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Model

ES-47

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. The pair of form-C (SPDT) output contacts can be used as a control output, tripping signal, or annunciation. 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 relay outputs (style 3xA1N0_A_0) 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 Documentation
⚡	Caution, Risk of Electric Shock

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.)

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.

Outputs

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

Relay Type:	SPDT (form-C)
AC Rating:	250 V, 5 A, non-resistive, 1,200 VA
DC Rating:	125 V, 1 A, resistive, 120 W
Operating Time:	<100 ms

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 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

Correct phase sequence is determined by the positive sequence component (V_1) being greater than the negative sequence component (V_2). When V_1 is greater than V_2 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.

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).

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

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.
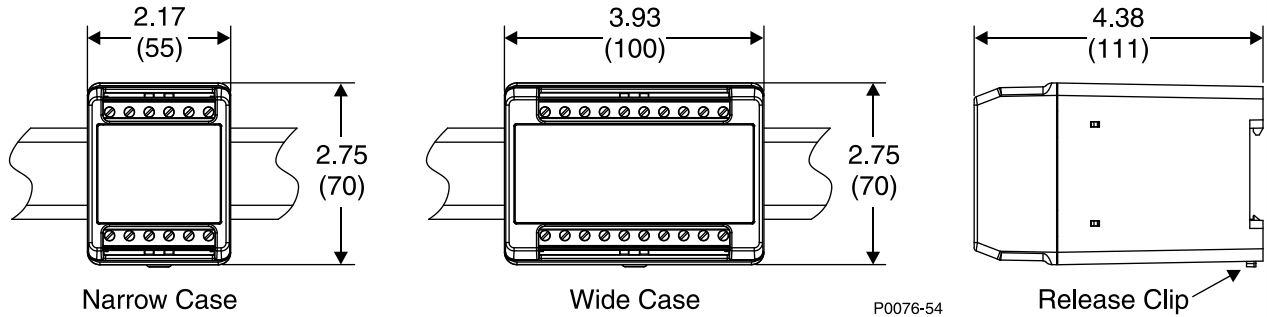
ORDERING INFORMATION

Mounting accessories (DIN rails and DIN rail end stops) are available from Basler Electric. Table 2 lists the part numbers for ordering.
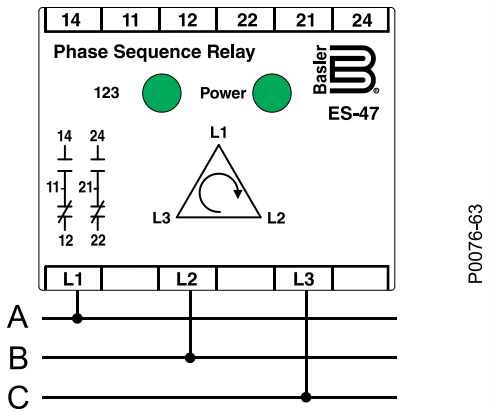
Figure 4 shows the ES phase sequence relay style chart.

FIGURES
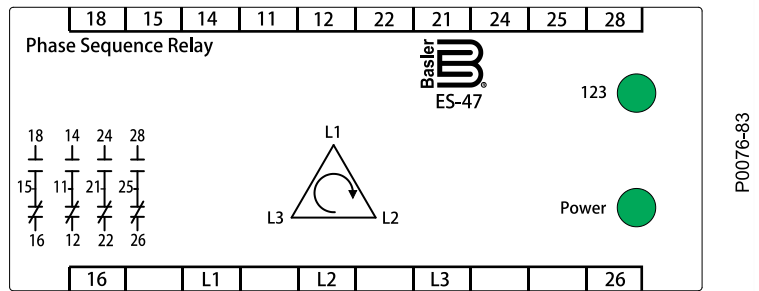

Narrow Case   Wide Case   P0076-54   Release Clip

Figure 1. Relay Dimensions

Figure 2. ES-47 Phase Sequence Sensing Connections

Figure 3. ES-47 Relay with Optional 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
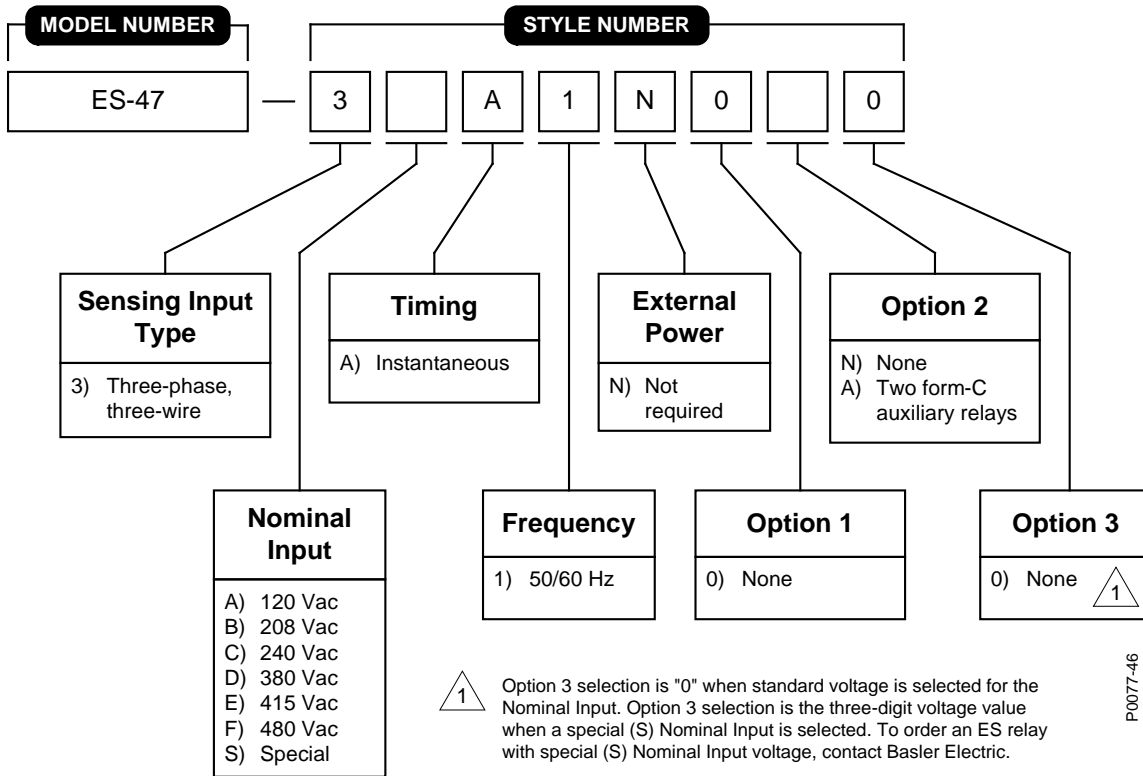
Figure 4. ES-47 Style Number Identification Chart