

FAQ • 12/2015

Can a contactor reversing combination be used in a safety function?

SIRIUS Industrial Controls, Safety Integrated

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# 1 Question

Can a contactor reversing combination be used in a safety function?

# 2 Answer

In general reversing combination can be used for switching drives in a safety function.

For applications up to SIL 1 in accordance with IEC 62061 or up to PL c in accordance with ISO 13849-1 it is sufficient to switch off the motor contactors for clockwise rotation and counter-clockwise rotation and to monitor its mirror contact (NC) in the feedback circuit.

From SIL 2 in accordance with IEC 62061 or PL d in accordance with ISO 13849-1 a two-channel architecture is required. Therefore an additional overlaid contactor is necessary – a combination of two contactors has to be switched on for the drive to run. Thus an additional, fourth contactor is not required.

The correct function of all three contactors has to be monitored via the mirror contacts (NC). Please be advised that hard-wired reversing combination use the mirror contacts. If the contactors do not provide enough mirror contacts to also implement the feedback circuit, contactors with auxiliary switch block are necessary (In this case a 3RA23 reversing combination and 3RH29 auxiliary switch blocks are used).

The additional auxiliary switch block 3RH29 is necessary because the internal NCcontacts of the 3RT-contactors are used for the electrical interlocking of the reversing combination.

In order to avoid common-cause failures, among other measures, the control lines to the contactors have to be laid separately or similar measures must be taken.

**Note** If the Application requires permanently mounted auxiliary switch blocks, it is also a device version for the 3RT20 contactors available.

### 2.1 Used components

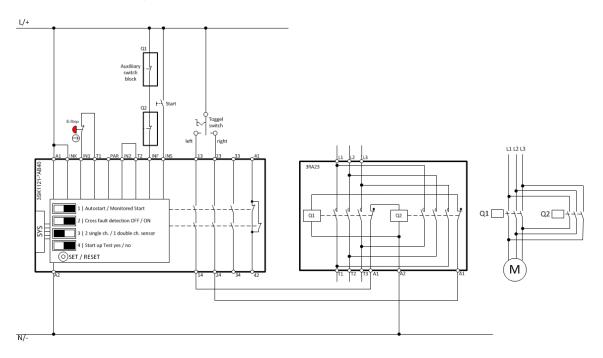
	ty relay or 3SK2	Contactor reversing combination	Snap on auxiliary switch blocks	Additional contactor relay for SIL 3 applications
			51 NC 61 NC 71 NC 81 NC 52 NC 62 NC 72 NC 82 NC	SIEMENS SIRUS
3SK1 ( <u>http://www.sie</u> <u>mens.com/saf</u> <u>ety-relays</u> )	3SK2 ( <u>http://www.sieme</u> <u>ns.com/safety-</u> <u>relays</u> )	3RA23 ( <u>http://www.siemens.com/siriu</u> <u>s-switching</u> )	3RH2911 ( <u>http://www.siemens.c</u> om/sirius-switching)	3RT20 ( <u>http://www.siemens.c</u> om/sirius-switching)

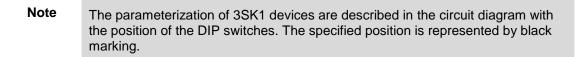
Note

This is an example for devices from the system components SIRIUS Innovations with the frame size S00. At other power ratings other device combinations could be necessary.

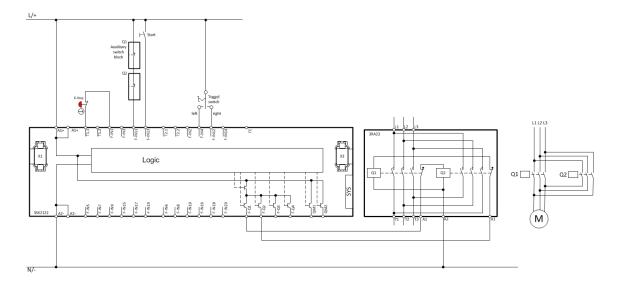
# 3 Circuit diagrams with 3SK1 and 3SK2 safety relay

3.1 SIL 1 reversing combination with 3SK1 safety relay

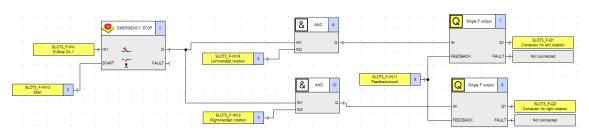




## 3.2 SIL 1 reversing combination with 3SK2 safety relay



# 3.2.1 Logic diagram of the software SIRIUS Safety ES for the safety relay 3SK2



#### 3.2.2 Adjustable parameter of the function elements in SIRIUS safety ES

• Parameter of the software module: Emergency Stop

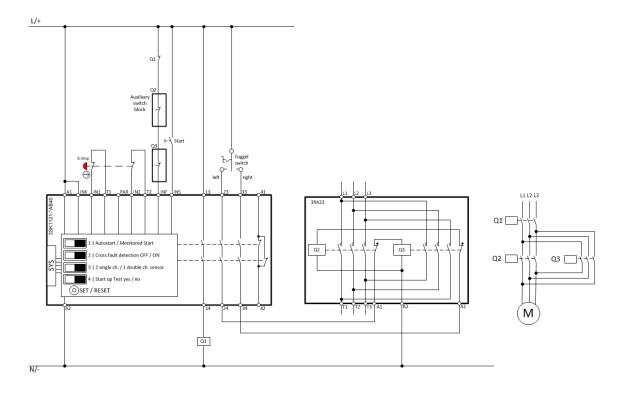
Properties - EMERGENCY STOP	×
	Parameter value
Parameter name	Parameter value
- IName	
- I Comment	
- Element number	1
- Element activated	
Element activated     Element activated     Element activated     Element activated	
E Carameter	
input	
– ≝ Type – ≝ IN1	Single-channel (NC)
	SLDT3_F-IN1 (E-Stop Ch.1)
- 🗐 IN2	Not connected
- 🗐 Input delay [ms]	
E Start	
- 🖹 Startup test	
└	monitored
	Cancel Help

Parameter name	Parameter value	
🗆 🚔 General		
—≡ Name		
— 🔲 Comment		
—Ⅲ Element number	7	
<ul> <li>Element activated</li> </ul>		
– 🗐 Substitute value - Q1	0	-
🔲 🗐 Substitute value - Q2	0	-
🗄 🔄 Parameter		
—	Single Foutput	-
🖃 🔄 Feedback circuit		
- 🗐 Monitoring	To OFF and ON status	-
🖳 🗐 Switching time [s]	0.090	
🛱 🔄 Output circuit		
- 📺 Q1	SLOT3_F-Q1 (Contactor for left rotation)	匡
— 🗐 Q2	Not connected	E
- 🗐 Auxiliary outputs	no	-
-⊞ AUX1	Not connected	E
- 🗐 AUX2	Not connected	E
FAULT	Not connected	E
🖃 🔄 Start		
Type of start	automatic	-

• Parameter of the software module: Single F-output Q1

• Parameter of the software module: Single F-output Q2

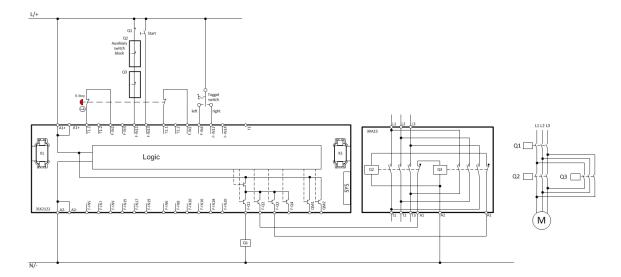
Parameter name	Parameter value
🖃 🔄 General	
- 🗐 Name	
- I Comment	
—	8
<ul> <li>Element activated</li> </ul>	
– ≝ Substitute value - Q1	0
🗆 🗐 Substitute value - Q2	0
🗆 🔄 Parameter	
—	Single F output
🖻 🔄 Feedback circuit	
Monitoring	To OFF and ON status
	0.090
🖶 🔄 Output circuit	
- 🖽 Q1	SLOT3_F-Q2 (Contactor for right rotation)
- 🖽 Q2	Not connected
– 🖹 Auxiliary outputs	Not connected
- 🖹 AUX1	Not connected
- 🗉 AUX2	Not connected
FAULT	Not connected
🗄 🔄 Start	
└ 🗐 Type of start	automatic
OK	Cancel Help



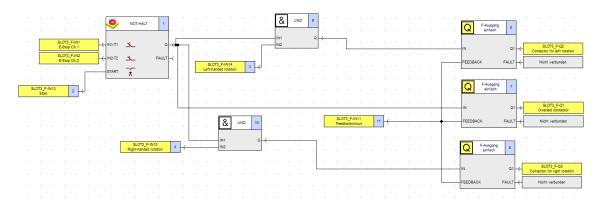
# 3.3 SIL 3 reversing combination with 3SK1 safety relay

**Note** The parameterization of 3SK1 devices are described in the circuit diagram with the position of the DIP switches. The specified position is represented by black marking.

## 3.4 SIL 3 reversing combination with 3SK2 safety relay



# 3.4.1 Logic diagram of the software SIRIUS Safety ES for the safety relay 3SK2



#### 3.4.2 Adjustable parameter of the function elements in SIRIUS safety ES

• Parameter of the software module: Emergency Stop

Properties - EMERGENCY STOP	
Parameter name	Parameter value
🖃 🔄 General	
-≝ Name	
– ≝ Comment	
—	1
Element activated	
E Function output substitute value	0
🖃 🤤 Parameter	
🗄 🔄 Input	
— 🖺 Type	2-channel (NC/NC)
- 🗉 IN1	SLOT3_F-IN1 (E-Stop Ch.1)
- 🗐 IN2	SLOT3_F-IN2 (E-Stop Ch.2)
— ≝ Input delay [ms]	0 🗸
Eross-circuit detection	
🗄 😋 Start	
- ≝ Startup test	
└	monitored
ОК	Cancel Help

• Parameter of the software module: Single F-output Q1

Parameter name	Parameter value
🖃 🔄 General	
—≝ Name	
- 🗉 Comment	
- 🗐 Element number	7
<ul> <li>Element activated</li> </ul>	
– 🗐 Substitute value - Q1	0
🖃 Substitute value - Q2	0
🖃 🔄 Parameter	
—	Single F output
🖃 🔄 Feedback circuit	
- 🕮 Monitoring	To OFF and ON status
🗏 🗐 Switching time [s]	0.090
🗄 🔄 Output circuit	
- 🗐 Q1	SLOT3_F-Q1 (Overlaid contactor)
—∭ Q2	Not connected
—) Auxiliary outputs	no 💌
–≝) AUX1	Not connected
–∭ AUX2	Not connected
└── FAULT	Not connected
🗄 🔄 Start	
□ I ype of start	automatic 👤
OK	Cancel Help

Parameter name	Parameter value	
🗄 🧮 General		
–  Name		
─		
—	5	
<ul> <li>Element activated</li> </ul>	V	
– 🗐 Substitute value - Q1	0	-
💷 Substitute value - Q2	0	-
🗄 😋 Parameter		
—	Single F output	-
🖶 🔄 Feedback circuit		
- 🗐 Monitoring	To OFF and ON status	-
_ □ Switching time [s]	0.090	
🛱 🔄 Output circuit		
- 🖺 Q1	SLOT3_F-Q2 (Contactor for left rotation)	E
- 🗐 Q2	Not connected	
–  Auxiliary outputs	no	1 - 1
- <u>@</u> ] AUX1	Not connected	E
-∭ AUX2	Not connected	E
FAULT	Not connected	国
🖃 🔄 Start		
Type of start	automatic	-

• Parameter of the software module: Single F-output Q2

• Parameter of the software module: Single F-output Q3

Parameter name	Parameter value
🗆 🔄 General	
—≝ Name	
— 🔳 Comment	
—	8
– 🗐 Element activated	
– 🗐 Substitute value - Q1	0
🖾 🗐 Substitute value - Q2	0
🖃 🔄 Parameter	
─	Single Foutput 👻
🖃 🔄 Feedback circuit	
— 🗐 Monitoring	To OFF and ON status
🖳 🗐 Switching time [s]	0.090
🕂 🔄 Output circuit	
- 📺 Q1	SLOT3_F-Q3 (Contactor for right rotation)
- <u>m</u> Q2	Not connected
- 🖹 Auxiliary outputs	Not connected
- 🗑 AUX1	Not connected
- 🗑 AUX2	Not connected
FAULT	Not connected
🗄 🔄 Start	
└── Type of start	automatic
OK	Cancel Help

# 4 Contact/Support

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