

A man in a light blue shirt is shown in profile, looking at a tablet computer. He is standing in a factory or industrial setting, with various pieces of machinery and equipment visible in the background. The lighting is bright and even. The overall scene suggests a professional or technical environment.

SIEMENS

Safe switching of contactors size S6 to S12

SIRIUS Safety

FAQ • 04/2014

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<http://support.automation.siemens.com/WW/view/en/50203404>

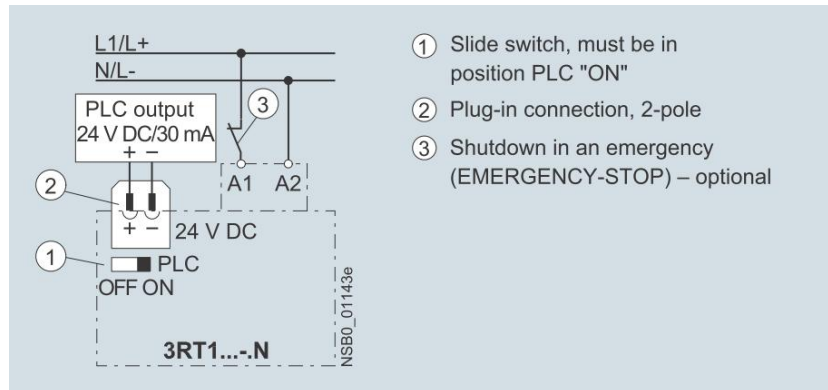
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1 Task

SIRIUS power contactors sizes S6 to S12 offer the version 3RT1...-N with the option of operating the solenoid directly from a PLC output DC 24 V/30 mA without the use of a coupling relay.

Figure 1-1



However, this input is not fit for safety related switching.

If the contactors have to be switched off safely, coupling links or contactor relays or a SIRIUS safety relay 3SK1 are required to reinforce the PLC's fail-safe outputs.

In the following these two options are illustrated.

2 Solution

2.1 Coupling links or contactor relays

The machine is switched through a redundant shutdown path (two SIRIUS power contactors). To switch the power contactors two coupling links or contactor relays (i.e. SIRIUS 3RH2, summarized as coupling links in the following) are required.

Figure 2-1

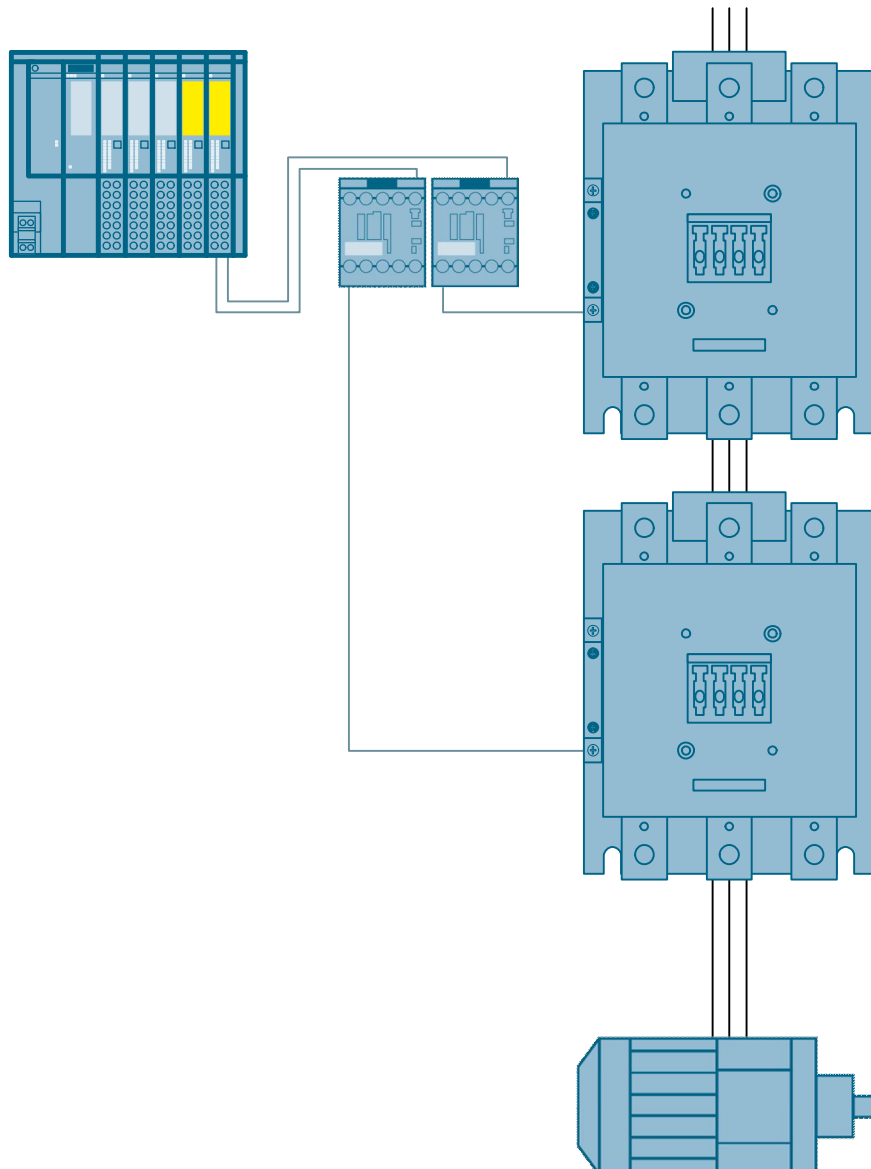
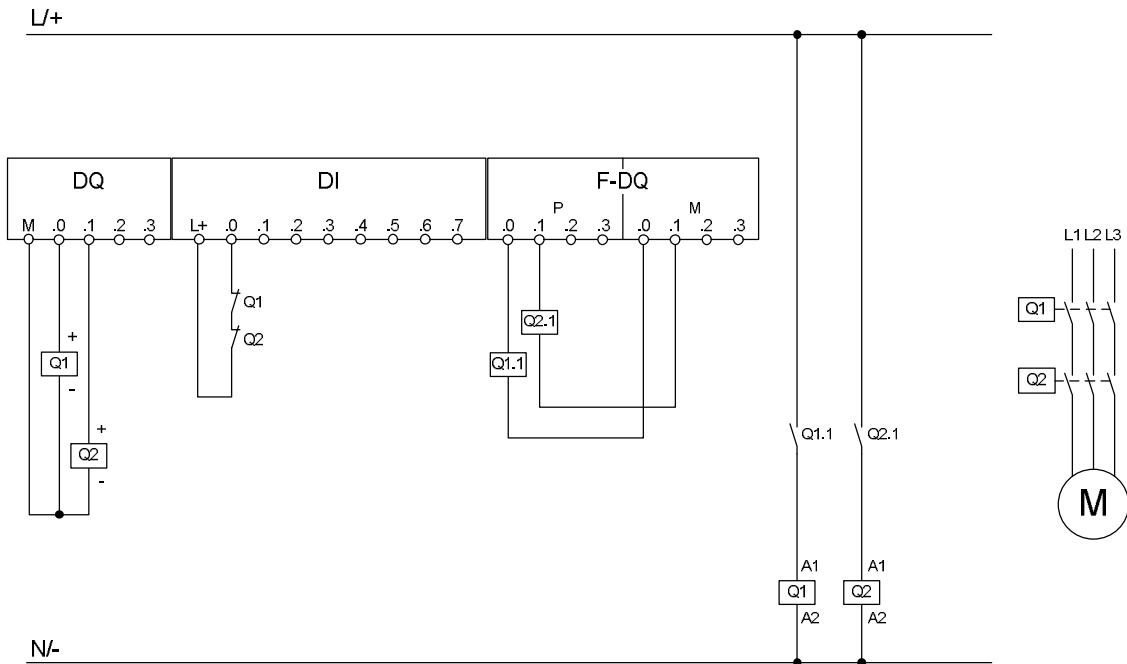


Figure 2-2



A fail-safe module switches the coupling links Q1.1 and Q2.1 which control the power contactors Q1 and Q2.

Therefore the coupling links are part of the safety function and need to be factored in in the evaluation of the safety function.

Through the feedback circuit the correct function of the power contactors is monitored by the fail-safe PLC. The coupling links do not need to be monitored since a possible fault is discovered monitoring the auxiliary contacts of the contactors at the next switch on signal at the latest.

The Diagnostic Coverage of the coupling links can be assumed with the same value as for the power contactors.

Note

Dynamic feedback circuit monitoring by the fail-safe controller is required for SIL 3 / PL e. This can be implemented, for example, with a FDBACK block that is available for Distributed Safety and Safety Advanced. If dynamic monitoring is not possible, the feedback circuit must be read in by means of a safe input.

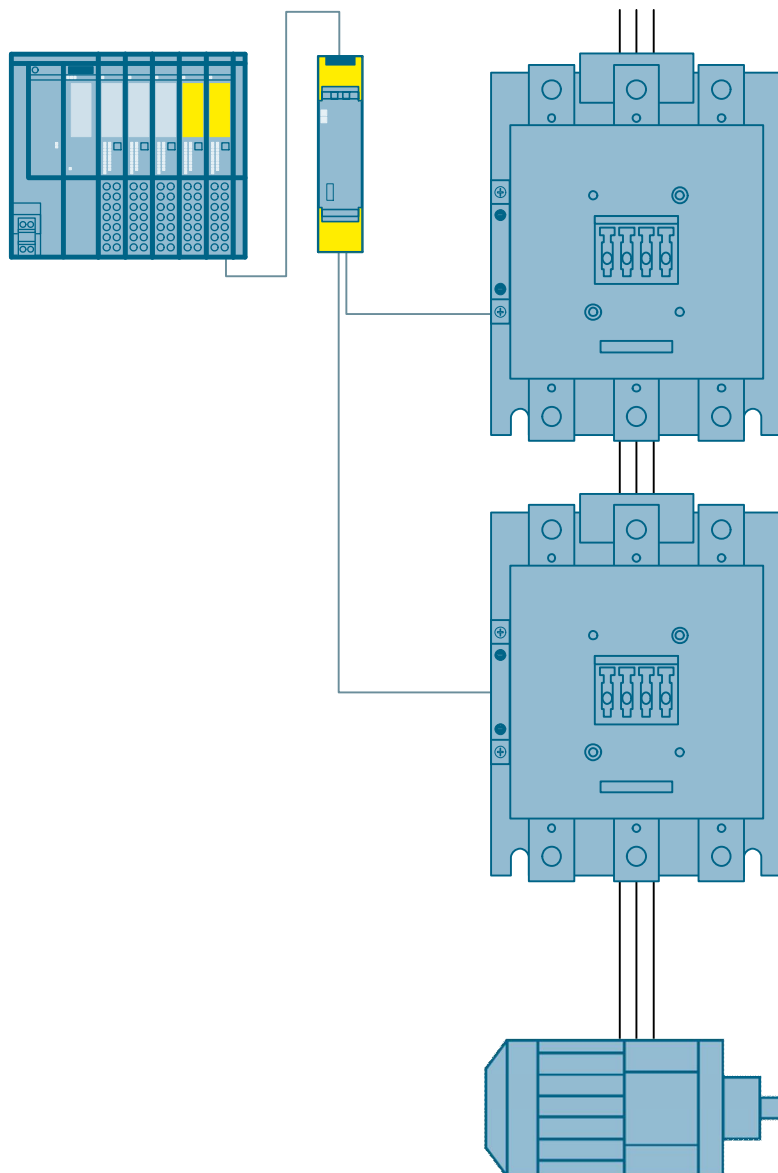
The operational switching is carried out through the PLC input on the contactors.

2.2 Safety relay

SIRIUS 3SK1 safety relays can be used as an alternative to coupling links. Both methods follow the same principle.

The advantage over coupling relays is that SIRIUS 3SK1 safety relays are certified up to SIL 3 / PL e, take up less space in the control cabinet and require less wiring.

Figure 2-3

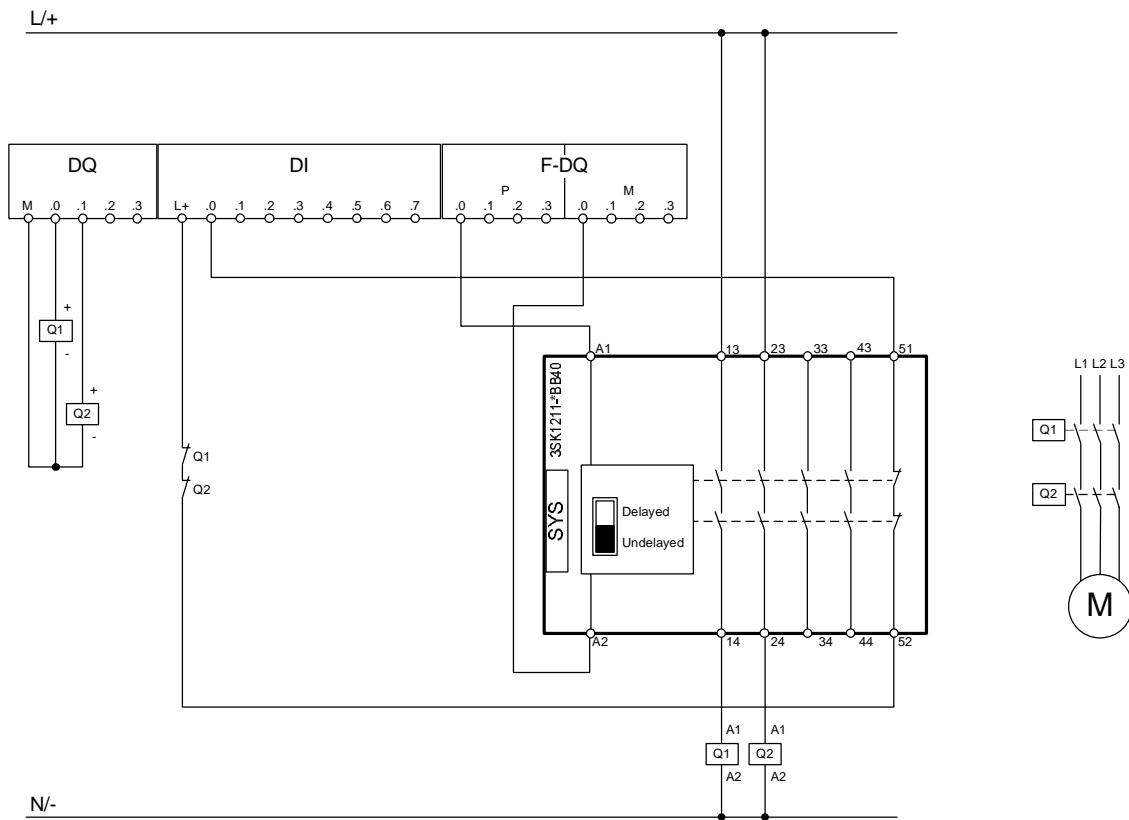


In a basic case a SIRIUS 3SK1 output expansion, i.e. 3SK1211-.BB40, can be used.

A pm-switching F-DQ module switches the 3SK1 output expansion. Over the relay contacts of the 3SK1 that can switch up to 5 A (AC-15 at 230 V) the power contactors are controlled.

The operational switching is carried out from a standard DQ module to the PLC inputs (+ and -) on the contactors.

Figure 2-4



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Through the feedback circuit the correct function of the power contactors and the 3SK1 output expansion is monitored by the failsafe controller. The feedback circuit is wired to a standard DI module. The monitored contacts need to be closed (the main circuit open) in order to switch on the machine.

Note

Dynamic feedback circuit monitoring by the fail-safe controller is required for SIL 3 / PL e. This can be implemented, for example, with a FDBACK block that is available for Distributed Safety and Safety Advanced. If dynamic monitoring is not possible, the feedback circuit must be read in by means of a safe input.

For more information on how to reinforce or expand a PLC's failsafe outputs using SIRIUS 3SK1 safety relays, please see:

<http://support.automation.siemens.com/WW/view/en/76676971>

3 Contact/Support

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