# X20AO2622

## 1 General information

The module is equipped with 2 outputs with 13-bit (including sign) digital converter resolution. It is possible to select between the current and voltage signal using different terminals.

This module is designed for X20 6-pin terminal blocks. If needed (e.g. for logistical reasons), the 12-pin terminal block can also be used.

- 2 analog outputs
- Either current or voltage signal possible
- 13-bit digital converter resolution

## 2 Order data

| Model number | Short description | Figure |
|---|---|---|
| | **Analog outputs** |  |
| X20AO2622 | X20 analog output module, 2 outputs, ±10 V or 0 to 20 mA / 4 to 20 mA, 13-bit converter resolution | |
| | **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** | |
| X20TB06 | X20 terminal block, 6-pin, 24 VDC keyed | |
| X20TB12 | X20 terminal block, 12-pin, 24 VDC keyed | |

Table 1: X20AO2622 - Order data

# 3 Technical data

| Model number | X20AO2622 |
|---|---|
| **Short description** | |
| I/O module | 2 analog outputs ±10 V or 0 to 20 mA / 4 to 20 mA [1] |
| **General information** | |
| B&R ID code | 0x1BA2 |
| 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 | 1.1 W |
| Additional power dissipation caused by the actuators (resistive) [W] | - |
| Electrical isolation | |
| Channel - Bus | Yes |
| Channel - Channel | No |
| Certification | |
| CE | Yes |
| KC | Yes |
| UL | cULus E115267<br>Industrial control equipment |
| HazLoc | cCSAus 244665<br>Process control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T5 |
| ATEX | Zone 2, II 3G Ex nA nC IIA T5 Gc<br>IP20, Ta = 0 - Max. 60°C<br>FTZÚ 09 ATEX 0083X |
| DNV GL | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **B** (4 g)<br>EMC: **B** (Bridge and open deck) |
| LR | ENV1 |
| GOST-R | Yes |
| **Analog outputs** | |
| Output | ±10 V or 0 to 20 mA / 4 to 20 mA, via different terminal connections [1] |
| Max. output current | 10 mA at voltages >5 V<br>15 mA at voltages <5 V |
| Digital converter resolution | |
| Voltage | ±12-bit |
| Current | 12-bit |
| Conversion time | 200 µs for all outputs |
| Settling time for output changes over entire range | 1 ms |
| Power on/off behavior | Internal enable relay for booting |
| Max. error at 25°C | |
| Voltage | |
| Gain | 0.15% [2] |
| Offset | 0.05% [3] |
| Current | |
| Gain | 0.15% [2] |
| Offset | 0.05% [3] |
| Output protection | Short circuit protection |
| Output format | |
| Voltage | INT 0x8001 - 0x7FFF / 1 LSB = 0x0010 = 4.882 mV |
| Current | INT 0x0000 - 0x7FFF / 1 LSB = 0x0010 = 9.766 µA |
| Load per channel | |
| Voltage | Max. ±10 mA, load ≥1 kΩ |
| Current | Load max. 600 Ω (Rev. ≥ J0); 500 Ω (Rev. < J0) |
| Short circuit protection | Current limiting ±40 mA |
| Output filter | 1st-order low pass / cutoff frequency 10 kHz |
| Max. gain drift | |
| Voltage | 0.02 %/°C [2] |
| Current | 0.02 %/°C [2] |
| Max. offset drift | |
| Voltage | 0.032 %/°C [3] |
| Current | 0.032 %/°C [3] |
| Error caused by load change | |
| Voltage | Max. 0.11%, from 10 MΩ → 1 kΩ, resistive |
| Current | Max. 0.5%, from 1 Ω → 600 Ω, resistive |
| Nonlinearity | <0.007% [4] |
| Isolation voltage between channel and bus | 500 $V_{eff}$ |

Table 2: X20AO2622 - Technical data

| Model number | X20AO2622 |
|---|---|
| **Operating conditions** | |
| Mounting orientation | |
| Horizontal | Yes |
| Vertical | Yes |
| Installation at elevations above sea level | |
| 0 to 2000 m | No limitations |
| >2000 m | Reduction of ambient temperature by 0.5°C per 100 m |
| EN 60529 protection | IP20 |
| **Environmental conditions** | |
| Temperature | |
| Operation | |
| Horizontal installation | -25 to 60°C |
| Vertical installation | -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 characteristics** | |
| Note | Order 1x X20TB06 or X20TB12 terminal block separately<br>Order 1x X20BM11 bus module separately |
| Spacing | 12.5$^{+0.2}$ mm |

Table 2: X20AO2622 - Technical data

1) 4 to 20 mA: From upgrade version 1.0.2.0 or hardware revision "I0"
2) Based on the current output value.
3) Based on the entire output range.
4) Based on the output range.

# 4 LED status indicators

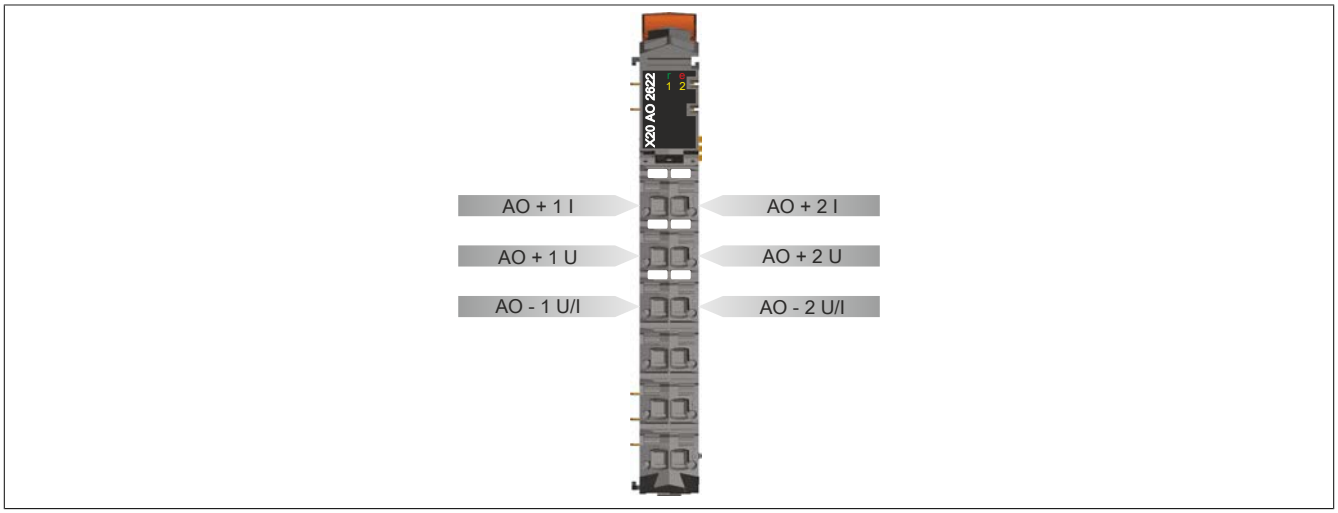
For a description of the various operating modes, see section "Additional information - Diagnostic LEDs" of the X20 system user's manual.

| 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 |
| | e + r | Red on / Green single flash | | Invalid firmware |
| | 1 - 2 | Orange | Off | Value = 0 |
| | | | On | Value ≠ 0 |

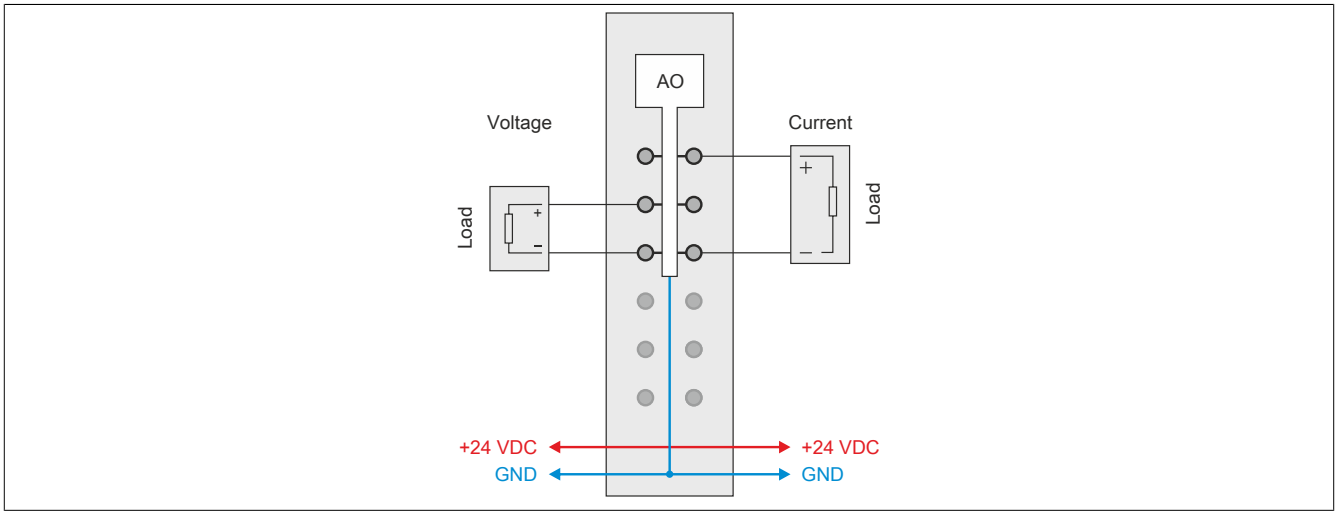
1) Depending on the configuration, a firmware update can take up to several minutes.

# 5 Pinout

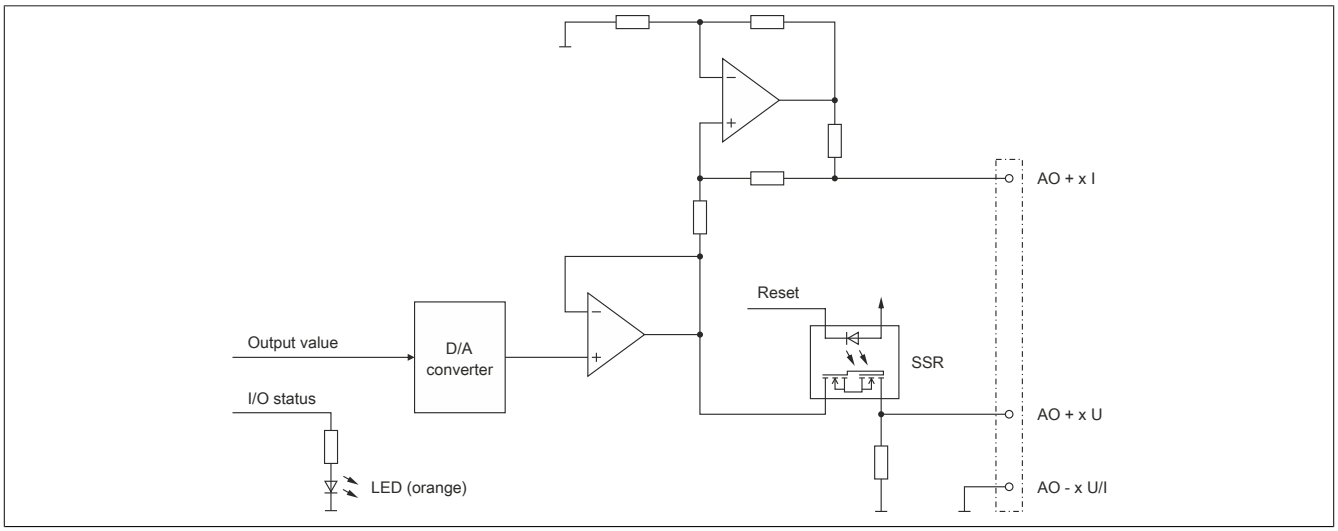
Each channel can be configured for either current or voltage signals. The type of signal is also determined by the terminals used.




# 6 Connection example




# 7 Output circuit diagram



# 8 Register description

## 8.1 General data points

In addition to the registers listed in the register description, the module also has other more general data points. These registers are not specific to the module but contain general information such as serial number and hardware version.

These general data points are listed in section "Additional information - General data points" of the X20 system user's manual.

## 8.2 Function model 0 - Standard and function model 1 - I/O with fast reaction

| Register | Name | Data type | Read | | Write | |
|---|---|---|---|---|---|---|
| | | | Cyclic | Non-cyclic | Cyclic | Non-cyclic |
| **Configuration** | | | | | | |
| 18 | ConfigOutput01 | USINT | | | | • |
| **Communication** | | | | | | |
| 0 | AnalogOutput01 | INT | | | • | |
| 2 | AnalogOutput02 | INT | | | • | |

## 8.3 Function model 254 - Bus controller

| Register | Offset[1)] | Name | Data type | Read | | Write | |
|---|---|---|---|---|---|---|---|
| | | | | Cyclic | Non-cyclic | Cyclic | Non-cyclic |
| **Configuration** | | | | | | | |
| 18 | - | ConfigOutput01 | USINT | | | | • |
| **Communication** | | | | | | | |
| 0 | 0 | AnalogOutput01 | INT | | | • | |
| 2 | 2 | AnalogOutput02 | INT | | | • | |

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

### 8.3.1 CAN I/O bus controller

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

## 8.4 Function model comparison

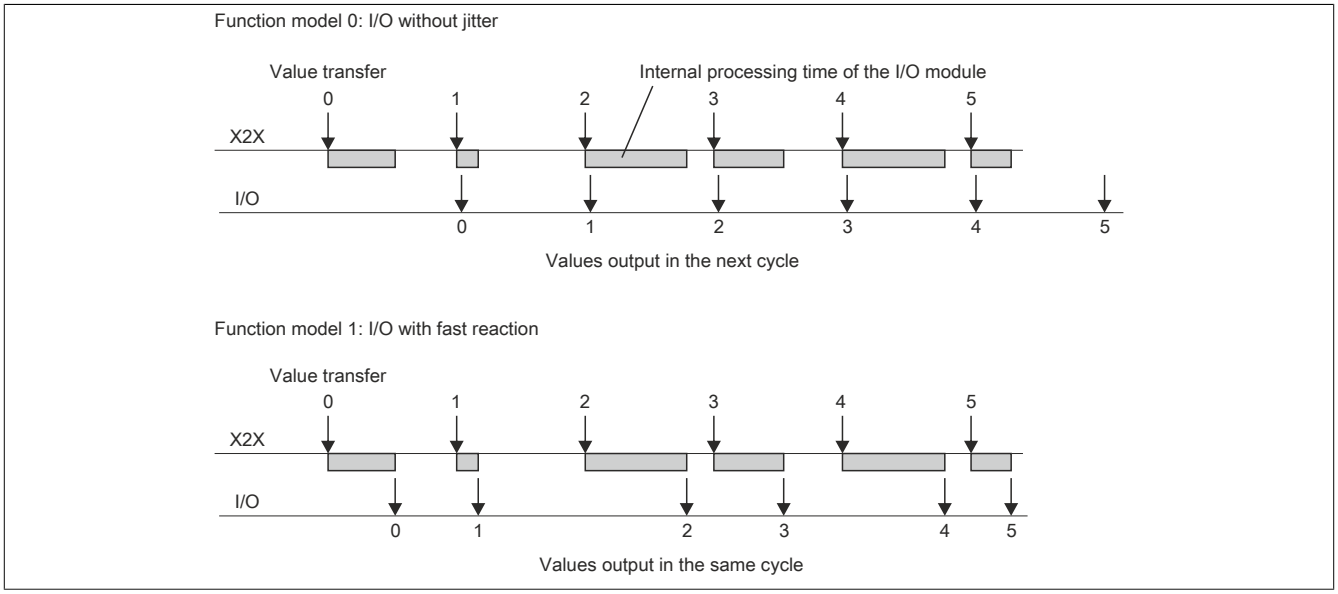
### Function model 0: I/O without jitter (standard)

Corrected values are output in the next cycle if the minimum cycle is ≥300 µs in order to reduce jitter to a minimum.

### Function model 1: I/O with fast reaction

Corrected values are output in the same cycle if the minimum cycle is ≥300 µs (optimized reactions).

### Comparison of the two function models




## 8.5 Analog outputs

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

### 8.5.1 Output values of the analog outputs

Name:
AnalogOutput01 to AnalogOutput02

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

| Data type | Value | Information |
|---|---|---|
| INT | -32768 to 32767 | Voltage signal -10 to 10 VDC |
| | 0 to 32767 | Current signal 0 to 20 mA |
| | 0 to 32767 | Current signal 4 to 20 mA[1)] |

1) From upgrade version 1.0.2.0 or hardware revision "I0"

### 8.5.2 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 (default)
- 0 to 20 mA current signal
- 4 to 20 mA current signal

| Data type | Values |
|---|---|
| USINT | See bit structure. |

Bit structure:

| Bit | Name | Value | Information |
|---|---|---|---|
| 0 | Channel 1 | 0 | Voltage signal |
| | | 1 | Current signal, measurement range corresponding to bit 4 |
| 1 | Channel 2 | 0 | Voltage signal |
| | | 1 | Current signal, measurement range corresponding to bit 5 |
| 2 - 3 | Reserved | 0 | |
| 4 | Channel 1: Current measurement range | 0 | 0 to 20 mA current signal |
| | | 1 | 4 to 20 mA current signal |
| 5 | Channel 2: Current measurement range | 0 | 0 to 20 mA current signal |
| | | 1 | 4 to 20 mA current signal |
| 6 - 7 | Reserved | 0 | |

## 8.6 Minimum cycle time

The minimum cycle time defines how far the bus cycle can be reduced without communication errors occurring. Note that very fast cycles decrease the idle time available for handling monitoring, diagnostics and acyclic commands.

| Minimum cycle time |
|---|
| 250 µs |

## 8.7 Minimum I/O update time

The minimum I/O update time defines how far the bus cycle can be reduced while still allowing an I/O update to take place in each cycle.

| Minimum I/O update time |
|---|
| 300 µs |