

Safety relay, 24 V DC, 14DI, 4DO-Trans, 1DO relay, display, easyNet



Part no. **ES4P-221-DMXD1**
Catalog No. **111017**
EL-Nummer **4521512**
(Norway)

Delivery program

Product range			Control relays for safety applications
Basic function			easy800 with safety function blocks
Features			
Safety functions			Stopping in the event of an emergency Protective door OSSD input ESPE with muting function Two-hand control Highest speed monitoring Zero speed monitoring Safety timing relay Mode selection Enabling switch Feedback circuit
Display & keypad			✓
Mounting width	mm	107.5	
Technical safety parameters:			
Values according to EN ISO 13849-1			
Performance level	according to EN ISO 13849-1		PL e
Category	according to EN ISO 13849-1		Kat. 4
Safety integrity level claim limit	in accordance with 62061		SILCL 3
Probability of failure per hour	PFH _d x 10 ⁻¹⁰	23	
Safety integrity level	In accordance with IEC 61508		SIL 3
Display			Display Keypad
Real time clock			#
Supply voltage	U _s	24 V DC	
Networking			easyNet/easyLink
Safety/standard circuit diagram			✓/✓
Instructions			Expandable: standard inputs/outputs and standard bus systems Individual laser inscription with ES4-COMBINATION possible → #2011790
Inputs (safety)		14	
Outputs (safety)			
6 A relay			1 (redundant)
Transistor		4	
Test signal		4	

Technical data

General		
Standards		EN ISO 13849-1 EN 50156-1, EN 50156-2 EN 50178 EN 50581_x EN 61000-6-2 EN 61000-6-3 IEC 61508 IEC 62061
Approvals		

Approvals			EAC
Dimensions (W x H x D)	mm	107.5 (6 TE) x 90 x 72	
Weight	kg	0.35	
Mounting			Top-hat rail IEC/EN 60715, 35 mm or screw fixing using fixing brackets ZB4-101-GF1 (accessories)
Times			
Inputs			
Max. duration of external test pulse	ms	1	
Semi-conductor output			
Off test pulse	ms	< 1	
Off-delay	ms	< 1	
Terminal capacities			
Solid	mm ²	0.2/4 (AWG 22 - 12)	
Flexible with ferrule	mm ²	0.2/2.5 (AWG 22 - 12)	
Standard screwdriver	mm	0.8 x 3.5	
Max. tightening torque	Nm	0.6	
Climatic environmental conditions			
Operating ambient temperature	°C	-25 to +55 cold as per IEC 60068-2-1 heat as per IEC 60068-2-2 Damp heat – constant to IEC 60068-2-78 – cyclical to IEC 60068-2-30	
Condensation		Take appropriate measures to prevent condensation	
LCD display (clearly legible)	°C	0 - 55	
Ambient temperature			
Storage	g	-40 - +55	
relative humidity	%	5 - 95 in accordance with IEC 60068-2-30, IEC 60068-2-78 Non-condensing	
Air pressure (operation)	hPa	795 - 1080	
Ambient conditions, mechanical			
Degree of protection		IP20 (IEC/EN 60529, EN50178, VBG 4)	
Constant amplitude 0.15 mm	Hz		
constant amplitude	Hz	10 - 57 (0.15 mm)	
constant acceleration	Hz	57 - 150 (2g)	
Vibrations	3,5 mm / 1 g	Hz	In accordance with IEC 60068-2-6
Mechanical shock resistance	g	18 shocks Sinusoidal 15 g/11 ms according to IEC 60068-2-27	
Drop to	Drop height	mm	50 (IEC/EN 60068-2-31)
Free fall, packaged		m	0,3 (IEC/EN 61131-2)
Electromagnetic compatibility (EMC)			
Electromagnetic compatibility			As per IEC 62061, increased EMC requirements for safety-relevant functions
Oversupply category/pollution degree			III/2
Electrostatic discharge (ESD)			
applied standard			nach IEC/EN 61000-4-2
Air discharge	kV	15	
Contact discharge	kV	8	
Electromagnetic fields (RFI)	V/m	30 to IEC EN 61000-4-3	
Radio interference suppression			EN 55011 Class B, EN 55022 Class B
Burst	kV	according to IEC/EN 61000-4-4 Supply cables: 4 Signal cables: 4	
power pulses (Surge)			2 kV (supply cables, symmetrical) 4 kV (semi-conductor outputs, symmetrical) In accordance with IEC 62061
Immunity to line-conducted interference	V	20, in accordance with IEC/EN 61000-4-6	
Insulation resistance			
Clearance in air and creepage distances			EN 50178, UL 508, CSA C22.2, No. 142, EN 60664-1:2003
Insulation resistance			EN 50178

Back-up of real-time clock

Accuracy of the real-time clock	s/day	① Backup time (hours) with fully charged double layer capacitor ② Service life (years) Normally ± 2 (± 0.5 h/year), may vary up to ± 5 s/day depending on the ambient temperature
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Accuracy

Resolution	ms	50
Range "S"	s	1
Range "M:S"	min	1

Repetition accuracy

Resolution	ms	50
Range "S"	s	1
Range "M:S"	min	1

Retentive memory

Read/write cycles (minimum)		1000000000000000 (10 ¹⁴)
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Power supply

Rated operational voltage	U _e	V	24 DC (-15/+20%)
Permissible range	U _e		20.4 - 28.8 V DC
Residual ripple		%	≤ 5
Input current		mA	< 250
Input current 115/230 V AC		ms	≤ 10 (IEC/EN 61131-2)
Voltage dips		W	< 6
Heat dissipation			From the inputs: yes: no from the outputs: yes to PC interface: no to easyLink: no to easyNet: yes
Potential isolation			

Network easyNet

Stations	Number	max. 8
Data transfer rate/distance		1000 kBit/s, 6 m 500 kBit/s, 25 m 250 kBit/s, 40 m 125 kBit/s, 125 m 50 kBit/s, 300 m 20 kBit/s, 700 m 10 kBit/s, 1000 m
Potential isolation		
Potential isolation between inputs and internal power supply		yes
Potential isolation		from power supply: yes From the inputs: yes from the outputs: yes to PC interface: yes to memory card: yes to easyLink: no to easyNet: yes
Bus termination		yes (first and last station)
Connection technique		RJ45, 8-pole

Digital inputs 24 V DC

Number			14
Status indication			LCD display
Potential isolation			from power supply: no between digital inputs: no from the outputs: yes to the interface: no to the memory card: no to easyLink: no to easyNet: yes
Rated signal voltage	U _e	V DC	24
On 0 signal	U _e	V DC	< 5
On 1 signal	U _e	V DC	> 15,0
Input current on 1 signal		mA	5.7 (at 24 V DC)
IS1 - IS14		ms	
Hardware delay time from 0 to 1			

			Debounce ON: 24 Debounce OFF: 0.06 (IS1, IS2), 0.17 (IS3 to IS14)
Hardware delay time from 1 to 0	ms		
Cable length (unscreened)	m	100	
Single cable length of test signal output to the device input (shielded)	m	1000	
Total of single cable lengths from one test signal output to the device inputs (shielded)	m	3000	
Maximum rotary frequency at device inputs IS1 and IS2, when using function block OM or ZM	Hz	1000	
Maximum switching frequency at input (does not apply to I1, I2, if function block SM or OM is used)	Operations/h	900	
Test signal outputs			
Number		4 (T1 to T4)	
Voltage	V DC	24	
Potential isolation		No	
Relay outputs			
Outputs in groups of		1 (redundant)	
Parallel switching of outputs for increased output		1	
Safety level		Not permissible	
Protection of an output relay		3 redundant relay outputs, 6 months test interval According to EN 50156	
Potential isolation		Fuse: 6 A gL/gG, Circuit-breaker with C characteristic: 4 A (only permissible with 24V DC), Short-circuit current $I_K < 250$ A	
Lifespan, mechanical	Operations	$\times 10^6$	10
Contacts			
Conventional thermal current	I_{th}	A	6
Rated impulse withstand voltage U_{imp} of contact coil		kV	6
Rated operational voltage	U_e	V AC	250
Rated insulation voltage	U_i	V AC	250
safe isolation between coil and contact		V AC	300 in accordance with 50178
Switching capacity			DC-13, 24 V DC, 0.1 Hz: 40000 operations (in accordance with IEC 60947-5-1) AC-15, 230 V AC, 3 A: 80000 operations (in accordance with IEC 60947-5-1) DC: B300 (in accordance with UL 508) AC: R300 (in accordance with UL 508)
Switching frequency			
Mechanical operations		$\times 10^6$	10
Switching frequency		Hz	15
Transistor outputs			
Number			4
Rated operational voltage	U_e	V DC	24
Permissible range	U_e		20.4 - 28.8 V DC
Residual ripple		%	5
Supply current			
On 0 signal		Normally/max. mA	30/50
On 1 signal		Normally/max. mA	60/100
Protection against polarity reversal			Yes
Potential isolation			from power supply: yes From the inputs: yes between digital inputs: no to the interface: yes to easyLink: yes to easyNet: yes to the memory card: yes

Rated operational current at signal „1“ DC per channel	I _e	A	Max. 0.5
Lamp load without R _v per channel		W	5
Max. output voltage			
On 0 signal with external load < 10 MΩ		V	≤ 2,4
On 1 signal with I _e = 0.5 A		V	U = U _e - 1 V
Short-circuit protection			Yes
Short-circuit tripping current for R _a ≤ 10 mΩ		A	0.7 ≤ I _e ≤ 2 per output
Total short-circuit current		A	8
Peak short-circuit current		A	16
Thermal cutout			Yes
Back-up fuse		A	≤ 8
max. load capacity		µF	0.6
Max. cable length (unscreened)		m	50
Max. operating frequency with constant resistive load		Operations/h	Operations 3500/h (RL < 100 kΩ, abhängig von Programm und Belastung)
Parallel switching of outputs for increased output			Not permissible
Output status indication			LCD-display
Inductive load to EN 60947-5-1			
Without external suppressor circuit			
Duty factor			T _{0.95} ≈ 3 x T _{0.65} = 3 x L/R. T _{0.95} = Time in ms, until 95 % of the steady-state current has been reached.
With external suppressor circuit			
Utilization factor		g	1
Duty factor		% DF	100
Max. switching frequency, max. duty factor = 50%	f	Hz	0.5

Design verification as per IEC/EN 61439

Technical data for design verification			
Rated operational current for specified heat dissipation	I _n	A	0
Heat dissipation per pole, current-dependent	P _{vid}	W	0
Equipment heat dissipation, current-dependent	P _{vid}	W	0
Static heat dissipation, non-current-dependent	P _{vs}	W	6
Heat dissipation capacity	P _{diss}	W	0
Operating ambient temperature min.		°C	-25
Operating ambient temperature max.		°C	55
IEC/EN 61439 design verification			
10.2 Strength of materials and parts			
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 Verification of resistance of insulating materials to abnormal heat and fire due to internal electric 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 Insulation properties			
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 8.0

Programmable logic controllers PLC (EG000024) / Logic module (EC001417)		
Electric engineering, automation, process control engineering / Control / Programmable logic control (SPS) / Logic module (ecl@ss10.0.1-27-24-22-16 [AKE539014])		
Supply voltage AC 50 Hz	V	0 - 0
Supply voltage AC 60 Hz	V	0 - 0
Supply voltage DC	V	20.4 - 28.8
Voltage type of supply voltage		DC
Switching current	A	8
Number of analogue inputs		0
Number of analogue outputs		4
Number of digital inputs		14
Number of digital outputs		5
With relay output		Yes
Number of HW-interfaces industrial Ethernet		0
Number of interfaces PROFINET		0
Number of HW-interfaces RS-232		1
Number of HW-interfaces RS-422		0
Number of HW-interfaces RS-485		0
Number of HW-interfaces serial TTY		0
Number of HW-interfaces USB		0
Number of HW-interfaces parallel		0
Number of HW-interfaces Wireless		0
Number of HW-interfaces other		3
With optical interface		No
Supporting protocol for TCP/IP		No
Supporting protocol for PROFIBUS		No
Supporting protocol for CAN		No
Supporting protocol for INTERBUS		No
Supporting protocol for ASI		No
Supporting protocol for KNX		No
Supporting protocol for Modbus		No
Supporting protocol for Data-Highway		No
Supporting protocol for DeviceNet		No
Supporting protocol for SUCONET		No
Supporting protocol for LON		No
Supporting protocol for PROFINET IO		No
Supporting protocol for PROFINET CBA		No
Supporting protocol for SERCOS		No
Supporting protocol for Foundation Fieldbus		No
Supporting protocol for EtherNet/IP		No
Supporting protocol for AS-Interface Safety at Work		No
Supporting protocol for DeviceNet Safety		No
Supporting protocol for INTERBUS-Safety		No
Supporting protocol for PROFIsafe		No
Supporting protocol for SafetyBUS p		No
Supporting protocol for other bus systems		Yes
Radio standard Bluetooth		No
Radio standard Wi-Fi 802.11		No

Radio standard GPRS		No
Radio standard GSM		No
Radio standard UMTS		No
IO link master		No
Redundancy		Yes
With display		Yes
Degree of protection (IP)		IP20
Basic device		Yes
Expandable		Yes
Expansion device		No
With time switch clock		Yes
Rail mounting possible		Yes
Wall mounting/direct mounting		Yes
Front built-in possible		No
Rack-assembly possible		No
Suitable for safety functions		Yes
SIL according to IEC 61508		3
Performance level according to EN ISO 13849-1		Level e
Appendant operation agent (Ex ia)		No
Appendant operation agent (Ex ib)		No
Explosion safety category for gas		None
Explosion safety category for dust		None
Width	mm	108
Height	mm	90
Depth	mm	72