

	<a href="http://www.basler.com">www.basler.com</a> +1 618.654.2341 (USA) <a href="mailto:info@basler.com">info@basler.com</a>	Model	<b>ES-27, ES-59, ES-27/59</b>
		Description	<b>Voltage Relays</b>

## 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. 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 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 contacts (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.

Publication	Revision	<h1 style="color: blue;">Instructions</h1>	Date	Page
<b>9500100990</b>	<b>L</b>		<b>Jun 2025</b>	<b>1 of 10</b>

**Table 1. Special Symbol Descriptions**

Symbol	Description
	Caution, Refer to Instructions
	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 voltage, 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 (Reset): 1 to 15% of nominal

Operating Time: <100 ms

#### Time Delayed Trip (Option)

Adjustable Time Delay: 0 to 20 s

Fixed Dropout (Reset): 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 mm<sup>2</sup>/20-12 AWG

Screw Torque: 4.4 to 5.3 in-lb (0.5 to 0.6 N•m)

Publication <b>9500100990</b>	Revision <b>L</b>	<b><i>Instructions</i></b>	Date <b>Jun 2025</b>	Page <b>2 of 10</b>
----------------------------------	----------------------	----------------------------	-------------------------	------------------------

### 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 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.

Publication <b>9500100990</b>	Revision <b>L</b>	<b>Instructions</b>	Date <b>Jun 2025</b>	Page <b>3 of 10</b>
----------------------------------	----------------------	---------------------	-------------------------	------------------------

**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-27, ES-59, ES-27/59									
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 <sup>6+</sup> )	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 26572.

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**

**Instantaneous Trip**

AC voltage protection in the ES-27 and ES-59 relays with instantaneous trip (style xxA1N2x0) 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 of any phase 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 of any phase 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.

Publication <b>9500100990</b>	Revision <b>L</b>	<b>Instructions</b>	Date <b>Jun 2025</b>	Page <b>4 of 10</b>
----------------------------------	----------------------	---------------------	-------------------------	------------------------

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 xxB1N0x0) 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**

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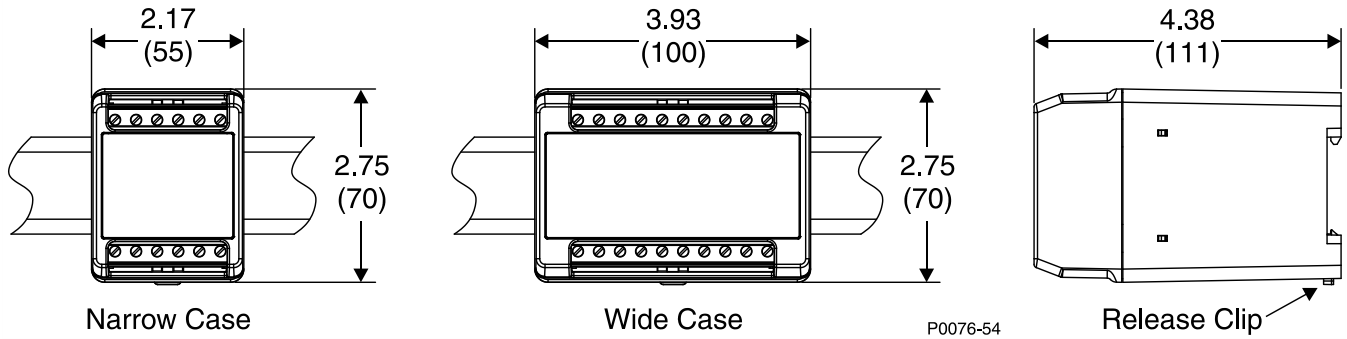
### **Caution**

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

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.

Publication <b>9500100990</b>	Revision <b>L</b>	<b><i>Instructions</i></b>	Date <b>Jun 2025</b>	Page <b>5 of 10</b>
----------------------------------	----------------------	----------------------------	-------------------------	------------------------



**Figure 1. Relay Dimensions**

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 xxx1NxA0).

**Note**

De-energized contact output states are shown in the diagram to the left of the Set control in Figures 2 and 3. An Overvoltage trip energizes the relay output contacts and an Undervoltage trip de-energizes the relay output contacts.

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.

Publication <b>9500100990</b>	Revision <b>L</b>	<b><i>Instructions</i></b>	Date <b>Jun 2025</b>	Page <b>6 of 10</b>
----------------------------------	----------------------	----------------------------	-------------------------	------------------------

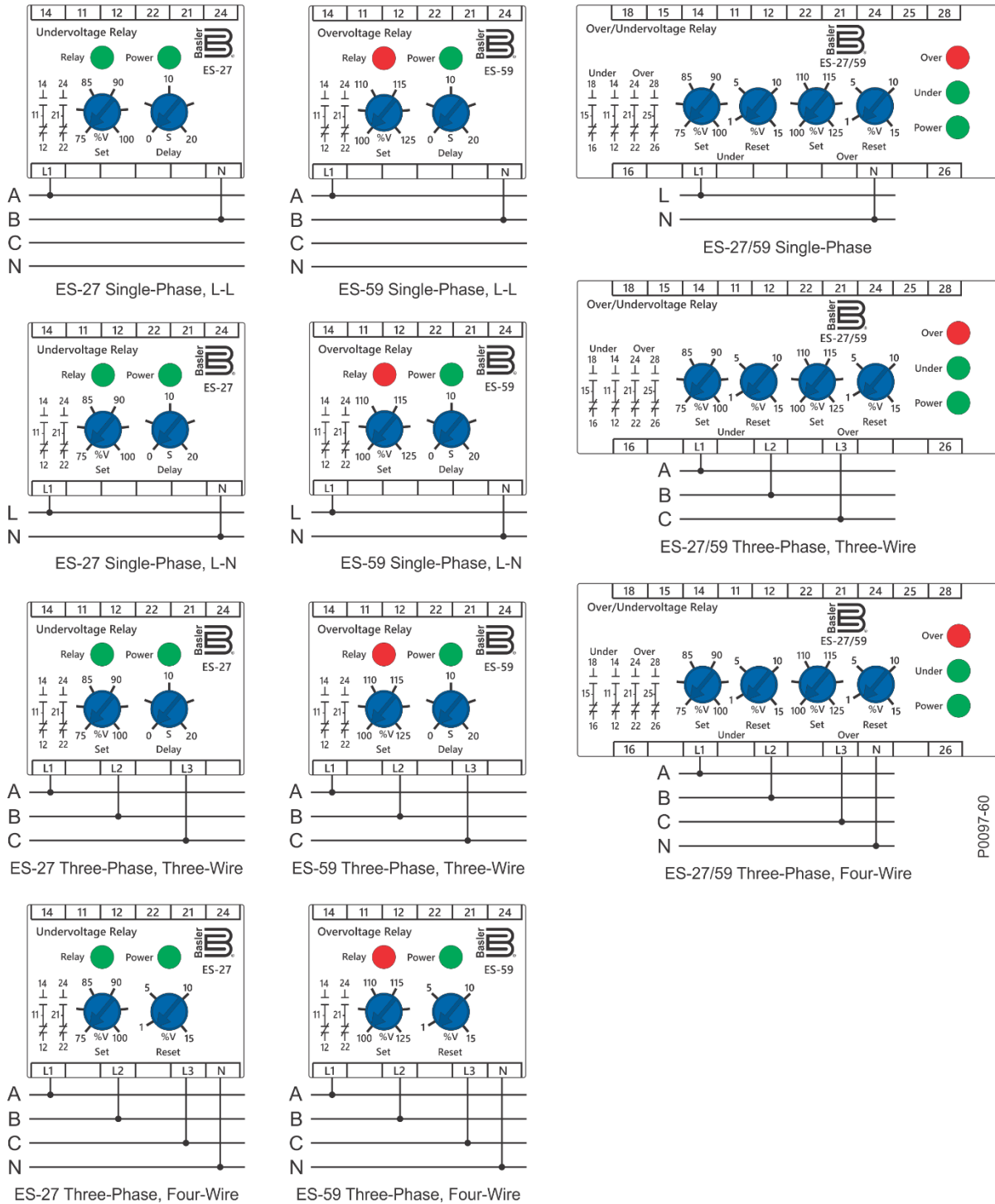


Figure 2. ES-27, ES-59, ES-27/59 AC Sensing Voltage Connections

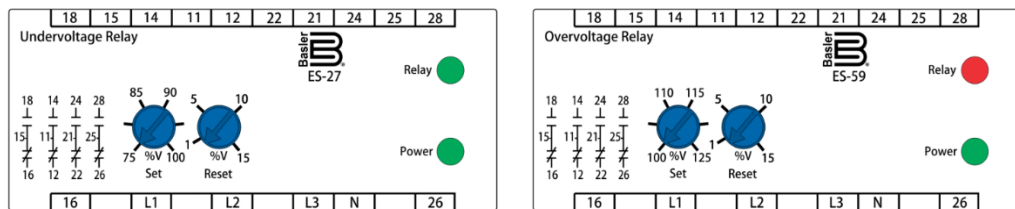


Figure 3. ES-27 and ES-59 Relays with Auxiliary Contact Outputs

Publication <b>9500100990</b>	Revision <b>L</b>	<b>Instructions</b>	Date <b>Jun 2025</b>	Page <b>7 of 10</b>
----------------------------------	----------------------	---------------------	-------------------------	------------------------

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## Calibration

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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

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

## Ordering Information

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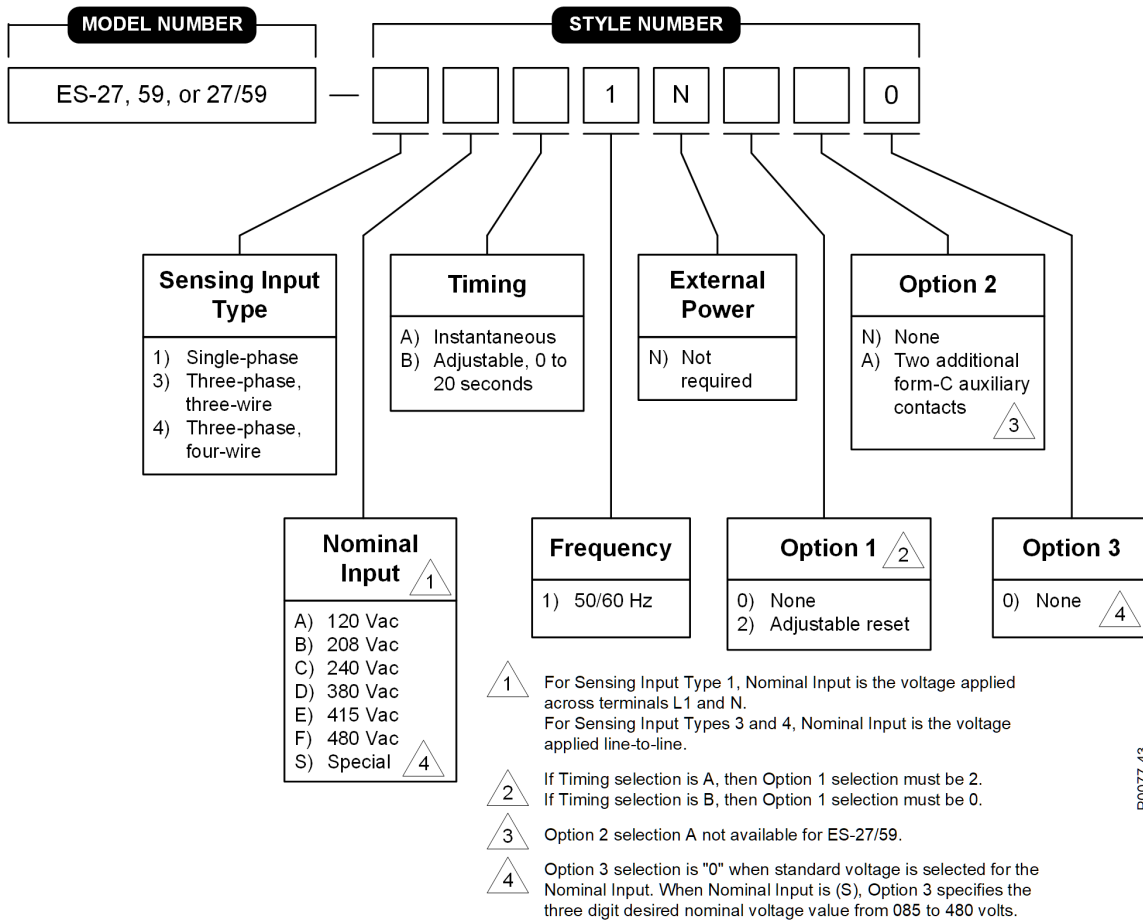
Mounting accessories (DIN rails and DIN rail end stops) are available from Basler Electric. Table 2 lists the part numbers for ordering.

**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

Publication <b>9500100990</b>	Revision <b>L</b>	<b>Instructions</b>	Date <b>Jun 2025</b>	Page <b>8 of 10</b>
----------------------------------	----------------------	---------------------	-------------------------	------------------------

Figure 4 shows the ES style number identification chart.



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

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Publication <b>9500100990</b>	Revision <b>L</b>	<b>Instructions</b>	Date <b>Jun 2025</b>	Page <b>9 of 10</b>
----------------------------------	----------------------	---------------------	-------------------------	------------------------

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Publication <b>9500100990</b>	Revision <b>L</b>	<b><i>Instructions</i></b>	Date <b>Jun 2025</b>	Page <b>10 of 10</b>
----------------------------------	----------------------	----------------------------	-------------------------	-------------------------

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