

SIEMENS



FAQ • 01/2017

Connection of F-DQ to F-DI of SINAMICS

SINAMICS S120; SIMOTION D



<https://support.industry.siemens.com/cs/ww/en/view/39700013>

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1 Content

This FAQ shows connection examples between failsafe digital outputs (F-DQ) of different safety modules and failsafe digital inputs (F-DI) of the SINAMICS drive system.

The failsafe digital inputs of the following SINAMICS drive systems respectively SIMOTION motion control systems hardware is taken into account:

- CU310-2
- CU320-2
- SIMOTION D410-2
- SIMOTION D4x5-2
- TM54F
- Motor Modules (EP terminal)

The failsafe digital outputs of the following SIEMENS hardware are taken into account in this FAQ:

- SIMATIC ET200M
- SIMATIC ET200MP
- SIMATIC ET200S
- SIMATIC ET200SP
- SIMATIC ET200pro
- SIMATIC S7-1200F
- Modular Safety System (MSS) SIRIUS 3RK3
- SIRIUS 3SK1
- SIRIUS 3SK2

NOTICE

In accordance with IEC 61131 Part 2, Chapter 5.2 (2008), for the interconnection with the failsafe digital inputs of SINAMICS drive system only those semiconductor outputs that have a maximum residual current of 0.5 mA in the „OFF“ state may be used.

This FAQ also describes possibilities of interconnecting modules with a residual current greater than 0.5 mA through the use of additional components such as relay modules, contact multiplier modules or a resistor with the digital inputs mentioned above.

NOTE

The digital inputs of the SINAMICS/SIMOTION range of products draw a very small current which is usually too low for the automatic open-circuit detection of the F-DQ modules of the ET200 range as well as the MSS. For this reason, a check should always be made whether the open-circuit detection of the F-DQ components must be deactivated.

2 SINAMICS Safety Integrated Functions via terminal

2.1.1 SINAMICS Safety Integrated Basic Functions via onboard-terminals

The Safety Integrated Basic Functions are selected with two channels.

- Channel 1: Digital input on the Control Unit
- Channel 2: EP terminal on the Motor Module

Depending on the utilized device differences occur in terminal block designation and pin connection.

SINAMICS S120 CU320-2, SIMOTION D4x5-2

Available digital inputs:

- Terminal block X122: DI 0 – DI 3, DI 16, DI 17
- Terminal block X132: DI 4 – DI 7, DI 20, DI 21

Designation of EP terminal:

- Single Motor Module, booksize X21, contacts 3 & 4
- Double Motor Module, booksize X21, X22, contacts 3 & 4
- Motor Module, chassis X41, contacts 1 & 2
- CUA31 on Power Module, blocksize X210, contacts 3 & 4
- CUA32 on Power Module, blocksize X210, contacts 3 & 4

CX32-2

Available digital inputs:

- Terminal block X122: DI 0 – DI 3, DI 16, DI 17

The EP terminal is located on the Motor Module and is labeled identically to the previous enumeration.

NOTE

The wiring for DI 0 on the CU320-2 and the EP terminal on a Single Motor Module (booksize) is shown in the following examples. These examples can be used as template for the connection of SIMOTION D4x5-2 and CX32-2.

SINAMICS S120 CU310-2, SIMOTION D410-2

Available digital input:

- F-DI 0: contacts 3, 4 & 5

The M1 reference ground is at pin 12.

NOTE

The wiring for the F-DI 0 on the CU310-2 is shown in the following examples. These examples can be used as template for the connection of SIMOTION D410-2.

2.1.2 SINAMICS Safety Integrated Extended Functions via onboard-terminals

For the SINAMICS (CU310-2) or the SIMOTION (D410-2) the Safety Integrated Extended Functions can be controlled with the 3 F-DI on terminal block X120.

The F-DIs compose as follows:

- F-DI 0: contacts 3, 4 & 5
- F-DI 1: contacts 6, 7 & 8
- F-DI 2: contacts 9, 10 & 11

The M1 reference ground for all of them is at pin 12.

NOTE

In the following examples, the wiring for F-DI0 of CU310-2 is shown. In all the examples, the F-DI 0 of the CU310-2 should be configured as „NC/NC contact“ in the STARTER or SCOUT project.

2.1.3 SINAMICS Safety Integrated Basic & Extended Functions via TM54F

Prerequisite for these wiring examples is the use of the TM54F with the following product version (or later):
6SL3055-0AA00-3BA0 Version B

The TM54F can be operated with the following components:

- CU310-2
- CU320-2
- SIMOTION D410-2
- SIMOTION D4x5-2
- CX32-2

NOTE

The wiring for the F-DI 0 at terminal X521 of the TM54F is shown in the examples. The other permissible F-DIs (F-DI 1 to F-DI 9 on X521, X522, X531 and X532) can also be used. In all the examples, the F-DIs of the TM54F should be configured as „NC/NC contacts“ in the STARTER or SCOUT project.

2.2 Version overview

This document refers to the currently available modules from the SINAMICS and SIMOTION range. These can be identified with the supplement „-2“ in the product name; e.g. CU320-2.

The procedure for older hardware is described in the previous document (version 1.0). This document can also be downloaded from the following link (<https://support.industry.siemens.com/cs/ww/en/view/39700013>).

The following table shows an overview in which document the procedure is described for the various hardware and firmware versions.

Table 2-1: Version overview

Document	Hardware	Software
39700013_mc_faq_i_001_v10_en	SIMOTION D4xx	up to V4.3 with SINAMICS Integrated up to V2.6
	SINAMICS S110	V4.1
	SINAMICS S120 with CU3x0	up to V2.6
39700013_mc_faq_i_001_v30_en	SIMOTION D4xx-2	from V4.2 with SINAMICS Integrated from V4.3
	SINAMICS S120 with CU3x0-2	from V4.3

Regarding the question, the essential difference is the introduction of a software filter in V4.3 (SINAMICS) for the failsafe inputs. Test pulses of the failsafe output modules can be filtered-out using this filter. This guarantees that the test pulses do not result in Safety Integrated Functions of the SINAMICS being briefly selected or deselected.

3 Failsafe wiring of ET200S with SINAMICS

3.1 Preferred option: Usage of F-RO

Figure 3-1: ET200S 4 F-DO (PM-switching) with 1 F-RO on CU320-2

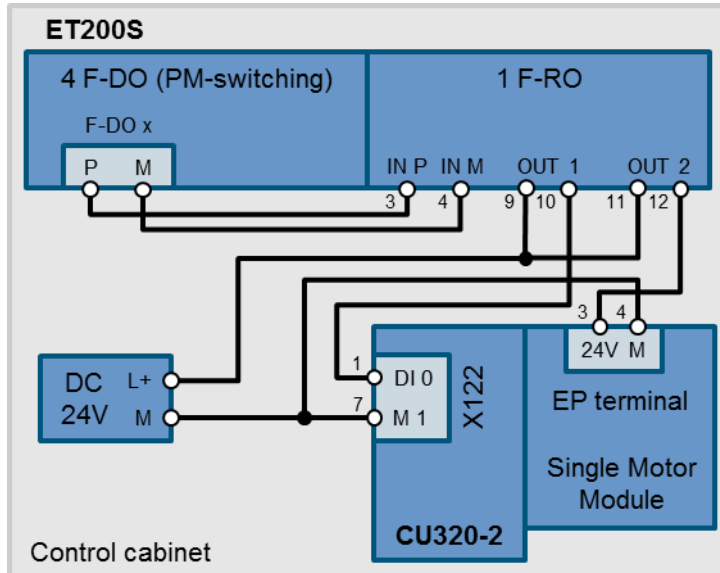


Figure 3-2: ET200S 4 F-DO (PM-switching) with 1 F-RO on TM54F

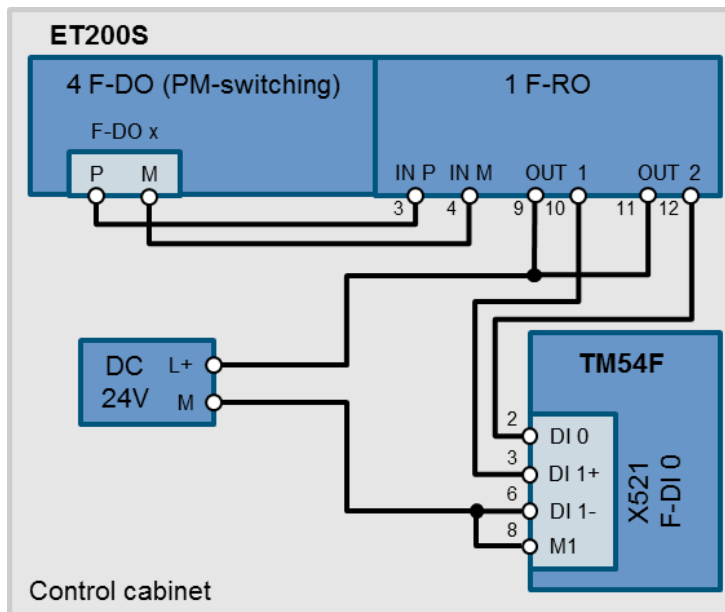


Figure 3-3: ET200S 4 F-DO (PM-switching) with 1 F-RO on CU310-2

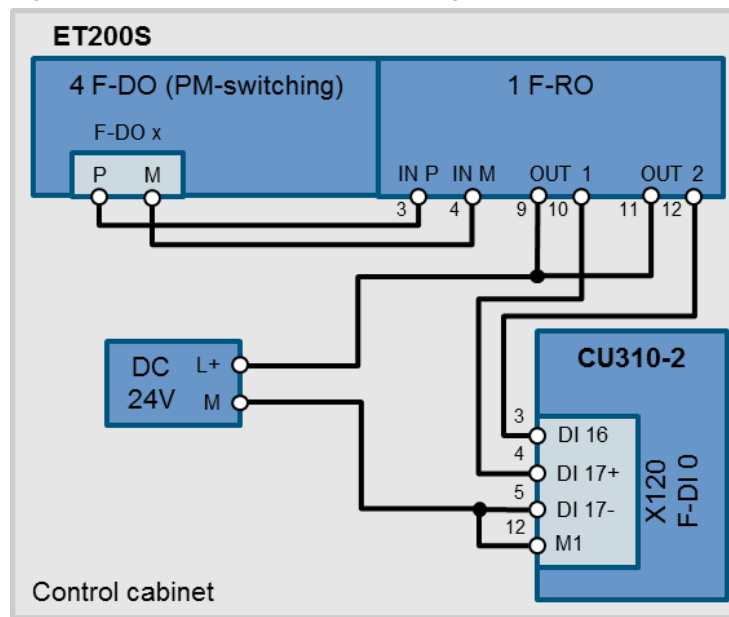


Table 3-1: Used components

Component	Article Number
ET200S 4 F-DO	6ES7138-4FB03-0AB0
ET200S 1 F-RO	6ES7138-4FR00-0AA0

The variant shown here should be used as **preferred** interconnection between the ET200S 4 F-DO (PM-switching) and the SINAMICS components. No problems whatsoever occur with regard to the test pulses of the F-DO module.

In addition, no measures have to be taken regarding residual currents, as they do not occur with the failsafe relay module (1 F-RO).

The 1F-RO module switches the outputs internally via two relays. Both relays have feedback contacts that are provided via the process image of the controller in the form of a bit. This feedback value must be used in the F-program to compare the control signal with the switching state in order to diagnose any deviations (e.g. through contacts sticking together) and to respond appropriately.

NOTE

The configuration of the monitoring of the control state and the feedback value as well as the response to a deviation is the responsibility of the user.

In the SIMATIC F-program there is the feedback block F_FDBCK for feedback monitoring available.

3.2 Further option: Contact multiplier module 3SK1211

Figure 3-4: ET200S 4 F-DO (PM-switching) with 3SK1211 on CU320-2

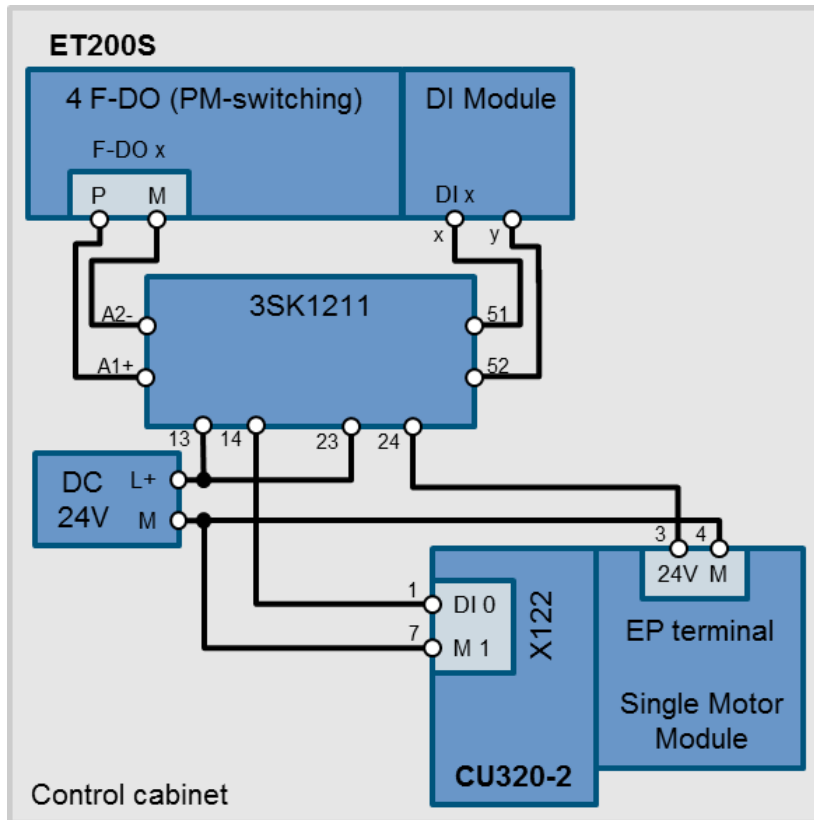


Figure 3-5: ET200S 4 F-DO (PM-switching) with 3SK1211 on TM54F

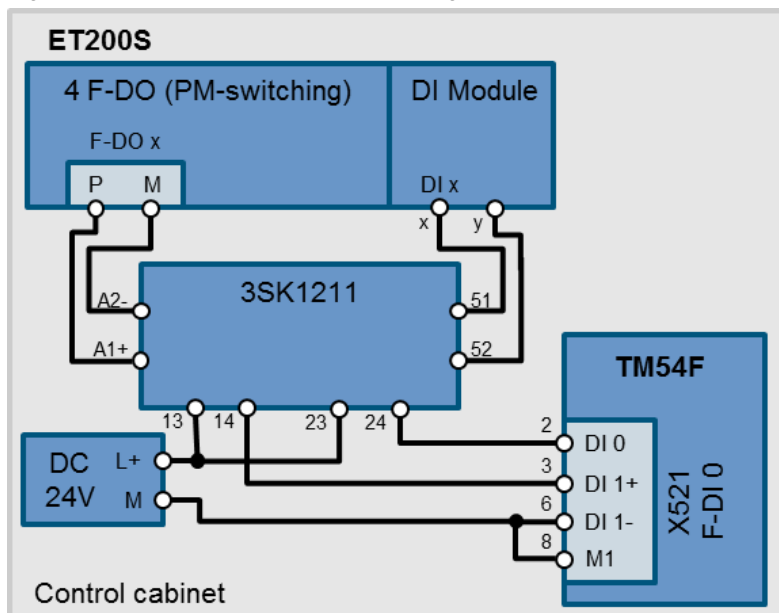


Figure 3-6: ET200S 4 F-DO (PM-switching) with 3SK1211 on CU310-2

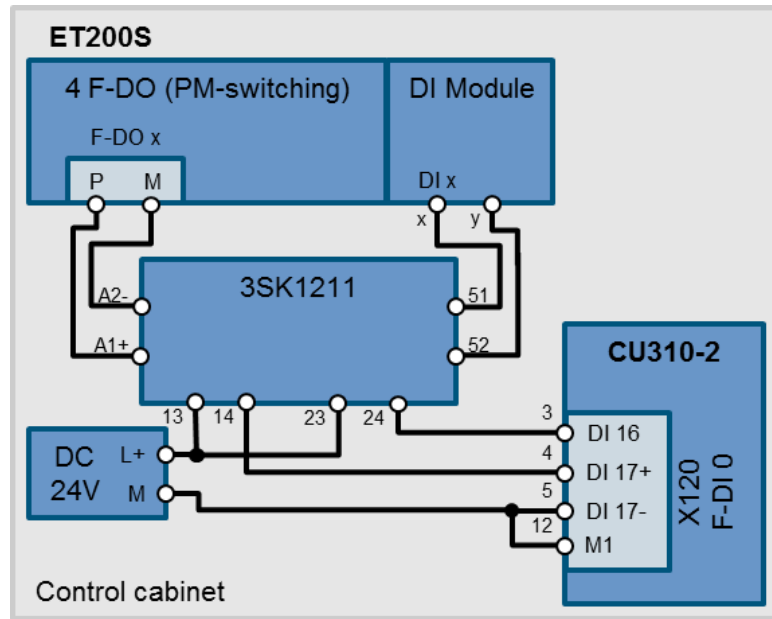


Table 3-2: Used components

Component	Article Number
ET200S 4 F-DO	6ES7138-4FB03-0AB0
3SK1211	3SK1211-2BB40

The contact multiplier module from the 3SK1 series (3SK1211-2BB40 here) can also be used as an alternative to the failsafe relay module (1 F-RO). This module also offers the advantage that no measures need be taken with regard to the residual currents and the test pulses of the 4 F-DO module.

However, this module has no internal monitoring of the control state and the switching state of the outputs. For this reason, the outputs of the feedback circuit (contacts 51 & 52) must be read back via a digital input module (DI module) and supplied to the F-program. The comparison must then be made in the F-program between the control signal and the switching state in order to diagnose any deviations (e.g. through contacts sticking together) and to respond appropriately.

NOTE The configuration of the monitoring of the control state and the feedback value as well as the response to a deviation is the responsibility of the user.

In the SIMATIC F-program there is the feedback block F_FDBCK for feedback monitoring available.

3.3 Further option: Direct connection with resistor wiring

Figure 3-7: ET200S 4 F-DO (PM-switching) with resistor on CU320-2

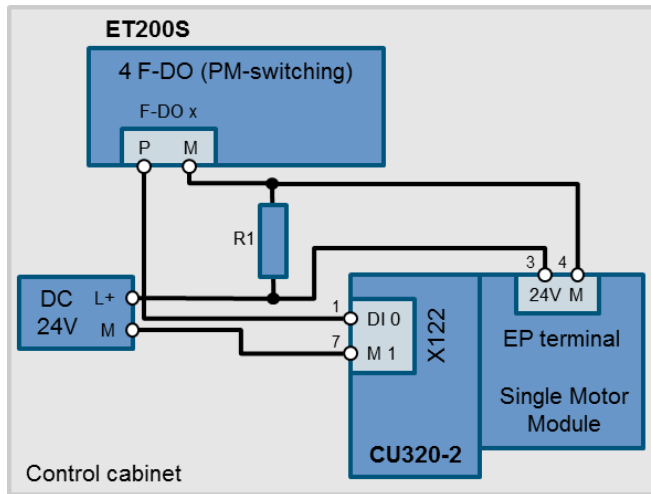


Figure 3-8: ET200S 4 F-DO (PM-switching) with resistor on TM54F

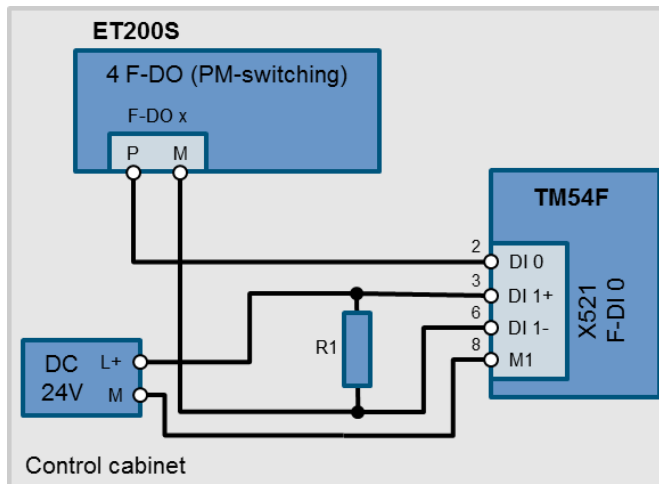


Figure 3-9: ET200S 4 F-DO (PM-switching) with resistor on CU310-2

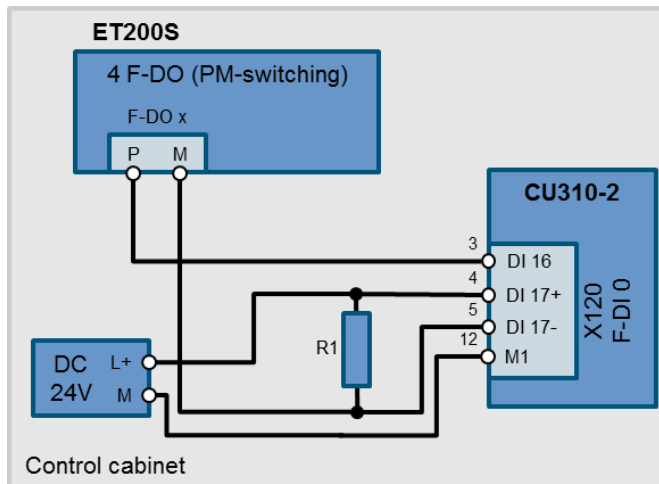


Table 3-3: Used components

Component	Article Number
ET200S 4 F-DO	6ES7138-4FB03-0AB0

Another alternative is the use of a resistor (R1) in the M channel of the F-DO to ensure that the level for logical zero is maintained.

The maximum permissible residual current of the DIs of the SINAMICS is 0.5 mA. The residual current of the ET200S 4 F-DO (PM) is maximum 0.5 mA at the P channel, i.e. a resistor is not required here. However, this is up to 4 mA at the M channel. The maximum permissible voltage at the DIs of the SINAMICS at which a LOW level is detected is 5 V. The internal resistance of the DIs is sufficiently high and can be neglected in the following calculation. Therefore, there may be a maximum voltage drop of 5 V at R1, i.e. the following applies for R1:

$$R1 \leq \frac{5V}{4mA} = 1.25 k\Omega \text{ e.g. } R1 = 1.2 k\Omega \text{ can be selected.}$$

The power loss at this resistor with constantly applied max. plus tolerance (20%) of non-stabilized power supplies is:

$$P = \frac{(28.8V)^2}{R1}. \text{ For } R1 = 1.2 k\Omega, P = 0.69 W$$

The resistor R1 is to be permanently dimensioned for this power loss. If a controlled power supply is used (e.g. SITOP) the max. plus tolerance of the output voltage is 3%. Consequently, there is also less power loss at the resistor.

Furthermore, the test pulses (light or dark test) are applied directly at the DIs of the SINAMICS components. The dark test pulses (temporary deactivation with logical 1 at the F-DO) have a maximum duration of 1 ms. The light test (temporary activation with logical 0 at the F-DO) can generate pulses with max. 4 ms.

To suppress both test pulses, the configurable input filter for the Basic Functions should be set to a minimum value of 4 ms as described in chapter [12](#).

4 Failsafe wiring of ET200SP with SINAMICS

Figure 4-1: ET200SP 4 F-DQ (PM-switching) with CU320-2

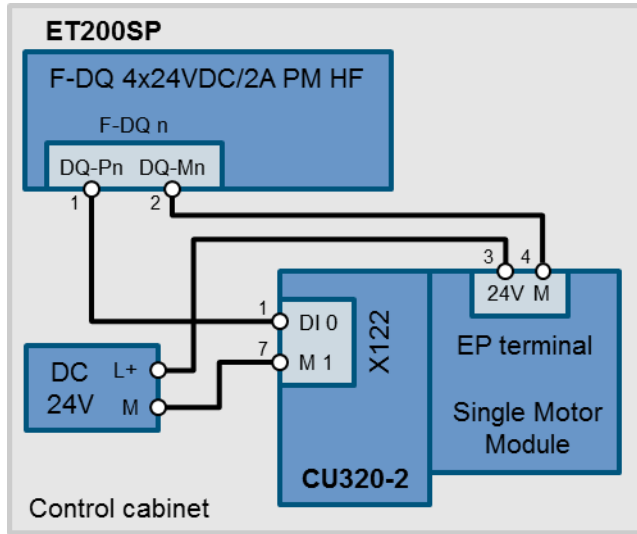


Figure 4-2: ET200SP 4 F-DQ (PM-switching) with TM54F

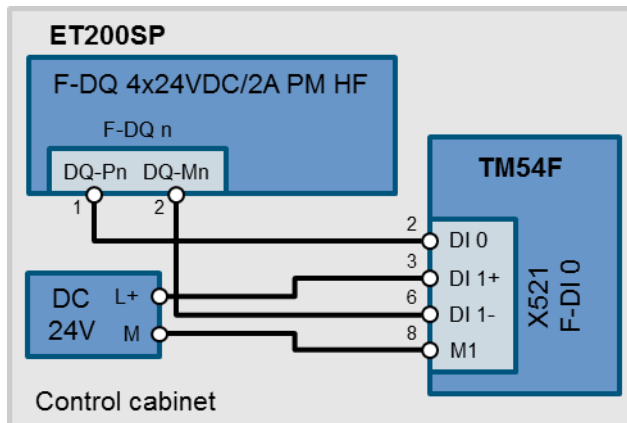


Figure 4-3: ET200SP 4 F-DQ (PM-switching) with CU310-2

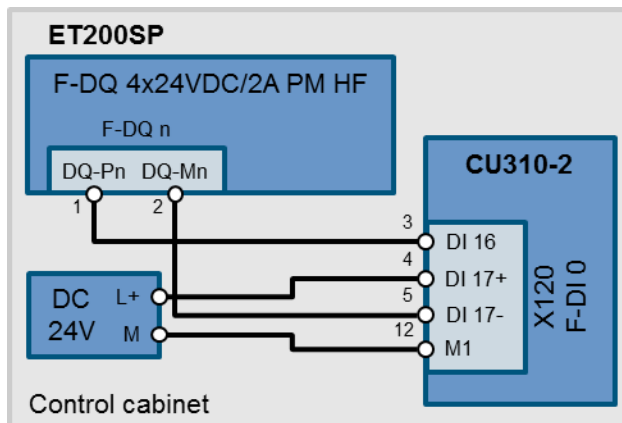


Table 4-1: Used components

Component	Article Number
ET200SP 4 F-DQ	6ES7136-6DB00-0CA0

The residual currents of the F-DQs of the ET200SP 4 F-DQ component are maximum 0.5 mA for both the P and the M channel. No special wiring is required here for a direct connection.

The test pulses (light or dark test) are also applied directly at the DIs of the SINAMICS components. The dark test pulses (temporary deactivation with logical 1 at the F-DQ) and the light test pulses (temporary activation with logical 0 at the F-DQ) have a configurable duration. Depending on the configured duration it can be necessary to suppress the test pulses in the SINAMICS components.

To suppress both test pulses, the input filter should be set to a minimum value equal to the configured test pulse duration as described in chapter [12](#).

5 Failsafe wiring of ET200pro with SINAMICS

Figure 5-1: ET200pro 4/8 F-DI / 4 F-DO (PM-switching) with resistor on CU320-2

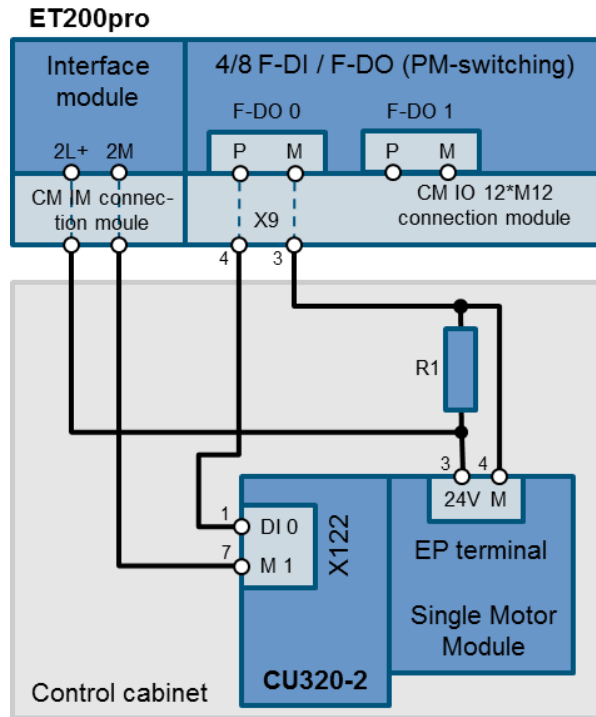


Figure 5-2: ET200pro 4/8 F-DI / 4 F-DO (PM-switching) with resistor on TM54F

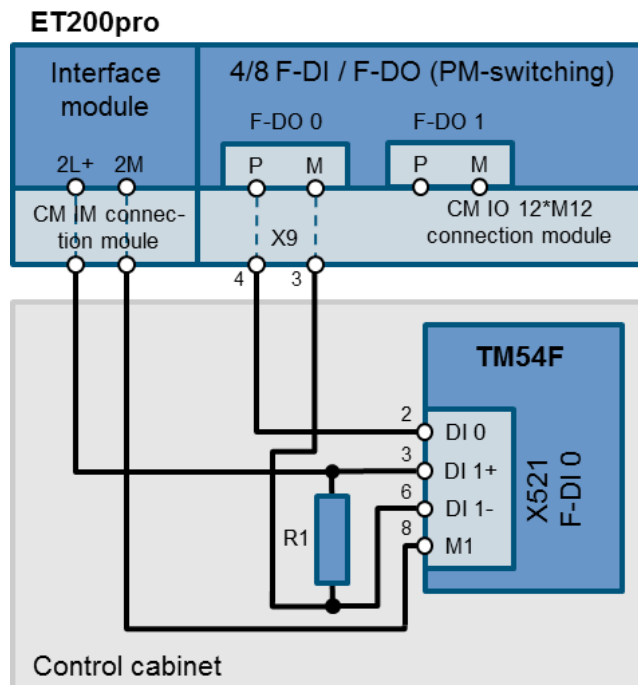


Figure 5-3: ET200pro 4/8 F-DI / 4 F-DO (PM-switching) with resistor on CU310-2

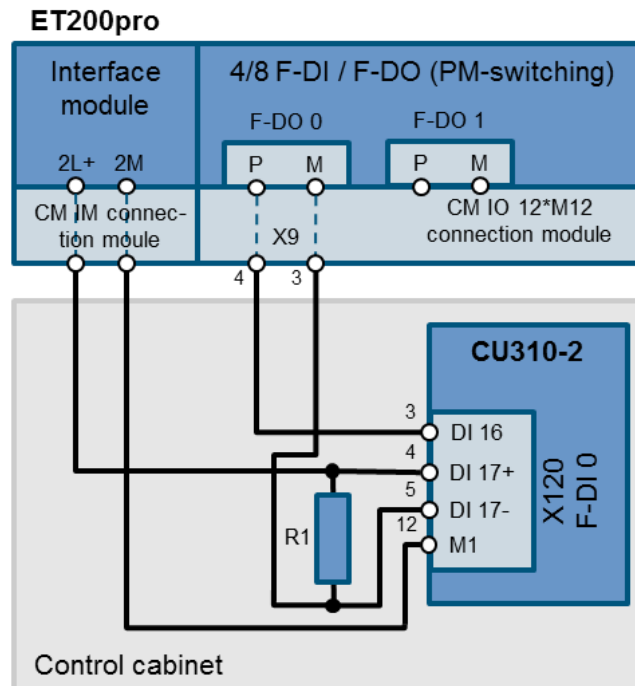


Table 5-1: Used components

Component	Article Number
ET200pro 4/8 F-DI / 4 F-DO	6ES7148-4FC00-0AB0
ET200pro CM IO 12 x M12	6ES7194-4DC00-0AA0

With this control, a resistor (R1) must be provided for the M channel of the F-DO to ensure that the level for logical zero is maintained.

The maximum permissible residual current of the DIs of the SINAMICS components is 0.5 mA. The residual current of the ET200pro 4 F-DO (PM) is maximum 0.5 mA at the P channel, i.e. a resistor is not required here. However, this is up to 1.0 mA at the M channel. The maximum permissible voltage at the DIs of the SINAMICS components at which a LOW level is detected is 5 V. The internal resistance of the DIs is sufficiently high and can be neglected in the following calculation. Therefore, there may be a maximum voltage drop of 5 V at R1, i.e. the following applies for R1:

$$R1 \leq \frac{5V}{1mA} = 5 k\Omega \text{ e.g. } R1 = 4.7 k\Omega \text{ can be selected.}$$

The power loss at this resistor with constantly applied max. plus tolerance (20%) of non-stabilized power supplies is:

$$P = \frac{(28.8V)^2}{R1}. \text{ For } R1 = 4.7 k\Omega, P = 177 mW$$

The resistor R1 is to be permanently dimensioned for this power loss. If a controlled power supply is used (e.g. SITOP) the max. plus tolerance of the output voltage is 3%. Consequently, there is also less power loss at the resistor.

The test pulses for the light and dark test are in a range less than 1 ms and therefore do not require parameter settings on the SINAMICS.

6 Failsafe wiring of ET200M with SINAMICS

6.1 ET200M with PM-switching F-DO

Figure 6-1: SM326 8 F-DO (PM-switching) with CU320-2

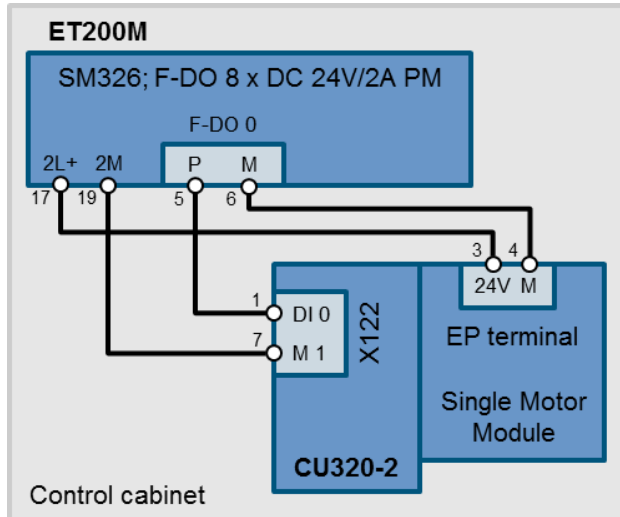


Figure 6-2: SM326 8 F-DO (PM-switching) with TM54F

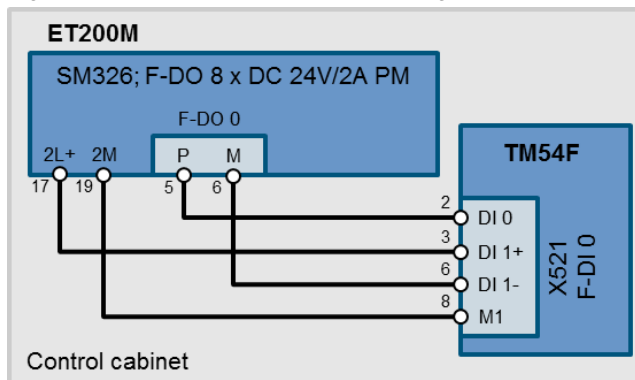


Figure 6-3: SM326 8 F-DO (PM-switching) with CU310-2

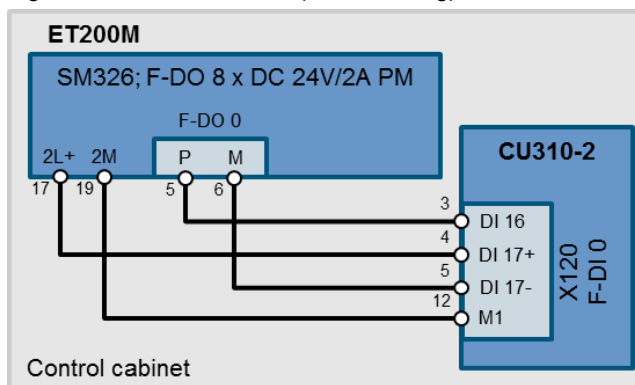


Table 6-1: Used components

Component	Article Number
ET200M SM326 8 F-DO	6ES7326-2BF41-0AB0

The residual currents of the F-DOs of the ET200M 8 F-DO component are maximum 0.5 mA for both the P and the M channel. No special wiring is required for a direct connection.

The test pulses (light or dark test) are also applied directly at the DIs of the SINAMICS components. The dark test pulses (temporary deactivation with logical 1 at the F-DO) have a maximum duration of 1 ms. The light test (temporary activation with logical 0 at the F-DO) can generate pulses with max. 4 ms.

To suppress both test pulses, the configurable input filter should be set to a minimum value of 4 ms as described in chapter [12](#).

6.2 ET200M with PP- switching F-DO

Figure 6-4: SM326 10 F-DO (PP-switching) with CU320-2

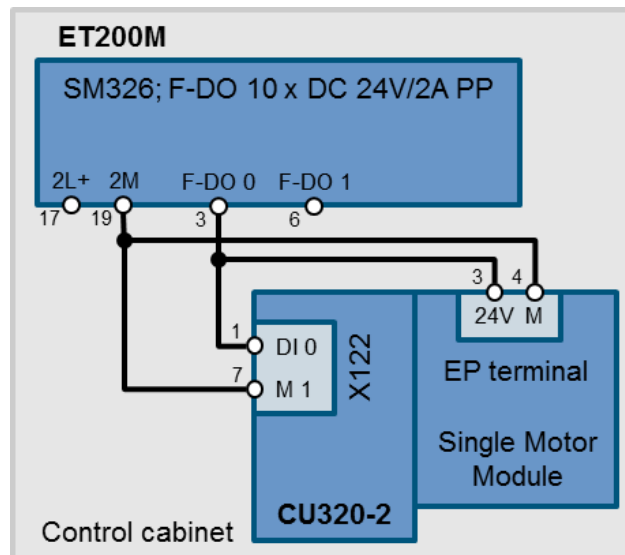


Figure 6-5: SM326 10 F-DO (PP-switching) with TM54F

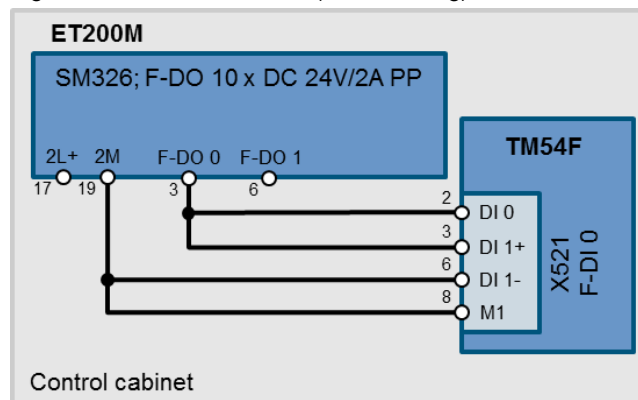


Figure 6-6: SM326 10 F-DO (PP-switching) with CU310-2

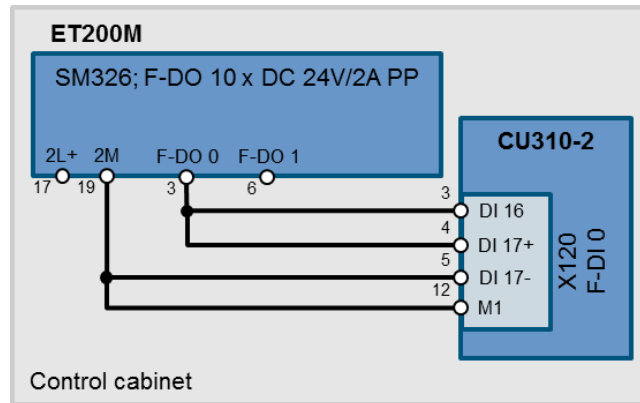


Table 6-2: Used components

Component	Article Number
ET200M SM326 10 F-DO	6ES7326-2BF10-0AB0

With this F-DO module, the individual F-DOs only have a P output which is connected internally to two semiconductor switches twice. The M connection is available at a common terminal (2M) for five outputs.

For wiring with fault exclusion for cross-circuit to 24 V (e.g. fixed installation within a cabinet, see EN 60204-1:2006, Chapter 13), both channels of one F-DI of the SINAMICS components may be connected to one F-DO. If there is no wiring with fault exclusion for cross-circuit to 24 V, two F-DOs with separate wiring can be used on the two channels F-DI of the SINAMICS components. These two F-DOs must then be controlled simultaneously.

No measures for residual currents are required for this module, as they are always less than 0.5 mA.

The test pulses for the light and dark test are also less than 1 ms and therefore parameter settings on the SINAMICS components are not required.

7 Failsafe wiring of ET200MP with SINAMICS

The F-DQ module of the ET200MP can be configured as PM- or PP-switching. Depending on the intended purpose, one configuration is suited:

- PM-switching for wiring in the field
- PP-switching for wiring in the same control cabinet

7.1 ET200MP with F-DQ configured as PM-switching

Figure 7-1: ET200MP 8 F-DQ (PM-switching) with CU320-2

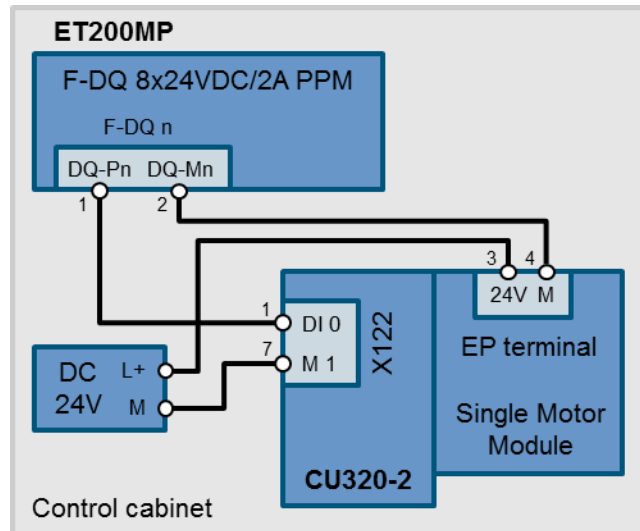


Figure 7-2: ET200MP 8 F-DQ (PM-switching) with TM54F

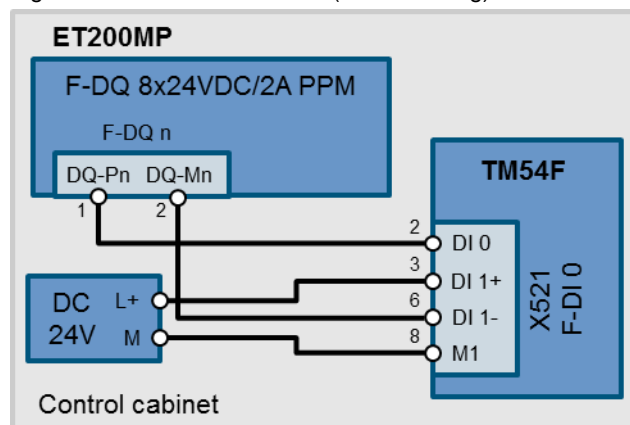


Figure 7-3: ET200MP 8 F-DQ (PM-switching) with CU310-2

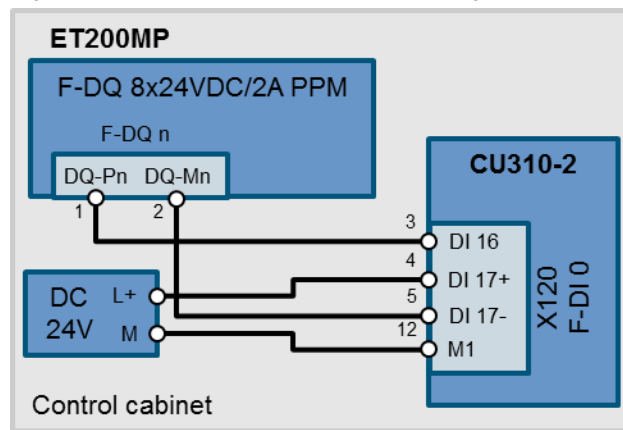


Table 7-1: Used components

Component	Article Number
ET200MP 8 F-DQ	6ES7526-2BF00-0AB0

The residual currents of the F-DQs of the ET200MP 8 F-DQ component are maximum 0.5 mA for both the P and the M channel. No special wiring is required for a direct connection.

The test pulses (light or dark test) are also applied directly at the DIs of the SINAMICS components. The dark test pulses (temporary deactivation with logical 1 at the F-DQ) and the light test pulses (temporary activation with logical 0 at the F-DQ) have a configurable duration. Depending on the configured duration it can be necessary to suppress the test pulses in the SINAMICS components.

To suppress both test pulses, the input filter should be set to a minimum value equal to the configured test pulse duration as described in chapter [12](#).

7.2 ET200MP with F-DQ configured as PP-switching

Figure 7-4: ET200MP 8 F-DQ (PP-switching) with CU320-2

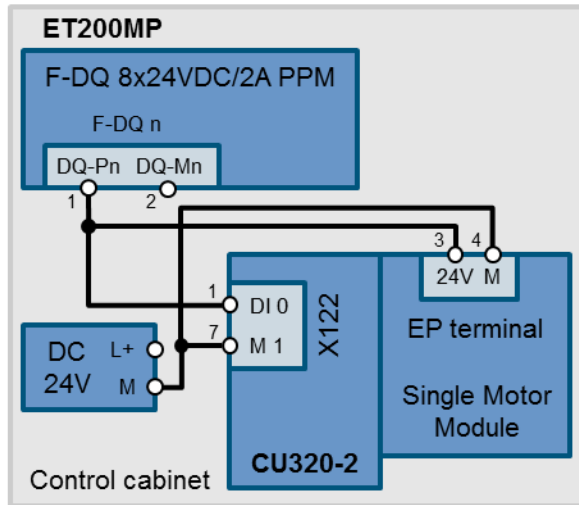


Figure 7-5: ET200MP 8 F-DQ (PP-switching) with TM54F

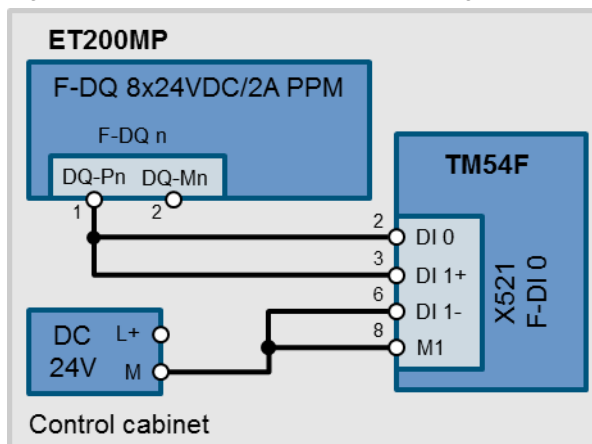


Figure 7-6: ET200MP 8 F-DQ (PP-switching) with CU310-2

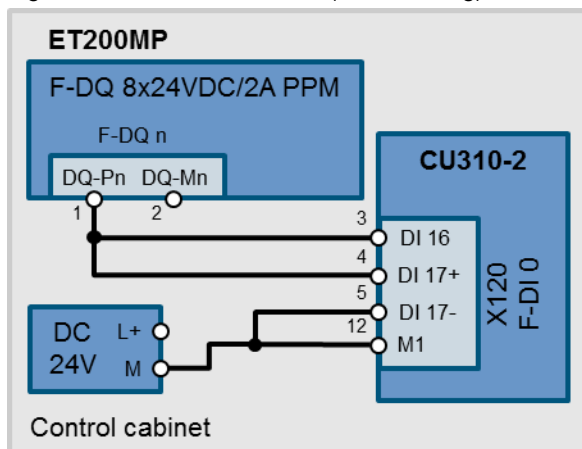


Table 7-2: Used components

Component	Article Number
ET200MP 8 F-DQ	6ES7526-2BF00-0AB0

The residual currents of the F-DQs of the ET200MP 8 F-DQ component are maximum 0.5 mA for both the P and the M channel. No special wiring is required for a direct connection.

For wiring with fault exclusion for cross-circuit to 24 V (e.g. fixed installation within a cabinet, see EN 60204-1:2006, Chapter 13), both channels of one F-DI of the SINAMICS components may be connected to one F-DQ. If there is no wiring with fault exclusion for cross-circuit to 24 V, two F-DQs with separate wiring can be used on the two channels F-DI of the SINAMICS components. These two F-DQs must then be controlled simultaneously.

The test pulses (light or dark test) are also applied directly at the DIs of the SINAMICS components. The dark test pulses (temporary deactivation with logical 1 at the F-DQ) and the light test pulses (temporary activation with logical 0 at the F-DQ) have a configurable duration. Depending on the configured duration it can be necessary to suppress the test pulses in the SINAMICS components.

To suppress both test pulses, the input filter should be set to a minimum value equal to the configured test pulse duration as described in chapter [12](#).

8 Failsafe wiring of S7-1200F with SINAMICS

Figure 8-1: S7-1200 4 F-DQ (PM-switching) with CU320-2

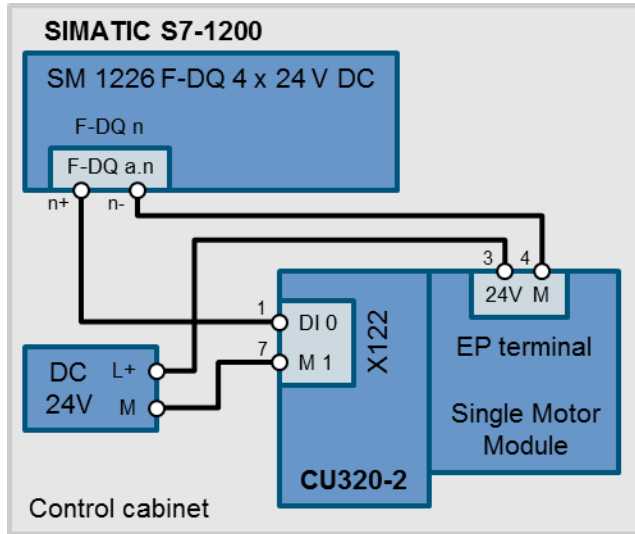


Figure 8-2: S7-1200 4 F-DQ (PM-switching) with TM54F

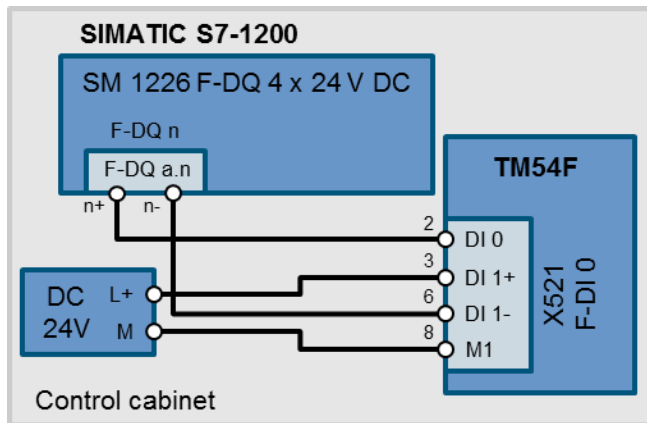


Figure 8-3: S7-1200 4 F-DQ (PM-switching) with CU310-2

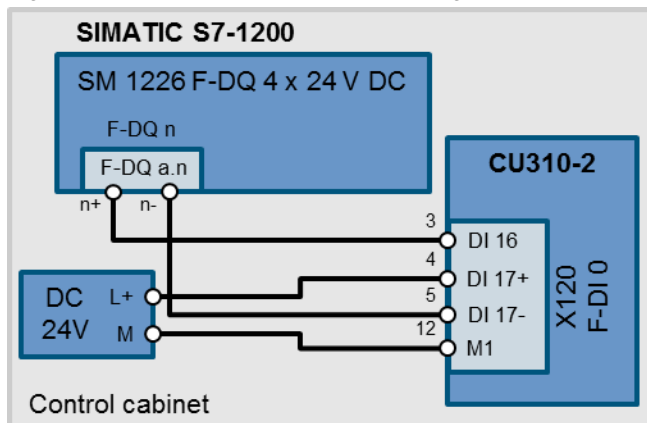


Table 8-1: Used components

Component	Article Number
S7-1200 4 F-DQ	6ES7226-6DA32-0XB0

The residual currents of the F-DQs of the S7-1200 4 F-DQ component are maximum 0.5 mA for both the P and the M channel. No special wiring is required for a direct connection.

The test pulses (light or dark test) are applied directly at the DIs of the SINAMICS components. The dark test pulses (temporary deactivation with logical 1 at the F-DQ) and the light test pulses (temporary activation with logical 0 at the F-DQ) have a configurable duration. Depending on the configured duration it can be necessary to suppress the test pulses in the SINAMICS components.

To suppress both test pulses, the input filter should be set to a minimum value equal to the configured test pulse duration as described in [chapter 12](#).

9 Failsafe wiring of MSS central unit 3RK3 with SINAMICS

Figure 9-1: MSS central unit 3RK3 with CU320-2

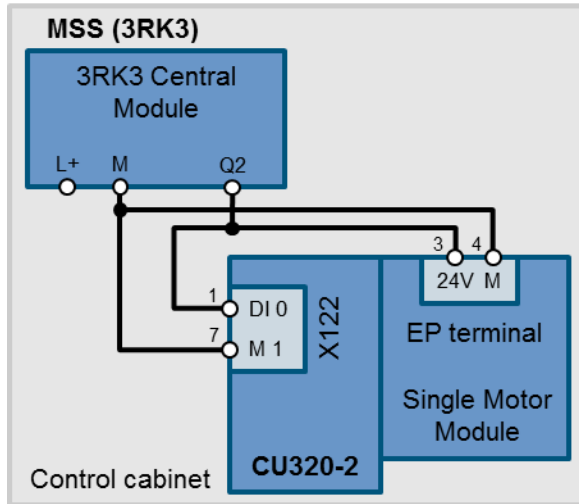


Figure 9-2: MSS central unit 3RK3 with TM54F

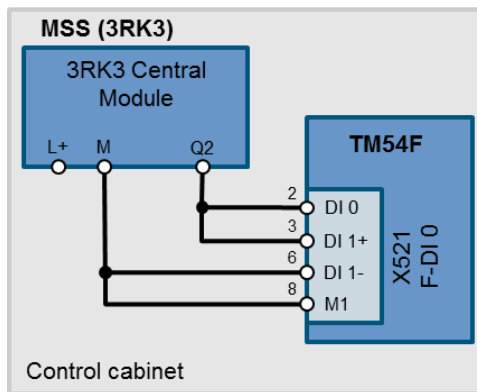


Figure 9-3: MSS central unit 3RK3 with CU310-2

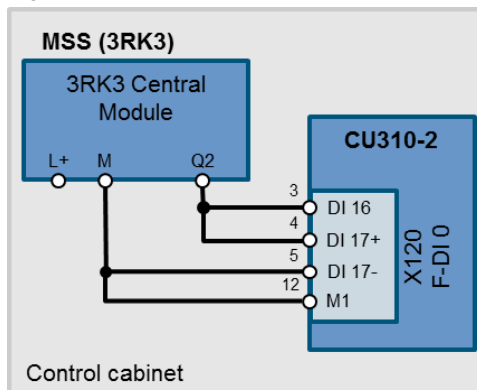


Table 9-1: Used components

Component	Article Number
MSS Basic central unit	3RK3111-1AA10
MSS Advanced central unit	3RK3131-1AC10
MSS ASIsafe basic central unit	3RK3121-1AC10
MSS ASIsafe extended central unit	3RK3122-1AC10
MSS Expansion module 4 F-DO	3RK3242-1AA10
MSS Expansion module 2/4 F-DI 2 F-DO	3RK3231-1AA10

In this example, the P/P-switching semiconductor output of the MSS central unit is used for the control of the F-DI of the SINAMICS components. This output only has one P output which is connected internally to two semiconductor switches twice. The M connection is available centrally at the M terminal.

For wiring with fault exclusion for cross-circuit to 24 V (e.g. fixed installation within a cabinet, see EN 60204-1:2006, Chapter 13), both channels of one F-DI of the SINAMICS components may be connected to one F-DQ. If there is no wiring with fault exclusion for cross-circuit to 24 V, two F-DQs with separate wiring can be used on the two channels F-DI of the SINAMICS components. These two F-DQs must then be controlled simultaneously.

No measures for residual currents are required for this module, as they are always less than 0.5 mA.

The duration of the test pulses for the dark test of the F-DQs depends on the MSS unit and can require up to 3 ms.

To suppress the test pulses, the configurable input should be set to a minimum value of 3 ms depending on the MSS unit as described in chapter [12](#).

10 Failsafe wiring of SIRIUS 3SK1 with SINAMICS

Figure 10-1: SIRIUS Safety Relay 3SK1 Advanced with CU320-2

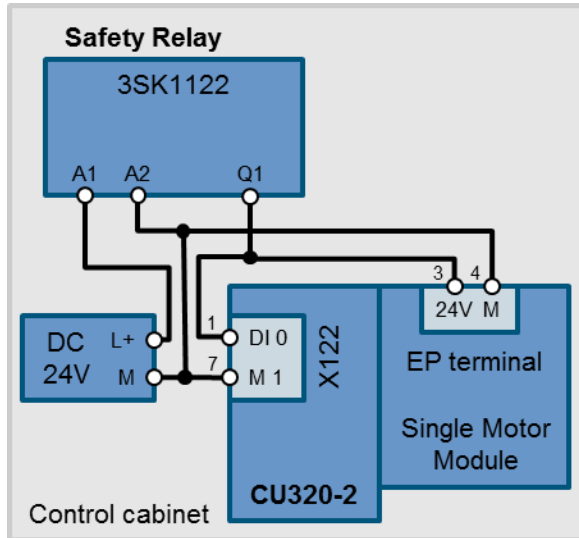


Figure 10-2: SIRIUS Safety Relay 3SK1 Advanced with TM54F

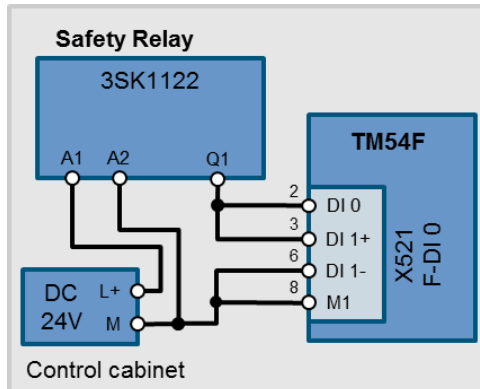


Figure 10-3: SIRIUS Safety Relay 3SK1 Advanced with CU310-2

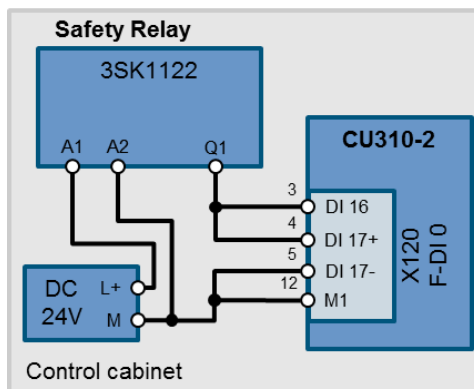


Table 10-1: Used components

Component	Article Number
SIRIUS 3SK1 Advanced	3SK1122-1CB41

The 3SK1122 example shows how the Safety Integrated Functions are controlled via the safe electronic outputs of the SIRIUS 3SK1 Safety Relays. The instantaneous output at terminal Q1 is used in the example. The delayed output (terminal Qt1) can also be used as an alternative. The F-DQs only have one P output which is connected twice internally to two semiconductor switches. The M connection is available at a common terminal (A2).

For wiring with fault exclusion for cross-circuit to 24 V (e.g. fixed installation within a cabinet, see EN 60204-1:2006, Chapter 13), both channels of one F-DI of the SINAMICS components may be connected to one F-DQ. If there is no wiring with fault exclusion for cross-circuit to 24 V, two F-DQs with separate wiring can be used on the two channels F-DI of the SINAMICS components. These two F-DQs must then be controlled simultaneously.

No measures for residual currents are required for this module, as they are always less than 0.5 mA.

The test pulses for the dark test of the F-DQs generally take less than 2 ms. Under certain circumstances, test pulses can also occur with a duration of up to 5ms.

To suppress the test pulses, the configurable input filter should be set to a minimum value of 5 ms as described in chapter [12](#).

11 Failsafe wiring of SIRIUS 3SK2 with SINAMICS

Figure 11-1: SIRIUS Safety Relay 3SK2 with CU320-2

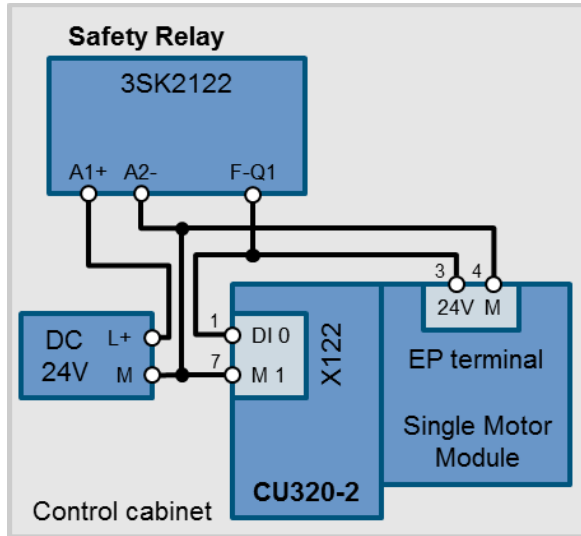


Figure 11-2: SIRIUS Safety Relay 3SK2 with TM54F

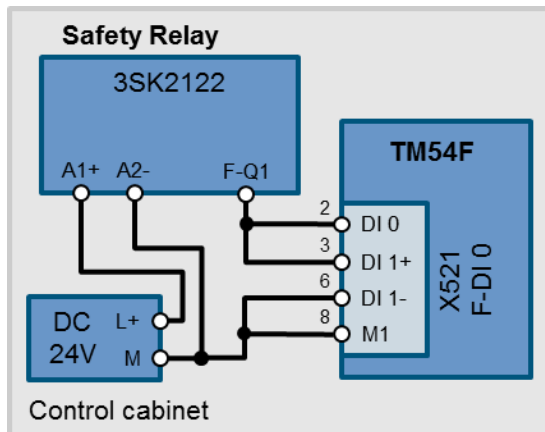


Figure 11-3: SIRIUS Safety Relay 3SK2 with CU310-2

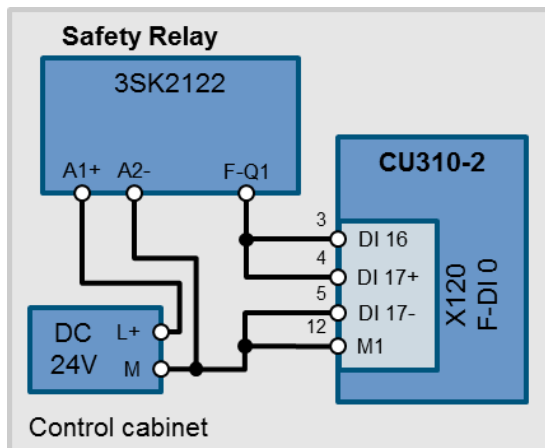


Table 11-1: Used components

Component	Article Number
SIRIUS Safety Relay 3SK2	3SK2122-2AA10

The 3SK2122 example shows how the Safety Integrated Functions are controlled via the safe electronic outputs of the SIRIUS 3SK2 Safety Relays. The instantaneous output at terminal F-Q1 is used in the example. The F-DQs only have one P output which is connected twice internally to two semiconductor switches. The M connection is available at a common terminal (A2-).

The logic in the SIRIUS Safety Relay 3SK2 is programmed with the software Safety ES. In this software, a delayed output can be realized.

For wiring with fault exclusion for cross-circuit to 24 V (e.g. fixed installation within a cabinet, see EN 60204-1:2006, Chapter 13), both channels of one F-DI of the SINAMICS components may be connected to one F-DQ. If there is no wiring with fault exclusion for cross-circuit to 24 V, two F-DQs with separate wiring can be used on the two channels F-DI of the SINAMICS components. These two F-DQs must then be controlled simultaneously.

No measures for residual currents are required for this module, as they are always less than 0.5 mA.

The dark test pulses have a maximum duration of 3 ms. If delayed F-DQs are used, the duration can be configured up to 400 ms. The light test pulses (temporary activation with logical 0 at the F-DQ) have a maximum duration of 3 ms.

To suppress both test pulses, the configurable input filter should be set to a minimum value of 3 ms as described in chapter [12](#).

12 Configuration of the F-DI input filter

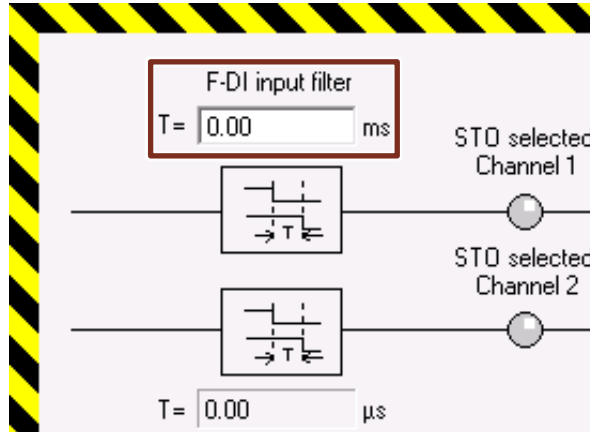
To suppress test pulses that are also applied directly at the DIs of the SINAMICS components, an input filter can be configured. This filter prevents that the Safety Integrated Functions are selected or deselected unintentionally.

The following parameter setting is required:

Basic Functions via onboard-terminals

$p9651 = p9581 \geq \text{Duration of test pulse}$

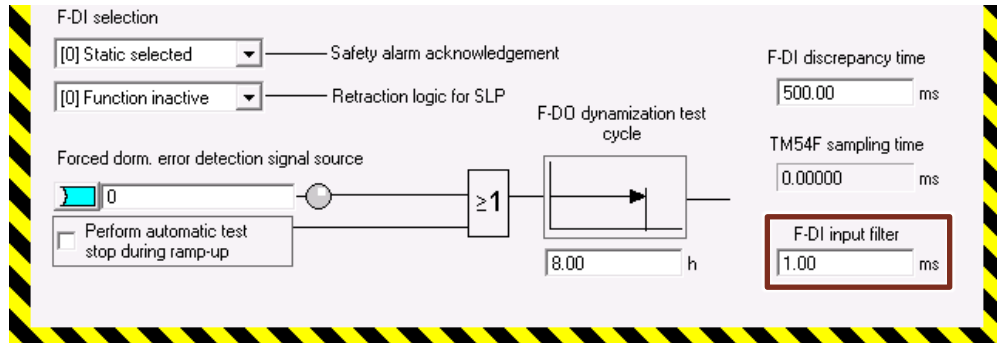
Figure 12-1: Configuring the F-DI input filter for the Basic Functions



Basic & Extended Functions via TM54F

$p10017 = p10117 \geq \text{Duration of test pulse}$

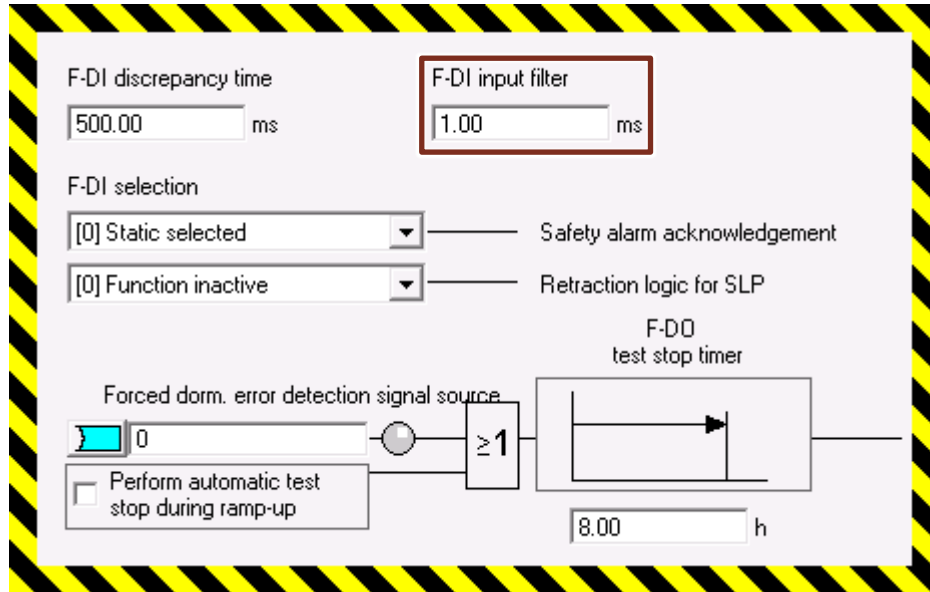
Figure 12-2: Configuring the F-DI input filter for TM54F



Extended Functions via onboard-terminals (F-DI) of CU310-2

$p10017 = p10117 \geq \text{Duration of test pulse}$

Figure 12-3: Configuring the F-DI input filter for the CU310-2 (Extended Functions)



NOTE The filter time increases the reaction time of the Safety Functions by this value.

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13 History

Table 13-1

Version	Datum	Änderung
V1.0	12/2009	First Edition
V2.0	01/2013	Update
V3.0	01/2017	Addition of ET200SP; ET200MP; S71200F; 3SK2; Exclusion 3TK28

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