X20DI4653

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).

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 inputs	
X20DI4653	X20 digital input module, 4 inputs, 100 to 240 VAC, 240 V keyed, 2-wire connections	
	Required accessories	
	Bus modules	
X20BM12	X20 bus module, 240 VAC keyed, internal I/O power supply connected through	
	Terminal blocks	
X20TB32	X20 terminal block, 12-pin, 240 VAC keyed	

Table 1: X20DI4653 - Order data

1.3 Module description

The module is equipped with 4 inputs for 2-wire connections. It is designed for an input voltage of 100 to 240 VAC.



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.

Functions:

- Digital inputs
- Monitoring the supply voltage

Digital inputs

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

Monitoring the supply voltage

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

2 Technical description

2.1 Technical data

Order number	X20DI4653
Short description	
I/O module	4 digital inputs 100 to 240 VAC for 2-wire connections
General information	
B&R ID code	0x2545
Status indicators	I/O function per channel, operating state, module status
Diagnostics	
Module run/error	Yes, using LED status indicator and software
External I/O power supply	Yes, using software (typ. threshold 85 VAC)
Power consumption	
Bus	0.17 W
Internal I/O	-
External I/O	0.91 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
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
ABS	Yes
BV	**EC33B** Temperature: 5 - 55°C Vibration: 4 g EMC: Bridge and open deck
KC	Yes
Digital inputs	
Nominal voltage	100 to 240 VAC
Input filter	
Software	Default 1 ms, configurable between 0 and 25 ms in 0.2 ms increments
Hardware	
1 → 0	≤30 ms
0 → 1	≤40 ms
Connection type	2-wire connections
Rated frequency	47 to 63 Hz
Switching threshold	
Low	<40 VAC
High	>79 VAC
Insulation voltage between channel and bus	1 minute 2500 VAC
Input voltage	
Maximum	264 VAC
Input current	
100 VAC / 60 Hz	4 mA (Rev. ≥ E0), 5 mA (Rev. < E0)
240 VAC / 50 Hz	8.5 mA (Rev. ≥ E0), 11 mA (Rev. < E0)
Sensor power supply	
Voltage	Corresponds to the module power supply
Summation current	4 A_{eff}
Short-circuit proof	No
Electrical properties	
Electrical isolation	Channel isolated from bus Channel not isolated from channel

Table 2: X20DI4653 - Technical data

Order number	X20DI4653
Operating conditions	
Mounting orientation	
Horizontal	Yes
Vertical	Yes
Installation elevation above sea level	
0 to 2000 m	No limitation
>2000 m	Not permitted
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
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 X20BM12 separately.
Pitch	12.5$^{+0.2}$ mm

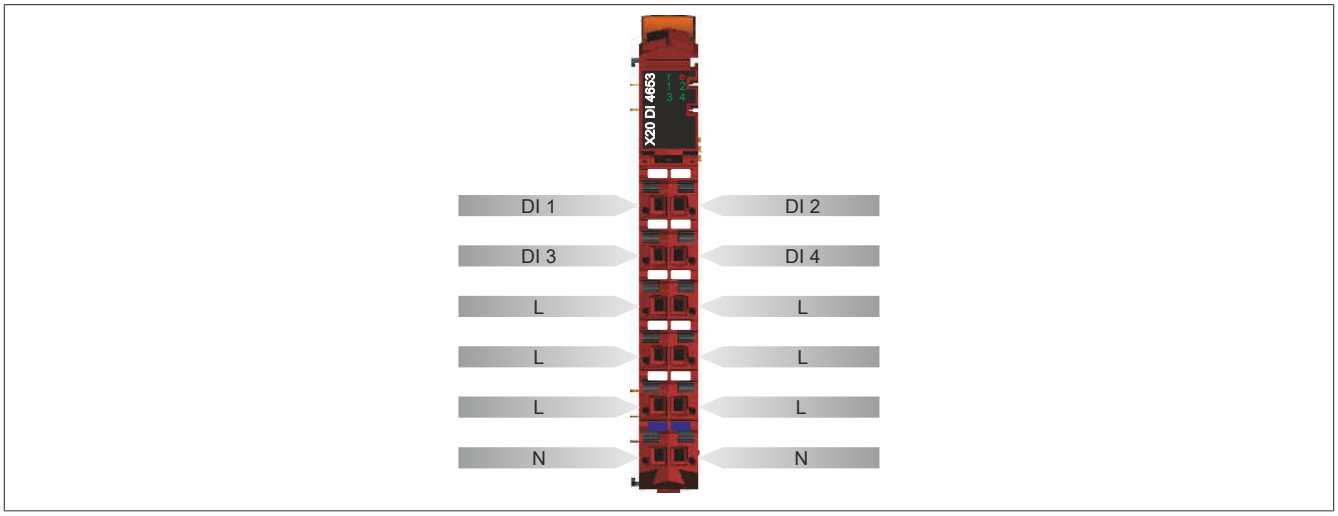
Table 2: X20DI4653 - Technical data

2.2 Status LEDs

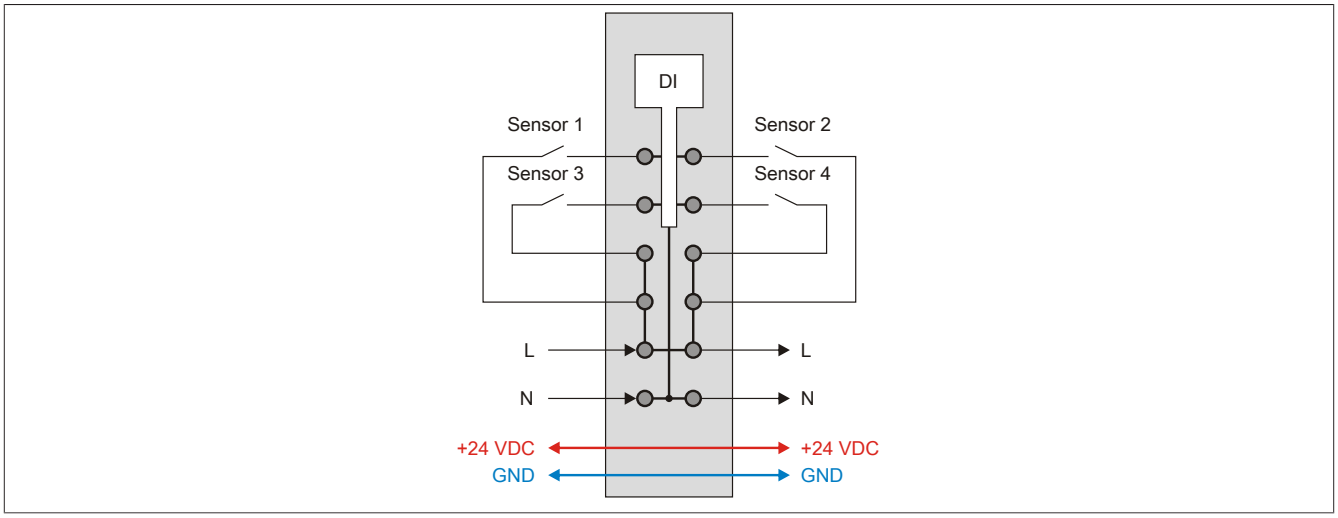
For a description of the various operating modes, see section "Additional information - Diagnostic LEDs" in the X20 System user's manual.

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
			Double flash	External supply is too low or not connected
	e + r	Red on / Green single flash		Invalid firmware
	1 - 4	Green		Input status of the corresponding digital input

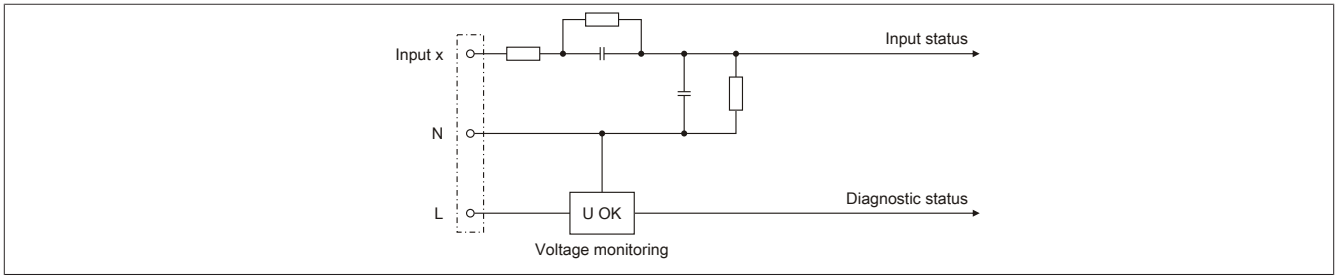
2.3 Pinout



2.4 Connection example



2.5 Input circuit diagram



3 Function description

3.1 Digital inputs

The module is equipped with 4 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)

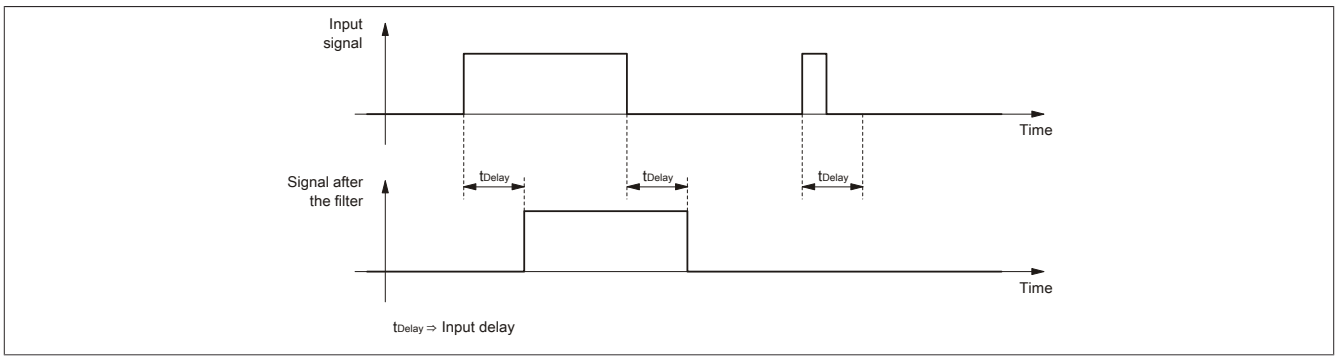
Setting "Packed inputs" in the Automation Studio I/O configuration can be used to determine whether all bits of the register should be applied as individual data points in the Automation Studio I/O mapping ("DigitalInput01 to DigitalInputxx") or whether the register should be displayed as a single USINT data point ("DigitalInput").

Information:

The register is described in "Input state of digital inputs 1 to 4" 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 Monitoring the supply voltage

The common status of the supply voltage of the digital inputs can be read out.

Value	Description
0	Supply voltage too low
1	Supply voltage >80 VAC



Information:

The register is described in "Input state of digital inputs 1 to 4" 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
Configuration							
18	-	ConfigOutput01 (input filter)	USINT				•
Communication							
0	1	DigitalInput	USINT	•			
		DigitalInput01	Bit 0				
		...	...				
		DigitalInput04	Bit 3				
		PowerSupply	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[1)]	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 4	USINT	•			
		DigitalInput01	Bit 0				
		...	...				
		DigitalInput04	Bit 3				
		PowerSupply	Bit 7				

1) The offset specifies where the register is 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.

5.4.2 Input state of digital inputs 1 to 4

Name:
DigitalInput or
DigitalInput01 to DigitalInput04
PowerSupply

This register contains the input state of digital inputs 1 to 4.

Data type	Values	Information[1)]	
USINT	0x0 to 0x8f	Packed inputs = On Data point: "DigitalInput"	
		0xy0 to 0yF	Status of inputs 1 to 4
		0x0y or 0x8y	Status of the supply voltage
	See the bit structure.	Packed inputs = Off or function model ≠ 0 - Standard Data points: "DigitalInput01" to "DigitalInput04" and "PowerSupply"	

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

Bit structure:

Bit	Name	Value	Information
0	DigitalInput01	0 or 1	Input state - Digital input 1
...		...	
3	DigitalInput04	0 or 1	Input state - Digital input 4
4 - 6	Reserved	0	
7	PowerSupply	0	Supply voltage too low
		1	Supply voltage >80 VAC

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 µs
With filtering	150 µs

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 µs
With filtering	200 µs