



Single/Dual Channel Safety Relay, 3 Enabling + 1 Signaling Path, 24V DC

Part no. **ESR5-NO-31-24VDC**
EP-401062

General specifications		
Product name		Eaton ESR5 Safety relay
Part no.		ESR5-NO-31-24VDC
EAN		4015082965143
Product Length/Depth		114.5 millimetre
Product height		99 millimetre
Product width		22.5 millimetre
Product weight		0.164 kilogram
Compliances		EMC Directive: 2004/108/EC
Certifications		UL File No.: E29184 Machines 2006/42/EG North America (UL listed, certified by UL for use in Canada) UL Category Control No.: NKCR; NKCR7 UL report applies to both US and Canada CSA Class No.: 3211-83; 3211-03 IEC 61508, Parts 1-7 EN 62061 EN 60204-1 EN 50178 EN ISO 13849-1
Product Tradename		ESR5
Product Type		Safety relay
Product Sub Type		None
Features & Functions		
Electric connection type		Screw connection
Features		6 kV between A1-A2 / logic / enable and signal current paths Reinforced insulation Safe insulation Basic insulation
Fitted with:		Approval for TÜV Approval according to UL Feedback circuit Start input Detachable clamps
Material		Contacts: silver tin oxide, gold plated (AgSnO ₂ , 0.2 µm Au) Enclosure: Polyamide (PA), not reinforced
General information		
Connection type		M3 screw terminals
Current consumption		70 mA, DC
Degree of protection		Enclosure: IP20 Terminals: IP20 Installation location: ≥ IP54 IP20
Emitted interference		According to EN 61000-6-4
Interference immunity		According to EN 662061_x According to EN-61000-6-2
Lifespan, mechanical		10,000,000 Operations
Lifetime		240 mo
Model		Basic device
Mounting method		Top-hat rail fixing (according to IEC/EN 60715, 35 mm) Rail mounting possible
Mounting width		22.5 mm
Overvoltage category		III
Pollution degree		2
Power loss		Normally 5.16 W
Protection		Finger and back-of-hand proof, Protection against direct contact when actuated from front (EN 50274)
Rated impulse withstand voltage (Uimp)		4000 V AC

Recovery time		1000 ms
Safety parameter (EN ISO 13849-1)		PL e, Performance level Cat. 4, Category 300,000 switching cycles, B10d
Safety parameter (IEC 62061)		5.05 x 10 ⁻¹⁰ , PFHd, Probability of failure per hour SIL 3, Safety integrity level, In accordance with IEC 61508
Stop category (IEC 60204)		0
Suitable for		monitoring of valves monitoring of tactile sensors monitoring of proximity switches Monitoring of magnetic switches Monitoring of emergency-stop circuits Monitoring of position switches
Switching frequency		Max. 0.5 Hz, Input data
Ambient conditions, mechanical		
Mounting position		As required
Prooftest		240 Months (High Demand) 66 Months (Low Demand)
Switching capacity		0.1 W 2.5 A at 3600 O/h, DC-13 at 24 V, Outputs 4 A at 360 O/h, DC-13 at 24 V, Outputs 3 A at 3600 O/h, AC-15 at 230 V, Outputs 4 A at 360 O/h, AC-15 at 230 V, Outputs In accordance with IEC 60947-5-1, Outputs
Vibration resistance		10 - 150 Hz, Amplitude: 0.15 mm, Acceleration: 2 g, (IEC/EN 60068-2-6)
Climatic environmental conditions		
Air pressure		795 - 1080 hPa (operation)
Altitude		Max. 2000 m
Ambient operating temperature - min		-20 °C
Ambient operating temperature - max		55 °C
Ambient storage temperature - min		-40 °C
Ambient storage temperature - max		70 °C
Climatic proofing		Damp heat, constant, to IEC 60068-2-3 Dry heat to IEC 60068-2-2 Cold to EN 60068-2-1
Environmental conditions		Condensation: Non-condensing Clearance in air and creepage distances according to EN 50178, UL 508, CSA C22.2, No. 14-95
Operating temperature - min		-20 °C
Operating temperature - max		55 °C
Relative humidity		< 75 %
Terminal capacities		
Terminal capacity		24 - 12 AWG, solid or stranded 2 x (0.25 – 1) mm ² , flexible with ferrule 1 x (0.25 – 2.5) mm ² , flexible with ferrule 2 x (0.2 – 1) mm ² , solid 1 x (0.2 – 2.5) mm ² , solid
Stripping length (main cable)		7 mm
Screwdriver size		0.6 x 3.5 mm, Terminal screws 2, Terminal screw, Pozidriv screwdriver
Tightening torque		0.6 Nm, Screw terminals
Electrical rating		
Inrush current		0.01 - 20 ($\Delta t \leq 100$ ms)
Rated control supply voltage (Us) at DC - min		20.4 V DC
Rated control supply voltage (Us) at DC - max		26.4 V DC
Rated insulation voltage (Ui)		250 V
Rated operational voltage		24 V DC (power supply)
Short-circuit current		2.3 A, Input data
Input/Output		
Breaking power		35 W max., inductive load ($\tau = 40$ ms), at 220 V DC 35 W max., inductive load ($\tau = 40$ ms), at 110 V DC 40 W max., inductive load ($\tau = 40$ ms), at 48 V DC 48 W max., inductive load ($\tau = 40$ ms), at 24 V DC 1500 VA, max., resistive load ($\tau = 0$ ms), at 250 V AC 88 W max., resistive load ($\tau = 0$ ms), at 220 V DC 110 W max., resistive load ($\tau = 0$ ms), at 110 V DC 288 W max., resistive load ($\tau = 0$ ms), at 48 V DC

		144 W max., resistive load ($\tau = 0$ ms), at 24 V DC
Input		∞ ms, Simultaneity for inputs 1/2
Number of inputs		One- and two-channel
Number of outputs (safety related, delayed) with contact		0
Number of outputs (safety related, undelayed) with contact		3
Number of outputs (signaling function, delayed) with contact		0
Number of outputs (signaling function, undelayed) with contact		1
Permissible total cable resistance		Approx. 50 Ω (input and starting circuits for UN)
Quadratic summation current		72 A ² ($I_{TH}^2 = I_1^2 + I_2^2 + I_3^2$)
Reset time		Normally 20 ms
Resistance		50 Ω (impedance)
Uninterrupted current		6 A N/C, Limiting continuous current 6 A N/O, Limiting continuous current

Design verification

Static heat dissipation, non-current-dependent Pvs		5.16 W
10.2.2 Corrosion resistance		Meets the product standard's requirements.
10.2.3.1 Verification of thermal stability of enclosures		Meets the product standard's requirements.
10.2.3.2 Verification of resistance of insulating materials to normal heat		Meets the product standard's requirements.
10.2.3.3 Resist. of insul. mat. to abnormal heat/fire by internal elect. effects		Meets the product standard's requirements.
10.2.4 Resistance to ultra-violet (UV) radiation		Meets the product standard's requirements.
10.2.5 Lifting		Does not apply, since the entire switchgear needs to be evaluated.
10.2.6 Mechanical impact		Does not apply, since the entire switchgear needs to be evaluated.
10.2.7 Inscriptions		Meets the product standard's requirements.
10.3 Degree of protection of assemblies		Does not apply, since the entire switchgear needs to be evaluated.
10.4 Clearances and creepage distances		Meets the product standard's requirements.
10.5 Protection against electric shock		Does not apply, since the entire switchgear needs to be evaluated.
10.6 Incorporation of switching devices and components		Does not apply, since the entire switchgear needs to be evaluated.
10.7 Internal electrical circuits and connections		Is the panel builder's responsibility.
10.8 Connections for external conductors		Is the panel builder's responsibility.
10.9.2 Power-frequency electric strength		Is the panel builder's responsibility.
10.9.3 Impulse withstand voltage		Is the panel builder's responsibility.
10.9.4 Testing of enclosures made of insulating material		Is the panel builder's responsibility.
10.10 Temperature rise		The panel builder is responsible for the temperature rise calculation. Eaton will provide heat dissipation data for the devices.
10.11 Short-circuit rating		Is the panel builder's responsibility. The specifications for the switchgear must be observed.
10.12 Electromagnetic compatibility		Is the panel builder's responsibility. The specifications for the switchgear must be observed.
10.13 Mechanical function		The device meets the requirements, provided the information in the instruction leaflet (IL) is observed.

Technical data ETIM 9.0

Relays (EG000019) / Device for monitoring of safety-related circuits (EC001449)		
Electric engineering, automation, process control engineering / Low-voltage switch technology / Monitoring equipment (low-voltage switch technology) / Device for monitoring of safety-related circuits (ecI@ss13-27-37-18-19 [ACD304016])		
Model		Basic device
Rail mounting possible		Yes
With detachable clamps		Yes
Type of electric connection		Screw connection
Voltage type (supply voltage)		DC
Supply voltage AC 50 Hz	V	0 - 0
Supply voltage AC 60 Hz	V	0 - 0
Supply voltage DC	V	0 - 24
Suitable for monitoring of position switches		Yes
Suitable for monitoring of emergency-stop circuits		Yes
Suitable for monitoring of valves		Yes
Suitable for monitoring of optoelectronic protection equipment		No
Suitable for monitoring of tactile sensors		Yes

Suitable for monitoring of magnetic switches		Yes
Suitable for monitoring of proximity switches		Yes
Evaluation inputs		One- and two-channel
Power consumption	W	1.68
With start input		Yes
With muting function		No
With feedback circuit		Yes
Release-delay	s	0 - 0
Type of control voltage 1		DC
Control voltage 1	V	24 - 26.4
Type of control voltage 2		
Control voltage 2	V	
Number of outputs, safety related, undelayed, with contact		3
Number of outputs, safety related, delayed, with contact		0
Number of outputs, safety related, undelayed, semiconductors		0
Number of outputs, safety related, delayed, semiconductors		0
Number of outputs, signalling function, undelayed, with contact		1
Number of outputs, signalling function, delayed, with contact		0
Number of outputs, signalling function, undelayed, semiconductors		0
Number of outputs, signalling function, delayed, semiconductors		0
Voltage type (operating voltage)		DC
Operating voltage AC 50 Hz	V	
Operating voltage AC 60 Hz	V	
Operating voltage DC	V	24 - 26.4
Rated switch current	A	6
Type of safety according to IEC 61496-1		None
Stop category according to IEC 60204		0
Performance level according to EN ISO 13849-1		Level e
SIL according to IEC 61508		3
With approval for BG BIA		No
With approval according to UL		Yes
Width	mm	22.5
Height	mm	99
Depth	mm	114.5
With approval for TÜV		Yes