

X20(c)DC1198

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

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.



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
	Counter functions	
X20DC1198	X20 digital counter module, 1 SSI absolute encoder, 5 V, 1 Mbit/s, 32-bit	
X20cDC1198	X20 digital counter module, coated, 1 SSI absolute encoder, 5 V, 1 Mbit/s, 32-bit	
	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: X20DC1198, X20cDC1198 - Order data

1.4 Module description

This module is equipped with one input for SSI absolute encoders with 5 V encoder signal.

Functions:

- [SSI absolute encoder](#)
- [Monitoring the encoder power supply](#)

SSI absolute encoder

Absolute encoders are linear or angular encoders used as position encoders on machine tools, in handling and automation technology, and on measuring and testing equipment. The absolute measured value is available without referencing immediately after switching on.

Monitoring the supply voltage

The encoder power supply voltage is monitored.

2 Technical description

2.1 Technical data

Order number	X20DC1198	X20cDC1198
Short description		
I/O module	1 SSI absolute encoder 5 V	
General information		
B&R ID code	0x1BB0	0xE501
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	0.01 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	-
Digital inputs		
Quantity	2	
Nominal voltage	24 VDC	
Input characteristics per EN 61131-2	Type 1	
Input voltage	24 VDC -15% / +20%	
Input current at 24 VDC	Approx. 3.3 mA	
Input circuit	Sink	
Input filter		
Hardware	≤2 µs	
Software	-	
Connection type	3-wire connections	
Input resistance	7.19 kΩ	
Switching threshold		
Low	<5 VDC	
High	>15 VDC	
Insulation voltage between channel and bus	500 V _{eff}	
SSI absolute encoder		
Encoder inputs	5 V, symmetrical	
Counter size	32-bit	
Max. transfer rate	1 Mbit/s	
Coding	Gray/Binary	
Insulation voltage between encoder and bus	500 V _{eff}	
Overload characteristics of encoder power supply	Short-circuit proof, overload-proof	
Transfer rate	125 kbit/s / 250 kbit/s / 500 kbit/s / 1 Mbit/s	

Table 2: X20DC1198, X20cDC1198 - Technical data

Technical description

Order number	X20DC1198	X20cDC1198
Encoder power supply		
5 VDC	±5%, module-internal, max. 300 mA	
24 VDC	Module-internal, max. 300 mA	
Electrical properties		
Electrical isolation	Bus isolated from encoder and channel Channel not isolated from channel and 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	
Ambient conditions		
Temperature		
Operation		
Horizontal mounting orientation	-25 to 60°C	
Vertical mounting orientation	-25 to 50°C	
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: X20DC1198, X20cDC1198 - Technical data

2.2 LED status indicators

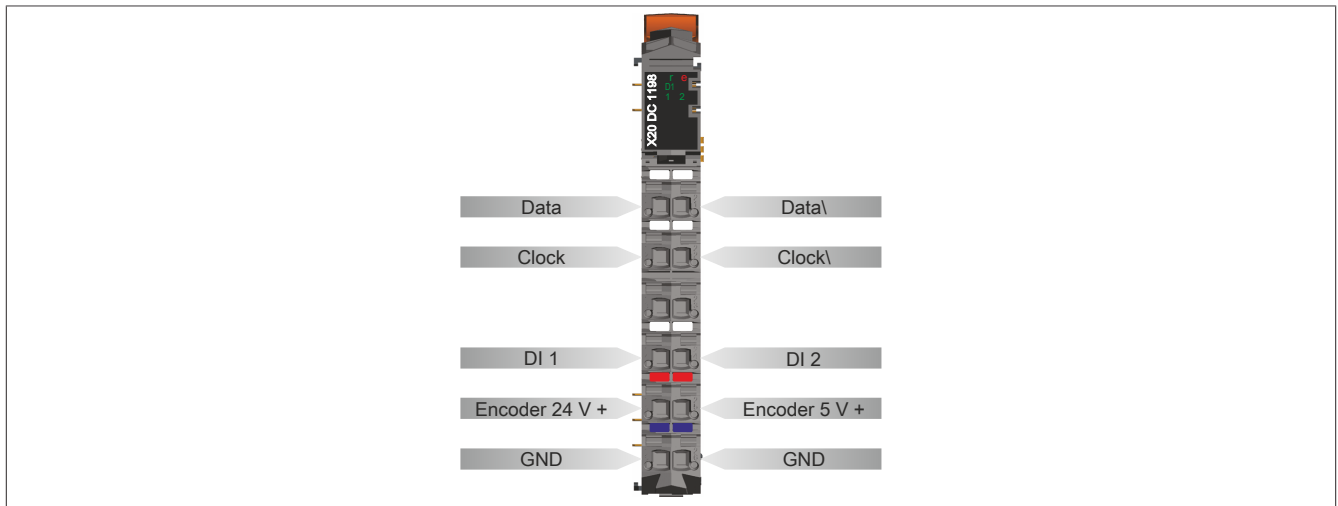
For a description of the various operating modes, see section "Additional information - Diagnostic LEDs" in the X20 System user's manual.

Figure	LED	Color	Status	Description
	r	Green	Off	No power to module
			Single flash	RESET mode
			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
	D1	Green		Input status - Data signal
	1 - 2	Green		Input state of the corresponding digital input

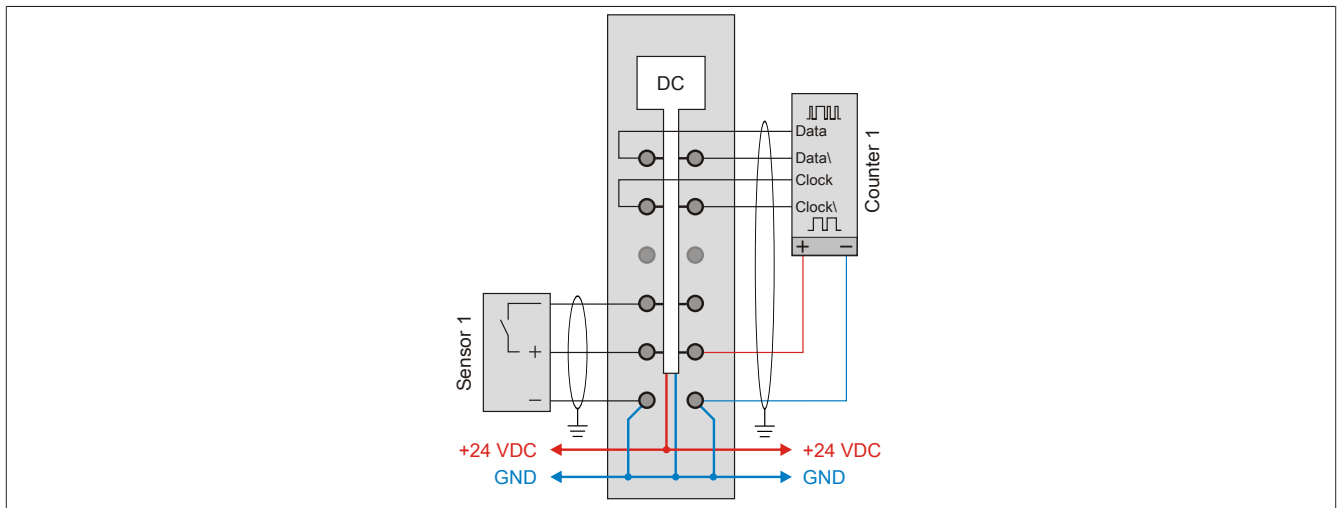
1) Depending on the configuration, a firmware update can take up to several minutes.

2.3 Pinout

Shielded cables must be used for all signal lines.

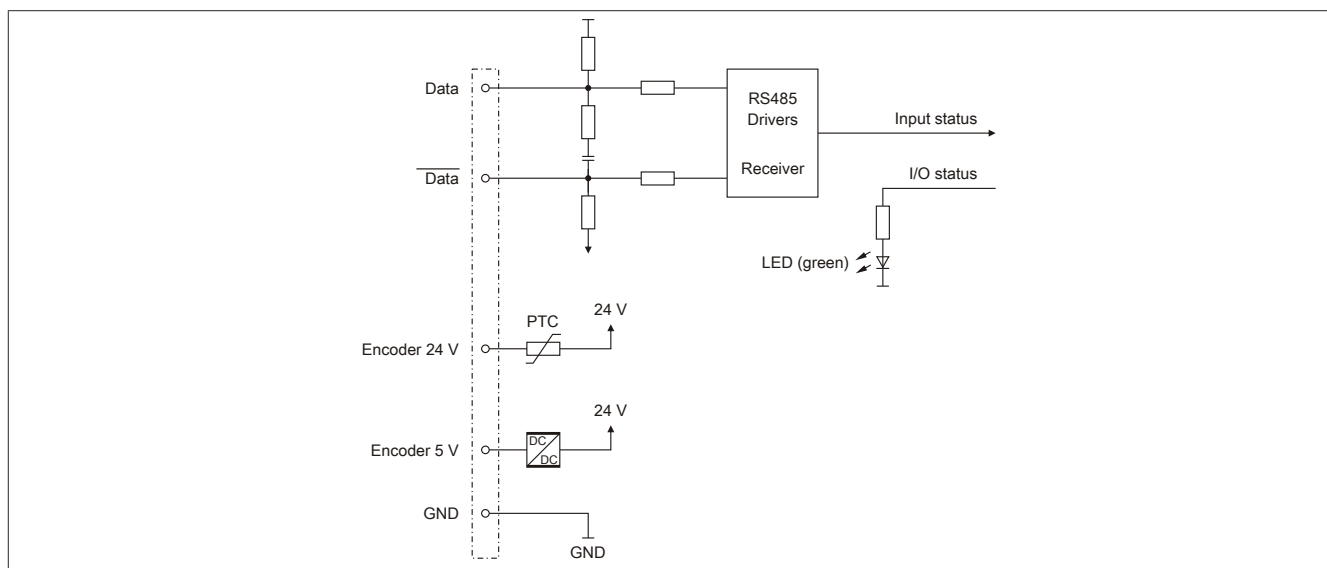


2.4 Connection example

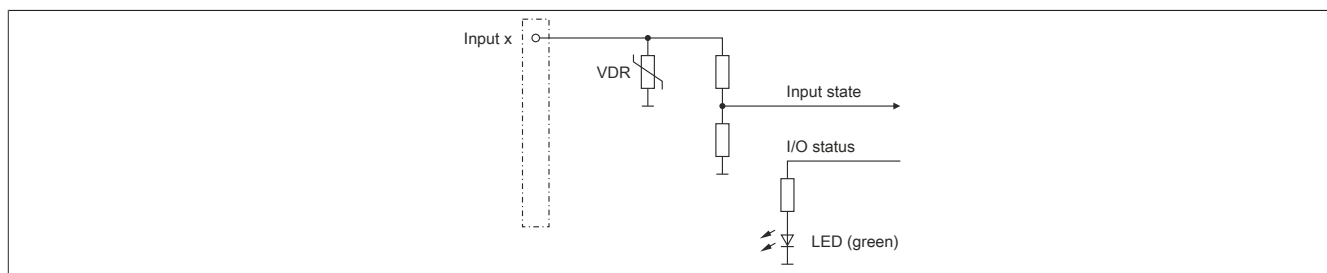


2.5 Input circuit diagram

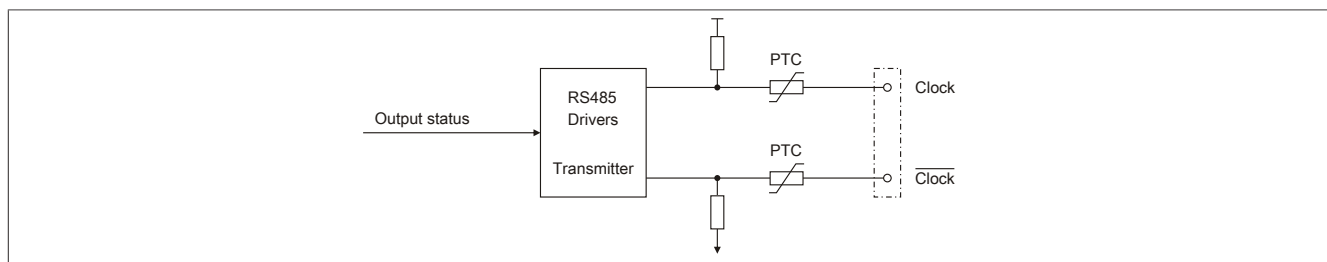
Counter input



Standard inputs



2.6 Output circuit diagram



3 Function description

3.1 SSI absolute encoder

This module is equipped with 1 input for SSI absolute encoders.

3.1.1 General information

Absolute encoders output the position information in the form of a digital numerical value. Since this numerical value is unique over the entire triggering area of the absolute encoder, no initial homing procedure such as is required for incremental encoders. The absolute values are transferred from the encoder to the module through a synchronous serial interface (SSI).

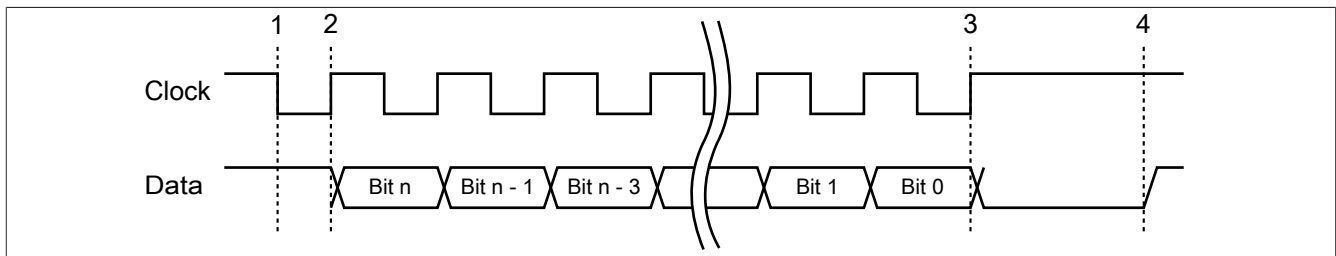
3.1.2 Setting the operating parameters

For proper operation, the operating parameters of the SSI absolute encoder must be set in order to correctly evaluate the data received from the encoder.

- **Monostable multivibrator testing**
With the monoflop, the encoder indicates that it is ready to accept a new clock cycle.
- **Data coding**
Binary or Gray coding of the data bits
- **Clock rate**
Speed of data transfer.

3.1.3 Transferring using Synchronous Serial Interface

Transferring using Synchronous Serial Interface



Processing the measured value

- 1) Start bit ... The measured value is saved.
- 2) Output of the first data bit
- 3) All data bits are transferred; the monostable multivibrator time starts to run.
- 4) The monostable multivibrator returns to its initial state; a new transfer can be started.



Information:

The registers are described in "[SSI encoder configuration registers](#)" on page 13.

3.2 Monitoring the encoder power supply

Monitoring the encoder power supply

The status of the integrated encoder supplies can be read.

Bit	Description
0	24 or 5 VDC encoder supply voltage OK
1	24 or 5 VDC encoder supply voltage faulty



Information:

The register is described in "[Status of encoder supplies](#)" on page 14.

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 analog 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	Name	Data type	Read		Write	
			Cyclic	Acyclic	Cyclic	Acyclic
Configuration						
7176	ConfigOutput14	UINT				•
7172	ConfigAdvanced	UDINT				•
Communication						
7184	Encoder01	UDINT	•			
264	Input state of digital inputs 1 to 2	USINT	•			
	DigitalInput01	Bit 4				
	DigitalInput02	Bit 5				
40	Status of encoder supplies	USINT	•			
	PowerSupply01	Bit 0				
	PowerSupply02	Bit 1				

5.3 Function model 254 - Bus controller

Register	Offset ¹⁾	Name	Data type	Read		Write	
				Cyclic	Acyclic	Cyclic	Acyclic
Configuration							
7176	-	ConfigOutput14	UINT				•
7172	-	ConfigAdvanced	UDINT				•
Communication							
7184	0	Encoder01	UDINT	•			
264	4	Input state of digital inputs 1 to 2	USINT	•			
		DigitalInput01	Bit 4				
		DigitalInput02	Bit 5				
40	5	Status of encoder supplies	USINT	•			
		PowerSupply01	Bit 0				
		PowerSupply02	Bit 1				

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

5.4 SSI encoder configuration registers

5.4.1 Standard configuration

Name:

ConfigOutput14

This configuration register sets the encoding, clock rate and number of bits. Default = 0. This must be set once using an acyclic write command.

Data type	Values	Bus controller default setting
UINT	See the bit structure.	0

Bit structure:

Bit	Name	Value	Information
0 - 5	SSI value valid bits	x	Bus controller default setting: 0
6 - 7	Clock rate	00	1 MHz (bus controller default setting)
		01	500 kHz
		10	250 kHz
		11	125 kHz
8 - 13	SSI number of bits	x	Number of bits including leading zeros. Bus controller default setting: 0
14	Reserved	0	
15	Keying	0	Binary encoding (bus controller default setting)
		1	Gray coding

5.4.2 Extended configuration

Name:

ConfigAdvanced

It only differs from "[ConfigOutput14](#)" on page 13 by data length and additional monostable multivibrator testing.

Data type	Values	Bus controller default setting
UDINT	See the bit structure.	65536

Bit structure:

Bit	Name	Value	Information
0 - 5	SSI value valid bits	x	Bus controller default setting: 0
6 - 7	Clock rate	00	1 MHz (bus controller default setting)
		01	500 kHz
		10	250 kHz
		11	125 kHz
8 - 13	SSI number of bits	x	Number of bits including leading zeros. Bus controller default setting: 0
14	Reserved	0	
15	Keying	0	Binary encoding (bus controller default setting)
		1	Gray coding
16 - 17	Monostable multivibrator testing	00	Check OFF, no additional clock bit
		01	Check set to high level (bus controller default setting)
		10	Check set to Low level
		11	Level is clocked but ignored
18 - 31	Reserved	0	Reserved

5.5 SSI encoder communication registers

5.5.1 SSI position values

Name:

Encoder01

The SSI encoder value is displayed as a 32-bit position value. The SSI position value is calculated synchronously with the X2X cycle.

Data type	Value	Information
UDINT	0 to 4,294,967,295	SSI position

5.5.2 Input state of digital inputs 1 to 2

Name:

DigitalInput01 to DigitalInput02

This register is used to indicate the input state of digital inputs 1 to 2.

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
4	DigitalInput01	0 or 1	Input state - Digital input 1
5	DigitalInput02	0 or 1	Input state - Digital input 2

5.5.3 Status of encoder supplies

Name:

PowerSupply01 to PowerSupply02

This register shows the status of the integrated encoder supplies. A faulty encoder power supply is displayed as a warning.

Data type	Value
USINT	See bit structure.

Bit structure:

Bit	Name	Value	Information
0	PowerSupply01	0	24 VDC encoder power supply OK
		1	24 VDC encoder power supply faulty
1	PowerSupply02	0	5 VDC encoder power supply OK
		1	5 VDC encoder power supply faulty
2 - 7	Reserved	-	

5.6 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
128 µs

5.7 Maximum cycle time

The maximum cycle time specifies the time up to which the bus cycle can be increased without internal counter overflows causing module malfunctions.

Maximum cycle time
16 ms

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
128 µs