until the relay trips.
5. Reduce the applied power and set the Delay control to the desired time setting.
6. Apply a value of reverse power that is greater than the relay trip point. Measure the time from when the power is applied until the relay trips.
7. Compare the measured time to the desired time delay and adjust the Delay control accordingly.
8. Repeat Steps 5, 6, and 7 as required.

Maintenance

ES relays require no maintenance. In the event that your relay requires repair, contact Basler Electric, Highland, IL, USA for return authorization.

Ordering Information

Mounting accessories (DIN rails and DIN rail end stops) are available from Basler Electric. Table 2 lists the part numbers for ordering.

Figure 3 shows the ES reverse power relay style numbers.

Table 2. Mounting Accessories

Mounting Accessories	Basler Part Number
DIN Rail, 3.0 inches (76 mm) wide	9323900001
DIN Rail, 5.5 inches (140 mm) wide	9323900002
DIN Rail, 8.0 inches (203 mm) wide	9323900003
DIN Rail, 39.4 inches (1,000 mm) wide	17366
DIN Rail End Stops	31761

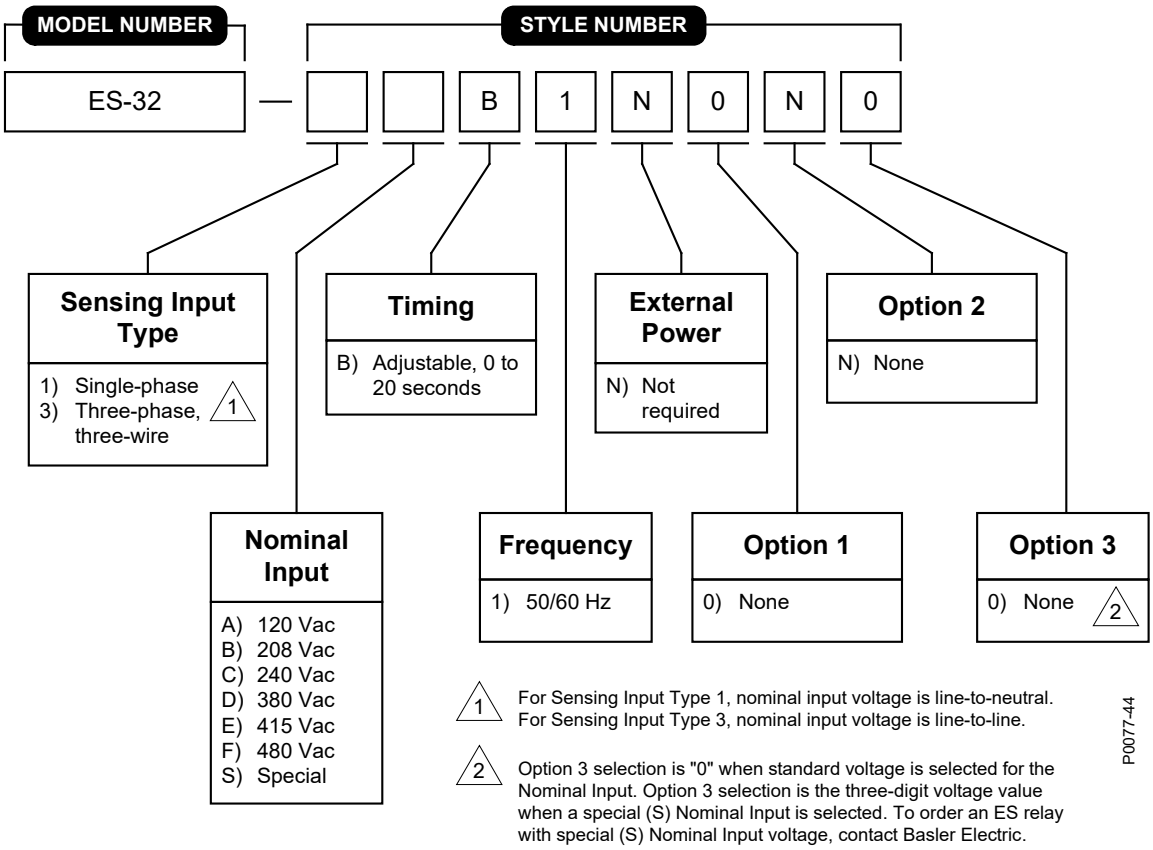

Figure 3. ES-32 Style Number Identification Chart