	www.basler.com +1 618.654.2341 (USA) info@basler.com	Model	ES-25
		Description	Sync-Check Relay

Introduction

ES-25 sync-check relays monitor two ac circuits and provide a contact output when the two circuits are synchronized. Typical application of the ES-25 involves supervision of an automatic or manual circuit breaker closing scheme. The ES-25 offers true sync-check protection by monitoring the phase displacement and voltage difference between two sources of single, dual, or three phase systems.

Warning!
<p>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.</p> <p>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.</p>

Optional Closure on Dead Bus

In applications requiring a continuous supply of power, the optional dead bus function enables connection of the generator to the load during a loss of bus voltage.

Relay Controls

ES-25 controls include an adjustment for the acceptable phase angle difference and an adjustment for the acceptable voltage difference. The phase angle difference setting is expressed in degrees of rotation and the voltage difference setting is expressed as a percentage of the relay's nominal input voltage rating.



Relay Output Contacts and Indicators

ES-25 relays are equipped with output contacts and LED indicators. Two form-C output contacts can be used for annunciation or control. The output contacts change state and the Relay LED lights when the two relay inputs are within the acceptable synchronization range. A continuously lit Power LED indicates the presence of adequate generator sensing voltage and a flashing Power LED indicates any relay fault detected by internal diagnostics.

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

Inputs

All units are self-powered by input voltage on GEN terminals 1 and 2.

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%, –30% of nominal rating
Frequency: 50 or 60 Hz
Burden: <2.5 VA
Overload Withstand: 2 times nominal for 3 s

Setpoint

Voltage Difference: Adjustable 5 to 30% of nominal
Dropout (Reset): Setpoint $\pm 1\%$ of V_{nom}
Repeatability: $\pm 2\%$ or ± 1 V (whichever is greater)
Angle Difference: Adjustable 1 to 20°
Dropout (Reset): 0.5°
Repeatability: $\pm 1^\circ$
Slip Frequency: <0.5 Hz
Dead Bus Pickup: Fixed at 8% of nominal
Dropout (Reset): Fixed at 9% of nominal
Repeatability: $\pm 2\%$ or ± 1 V (whichever is greater)
Operating Time: <100 ms

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: $\leq 95\%$, 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)

All ES-25 models are supplied in a wide case.

Wide Case: 3.93 x 2.75 x 4.38 inches
(100 x 70 x 111 mm)

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Weight

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 – *For Relays and Relay Systems Associated with Electric Power Apparatus*

IEEE Std C37.90.1™-2012 – *For Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus*

IEEE Std C37.90.2™-2004 – *For Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers*

IEEE Std C37.90.3™-2001 – *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.

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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-25										
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 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)	邻苯二甲酸二乙基己酯 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 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

ES-25 sync-check relays monitor two ac circuits and provide a contact output when the two circuits are synchronized. Synchronization protection in the ES-25 relay is adjusted by controls marked Set (%V) and Set (Deg). ES-25 relays are powered by input voltage on GEN terminals 1 and 2.

Set (%V) Control

The ES-25 Set (%V) control adjusts the synchronization voltage difference from 5 to 30% of the nominal input.

Set (Deg) Control

The ES-25 Set (Deg) control adjusts the synchronization voltage phase displacement from 1 to 20°.

Synchronization

When the voltage difference and phase displacement between the two sources are within the ranges established by the Set (%V) and Set (Deg) controls, and the slip frequency is less than 0.5 Hz, synchronization occurs. This condition energizes the relay output and lights the green Relay LED.

Close on Dead Bus Option

ES-25 relays with the Close On Dead Bus option (style 1xA1N1N0) allow a generator to energize a dead bus when the monitored bus voltage is less than 8% of the nominal input.

Setting Example

An ES-25 relay with a nominal input rating of 120 Vac has the following settings:

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- Set (%V) – 20%
- Set (Deg) – 10°

If the bus voltage is fixed at 120 Vac, the generator voltage must be between 96 Vac and 144 Vac, the phase angles of the bus and generator voltage must be within 10° of each other, and the frequencies of the bus and generator must be within 0.5 Hz for synchronization to occur.

Dropout due to voltage difference will occur if the difference between sensed bus and generator voltage magnitudes increases above the 20% setpoint by 1% of nominal. Therefore, dropout occurs when the voltage difference rises above 25.2 Vac.

$$120 V_{nom} (20\% + 1\%) = 25.2 \text{ Vac}$$

Dropout due to phase angle difference will occur if the difference between sensed bus and generator voltage phase angles increases above the 10° setpoint by more than 0.5°. Therefore, dropout occurs when the phase angle difference rises above 10.5°.

When dropout occurs, the relay is de-energized and the green Relay LED extinguishes.

Installation

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 sync-check 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-25 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-25 relay.

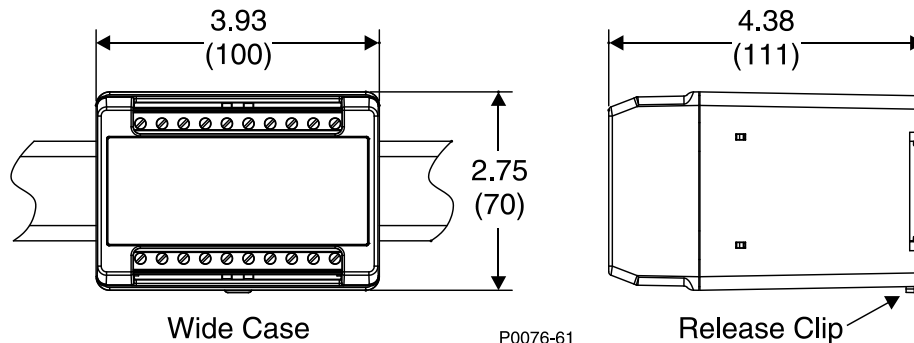
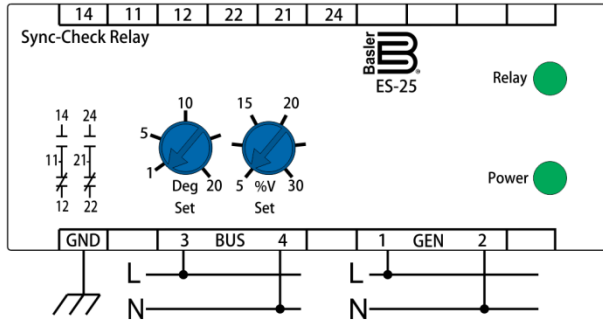


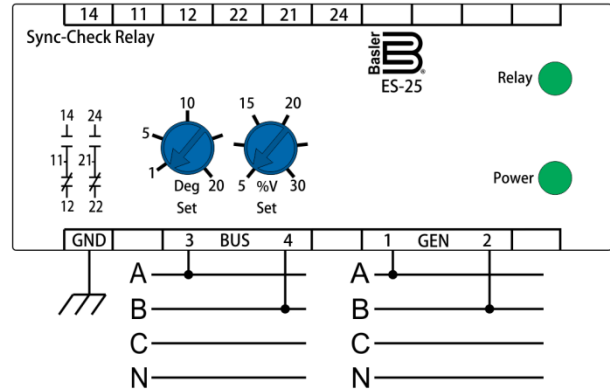
Figure 1. Relay Dimensions

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.



Connections to Single-Phase System



Connections to Three-Phase System

Figure 2. ES-25 Sync-Check Relay Sensing Connections

Calibration

The calibration marks on the faceplate are provided only as guides. Proper calibration requires using an accurate meter to monitor the voltage. Use the following procedure to calibrate your relay.

1. Adjust the Set (%V) and Set (Deg) controls fully counterclockwise (CCW).
2. Apply nominal voltage to the BUS and GEN terminals. These voltages must be in phase and have the same frequency.
3. Adjust the voltage applied to the GEN terminals to the maximum or minimum level for synchronization.
4. Adjust the Set (%V) control clockwise (CW) until the relay energizes.
5. Apply nominal voltage to the BUS and GEN terminals. These voltages must be in phase and have the same frequency.
6. Adjust the phase angle of the GEN voltage to the maximum or minimum synchronization angle.
7. Adjust the Set (Deg) CW until the relay energizes.

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 3 shows the ES 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

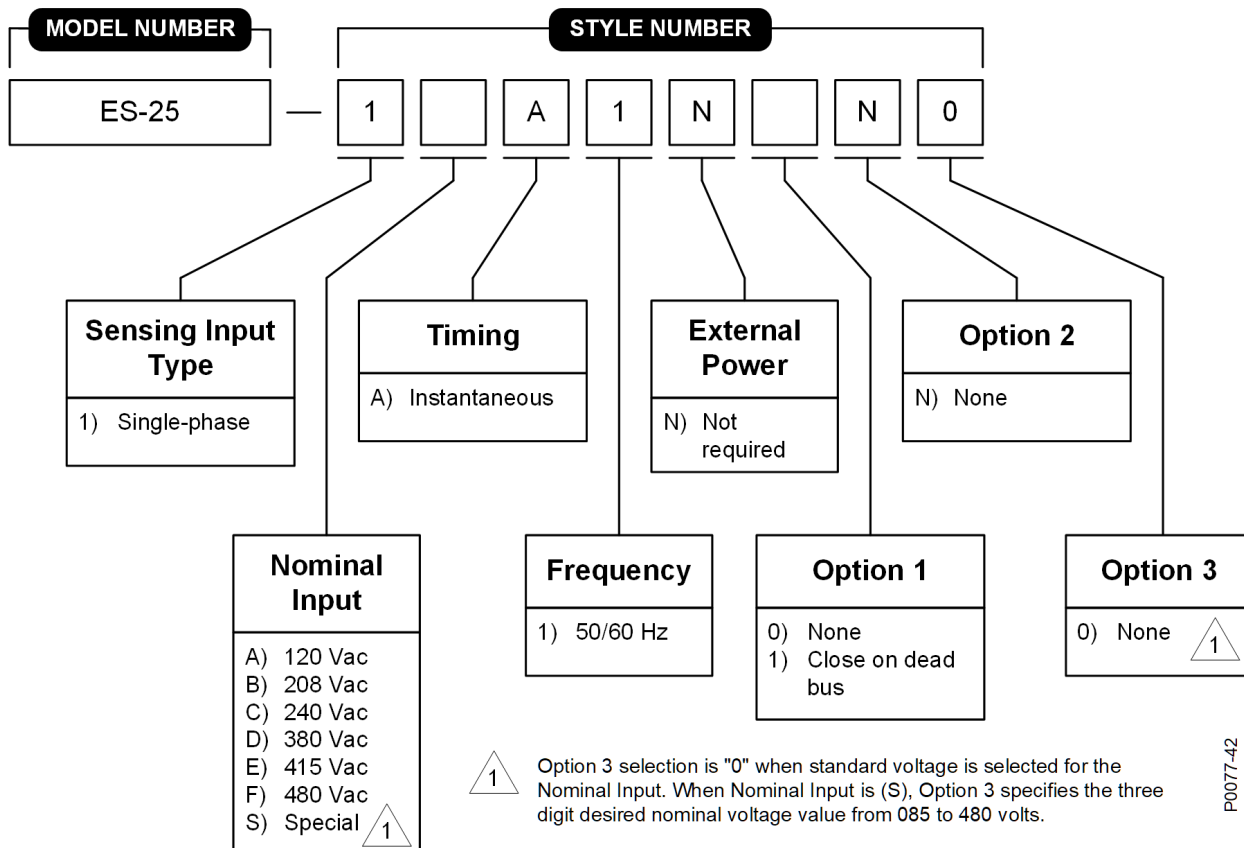


Figure 3. ES-25 Style Number Identification Chart

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