# DATASHEET - ES4P-221-DRXX1

**Safety relay, 24 V DC, 14DI, 4DO relays, easyNet**

| | |
|---|---|
| **Part no.** | **ES4P-221-DRXX1** |
| **Catalog No.** | **111018** |
| **EL-Nummer (Norway)** | **0004521513** |

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## 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<br>Protective door<br>OSSD input<br>ESPE with muting function<br>Two-hand control<br>Highest speed monitoring<br>Zero speed monitoring<br>Safety timing relay<br>Mode selection<br>Enabling switch<br>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 | $PFH_d$ | $\times 10^{-10}$ | 4.26 |
|   Safety integrity level | In accordance with IEC 61508 | | SIL 3 |
|   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 | | | |
| | | | 4 |
|   Test signal | | | 4 |

## Technical data
### General

| | | | |
|---|---|---|---|
| Standards | | | EN ISO 13849-1<br>EN 50156-1, EN 50156-2<br>EN 50178<br>EN 50581_x<br>EN 61000-6-2<br>EN 61000-6-3<br>IEC 61508<br>IEC 62061 |
| Approvals | | | |
|   Approvals | | | EAC |
| Dimensions (W x H x D) | | mm | 107.5 (6 TE) x 90 x 72 |
| Weight | | kg | 0.38 |

| | | | |
|---|---|---|---|
| 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 pulde | | 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<br>cold as per IEC 60068-2-1<br>heat as per IEC 60068-2-2<br>Damp heat – constant to IEC 60068-2-78 – cyclical to ICE 60068-2-30 |
| Condensation | | | Take appropriate measures to prevent condensation |
| Ambient temperature | | | |
| Storage | $\vartheta$ | °C | -40 - +70 |
| relative humidity | | % | 5 - 95<br>in accordance with IEC 60068-2-30, IEC 60068-2-78<br>Non-condensing |
| Air pressure (operation) | | hPa | 795 - 1080 |

## Ambient conditions, mechanical

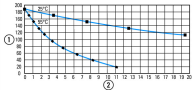| | | | |
|---|---|---|---|
| Degree of protection | | | IP20 (IEC/EN 60529, EN50178, VBG 4) |
| Constant amplitude 0.15 mm | | Hz | |
| constant amplitude | | Hz | 10 - 57 (0.15 mm) |
| constant acceleration | | Hz | 57 - 150 (2g) |
| Vibrations | 3,5 mm / 1 g | Hz | In accordance with IEC 60068-2-6 |
| Mechanical shock resistance | | g | 18 shocks<br>Sinusoidal 15 g/11 ms<br>according to IEC 60068-2-27 |
| Drop to | Drop height | mm | 50<br>(IEC/EN 60068-2-31) |
| Free fall, packaged | | m | 0,3<br>(IEC/EN 61131-2) |

## Electromagnetic compatibility (EMC)

| | | | |
|---|---|---|---|
| Electromagnetic compatibility | | | As per ICE 62061, increased EMC requirements for safety-relevant functions |
| Overvoltage 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<br>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<br>Supply cables: 4<br>Signal cables: 4 |
| power pulses (Surge) | | | 2 kV (supply cables, symmetrical)<br>4 kV (semi-conductor outputs, symmetrical)<br>In accordance with IEC 62061 |
| Immunity to line-conducted interference | | V | 20, in accordsnce 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

| | | | |
|---|---|---|---|
| Back-up of real-time clock | | |  |

① Backup time (hours) with fully charged double layer capacitor

| | | | ② Service life (years) |
|---|---|---|---|
| Accuracy of the real-time clock | | s/day | Normally ±2 (±0.5 h/year), may vary up to ±5 s/day depending on the ambient temperature |

## Accuracy

| | | | |
|---|---|---|---|
| Resolution | | | |
| Range "S" | | ms | 50 |
| Range "M:S" | | s | 1 |
| Range "H:M" | | min | 1 |

## Repetition accuracy

| | | | |
|---|---|---|---|
| Resolution | | | |
| Range "S" | | ms | 50 |
| Range "M:S" | | s | 1 |
| Range "H:M" | | min | 1 |

## Retentive memory

| | | | |
|---|---|---|---|
| Read/write cycles (minimum) | | | 100000000000000 ($10^{14}$) |

## Power supply

| | | | |
|---|---|---|---|
| Rated operational voltage | $U_e$ | V | 24 DC (-15/+20%) |
| Permissible range | $U_e$ | | 20.4 - 28.8 V DC |
| Residual ripple | | % | ≦ 0 |
| Input current | | | |
| Input current 115/230 V AC | | mA | < 250 |
| Voltage dips | | ms | ≤ 10 (IEC/EN 61131-2) |
| Heat dissipation | | W | < 6 |
| Potential isolation | | | From the inputs: yes: no from the outputs: yes to PC interface: no to easyLink:no to easyNet: yes |

## 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 |
| 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 | | | |
| IS1 - IS14 | | mA | 5.7 (at 24 V DC) |
| Hardware delay time from 0 to 1 | | ms | |
| | | | Debounce ON: 24 Debounce OFF: 0.06 (IS1, IS2), 0.17 (IS3 to IS14) |
| Hardware delay time from 1 to 0 | | ms | |

| | | | Debounce ON: 24<br>Debounce OFF: 0.08 (IS1, IS2), 0.22 (IS3 to IS14) |
|---|---|---|---|
| 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

| | | | |
|---|---|---|---|
| | | | 4 |
| Outputs in groups of | | | 1 |
| Safety level | | | 3 redundant relay outputs, 6 months test interval<br>According to EN 50156 |
| Protection of an output relay | | | Fuse: 6 A gL/gG,<br>Circuit-breaker with C characteristic: 4 A (only permissible with 24V DC),<br>Short-circuit current $I_K$ < 250 A |
| Potential isolation | | | from power supply: yes<br>From the inputs: yes<br>between digital inputs: yes<br>to the interface: yes<br>to easyNet: yes<br>to easyLink: yes<br>Safe isolation according to EN 50178: 300 V AC<br>Basic isolation: 600 V AC |
| Lifespan, mechanical | Operations | x $10^6$ | 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<br>in accordance with 50178 |
| Switching capacity | | | DC-13, 24 V DC, 0.1 Hz: 40000 operations (in accordance with IEC 60947-5-1)<br>AC-15, 230 V AC, 3 A: 80000 operations (in accordance with IEC 60947-5-1)<br>DC: B300 (in accordance with UL 508)<br>AC: R300 (in accordance with UL 508) |
| Switching frequency | | | |
|     Mechanical operations | | x $10^6$ | 10 |
|     Switching frequency | | Hz | 15 |

### Transistor outputs

| | | | |
|---|---|---|---|
| Residual ripple | | % | 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 7.0

| PLC's (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 | | 4 |
| 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 WLAN 802.11 | | No |
| Radio standard GPRS | | No |
| Radio standard GSM | | No |
| Radio standard UMTS | | No |
| IO link master | | No |
| Redundancy | | Yes |
| With display | | No |
| Degree of protection (IP) | | IP20 |
| Basic device | | Yes |
| Expandable | | Yes |
| Expansion device | | No |
| With timer | | Yes |
| Rail mounting possible | | Yes |
| Wall mounting/direct mounting | | Yes |
| Front build in possible | | No |
| Rack-assembly possible | | No |
| Suitable for safety functions | | Yes |
| Category according to EN 954-1 | | 4 |
| SIL according to IEC 61508 | | 3 |
| Performance level acc. 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 | 107.5 |
| Height | mm | 90 |
| Depth | mm | 72 |

## Approvals

| | | |
|---|---|---|
| Product Standards | | IEC/EN see Technical Data; UL 508; CSA-C22.20.4-04; CSA-22.2 No. 142-MI1987; CE marking |
| UL File No. | | CSA report applies to both US and Canada |
| UL Category Control No. | | NRAQ |
| CSA File No. | | 012528 |
| CSA Class No. | | 2252-81; 2252-01 |
| North America Certification | | CSA certified, certified by CSA for use in the US |
| Degree of Protection | | IEC: IP20, UL/CSA Type: - |

## Characteristics

PU05907001Z safety manual

# Dimensions