X20(c)DO9322

Data sheet
3.22 (February 2026)



Translation of the original documentation

Publishing information

B&R Industrial Automation GmbH

B&R Strasse 1

5142 Eggelsberg

Austria

Telephone: +43 7748 6586-0

Fax: +43 7748 6586-26

office.br@abb.com

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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

1.2 Coated modules

Coated modules are X20 modules with a protective coating for the electronics component. This coating protects X20c modules from condensation and corrosive gases.
The modules' electronics are fully compatible with the corresponding X20 modules.

Information:

For simplification purposes, only images and module IDs of uncoated modules are used in this data sheet.

The coating has been certified according to the following standards:

- Condensation: BMW GS 95011-4, 2x 1 cycle
- Corrosive gas: EN 60068-2-60, method 4, exposure 21 days



1.2.1 Starting temperature

The starting temperature describes the minimum permissible ambient temperature in a voltage-free state at the time the coated module is switched on. This is permitted to be as low as -40°C. During operation, the conditions as specified in the technical data continue to apply.

Information:

It is important to absolutely ensure that there is no forced cooling by air currents in the closed control cabinet, e.g. due to the use of a fan or ventilation slots.

1.3 Order data

Order number	Short description	Figure
	Digital output modules	
X20DO9322	X20 digital output module, 12 outputs, 24 VDC, 0.5 A, source, 1-wire connections	
X20cDO9322	X20 digital output module, coated, 12 outputs, 24 VDC, 0.5 A, source, 1-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	
X20cBM11	X20 bus module, coated, 24 VDC keyed, internal I/O power supply connected through	
	Terminal blocks	
X20TB12	X20 terminal block, 12-pin, 24 VDC keyed	

Table 1: X20DO9322, X20cDO9322 - Order data

1.4 Module description

This module is equipped with 12 outputs for 1-wire connections. The outputs are designed for a source circuit.

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	X20DO9322	X20cDO9322
Short description		
I/O module	12 digital outputs 24 VDC for 1-wire connections	
General information		
B&R ID code	0x1B9A	0xD578
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	0.26 W	
Internal I/O	1.15 W	
Additional power dissipation caused by actuators (resistive) [W] [1)]	+0.63	
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	
DNV	Temperature: **B** (0 to 55°C) Humidity: **B** (up to 100%) Vibration: **B** (4 g) EMC: **B** (bridge and open deck)	
CCS	Yes	-
LR	ENV1	
KR	Yes	
ABS	Yes	
BV	**EC33B** Temperature: 5 - 55°C Vibration: 4 g EMC: Bridge and open deck	
KC	Yes	-
Digital outputs		
Variant	Current-sourcing FET	
Nominal voltage	24 VDC	
Switching voltage	24 VDC -15% / +20%	
Nominal output current	0.5 A	
Total nominal current	6 A	
Connection type	1-wire connections	
Output circuit	Source	
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	5 µA	
$R_{DS(on)}$	210 mΩ	
Peak short-circuit current	<12 A	
Switch-on in the event of overload shutdown or short-circuit shutdown	Approx. 10 ms (depends on the module temperature)	
Switching delay [2)]		
0 → 1	<300 µs	
1 → 0	<300 µs	
Switching frequency		
Resistive load [2)]	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}	

Table 2: X20DO9322, X20cDO9322 - Technical data

Order number	X20DO9322	X20cDO9322
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	
Ambient conditions		
Temperature		
Operation		
Horizontal mounting orientation	-25 to 60°C	
Vertical mounting orientation	-25 to 50°C	
Derating	See section "Derating".	
Starting temperature	-	Yes, -40°C
Storage	-40 to 85°C	
Transport	-40 to 85°C	
Relative humidity		
Operation	5 to 95%, non-condensing	Up to 100%, condensing
Storage	5 to 95%, non-condensing	
Transport	5 to 95%, non-condensing	
Mechanical properties		
Note	Order 1x terminal block X20TB12 separately. Order 1x bus module X20BM11 separately.	Order 1x terminal block X20TB12 separately. Order 1x bus module X20cBM11 separately.
Pitch	12.5$^{+0.2}$ mm	

Table 2: X20DO9322, X20cDO9322 - Technical data

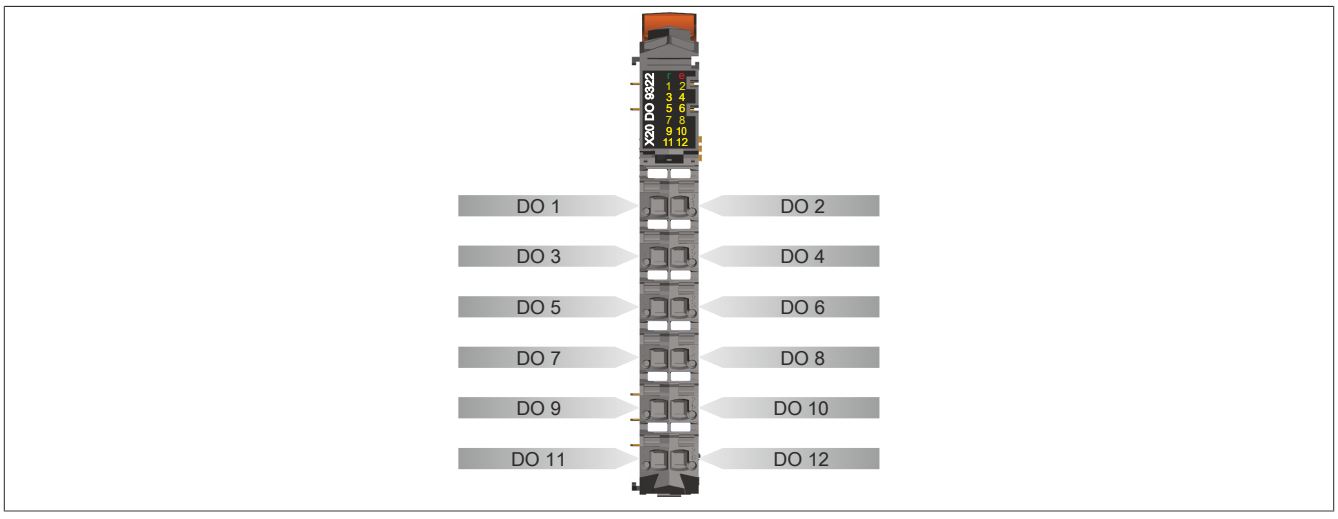
1) Number of outputs x $R_{DS(on)}$ x Nominal output current^2. For a calculation example, see section "Mechanical and electrical configuration" in the X20 system user's manual.
2) At loads ≤ 1 kΩ

2.2 Status LEDs

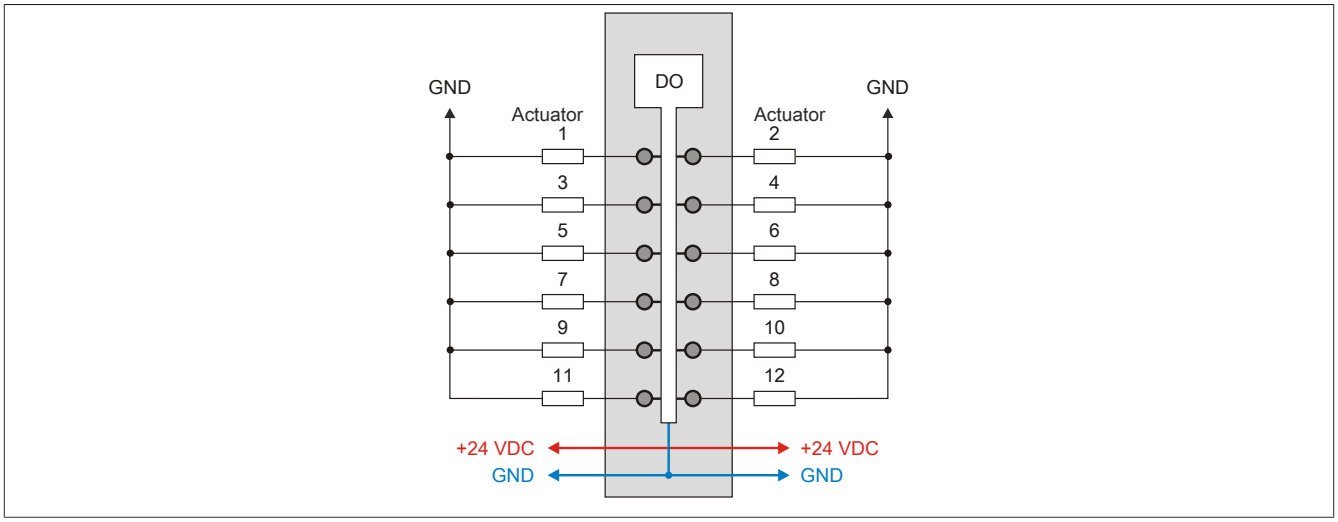
For a description of the various operating modes, see section "Additional information - Diagnostic LEDs" in the X20 system user's manual.

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 - 12	Orange		Output status of the corresponding digital output

2.3 Pinout



2.4 Connection example



Caution!

If the module is operated outside specifications, the output current may rise above the maximum permissible nominal current. This applies both to individual channels and to the summation current of the module.

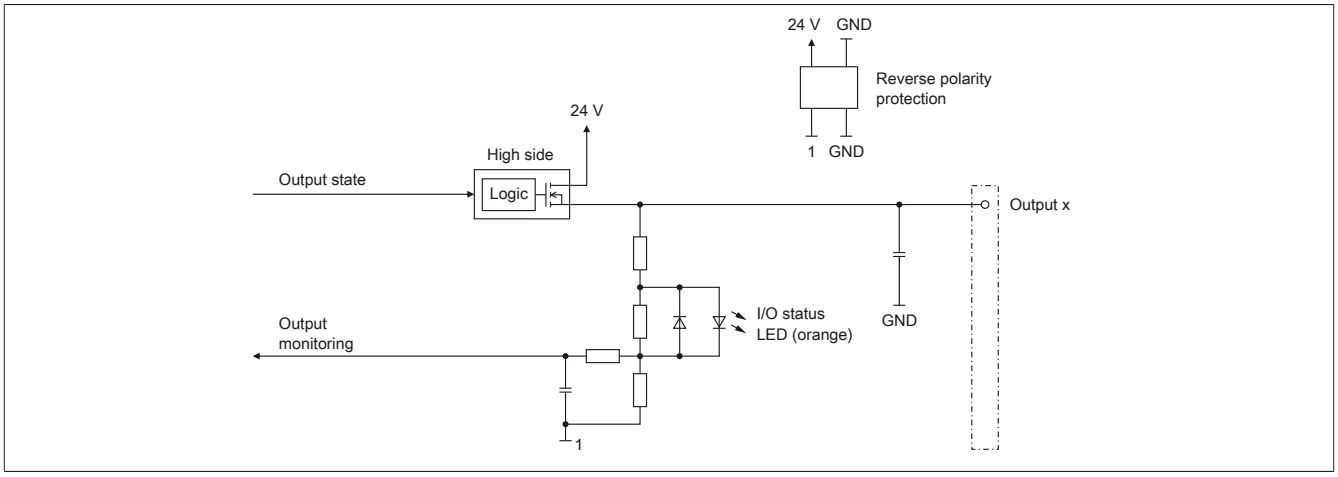
Appropriate cable cross-sections or external safety measures must therefore be provided.

Attention !

Si le module est utilisé en dehors des spécifications, le courant de sortie peut dépasser le courant nominal maximal autorisé. Ceci s'applique aussi bien aux voies individuelles qu'au courant de sommation du module.

Il faut donc prévoir des sections de câble appropriées ou des mesures de sécurité externes.

2.5 Output circuit diagram



2.6 Module installation

The following must be noted when installing the module in the X20 System:



Caution!

The module must be installed so that the left side of the module is not accessible to the user. Module X20FZ0000 can be used temporarily if the left side of the module is not occupied.



Attention !

Le module doit être installé de manière à ce que le côté gauche du module ne soit pas accessible à l'utilisateur. Le module X20FZ0000 peut être utilisé temporairement si le côté gauche du module n'est pas occupé.

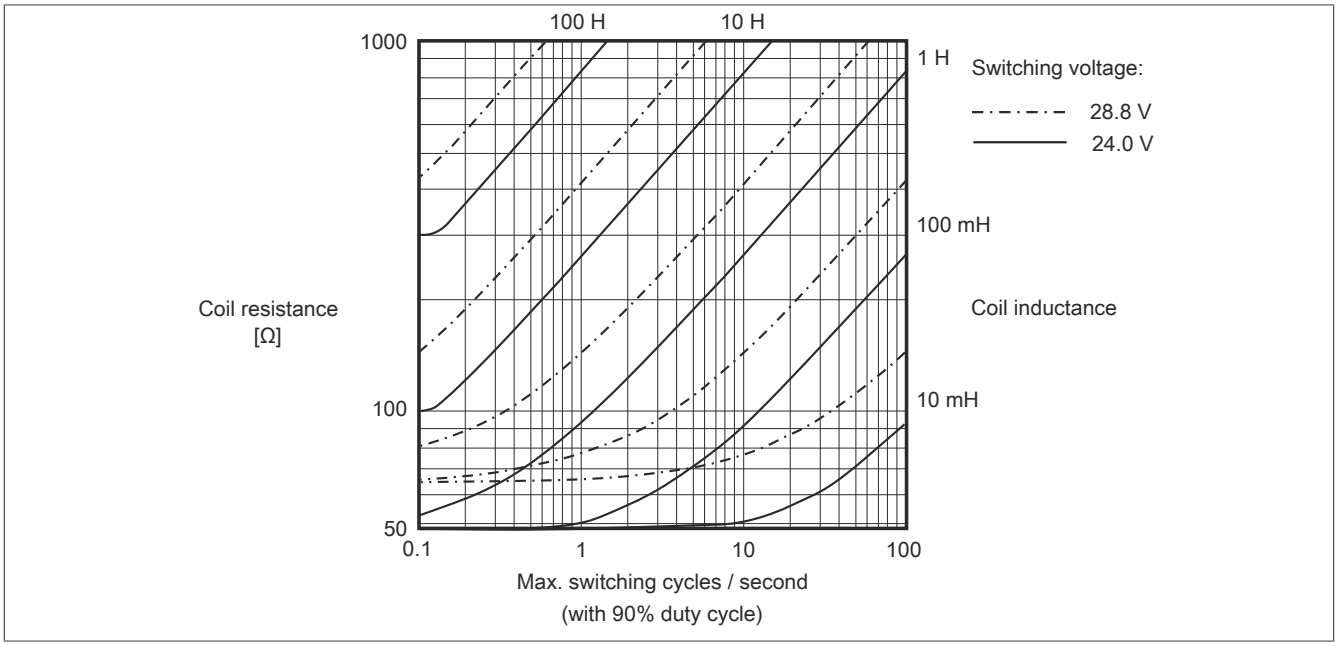
2.7 Derating

There is no derating when operated below 55°C.

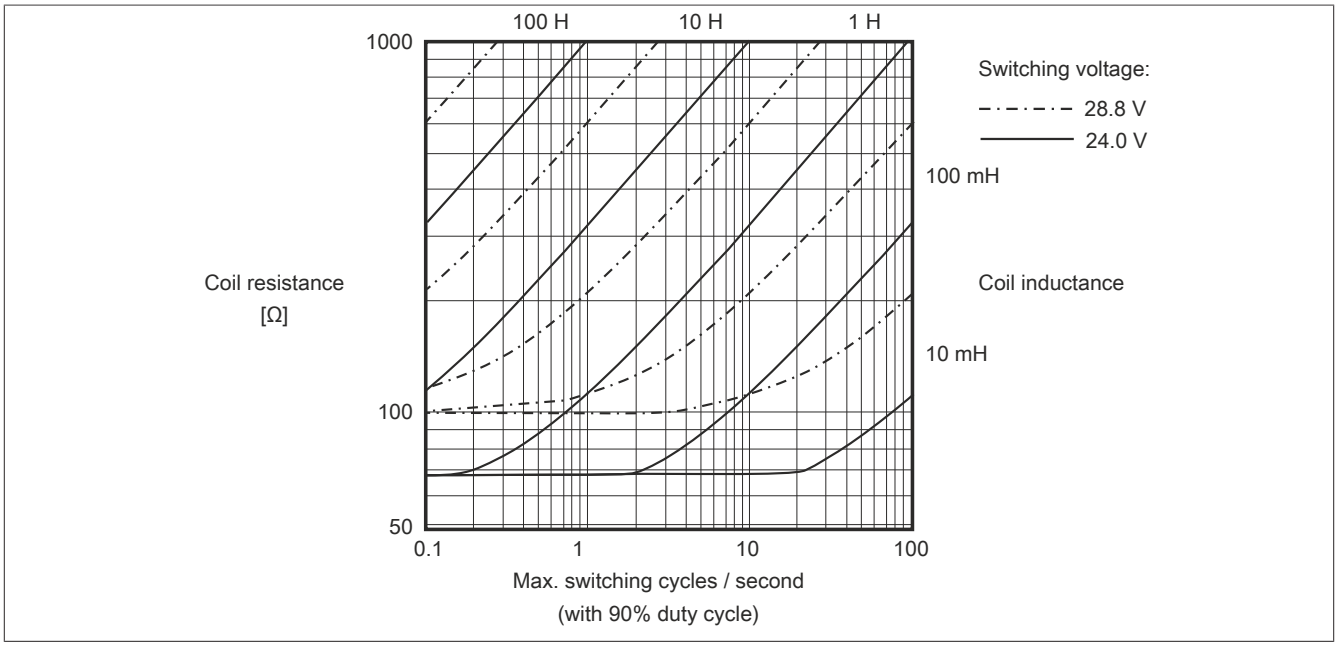
The maximum current per channel is reduced to 0.35 A when operated above 55°C!

2.8 Switching inductive loads

Ambient temperature: 55°C, all outputs with the same load



Ambient 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 12 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 UINT data point (e.g. "DigitalOutput").



Information:

The register is described in "Switching state of digital outputs 1 to 12" on page 12.

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 12" on page 13.

3.2 Commissioning

3.2.1 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).

3.2.1.1 CAN I/O bus controller

The module occupies 2 digital logical slots on CAN I/O.

4 Register description

4.1 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.

4.2 Function model 0 - Standard

Register	Fixed offset	Name	Data type	Read		Write	
				Cyclic	Acyclic	Cyclic	Acyclic
	1	DigitalOutput	UINT			•	
2	0	Switching state of digital outputs 1 to 8	USINT			•	
		DigitalOutput01	Bit 0				
		...	...				
		DigitalOutput08	Bit 7				
3	1	Switching state of digital outputs 9 to 12	USINT			•	
		DigitalOutput09	Bit 0				
		...	...				
		DigitalOutput12	Bit 3				
	1	StatusInput01	UINT	•			
30	1	Status of digital outputs 1 to 8	USINT	•			
		StatusDigitalOutput01	Bit 0				
		...	...				
		StatusDigitalOutput08	Bit 7				
31	2	Status of digital outputs 9 to 12	USINT	•			
		StatusDigitalOutput09	Bit 0				
		...	...				
		StatusDigitalOutput12	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.

4.3 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 8	USINT			•	
		DigitalOutput01	Bit 0				
		...	...				
		DigitalOutput08	Bit 7				
3	1	Switching state of digital outputs 9 to 12	USINT			•	
		DigitalOutput09	Bit 0				
		...	...				
		DigitalOutput12	Bit 3				
30	-	Status of digital outputs 1 to 8	USINT		•		
		StatusDigitalOutput01	Bit 0				
		...	...				
		StatusDigitalOutput08	Bit 7				
31	-	Status of digital outputs 9 to 12	USINT		•		
		StatusDigitalOutput09	Bit 0				
		...	...				
		StatusDigitalOutput12	Bit 3				

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

4.4 Digital outputs

4.4.1 Switching state of digital outputs 1 to 12

Name:
DigitalOutput
DigitalOutput01 to DigitalOutput12

This register stores the switching state of digital outputs 1 to 12.

Data type	Values	Information[1)]
UINT	0 to 4095	Packed outputs = On Data point: "DigitalOutput"
USINT	See the bit structure.	Packed outputs = Off or function model ≠ 0 - Standard. Data points: "DigitalOutput01" to "DigitalOutput12"

1) See "Digital outputs" on page 10.

Bit structure:

Register 2, offset 0:

Bit	Description	Value	Information
0	DigitalOutput01	0	Digital output 01 reset
		1	Digital output 01 set
...		...	
7	DigitalOutput08	0	Digital output 08 reset
		1	Digital output 08 set

Register 3, offset 1:

Bit	Description	Value	Information
0	DigitalOutput09	0	Digital output 09 reset
		1	Digital output 09 set
...		...	
3	DigitalOutput12	0	Digital output 12 reset
		1	Digital output 12 set

4.5 Monitoring status of the digital outputs

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

4.5.1 Status of digital outputs 1 to 12

Name:
StatusInput01
StatusDigitalOutput01 to StatusDigitalOutput12

This register contains the state of digital outputs 1 to 12.

Data type	Values	Information
UINT	0 to 4095	Packed outputs = On Data point: "StatusInput01"
USINT	See the bit structure.	Packed outputs = Off or function model ≠ 0 - Standard. Data points: "StatusDigitalOutput01" to "StatusDigitalOutputput12"

1) See "Digital outputs" on page 10.

Bit structure:

Register 30, (offset 1):

Bit	Description	Value	Description
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
...		...	
7	StatusDigitalOutput08	0	Channel 08: No error
		1	Channel 08: For an error description, see channel 01.

Register 31, (offset 2):

Bit	Description	Value	Information
0	StatusDigitalOutput09	0	Channel 09: No error
		1	Channel 09: • Short circuit or overload • Channel switched on and missing I/O power supply • Channel switched off and external voltage applied to channel
...		...	
3	StatusDigitalOutput12	0	Channel 12: No error
		1	Channel 12: For an error description, see channel 09.

4.6 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

4.7 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

5 UL information

English



Caution!

Minimum temperature rating of the cables to be connected to the field wiring terminals: 85°C, AWG (Sol. / Str.) 28-14. Use Copper Conductors Only.

French



Attention !

Température minimale nominale des câbles à connecter aux bornes de câblage sur place: 85°C, AWG (Sol. / Str.) 28-14. Utiliser des conducteurs en cuivre uniquement.