

OPERATING INSTRUCTIONS

SLC-A-UE10-2FG3D0/ SLC-A-UE12-2FG3D0

SafeLogic compact Safety relay

EN

Bosch Rexroth AG
Electric Drives and Controls
Bgm.-Dr.-Nebel-Straße 2
97816 Lohr am Main, Germany
Phone +49 9352 40 5060
www.boschrexroth.com

Rexroth Bosch Group

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1 On safety

This chapter deals with your own safety and the safety of the equipment operators.

➤ Please read this chapter carefully before working with the SLC-A-UE10-2FG3D0/SLC-A-UE12-2FG3D0 or with the machine protected by the SLC-A-UE10-2FG3D0/SLC-A-UE12-2FG3D0.

1.1 Qualified safety personnel

The SLC-A-UE10-2FG3D0/SLC-A-UE12-2FG3D0 safety relay must only be installed, commissioned and serviced by qualified safety personnel.

1.2 Applications of the device

The SLC-A-UE10-2FG3D0/SLC-A-UE12-2FG3D0 safety relay can be used as per the following standards:

- EN ISO 13849-1
- EN 62061
- IEC 60204-1
- UL 508:1999
- CSA 22.2 – No. 14-05
- NFPA 79 ERR 1

The actual performance level or SIL claim limit achieved depends on the external circuit, the design of the wiring, the selection of the control switch and its placement on the machine.

The related actuators on the machine or system can be safely shut down using the safety relay's output signal switching contacts.

1.3 Correct use

The SLC-A-UE10-2FG3D0/SLC-A-UE12-2FG3D0 safety relay must be used only as defined in section 1.2 "Applications of the device".

It must be used only by qualified safety personnel and only on the machine where it has been installed and initialised by qualified safety personnel in accordance with the operating instructions. If the device is used for any other purposes or modified in any way – also during mounting and installation – any warranty claim against Bosch Rexroth shall become void.

1.4 General safety notes and protective measures

⚠ Pay attention to the safety notes and protective measures!

Please observe the following items in order to ensure the correct use of the SLC-A-UE10-2FG3D0/SLC-A-UE12-2FG3D0 safety relays.

- During the mounting, installation and usage of the safety relays, observe the standards and directives applicable in your country
- The national/international rules and regulations apply to the installation, commissioning, use and periodic technical inspection of the safety relay, in particular:
 - Machinery Directive 2006/42/EC
 - EMC directive 2014/30/EU
 - Provision and Use of Work Equipment Directive 2009/104/EC
 - Low Voltage Directive 2014/35/EC
 - Work safety regulations/safety rules
- Manufacturers and operators of the machine on which a safety relay is used are responsible for obtaining and observing all applicable safety regulations and rules
- The tests must be carried out by qualified safety personnel or specially qualified and authorised personnel and must be recorded and documented to ensure that the tests can be reproduced and retraced at any time by third parties
- The operating instructions must be made available to the operator of the machine where the SLC-A-UE10-2FG3D0/SLC-A-UE12-2FG3D0 is used
- The machine operator is to be instructed in the use of the device by qualified safety personnel and must be instructed to read the operating instructions

1.5 Environmental protection

Unusable or irreparable devices should always be disposed as per the applicable national regulations on waste disposal (e.g. European waste code 16 02 14).

2 Product description

The SLC-A-UE10-2FG3D0/SLC-A-UE12-2FG3D0 is a safety relay with two safety capable outputs with contacts (normally open) as well as one feedback current path (normally closed).

If a voltage is applied to the input circuit B1/A2, the internal relay (K1) is energised and the enable current path (13/14) closes.

If a voltage is applied to the input circuit B2/A2, the internal relay (K2) is energised and the enable current path (23/24) closes.

The return current path Y1 and Y2 opens as soon as one of the internal relays (K1 or K2) is energised. The contacts for the return current path are provided for the connection of the external device monitoring (EDM). (Electrical connection see chapter 4 "Electrical installation".)

⚠ Connect the external device monitoring to achieve SIL3/PL e!

To achieve SIL3/PL e, external diagnostics with DC ≥ 99% must be applied (i.e. EDM must be connected).

Please also note the information in chapter 10 "Application examples".

With the SLC-A-UE12-2FG3D0 safety relay it is also possible to cascade several safety relays of type SLC-A-UE12-2FG3D0 using a jumper. In this way the number of contacts can be multiplied.

Status indicators

Display	Meaning
K1 ● Green	Channel 1 switched
K2 ● Green	Channel 2 switched

3 Mounting

⚠ Mounting only with enclosure rating IP 54 or better!

The safety relay is only allowed to be mounted in the control cabinet. The control cabinet must at least comply with enclosure rating IP 54.

- Mounting according to EN 50274
- The modules are located in a 17.5 mm wide modular system for 35 mm mounting rails as per EN 60715

4 Electrical installation

⚠ Switch the entire machine/system off line!

- The voltage supply must satisfy the regulations for extra-low voltages with safe isolation (SELV, PELV) for overvoltage category as per EN 60664 and EN 50178

- The maximum cable length L_{Max} for the connection of the input circuit (B1/B2) is calculated using the formula:

$$L_{Max} = \frac{60 \Omega}{\text{Resistance per metre cable}}$$

- All connections, wiring and cable runs must comply with the required category as per EN 13849-1 and EN 62061 (e.g. cables laid with protection, individually sheathed cable with screen etc.)

- To protect the contact outputs on the SLC-A-UE10-2FG3D0/SLC-A-UE12-2FG3D0 and to increase the service life, the loads connected must be equipped with, e.g., varistors and RC circuits. Please also note that the selection of the arc suppression can increase the total response time of the safety function. In case of installation in overvoltage category III environments, external protection elements must be used

- The output signal switching devices and the external device monitoring (EDM) must be wired in the control cabinet

- To prevent welding of the output contacts (13/14, 23/24), an overcurrent protection device (short-circuit protection of duty class gL) in accordance with the related usage category is to be selected and integrated into the output current path

Terminal assignment

⚠ Pay attention to different electrical connections when cascading!

When cascading several SLC-A-UE12-2FG3D0 you must connect the contacts Y1, B1, B2 and A2 to the first safety relay in the cascade, and the contacts Y2 to the last safety relay.

Pay attention to maximum current when cascading!

The number of possible safety relays is dependent on the output current from an upstream evaluation unit (e.g. OSSD).

The input current on the inputs B1 and B2 is a maximum of 50 mA.

Example:

- maximum output current from the upstream evaluation unit per output signal switching device: 275 mA
- maximum input current B1: 50 mA
- maximum number of safety relays: 5 (275/50 = 5.5)

Terminal	Signal	Description
B1	+24 V	Input circuit 1
B2	+24 V	Input circuit 2
A2	GND	Voltage supply
Y1		Feedback current path for B1 and B2 (for usage as external device monitoring)
Y2		
13		Enable current path for B1 (safety relevant)
14		
23		Enable current path for B2 (safety relevant)
24		
IN		Input for cascading (SLC-A-UE12-2FG3D0 only)
OUT		Output for cascading (SLC-A-UE12-2FG3D0 only)

5 Commissioning

⚠ Commissioning requires a thorough check by qualified safety personnel!

Before you operate a system protected by the safety relay for the first time, make sure that the system is first checked and released by qualified safety personnel.

- Please read the notes in chapter 1 "On safety".
- Observe the relevant laws and national regulations.

⚠ Check the hazardous area

- Ensure there is nobody in the hazardous area before commissioning.
- Secure the hazardous area against entry.

Regular inspection of the protective devices by qualified safety personnel

- Check the system following the inspection intervals specified in the national rules and regulations
- Each safety application must be checked at an interval specified by you
- The effectiveness of the protective devices must be checked daily by a specialist or by authorised personnel
- If changes have been made to the machine or the protective device, or the safety controller has been changed or repaired, you must again thoroughly check the entire safety application

6 In the event of faults or errors

⚠ Cease operation if the cause of the malfunction has not been clearly identified!

- Stop the machine if you cannot clearly identify or allocate the error and if you cannot safely rectify the malfunction.

⚠ Complete function test after rectification of fault!

- After rectifying a fault, perform a complete function test.

7 Ordering information

Device type	Part no.
SLC-A-UE10-2FG3D0 for 24 V DC with removable terminals	R911172295
SLC-A-UE12-2FG3D0 for 24 V DC with removable terminals incl. 1 jumper	R911172296

8 Conformity

This safety relay has been produced according to the following directives:

- Machinery Directive 2006/42/EC
- Low Voltage Directive 2014/35/EC

Note:

The complete EC declaration of conformity is available on request.

9 Internal circuitry

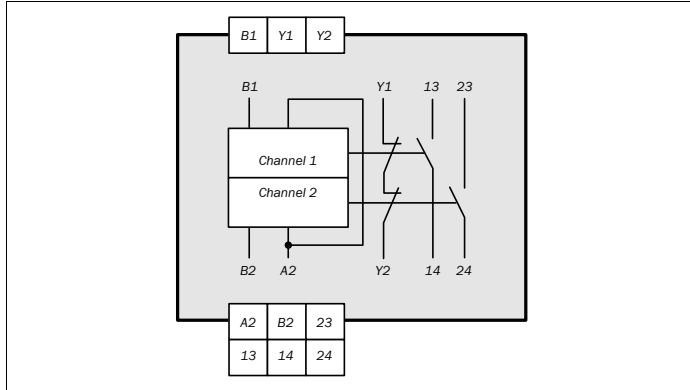


Fig. 1: Internal circuitry SLC-A-UE10-2FG3D0

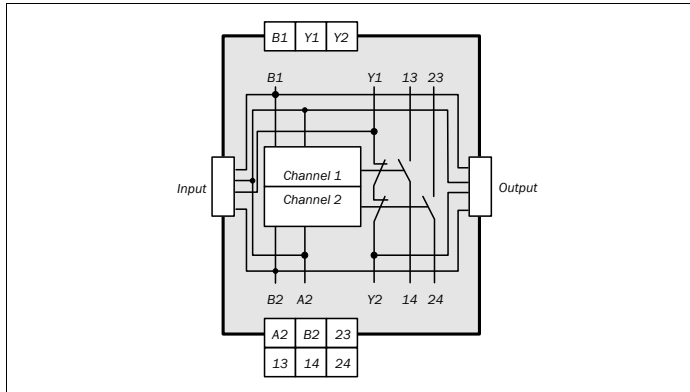


Fig. 2: Internal circuitry SLC-A-UE12-2FG3D0

10 Application examples

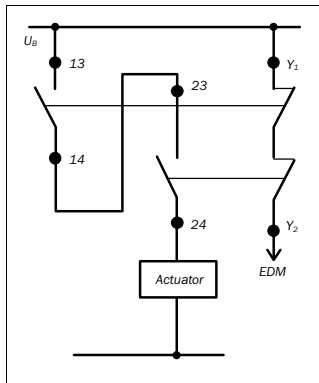


Fig. 3: Connection of an actuator according to SIL3/PL e

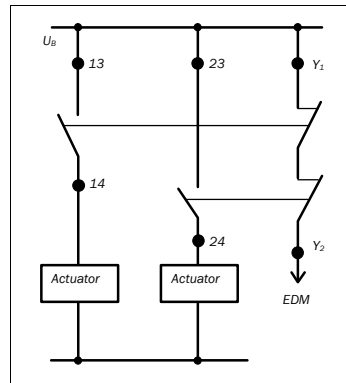


Fig. 4: Connection of two actuators according to SIL3/PL e

11 Technical specifications

11.1 Data sheet

	Minimum	Typical	Maximum
General system data			
Safety integrity level ¹⁾	SIL3 (IEC 61508), SILCL3 (EN 62061)		
Category	Category 4 (EN ISO 13849-1) Category 4 (EN 954-1) ²⁾		
Performance level ¹⁾	PL e (EN ISO 13849-1)		
B _{10d} value (relay)	AC-15, 230 V, I = 2 A I = 1 A (N) I = 0,5 A DC-13, 24 V, I ≤ 2 A		
PFHd (mean probability of a dangerous failure per hour) ³⁾	SLC-A-UE10-2FG3D0 SLC-A-UE12-2FG3D0		
Diagnostic coverage (with EDM)	DC ≥ 99%		
T _M (mission time)	20 years		

Supply voltage/input circuit (B1, B2)

Input voltage (B1, B2), nominal voltage 24 V DC	16.8 V ⁴⁾	24 V	27.6 V ⁴⁾
Output current paths > 25 V AC/60 V DC	PELV on B1/A2, B2/A2		
Output current paths ≤ 25 V AC/60 V DC	SELV or PELV on B1/A2, B2/A2		
Residual ripple with DC operation (within the limits of V _S)			2.4 V _{PP}
Power consumption (B1, B2)			3.2 W
Input current per channel (B1, B2)			50 mA
Input current per channel (B1, B2) with full configuration			500 mA
Maximum number of cascaded devices with full configuration			10
Reset time (B1, B2)			30 ms
Minimum switch-off time (B1, B2)	10 ms		
Minimum switch-on time (B1, B2)	30 ms		
Reactivation current	2 mA		
Permissible test pulse duration			1 ms

Output current paths (13/14, 23/24, Y1/Y2)

Reactivation delay			10 ms
Contact material + surface finish	Y1/Y2 13/14, 23/24		
Enable current paths (N/O contact), safety relevant			2
Contact monitoring paths (N/C contact)			1
Contact type	13/14, Y1/Y2 23/24, Y1/Y2		
Max. contact load signalling current path (Y1, Y2)	Positively guided Positively guided		
Switching voltage AC	0.1 V		60 V
Switching voltage DC	0.1 V		60 V
Switching current	1 mA		300 mA
Switching capacity AC/DC	1 mVA/mW		7 VA/W
Max. contact load, enable current path (13, 14) (23, 24)	Positively guided Positively guided		
Switching voltage AC	10 V		250 V
Switching voltage DC	10 V		250 V
Switching current	10 mA		6 A
Switching capacity AC	3 VA		1500 VA
Switching capacity DC	3 W		200 W

¹⁾ For detailed information on the exact design of your machine/system, please contact your local Bosch Rexroth representative

²⁾ Only valid for the assumption of conformity until 28.11.2009. From then on it will only be allowed to use the successor EN ISO 13849-1

³⁾ At a switching frequency of $C \leq 5 [1/h]$ and $n_{op} \leq 10,000 [1/a]$

⁴⁾ Equivalent to nominal voltage min./max. value 24 V DC -30%/+15%

	Minimum	Typical	Maximum
Usage category as per EN 60947-5-1	AC-15: Vi 230 V AC, li 3 A DC-13: Vi 24 V DC, li 4 A		
Contact fuse protection gL or circuit breaker with characteristic B or C			6 A
Service life, mechanical	10 ⁷ switching operations		
Service life, electrical (at 230 V AC, cos φ = 1)	10 ⁵ switching operations		
Operating data			
Rated impulse withstand voltage V _{imp}		4 kV	
Overvoltage category		II	
Rated voltage		300 V AC	
Test voltage U _{rms} 50 Hz		1.2 kV	
Enclosure rating according to IEC 60529 (housing/ terminals)	IP 40/IP 20		
Mounting	Mounting rail as per EN 60 715		
Ambient operating temperature	0 °C		+55 °C
Storage temperature	-25 °C		+75 °C (≤24 h)
Wire cross-sections SLC-A-UE1X-2FG3D0			
Single wire (1×)	0.2 mm ²		2.5 mm ²
Single wire (2×, same cross-section)	0.2 mm ²		1 mm ²
Fine stranded wire with ferrules (1×)	0.2 mm ²		2.5 mm ²
Fine stranded wire with ferrules (2×)	0.2 mm ²		1.5 mm ²
Allowed tightening torque		0.6 Nm	
Weight	86 g		91 g

11.2 Characteristic curve – load on the output signal switching devices

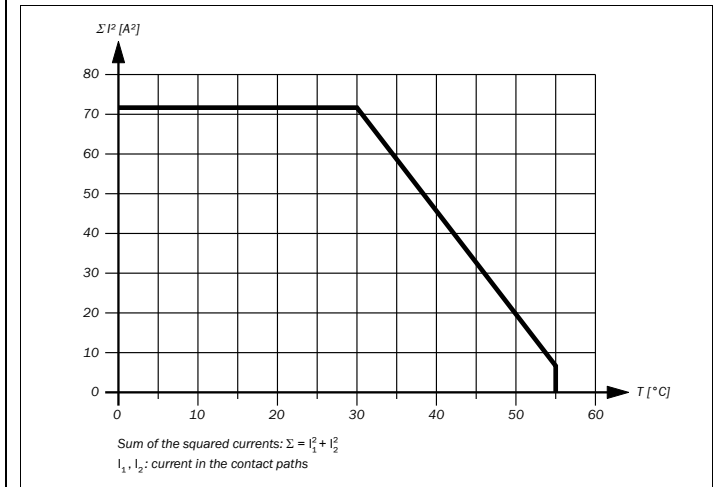


Fig. 5: Characteristic curve SLC-A-UE10-2FG3D0/SLC-A-UE12-2FG3D0 – load on the output signal switching devices