X20DO6321

Data sheet
3.40 (September 2024)

Translation of the original documentation

Publishing information

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Version history

B&R makes every effort to keep documents as current as possible. The most current versions are available for download on the B&R website (www.br-automation.com).

1 General information

1.1 Other applicable documents

For additional and supplementary information, see the following documents.

Other applicable documents

Document name	Title
MAX20	X20 System user's manual
MAEMV	Installations / EMV guide

1.2 Order data

Order number	Short description	Figure
	Digital outputs	
X20DO6321	X20 digital output module, 6 outputs, 24 VDC, 0.5 A, sink, 2-wire connections	
	Required accessories	
	Bus modules	
X20BM11	X20 bus module, 24 VDC keyed, internal I/O power supply connected through	
X20BM15	X20 bus module, with node number switch, 24 VDC keyed, internal I/O power supply connected through	
	Terminal blocks	
X20TB06	X20 terminal block, 6-pin, 24 VDC keyed	
X20TB12	X20 terminal block, 12-pin, 24 VDC keyed	

Table 1: X20DO6321 - Order data

1.3 Module description

The module is equipped with 6 outputs for 1- or 2-wire connections. The outputs are designed for a sink circuit.
For continuous 1-wire wiring, the 6x X20 terminal block can be used. 2-wire wiring can be implemented with the 12x terminal block.

Functions:

- Digital outputs

Monitoring status of the digital outputs

The output signal of the digital outputs is monitored for short circuit or overload, as is the state of the power supply.

2 Technical description

2.1 Technical data

Order number	X20DO6321
Short description	
I/O module	6 digital outputs 24 VDC for 1- or 2-wire connections
General information	
B&R ID code	0x1B99
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 and software (output error status)
Power consumption	
Bus	0.2 W
Internal I/O	0.59 W
Additional power dissipation caused by actuators (resistive) [W] [1)]	+0.18
Certifications	
CE	Yes
UKCA	Yes
ATEX	Zone 2, II 3G Ex nA nC IIA T5 Gc IP20, Ta (see X20 user's manual) FTZÚ 09 ATEX 0083X
UL	cULus E115267 Industrial control equipment
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5
KC	Yes
Digital outputs	
Variant	FET current-sinking
Nominal voltage	24 VDC
Switching voltage	24 VDC -15% / +20%
Nominal output current	0.5 A
Total nominal current	3 A
Connection type	1- or 2-wire connections
Output circuit	Sink
Output protection	Thermal shutdown in the event of overcurrent or short circuit (see value "Short-circuit peak current") Internal freewheeling diode for switching inductive loads (see section "Switching inductive loads")
Diagnostic status	Output monitoring with 10 ms delay
Leakage current when the output is switched off	75 µA
$R_{DS(on)}$	120 mΩ
Peak short-circuit current	<7 A
Switch-on in the event of overload shutdown or short-circuit shutdown	Approx. 10 ms (depends on the module temperature)
Switching delay	
0 → 1	<300 µs
1 → 0	<300 µs
Switching frequency	
Resistive load	Max. 500 Hz
Inductive load	See section "Switching inductive loads".
Braking voltage when switching off inductive loads	Typ. 50 VDC
Insulation voltage between channel and bus	500 V_{eff}
Electrical properties	
Electrical isolation	Channel isolated from bus Channel not isolated from channel 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
Degree of protection per EN 60529	IP20

Table 2: X20DO6321 - Technical data

Order number	X20DO6321
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 X20TB06 or X20TB12 separately. Order 1x bus module X20BM11 separately.
Pitch	$12.5^{+0.2}$ mm

Table 2: X20DO6321 - Technical data

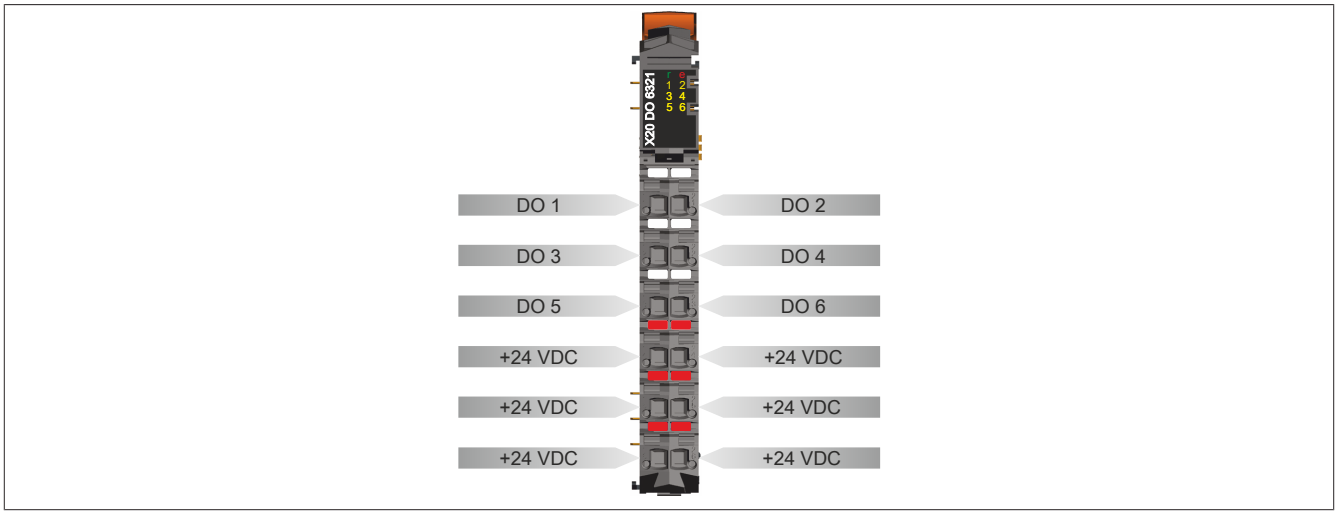
1) Number of outputs x $R_{DS(on)}$ x Nominal output current². For a calculation example, see section "Mechanical and electrical configuration" in the X20 system user's manual.

2.2 Status LEDs

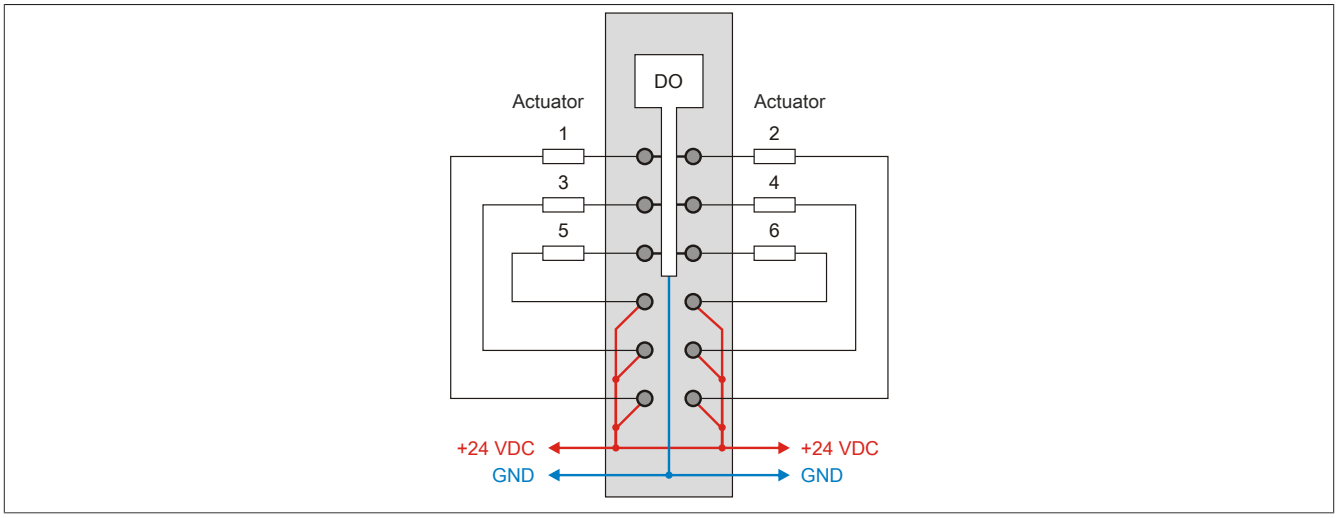
For a description of the various operating modes, see section "Additional information - Diagnostic LEDs" in the X20 System user's manual.

Figure	LED	Color	Status	Description
	r	Green	Off	Module supply not connected
			Single flash	RESET mode
			Blinking	PREOPERATIONAL mode
			On	RUN mode
	e	Red	Off	Module supply not connected or everything OK
			Single flash	Warning/Error on an I/O channel. Level monitoring for digital outputs has been triggered.
	e + r	Red on / Green single flash		Invalid firmware
	1 - 6	Orange		Output status of the corresponding digital output

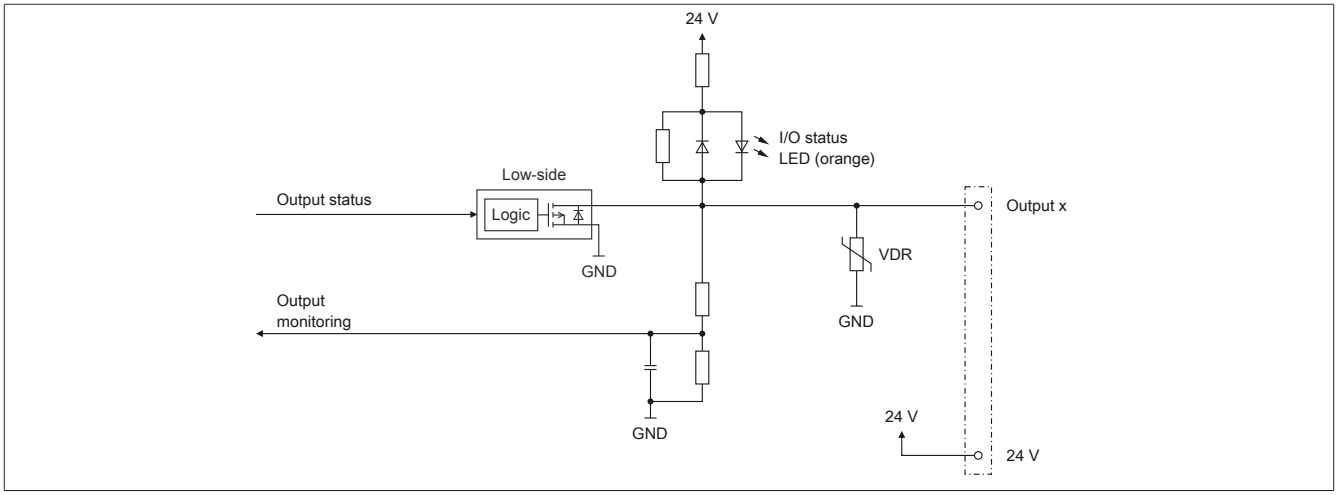
2.3 Pinout



2.4 Connection example

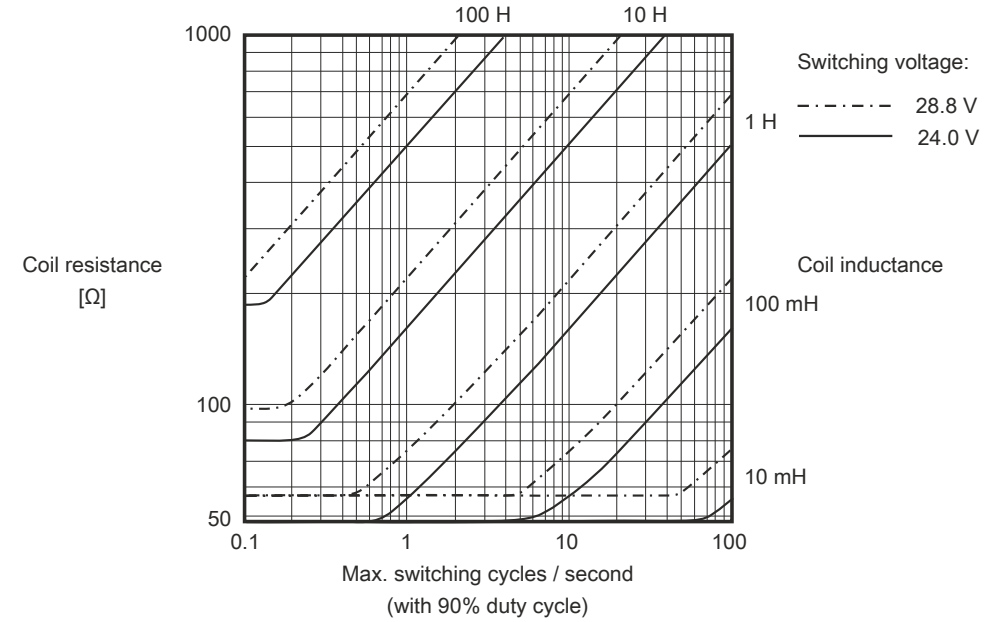


2.5 Output circuit diagram



2.6 Switching inductive loads

Environmental temperature: 60°C, all outputs with the same load



Information:

If the maximum number of operating cycles per second is exceeded, an external inverse diode must be used.

Operating conditions outside of the area in the diagram are not permitted!

3 Function description

3.1 Digital outputs

The module is equipped with 6 digital outputs.

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

Packed outputs (only function model 0 - Standard)

Setting "Packed outputs" in the Automation Studio I/O configuration can be used to determine whether all bits of the register should be applied as individual data points in the Automation Studio I/O mapping (e.g. "DigitalOutput01 to DigitalOutputxx") or whether the register should be displayed as a single USINT data point (e.g. "DigitalOutput").

Information:

The register is described in "Switching state of digital outputs 1 to 6" on page 11.

3.1.1 Monitoring status of the outputs

On the module, the output states of the outputs are compared to the target states. The control of the output driver is used for the target state.

A change in the output state resets monitoring for that output. The status of each individual channel can be read out. A change in the monitoring status is actively transmitted as an error message.

Supervision status	Description
0	Digital output channel: No error
1	Digital output channel: • Short circuit or overload • Channel switched on and missing I/O power supply • Channel switched off and external voltage applied to channel

Information:

The register is described in "Status of digital outputs 1 to 6" on page 11.

4 Commissioning

4.1 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).

4.1.1 CAN I/O bus controller

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

5 Register description

5.1 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.

5.2 Function model 0 - Standard

Register	Fixed offset	Name	Data type	Read		Write	
				Cyclic	Acyclic	Cyclic	Acyclic
2	0	DigitalOutput	USINT			•	
		DigitalOutput01	Bit 0				
		...	...				
		DigitalOutput06	Bit 5				
30	1	StatusInput01	USINT	•			
		StatusDigitalOutput01	Bit 0				
		...	...				
		StatusDigitalOutput06	Bit 5				

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.

5.3 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 6	USINT			•	
		DigitalOutput01	Bit 0				
			...				
		DigitalOutput06	Bit 5				
30	-	Status of digital outputs 1 to 6	USINT		•		
		StatusDigitalOutput01	Bit 0				
			...				
		StatusDigitalOutput06	Bit 5				

1) The offset specifies where the register is within the CAN object.

5.4 Digital outputs

5.4.1 Switching state of digital outputs 1 to 6

Name:
DigitalOutput
DigitalOutput01 to DigitalOutput06

This register stores the switching state of digital outputs 1 to 6.

Data type	Values	Information[1)]
USINT	0 to 63	Packed outputs = On Data point: "DigitalOutput"
	See the bit structure.	Packed outputs = Off or function model ≠ 0 - Standard. Data points: "DigitalOutput01" to "DigitalOutput06"

1) See "Digital outputs" on page 8.

Bit structure:

Bit	Name	Value	Information
0	DigitalOutput01	0	Digital output 01 reset
		1	Digital output 01 set
...		...	
5	DigitalOutput06	0	Digital output 06 reset
		1	Digital output 06 set

5.5 Monitoring status of the digital outputs

On the module, the output states of the outputs are compared to the target states.

5.5.1 Status of digital outputs 1 to 6

Name:
StatusInput01
StatusDigitalOutput01 to StatusDigitalOutput06

The status of digital outputs 1 to 6 is mapped in this register.

Data type	Values	Information[1)]
USINT	0 to 63	Packed outputs = On Data point: "StatusInput01"
	See the bit structure.	Packed outputs = Off or function model ≠ 0 - Standard. Data points: "StatusDigitalOutput01" to "StatusDigitalOutput06"

1) See "Digital outputs" on page 8.

Bit structure:

Bit	Name	Value	Information
0	StatusDigitalOutput01	0	Channel 01: No error
		1	Channel 01: • Short circuit or overload • Channel switched on and missing I/O power supply • Channel switched off and external voltage applied to channel
...		...	
5	StatusDigitalOutput06	0	Channel 06: No error
		1	Channel 06: For an error description, see channel 01.

5.6 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
100 µs

5.7 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