1.3 Module description

This module is a multifunctional counter module. It can be connected to two SSI encoders, two ABR encoders, four AB encoders or eight event counters. Four outputs are available for pulse width modulation. The functions can also be mixed.

Functions:

- Digital inputs and outputs
- Counters and encoders
- SSI encoder interface
- PWM - Pulse width modulation
- Time measurement function
- Controlling the LED status indicators
- Monitoring the encoder power supply

Digital inputs and outputs

This module is equipped with 8 digital channels. All channels are used as inputs, 4 channels are also configurable as outputs. The inputs can be compared with predefined states and used to generate events. In addition to being controlled from the application, the setting or clearing of outputs can also be controlled by events.

Counters and encoders

The module provides counter functions for each channel. These can be configured for different counter or encoder functions depending on the channel. These include:

- AB encoder
- ABR encoders
- Up/Down counter
- Event counters

SSI absolute encoder

The module provides 2 SSI absolute encoders that are directly supported by the hardware.

PWM - Pulse width modulation

The module provides 4 PWM functions that are directly supported by the hardware.

Time measurement function

The module has a time measurement function for each I/O channel. It can be configured separately for rising and falling edges on each channel.

Controlling LED status indicators

The module LED status indicators can be controlled by the application. This allows blink signals to be output or the states of physical inputs and outputs to be displayed.

Monitoring the supply voltage

The encoder power supply voltage is monitored.

2 Technical description

2.1 Technical data

Order number	X20DC4395
Short description	
I/O module	2 SSI absolute encoders 24 V, 2 ABR incremental encoders 24 V, 4 AB incremental encoders 24 V, 8x event counter or 4x pulse width modulation, time measurement, relative timestamp
General information	
Input voltage	24 VDC -15% / +20%
B&R ID code	0x1CC5
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 state)
Power consumption	
Bus	0.01 W
Internal I/O	1.5 W
Additional power dissipation caused by actuators (resistive) [W]	-
Type of signal lines	Shielded lines must be used for all signal lines.
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
Incremental encoders	
Quantity	4
Encoder inputs	24 V, asymmetrical
Counter size	16/32-bit
Input frequency	Max. 100 kHz
Evaluation	4x
Encoder power supply	Module-internal, max. 600 mA
Overload characteristics of encoder power supply	Short-circuit proof, overload-proof
SSI absolute encoder	
Quantity	2
Encoder inputs	24 V, asymmetrical
Counter size	32-bit
Max. transfer rate	125 kbit/s
Encoder power supply	Module-internal, max. 600 mA
Coding	Gray/Binary
CLK: Output current	Max. 100 mA
Overload characteristics of encoder power supply	Short-circuit proof, overload-proof
Event counters	
Quantity	8
Nominal voltage	24 VDC
Signal form	Square wave pulse

Table 2: X20DC4395 - Technical data

Technical description

Order number	X20DC4395
Evaluation	Each edge, cyclic counter
Input frequency	Max. 100 kHz
Input current at 24 VDC	Approx. 1.3 mA
Input resistance	18.4 kΩ
Insulation voltage between channel and bus	500 V_{eff}
Counter frequency	200 kHz
Counter size	16/32-bit
Input filter	
Hardware	≤2 µs
Software	-
Switching threshold	
Low	<5 VDC
High	>15 VDC
Edge detection / Time measurement	
Possible measurements	Gate time, period duration, edge offset for various channels
Measurements per module	Up to 9
Measurements per channel	Up to 2
Signal form	Square wave pulse
Counter size	16-bit
Counter frequency	
Internal	8 MHz, 4 MHz, 2 MHz, 1 MHz, 500 kHz, 250 kHz, 125 kHz, 62.5 kHz
Measurement type	Continuous or triggered
Digital outputs	
Quantity	4
Variant	Push / Pull / Push-Pull
Nominal voltage	24 VDC
Switching voltage	24 VDC -15% / +20%
Nominal output current	0.1 A
Total nominal current	0.4 A
Output circuit	Sink or source
Output protection	Thermal shutdown in the event of overcurrent or short circuit, integrated protection for switching inductive loads
Pulse width modulation [1)]	
Period duration	41.6 µs to 1.36 s
Factor for period duration	n/48000 s, n = 2 to 65535
Pulse duration	0 to 100%
Resolution for pulse duration	0.1%
Actuator power supply	Module-internal, max. 600 mA
Diagnostic status	Output monitoring
Leakage current when the output is switched off	Max. 25 µA
Residual voltage	<0.9 V at 0.1 A nominal current
Peak short-circuit current	<10 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	<2 µs
1 → 0	<2 µs
Switching frequency	
Resistive load	Max. 24 kHz
Inductive load	See section "Switching inductive loads".
Braking voltage when switching off inductive loads	Switching voltage + 0.6 VDC
Insulation voltage between channel and bus	500 V_{eff}
Electrical properties	
Electrical isolation	Bus isolated from encoder and output Output not isolated from output and encoder Encoder not isolated from encoder
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: X20DC4395 - Technical data

Order number	X20DC4395
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	$12.5^{+0.2}$ mm

Table 2: X20DC4395 - Technical data

1) Dead time when switching between push and pull: Max. 1.5 µs.

2.2 LED status indicators

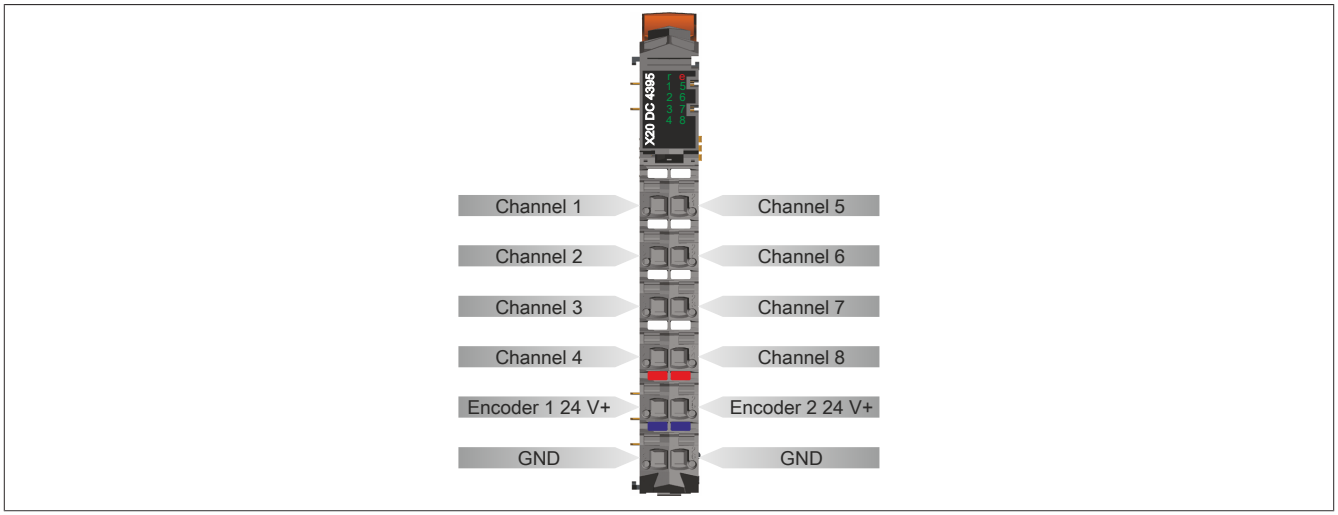
For a description of the various operating modes, see section "Additional information - Diagnostic LEDs" in the X20 System user's manual.

Figure	LED	Color	Status	Description
	r	Green	Off	No power to module
			Single flash	RESET mode
			Double flash	BOOT mode (during firmware update)[1)]
			Blinking	PREOPERATIONAL mode
			On	RUN mode
	e	Red	Off	No power to module or everything OK
			On	Error or reset status
	1 - 8	Green		Status of the corresponding digital signal

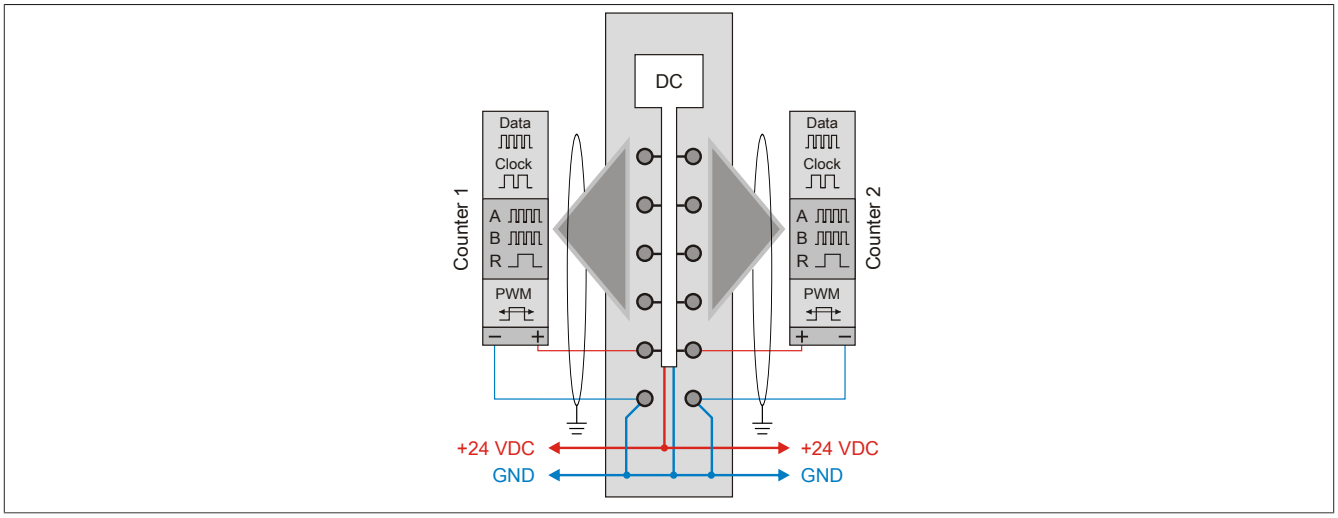
1) Depending on the configuration, a firmware update can take up to several minutes.

2.3 Pinout

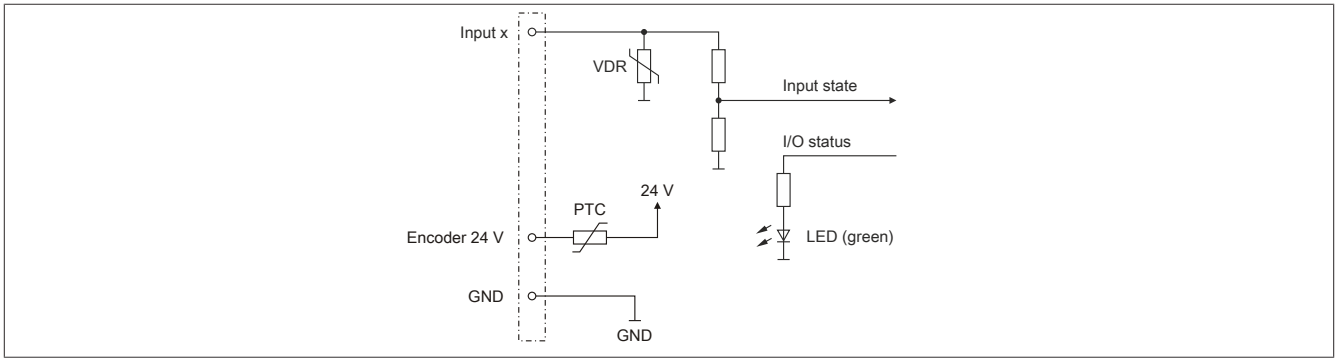
Shielded cables must be used for all signal lines.



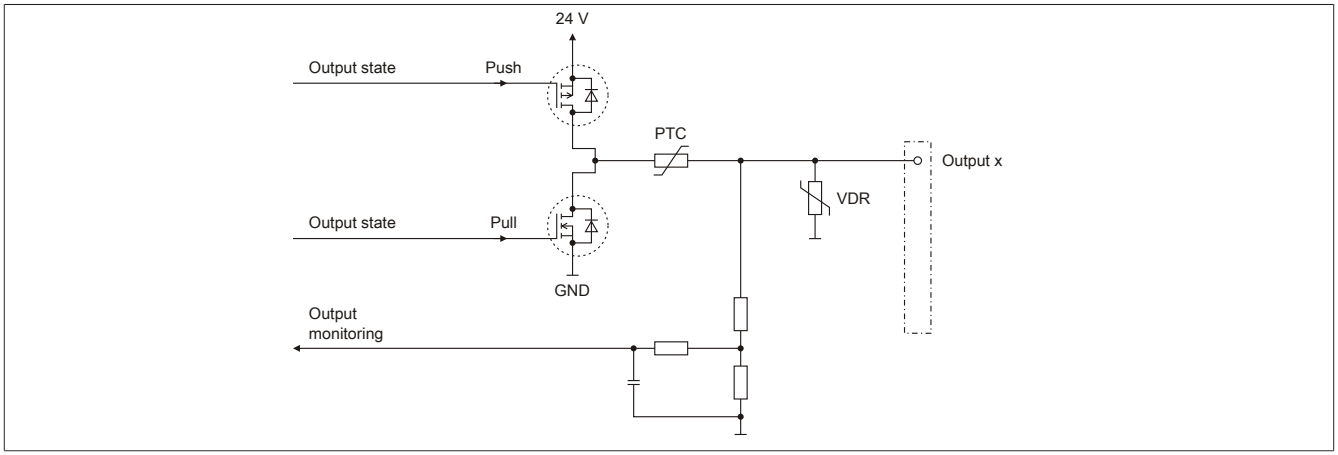
2.4 Connection example



2.5 Input circuit diagram



2.6 Output circuit diagram



2.7 Switching inductive loads

