INTRODUCTION

ES ac voltage relays provide voltage monitoring and protection and may be specified for use in single-phase or three-phase applications. Three models are available: the ES-27 provides undervoltage protection, the ES-59 provides overvoltage protection, and the ES-27/59 provides undervoltage and overvoltage 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.

Voltage Sensing

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

Relay Adjustments

All ES ac voltage relays are equipped with a Set adjustment for undervoltage trips and/or overvoltage trips. The Set adjustment is based on a percentage of the relay's nominal sensing voltage rating. Relays with instantaneous timing have a Reset adjustment which allows the system to recover during load swings before dropping out and resetting the relay. Relays with adjustable timing have a Delay adjustment which prevents premature relay operation during brief voltage fluctuations.

Relay Output Contacts and Indicators

ES ac voltage relays come equipped with output contacts and LED indicators. Relay output contacts can be used as an alarm annunciation, a control output, or a tripping signal. A pair of form-C (SPDT) output contacts and an LED indicator are provided for each protection function. A Power LED indicates the presence of adequate sensing voltage when continuously lit and annunciates any relay fault, detected by internal diagnostics, when flashing.

Case Sizes

All ES-27/59 models are supplied in a wide case as are ES-27 and ES-59 models with auxiliary relay outputs (style xxx1NxA0). All other ES-27 and ES-59 models are supplied in a narrow 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 Documentation
⚡	Caution, Risk of Electric Shock

SPECIFICATIONS

Inputs

All units are self-powered.

Nominal Voltage: 120 Vac, 208 Vac, 240 Vac, 380 Vac, 415 Vac, or 480 Vac.
(For other nominal voltages, contact Basler Electric.)

Overload Withstand: 1.25 times nominal continuous
2 times nominal for 3 s
Frequency: 50 or 60 Hz
Burden: <2.5 VA per phase for narrow case units, <3 VA per phase for wide case units.

Adjustable Setpoint

Undervoltage Range: 75 to 100% of nominal
Overvoltage Range: 100 to 125% of nominal
Repeatability: ±2% or ±1 V (whichever is greater)

Instantaneous Trip (Option)
Adjustable Dropout: 1 to 15% of nominal
Operating Time: <100 ms

Time Delayed Trip (Option)
Adjustable Time Delay: 0 to 20 s
Fixed Dropout: 1% of nominal

Outputs

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

Relay Type: SPDT (form-C)

AC Rating:
Make and Carry:	250 V, 5 A
Break Resistive or Inductive:	0.3 A at 250 V (L/R=0.04 maximum)

DC Rating:
Make and Carry:	125 V, 1 A
Break Resistive or Inductive:	0.3 A at 125 V (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 mm^2/20-12 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)
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

UL

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

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

CE

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

EU directives:
- Low Voltage (LVD) 2006/95/EC
- Electromagnetic Compatibility (EMC) 2004/108/EC
- 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

EAC (Eurasian Conformity)
- TP TC 004/2011
- TP TC 020/2011

OPERATION

Instantaneous Trip

AC voltage protection in the ES-27 and ES-59 relays with instantaneous trip (style xx<u>A</u>1N<u>2</u>x0) is adjusted by controls marked Set and Reset. The ES-27/59 relay has four controls: Under Set, Over Set, Under Reset, and Over Reset.

Set Control

The ES-59 relay Set control adjusts the overvoltage trip point. When the monitored voltage rises above the percentage established by the Set control, a relay trip occurs. This condition energizes the relay output and lights the red *Relay/Over* LED. The overvoltage trip point is adjustable from 100 to 125% of the nominal input.

The ES-27 relay Set control adjusts the undervoltage trip point. When the monitored voltage drops below the percentage established by the Set control, a relay trip occurs. This condition de-energizes the relay output and extinguishes the green *Relay/Under* LED. The undervoltage trip point is adjustable from 75 to 100% of the nominal input.

Reset Control

The ES-59 Reset control adjusts the overvoltage dropout point. When the monitored voltage drops below the trip point by the percentage established by the Reset control, the relay is de-energized and the red Relay/Over LED extinguishes.

The ES-27 Reset control adjusts the undervoltage dropout point. When the monitored voltage rises above the trip point by the percentage established by the Reset control, the relay is energized and the green Relay/Under LED lights.

The undervoltage and overvoltage dropout point is adjustable from 1 to 15% of the nominal input.

Setting Example

An ES-59 relay with a nominal input rating of 240 Vac has the following settings:

- Set - 120%
- Reset - 5%

A trip occurs when the sensing voltage rises above 288 Vac. Dropout occurs when the voltage decreases below 276 Vac (5% of nominal below the trip point).

Time Delayed Trip

AC voltage protection in the ES-27 and ES-59 relays with time delayed trip (style xx<u>B</u>1N<u>0</u>x0) is adjusted by controls marked Set and Delay. The ES-27/59 relay has four controls for adjusting ac voltage protection: Under Set, Over Set, Under Delay, and Over Delay.

Set Control

The ES-59 relay Set control adjusts the overvoltage trip point. When the monitored voltage 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 overvoltage trip point is adjustable from 100 to 125% of the nominal input.

The ES-27 relay Set control adjusts the undervoltage trip point. When the monitored voltage 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 undervoltage trip point is adjustable from 75 to 100% 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-59 relay with a nominal input rating of 240 Vac has the following settings:

- Set - 120%
- Delay - 4 seconds

A trip occurs when the sensing voltage remains above 288 Vac for 4 seconds. Dropout occurs when the voltage decreases below 285.6 Vac (1% of nominal below the trip point).

INSTALLATION

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

ES ac voltage 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-27, ES-59, and ES-27/59 relays.

Relay connections should be made using wire that meets applicable codes and is properly sized for the application. Figure 2 shows the sensing connections for the ES-27, ES-59, and ES-27/59 relays. Figure 3 illustrates the front panel appearance of ES-27 and ES-59 relays with optional auxiliary relay outputs (style xxx1Nx<u>A</u>0).

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

CALIBRATION

The calibration marks on the faceplate are provided only as guides. Proper calibration requires using an accurate voltmeter in parallel with the input signal. Use the following procedure to calibrate your relay.

Instantaneous Overvoltage

1. Adjust the Set and Reset controls fully clockwise (CW).
2. Apply the desired trip voltage to the relay.
3. Adjust the Set control counterclockwise (CCW) until the relay trips.
4. Reduce the applied voltage to the desired dropout level.
5. Adjust the Reset control CCW until the relay drops out.

Instantaneous Undervoltage

1. Adjust the Set control fully CCW and the Reset control fully CW.
2. Apply the desired trip voltage to the relay.
3. Adjust the Set control CW until the relay trips.
4. Increase the applied voltage to the desired dropout level.
5. Adjust the Reset control CCW until the relay drops out.

Time Delayed Overvoltage

1. Adjust the Set control fully CW and the Delay control fully CCW.
2. Apply the desired trip voltage to the relay.
3. Adjust the Set control CCW until the relay trips.
4. Reduce the applied voltage and set the Delay control to the desired time delay.
5. Increase the applied voltage to a level above the trip level set in Step 3 and measure the time delay.
6. Adjust the Delay and repeat Steps 4 and 5 until you have the desired time delay.

Time Delayed Undervoltage

1. Adjust the Set and Delay controls fully CCW.
2. Apply the desired trip voltage to the relay.
3. Adjust the Set control CW until the relay trips.
4. Increase the applied voltage and set the Delay control to the desired time delay.
5. Reduce the applied voltage to a level below the trip level set in Step 3 and measure the time delay.
6. Adjust the Delay and repeat Steps 4 and 5 until you have the desired time delay.

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 4 shows the ES style number identification chart.

FIGURES

Narrow Case   Wide Case   P0076-54   Release Clip
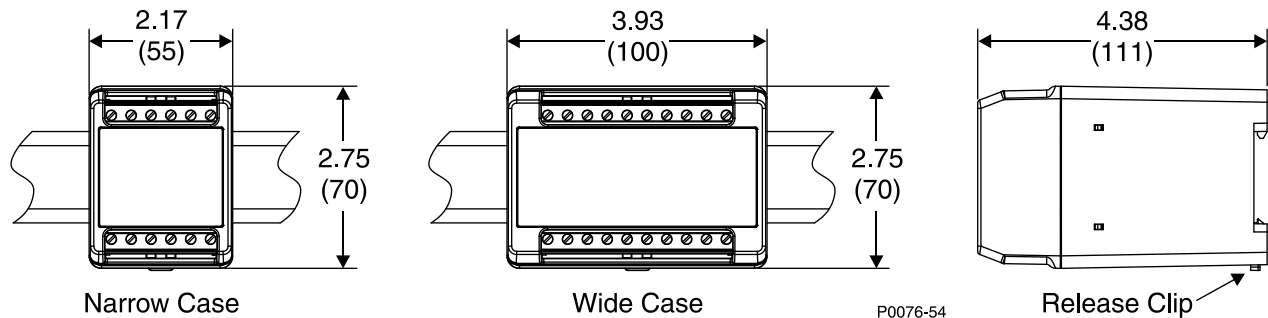
Figure 1. Relay Dimensions
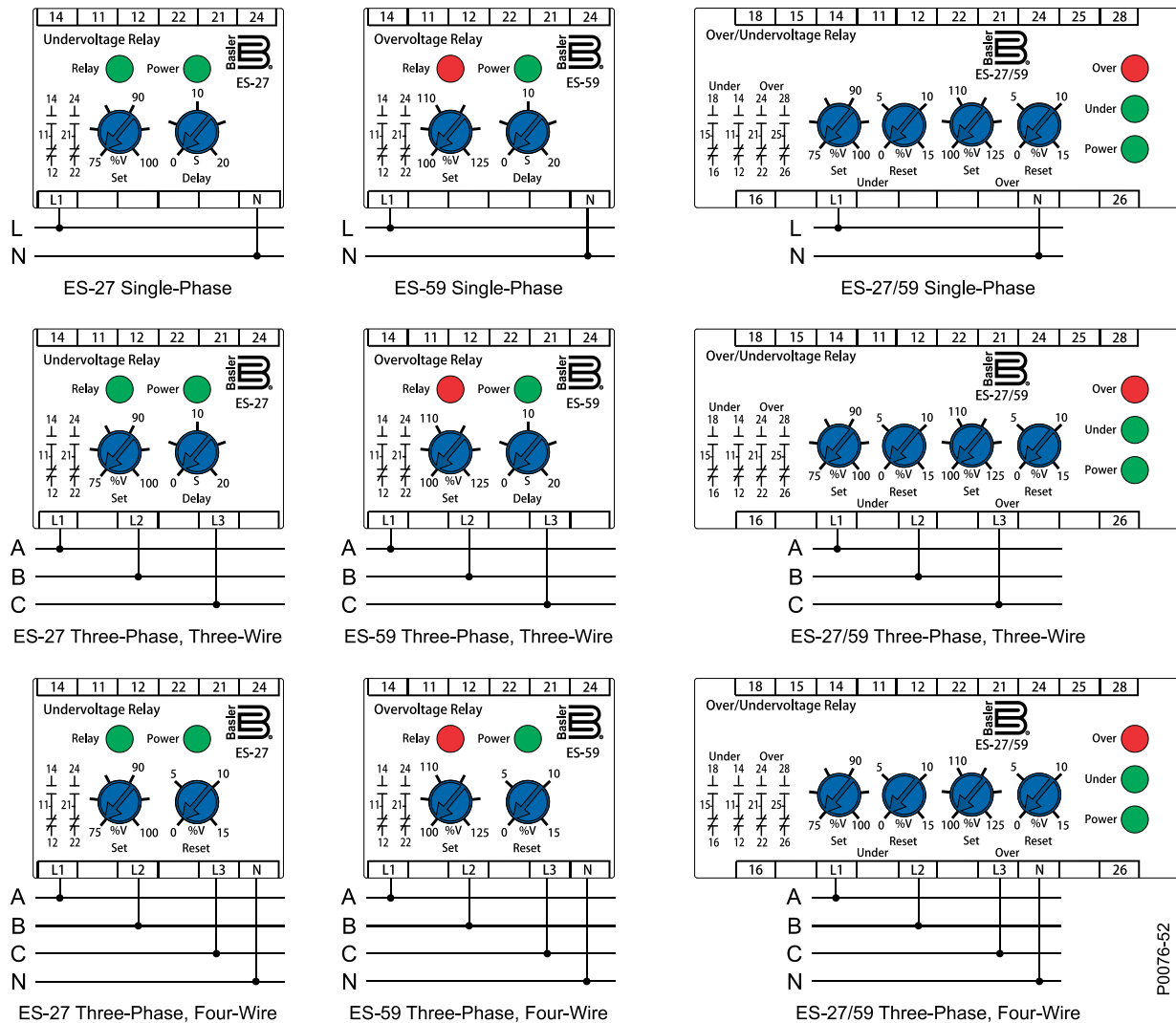
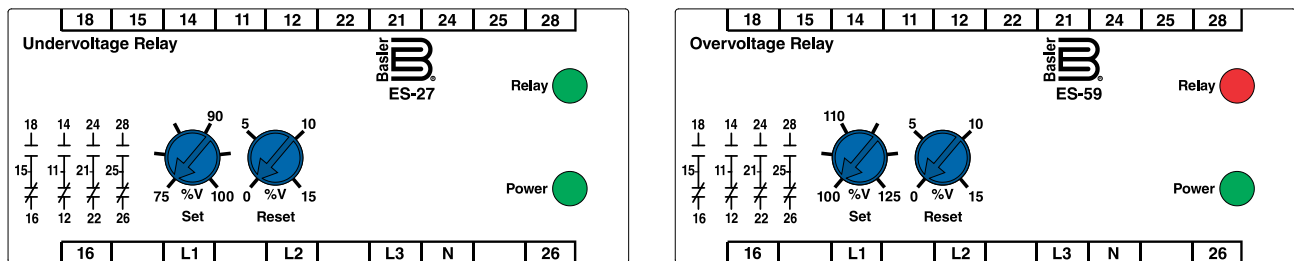**Figure 2. ES-27, ES-59, ES-27/59 AC Sensing Voltage Connections**

Figure 3. ES-27 and ES-59 Relays with Auxiliary Relay Outputs

Table 2. Mounting Accessories

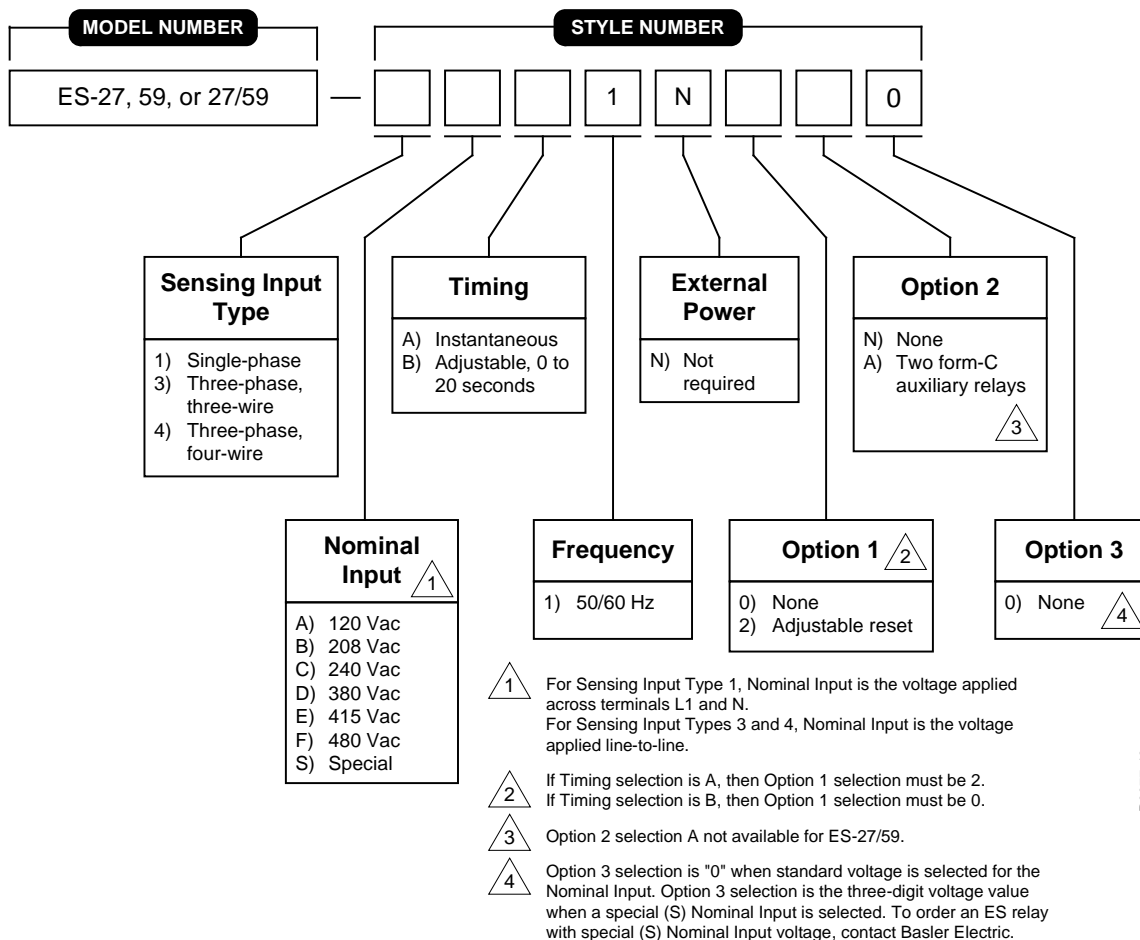| Mounting Accessories	Basler Part Number
DIN Rail, 3.0 inches (76 mm) wide	9323900001
DIN Rail, 5.5 inches (140 mm) wide	9323900002
DIN Rail, 8.0 inches (203 mm) wide	9323900003
DIN Rail, 39.4 inches (1,000 mm) wide	17366
DIN Rail End Stops	31761

Figure 4. ES-27, ES-59, ES-27/59 Style Number Identification Chart

P0077-43