X20AO4635

1 General information

The module is equipped with 4 outputs with 16-bit (including sign) digital converter resolution. It is possible to select between the current and voltage signal using different terminals.

- 4 analog outputs
- Either current or voltage signal possible
- 16-bit digital converter resolution
- Low temperature drift

2 Order data

Model number	Short description	Figure
	Analog outputs	
X20AO4635	X20 analog output module, 4 outputs, ±10 V or 0 to 20 mA, 16-bit converter resolution, low temperature drift	
	Required accessories	
	Bus modules	
X20BM11	X20 bus module, 24 VDC keyed, internal I/O supply continuous	
X20BM15	X20 bus module, with node number switch, 24 VDC keyed, internal I/O supply continuous	
	Terminal blocks	
X20TB12	X20 terminal block, 12-pin, 24 VDC keyed	

Table 1: X20AO4635 - Order data

3 Technical data

Model number	X20AO4635
Short description	
I/O module	4 analog outputs, ±10 V or 0 to 20 mA, low temperature drift
General information	
B&R ID code	0xA7FE
Status indicators	I/O function per channel, operating state, module status
Diagnostics	
Module run/error	Yes, using status LED and software
Channel type	Yes, using software
Power consumption	
Bus	0.01 W
Internal I/O	1.5 W
Additional power dissipation caused by actuators (resistive) [W]	-
Certifications	
CE	Yes
KC	Yes
EAC	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5
ATEX	Zone 2, II 3G Ex nA nC IIA T5 Gc IP20, Ta (see X20 user's manual) FTZÚ 09 ATEX 0083X
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **B** (4 g) EMC: **B** (bridge and open deck)
LR	ENV1
KR	Yes
Analog outputs	
Output	±10 V or 0 to 20 mA, via different terminal connections
Digital converter resolution	
Voltage	±15-bit
Current	15-bit
Conversion time	50 µs for all outputs
Settling time for output changes over entire range	500 µs
Switch on/off behavior	Internal enable relay for booting
Max. error at 25°C	
Gain	0.04% [1]
Offset	0.022% [2]
Output protection	Short circuit protection
Output format	
Voltage	INT 0x8000 - 0x7FFF / 1 LSB = 0x0001 = 305.176 µV
Current	INT 0x0000 - 0x7FFF / 1 LSB = 0x0001 = 610.352 nA
Load per channel	
Voltage	Max. ±10 mA, load ≥ 1 kΩ
Current	Max. load is 500 Ω
Short-circuit proof	Current limiting ±40 mA
Output filter	1st-order low pass / cutoff frequency 10 kHz
Error caused by load change	
Voltage	Max. 0.02%, from 10 MΩ → 1 kΩ, resistive
Current	Max. 0.5%, from 1 Ω → 500 Ω, resistive
Nonlinearity	<0.005%
Isolation voltage between channel and bus	500 V_{eff}
Signal	
0 to 20 mA	
Max. gain drift	0.01 %/°C [1]
Max. offset drift	0.012 %/°C [2]
±10 V	
Max. gain drift	0.0025 %/°C [1]
Max. offset drift	0.001 %/°C [2]
Electrical properties	
Electrical isolation	Channel isolated from bus Channel not isolated from channel
Operating conditions	
Mounting orientation	
Horizontal	Yes
Vertical	Yes

Table 2: X20AO4635 - Technical data

Model number	X20AO4635
Installation elevation above sea level	
0 to 2000 m	No limitations
>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 55°C
Vertical mounting orientation	-25 to 50°C
Derating	See section "Module operation"
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 X20TB12 terminal block separately Order 1x X20BM11 bus module separately
Spacing	12.5$^{+0.2}$ mm

Table 2: X20AO4635 - Technical data

1)   Based on the current output value.
2)   Based on the entire output range.

4 LED status indicators

For a description of the various operating modes, see section "Additional information - Diagnostic LEDs" of 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 - 4	Orange	Off	Value = 0
			On	Value ≠ 0

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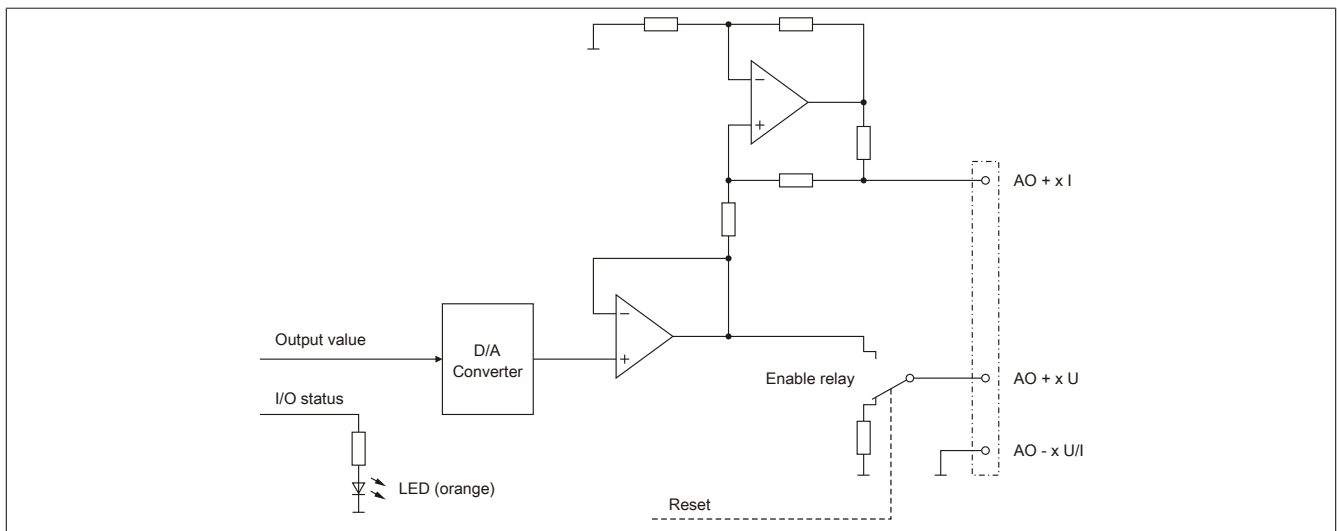
5 Pinout

Each channel can be configured for either current or voltage signals. The type of signal is also determined by the terminals used.
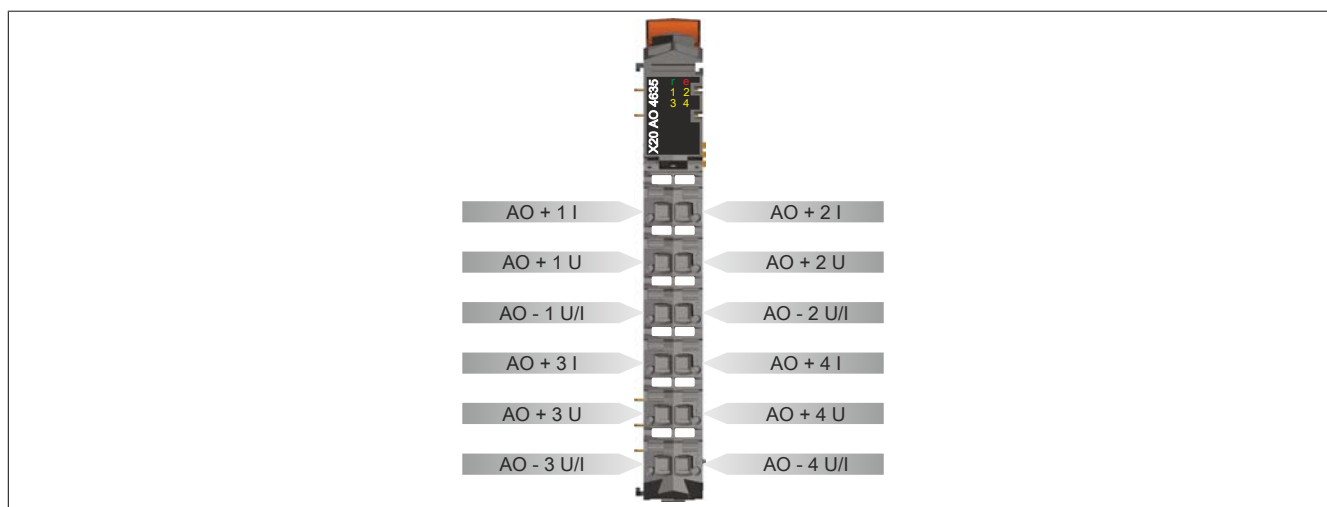
6 Connection example
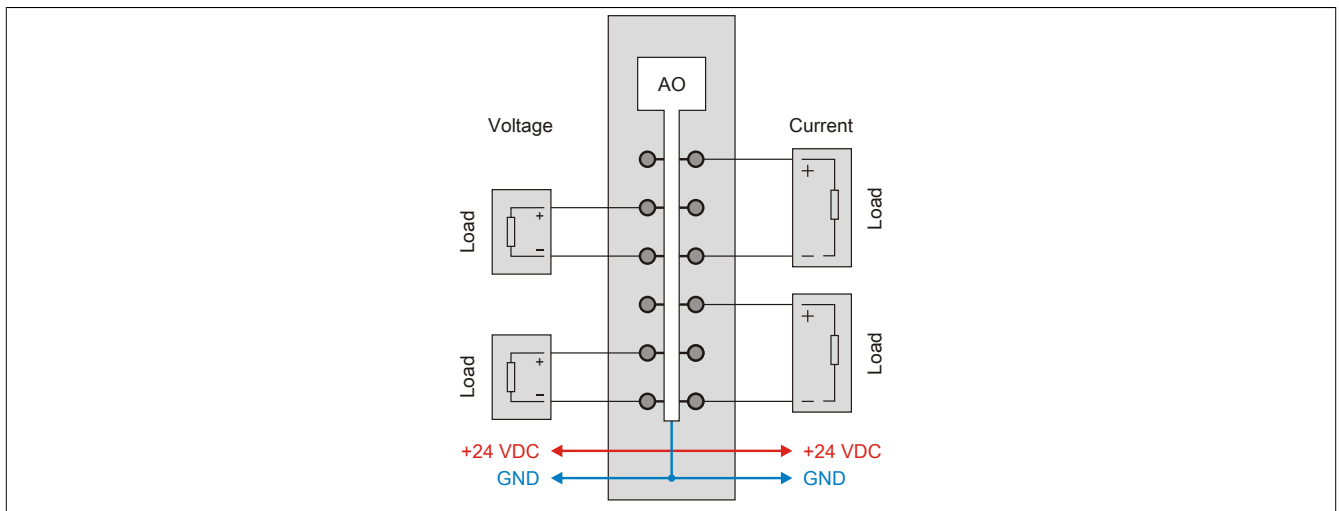
7 Output circuit diagram

8 Module operation

To ensure proper operation, the following items must be taken into consideration:

- The following derating listings must be taken into consideration
- For mixed operation with one current output, the average of both derating curves should be used
- For mixed operation with 2 or 3 current outputs, the derating for the current outputs should be used
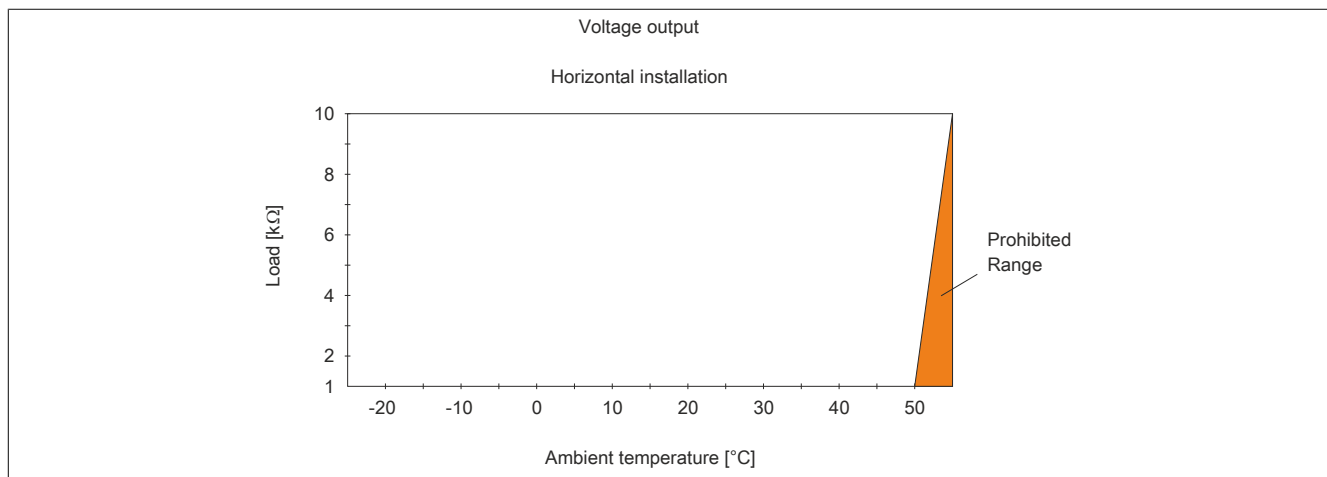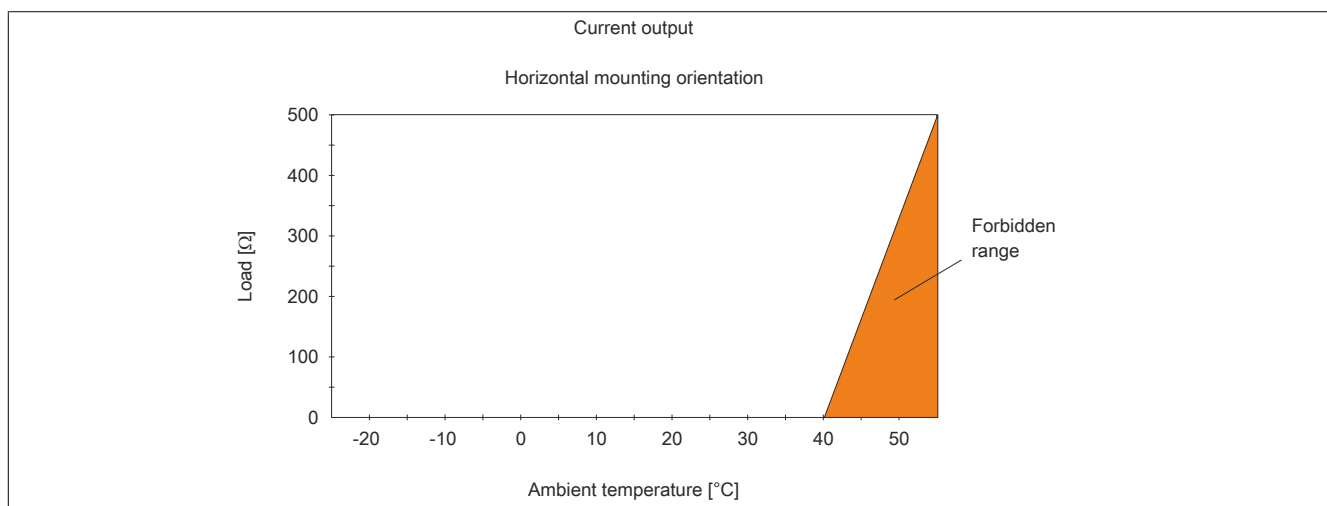
Horizontal installation

Figure 1: Derating the load with a voltage output and horizontal mounting
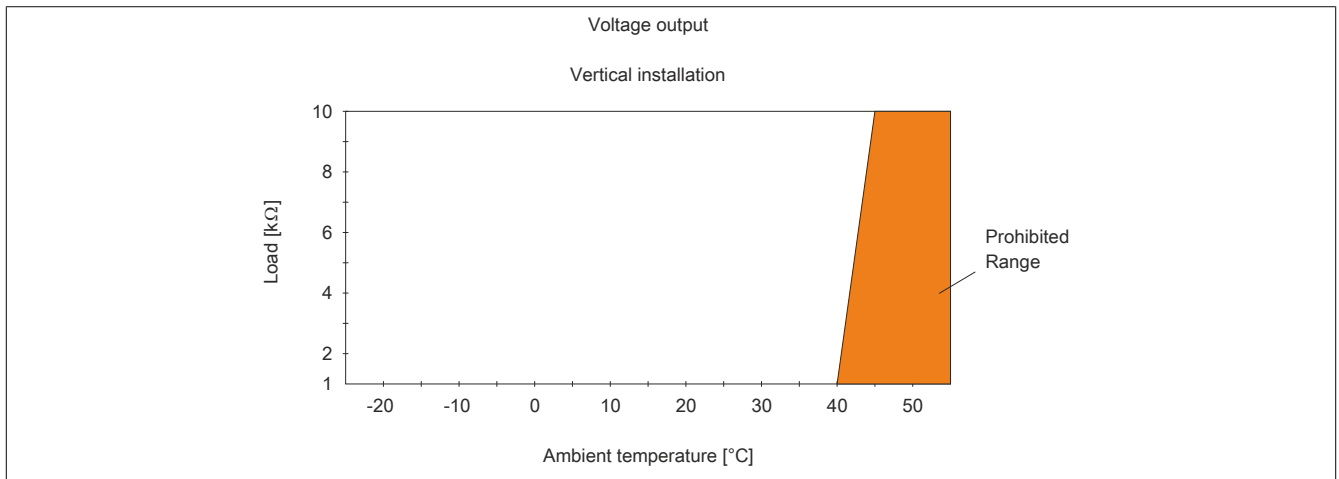
Vertical installation

Voltage output

Vertical installation

Figure 2: Derating the load with a voltage output and vertical mounting

Current output

Vertical mounting orientation
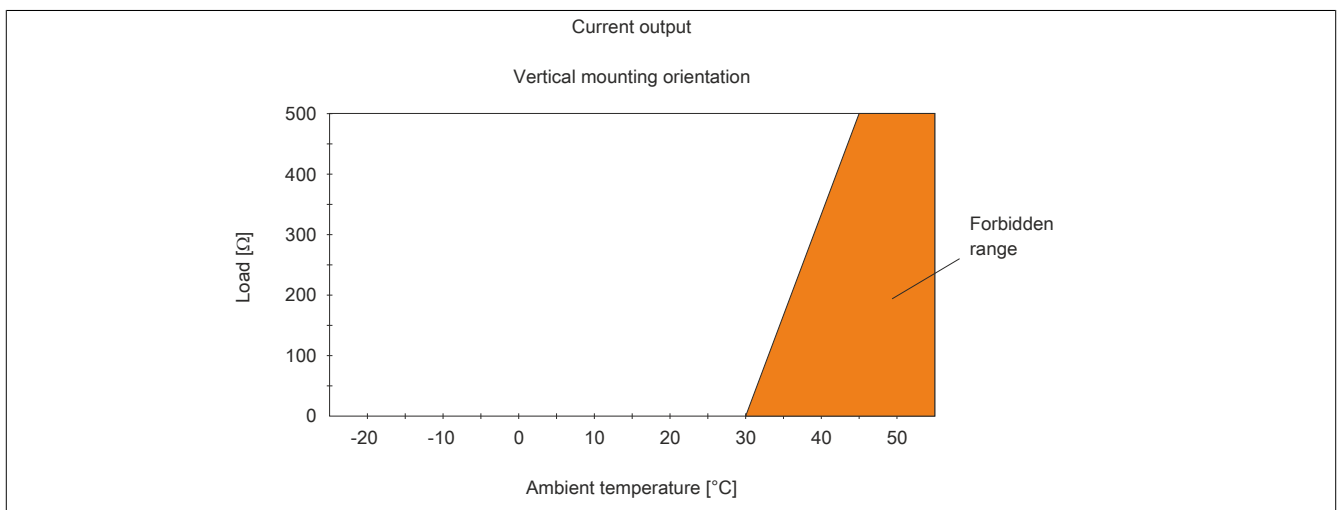
9 Register description

9.1 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" of the X20 system user's manual.

9.2 Function model 0 - Standard

Register	Name	Data type	Read		Write	
			Cyclic	Non-cyclic	Cyclic	Non-cyclic
Configuration						
0	ConfigOutput01 (channel type)	UINT				●
Communication						
2	AnalogOutput01	INT			●	
4	AnalogOutput02	INT			●	
6	AnalogOutput03	INT			●	
8	AnalogOutput04	INT			●	

9.3 Function model 254 - Bus controller

Register	Offset[1]	Name	Data type	Read		Write	
				Cyclic	Non-cyclic	Cyclic	Non-cyclic
Configuration							
0	-	ConfigOutput01 (channel type)	UINT				●
Communication							
2	0	AnalogOutput01	INT			●	
4	2	AnalogOutput02	INT			●	
6	4	AnalogOutput03	INT			●	
8	6	AnalogOutput04	INT			●	

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

9.3.1 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 additional registers and functions depending on the fieldbus used.

For detailed information, see section "Additional information - Using I/O modules on the bus controller" of the X20 user's manual (version 3.50 or later).

9.3.2 CAN I/O bus controller

The module occupies 1 analog logical slot on CAN I/O.

9.4 Analog outputs

Each channel can be configured for either current or voltage signals. The type of signal is also determined by the terminals used.

9.4.1 Output values of the analog outputs

Name:
AnalogOutput01 to AnalogOutput04

These registers provide the standardized output values. Once a permitted value is received, the module outputs the respective current or voltage.

> **Information:**
>
> **The value "0" disables the channel status LED.**

Data type	Value	
INT	-32767 to 32767	Voltage
	0 to 32767	Current

9.4.2 Setting the channel type

Name:
ConfigOutput01

This register can be used to set the channel type of the outputs.

Each channel is capable of handling either current or voltage signals. The type of signal is determined by the terminal connections used. Since current and voltage require different adjustment values, it is also necessary to configure the desired type of output signal. The following output signals can be set:

- ±10 V voltage signal
- 0 to 20 mA current signal

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

Bit structure:

Bit	Description	Value	Information
0 - 7	Reserved	0	
8	Channel 1	0	Voltage signal (bus controller default setting)
		1	Current signal
...		...	
11	Channel 4	0	Voltage signal (bus controller default setting)
		1	Current signal
12 - 15	Reserved	0	

9.5 Minimum cycle time

The minimum cycle time specifies the time up to which 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
200 µs

9.6 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
200 µs