SIEMENS

SIMATIC

ET 200SP
Digital output module
F-RQ 1x24VDC/24..230VAC/5A
(6ES7136-6RA00-0BF0)

Manual

03/2014
A5E33267029-AA

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Preface

Purpose of this documentation

This manual complements the system manual ET 200SP distributed I/O system. General functions of the ET 200SP are described in the system manual ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293).

The information in this manual and the system manual supports you when commissioning the ET 200SP system.

Conventions

Pay particular attention to notes highlighted as follows::

Note

A note contains important information on the product described in the documentation, on handling the product or on the part of the documentation to which you should pay special attention.

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. You can find more information about industrial security on the Internet (http://www.siemens.com/industrialsecurity).

To stay informed about product updates as they occur, sign up for a product-specific newsletter. You can find more information on the Internet (http://support.automation.siemens.com).

Table of contents

Guide to the documentation

1

1.1 Guide to the documentation for the digital output module F-RQ 1x24VDC/24..230VAC/5A

Introduction

The documentation of the SIMATIC products has a modular structure and includes topics relating to your automation system.

The complete documentation of the ET 200SP system consists of different modules made up of system manuals, function manuals and device manuals.

The STEP 7 (online help) information system supports you when configuring and programming your automation system.

Overview of the documentation for the fail-safe digital output module F-RQ 1x24VDC/24..230VAC/5A

The table below lists additional documents that complement this description of the fail-safe digital output module F-RQ 1x24VDC/24..230VAC/5A and that are available on the Internet.

Table 1- 1 Documentation for the fail-safe digital output module F-RQ 1x24VDC/24..230VAC/5A

Topic	Documentation	Most important contents
Description of the system	System manual ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293)	• Application planning • Installation • Connecting up • Commissioning • Approvals • TÜV certificates
BaseUnits	Manual ET 200SP BaseUnits (http://support.automation.siemens.com/WW/view/en/58532597/133300)	Technical specifications
Description of the SIMATIC Safety F-system	Programming and operating manual SIMATIC Safety - Configuring and Programming (http://support.automation.siemens.com/WW/view/en/54110126)	• Configuring • Programming • Approvals

SIMATIC manuals

The latest manuals for SIMATIC products are available on the Internet (http://www.siemens.com/automation/service&support) for free download.

Functional Safety Services

Siemens Functional Safety Services support you with a comprehensive package of services from risk assessment and verification right through to plant commissioning and modernization. We also offer consultation on the use of fail-safe and fault-tolerant SIMATIC S7 automation systems.

You will find more detailed information on the Internet (http://www.siemens.com/automation/service&support).

Please e-mail any queries you may have e-mail (mailto:safety-services.industry@siemens.com).

Product overview

2

2.1 Properties of the F-RQ 1x24VDC/24..230VAC/5A

Article number

6ES7136-6RA00-0BF0

View of the module

Figure 2-1 View of the F-RQ 1x24VDC/24..230VAC/5A module

Properties

- Technical properties
  - Digital module with 1 relay output (2 isolated NO contacts)
  - Safety class SIL3/category 4/PLe can be achieved if the F-RQ module is controlled by a fail-safe output (for example F-module F-DQ 4x24VDC/2A PM HF)
  - Control voltage 24 VDC
  - Total current for both NO contacts 5 A max.
  - Isolated from control voltage
  - Suitable for solenoid valves, DC contactors and signal lamps
- Supported system functions
  - I&M identification data
  - Firmware update

WARNING

The fail-safe performance characteristics in the technical specifications apply for a service life of 20 years and a repair time of 100 hours. If a repair within 100 hours is not possible, remove the module in question from the BaseUnit or switch off its supply voltage before 100 hours are up.

Accessories

The following components can be used with the module:

- Labeling strips
- Color identification labels
- Reference identification labels

Connecting up

3

3.1 Terminal assignment

General terminal assignment

Table 3- 1 Terminal assignment for F-RQ 1x24VDC/24..230VAC/5A

Terminal assignment for F-RQ 1x24VDC/24..230VAC/5A (6ES7136-6RA00-0BF0)						
Terminal	**Assignment**	**Terminal**	**Assignment**	**Description**	**BaseUnit**	**Color identification label (terminals 1 to 16)**
1	RQ_{01}+ [13]	**2**	RQ_{01}- [14]	• RQ_n+, RQ_n-: Channel n • IN: Control input • OUT: Control input for loop-through	BU20-P8+A4+0B	 CC42 6ES7193-6CP42-2MB0
3	RQ_{02}+ [23]	**4**	RQ_{02}- [24]			
5	—	**6**	—			
7	—	**8**	—			
9	IN P	**10**	OUT P			
11	IN M	**12**	OUT M			
13	AUX	**14**	AUX			
15	AUX	**16**	AUX			

3.2 Block diagram

Block diagram

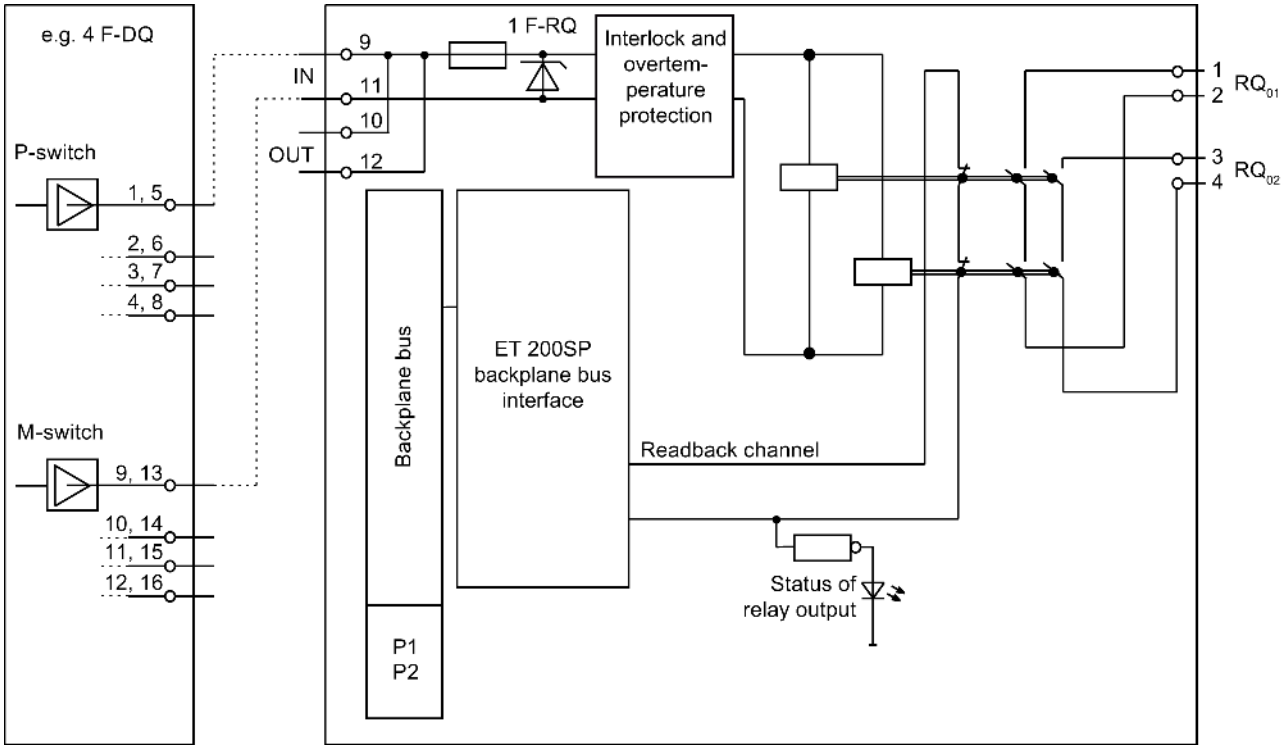


Figure 3-1 Block diagram F-RQ 1x24VDC/24..230VAC/5A

Addressing

4

4.1 Address space

Address assignment of the digital output module F-RQ 1x24VDC/24..230VAC/5A

The digital output module F-RQ 1x24VDC/24..230VAC/5A occupies the following address ranges in the F-CPU:

Table 4- 1 Address assignment in the F-CPU

Occupied bytes in the F-CPU:	
in input range	in output range
x.0 and x.1	—

x = Module start address

Address assignment of the user data of the digital output module F-RQ 1x24VDC/24..230VAC/5A

Of the occupied addresses of the digital output module F-RQ 1x24VDC/24..230VAC/5A, the user data occupies the following addresses in the F-CPU:

Table 4- 2 User data address assignment in the input range

Byte in the F-CPU	Assigned bits in F-CPU per F-RQ module:							
	7	6	5	4	3	2	1	0
x + 0	—	—	—	—	—	—	RQ_1 Inverted readback channel (corresponds to process signal at IN)	RQ_0 Readback channel

x = Module start address

The user data is in the standard process image of the inputs and is not transferred to the F-CPU in safety-related communication. The readback channel in the user program is therefore displayed as a non-failsafe variable.

Note

With migration projects from the ET 200S product family, note the following:

The readback channel RQ_0 (bit 0) allows direct interconnection with the FDBACK instruction (F-block F_FDBACK) to its FEEDBACK input without additional inversion.

The readback channel RQ_1 (bit 1) is inverted.

Additional information

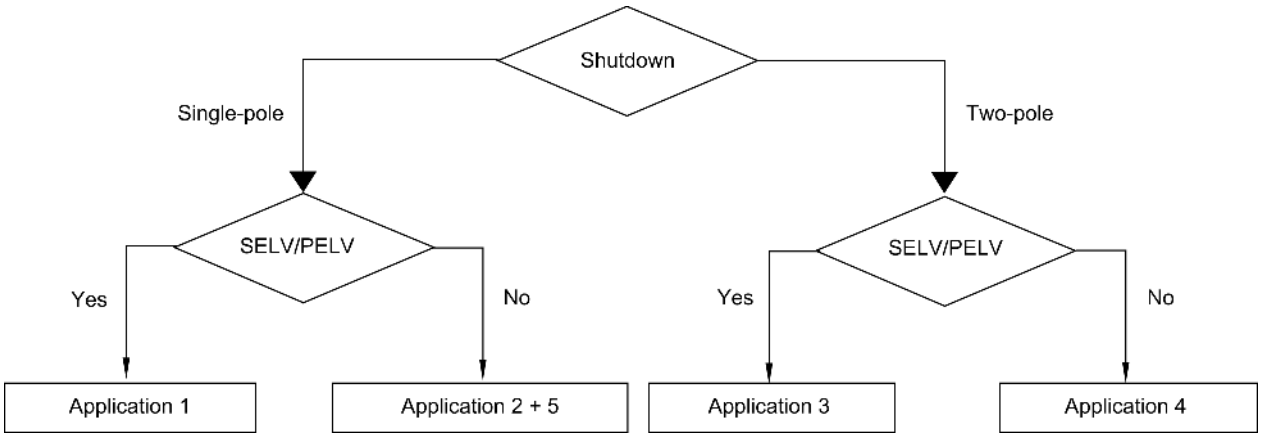
For detailed information about F-I/O access, refer to the SIMATIC Safety, Configuring and Programming (http://support.automation.siemens.com/WW/view/en/54110126) manual.

Applications of the F-I/O module

5

5.1 Applications of the F-RQ 1x24VDC/24..230VAC/5A

You can achieve SIL3/category 4/PLe in the following applications if the activating F-module supports SIL3/category 4/PLe.



The wiring is carried out on the suitable BaseUnit (http://support.automation.siemens.com/WW/view/en/58532597/133300).

Wiring the 24 VDC power supply

Apply the 24 VDC control voltage to IN P (terminal 9) and IN M (terminal 11). The 24 VDC supply line is usually connected via a sourcing/sinking fail-safe output (e.g. digital output module F-DQ 4x24VDC/2A PM HF). Wire the P output (sourcing) of the F-DQ to the IN P of the F-RQ module and the M output (sinking)to the IN M of the F-RQ module.

As an alternative, you can also connect to a sourcing-sourcing fail-safe output. However, note that external short-circuits to P at the P input cannot be controlled. In this case, IN M would be connected directly to the control voltage ground.

NOTICE
Connecting the control voltage to the IN P and IN M inputs with the reverse polarity will destroy the F-module.

Wiring the load voltage and the load

The connectors of the relay output are electrically isolated NO contacts. This means that power must be supplied to these contacts from an external source. Connect the load supply (supply 1) and the load (load 1) in series to the RQ_{01} connectors (terminals 1;2). This ensures that the NO contacts of the relay interrupt the current flow of the power supply through the load. Due to the two relay contacts connected in series, the current flow can still be interrupted if one of the two relays has a fault..

The second circuit is independent of the first. They are logically interconnected by the common control. This means that the potential in the RQ_{02} (terminals 3;4), supply 2 and load 2 circuit may be different.

⚠ WARNING
If you connect a non-SELV/PELV power supply to one channel, you must not use the other channel.

Parameter assignment of the digital output module F-DQ 4x24VDC/2A PM HF

Assign the following parameters for the channel of the F-DQ 4x24VDC/2A PM HF digital output module to be activated:

Table 5- 1 Parameter assignment

Parameter	
Max. readback time dark test	1 ms
Max. readback time switch on test	1 ms

As the relays are highly inductive, you have the option of activating "Diagnostics: wire break" *or "*enable light test".

5.2 Application 1: 2 loads, single-pole switch-off

Wiring diagram

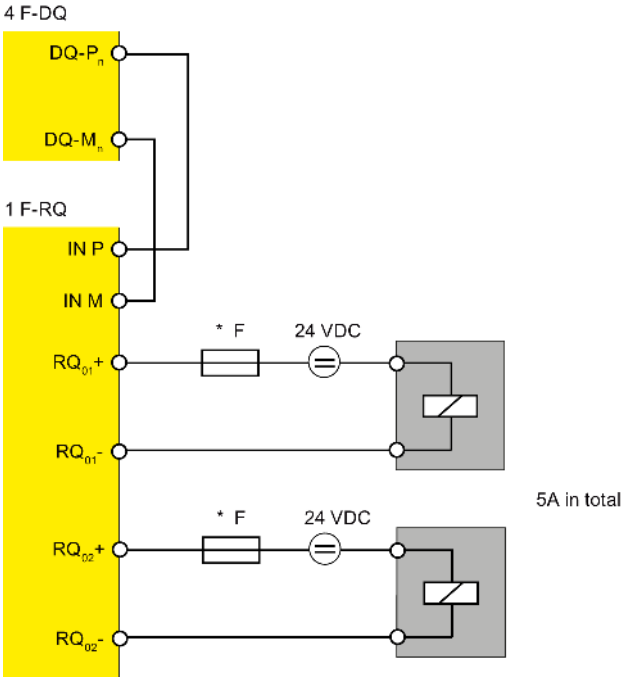


Figure 5-1 Wiring diagram of the F-RQ 1x24VDC/24..230VAC/5A to an F-DQ module

In this application, you can use one F-RQ module for single-pole switching of two loads with a total of 5A and one/two SELV/PELV power supplies.

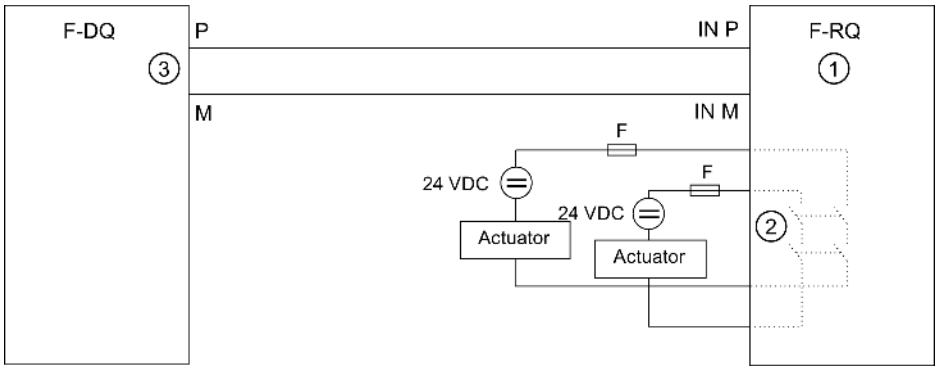
WARNING

* Always install an external fuse with the following properties to protect the relay contacts from overload and short-circuits: Fuse, 6 A, operating class gL/gG or C6A miniature circuit breaker, rated short-circuit current of 400 A.

Note that for applications in accordance with EN 50156-1 the specified rated current of the overcurrent protective device must be multiplied by a safety factor of 0.6 to rule out the error "non-opening of contact elements due to permanent contact welding".

Reading back the relay contacts

In the safety program, always compare the readback value returned by the F-RQ module with the control status. In *STEP 7 Safety Advanced*, you can use the instruction "FDBACK: Feedback circuit monitoring" in your safety program (see the SIMATIC Safety - Configuring and Programming (http://support.automation.siemens.com/WW/view/en/54110126) manual).



① F-RQ with integrated FEEDBACK input
② Relay contacts for switching the load
③ Output Q

Figure 5-2 Wiring example for the FDBACK instruction

If the 24 VDC control voltage falls below the value required for relay pick-up or if the wire to the input connectors breaks, the relays are released and "1" is read back instead of "0". This fault is only detected if the F-DQ module output is switched on.

If one of the two load contacts connected in series fails to open, "0" is read back by the module. The fault is detected by comparing this readback value with the setpoint "1" in the safety program. This fault is only detected if the control voltage is switched off.

Note

SIL3/category 4/PLe requires that there is a signal change at least once a month and that the process status is read back.

SIL2/category 3/PLd requires that there is a signal change at least once a year and that the process status is read back.

If a fault is detected during this function test, replace the F-RQ module.

5.3 Application 2: 1 load, single-pole switch-off

Wiring diagram

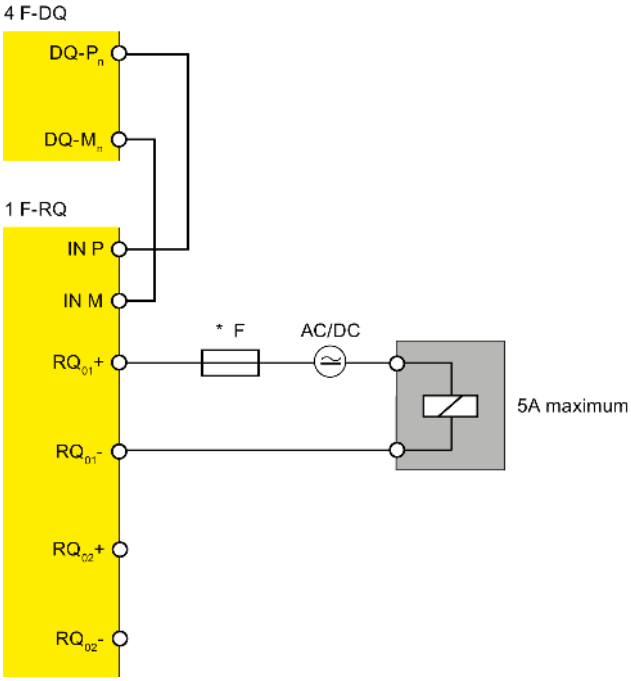


Figure 5-3 Wiring diagram of the F-RQ 1x24VDC/24..230VAC/5A to an F-DQ module

This application allows single-pole switching of one load with a total of 5A with one F-RQ module.

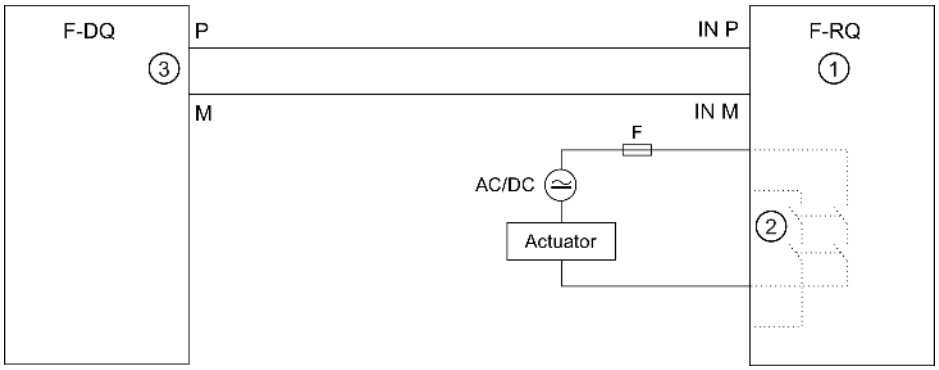
WARNING

* Always install an external fuse with the following properties to protect the relay contacts from overload and short-circuits: Fuse, 6 A, operating class gL/gG or C6A miniature circuit breaker, rated short-circuit current of 400 A.

Please note that for applications in accordance with EN 50156-1, the specified rated current of the overcurrent protective device must be multiplied by the safety factor 0.6 to rule out the error "non-opening of contact elements due to permanent contact welding".

Reading back the relay contacts

In the safety program, always compare the readback value returned by the F-RQ module with the control status. In *STEP 7 Safety Advanced*, you can use the instruction "FDBACK: Feedback circuit monitoring" in your safety program (see the SIMATIC Safety - Configuring and Programming (http://support.automation.siemens.com/WW/view/en/54110126) manual).



① F-RQ with integrated FEEDBACK input
② Relay contacts for switching the load
③ Output Q

Figure 5-4 Wiring example for the FDBACK instruction

If the 24 VDC control voltage falls below the value required for relay pick-up or if the wire to the input connectors breaks, the relays are released and "1" is read back instead of "0". This fault is only detected if the F-DQ module output is switched on.

If one of the two load contacts connected in series fails to open, "0" is read back by the module. The fault is detected by comparing this readback value with the setpoint "1" in the safety program. This fault is only detected if the control voltage is switched off.

Note

SIL3/category 4/PLe requires that there is a signal change at least once a month and that the process status is read back.

SIL2/category 3/PLd requires that there is a signal change at least once a year and that the process status is read back.

If a fault is detected during this function test, replace the F-RQ module.

5.4 Application 3: 1 load, two-pole switch-off with 1 F-RQ module

Wiring diagram

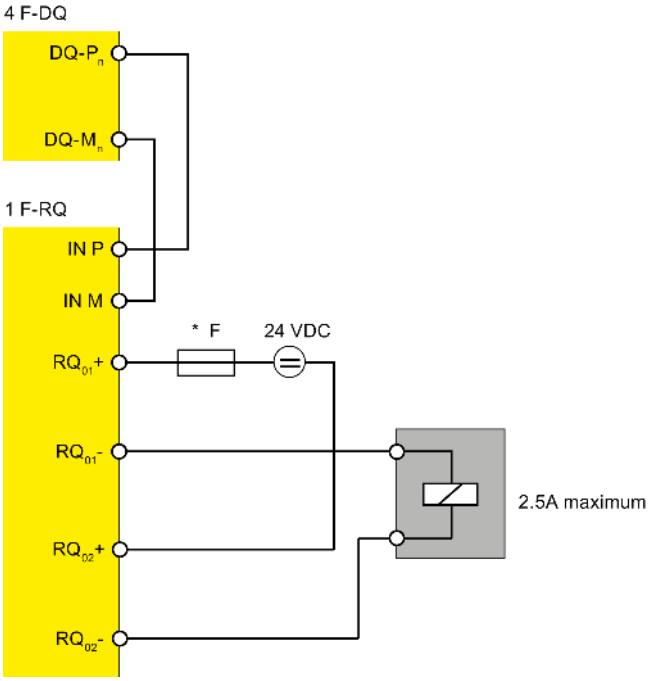


Figure 5-5 Wiring diagram for two F-RQ 1x24VDC/24..230VAC/5A to one F-DQ module

This application allows two-pole switching with one F-RQ module of one load with a maximum of 2.5A and an SELV/PELV power supply.

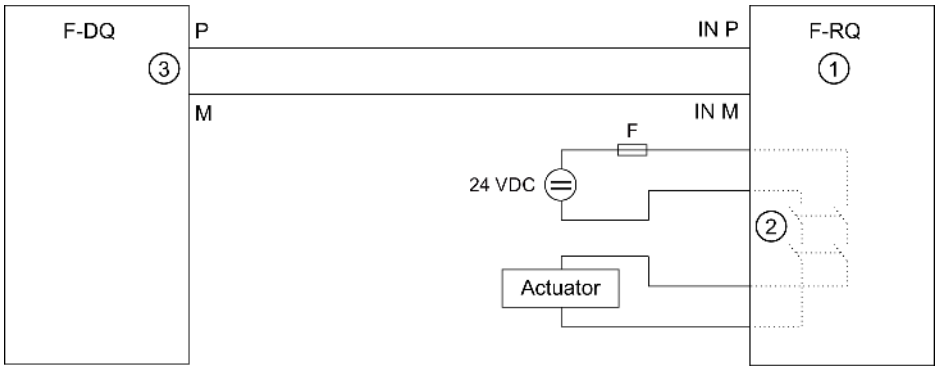
⚠ WARNING

* Always install an external fuse with the following properties to protect the relay contacts from overload and short-circuits: Fuse, 6 A, operating class gL/gG or C6A miniature circuit breaker, rated short-circuit current of 400 A.

Note that for applications in accordance with EN 50156-1 the specified rated current of the overcurrent protective device must be multiplied by a safety factor of 0.6 to rule out the error "non-opening of contact elements due to permanent contact welding".

Reading back the relay contacts

In the safety program, always compare the readback value returned by the F-RQ module with the control status. In *STEP 7 Safety Advanced*, you can use the instruction "FDBACK: Feedback circuit monitoring" in your safety program (see the SIMATIC Safety - Configuring and Programming (http://support.automation.siemens.com/WW/view/en/54110126) manual).



① F-RQ with integrated FEEDBACK input
② Relay contacts for switching the load
③ Output Q

Figure 5-6 Wiring example for the FDBACK instruction

If the 24 VDC control voltage falls below the value required for relay pick-up or if the wire to the input connectors breaks, the relays are released and "1" is read back instead of "0". This fault is only detected if the F-DQ module output is switched on.

If one of the two load contacts connected in series fails to open, "0" is read back by the module. The fault is detected by comparing this readback value with the setpoint "1" in the safety program. This fault is only detected if the control voltage is switched off.

Note

SIL3/category 4/PLe requires that there is a signal change at least once a month and that the process status is read back.

SIL2/category 3/PLd requires that there is a signal change at least once a year and that the process status is read back.

If a fault is detected during this function test, replace the F-RQ module.

5.5 Application 4: 1 load, two-pole switch-off with 2 F-RQ modules

Wiring diagram

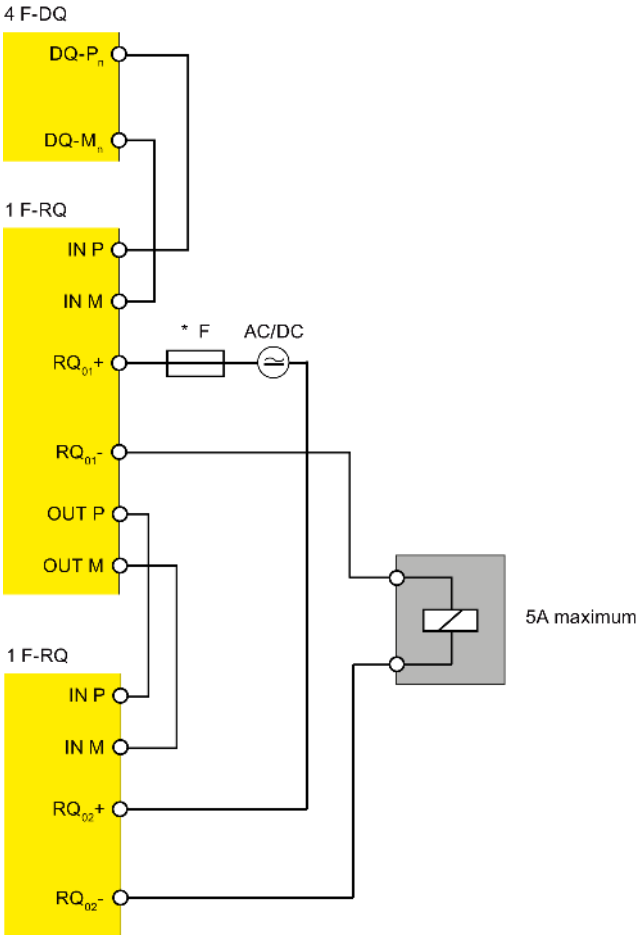


Figure 5-7 Wiring diagram for two F-RQ 1x24VDC/24..230VAC/5A to one F-DQ module

This application allows two-pole switching of one load with a max. of 5A with two F-RQ modules.

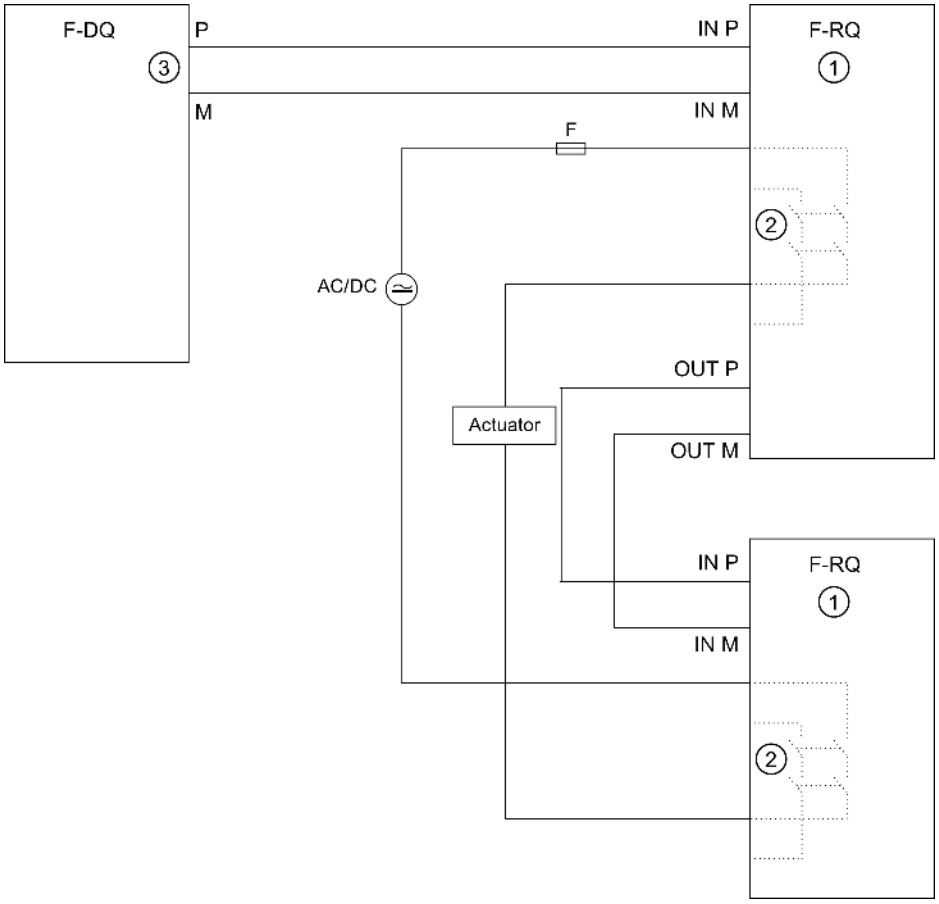
WARNING

* Always install an external fuse with the following properties to protect the relay contacts from overload and short-circuits: Fuse, 6 A, operating class gL/gG or C6A miniature circuit breaker, rated short-circuit current of 400 A.

Note that for applications in accordance with EN 50156-1 the specified rated current of the overcurrent protective device must be multiplied by a safety factor of 0.6 to rule out the error "non-opening of contact elements due to permanent contact welding".

Reading back the relay contacts

In the safety program, always compare the readback value returned by the F-RQ module with the control status. In *STEP 7 Safety Advanced*, you can use the instruction "FDBACK: Feedback circuit monitoring" in your safety program (see the SIMATIC Safety - Configuring and Programming (http://support.automation.siemens.com/WW/view/en/54110126) manual).



① F-RQ with integrated FEEDBACK input
② Relay contacts for switching the load
③ Output Q

Figure 5-8 Wiring example for the FDBACK instruction

If the 24 VDC control voltage falls below the value required for relay pick-up or if the wire to the input connectors breaks, the relays are released and "1" is read back instead of "0". This fault is only detected if the F-DQ module output is switched on.

If one of the two load contacts connected in series fails to open, "0" is read back by the module. The fault is detected by comparing this readback value with the setpoint "1" in the safety program. This fault is only detected if the control voltage is switched off.

Note

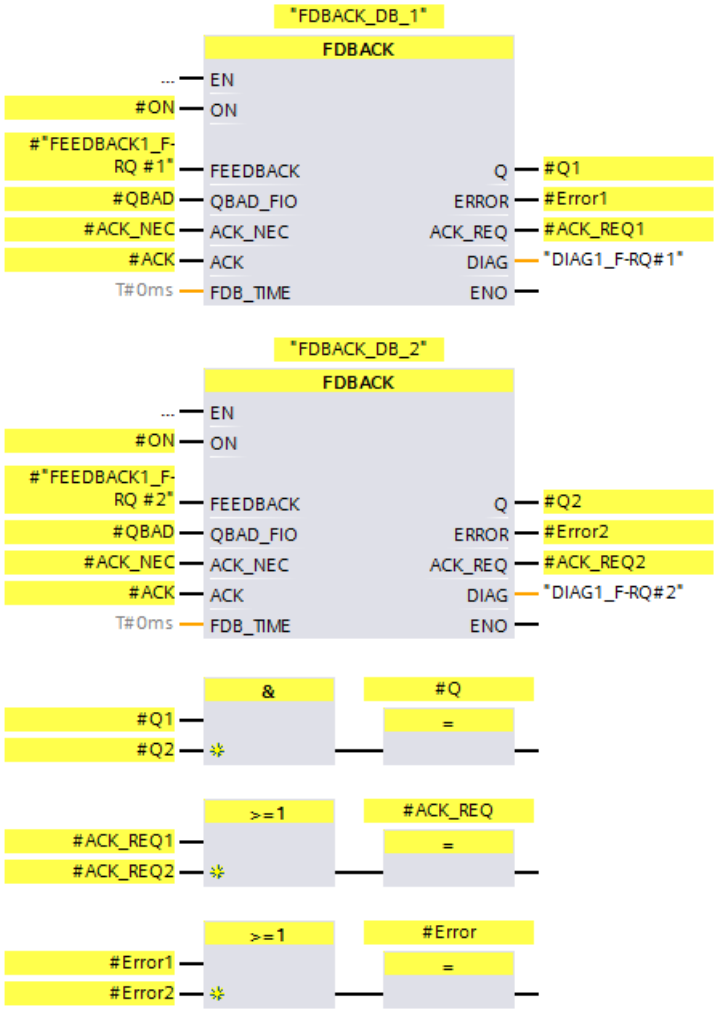
SIL3/category 4/PLe requires that there is a signal change at least once a month and that the process status is read back.

SIL2/category 3/PLd requires that there is a signal change at least once a year and that the process status is read back.

If a fault is detected during this function test, replace the F-RQ module.

Program example

For this application, program an FDBACK instruction for each F-RQ module as follows:



5.6 Application 5: 2 loads, single-pole switch-off with 2 F-RQ modules

Wiring diagram

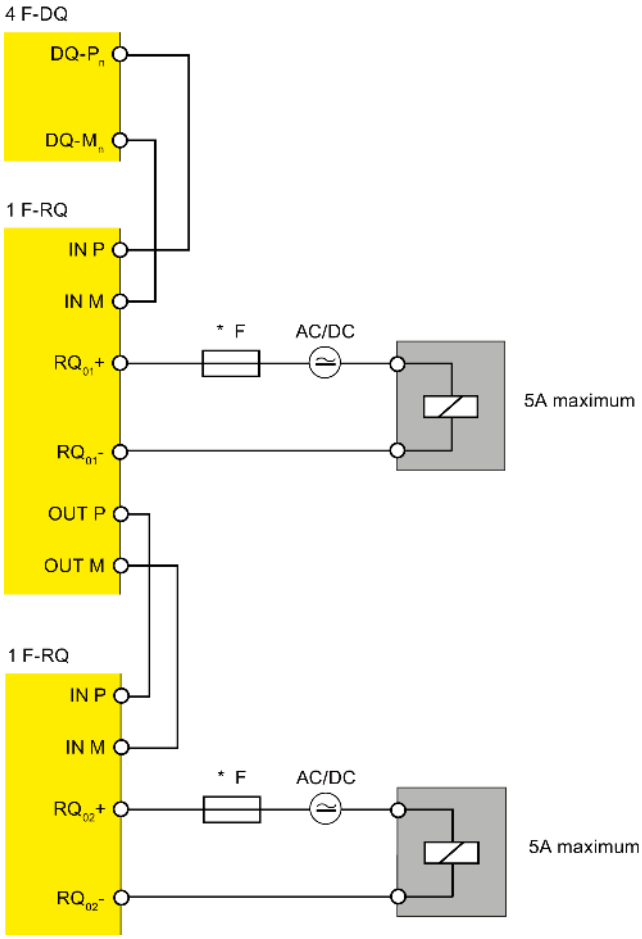


Figure 5-9 Wiring diagram for two F-RQ 1x24VDC/24..230VAC/5A to one F-DQ module

This application allows the single-pole switching of two loads with 5A each with two F-RQ modules. One power supply is not SELV/PELV.

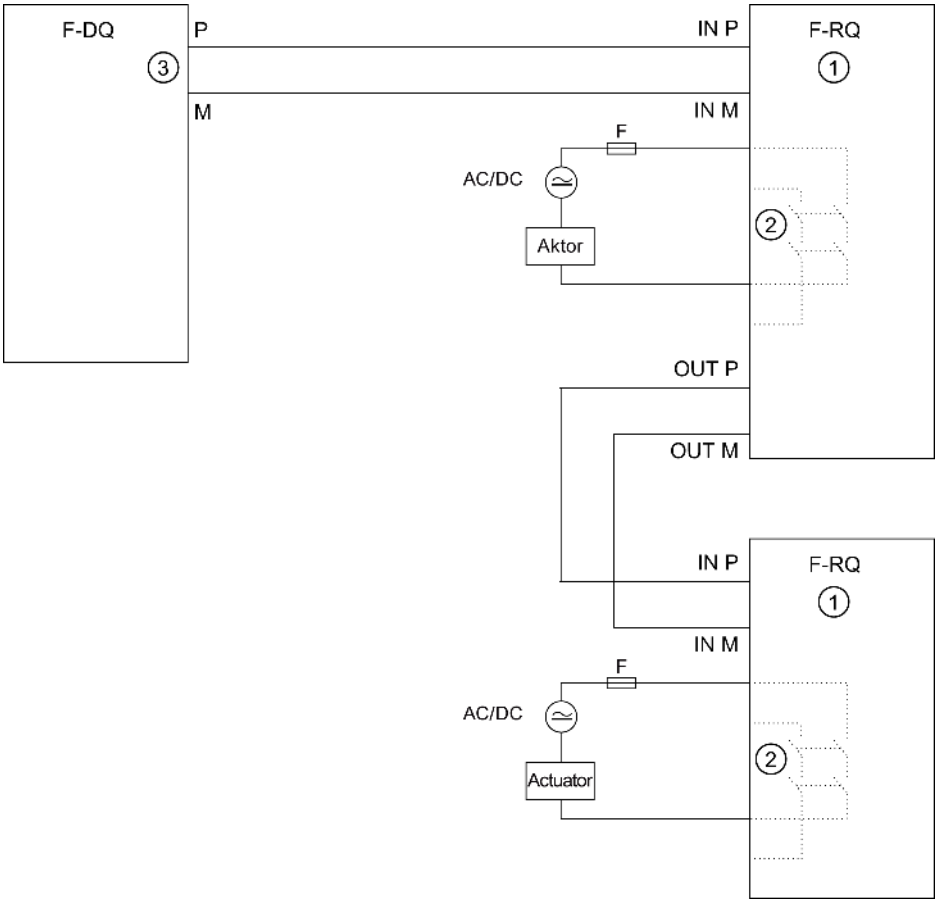
WARNING

* Always install an external fuse with the following properties to protect the relay contacts from overload and short-circuits: Fuse, 6 A, operating class gL/gG or C6A miniature circuit breaker, rated short-circuit current of 400 A.

Note that for applications in accordance with EN 50156-1 the specified rated current of the overcurrent protective device must be multiplied by a safety factor of 0.6 to rule out the error "non-opening of contact elements due to permanent contact welding".

Reading back the relay contacts

In the safety program, always compare the readback value returned by the F-RQ module with the control status. In *STEP 7 Safety Advanced*, you can use the instruction "FDBACK: Feedback circuit monitoring" in your safety program (see the SIMATIC Safety - Configuring and Programming (http://support.automation.siemens.com/WW/view/en/54110126) manual).



① F-RQ with integrated FEEDBACK input
② Relay contacts for switching the load
③ Output Q

Figure 5-10 Wiring example for the FDBACK instruction

If the 24 VDC control voltage falls below the value required for relay pick-up or if the wire to the input connectors breaks, the relays are released and "1" is read back instead of "0". This fault is only detected if the F-DQ module output is switched on.

If one of the two load contacts connected in series fails to open, "0" is read back by the module. The fault is detected by comparing this readback value with the setpoint "1" in the safety program. This fault is only detected if the control voltage is switched off.

Note

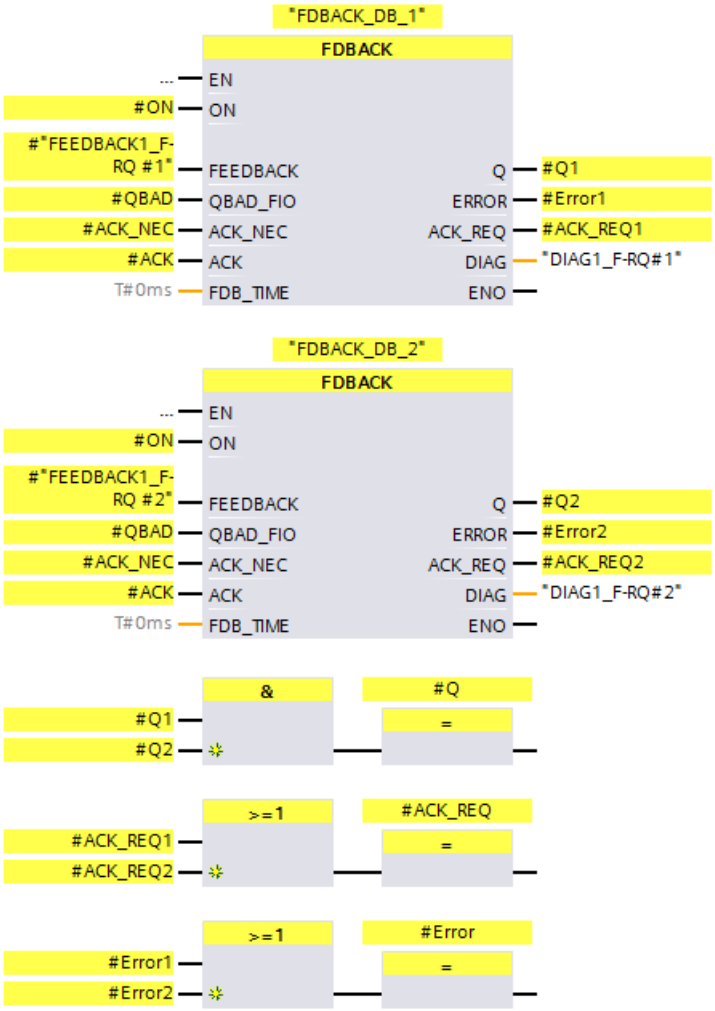
SIL3/category 4/PLe requires that there is a signal change at least once a month and that the process status is read back.

SIL2/category 3/PLd requires that there is a signal change at least once a year and that the process status is read back.

If a fault is detected during this function test, replace the F-RQ module.

Program example

For this application, program an FDBACK instruction for each F-RQ module as follows:

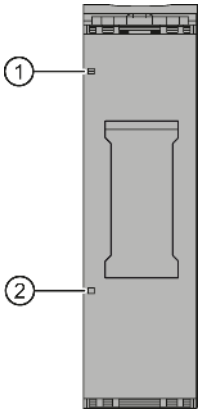


Status and error display

6

6.1 Status and error display

LED display



① DIAG (green/red)
② Channel status (green)

Figure 6-1 LED display

Meaning of the LED displays

The following tables explain the meaning of the status and error displays.

WARNING
The DIAG LED and the channel status LED of the output are not designed as safety-related LEDs and therefore must not be evaluated for safety-related activities.

DIAG LED

Table 6- 1 Meaning of the DIAG LED

DIAG	Meaning
Off	Backplane bus supply of the ET 200SP not OK
Flashing	Module parameters not set
On	Module parameters set and no module diagnostics

Channel status LED

Table 6- 2 Meaning of the channel status LED

Status	Meaning
Off	Process signal = 0
On	Process signal = 1

Technical specifications

7

7.1 Technical specifications

Technical specifications of F-RQ 1×24VDC/24...230VAC/5A

	6ES7136-6RA00-0BF0
Product type designation	F-RQ 1x24VDC/24 ... 230VAC/5A
General information	
Hardware product version	01
Firmware version	V1.0.0
Product function	
I&M data	Yes; I&M0 to I&M3
Engineering with	
STEP 7 TIA Portal configurable/integrated as of version	V13
STEP 7 configurable/integrated as of version	V5.5 SP4 and higher
Installation type/mounting	
Rail mounting possible	Yes; standard mounting rail
Supply voltage	
Type of supply voltage	24 VDC
Rated value (DC)	24 V; coil voltage
Low limit of permitted range (DC)	20.4 V
High limit of permitted range (DC)	28.8 V
Power	
Power consumption from the backplane bus	100 mW
Power loss	
Power loss, typ.	1 W
Address range	
Address space per module	
Input	1 byte
Digital outputs	
Number of outputs	1
Voltage induced on current interruption limited to	No
Control of a digital input	Yes
Switching capacity of outputs	
With resistive load, max.	5 A
With lamp load, max.	25 W

	6ES7136-6RA00-0BF0
Switching frequency	
With resistive load, max.	2 Hz
With inductive load, max.	0.1 Hz; see information in the manual
With inductive load (to IEC 60947-5-1, DC13), max.	0.1 Hz
With inductive load (to IEC 60947-5-1, AC15), max.	2 Hz
Total current of the outputs (per module)	
Horizontal installation	
• Up to 40 °C, max.	5 A; note derating information in the manual
• Up to 50 °C, max.	4 A; note derating information in the manual
• Up to 60 °C, max.	3 A; note derating information in the manual
Vertical installation	
• Up to 50 °C, max.	3 A; note derating information in the manual
Relay outputs	
Number of relay outputs	1; 2 NO contacts
Rated input voltage of relay coil L+ (DC)	24 V
Current consumption of relays (coil current of all relays), max.	70 mA
External fuse for relay outputs	Yes, 6 A, see information in the manual
Relay approved acc. to UL 508	Yes; Pilot Duty B300 R300
Switching capacity of contacts	
• With inductive load, max.	See additional description in the manual
• With resistive load, max.	See additional description in the manual
• Thermal continuous current, max.	5 A
• Contact rating, min.	1 mA
• Contact rating after exceeding 300 mA, min.	10 mA
• Contact rating after exceeding 300 mA, max.	5 A
• Rated switching voltage (DC)	24 V
• Rated switching voltage (AC)	230 V
Length of cable	
Cable length, shielded, max.	500 m; for load contacts
Cable length unshielded, max.	300 m; for load contacts
Control cable (input), max.	10 m
Interrupts/diagnostics/status information	
Diagnostics messages	
Diagnostics	Yes, firmware update
Diagnostics display LED	
RUN LED	Yes; green/red DIAG LED
Channel status display	Yes; green LED

	6ES7136-6RA00-0BF0
Electrical isolation	
Electrical isolation, channels	
Between channels	Yes; only with SELV / PELV
Between the channels and the backplane bus	Yes
Between the channels and the supply voltage of the electronics	Yes
Permitted potential difference	
Between channels and backplane bus/supply voltage	250 VAC (reinforced insulation)
Between backplane bus and supply voltage	60 VAC/75 VDC
Insulation	
Insulation test voltage	2545 VDC 2 s (routine test)
Overvoltage category	III
Tested with	
Between channels and backplane bus/supply voltage	2545 VDC 2s (routine test), surge voltage test 7200 VDC/5 positive and 5 negative pulses (type test)
Between backplane bus and supply voltage	707 VDC (type test)
Standards, approvals, certificates	
Suitable for safety functions	Yes
Maximum achievable safety class in safety mode	
Performance level according to EN ISO 13849-1:2008	PLe
Category according to ISO 13849-1:2008	4
SIL according to IEC 61508:2010	SIL 3
Low demand (PFD) acc. to SIL2	<1.00E-04, proof test interval 1 year
Low demand (PFD) acc. to SIL3	<1.00E-05, proof test interval 1 month
High demand (PFH) acc. to SIL2	<1.00E-08 1/h, proof test interval 1 year
High demand (PFH) acc. to SIL3	<6.00E-09 1/h, proof test interval 1 month
Dimensions	
Width	20 mm
Weights	
Weight, approx.	56 g

Supplement to the technical specifications

Technical specifications	
Relay outputs	
Current consumption of relays (coil current of all relays), min.	20 mA
Permitted potential difference	
• Between NO contacts	75 VDC / 60 VAC
Insulation tested	
• Between the NO contacts	707 VDC (type test)

Derating

Note

As the modules are small, you need to monitor the heat build-up between adjacent modules if output modules are subject to high loads. A temperature rise in an output module exposed to a high load can result in shutdown and reduce plant availability. If the operating voltage > 25 VDC, the average total current of the modules directly adjacent should not exceed 50% of the levels listed in the technical specifications, and the ambient temperature should not exceed 50 °C.

If the ambient temperature exceeds 50 °C, supply voltage L+ must not exceed 25 VDC.

Dimension drawing

See ET 200SP BaseUnits (http://support.automation.siemens.com/WW/view/en/58532597/133300) manual

7.2 Mechanical and climatic ambient conditions

In contrast to the specifications for mechanical environmental conditions and mechanical environmental conditions testing in the "Mechanical and climatic ambient conditions" section of the ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293) system manual, the following applies to this F-module:

Mechanical ambient conditions

The following table shows the mechanical ambient conditions in the form of sinusoidal vibrations.

Table 7- 1 Mechanical ambient conditions

Frequency band	ET 200SP with BusAdapter BA 2×FC	ET 200SP with BusAdapter BA 2×RJ45/ BA 2xSCRJ
5 ≤ f ≤ 8.4 Hz	3.5 mm amplitude	
8.4 ≤ f ≤ 150 Hz	1 g constant acceleration	

Tests of mechanical ambient conditions

The following table provides important information about the type and scope of the tests for ambient mechanical conditions.

Table 7- 2 Tests of mechanical ambient conditions

Check for ...	Test standard	Comment
Vibration	Vibration test according to IEC 60068-2-6 (sinus)	Type of vibration: Frequency sweeps with a rate of change of 1 octave/minute. • 5 Hz ≤ f ≤ 8.4 Hz, 3.5 mm constant amplitude • 8.4 Hz ≤ f ≤ 150 Hz, 1 g constant acceleration Duration of vibration: 10 frequency sweeps per axis at each of three vertically aligned axes
Shock	Shock, tested according to IEC 60068-2-27	Type of shock: Half sine Shock intensity: 150 m/s^2 peak value, 11 ms duration Direction of shock: 3 shocks in each direction (+/-) at each of three vertically aligned axes

7.3 Switching capacity and service life of contacts

Switching capacity and service life of contacts

You can extend the service life beyond the value indicated in the tables below by installing an external protective circuit.

The tables below show the switching capacity and service life of the contacts.

Table 7- 3 Switching capacity and service life of contacts with resistive load

Voltage	Current	Duty cycles (typ.) NO contact
24 VDC	5.0 A	350000
	3.0 A	500000
	2.0 A	750000
	1.0 A	1800000
	0.5 A	4000000
230 VAC	5.0 A	100000
	3.0 A	150000
	2.0 A	200000
	1.0 A	400000
	0.5 A	800000

Table 7- 4 Switching capacity and service life of contacts **with inductive load according to IEC 947-5-1 DC 13/ AC15**

Voltage	Current	Duty cycles (typ.) NO contact
24 VDC	1.0 A	100000
	0.5 A	200000
230 VAC	1.0 A	200000
	0.5 A	350000

Table 7- 5 B10d values

AC	750000
DC	10000000

Response times

A

A.1 Response times

Introduction

The section below shows the response times of the digital output module F-RQ 1x24VDC/24..230VAC/5A. The response times of digital output module F-RQ 1x24VDC/24..230VAC/5A are included in the calculation of the F-system response time.

Definition of response time for fail-safe relay outputs

The response time defines the interval between controlling by means of a fail-safe digital output module until the signal change at the relay output.

Maximum response time without errors

The maximum response time for fail-safe relay outputs when there are no errors is equal to:

Max. response time = 16 ms

Readback response time

The readback response time for fail-safe relay outputs is equal to:

Readback response time = 30 ms

Maximum response time until error detection

Max. response time = cycle time of the safety program + max. readback time of the FDBACK instruction + max. response time of the F-DQ module + max. response time of the F-RQ module + 12.8 ms