X20DO4F49

1 General information

This module is equipped with 4 relay outputs. It can switch DC voltages up to 250 VDC and is therefore suitable for use in power generation systems.

- 4 digital outputs
- Relay module for 250 VDC / 240 VAC
- 2 normally open contacts and 2 changeover contacts
- Single-channel isolated outputs

Danger!

Risk of electric shock!

The terminal block is only permitted to conduct voltage when it is connected. It is not permitted to be disconnected or connected while voltage is applied or have voltage applied to it while it is removed under any circumstances.

This module is not permitted to be the last module connected on the X2X Link network. At least one subsequent X20ZF dummy module must provide protection against contact.

Danger!

The voltage classes on the terminal block must not be mixed! Only operation at mains voltage (e.g. 230 VAC) OR safety extra-low voltage (e.g. 24 VDC SELV) is permitted.

2 Order data

Order number	Short description	Figure
	Digital outputs	
X20DO4F49	X20 digital output module, 4 relays, 2x normally open contacts, 2x changeover contacts, 240 VAC / 2 A, 250 VDC / 0.28 A	
	Required accessories	
	Bus modules	
X20BM32	X20 bus module, for double-width modules, 240 VAC keyed, internal I/O power supply connected through	
	Terminal blocks	
X20TB32	X20 terminal block, 12-pin, 240 VAC keyed	

Table 1: X20DO4F49 - Order data

3 Technical data

Order number	X20DO4F49
Short description	
I/O module	4 digital outputs 250 VDC / 240 VAC, outputs single-channel isolated
General information	
B&R ID code	0xF76A
Status indicators	I/O function per channel, operating state, module status
Diagnostics	
Module run/error	Yes, using LED status indicator and software
Outputs	Yes, using LED status indicator
Power consumption	
Bus	1.1 W
Internal I/O	-
Additional power dissipation caused by actuators (resistive) [W] [1)	+0.32
Certifications	
CE	Yes
Functional safety	IEC 61508 in preparation EN 62061 in preparation EN ISO 13849-1 in preparation IEC 61511 in preparation
UL	cULus E115267 Industrial control equipment
DNV	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **B** (4 g) EMC: **B** (bridge and open deck)
Digital outputs	
Variant	Relays: 2 normally open contacts and 2 changeover contacts Channels are single-channel isolated.
Nominal voltage	250 VDC / 240 VAC
Max. voltage	250 VAC
Switching voltage	Max. 250 VDC / 250 VAC
Rated frequency	DC / 45 to 63 Hz
Nominal output current	DC: See section "DC switching capacity". AC: 2 A at 240 VAC
Total nominal current	DC: See section "DC switching capacity". AC: 8 A at 240 VAC
Actuator power supply	External
Inrush current	Max. 8 A (per channel)
Contact resistance	Max. 100 mΩ
Switching delay	
0 → 1	Normally open contact ≤15 ms / Changeover contact ≤19 ms
1 → 0	Normally open contact ≤11 ms / Changeover contact ≤15 ms
Insulation voltages	
Channel - Bus	Tested at 3500 VAC
Channel - Channel	Tested at 1700 VAC
Channel - Ground	Tested at 3500 VAC
Service life	
Electrical [2)	10^5 at 2 A (normally open contact and changeover contact)
Mechanical	30 x10^6 cycles (normally open contact and changeover contact)
Switching capacity	
Minimum	0.12 W DC / 2.4 W AC
Maximum	DC: See section "DC switching capacity". AC: 480 W
Protective circuit	
Internal	None
External	
AC	RC combination or VDR
DC	Inverse diode, RC combination or VDR
Electrical properties	
Electrical isolation	Channel isolated from channel, bus and I/O power supply
Operating conditions	
Mounting orientation	
Horizontal	Yes
Vertical	Yes
Installation elevation above sea level	
0 to 2000 m	No limitation
>2000 m	Reduction of ambient temperature by 0.5°C per 100 m [3)
Degree of protection per EN 60529	IP20

Table 2: X20DO4F49 - Technical data

Order number	X20DO4F49
Ambient conditions	
Temperature	
Operation	
Horizontal mounting orientation	-25 to 60°C
Vertical mounting orientation	-25 to 50°C
Derating	-
Storage	-40 to 85°C
Transport	-40 to 85°C
Relative humidity	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical properties	
Note	Order 1x terminal block X20TB32 separately. Order 1x bus module X20BM32 separately.
Pitch	$25^{+0.2}$ mm

Table 2: X20DO4F49 - Technical data

1) Number of outputs x Contact resistance x Nominal output current². For a calculation example, see section "Mechanical and electrical configuration" in the X20 system user's manual.
2) With resistive load. See also section "Electrical service life".
3) Maximum permissible height: 4000 m

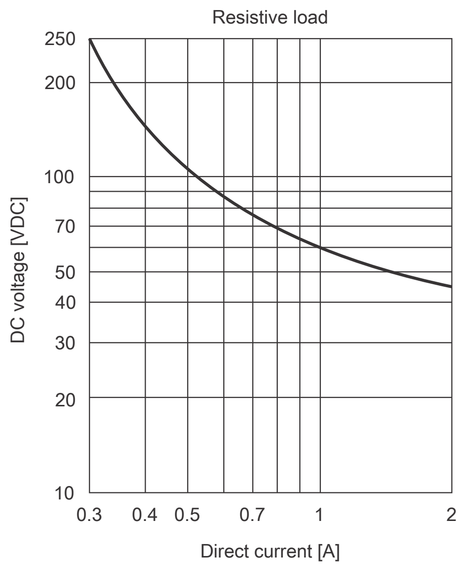
3.1 DC switching capacity

The following table shows the possible load on the outputs with resistive or inductive load based on the DC voltage applied.

Voltage [VDC]	Resistive load [A]	Inductive load (L/R = 20 ms) [A]
24	2	0.7
48	0.58 1)	0.3
72	0.38 1)	0.2
110	0.28	0.15
125	0.28	0.14
200	0.28	0.1
250	0.28	-

1) Based on R300 rating per UL 508

Switching capacity for resistive load

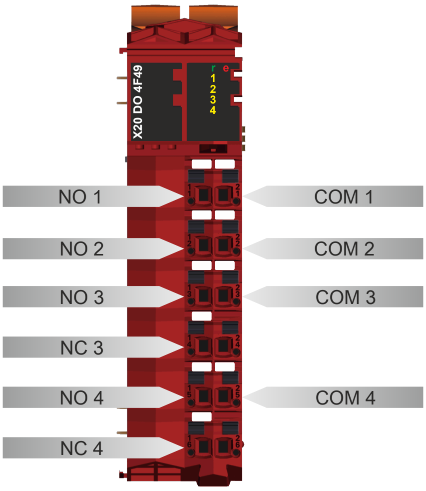


4 LED status indicators

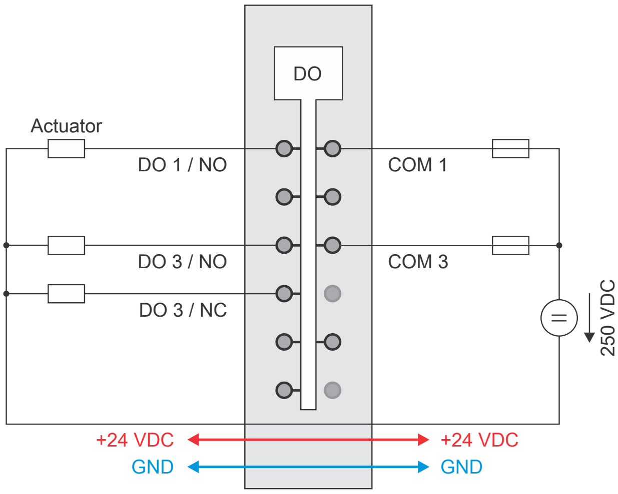
For a description of the various operating modes, see section "Additional information - Diagnostic LEDs" in the X20 system user's manual.

Figure	LED	Color	Status	Description
	r	Green	Off	No power to module
			Single flash	Mode RESET
			Blinking	Mode PREOPERATIONAL
			On	Mode RUN
	e	Red	Off	Module not supplied with power or everything OK
			On	Error or reset state
	e + r	Solid red / Single green flash		Invalid firmware
	1 - 4	Orange		Output state of the corresponding digital output

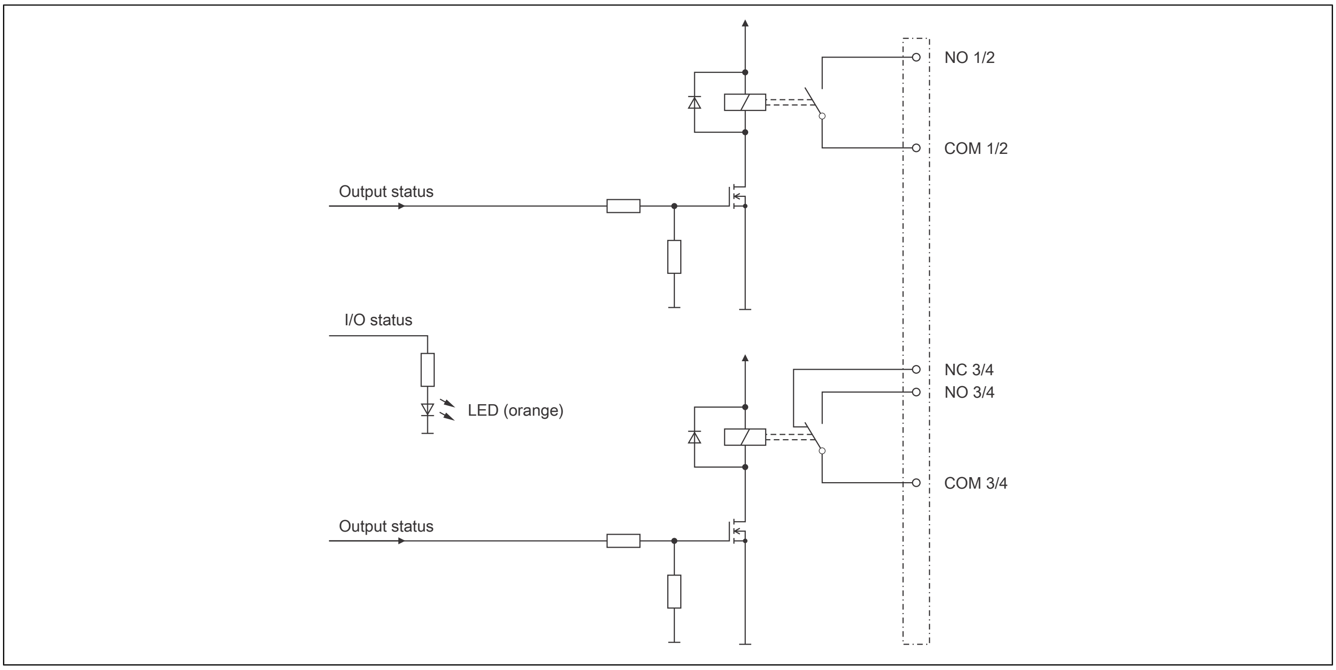
5 Pinout



6 Connection example

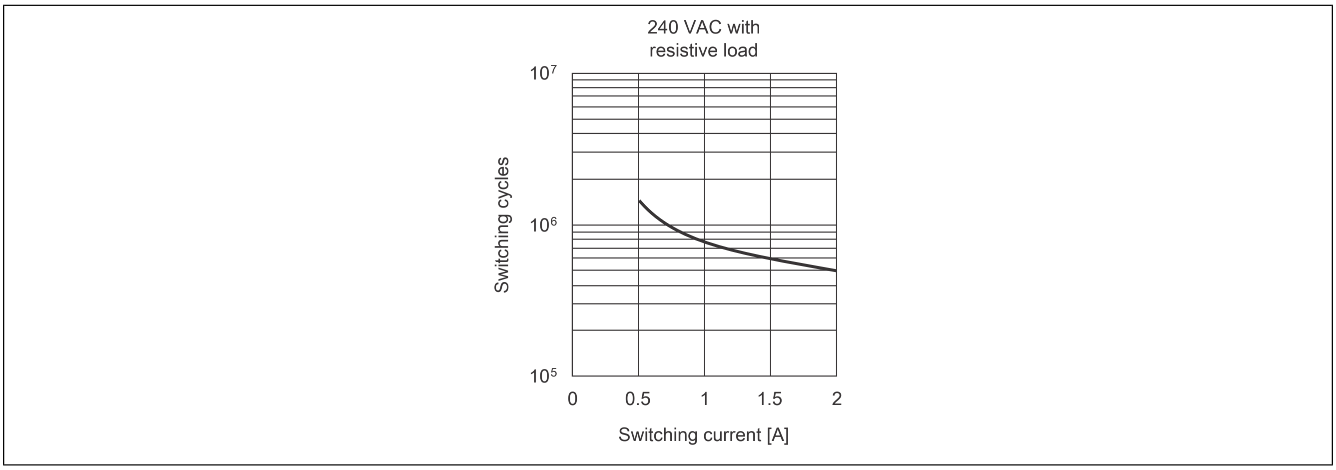


7 Output circuit diagram



8 Electrical service life

The diagram shows the number of switching cycles based on current at 240 VAC and with resistive load.



9 Register description

9.1 General data points

In addition to the registers described in the register description, the module has additional general data points. These are not module-specific but contain general information such as serial number and hardware variant.

General data points are described in section "Additional information - General data points" in the X20 system user's manual.

9.2 Function model 0 - Standard

Register	Fixed offset	Name	Data type	Read		Write	
				Cyclic	Acyclic	Cyclic	Acyclic
2	0	DigitalOutput	USINT			•	
		DigitalOutput01	Bit 0				
		...	...				
		DigitalOutput04	Bit 3				

Fixed modules require their data points to be in a specific order in the X2X frame. Cyclic access occurs according to a predefined offset, not based on the register address.

Acyclic access continues to be based on the register numbers.

9.3 Function model 254 - Bus controller

Register	Offset[1]	Name	Data type	Read		Write	
				Cyclic	Acyclic	Cyclic	Acyclic
2	0	Switching state of digital outputs 1 to 4	USINT			•	
		DigitalOutput01	Bit 0				
		...	...				
		DigitalOutput04	Bit 3				

1) The offset specifies the position of the register within the CAN object.

9.3.1 Using the module on the bus controller

Function model 254 "Bus controller" is used by default only by non-configurable bus controllers. All other bus controllers can use other registers and functions depending on the fieldbus used.

For detailed information, see section "Additional information - Using I/O modules on the bus controller" in the X20 user's manual (version 3.50 or later).

9.3.2 CAN I/O bus controller

The module occupies 1 digital logical slot on CAN I/O.

9.4 Digital outputs

The output state is transferred to the output channels with a fixed offset (<60 µs) based on the network cycle (SyncOut).

9.4.1 Switching state of digital outputs 1 to 4

Name:
DigitalOutput
DigitalOutput01 to DigitalOutput04

This register is used to store the switching state of digital outputs 1 to 4.

Only function model 0 - Standard:

Setting "Packed outputs" in the Automation Studio I/O configuration determines whether all bits of this register should be applied individually as data points in the Automation Studio I/O assignment ("DigitalOutput01" to "DigitalOutput0x") or whether this register should be displayed as a single USINT data point ("DigitalOutput").

Data type	Values	Information
USINT	0 to 15	Packed outputs = On
	See the bit structure.	Packed outputs = Off or function model ≠ 0 - Standard.

Bit structure:

Bit	Description	Value	Information
0	DigitalOutput01	0	Digital output 01 reset
		1	Digital output 01 set
...		...	
3	DigitalOutput04	0	Digital output 04 reset
		1	Digital output 04 set

9.5 Minimum cycle time

The minimum cycle time specifies how far the bus cycle can be reduced without communication errors occurring. It is important to note that very fast cycles reduce the idle time available for handling monitoring, diagnostics and acyclic commands.

Minimum cycle time
250 µs

9.6 Minimum I/O update time

The minimum I/O update time specifies how far the bus cycle can be reduced so that an I/O update is performed in each cycle.

Minimum I/O update time
Equal to the minimum cycle time

10 UL Markings

To install the device(s) according to the UL/CSA/IEC standard, the following rules must be observed.

Information:

- **The switch or circuit-breaker must be included *in the installation of external device connected to MAINS SUPPLY through switching contacts of X20DO4F49*, be suitably located, easily reached and marked as the disconnecting device for the equipment. If there is only one device - one switch or one circuit-breaker - symbols 9 and 10 of Table 1, UL/CSA/IEC 61010 are sufficient if the symbols are marked on or adjacent to the switch or circuit-breaker.**
    a) **Circuit-breaker employed as a disconnecting device shall meet the relevant requirements of UL Standard 489 / CSA Standard (C22.2) No. 5 / IEC 60947-2, be suitable for the application and installed near the equipment.**
    b) **Switch employed as a disconnecting device shall meet the relevant requirements of UL Standard 508 / CSA Standard (C22.2) No. 14 / IEC 60947-3, be suitable for the application and installed near the equipment.**
- **Equipment intended to be energized from a MAINS supply shall be protected by fuses, circuit-breakers, thermal cut-outs, impedance limiting circuits or similar means, to provide protection against excessive current being drawn from the MAINS in case of a fault in the equipment.**
    a) **Overcurrent protection devices shall not be fitted in the protective conductor. Fuses or single pole circuit-breakers shall not be fitted in the neutral conductor of multi-phase equipment.**
    b) **A single-pole circuit-breaker used as an overcurrent protective device shall be connected in the ungrounded supply conductor.**
    c) **A multiple-pole circuit-breaker used as an overcurrent protective device or devices shall be so constructed as to interrupt all of the neutral (grounded) and ungrounded conductors of the MAINS supply simultaneously.**
    d) **Fuses shall meet the relevant requirements of UL Standard 248 / CSA Standard (C22.2) No. 248 / IEC 60127, be suitable for the application and installed near the equipment.**
    e) **A single fuse used as an overcurrent protective device shall be connected in the ungrounded supply conductor.**
    f) **Where fuses are used as overcurrent protective devices in both the neutral (grounded) and ungrounded supply conductors, the fuse holders shall be mounted adjacent to each other and the fuses shall be of the same RATING and characteristics.**
    g) **The screw shell of a plug fuse holder and the ACCESSIBLE contact of an extractor fuse holder connected to the ungrounded supply conductor shall be connected towards the load. The ACCESSIBLE contact or screw shell of fuse holders connected in the neutral (grounded) conductor shall be located towards the grounded supply line.**

Information:

- **If the equipment is used in a not specified manner, the protection provided by the equipment may be impaired.**
- **The devices are intended to be used in a final safety enclosure that must conform with rquirements for protection against the spread of fire and have adequate rigidity per UL 61010-1 and UL 61010-2-201.**
- **Minimum temperature rating of the cable to be connected to the field wiring terminals 75°C, AWG 28 ... 14, Use Copper Conductors Only.**
- **The devices are designed to be maintenance-free, repairs are not permitted to be carried out.**

Caution!

- **The external circuits intended to be connected to this device, except for MAINS supply of the equipment, shall be galvanically separated from MAINS supply or hazardous live voltage by reinforced or double insulation and meet the requirements of SELV/PELV.**