

# Dold UG6970 Series Safety Relay 2 With Independent Selectable Function



- Designed to protect people and machines in applications with various safety devices.
- Two independent, separately adjustable safety functions: (power off before selecting the desired function):
  - E-Stop
  - Safety gate
  - Two-hand control
  - Safety mat / Safety edge
  - Exclusive XOR contacts
  - Light curtain
- Only one device, two safety functions at the same time

- According to:
  - Performance Level (PL) e and category 4 to EN ISO 13849-1: 2008
  - SIL Claimed Level (SIL CL) 3 to IEC/EN 62061
  - Safety Integrity Level (SIL) 3 to IEC/EN 61508 and IEC/EN 61511
  - Acc. to EN 50156-1 for furnaces
- Line fault detection on Pushbutton:
- Manual restart or automatic restart
- With or without cross fault monitoring
- 2-channel
- Forcibly guided output contacts
- Output: 2 N.O. contacts per safety function
- One semiconductor output per safety function
- LED indicator for operation, safety function 1, 2 and failure
- Pluggable terminal blocks for easy exchange of devices
- Width: 22.5 mm
- Two PNP sensor inputs only

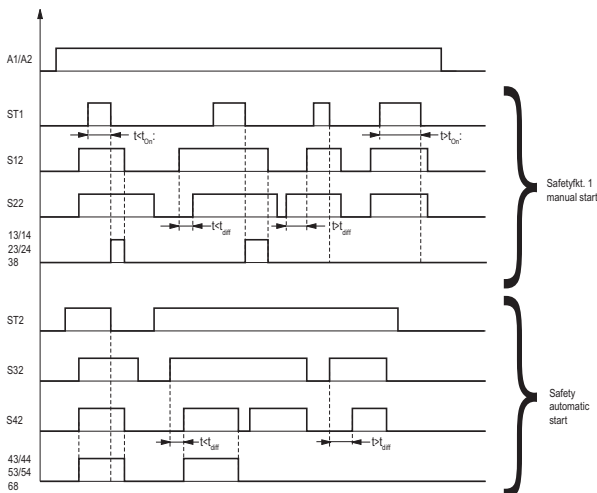
## Safety Data – Values per EN ISO 13849-1

|                                                     |                                      |
|-----------------------------------------------------|--------------------------------------|
| Category                                            | 4                                    |
| Performance level                                   | PLe                                  |
| MTTF <sub>d</sub>                                   | 134.5 years                          |
| DC <sub>avg</sub>                                   | 99%                                  |
| Safety Data – Values per IEC/EN 62061 /IEC/EN 61508 |                                      |
| SIL CL                                              | 3                                    |
| SIL                                                 | 3                                    |
| HFT (Hardware Failure Tolerance)                    | 1                                    |
| DC <sub>avg</sub>                                   | 99%                                  |
| SFF                                                 | 99.6%                                |
| PFH <sub>D</sub>                                    | 3.89E <sup>-10</sup> h <sup>-1</sup> |

## Safety Relays Selection Chart

| Part Number              | Price    | Marking Type        | Voltage | Outputs                                                                |
|--------------------------|----------|---------------------|---------|------------------------------------------------------------------------|
| <u>UG6970-04PS-61-24</u> | \$361.00 | Safety relay module | 24VDC   | 4 N.O. positive guided safety contact(s), 2 N.O. monitoring contact(s) |

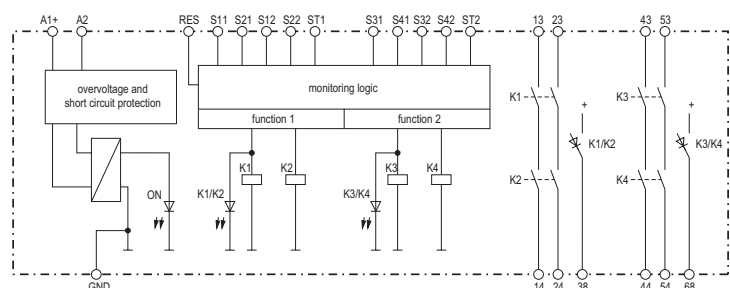
## Function Diagram



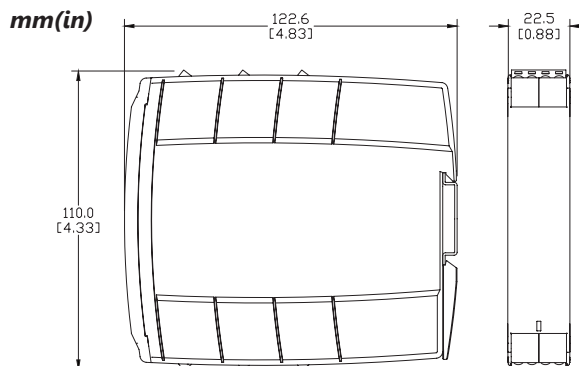
$t_{off}$ : max. time delay for simultaneity demand dependent on selected safety function  
 E-Stop, safety gate, safety mat  $t_{off}$ : max. 3s  
 Light curtains  $t_{off}$ : max. 1s  
 Two-hand control  $t_{off}$ : max. 0.5s  
 other times on request

$t_{on}$ : max. actuation time of start button  
 Standard  $t_{on}$ : max. 3s  
 other times on request

## Block Diagram



## Dimensions



See our website: [www.AutomationDirect.com](http://www.AutomationDirect.com) for complete Engineering Drawings.

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Safety Electrical Components

tESC-416

# Dold UG6970 Series Safety Relay 2 With Independent Selectable Function



## Dold UG6970 Series Safety Relay 2 with Independent Selectable Function Specification Table

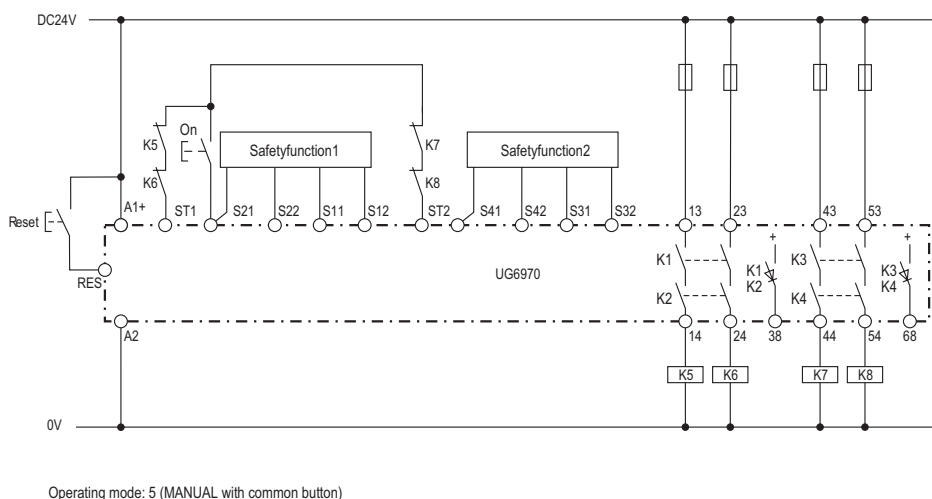
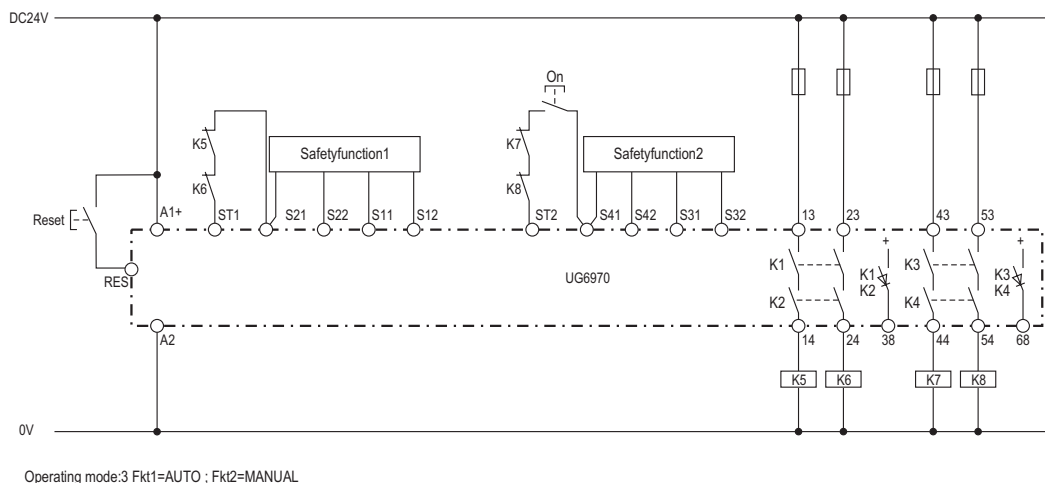
| General Specifications                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature                                            | Storage: -25°C to 85°C (-13°F to 185°F) Operating: -15°C to 55°C (5°F to 131°F)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Altitude                                               | <2,000 meters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Vibration Resistance                                   | Amplitude: 0.35mm, Frequency: 10 to 55 Hz (IEC/EN 60-068-2-6)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Degree of Protection                                   | Per IEC/EN 60 529. Housing: IP40; Terminals IP20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Housing                                                | UL 94V-0 Thermoplastic; DIN mount 35 mm x 7.5 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Weight                                                 | 275g (9.7 oz.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Terminal Designation per EN 60 000<br>Wire Connections | 1x4 mm <sup>2</sup> solid or 1 x 2.5 mm <sup>2</sup> stranded ferruled (isolated) or 2 x 1.5 mm <sup>2</sup> stranded ferruled (isolated) DIN 46 228-1/-2/-3/-4<br>or 2 x 2.5 mm <sup>2</sup> solid DIN 46 228-1/-2/-3/-4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Wire Fixing                                            | Terminal screws M3.5 box terminals with wire protection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Wire Connection                                        | 60degC/75degC Copper conductors only; AWG20-12 Sol/Str Torque 0.5NM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Input Specifications                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Nominal Voltage                                        | 24VDC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Voltage Range                                          | At 10% residual ripple: DC: 0.8 to 1.1 U <sub>N</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Maximum Consumption                                    | DC approx. 3.2W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Nominal Frequency                                      | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Minimum Off-time                                       | 250ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Control Voltage on S11 At U <sub>N</sub>               | 20VDC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Control Current Typ. Over S12, S22                     | 8mA at U <sub>N</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Min. Voltage on S12, S22 (relay activated)             | 10VDC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Short Circuit Protection                               | Internal with PTC (Positive Temperature Coefficient resistor)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Overvoltage Protection                                 | Internal VDR (Voltage Dependent Resistor)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Output Specifications                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Electrical Contact Life                                | AC 15 at 5A, 230VAC: > 1.5x10 <sup>5</sup> switching cycles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Mechanical Life                                        | > 10x10 <sup>6</sup> switching cycles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Contact Type                                           | Independent N.O. positive-guided safety contacts (2 per safety function)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Operate Delay                                          | Manual start: 30ms; automatic start: 350ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Release Delay                                          | <p>E-Stop (1) (6), Safety gate (2) (7), Exclusive or contacts (5):<br/>           Start up at U : &lt; 65ms<br/>           Release delay at U and disconnecting the supply: &lt; 40ms<br/>           Release delay at U and disconnecting S12,S22: &lt; 60ms</p> <p>Two-hand control (3)<br/>           Start up at U : &lt; 110ms<br/>           Release delay at U and disconnecting the supply: &lt; 40ms<br/>           Release delay at U and disconnecting S12,S22: &lt; 60ms<br/>           Simultaneity demand: max. 0,5 s</p> <p>Safety mat (4)<br/>           Start up at U : &lt; 85ms<br/>           Release delay at U and disconnecting the supply: &lt; 40ms<br/>           Release delay at U and disconnecting S12,S22: &lt; 60ms</p> <p>Light curtains (8)<br/>           Start up at U : &lt; 35ms<br/>           Release delay at U and disconnecting the supply: &lt; 40ms<br/>           Release delay at U and disconnecting S12,S22: &lt; 25ms</p> |
| Nominal Output Voltage                                 | AC: 24VDC: See continuous current limit curve in installation manual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Thermal Current (I <sub>th</sub> )                     | Max. 8A. See quadratic total current limit curve in installation manual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Short Circuit Strength                                 | Max. fuse rating: 6A gL (IEC/EN 60 947-5-1); Line circuit breaker: B 6A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Switching Capacity (IEC/EN 60 947-5-1)                 | AC 15: N.O. contacts: 3A/230V<br>DC 13: N.O. contacts: 2A/DC24V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Switching Frequency                                    | Safety function 1: Max. 1800 switching cycles/hr<br>Safety function 1: Max. 360 switching cycles/hr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Agency Approvals and Standards                         | CSA, cULus file E107778, CE, RoHS, TUV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page at [www.automationdirect.com](http://www.automationdirect.com)

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## Application Examples

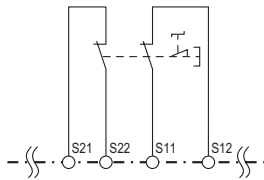


*Note: See page for Safety Function example drawings.*

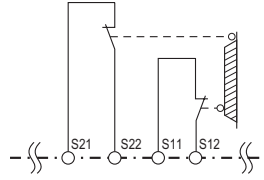
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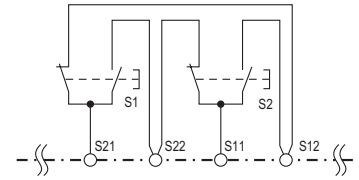
## Safety Functions



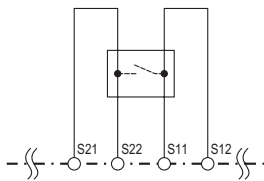
Fct.: E-stop (1),  
with cross fault detection  
SIL 3, PL e, Cat. 4



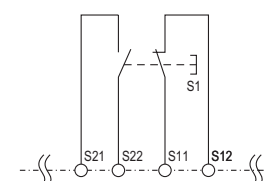
Fct.: Safety gate (2),  
with cross fault detection  
SIL 3, PL e, Cat. 4



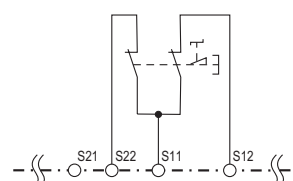
Fct.: Two-hand control (3),  
with cross fault detection  
SIL 3, PL e, Cat. 4  
Type III C to EN 574



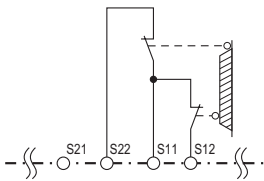
Fct.: Safety mat / Safety edge (4),  
with cross fault detection  
SIL 3, PL e, Cat. 4



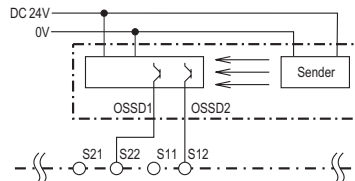
Fct.: Exclusive XOR contacts (5),  
with cross fault detection  
SIL 3, PL e, Cat. 4



Fct.: E-Stop (6),  
without cross fault detection  
SIL 3, PL e, Cat. 4<sup>1)</sup>

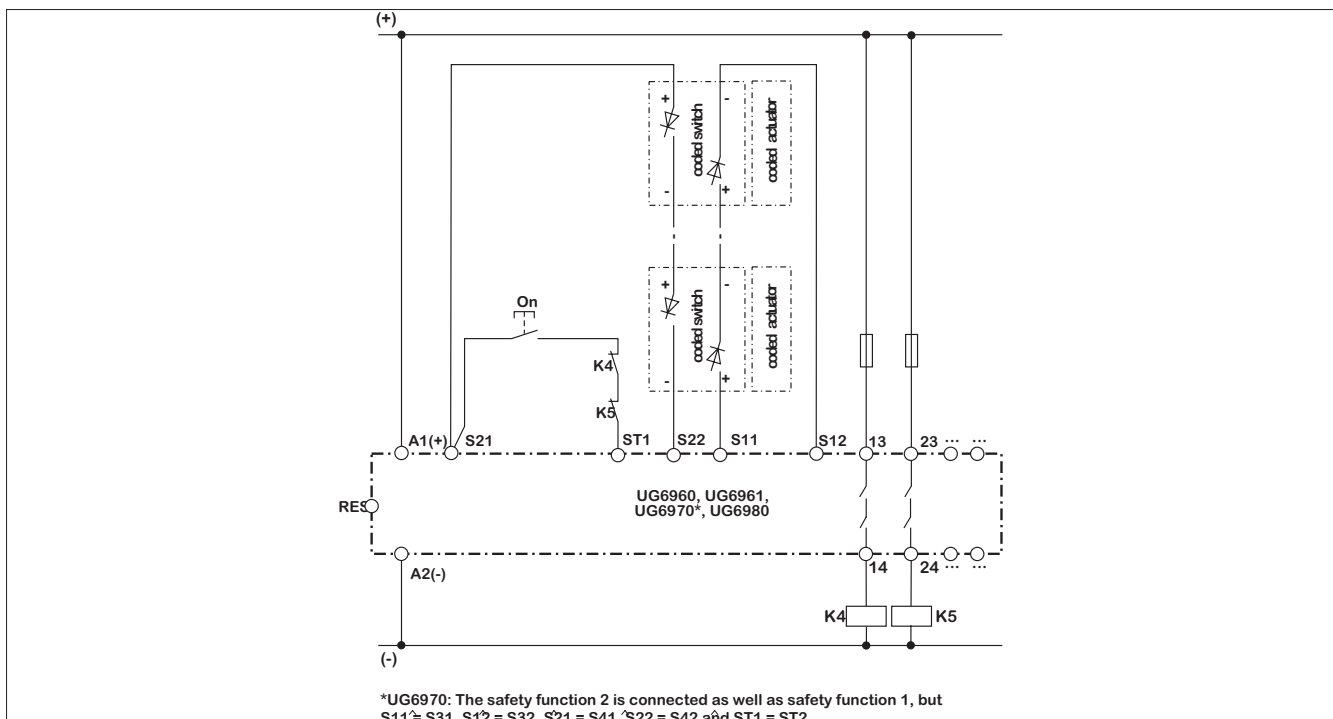


Fct.: Safety gate (7),  
without cross fault detection  
SIL 3, PL e, Cat. 4<sup>1)</sup>



Fct.: Light curtain (8),  
without cross fault detection  
SIL 3, PL e, Cat. 4<sup>2)</sup>

<sup>1)</sup> To achieve the stated safety classification the wiring has to be done with crossfault monitoring.  
<sup>2)</sup> To achieve the stated safety classification light curtains with selftest (type 4) according to IEC/EN 61496-1 have to be used.



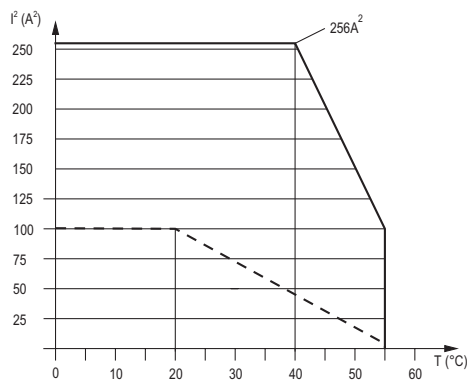
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## Connection Terminals

| Terminal designation                 | Signal designation                                         |
|--------------------------------------|------------------------------------------------------------|
| A1 +                                 | DC 24 V                                                    |
| A2                                   | 0 V                                                        |
| 13, 14, 23, 24,<br>43, 44, 53, 54    | Forcibly guided NO contacts for<br>release circuit         |
| 38, 68                               | Semiconductor monitoring output                            |
| GND                                  | Reference potential for<br>Semiconductor monitoring output |
| S11, S21, S31, S41                   | control output                                             |
| S12, S22, S32, S42,<br>ST1, ST2, RES | control input                                              |

## Characteristic Curves



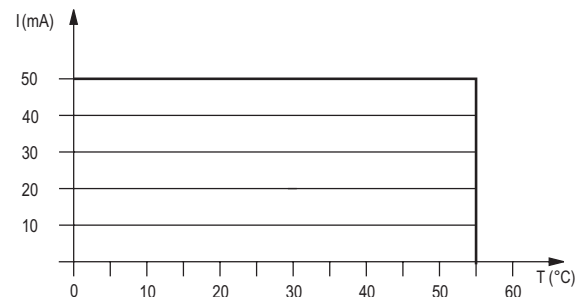
— device free-standing  
max. current at 55°C over  
4 contact path =  $5A \triangleq 4 \times 5^2 A^2 = 100A^2$

- - - device mounted without distance heated by  
devices with same load,  
max. current at 55°C over  
4 contact path =  $1A \triangleq 4 \times 1^2 A^2 = 4A^2$

$$\sum I^2 = I_1^2 + I_2^2 + I_3^2 + I_4^2$$

$I_1, I_2, I_3$  - current in contact paths

Quadratic total current limit curve output contacts



$$\sum I = I_{38} + I_{68}$$

z.B. :  $\sum I = 35mA + 15mA = 50mA$

$I_{38}$  - current semiconductor output 38

$I_{68}$  - current semiconductor output 68

Quadratic total current limit curve semiconductor monitoring outputs

## Function Setting

| Fkt. 1/Fkt. 2 | Safety Function          |                                  |
|---------------|--------------------------|----------------------------------|
| 1             | E-Stop                   | Cross fault detection            |
| 2             | Safety Gate              |                                  |
| 3             | Two-hand Control         |                                  |
| 4             | Safety mat / safety edge |                                  |
| 5             | Exclusive XOR contacts   |                                  |
| 6             | E-stop                   | Without cross fault<br>defection |
| 7             | Safety gate              |                                  |
| 8             | Light curtain            |                                  |

# Safety Products



*Warning: Safety products sold by AutomationDirect are Safety components only. The purchaser/installer is solely responsible for the application of these components and ensuring all necessary steps have been taken to assure each application and use meets all performance and applicable safety requirements and/or local, national and/or international safety codes as required by the application. AutomationDirect cannot certify that our products, used solely or in conjunction with other AutomationDirect or other vendors' products, will assure safety for any application. Any person using or applying any products sold by AutomationDirect is responsible for learning the safety requirements for their individual application and applying them, and therefore assumes all risks, and accepts full and complete responsibility, for the selection and suitability of the product for their respective application.*

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