## **PSR-PC50**

### SIL 3 coupling relay for safety-related switch on

Data sheet 105818\_en\_01

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### 1 Description

The PSR-PC50 SIL coupling relay can be used for power adaptation and electrical isolation in Safe-State-ON applications up to SIL 3 according to IEC 61508 as well as IEC 61511.

By filtering the controller test pulses, premature failure of the safety relays is prevented.

The contact side is fully monitored for open circuit and short circuit as well as load and diagnostics supply voltage.

If an error occurs, the internal device input impedance is affected. As such, the test pulses sent from the controller are disrupted and the error is reported to the corresponding digital output without additional wiring effort.

#### Features

- SIL 3 coupling relays for safety-related switch on
- Applications: Energized-to-Safe
- Complete monitoring of the load side for:
  - Open circuit
  - Short circuit
  - Presence of supply voltage for diagnostics and loads
- Error message output through interrupting test pulses of the higher-level controller
- Easy proof test
- Integrated DCS test pulse filter
- Low inrush current
- One undelayed enabling channel
- Optional plug-in screw or spring-cage terminal blocks
- Special design for avoiding spurious trips
- Housing width 17.5 mm
- Compatible with EMERSON DeltaV SIS SLS1508 and CSLS (further controller cards on request)

| Δ           | WARNING: Risk of electric shock   |  |
|-------------|---|--|
| <u>_!</u> \ | Observe the safety instructions in the corresponding section!   |  |
| 1           | Make sure you always use the latest documentation.<br>It can be downloaded from the product at <u>phoenixcontact.net/products</u> . |  |
| 1           | This data sheet is valid for all products listed on the following pages.  |  |





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## 3 Ordering data

| Description   | Туре                     | Order No. | Pcs. / Pkt. |
|---|--------------------------|-----------|-------------|
| Coupling relay for SIL 3 low demand applications, couples digital output signals to the periphery, 1 enabling current path, module for F&G applications, test pulse filter, plug-in screw connection, 17.5 mm width       | PSR-PC50-1NO-1DO-24DC-SC | 2904664   | 1           |
| Coupling relay for SIL 3 low demand applications, couples digital output signals to the periphery, 1 enabling current path, module for F&G applications, test pulse filter, plug-in spring-cage connection, 17.5 mm width | PSR-PC50-1NO-1DO-24DC-SP | 2904665   | 1           |

## 4 Technical data

| Nomial pipt voltage μ <sub>h</sub> 24 VDC-15 %; +10 %; (A1A2 and 24VA2)Input voltage range (factor)06 S 1.1Typical input a corrent68 m. (A1A2)<br>15 m. (A2VA2; topolagin on load M1 +100 mA)Typical input hourent25 A (24VA2; topolagin on load M1 +100 mA)Typical input hourent25 A (24VA2; topolagin on load M1 +100 mA)Current consumption30 m. A (1A22)<br>9, 9, 9, 9, 9, 9, 9, 9, 9, 9, 9, 9, 9, 9  | Input data  |   |
|---|---|---|
| Typical input current     65 mA (41/A2)<br>5 mA (24/K2) (sep)<br>280 mA (41/A2)<br>280 mA (41/A2) | Nominal input voltage U <sub>N</sub>                  | 24 V DC -15 %; +10 % (A1/A2 and 24V/A2)   |
| Typical inrush current     15 mA (241/A/2)<br>2.5 A (24/A/2); for 10 µs)<br>2.5 A (24/A/2; for 10 µs)<br>2.5 m (1 foput TPs)<br>Vp. 13 m (1 foput TPs)       Input filter time     2 m (5 for 5 puble duration)<br>* 100 ms (Test puble rate)       Max permissible overall conductor resistance<br>(1 foput and reset circuit at U <sub>1</sub> )     30 ms       Recovery time     1 s       Operating voltage display     Yelow LED       Status display     Gareen LED       Protective circuit     Overlaad protection Suppressor diode <b>Otyput data</b> 1 enabling current path       Contact type     1 enabling current path       Contact type     15 V AC/D2 (with diagnostics)<br>20 V AC/D2   | Input voltage range (factor)                          | 0.85 1.1  |
| 2.5 A (24/λ2, (c) 10µs)<br>200 nA ((nput TP))       Current consumption     ½ 2.0 mA (nput TP))       Input filer time     2 mo. (feapt TP))       Max permissible overall conductor resistance     2 mo. (feapt used auration)       * 100 m (Input TP)     2 mo. (feapt used auration)       * 100 m (Test pulse inte)     30 ms       Recovery time     30 ms       Operating voltage display     Yelow LED       Status display     Green LED       Protective circuit     Querical protection Suppressor diode       Operating voltage display     Yelow LED       Status display     Green LED       Protective circuit     Querical protection Suppressor diode       Operating voltage     ApNL gold-fashed       Mainmum switching voltage     1 a nabing current path       Contact materia     ApNL gold-fashed       Mainmum switching voltage     25 v A/C/C (with uid agnostics)       Diagnostic threshold     20 v A/C/C (with diagnostics)       Maximum switching voltage     25 v A/C/C (with diagnostics)       Diagnostic threshold     20 v A/C/C (with diagnostics)       Maximum inskitching voltage     25 v A/C/C (with diagnostics)       Diagnostic   | Typical input current                                 |   |
| Input filter time2 ms (Input TP2)<br>by 5 sm (Input TP2)<br>by 5 sm (Input tP3)Input filter time2 ms (Test pulse duration)<br>> 100 (LO/LO and NINT and load resistance in the event of a short circuit)<br>(Input and reset circuit at Un)Max, permissible overall conductor resistance<br>(Input and reset circuit at Un)30 msRecovery time30 msRecovery time1 sOperating voltage displayGreen LEDIndicationRed LEDIndicationIndicationProtective circuitOverload protection Suppressor diodeOttact type1 enabling current pathContact tasiailApN, gold-filashadMinimum switching voltage250 VACC (with diagnostics)Outs turing continuous current5 A (NO contact)Diagnostic threshold20 maBayneshold Eleg20 maMaximum insub current5 A (NO contact)Insub current path5 A (NO contact)Diagnostic threshold20 maMaximum insub current5 A (NO contact)Bayneshold Eleg20 VACD (with diagnostics)Switching capacity min.5 A (NO contact)Musch and savice life20 MaDiagnostic threshold20 MaSwitching capacity min.16 (digila)Musch and savice life20 VACDMusch and savice life20 VACDDiagnostic threshold20 VACDNominal voltage Un20 VACDDiagnostic threshold20 VACDDiagnostic threshold20 VACDDiagnostic threshold20 VACDDiagnostic  | Typical inrush current                                | 2.5 A (24V/A2; for 10 μs)   |
| > 100 mis (Test pulse rate)       Max permissible overall conductor resistance<br>(input and reset circuit at U <sub>µ</sub> )       Max permissible overall conductor resistance       Typical pick-up time       Becovery time       Operating voltage display       Status display       Operating voltage display       Status display       Indication       Protective circuit       Contact type       Contact type       Contact type       Contact material       Minimum switching voltage       250 V AC       150 V CDC (with diagnostics)       200 / 18 AC (wervupper)       Maximum switching voltage       Maximum switching voltage       100 maA       101 mush current       54 (NO contact)       Diagnostic threshold       Maximum switching voltage       Maximum insurf current, minimum       100 mA  | Current consumption                                   | typ. 18 mA (Input TP2)  |
| (Input and reset circuit at U <sub>N</sub> )Typical pick-up time0 msRecovery time1 sOperating voltage displayYellow LEDStatus displayGreen LEDIndicationRed LEDProtective circuitOverload protection Suppressor diodeOutput dataContact typeContact type1 enabling current pathContact tratarialAqNi, gold/fashedMinimum switching voltage20 V AC/DC (with uit diagnostics)20 V AC/DC (with uit diagnostics)20 V AC/DC (with uit diagnostics)Maximum switching voltage20 Q / 18 kQ (lower/upper)Limitig continuous current5 A (IVO contect)Diagnostic threshold20 Q / 18 kQ (lower/upper)Maximum insub current1.5 VMaximum insub current1.5 VMusher ol outputs1 (diglal)Number ol outputs1 (20 mAPercer data100 mAPercer data1 (low manument outputs)Contact type1 (diglal)Number ol outputs1 (diglal)Number ol outputs1 (diglal)Number ol outputs1 (low manument outputs)Diagonstict treshoutputs1 (low manument outputs)Diagonstict treshoutputs1 (low manument outputs)Diagonstict treshoutputs1 (low manument outputs)Diago  | Input filter time                                     |   |
| Recovery time     1 s       Operating voltage display     Yellow LED       Status display     Green LED       Indication     Red LED       Protective circuit     Overload protection Suppressor diode       Output data     Contact material       Contact material     AgNi, gold-flashed       Minimum switching voltage     1 s V AC/DC (without diagnostics)<br>20 V ACC (Without diagnostics)<br>20 V AC/DC (without diagnostics)<br>20 V AC       Limiting continuous current     5 A (I/VO contact)       Diagnostic threshold     20 Ω / 18 kΩ (lower/upper)       Maximum invus current     5 A (I/VO contact)       Invus current, minimum     100 mA       Switching capacity min.     1.5 W       Mechanical service life     28 V DC       Number of outputs     1 (digital)       Nominal voltage U <sub>N</sub> 28 V DC       Limiting continuous current     100 mA       Electromagnetic du   |   | $<$ 10 $\Omega$ (LO/LO' and NI/NI' and load resistance in the event of a short circuit) |
| Operating voltage displayYellow LEDStatus displayGreen LEDIndicationRed LEDProtective circuitOverload protection Suppressor diodeOutput dataI enabling current pathContact type1 enabling current pathContact traterialAgNi, gold-flashedMinimum switching voltage250 VAC/DC (without diagnostics)<br>20 VAC/DC (without diagnostics)Maximum switching voltage250 VACLimiting continuous current5.4 (N/O contact)Diagnostic threshold20 0.7 18 kQ (lower/upper)Maximum invush current5.4Nusch capacity min.1.5 WMechanical service life39 VDCMumber of outputs1 (digital)Number of outputs1 (digital)Number of outputs1 (digital)Contact type23 VDCLimiting continuous current29 VDCDescent data100 mANumber of outputs1 (digital)Number of outputs1 (digital)Number of outputs100 mACenter data100 mA <td>Typical pick-up time</td> <td>30 ms</td>   | Typical pick-up time                                  | 30 ms   |
| Staus disply     Green LED       Indication     Red LED       Protective circuit     Overload protection Suppressor diode       Output data     Enabling current path       Contact type     1 enabling current path       Contact material     AgNi, gold-flashed       Minimum switching voltage     250 V AC/C (with diagnostics)<br>20 V AC/CC (with diagnostics)       Maximum switching voltage     250 V AC       Limiting continuous current     5 A (IVO contact)       Diagnostic threshold     20 Q / 18 KQ (lower/upper)       Maximum inrush current     5 A (IVO contact)       Diagnostic threshold     20 Q / 18 KQ (lower/upper)       Maximum inrush current     100 mA       Switching capacity min.     1.5 W       Mechanical service life     Approx.5 x 10 <sup>7</sup> cycles       Numier of outputs     1 (digital)       Nominal voltage U <sub>N</sub> 23 V DC       Limiting continuous current     100 mA       Concert data     Electromagnetic dust-proof relay       Nominal operating mode     100 <sup>w</sup> Goperating factor       Degree of protection of inst. location     IPs4       Mounting type     Vin all mounting  | Recovery time   | 1 s   |
| Indication     Red LED       Protective circuit     Overload protection Suppressor diode       Output data     Enabling current path       Contact material     AgNi, gold-flashed       Minimum switching voltage     1 sV AC/DC (with diagnostics)<br>20 V AC/DC (with diagnostics)       Maximum switching voltage     250 V AC       Maximum switching voltage     250 V AC/DC (with diagnostics)       Maximum switching voltage     250 V AC       Limiting continuous current     5 A (NC contact)       Diagnostic threshold     20 Q / 18 kΩ (lower/upper)       Maximum inrush current     5 A       Inrush current, minimum     100 mA       Switching capacity min.     1.5 W       Mechanical service life     230 V C       Number of outputs     1 (digital)       Nominal voltage U <sub>N</sub> 23 V DC       Limiting continuous current     100 mA       Solidauge U <sub>N</sub> 23 V DC       Limiting continuous current     100 mA       Sominal voltage U <sub>N</sub> 23 V DC       Limiting continuous current     100 mA       Sominal voltage U <sub>N</sub> 23 V DC       Limiting contrinuous current   | Operating voltage display                             | Yellow LED  |
| Protective circuit     Overload protection Suppressor diode       Contact type     1 enabling current path       Contact material     AgNi, gold-flashed       Minimum switching voltage     15 V AC/DC (without diagnostics)       Maximum switching voltage     250 V AC       Maximum switching voltage     250 V AC/DC (with diagnostics)       Maximum switching voltage     250 V AC       Diagnostic threshold     20 Q / 18 kQ (lower/upper)       Maximum inrush current     5 A (N/O contact)       Diagnostic threshold     20 Q / 18 kQ (lower/upper)       Maximum inrush current     5 A       Inrush current, minimum     100 mA       Switching capacity min.     1.5 W       Mechanical service life     Approx. 5 x 10 <sup>7</sup> cycles       Aumber of outputs     1 (dig1a)       Nominal voltage U <sub>N</sub> 23 V DC       Limiting continuous current     100 mA       Secondate U     20 V AC/DC (with diagnostics)       Nominal voltage U <sub>N</sub> 23 V DC       Limiting continuous current     100 mA       Secondate U     20 V DC       Nominal operating mode     100 voperating factor       Peigr   | Status display  | Green LED   |
| Output data     I enabling current path       Contact type     1 enabling current path       Contact material     AgNi, gold-flashed       Minimum switching voltage     20 V AC/DC (without diagnostics)<br>20 V AC/DC (with diagnostics)       Maximum switching voltage     250 V AC<br>125 V DC       Limiting continuous current     5 A (N/O contact)       Diagnostic threshold     20 Ω / 18 kΩ (lower/upper)       Maximum inrush current     5 A       Switching capacity min.     100 mA       Switching capacity min.     1.5 W       Mechanical service life     Approx.5 x 10 <sup>7</sup> cycles       Number of outputs     1 (digital)       Nominal voltage U <sub>N</sub> 23 V DC       Limiting continuous current     100 mA       Softer performance     20 m       Iumiting continuous current     1 (digital)       Nominal voltage U <sub>N</sub> 23 V DC       Limiting continuous current     100 mA       Softer performance     20 m       General data     100 mA       Nominal voltage U <sub>N</sub> 23 V DC       Limiting continuous current     100 mA       Nominal operating mode     100% operating   | Indication  | Red LED   |
| Contact type1 enabling current pathContact materialAgNi, gold-flashedMinimum switching voltage15 V AC/DC (with diagnostics)<br>20 V AC/DC (with diagnostics)Maximum switching voltage250 V AC<br>125 V DCLimiting continuous current5 A (N/O contact)Diagnostic threshold20 Q / 18 KQ (lower/upper)Maximum inrush current5 AInrush current, minimum100 mASwitching capacity min.1.5 WSwitching capacity min.1.5 WNumber of outputs1 (digital)Number of outputs1 (digital)Number of outputs1 (digital)Number of outputs1 (digital)Number of outputs1 (digital)Refer20 W PCLimiting continuous current100 mASetter100 mANumber of outputs1 (digital)Number of outputs1 (digital)Nominal voltage UN23 V DCLimiting continuous current100 mASetter100 mASetter100 mASetter100 mALimiting continuous current1 (digital)Number of outputs1 (digital)Nominal voltage UN20 V DCLimiting continuous current100 mASetter100 mASetter100 mASetter100 mALimiting continuous current100 mASetter100 mASetter100 mASetter100 mASetter100 mA <trr>Setter100 mA</trr>   | Protective circuit                                    | Overload protection Suppressor diode  |
| Contact materialAgNi, gold-flashedMinimum switching voltage15 V AC/DC (without diagnostics)<br>20 V AC/DC (with diagnostics)Maximum switching voltage250 V AC<br>125 V DCLimiting continuous current5 A (N/O contact)Diagnostic threshold20 Ω / 18 kΩ (lower/upper)Maximum inrush current5 ASwitching capacity min.100 mASwitching capacity min.1.5 WMechanical service life20 X / DCNumber of outputs1 (digital)Nominal voltage UN23 V DCLimiting continuous current100 mAStart23 V DCLimiting continuous current100 mANominal voltage UN23 V DCLimiting continuous current100 mAStart100 mAStart100 mAStart100 mANominal voltage UN23 V DCLimiting continuous current100 mAStart100 mAStart <td>Output data</td> <td></td>  | Output data   |   |
| Minimum switching voltage15 V AC/DC (without diagnostics)<br>20 V AC/DC (with diagnostics)Maximum switching voltage250 V AC<br>125 V DCLimiting continuous current5 A (N/O contact)Diagnostic threshold20 Ω / 18 kΩ (lower/upper)Maximum inrush current5 ANarinum inrush current100 mASwitching capacity min.1.5 WMechanical service lifeAppros. 5 x 10 <sup>7</sup> cyclesAlterm outputsNumber of outputs1 (digital)Nominal voltage UN23 V DCLimiting continuous current100 mASetter23 V DCLimiting continuous current100 mAStreet23 V DCLimiting continuous current100 mAStreet100 mAStreet100 mAStreet100 mAStreet100 mANumber of outputs1 (digital)Nominal voltage UN23 V DCLimiting continuous current100 mAStreet100 mA<  | Contact type  | 1 enabling current path   |
| 20 V AC/DC (with diagnostics)   Maximum switching voltage 250 V AC   Limiting continuous current 5 A (N/O contact)   Diagnostic threshold 20 Ω / 18 kΩ (lower/upper)   Maximum inrush current 5 A   Inrush current, minimum 100 mA   Switching capacity min. 1.5 W   Mechanical service life Approx.5 x 10 <sup>7</sup> cycles   Atarm outputs 1 (digital)   Number of outputs 1 (digital)   Nominal voltage U <sub>N</sub> 23 V DC   Limiting continuous current 100 mA   Starm outputs 1 (digital)   Nominal voltage U <sub>N</sub> 23 V DC   Limiting continuous current 100 mA   Starm outputs 1 (digital)   Nominal voltage U <sub>N</sub> 23 V DC   Limiting continuous current 100 mA   Diagnostic dust-proof relay 100 mA   Start dust 100% operating factor   Pelay type Io0% operating factor   Nominal operating mode 100% operating factor   Diagnostion IP20   Min. degree of protection of inst. location IP4   Mounting type IN rait mounting   Airand oreepage distances between the power circuits DIN rait mounting   | Contact material                                      | AgNi, gold-flashed  |
| Line bood125 V DCLimiting continuous current5 A (N/O contact)Diagnostic threshold20 Ω / 18 kΩ (lower/upper)Maximum inrush current5 AInrush current, minimum100 mASwitching capacity min.1.5 WMechanical service lifeApprox. 5 x 10 <sup>7</sup> cyclesAtarm outputsNumber of outputs1 (digital)Nominal voltage U <sub>N</sub> 23 V DCLimiting continuous current100 mACenteral dataVector fielayNominal operating mode100% operating factorDegree of protection of inst. locationIP54Mounting positionvertical or horizontalMounting typeDIN rail mountingAir and creepage distances between the power circuitsDIN FaiT   | Minimum switching voltage                             |   |
| Diagnostic threshold20 Ω / 18 kΩ (lower/upper)Maximum inrush current5 AInrush current, minimum100 mASwitching capacity min.1.5 WMechanical service lifeApprox. 5 x 10 <sup>7</sup> cyclesAlarm outputsNumber of outputs1 (digital)Nominal voltage U <sub>N</sub> 23 V DCLimiting continuous current100 mABelectromagnetic dust-proof relayRelay typeElectromagnetic dust-proof relayNominal operating mode100% operating factorDegree of protectionIP20Min. degree of protection of inst. locationIP54Mounting positionvertical or horizontalMounting typeDIN rail mountingAir and creepage distances between the power circuitsDIN Fail mounting   | Maximum switching voltage                             |   |
| Maximum inrush current5 AInrush current, minimum100 mASwitching capacity min.1.5 WMechanical service lifeApprox. 5 x 10 <sup>7</sup> cyclesAlarm outputsNumber of outputs1 (digital)Nominal voltage UN23 V DCLimiting continuous current100 mABelay typeRelay typeElectromagnetic dust-proof relayNominal operating mode100% operating factorDegree of protectionIP20Min. degree of protection of inst. locationIP54Mounting positionvertical or horizontalMounting typeDIN rail mountingAir and creepage distances between the power circuitsDIN EN 50178  | Limiting continuous current                           | 5 A (N/O contact)   |
| Inrush current, minimum   100 mA     Switching capacity min.   1.5 W     Mechanical service life   Approx. 5 x 10 <sup>7</sup> cycles     Alarm outputs   1 (digital)     Number of outputs   1 (digital)     Nominal voltage U <sub>N</sub> 23 V DC     Limiting continuous current   100 mA     General data     Relay type   Electromagnetic dust-proof relay     Nominal operating mode   100% operating factor     Degree of protection of inst. location   IP20     Min. degree of protection of inst. location   IP54     Mounting position   vertical or horizontal     Mounting type   DIN rail mounting     Air and creepage distances between the power circuits   DIN EN 50178  | Diagnostic threshold                                  | $20 \Omega / 18 k\Omega$ (lower/upper)  |
| Switching capacity min.1.5 WMechanical service lifeApprox. 5 x 10 <sup>7</sup> cyclesAlarm outputsI (digital)Number of outputs1 (digital)Nominal voltage UN23 V DCLimitig continuous current100 mAGeneral dataRelay typeElectromagnetic dust-proof relayNominal operating mode100% operating factorDegree of protectionIP20Min. degree of protection of inst. locationIP54Mounting positionvertical or horizontalMounting typeDIN rail mountingAir and creepage distances between the power circuitsDIN EN 50178  | Maximum inrush current                                | 5 A   |
| Mechanical service life Approx. 5 x 10 <sup>7</sup> cycles   Alarm outputs I (digital)   Number of outputs 1 (digital)   Nominal voltage U <sub>N</sub> 23 V DC   Limiting continuous current 100 mA   General data   Relay type Electromagnetic dust-proof relay   Nominal operating mode 100% operating factor   Degree of protection IP20   Min. degree of protection of inst. location IP54   Mounting position vertical or horizontal   Mounting type DIN rail mounting   Air and creepage distances between the power circuits DIN EN 50178   | Inrush current, minimum                               | 100 mA  |
| Alarm outputs     Number of outputs   1 (digital)     Nominal voltage U <sub>N</sub> 23 V DC     Limiting continuous current   100 mA <b>General data</b> Relay type   Electromagnetic dust-proof relay     Nominal operating mode   100% operating factor     Degree of protection of inst. location   IP20     Munting position   vertical or horizontal     Mounting type   DIN rail mounting     Air and creepage distances between the power circuits   DIN EN 50178   | Switching capacity min.                               | 1.5 W   |
| Number of outputs1 (digital)Nominal voltage UN23 V DCLimiting continuous current100 mAGeneral dataFelay typeRelay typeElectromagnetic dust-proof relayNominal operating mode100% operating factorDegree of protectionIP20Min. degree of protection of inst. locationIP54Mounting positionvertical or horizontalMounting typeDIN rail mountingAir and creepage distances between the power circuitsDIN EN 50178  | Mechanical service life                               | Approx. 5 x 10 <sup>7</sup> cycles  |
| Nominal voltage UN23 V DCLimiting continuous current100 mAGeneral dataRelay typeElectromagnetic dust-proof relayNominal operating mode100% operating factorDegree of protectionIP20Min. degree of protection of inst. locationIP54Mounting positionvertical or horizontalMounting typeDIN rail mountingAir and creepage distances between the power circuitsDIN EN 50178  | Alarm outputs   |   |
| Limiting continuous current100 mAGeneral data100 mAGeneral dataElectromagnetic dust-proof relayRelay typeElectromagnetic dust-proof relayNominal operating mode100% operating factorDegree of protectionIP20Min. degree of protection of inst. locationIP54Mounting positionvertical or horizontalMounting typeDIN rail mountingAir and creepage distances between the power circuitsDIN EN 50178   | Number of outputs                                     | 1 (digital)   |
| General data     Relay type   Electromagnetic dust-proof relay     Nominal operating mode   100% operating factor     Degree of protection   IP20     Min. degree of protection of inst. location   IP54     Mounting type   DIN rail mounting     Air and creepage distances between the power circuits   DIN EN 50178   | Nominal voltage U <sub>N</sub>                        | 23 V DC   |
| Relay type Electromagnetic dust-proof relay   Nominal operating mode 100% operating factor   Degree of protection IP20   Min. degree of protection of inst. location IP54   Mounting position vertical or horizontal   Mounting type DIN rail mounting   Air and creepage distances between the power circuits DIN EN 50178   | Limiting continuous current                           | 100 mA  |
| Nominal operating mode 100% operating factor   Degree of protection IP20   Min. degree of protection of inst. location IP54   Mounting position vertical or horizontal   Mounting type DIN rail mounting   Air and creepage distances between the power circuits DIN EN 50178   | General data  |   |
| Degree of protection IP20   Min. degree of protection of inst. location IP54   Mounting position vertical or horizontal   Mounting type DIN rail mounting   Air and creepage distances between the power circuits DIN EN 50178  | Relay type  | Electromagnetic dust-proof relay  |
| Min. degree of protection of inst. location IP54   Mounting position vertical or horizontal   Mounting type DIN rail mounting   Air and creepage distances between the power circuits DIN EN 50178  | Nominal operating mode                                | 100% operating factor   |
| Mounting position vertical or horizontal   Mounting type DIN rail mounting   Air and creepage distances between the power circuits DIN EN 50178   | Degree of protection                                  | IP20  |
| Mounting type DIN rail mounting   Air and creepage distances between the power circuits DIN EN 50178  | Min. degree of protection of inst. location           | IP54  |
| Air and creepage distances between the power circuits DIN EN 50178  | Mounting position                                     | vertical or horizontal  |
|   | Mounting type   | DIN rail mounting   |
| Rated insulation voltage 250 V AC   | Air and creepage distances between the power circuits | DIN EN 50178  |
|   | Rated insulation voltage                              | 250 V AC  |

| General data   |   |   |  |
|--|---|---|--|
| Rated surge voltage / insulation                           | 6 kV/safe isolation (through prote        | ctive impedance)                        |  |
| Pollution degree   | 2   |   |  |
| Surge voltage category                                     | III                                       |   |  |
| Dimensions   | Screw connection                          | Spring-cage connection                  |  |
| WxHxD  | 17.5 x 112.2 x 114.5 mm                   | 17.5 x 117.4 x 114.5 mm                 |  |
| Connection data  | Screw connection                          | Spring-cage connection                  |  |
| Conductor cross section, solid                             | 0.2 mm <sup>2</sup> 2.5 mm <sup>2</sup>   | 0.2 mm <sup>2</sup> 1.5 mm <sup>2</sup> |  |
| Conductor cross section, stranded                          | 0.2 mm <sup>2</sup> 2.5 mm <sup>2</sup>   | 0.2 mm <sup>2</sup> 1.5 mm <sup>2</sup> |  |
| Conductor cross section AWG/kcmil                          | 24 12                                     | 24 16                                   |  |
| Stripping length   | 7 mm                                      | 8 mm                                    |  |
| Ambient conditions   |   |   |  |
| Ambient temperature (operation)                            | -20 °C 55 °C                              |   |  |
| Ambient temperature (storage/transport)                    | -40 °C 65 °C                              |   |  |
| Max. permissible relative humidity (operation)             | 75 % (on average, 85% infrequer           | ntly, non-condensing)                   |  |
| Max. permissible humidity (storage/transport)              | 75 % (on average, 85% infrequer           | ntly, non-condensing)                   |  |
| Maximum altitude   | max. 2000 m (Above sea level)             |   |  |
| Shock  | 15g                                       |   |  |
| Vibration (operation)                                      | 2g  |   |  |
| Certification / Approvals                                  |   |   |  |
| Approvals  | applied for                               |   |  |
| Safety parameters for IEC 61508 - Low dem                  | and                                       |   |  |
| SIL  | 3 (15 % of total SIL)                     |   |  |
| PFD <sub>avg</sub>   | 1,49 x 10 <sup>-4</sup>                   |   |  |
| Proof test interval  | 120 Months                                |   |  |
| Duration of use  | 240 Months                                |   |  |
| Alternative illustration of the device as 100 <sup>-</sup> | I structure for process customers         |   |  |
| Calculation basis  | Application example 1 - SIL 3             |   |  |
| Equipment type   | Туре А                                    |   |  |
| HFT  | 0   |   |  |
| SIL  | 3 (15 % of total SIL)                     |   |  |
| Safe Failure Fraction (SFF)                                | 99.6 %                                    |   |  |
| λSD  | 4.27 FIT                                  |   |  |
| λSU  | 849 FIT                                   |   |  |
| λDD  | 4.21 FIT                                  |   |  |
| λDU  | 3.40 FIT                                  |   |  |
| λTotal   | 860.88 FIT                                |   |  |
| MTBF   | 110.5 Years                               |   |  |
| PFD <sub>avg</sub>   | 1,49 x 10 <sup>-5</sup> (For T1 = 1 year) |   |  |
|  |   |   |  |

## 5 Safety notes



#### WARNING: Risk of electric shock

During operation, parts of electrical switching devices carry hazardous voltages.

Before working on the switching device, disconnect the power.

Please observe the safety regulations of electrical engineering and industrial safety and liability associations!

Disregarding these safety regulations may result in death, serious personal injury or damage to equipment.

Startup, mounting, modifications, and upgrades should only be carried out by a skilled electrical engineer!



WARNING: Danger due to faulty devices!

The devices may be damaged following an error and correct operation can no longer be ensured.

In the event of an error, replace the device immediately.

Repairs to the device, especially if the housing must be opened, may only be carried out by the manufacturer or authorized persons. Otherwise the warranty is invalidated.



#### WARNING: risk of electric shock!

The safety relay may only be connected to devices which meet the requirements of EN 60950.

Suitable devices are available online at phoenixcontact.net/products.



#### WARNING: Loss of safety function

When an error is detected by the higher-level controller, it is assumed that the safety function can no longer be performed. The error must be removed within 72 hours or

within the process safety time if required by the application.



# NOTE: Risk of damage to equipment due to incorrect installation

For reliable operation, the safety relay must be installed in housing protected from dust and humidity (IP54).

Carry out wiring according to the application. Refer to the "Application examples" section for this.

# NOTE: Risk of damage to equipment due to noise emissions

When operating relay modules the operator must meet the requirements for noise emission for electrical and electronic equipment (EN 61000-6-4) on the contact side and, if required, take appropriate measures.

## 6 Basic circuit diagram

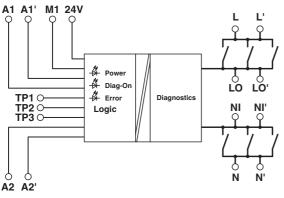


Figure 1 Block diagram

#### Key:

| Designation | Explanation   |
|-------------|---|
| A1/A2       | Safety relay input voltage                                      |
| A1'/A2'     | Safety relay input voltage for optionally re-<br>dundant wiring |
| M1          | Semiconductor alarm output                                      |
| 24 V        | Supply voltage for connectable load mon-<br>itoring             |
| TP1/TP2/TP3 | Test point for proof test                                       |
| L/L'        | On-load voltage input   |
| N/N'        | 0 V   |
| LO/LO'      | Load input  |
| NI/NI'      | Load output   |



Contacts A1', A2', L', N', LO', NI' are **not** suitable for further wiring. These contacts may only be used for optional redundant wiring.

## 7 Derating

#### 7.1 Vertical mounting position

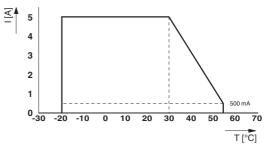
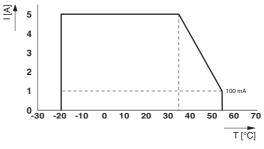


Figure 2 Vertical installation derating curve

#### 7.2 Horizontal mounting position





### 8 Load curve

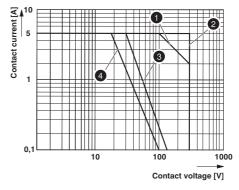


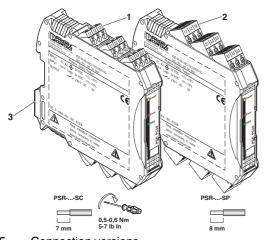
Figure 4 Relay load curve

#### Key:

| No. | Explanation                            |
|-----|--|
| 1   | AC inductive load $\cos \varphi = 0.4$ |
| 2   | AC resistive load                      |
| 3   | DC resistive load                      |
| 4   | DC inductive load L/R = 7 ms           |

## 9 Operating and indication elements

#### 9.1 Connection versions



- 1 COMBICON plug-in screw terminal block
- 2 COMBICON plug-in spring-cage terminal block
- 3 Metal lock for fixing to DIN rail

#### Figure 5 **Connection versions** 9.2 **Connection assignment** Figure Designation Explanation TP1/TP2/TP3 Test point for proof test A1/A2 Safety relay input voltage A1'/A2' Safety relay input voltage for optionally redundant wiring TP1 TP2 TP3 A1´ 24V A2 A1 M1 A2 24 V Supply voltage for connectable load monitoring M1 Semiconductor alarm output Erro Power LED status indicator, yellow - contacts on the load side are closed Error LED status indicator, red - error Diag LED status indicator, green - diagnostics are active Diag PSR-PC50 L/L'On-load voltage input N/N' 0 V LO/LO' Load input NI/NI' Load output

1

Contacts A1', A2', L', N', LO', NI' are **not** suitable for further wiring. These contacts may only be used for optional redundant wiring.

## 10 Startup

Once the nominal input voltage of 24 V DC has been enabled at terminals A1 and A2 (as well as A1' and A2' for optionally redundant wiring), the Power LED lights up.

The contacts L, L', LO, LO' as well as NI, NI' and N, N' close.

The **24 V** connection should only be activated if the diagnostic function is to be used, and should be set to **A2**.

The minimum diagnostic threshold value is **20**  $\Omega$ , the maximum value is **18** k $\Omega$ .

Diagnostics is performed for open circuit and short circuit of the load as well as for a loss of on-load voltage, load supply voltage and supply voltage for diagnostics.

The activation of diagnostic functions is indicated by the **Diag** LED.

If the diagnostics respond, the minimum current consumption is pushed and a **bad channel** is generated **via A1** (depending on the controller).

Additionally the **Error** LED illuminates and the semiconductor alarm output **M1** is active.

The load is not monitored when the contacts are closed on the output side.

The diagnostic function is not suitable for semiconductor loads.

 Perform a full function and diagnostic test during startup.

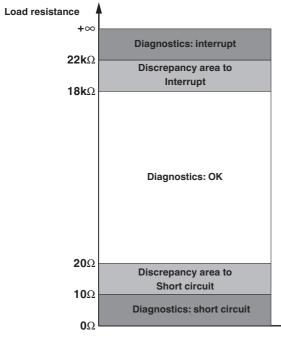


Figure 6 Diagnostic thresholds

## 11 Proof test

The Proof test checks the individual relay channels and device diagnostics to ensure proper functioning.



**CAUTION**: The enabling contacts are closed during the Proof test!

#### 11.1 Testing of relay channels

- 1. Disconnection of A1/A1'
- Apply 24 V DC to TP1 (set to A2/A2'. Check whether the load is activated/whether the contacts L to LO to N to NI have continuity. Then disconnect TP1 again.
- 3. Repeat step 2 for TP2 and TP3
- 4. Restore the original configuration so that the reference configuration and the physical configuration are the same again.
- 5. Check switchability by the controller!



**CAUTION**: If during step 2 or 3 the load is not activated or no continuity can be measured, the device is faulty. Replace the device!

#### 11.2 Testing diagnostics

- 1. Interrupt the load path then close it again.
- 2. Interrupt the load path briefly then restore this to the operating state.
- Interrupt the supply voltage of the load before connection L or after connection N. Then restore the supply voltage.



**CAUTION**: If during this diagnostics test no error (ERROR) is displayed. the device is faulty. Replace the device!

## 12 Application examples

Key:

- SIS = Safety Instrumented System (safe control)
- DC = Diagnostic Coverage according to IEC 61508 (line/load diagnostics at DO)
- DI = Digital input
- DO = Digital output

#### **Connection options:**

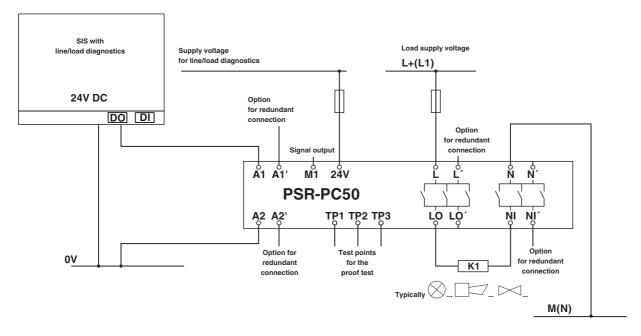


Figure 7 Connection options

#### 12.1 Application example 1 - SIL 3

#### Assumptions, information, and marginal conditions

- The DC of the digital output is 90%.
- Diagnostics of PSR-PC50 are active.
- The test pulses of the controller are activated and evaluated.

A fault e.g., open circuit or short circuit of the

- A potential error is indicated accordingly.

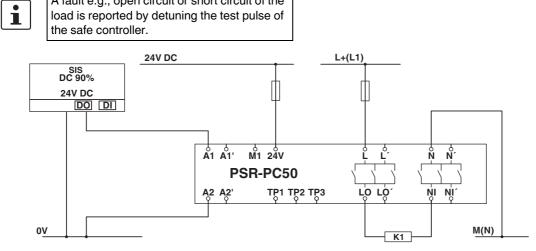


Figure 8 Application example 1 - SIL 3