## Introduction

ES ac current relays provide current monitoring and protection and may be specified for use in single-phase or three-phase applications. Three models are available: the ES-37 provides undercurrent protection, the ES-51 provides overcurrent protection, and the ES-37/51 provides undercurrent and overcurrent protection. 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.

## Current Sensing

ES ac current relays operate on only the fundamental component of the sensed current, rejecting all harmonic components. Single-phase sensing or three-phase sensing may be specified.

## Relay Adjustments

Relay adjustments include a Set control and a Delay control. The Set adjustment is based on a percentage of the relay's nominal sensing current rating. A fixed, internal dropout setting reduces nuisance tripping when monitoring current that is noisy or unstable. The Delay adjustment prevents premature relay operation during brief current fluctuations.

## Relay Output Contacts and Indicators

ES ac current relays are equipped with output contacts and LED indicators. Relay output contacts can be used as an alarm annunciation, a control output, or a tripping signal. Two form-C output contacts and an LED indicator are provided for each protective function. Some models provide the option for an additional pair of form-C auxiliary contacts. Refer to the style chart (Figure 4). A Power LED indicates the presence of control power at the relay's auxiliary power input when continuously lit and annunciates any relay fault, detected by internal diagnostics, when flashing.

## Case Sizes

ES-37 and ES-51 models with single-phase sensing and no auxiliary contacts (style 1GB1x0N0) are supplied in a narrow case. All other ES-37, ES-51, and ES-37/51 models are supplied in a wide case.

## 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

### Operating Power

All units require external operating power.

| | |
|---|---|
| Nominal Voltage: | 120 Vac, 208 Vac, 240 Vac, 380 Vac, 415 Vac, 480 Vac, or 24 Vdc<br>(For other nominal voltages, contact Basler Electric.) |
| AC Operating Range: | Nominal ±25% |
| DC Operating Range: | Nominal ±20% |
| Frequency: | 50 or 60 Hz |

*Burden*

| | |
|---|---|
| AC Power Supply: | <2.5 VA (narrow case)<br><3 VA (wide case) |
| DC Power Supply: | <1.5 W |

### Sensing Input

| | |
|---|---|
| Nominal Current: | 5 Aac |
| Range: | 0.2 to 10 Aac |
| Continuous Withstand: | 10 Aac |
| Burden: | <0.2 VA at nominal current |

### Setpoint

| | |
|---|---|
| Undercurrent Range: | Adjustable 5 to 80% of nominal |
| Overcurrent Range: | Adjustable 40 to 120% of nominal |
| Repeatability: | ±2% or ±50 mA (whichever is greater) |
| Time Delay: | Adjustable 0 to 20 sec |
| Operation Time: | 15 to 50 ms typical with no intentional time delay |
| Dropout (Reset): | Fixed at 1% of nominal |

### 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

| | |
|---|---|
| Operating Temperature: | –40 to 70°C (–40 to 158°F) |
| Storage Temperature: | –40 to 85°C (–40 to 185°F) |
| Temperature 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 IEC60715 |

*Size (WxHxD)*

| | |
|---|---|
| Narrow Case: | 2.17 x 2.75 x 4.38 inches (55 x 70 x 111 mm) |
| Wide Case: | 3.93 x 2.75 x 4.38 inches (100 x 70 x 111 mm) |

*Weight*

| | |
|---|---|
| Narrow Case: | 0.85 lb (0.38 kg) |
| 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*

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-37, ES-51, ES-37/51 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 零件名称<br>Part Name | 有害物质<br>Hazardous Substances | | | | | | | | | |
| | 铅<br>Lead (Pb) | 汞<br>Mercury (Hg) | 镉<br>Cadmium (Cd) | 六价铬<br>Hexavalent Chromium ($Cr^{6+}$) | 多溴联苯<br>Polybrominated Biphenyls (PBB) | 多溴二苯醚<br>Polybrominated Diphenyl Ethers (PBDE) | 邻苯二甲酸二丁酯<br>Dibutyl Phthalate (DBP) | 邻苯二甲酸丁苄酯<br>Benzyl butyl phthalate (BBP) | 邻苯二甲酸二酯<br>Bis(2-ethylhexyl) phthalate (BEHP) | 邻苯二甲酸二异丁酯<br>Diisobutyl phthalate (DIBP) |
| 金属零件<br>Metal parts | O | O | O | O | O | O | O | O | O | O |
| 聚合物<br>Polymers | O | O | O | O | O | O | O | O | O | O |
| 电子产品<br>Electronics | X | O | O | O | O | O | O | O | O | O |
| 电缆和互连配件<br>Cables & interconnect accessories | X | O | O | O | O | O | O | O | O | O |
| 绝缘材料<br>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

AC current protection in the ES-37 and ES-51 relays is adjusted by controls marked Set and Delay. The ES-37/51 has four controls: Under Set, Under Delay, Over Set, and Over Delay.

### Set Control

The ES-51 Set control adjusts the overcurrent trip point. When the monitored current on any phase rises above the percentage established by the Set control for the duration of the adjustable time delay, a relay trip occurs. This condition energizes the relay output and lights the red Relay/Over LED. The overcurrent trip point is adjustable from 40 to 120% of the nominal input.

The ES-37 Set control adjusts the undercurrent trip point. When the monitored current on any phase drops below the percentage established by the Set control for the duration of the adjustable time delay, a relay trip occurs. This condition de-energizes the relay output and extinguishes the green Relay/Under LED. The undercurrent trip point is adjustable from 5 to 80% of the nominal input.

### Delay Control

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

### Setting Example

An ES-51 relay has the following settings:

- Set – 120%
- Delay – 4 seconds

A trip occurs when the sensing current remains above 6 amperes for 4 seconds. Dropout occurs when the current decreases below 5.95 amperes (1% of nominal below trip point).

## Installation

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

ES ac current sensing 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 of the ES-37, ES-51, and ES-37/51 relays.

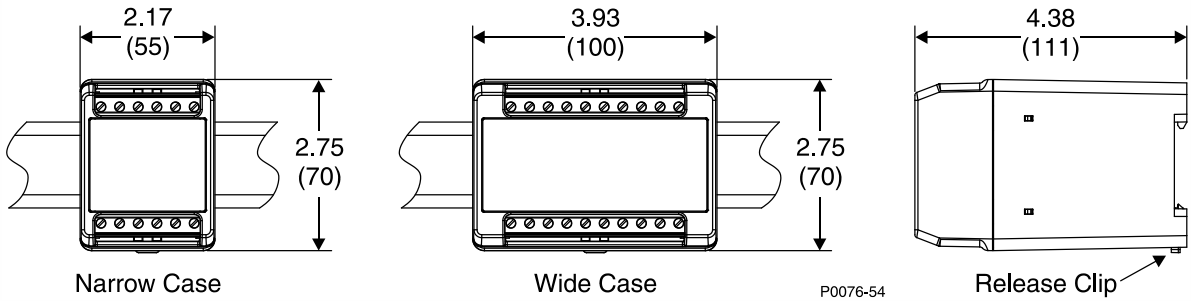


**Figure 1. Relay Dimensions**

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.

Figure 2 shows the sensing connections for the ES-37, ES-51, and ES-37/51 ac current relays. Figure 3 illustrates the front panel appearance of ES 37 and ES-51 relays with optional auxiliary relay outputs (style 1GB1x0A0).

**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.

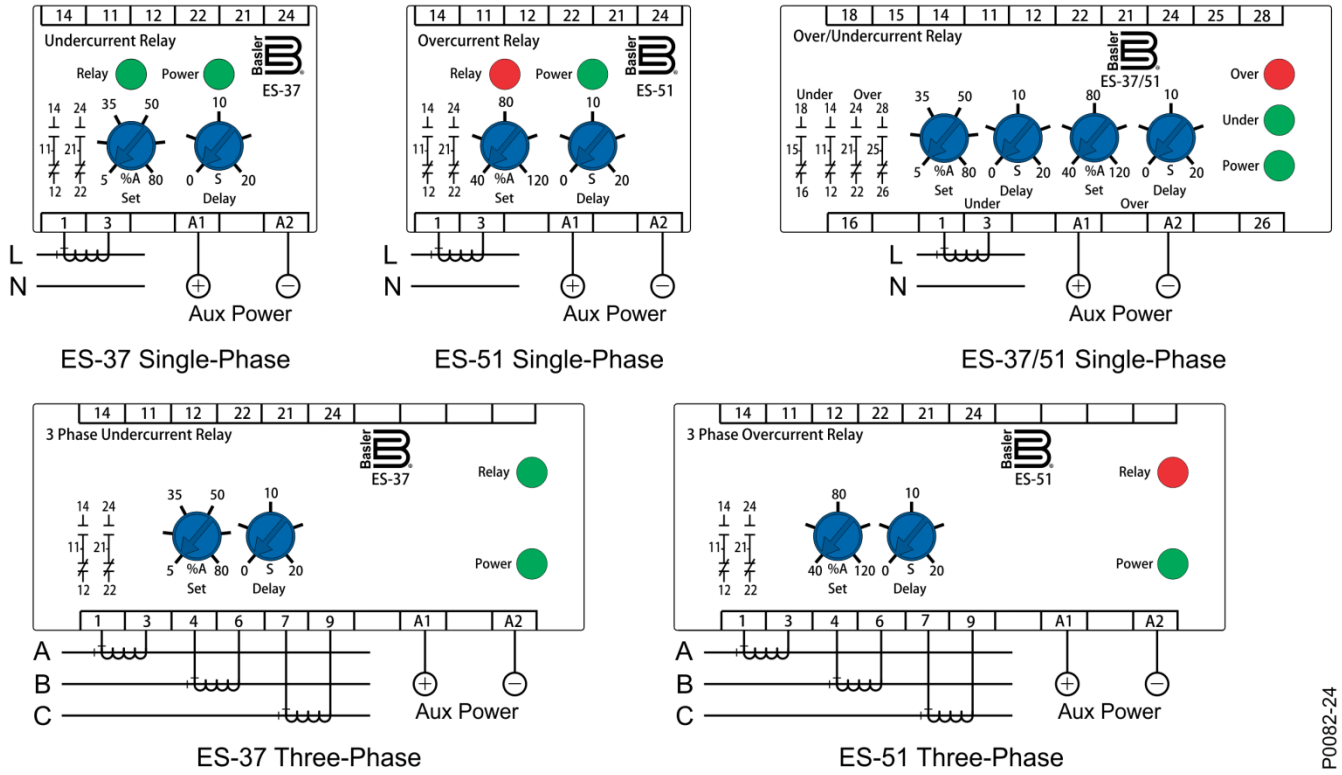


**Figure 2. ES-37, ES-51, and ES-37/51 AC Current Sensing Connections**

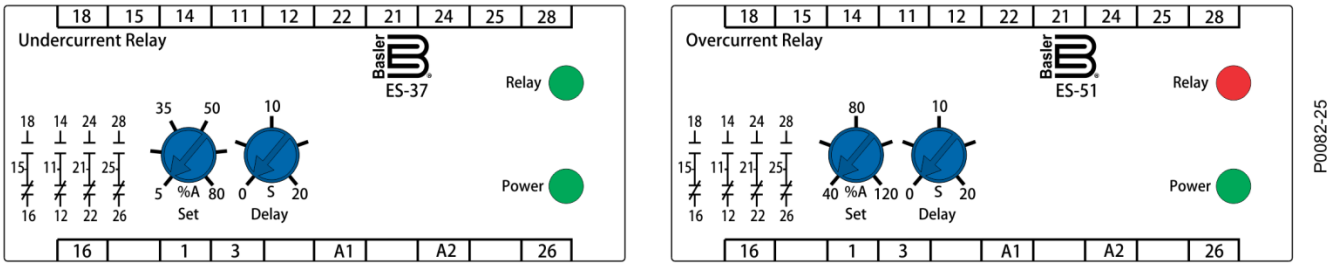


**Figure 3. ES-37 and ES-51 Relays with Auxiliary Contact Outputs**

## Calibration

The calibration marks on the faceplate are provided only as guides. Proper calibration requires using an accurate ammeter in series with the current source. Use the following procedure to calibrate your relay.

### Overcurrent

1. Adjust the Set control fully clockwise (CW) and the Delay control fully counterclockwise (CCW).
2. Apply the desired trip current to the relay.
3. Adjust the Set control CCW until the relay trips.
4. Remove the applied current and set the Delay control to the desired time delay.
5. Apply current at a level above the trip level set in Step 3 to the relay and measure the time to trip.
6. Adjust the Delay and repeat Steps 4 and 5 until the desired time delay is achieved.

### Undercurrent

1. Adjust the Set and Delay controls fully CCW.
2. Apply the desired trip current to the relay.
3. Adjust the Set control CW until the relay trips.
4. Set the applied current to nominal and set the Delay control to the desired time delay.
5. Apply current at a level below the trip level set in Step 3 to the relay and measure the time to trip.
6. Adjust the Delay and repeat Steps 4 and 5 until the desired time delay is achieved.

## 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

Figure 4 shows the ES ac current relay style chart.

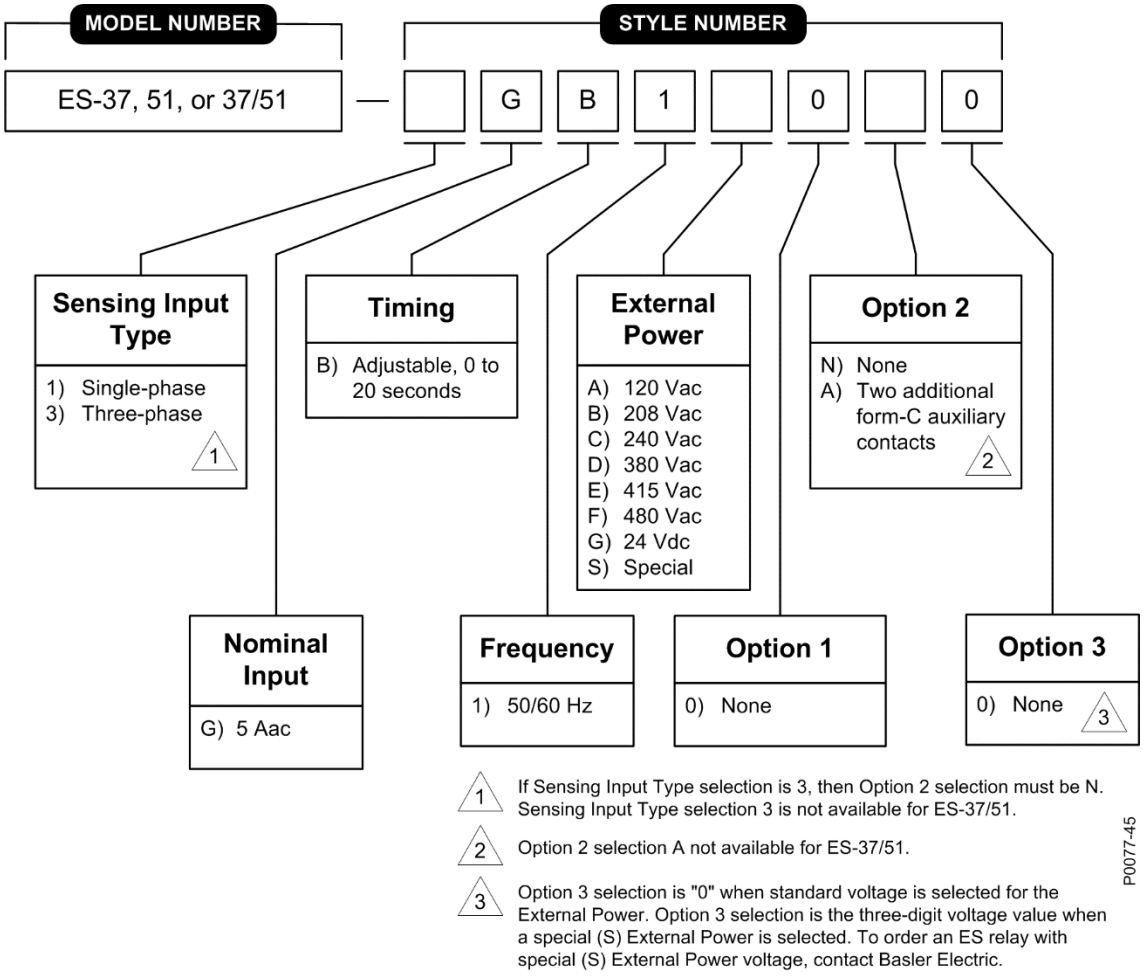


**Figure 4. ES-37, ES-51, and ES-37/51 Style Number Identification Chart**

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

**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 |