

# X20DO8323

Data sheet  
1.40 (September 2024)



**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](http://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	<a href="#">X20 System user's manual</a>
MAEMV	<a href="#">Installations / EMV guide</a>

## 1.2 Order data


Order number	Short description	Figure
	<b>Digital outputs</b>	
X20DO8323	X20 digital output module, 8 outputs, 12 to 24 V, 0.5 A, sink/source, 1-wire connections, full bridge, half bridge, thermal overload protection	
	<b>Required accessories</b>	
	<b>Bus modules</b>	
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	
	<b>Terminal blocks</b>	
X20TB12	X20 terminal block, 12-pin, 24 VDC keyed	

Table 1: X20DO8323 - Order data

## 1.3 Module description

The module is an electrically isolated 8-channel digital output module. It can be configured as high-side or low-side or as a push/pull output for controlling 12 to 24 VDC DC motors.

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	X20DO8323
Short description	
I/O module	8 digital outputs 11.5 to 30 V with 1-wire connections
General information	
B&R ID code	0xDF4E
Status indicators	Operating state, module status
Diagnostics	
Module run/error	Yes, using LED status indicator and software
Outputs	Yes, using software
Power consumption	
Bus	0.16 W
External I/O	0.2 W
Additional power dissipation caused by actuators (resistive) [W]	-
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
Digital outputs	
Variant	FET push/pull (high-resistance)
Nominal voltage	11.5 to 30 V
Nominal output current	0.5 A
Total nominal current	4 A
Connection type	1-wire connections
Output circuit	Sink/Source
Diagnostic status	
Voltage monitoring <sup>1)</sup>	11.5 V < Supply voltage < 30 V
Output monitoring	Output OK
Leakage current when the output is switched off	5 µA per channel
R <sub>DS(on)</sub>	120 mΩ (low-side), 140 mΩ (high-side)
Switching delay	
0 → 1	Max. 450 µs
1 → 0	Max. 450 µs
Switching frequency	
Resistive load	Max. 100 Hz
Insulation voltage between channel and bus	500 V
Reverse polarity protection	Yes
Switching voltage	
Minimum	11.5 VDC
Nominal	12 to 24 VDC
Maximum	30 VDC
Protective circuit	
External	24 VDC power supply - maximum current 5 A (melting fuse)
Internal	Thermal shutdown, integrated protection for switching inductive loads
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: X20DO8323 - Technical data

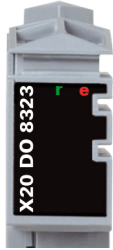
Order number	X20DO8323	
Ambient conditions		
Temperature		
Operation		
Horizontal mounting orientation	-25 to 60°C	
Vertical mounting orientation	-25 to 50°C	
Derating	-	
Storage	-40 to 85°C	
Transport	-40 to 85°C	
Relative humidity		
Operation	5 to 95%, non-condensing	
Storage	5 to 95%, non-condensing	
Transport	5 to 95%, non-condensing	
Mechanical properties		
Note	Order 1x terminal block X20TB12 separately. Order 1x bus module X20BM11 separately.	
Pitch	12.5 <sup>+0.2</sup> mm	

Table 2: X20DO8323 - Technical data

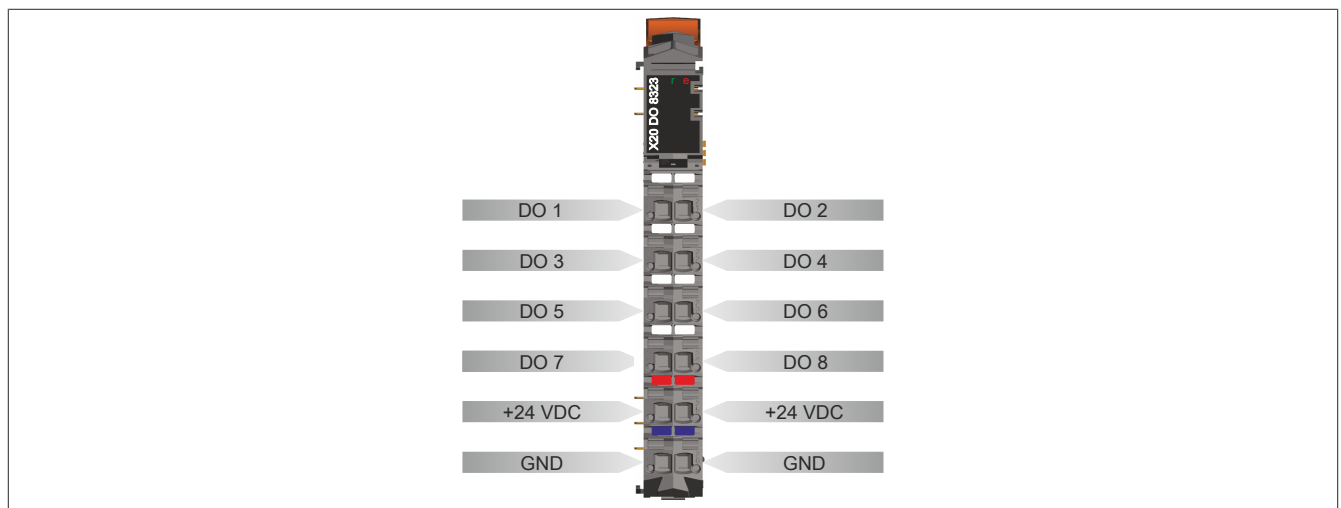
- 1) The outputs are cut off in the event of undervoltage.

## 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.

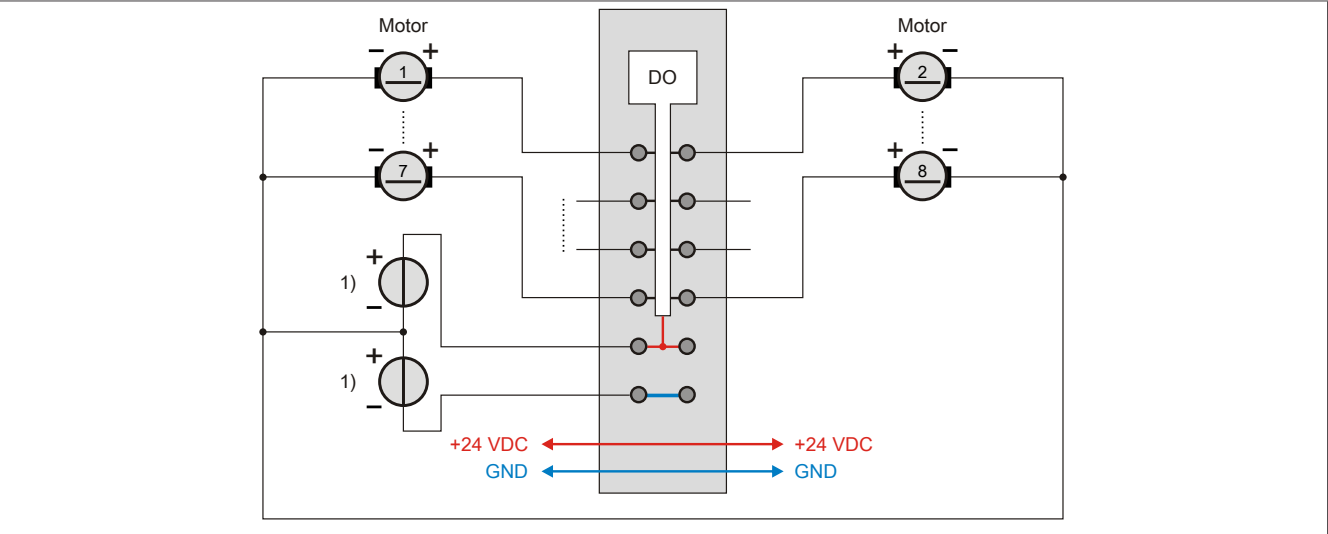
Image	LED	Color	Status	Description
	r	Green	Off	No power to module
			Single flash	RESET mode
			Blinking	PREOPERATIONAL mode
			On	RUN mode
	e	Red	Off	Module supply not connected or everything OK
			On	Error or reset status
			Single flash	Warning/Error on an I/O channel. Level monitoring for digital outputs has been triggered.
			Double flash	I/O supply too low

## 2.3 Pinout



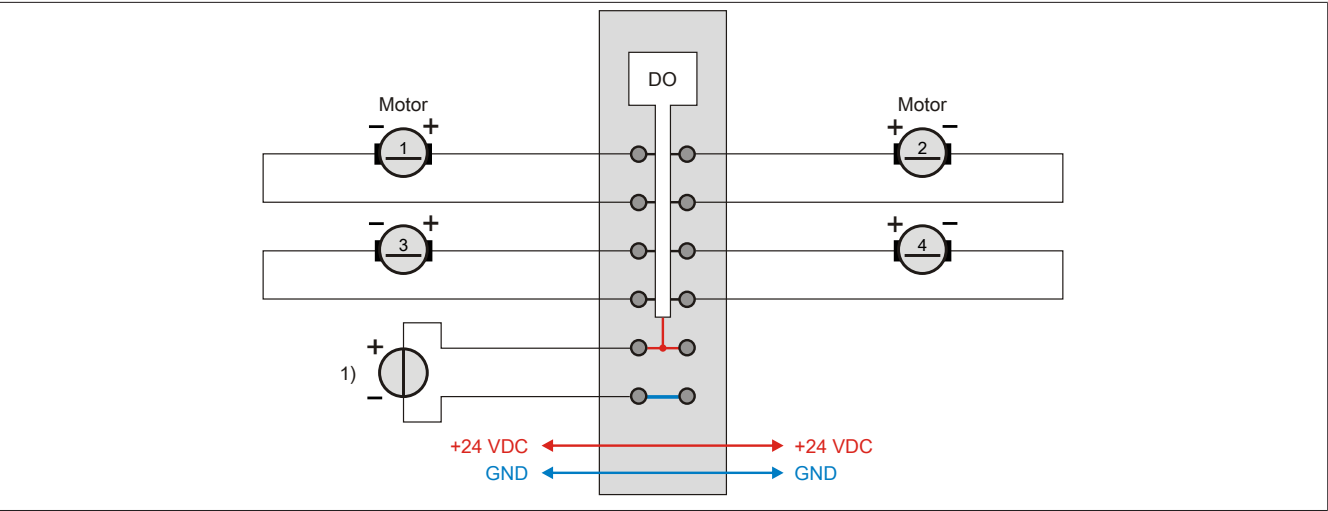
2.4 Connection example

Half bridge connection:



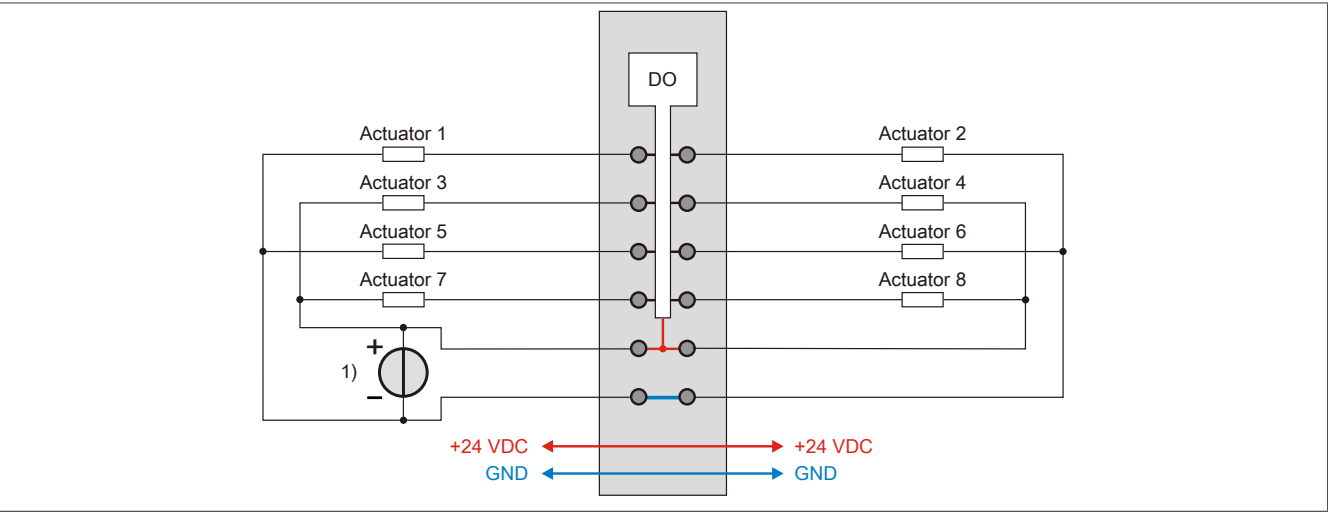
1) External power supply 12 VDC

Full-bridge circuit:



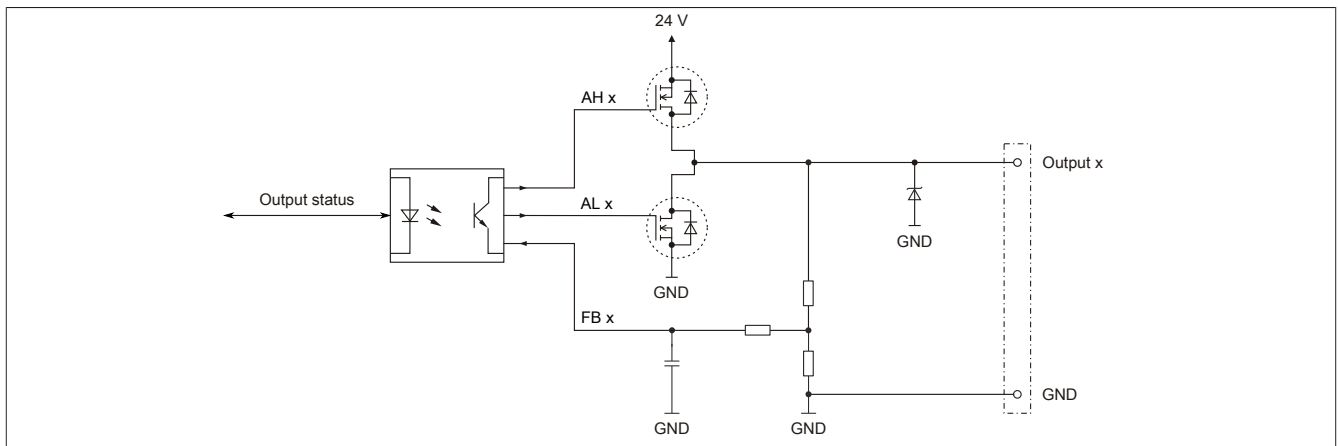
1) External power supply 24 VDC

Use as high-side or low-side:



1) External power supply 24 VDC

## 2.5 Output circuit diagram



## 3 Function description

### 3.1 Digital outputs

This module is equipped with 8 digital outputs.

The output state is transferred acyclically to the network in the system timer (100 µs) to the output ports (max. switch-off jitter approx. 50 µs, max. switch-on jitter approx. 150 µs).

When switching the output state, a minimum waiting time of 300 µs must be observed to prevent the high and low-side drivers from switching together.

**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 8" on page 11.](#)

#### 3.1.1 Monitoring status of the outputs

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

Supervision status	Description
0	Digital output channel: No error
1	Digital output channel: <ul style="list-style-type: none"> <li>• Short circuit or overload</li> <li>• Channel switched on and missing I/O power supply</li> <li>• Channel switched off and external voltage applied to channel</li> </ul>



#### Information:

The register is described in ["Status of digital outputs 1 to 8" on page 12.](#)



## 4 Commissioning

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### 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 - Default

Register	Fixed offset	Name	Data type	Read		Write	
				Cyclic	Acyclic	Cyclic	Acyclic
Configuration							
4	1	EnableDigitalOutput	USINT			•	
		EnabDigitalOutput01	Bit 0				
		...	...				
		EnabDigitalOutput08	Bit 7				
Communication							
0	1	DigitalInput	USINT	•			
		DigitalInput01	Bit 0				
		...	...				
		DigitalInput08	Bit 7				
2	0	DigitalOutput	USINT			•	
		DigitalOutput01	Bit 0				
		...	...				
		DigitalOutput08	Bit 7				
30	2	StatusInput01	USINT	•			
		StatusDigitalOutput01	Bit 0				
		...	...				
		StatusDigitalOutput08	Bit 7				
31	3	Cumulative status	USINT	•			
		StatusDigitalOutputs	Bit 0				
		StatusSupplyLO	Bit 4				
		StatusSupplyHI	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 <sup>1)</sup>	Name	Data type	Read		Write	
				Cyclic	Acyclic	Cyclic	Acyclic
Configuration							
4	-	Switching between input and output	USINT				•
		EnabDigitalOutput01	Bit 0				
		...	...				
		EnabDigitalOutput08	Bit 7				
Communication							
0	0	Digital inputs	USINT	•			
		DigitalInput01	Bit 0				
		...	...				
		DigitalInput08	Bit 7				
2	0	Switching state of digital outputs 1 to 8	USINT			•	
		DigitalOutput01	Bit 0				
		...	...				
		DigitalOutput08	Bit 7				
30	-	Status of digital outputs 1 to 8	USINT		•		
		StatusDigitalOutput01	Bit 0				
		...	...				
		StatusDigitalOutput08	Bit 7				
31	-	Cumulative status	USINT		•		
		StatusDigitalOutputs	Bit 0				
		StatusSupplyLO	Bit 4				
		StatusSupplyHI	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 8

Name:

DigitalOutput

DigitalOutput01 to DigitalOutput08

The switching state of digital outputs 1 to 8 are stored in this register.

Data type	Values	Information <sup>1)</sup>
USINT	0 to 255	Packed outputs = On Data point: "DigitalOutput"
	See the bit structure.	Packed outputs = Off or function model ≠ 0 - Standard. Data points: "DigitalOutput01" to "DigitalOutput08"

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
...	...	...	...
7	DigitalOutput08	0	Digital output 08 reset
		1	Digital output 08 set

## Register description

### 5.4.2 Status of digital outputs 1 to 8

Name:

StatusInput01

StatusDigitalOutput01 to StatusDigitalOutput08

This register is used to indicate the status of digital outputs 1 to 8.

Data type	Values	Information <sup>1)</sup>
USINT	0 to 255	Packed outputs = On Data point: "StatusInput01"
	See the bit structure.	Packed outputs = Off or function model ≠ 0 - Standard. Data points: "StatusDigitalOutput01" to "StatusDigitalOutput0x"

1) See ["Digital outputs" on page 8](#).

Bit structure:

Bit	Name	Value	Information
0	StatusDigitalOutput01	0	Channel 01: No error
		1	Channel 01: <ul style="list-style-type: none"><li>• Short circuit or overload</li><li>• Channel switched on and missing I/O power supply</li><li>• Channel switched off and external voltage applied to channel</li></ul>
...		...	
8	StatusDigitalOutput08	0	Channel 08: No error
		1	Channel 08: For an error description, see channel 01.

### 5.4.3 Switching between input and output

Name:

EnableDigitalOutput

EnabDigitalOutput01 through EnabDigitalOutput08

In this register, all channels can be connected as inputs or outputs. For each output there is a corresponding switching bit. Clearing this bit switches to tristate mode.

Data type	Values	Information <sup>1)</sup>
USINT	0 to 255	Packed outputs = On Data point: "EnableDigitalOutput"
	See the bit structure.	Packed outputs = Off or function model ≠ 0 - Default, Data point: "EnabDigitalOutput01" to "EnabDigitalOutput08" Bus controller default setting: 255

1) See ["Digital outputs" on page 8](#).

Bit structure:

Bit	Name	Value	Information
0	EnabDigitalOutput01	0	Channel 1 used as input
		1	Channel 1 used as output (bus controller default setting)
...		...	
7	EnabDigitalOutput08	0	Channel 8 used as input
		1	Channel 8 used as output (bus controller default setting)

## 5.5 Digital inputs

Name:

DigitalInput

DigitalInput01 through DigitalInput08

The status of digital inputs 1 to 8 is mapped in this register.

The digital input statuses are recorded with a minimum update rate of 5 to 8 ms, corresponding to the digital output status sampling.

Data type	Values	Information <sup>1)</sup>
USINT	0 to 255	Packed outputs = On Data point: "DigitalInput"
	See the bit structure.	Packed outputs = Off or function model ≠ 0 - Standard. Data points: "DigitalInput01" to "DigitalInput08"

1) See "Digital outputs" on page 8.

Bit structure:

Bit	Name	Value	Information
0	DigitalInput01	0 or 1	Input status - Digital input 1
...		...	
7	DigitalInput08	0 or 1	Input state - Digital input 8

## 5.6 Cumulative status

Name:

StatusDigitalOutputs

StatusSupplyLO

StatusSupplyHI

The state of output monitoring and the power supply for all outputs is displayed collectively in this register.

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
0	StatusDigitalOutputs	0	No output monitoring
		1	Output monitoring active for at least one channel
1 - 3	Reserved	0	
4	StatusSupplyLO	0	No error
		1	Power supply too low ( $\leq 11.5$ VDC)
5	StatusSupplyHI	0	No error
		1	Power supply too high ( $> 30$ VDC)
6 - 7	Reserved	0	

## 5.7 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 $\mu$ s

## 5.8 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
All channels 400 $\mu$ s