

	www.basler.com +1 618.654.2341 (USA) info@basler.com	Model	ES-47
		Description	Phase Sequence Relay

Introduction

The ES-47 Phase Sequence Relay monitors a three-phase, three-wire system for correct phase rotation/sequence. It provides protection against incorrect phase sequence, phase loss, and undervoltage. ES-47 relays operate on only the fundamental component of the sensed voltage, rejecting all harmonic components.

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.

Relay Output Contacts and Indicators

ES-47 relays are equipped with output contacts and LED indicators. Two form-C output contacts can be used for a control output, tripping signal, or annunciation. Some models provide the option for an additional pair of form-C auxiliary contacts. Refer to the style chart (Figure 4). A 123 LED indicates correct three-phase sequence. 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-47 models with auxiliary contacts (style 3xA1N0A0) are supplied in a wide case. All other ES-47 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 Instructions
	Caution, Risk of Electric Shock

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Specifications

Inputs

All units are self-powered by input voltage on terminals L1 and L2.

Nominal Voltage:	120 Vac, 208 Vac, 240 Vac, 380 Vac, 415 Vac, or 480 Vac (For other nominal voltages, contact Basler Electric.)
Voltage Input Operating Range:	±25% of nominal rating
Frequency:	50 or 60 Hz
Burden:	<2.5 VA per phase for narrow case units, <3 VA per phase for wide case units.
Overload Withstand:	2 times nominal for 3 s

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 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*

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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

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-47									
	有害物质 Hazardous Substances									
零件名称 Part Name	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 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.

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:

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- 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.

Operation

Correct phase sequence is determined by the positive sequence component (V1) being greater than the negative sequence component (V2). When V1 is greater than V2 and also greater than 75% of the nominal input voltage, the output relay energizes and the green 123 LED lights. Otherwise, the output relay de energizes and the green 123 LED extinguishes. A flashing Power LED indicates a relay fault, detected by internal diagnostics. ES-47 relays are powered by input voltage on terminals L1 and L2.

Installation

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

ES phase sequence 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-47 relay.

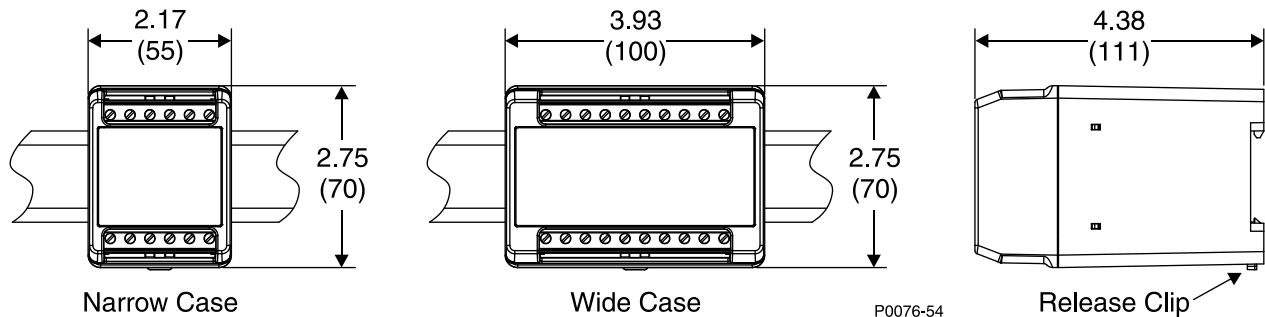


Figure 1. Relay Dimensions

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.

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-47 relay. Figure 3 illustrates the front panel appearance of the ES-47 relay with auxiliary relay outputs (style 3xA1N0A0).

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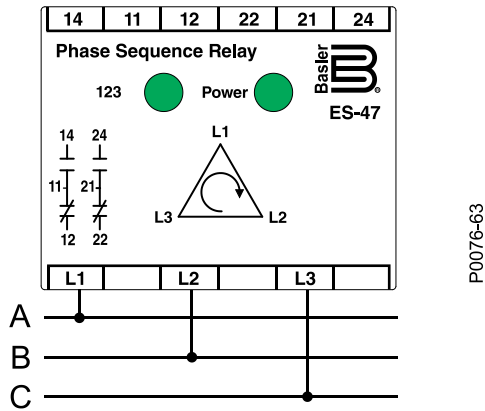


Figure 2. ES-47 Phase Sequence Sensing Connections

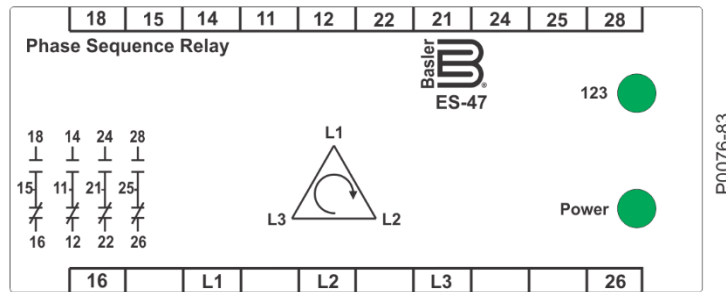


Figure 3. ES-47 Relay with Optional Auxiliary Contact Outputs

Calibration

The ES-47 has no adjustments and no calibration is necessary. The following procedure may be used to verify proper operation.

1. Apply a nominal, three-phase input with the correct phase sequence. The output relay energizes and the green 123 LED lights.
2. Apply a nominal, three-phase input with an incorrect phase sequence. The output relay de energizes and the green 123 LED extinguishes.

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-47 phase sequence relay style chart.

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

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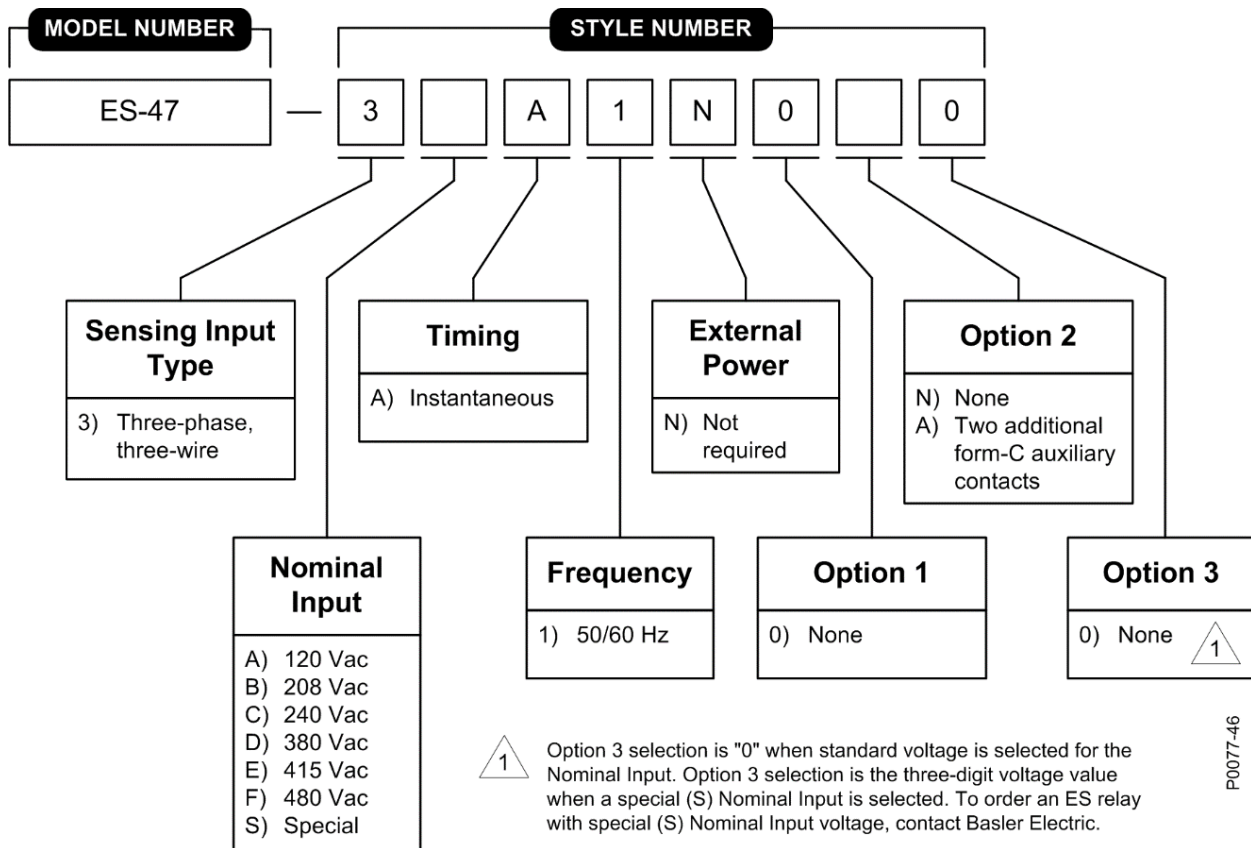


Figure 4. ES-47 Style Number Identification Chart

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

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