

# X20DI0471

Data sheet  
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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 inputs</b>	
X20DI0471	X20 digital input module, 10 inputs, 5-48 VDC, sink, configurable input filter, 1-wire connections	
	<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: X20DI0471 - Order data

## 1.3 Module description

The module is equipped with 10 inputs for 1-wire connections. It is designed for a nominal voltage of 5 to 48 VDC.

Functions:

- [Digital inputs](#)
- [Reference voltage and switching thresholds](#)

### Digital inputs

The digital inputs are equipped with an input filter with a configurable input delay.

### Monitoring the reference voltage

The reference voltage of the digital inputs is monitored for voltage undershoot.

## 2 Technical description

### 2.1 Technical data

Order number	X20DI0471
Short description	
I/O module	10 digital inputs 5 to 48 VDC for 1-wire connections
General information	
B&R ID code	0xE7CE
Status indicators	I/O function per channel, operating state, module status
Diagnostics	
Module run/error	Yes, using LED status indicator and software
Power consumption	
Bus	0.3 W
Internal I/O	0.6 W
External I/O	0.94 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
Digital inputs	
Nominal voltage	5 to 48 VDC
Input voltage	4.75 to 60 VDC
Input current at 48 VDC	Typ. 0.96 mA
Reference voltage	4.75 to 60 VDC
Input circuit	Sink
Input filter	
Hardware	≤100 μs
Software	Default 1 ms, configurable between 0 and 25 ms in 0.2 ms increments
Connection type	1-wire connections
Reference voltage input resistance	20 kΩ
Switching threshold	
Low	≤0.2 × U <sub>ref</sub>
High	≥0.6 × U <sub>ref</sub>
Reference voltage monitoring	Yes
Insulation voltage between channel and bus	500 V <sub>eff</sub>
Electrical properties	
Electrical isolation	Channel isolated from bus Channel not isolated from channel
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	-
Storage	-40 to 85°C
Transport	-40 to 85°C

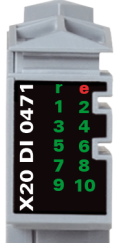
Table 2: X20DI0471 - Technical data

Order number	X20DI0471
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

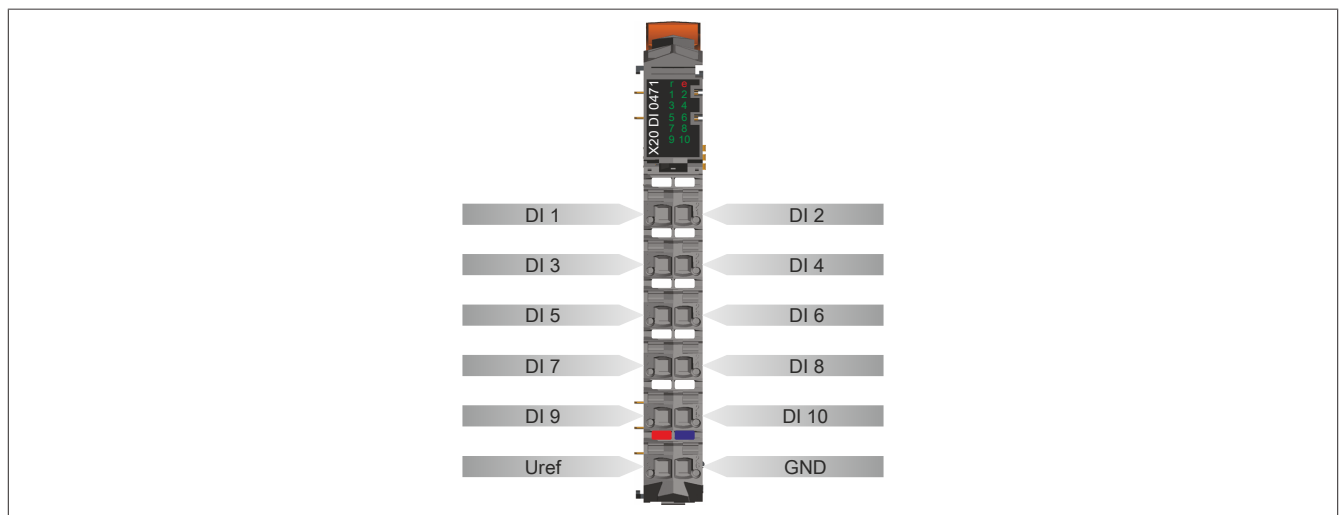
Table 2: X20DI0471 - Technical data

## 2.2 LED status indicators

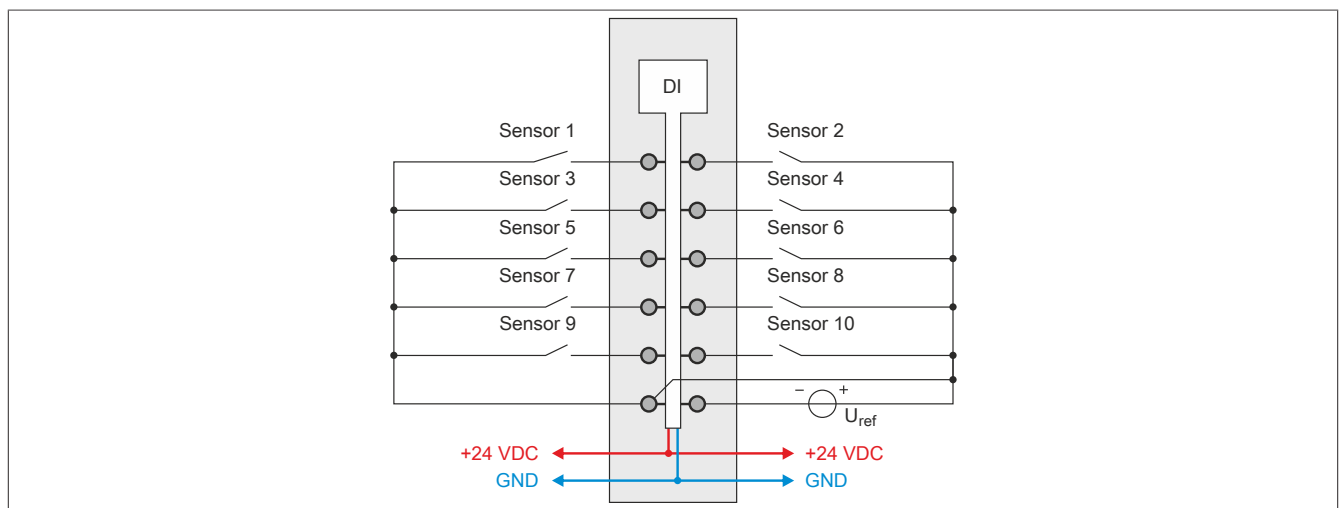
For a description of the various operating modes, see section "Additional information - Diagnostic LEDs" in the X20 System user's manual.

Figure	LED	Color	Status	Description
	r	Green	Off	No power to module
			Single flash	RESET mode
			Blinking	PREOPERATIONAL mode
			On	RUN mode
	e	Red	Off	No power to module or everything OK
			On	Error or reset status
	e + r	Red on / Green single flash		Invalid firmware
	1 - 10	Green		Input state of the corresponding digital input

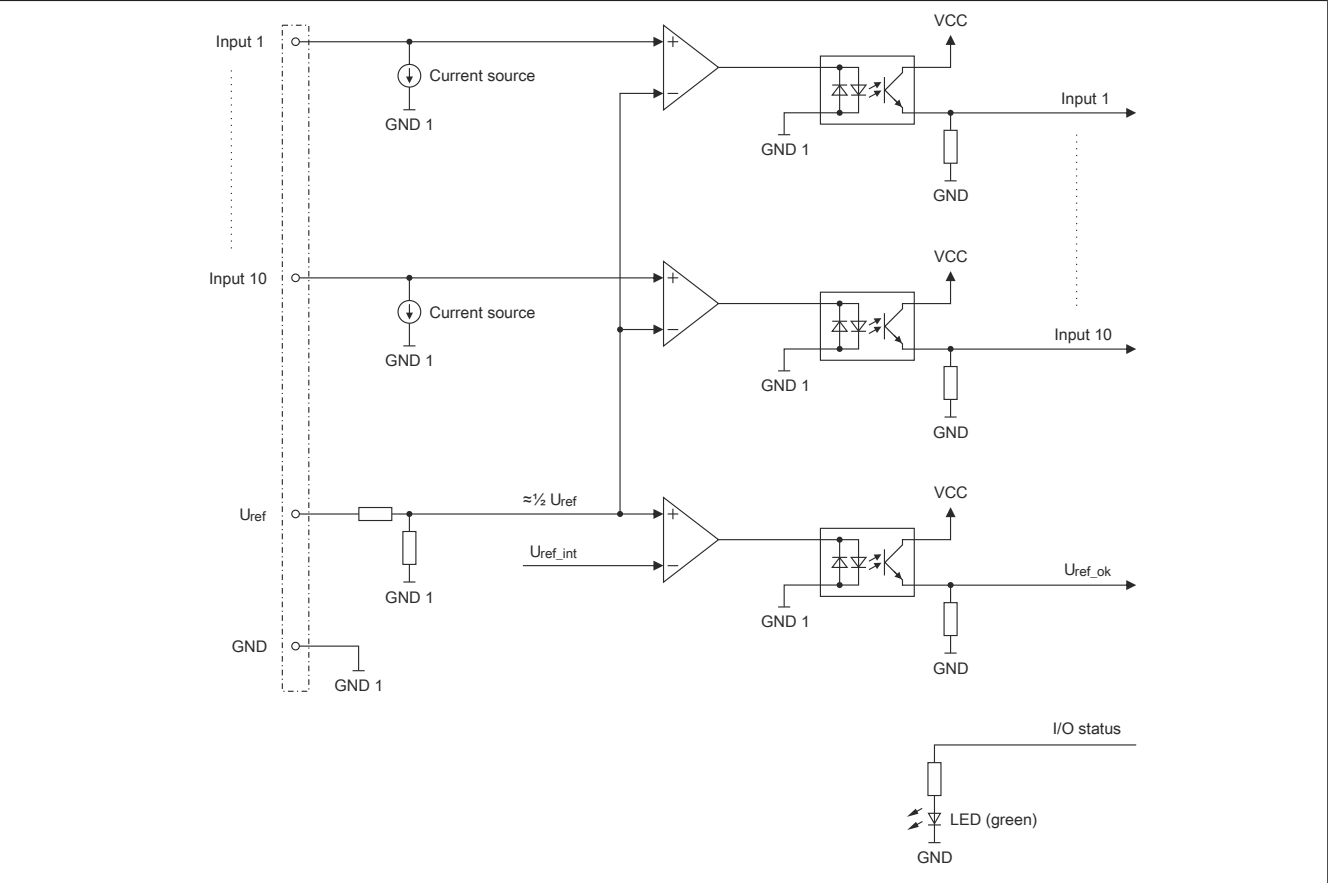
## 2.3 Pinout



## 2.4 Connection example



2.5 Input circuit diagram



## 3 Function description

### 3.1 Digital inputs

The module is equipped with 10 digital input channels.

#### 3.1.1 Recording the input state

##### Unfiltered

The input state is collected with a fixed offset to the network cycle and transferred in the same cycle.

##### Filtered

The filtered state is collected with a fixed offset to the network cycle and transferred in the same cycle. Filtering takes place asynchronously to the network in multiples of 200 µs with a network-related jitter of up to 50 µs.

##### Packed outputs (only function model 0 - Standard)

Setting "Packed inputs" 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 ("DigitalInput01 to DigitalInputxx") or whether the register should be displayed as a single UINT data point ("DigitalInput").

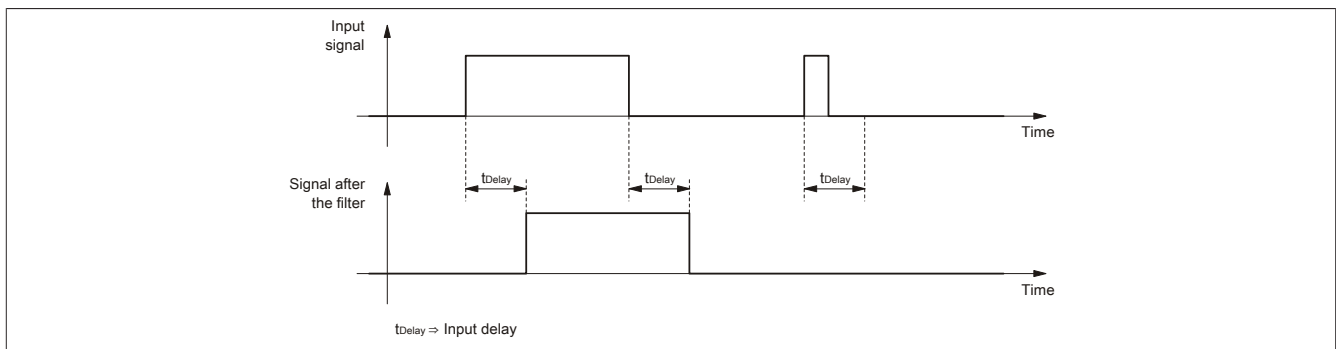


#### Information:

The register is described in ["Input state of digital inputs 1 to 10" on page 11.](#)

#### 3.1.2 Input filter

An input filter is available for each input. Disturbance pulses that are shorter than the input delay are suppressed by the input filter.



The input delay can be set in steps of 100 µs. It makes sense, however, to enter values in steps of 2 since the input signals are sampled in an interval of 200 µs.

Values	Filter
0	No software filter
2	0.2 ms
...	...
250	25 ms - Higher values are limited to this value.



#### Information:

The register is described in ["Digital input filter" on page 10.](#)

## 3.2 Reference voltage and switching thresholds

The status of the digital inputs depends on the reference voltage and input voltage. The state of the reference voltage can be read out.

Value	Description
0	Reference voltage $U_{ref} < 4.75$ V
1	Reference voltage $U_{ref} \geq 4.75$

State of the digital inputs depending on the reference voltage.

Reference voltage	State of the digital inputs	
$U_{ref} < 4.75$ V	All digital inputs are in the low state regardless of the voltage on the inputs.	
$U_{ref} \geq 4.75$ V	$U_{in} \leq 0.2 * U_{ref}$	The digital input is Low.
	$U_{in} \geq 0.6 * U_{ref}$	The digital input is High.
	$0.2 * U_{ref} < U_{in} < 0.6 * U_{ref}$	This range is undefined. The digital input is either Low or High.

### Example

The reference voltage  $U_{ref} = 48$  VDC.

Calculation of the switching thresholds:

Low switching threshold =  $48 * 0.2 = 9.6$  VDC

High switching threshold =  $48 * 0.6 = 28.8$  VDC

State of the digital inputs depending on the input voltage.

Input voltage	State of the digital input
$U_{in} \leq 9.6$ VDC	The digital input is Low.
$9.6 \text{ VDC} < U_{in} < 28.8 \text{ VDC}$	The digital input is either Low or High (undefined).
$U_{in} \geq 28.8$ VDC	The digital input is High.



### Information:

The register is described in "[Input state of digital inputs 1 to 10](#)" on page 11.

## 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 2 digital logical slots 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	Register name	Data type	Read		Write	
				Cyclic	Acyclic	Cyclic	Acyclic
Configuration							
18	-	ConfigOutput01 (input filter)	USINT				•
Communication							
-	1	DigitalInput	UINT	•			
0	1	Input state of digital inputs 1 to 8	USINT				
		DigitalInput01	Bit 0				
		...	...				
		DigitalInput08	Bit 7				
1	2	Input state of digital inputs 9 to 10	USINT	•			
		DigitalInput09	Bit 0				
		DigitalInput10	Bit 1				
		ReferenceStatus	Bit 7				

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>	Register name	Data type	Read		Write	
				Cyclic	Acyclic	Cyclic	Acyclic
Configuration							
18	-	ConfigOutput01 (input filter)	USINT				•
Communication							
0	0	Input state of digital inputs 1 to 8	USINT	•			
		DigitalInput01	Bit 0				
		...	...				
		DigitalInput08	Bit 7				
1	1	Input state of digital inputs 9 to 10	USINT	•			
		DigitalInput09	Bit 0				
		DigitalInput10	Bit 1				
		ReferenceStatus	Bit 7				

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

### 5.4 Digital inputs

#### 5.4.1 Digital input filter

Name:

ConfigOutput01

The filter value for all digital inputs can be configured in this register.

Data type	Values	Filter
USINT	0	No software filter (bus controller default setting)
	2	0.2 ms
	...	...
	250	25 ms - Higher values are limited to this value.

### 5.4.1.1 Details related to use

The table shows how the register must be defined in relation to the function model and which parameter is available for this in the Automation Studio configuration.

Function model	Value or path for the configuration parameter
All	General / Input filter [0.1 ms]

### 5.4.2 Input state of digital inputs 1 to 10

Register name:  
DigitalInput or  
DigitalInput01 to DigitalInput10  
ReferenceStatus

This register contains the input state of digital inputs 1 to 10 and the state of the reference voltage. The reference voltage is monitored.

Data type	Value	Information
UINT	0x0000 to 0x83FF	Packed inputs = On Data point: "DigitalInput"
		0xy000 to 0xy3FF      Status of digital inputs 1 to 10
		0x0yyy or 0x8yyy      State of the reference voltage
USINT	See bit structure.	Packed inputs = Off or function model $\neq$ 0 - Standard Data points: "DigitalInput01" to "DigitalInput10" and "ReferenceStatus"

Bit structure:

#### Register 0

Bit	Name	Value	Information <sup>1)</sup>
0	DigitalInput01	0 or 1	Input state - Digital input 1
...		...	
7	DigitalInput08	0 or 1	Input state - Digital input 8

1) See "Digital inputs - Record input status" on page 7.

#### Register 1

Bit	Name	Value	Information
0	DigitalInput09	0 or 1	Input state - Digital input 9
1	DigitalInput10	0 or 1	Input state - Digital input 10
2 - 6	Reserved		
7	ReferenceStatus	0	Reference voltage $U_{ref} < 4.75$ V
		1	Reference voltage $U_{ref} \geq 4.75$ V

## 5.5 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	
Without filtering	100 $\mu$ s
With filtering	150 $\mu$ s

## 5.6 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	
Without filtering	100 $\mu$ s
With filtering	200 $\mu$ s