

Safety Relays



40.10 Safety Relays

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**Note:** Supplement to Volume 7—Motor Controls, Logic and Connectivity, CA08100008E, Tab 40.

### Safety Relays



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#### Description

#### Safety Relays

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### Product Description

Safety relays are intended to reliably monitor the signals from safety devices at all times and switch off quickly and reliably in an emergency. Single-channel and dual channel versions are available for the construction of safety applications. The internal logic of the safety relays monitors the safety circuits (emergency stop, guard door, and so on) and activates the enable paths in a fault-free condition. Upon actuation of the safety device or in the event of a fault, the enable paths are switched off. Any faults that occur in the control circuit, such as ground fault, cross connection fault or wire breakage are also detected.

### Application Description

Eaton's ESR5 safety relays provide optimal safety and a high degree of reliability on plant machinery. Applications that meet the highest safety requirements in accordance with EN 954-1, EN ISO 13849-1 up to PL e and accordance with IEC 62061 up to SILCL 3 can be realized with the ESR5 safety relay.

Compatible with a wide variety of safety devices:

- Emergency stops
- Rope pulls
- Two-hand control stations
- Light curtain (OSSD)
- Gate enable device
- Safety switches

### Features

- Use for the highest safety requirements in accordance with EN 954-1, EN ISO 13849-1, IEC 62061 and EC 61508
- Suitable for the world market with UL, cUL certifications and TÜV Rheinland functional safety certifications
- Applicable for EN 60204 stop categories 0 or 1
- Plug-in screw terminals for fast and fault-free replacement
- Multi-voltage versions (24–230 Vac/Vdc) for a flexible range of application
- Delayed and non-delayed contact expansions accommodate a wide variety of applications

### Standards and Certifications

- UL 508; CSA-C22.2 No 14-95; CE Marked
- UL/cUL file number: E29184
- Degree of protection: IP20
- TÜV Rheinland certified
- UL/cULus listed



## Product Selection

## Safety Relays

## Technical Overview



| Single Channel | Dual Channel | Safety Output (NO) | Safety Output (NO) (Delayed) | Output Delay | Signal Output (NC) | Feedback Output | Control Voltage | Removable Terminal Blocks | Type of Unit | Catalog Number      |
|----------------|--------------|--------------------|------------------------------|--------------|--------------------|-----------------|-----------------|---------------------------|--------------|---------------------|
| ■              | —            | 4                  | —                            | —            | 1                  | —               | 24 Vac/Vdc      | ■                         | Main         | ESR5-NO-41-24VAC-DC |
| ■              | ■            | 2                  | —                            | —            | 1                  | —               | 24 Vac/Vdc      | ■                         | Main         | ESR5-NO-21-24VAC-DC |
| ■              | ■            | 3                  | —                            | —            | 1                  | —               | 24 Vac/Vdc      | ■                         | Main         | ESR5-NO-31-24VAC-DC |
| ■              | ■            | 3                  | —                            | —            | 1                  | —               | 230 Vac         | ■                         | Main         | ESR5-NO-31-230VAC   |
| ■              | ■            | 3                  | —                            | —            | 1                  | —               | 24–230 Vac/Vdc  | ■                         | Main         | ESR5-NO-31-AC-DC    |
| ■              | ■            | 2                  | 2                            | 0.1–30s      | —                  | —               | 24 Vdc          | ■                         | Main         | ESR5-NV3-30         |
| —              | ■            | 2                  | —                            | —            | 1                  | —               | 24 Vac/Vdc      | ■                         | Main         | ESR5-NZ-21-24VAC-DC |
| ■              | —            | 5                  | —                            | —            | 1                  | 1               | 24 Vac/Vdc      | ■                         | Expansion    | ESR5-NE-51-24VAC-DC |
| ■              | —            | —                  | 4                            | 0.3–3s       | 1                  | 1               | 24 Vdc          | ■                         | Expansion    | ESR5-VE3-42         |

## Application Overview

| Emergency Stop | Safety Switches | Light Curtain/ OSSD ① | Two-Hand Control (EN 574 Type III C) | Contact Expansion | Off-Delayed | Cross Circuit Recognition | Monitored Manual Reset ② | Catalog Number      |
|----------------|-----------------|-----------------------|--------------------------------------|-------------------|-------------|---------------------------|--------------------------|---------------------|
| ■              | ■               | —                     | —                                    | —                 | —           | —                         | —                        | ESR5-NO-41-24VAC-DC |
| ■              | ■               | —                     | —                                    | —                 | —           | ■                         | —                        | ESR5-NO-21-24VAC-DC |
| ■              | ■               | —                     | —                                    | —                 | —           | ■                         | —                        | ESR5-NO-31-24VAC-DC |
| ■              | ■               | —                     | —                                    | —                 | —           | ■                         | ■                        | ESR5-NO-31-230VAC   |
| ■              | ■               | —                     | —                                    | —                 | —           | ■                         | ■                        | ESR5-NO-31-AC-DC    |
| ■              | ■               | ■                     | —                                    | —                 | ■           | ■                         | ■                        | ESR5-NV3-30         |
| —              | ■               | —                     | ■                                    | —                 | —           | ■                         | —                        | ESR5-NZ-21-24VAC-DC |
| —              | —               | —                     | —                                    | ■                 | —           | —                         | —                        | ESR5-NE-51-24VAC-DC |
| —              | —               | —                     | —                                    | ■                 | ■           | —                         | —                        | ESR5-VE3-42         |

## Application Overview, continued

| Single Channel | Dual Channel | Stop Category EN 60204 | Control Category to EN 954-1 | Achievable PL per ISO 13849-1 | Achievable SIL per EN IEC 62061 | Catalog Number      |
|----------------|--------------|------------------------|------------------------------|-------------------------------|---------------------------------|---------------------|
| ■              | —            | 0                      | 2                            | PL d                          | SIL 3                           | ESR5-NO-41-24VAC-DC |
| ■              | ■            | 0                      | 4                            | PL e                          | SIL 3                           | ESR5-NO-21-24VAC-DC |
| ■              | ■            | 0                      | 4                            | PL e                          | SIL 3                           | ESR5-NO-31-24VAC-DC |
| ■              | ■            | 0                      | 4                            | PL e                          | SIL 3                           | ESR5-NO-31-230VAC   |
| ■              | ■            | 0                      | 4                            | PL e                          | SIL 3                           | ESR5-NO-31-AC-DC    |
| ■              | ■            | 0/1                    | 4                            | PL e                          | SIL 3                           | ESR5-NV3-30         |
| —              | ■            | 0                      | 4                            | PL e                          | SIL 3                           | ESR5-NZ-21-24VAC-DC |
| ■              | —            | 0                      | 4                            | PL e                          | SIL 3                           | ESR5-NE-51-24VAC-DC |
| ■              | —            | 1                      | 3                            | PL d                          | SIL 2                           | ESR5-VE3-42         |

## Notes

① Laser scanners or light curtains with OSSD outputs.

② All main units can also be reset automatically or manually.

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## Safety Relays

### Technical Data and Specifications

#### Safety Relay

| Description                                                                    | Unit              | ESR5-NO-21_                                                                                            | ESR5-NO-41_                                                            | ESR5-NO-31-24VAC-DC                                                                                    | ESR5-NZ-21_                                                            |
|--------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| <b>General</b>                                                                 |                   |                                                                                                        |                                                                        |                                                                                                        |                                                                        |
| Standards                                                                      |                   | EN ISO 13849-1, IEC 62061, IEC 61508, DIN EN 50178, UL/CUL listed                                      | EN ISO 13849-1, IEC 62061, IEC 61508, DIN EN 50178, UL/CUL listed      | EN ISO 13849-1, IEC 62061, IEC 61508, DIN EN 50178, UL/CUL listed                                      | EN ISO 13849-1, IEC 62061, IEC 61508, DIN EN 50178, UL/CUL listed      |
| Type-dependent standards                                                       |                   | —                                                                                                      | —                                                                      | —                                                                                                      | EN 574 Part no. IIIC                                                   |
| Lifespan, mechanical—c (contacts)                                              | x 10 <sup>6</sup> | 10                                                                                                     | 10                                                                     | 10                                                                                                     | 10                                                                     |
| Maximum operating frequency                                                    | Ops/h             | 3600                                                                                                   | 3600                                                                   | 3600                                                                                                   | 3600                                                                   |
| Climatic proofing                                                              |                   | Cold according to EN 60068-2-1, dry heat according to EN60068-2-2, damp heat according to EN 60068-2-3 | Dry heat according to EN60068-2-2, damp heat according to EN 60068-2-3 | Cold according to EN 60068-2-1, dry heat according to EN60068-2-2, damp heat according to EN 60068-2-3 | Dry heat according to EN60068-2-2, damp heat according to EN 60068-2-3 |
| Ambient temperature                                                            | °F (°C)           | –4° to 131° (–20° to 55°)                                                                              | –4° to 131° (–20° to 55°)                                              | –4° to 131° (–20° to 55°)                                                                              | –4° to 131° (–20° to 55°)                                              |
| Ambient temperature storage                                                    | °F (°C)           | –13° to 167° (–25° to 75°)                                                                             | –13° to 167° (–25° to 75°)                                             | –13° to 167° (–25° to 75°)                                                                             | –13° to 167° (–25° to 75°)                                             |
| Mounting position                                                              |                   | Any                                                                                                    | Any                                                                    | Any                                                                                                    | Any                                                                    |
| Vibration resistance (IEC/EN 60068-2-6)                                        |                   | 2g, frequency: 10–150 Hz, amplitude: 0.15 mm                                                           | 2g, frequency: 10–150 Hz, amplitude: 0.15 mm                           | 2g, frequency: 10–150 Hz, amplitude: 0.15 mm                                                           | 2 g, frequency: 10–150 Hz, amplitude: 0.15 mm                          |
| Shock resistance (IEC 60068-2-27)                                              |                   | —                                                                                                      | —                                                                      | —                                                                                                      | —                                                                      |
| Protection type                                                                |                   |                                                                                                        |                                                                        |                                                                                                        |                                                                        |
| Housing                                                                        |                   | IP20                                                                                                   | IP20                                                                   | IP20                                                                                                   | IP20                                                                   |
| Terminals                                                                      |                   | IP20                                                                                                   | IP20                                                                   | IP20                                                                                                   | IP20                                                                   |
| Protection against direct contact when actuated from front (IEC 0106 Part 100) |                   | Finger- and back-of-hand proof                                                                         | Finger- and back-of-hand proof                                         | Finger- and back-of-hand proof                                                                         | Finger- and back-of-hand proof                                         |
| Weight                                                                         | kg                | 0.17                                                                                                   | 0.22                                                                   | 0.17                                                                                                   | 0.22                                                                   |
| Terminal capacity                                                              |                   |                                                                                                        |                                                                        |                                                                                                        |                                                                        |
| Solid or flexible                                                              | mm <sup>2</sup>   | 1 x (0.2–2.5)<br>2 x (0.2–1)                                                                           | 1 x (0.2–2.5)<br>2 x (0.2–1)                                           | 1 x (0.2–2.5)<br>2 x (0.2–1)                                                                           | 1 x (0.2–2.5)<br>2 x (0.2–1)                                           |
| Flexible with ferrule                                                          | mm <sup>2</sup>   | 1 x (0.25–2.5)<br>2 x (0.25–1)                                                                         | 1 x (0.25–2.5)<br>2 x (0.25–1)                                         | 1 x (0.25–2.5)<br>2 x (0.25–1)                                                                         | 1 x (0.25–2.5)<br>2 x (0.25–1)                                         |
| Solid or stranded                                                              | AWG               | 24–12                                                                                                  | 24–12                                                                  | 24–12                                                                                                  | 24–12                                                                  |
| Terminal screw                                                                 |                   |                                                                                                        |                                                                        |                                                                                                        |                                                                        |
| Pozidriv screwdriver                                                           | Size              | 2                                                                                                      | 2                                                                      | 2                                                                                                      | 2                                                                      |
| Flat-blade screwdriver                                                         | mm                | 0.6 x 3.5                                                                                              | 0.6 x 3.5                                                              | 0.6 x 3.5                                                                                              | 0.6 x 3.5                                                              |
| Max. tightening torque                                                         | Nm                | 0.6                                                                                                    | 0.6                                                                    | 0.6                                                                                                    | 0.6                                                                    |
| <b>Main Contacts</b>                                                           |                   |                                                                                                        |                                                                        |                                                                                                        |                                                                        |
| Rated impulse withstand voltage—U <sub>imp</sub>                               | Vac               | 6000                                                                                                   | 4000                                                                   | 4000                                                                                                   | 6000                                                                   |
| Overvoltage category/pollution degree                                          |                   |                                                                                                        |                                                                        |                                                                                                        |                                                                        |
| Outside                                                                        |                   | III/2                                                                                                  | III/2                                                                  | III/2                                                                                                  | III/2                                                                  |
| Inside                                                                         |                   | —                                                                                                      | —                                                                      | —                                                                                                      | —                                                                      |
| Rated insulation voltage—U <sub>i</sub>                                        | Vac               | 250                                                                                                    | 250                                                                    | 250                                                                                                    | 250                                                                    |
| Rated operating voltage—U <sub>e</sub>                                         | Vac               | 230                                                                                                    | 230                                                                    | 230                                                                                                    | 230                                                                    |
| Rated operation current                                                        |                   |                                                                                                        |                                                                        |                                                                                                        |                                                                        |
| AC-15                                                                          |                   |                                                                                                        |                                                                        |                                                                                                        |                                                                        |
| 230V (360 ops./h)—I <sub>e</sub>                                               | A                 | 5                                                                                                      | 4                                                                      | 5                                                                                                      | 4                                                                      |
| 230V (3600 ops./h)—I <sub>e</sub>                                              | A                 | 3                                                                                                      | 3                                                                      | 3                                                                                                      | 3                                                                      |
| DC-13                                                                          |                   |                                                                                                        |                                                                        |                                                                                                        |                                                                        |
| 24V (360 ops./h)—I <sub>e</sub>                                                | A                 | 6                                                                                                      | 4                                                                      | 6                                                                                                      | 4                                                                      |
| 24V (3600 ops./h)—I <sub>e</sub>                                               | A                 | 3                                                                                                      | 2.5                                                                    | 3                                                                                                      | 2.5                                                                    |
| Max. summation current of all poles                                            |                   |                                                                                                        |                                                                        |                                                                                                        |                                                                        |
| 24 Vac/Vdc devices                                                             | A                 | 72                                                                                                     | 72                                                                     | 72                                                                                                     | 72                                                                     |
| 230 Vac devices                                                                | A                 | —                                                                                                      | —                                                                      | —                                                                                                      | —                                                                      |
| Square of the total current (and total current) of all current paths           |                   | 72 A <sup>2</sup> (6 + 6)                                                                              | 72 A <sup>2</sup> (4.2 + 4.2 + 4.2 + 4.2)                              | 72 A <sup>2</sup> (4.9 + 4.9 + 4.9)                                                                    | 72 A <sup>2</sup> (6 + 6)                                              |
| Short-circuit protection                                                       |                   |                                                                                                        |                                                                        |                                                                                                        |                                                                        |
| Max. fuse                                                                      | A gG/gL           | 10                                                                                                     | 6                                                                      | 10                                                                                                     | 6                                                                      |

## Safety Relay, continued

| Description                                      | Unit  | ESR5-N0-21_                            | ESR5-N0-41_               | ESR5-N0-31-24VAC-DC                    | ESR5-NZ-21_               |
|--------------------------------------------------|-------|----------------------------------------|---------------------------|----------------------------------------|---------------------------|
| <b>Power Supply Circuit</b>                      |       |                                        |                           |                                        |                           |
| Actuating voltage 50/60 Hz                       | Vac   | 24                                     | 24                        | 24                                     | 24                        |
| Actuating voltage— $U_s$                         | Vdc   | 24                                     | 24                        | 24                                     | 24                        |
| Voltage tolerance pick-up voltage                | $x_e$ | 0.85–1.1                               | 0.85–1.1                  | 0.85–1.1                               | 0.85–1.1                  |
| Power consumption                                |       |                                        |                           |                                        |                           |
| AC operated 50/60 Hz                             | VA    | —                                      | —                         | —                                      | —                         |
| AC operated 50/60 Hz                             | W     | 3.4                                    | 3.4                       | 3.4                                    | 3                         |
| DC operated                                      | W     | 1.6                                    | 1.6                       | 1.6                                    | 1.5                       |
| Fuse for control circuit supply                  |       |                                        |                           |                                        |                           |
| 24V                                              |       | Short-circuit proof                    | Short-circuit proof       | Short-circuit proof                    | Short-circuit proof       |
| 115/230V                                         |       | —                                      | —                         | —                                      | —                         |
| <b>Control Circuit</b>                           |       |                                        |                           |                                        |                           |
| Rated output voltage                             | Vdc   | 24                                     | 24                        | 24                                     | 24                        |
| Rated operational current                        | mA    | S12, S22: 30, S34: 45                  | S12: 65, S34: 40          | S12, S22: 30, S34: 45                  | S11, S21: 60, Y2: 45      |
| Resistance—R                                     |       | 50                                     | 22                        | 50                                     | 22                        |
| Short-circuit current                            | A     | 2.3                                    | 2.3                       | 2.3                                    | 2.3                       |
| Response time                                    | ms    | 100                                    | 65                        | 100                                    | 50                        |
| Recovery time                                    | ms    | —                                      | —                         | —                                      | —                         |
| Response time with reset monitoring— $t_{A1}$    | ms    | —                                      | —                         | —                                      | —                         |
| Response time without reset monitoring— $t_{A2}$ | ms    | 100                                    | 65                        | 100                                    | 50                        |
| Reset time— $t_R/t_{R1}$                         | ms    | Single-channel 45;<br>dual-channel 10  | 45                        | Single-channel 45;<br>dual-channel 10  | 20                        |
| Minimum on duration— $t_M$                       | ms    | —                                      | —                         | —                                      | —                         |
| Recovery time— $t_W$                             | ms    | Approx. 1000                           | Approx. 1000              | Approx. 1000                           | Approx. 1000              |
| Synchronous monitoring time— $t_S$               | ms    | —                                      | —                         | —                                      | 500                       |
| <b>Electromagnetic Compatibility (EMC)</b>       |       |                                        |                           |                                        |                           |
| Emitted interference                             |       | EN 61000-6-4                           | EN 61000-6-4              | EN 61000-6-4                           | EN 61000-6-4              |
| Interference immunity                            |       | According to EN 61000-6-2,<br>EN 62061 | According to EN 61000-6-2 | According to EN 61000-6-2,<br>EN 62061 | According to EN 61000-6-2 |

# 40.10 Control Relays and Timers

## Safety Relays

### Safety Relay, continued

| Description                                                                    | Unit              | ESR5-NO-31-230VAC                                                      | ESR5-NO-31-24V-230VAC-DC                                               | ESR5-NV3_                                                                                                                            | ESR5-VE3_                                                              | ESR5-NE-51_                                                            |
|--------------------------------------------------------------------------------|-------------------|------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------|
| <b>General</b>                                                                 |                   |                                                                        |                                                                        |                                                                                                                                      |                                                                        |                                                                        |
| Standards                                                                      |                   | EN ISO 13849-1, IEC 62061, IEC 61508, DIN EN 50178, UL/CUL listed      | EN ISO 13849-1, IEC 62061, IEC 61508, DIN EN 50178, UL/CUL listed      | EN ISO 13849-1, IEC 62061, IEC 61508, DIN EN 50178, UL/CUL listed                                                                    | EN ISO 13849-1, IEC 62061, IEC 61508, DIN EN 50178, UL/CUL listed      | EN ISO 13849-1, IEC 62061, IEC 61508, DIN EN 50178, UL/CUL listed      |
| Type-dependent standards                                                       |                   | EN 60204 (if applicable)                                               | EN 60204 (if applicable)                                               | EN 60204 (if applicable)                                                                                                             | —                                                                      | —                                                                      |
| Lifespan, mechanical—c (contacts)                                              | x 10 <sup>6</sup> | 10                                                                     | 10                                                                     | 10                                                                                                                                   | 10                                                                     | 10                                                                     |
| Maximum operating frequency                                                    | Ops/h             | 3600                                                                   | 3600                                                                   | 3600                                                                                                                                 | 900                                                                    | 3600                                                                   |
| Climatic proofing                                                              |                   | Dry heat according to EN60068-2-2, damp heat according to EN 60068-2-3 | Dry heat according to EN60068-2-2, damp heat according to EN 60068-2-3 | Cold in accordance with: EN 60068-2-1, dry heat in accordance with EN 60068-2-2, humidity storage test in accordance with 60068-2-78 | Dry heat according to EN60068-2-2, damp heat according to EN 60068-2-3 | Dry heat according to EN60068-2-2, damp heat according to EN 60068-2-3 |
| Ambient temperature                                                            | °F (°C)           | –4° to 131° (–20° to 55°)                                              | –4° to 131° (–20° to 55°)                                              | –4° to 113° (–20° to 45°)                                                                                                            | –4° to 131° (–20° to 55°)                                              | –4° to 131° (–20° to 55°)                                              |
| Ambient temperature storage                                                    | °F (°C)           | –13° to 167° (–25° to 75°)                                             | –13° to 167° (–25° to 75°)                                             | –13° to 167° (–25° to 75°)                                                                                                           | –13° to 167° (–25° to 75°)                                             | –13° to 167° (–25° to 75°)                                             |
| Mounting position                                                              |                   | Any                                                                    | Any                                                                    | Any                                                                                                                                  | Any                                                                    | Any                                                                    |
| Vibration resistance (IEC/EN 60068-2-6)                                        |                   | 2g, frequency: 10–150 Hz, amplitude: 0.15 mm                           | 2g, frequency: 10–150 Hz, amplitude: 0.15 mm                           | 2g, frequency: 10–150 Hz, amplitude: 0.15 mm                                                                                         | 2g, frequency: 10–150 Hz, amplitude: 0.15 mm                           | 2g, frequency: 10–150 Hz, amplitude: 0.15 mm                           |
| Shock resistance (IEC 60068-2-27)                                              |                   | —                                                                      | —                                                                      | —                                                                                                                                    | —                                                                      | —                                                                      |
| Protection type                                                                |                   |                                                                        |                                                                        |                                                                                                                                      |                                                                        |                                                                        |
| Housing                                                                        |                   | IP40                                                                   | IP40                                                                   | IP20                                                                                                                                 | IP20                                                                   | IP20                                                                   |
| Terminals                                                                      |                   | IP20                                                                   | IP20                                                                   | IP20                                                                                                                                 | IP20                                                                   | IP20                                                                   |
| Protection against direct contact when actuated from front (IEC 0106 Part 100) |                   | Finger- and back-of-hand proof                                         | Finger- and back-of-hand proof                                         | Finger- and back-of-hand proof                                                                                                       | Finger- and back-of-hand proof                                         | Finger- and back-of-hand proof                                         |
| Weight                                                                         | kg                | 0.3                                                                    | 0.3                                                                    | 0.17                                                                                                                                 | 0.17                                                                   | 0.22                                                                   |
| Terminal capacity                                                              |                   |                                                                        |                                                                        |                                                                                                                                      |                                                                        |                                                                        |
| Solid or flexible                                                              | mm <sup>2</sup>   | 1 x (0.2–2.5)<br>2 x (0.2–1)                                           | 1 x (0.2–2.5)<br>2 x (0.2–1)                                           | 1 x (0.2–2.5)<br>2 x (0.2–1)                                                                                                         | 1 x (0.2–2.5)<br>2 x (0.2–1)                                           | 1 x (0.2–2.5)<br>2 x (0.2–1)                                           |
| Flexible with ferrule                                                          | mm <sup>2</sup>   | 1 x (0.25–2.5)<br>2 x (0.25–1)                                         | 1 x (0.25–2.5)<br>2 x (0.25–1)                                         | 1 x (0.25–2.5)<br>2 x (0.25–1)                                                                                                       | 1 x (0.25–2.5)<br>2 x (0.25–1)                                         | 1 x (0.25–2.5)<br>2 x (0.25–1)                                         |
| Solid or stranded                                                              | AWG               | 24–12                                                                  | 24–12                                                                  | 24–12                                                                                                                                | 24–12                                                                  | 24–12                                                                  |
| Terminal screw                                                                 |                   |                                                                        |                                                                        |                                                                                                                                      |                                                                        |                                                                        |
| Pozidriv screwdriver                                                           | Size              | 2                                                                      | 2                                                                      | 2                                                                                                                                    | 2                                                                      | 2                                                                      |
| Flat-blade screwdriver                                                         | mm                | 0.6 x 3.5                                                              | 0.6 x 3.5                                                              | 0.6 x 3.5                                                                                                                            | 0.6 x 3.5                                                              | 0.6 x 3.5                                                              |
| Max. tightening torque                                                         | Nm                | 0.6                                                                    | 0.6                                                                    | 0.6                                                                                                                                  | 0.6                                                                    | 0.6                                                                    |
| <b>Main Contacts</b>                                                           |                   |                                                                        |                                                                        |                                                                                                                                      |                                                                        |                                                                        |
| Rated impulse withstand voltage—U <sub>imp</sub>                               | Vac               | 6000                                                                   | 6000                                                                   | 4000                                                                                                                                 | 4000                                                                   | 4000                                                                   |
| Overvoltage category/pollution degree                                          |                   |                                                                        |                                                                        |                                                                                                                                      |                                                                        |                                                                        |
| Outside                                                                        |                   | III/2                                                                  | III/2                                                                  | III/2                                                                                                                                | III/2                                                                  | III/2                                                                  |
| Inside                                                                         |                   | —                                                                      | —                                                                      | —                                                                                                                                    | —                                                                      | —                                                                      |
| Rated insulation voltage—U <sub>i</sub>                                        | Vac               | 250                                                                    | 250                                                                    | 250                                                                                                                                  | 250                                                                    | 250                                                                    |
| Rated operating voltage—U <sub>e</sub>                                         | Vac               | 230                                                                    | 230                                                                    | 230                                                                                                                                  | 230                                                                    | 230                                                                    |
| Rated operation current                                                        |                   |                                                                        |                                                                        |                                                                                                                                      |                                                                        |                                                                        |
| AC-15                                                                          |                   |                                                                        |                                                                        |                                                                                                                                      |                                                                        |                                                                        |
| 230V (360 ops./h)—I <sub>e</sub>                                               | A                 | 4                                                                      | 4                                                                      | —                                                                                                                                    | 5                                                                      | 4                                                                      |
| 230V (3600 ops./h)—I <sub>e</sub>                                              | A                 | 3                                                                      | 3                                                                      | 3                                                                                                                                    | 3                                                                      | 3                                                                      |
| DC-13                                                                          |                   |                                                                        |                                                                        |                                                                                                                                      |                                                                        |                                                                        |
| 24V (360 ops./h)—I <sub>e</sub>                                                | A                 | 4                                                                      | 4                                                                      | —                                                                                                                                    | 6                                                                      | 4                                                                      |
| 24V (3600 ops./h)—I <sub>e</sub>                                               | A                 | 2.5                                                                    | 2.5                                                                    | 3                                                                                                                                    | 3                                                                      | 2.5                                                                    |
| Max. summation current of all poles                                            |                   |                                                                        |                                                                        |                                                                                                                                      |                                                                        |                                                                        |
| 24 Vac/Vdc devices                                                             | A                 | 50                                                                     | 50                                                                     | 49                                                                                                                                   | 50                                                                     | 50                                                                     |
| 230 Vac devices                                                                | A                 | 50                                                                     | 50                                                                     | —                                                                                                                                    | —                                                                      | —                                                                      |
| Square of the total current (and total current) of all current paths           |                   | 50 A <sup>2</sup> (4 + 4 + 4)                                          | 50 A <sup>2</sup> (4 + 4 + 4)                                          | 50 A <sup>2</sup> (4 + 4 + 4)                                                                                                        | 49 A <sup>2</sup> (3.5 + 3.5 + 3.5 + 3.5)                              | 50 A <sup>2</sup> (3.7 + 3.7 + 3.7 + 3.7)                              |
| Short-circuit protection                                                       |                   |                                                                        |                                                                        |                                                                                                                                      |                                                                        |                                                                        |
| Max. fuse                                                                      | A gG/gL           | 6                                                                      | 6                                                                      | 10                                                                                                                                   | 10                                                                     | 6                                                                      |

### Safety Relay, continued

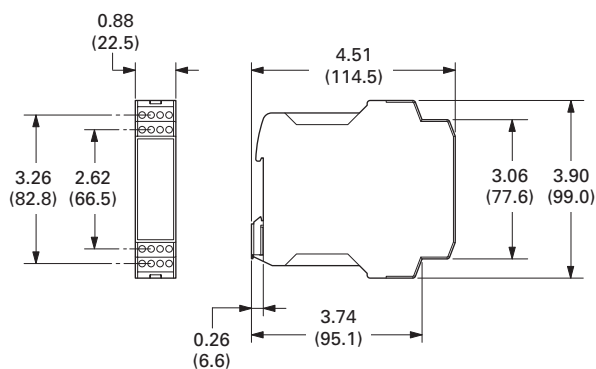
| Description                                      | Unit  | ESR5-NO-31-230VAC               | ESR5-NO-31-24V-230VAC-DC        | ESR5-NV3_                                                      | ESR5-VE3_                 | ESR5-NE-51_               |
|--------------------------------------------------|-------|---------------------------------|---------------------------------|----------------------------------------------------------------|---------------------------|---------------------------|
| <b>Power Supply Circuit</b>                      |       |                                 |                                 |                                                                |                           |                           |
| Actuating voltage 50/60 Hz                       | Vac   | 230                             | 24–230                          | —                                                              | —                         | 24                        |
| Actuating voltage— $U_s$                         | Vdc   | —                               | 230                             | 24                                                             | 24                        | 24                        |
| Voltage tolerance pick-up voltage                | $x_e$ | 0.85–1.1                        | 0.85–1.1                        | 0.85–1.1                                                       | 0.85–1.1                  | 0.8–1.1                   |
| <b>Power consumption</b>                         |       |                                 |                                 |                                                                |                           |                           |
| AC operated 50/60 Hz                             | VA    | —                               | —                               | —                                                              | —                         | —                         |
| AC operated 50/60 Hz                             | W     | 5.8                             | 5.8                             | —                                                              | —                         | 2.2                       |
| DC operated                                      | W     | 2.9                             | 2.9                             | 1.8                                                            | 2                         | 2.2                       |
| <b>Fuse for control circuit supply</b>           |       |                                 |                                 |                                                                |                           |                           |
| 24V                                              |       | —                               | Short-circuit proof             | —                                                              | —                         | —                         |
| 115/230V                                         |       | Short-circuit proof             | Short-circuit proof             | —                                                              | —                         | —                         |
| <b>Control Circuit</b>                           |       |                                 |                                 |                                                                |                           |                           |
| Rated output voltage                             | Vdc   | 24                              | 24                              | 24                                                             | 24                        | 24                        |
| Rated operational current                        | mA    | S10, S12, S22: 35, S34, S35: 45 | S10, S12, S22: 35, S34, S35: 45 | S12, S22: 3.5, S34, S35: 7                                     | A1, A2: 84, K1/K2: 5      | A1, A2: 92                |
| Resistance— $R$                                  |       | 11                              | 11                              | 500                                                            | —                         | —                         |
| Short-circuit current                            | A     | 0.7                             | 0.7                             | 0.1                                                            | —                         | —                         |
| Response time                                    | ms    | 250                             | 250                             | 150                                                            | 20                        | 20                        |
| Recovery time                                    | ms    | —                               | —                               | —                                                              | —                         | —                         |
| Response time with reset monitoring— $t_{A1}$    | ms    | 60                              | 60                              | 150                                                            | 20                        | 20                        |
| Response time without reset monitoring— $t_{A2}$ | ms    | 250                             | 250                             | 150                                                            | 20                        | 20                        |
| Reset time— $t_R/t_{R1}$                         | ms    | 20                              | 20                              | 20 (non-delayed enable paths); 100 (min. delayed enable paths) | 0.3–3 s (+50%) adjustable | 20                        |
| Minimum on duration— $t_M$                       | ms    | —                               | —                               | —                                                              | —                         | —                         |
| Recovery time— $t_W$                             | ms    | Approx. 1000                    | Approx. 1000                    | Approx. 330                                                    | Approx. 1000              | —                         |
| Synchronous monitoring time— $t_S$               | ms    | —                               | —                               | —                                                              | —                         | —                         |
| <b>Electromagnetic Compatibility (EMC)</b>       |       |                                 |                                 |                                                                |                           |                           |
| Emitted interference                             |       | EN 61000-6-4                    | EN 61000-6-4                    | EN 61000-6-4                                                   | EN 61000-6-4              | EN 61000-6-4              |
| Interference immunity                            |       | According to EN 61000-6-2       | According to EN 61000-6-2       | According to EN 61000-6-2, EN 62061                            | According to EN 61000-6-2 | According to EN 61000-6-2 |

### Dimensions

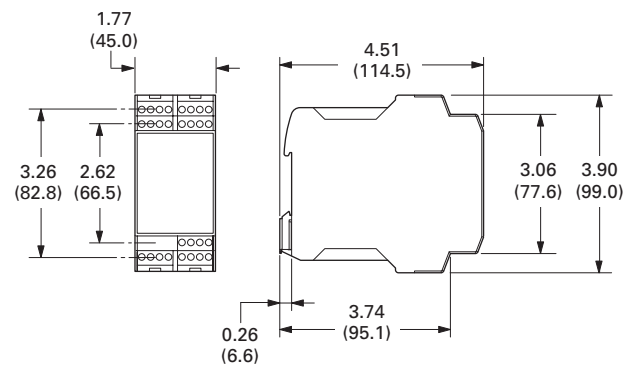
Approximate Dimensions in Inches (mm)

#### Safety Relays, Contact Expansion Modules

##### ESR5\_ 24 Vac/Vdc



##### ESR5\_ 230 Vac



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