# SMX 100-2/2/x

SMXSERIES » Modular » Basic modules


## DESCRIPTION

**Free programmable and configurable modular safety controller with integrated drive monitoring for up to 12 axes**

- 14 Safe digital inputs
- 6 Auxiliary outputs
- 20 Safe digital I/O s
- 2 Safe relay / pulse outputs
- 2 /4 pn- or pp-switching outputs
- Safety Controller up to PL e acc. to EN ISO 13849-1 or SIL3 acc. to IEC 61508
- Optional: safe/non-safe Fieldbus interface

## CHARACTERISTIC OF THE MODULE

» Extendable up to:
  - max. 126 safe digital inputs
  - max. 36 siafe digital outputs,
  - max. 120 safe digital I/O's,
  - max. 50 safe relay outputs,
  - max. 34 auxiliary outputs
  - and/or 12 safe axes

» Freely programmable modular controller for up to 3000 IL instructions

» Complete speed and position-based safety functions for drive monitoring in accordance with IEC 61800-5-2 are integrated in firmware
  - Spatial functions for safe speed and are monitoring are possible

» Functionplan oriented programming via SafePLC²

» Pulse outputs for cross-shorting detection of digital input signals

» External contact monitoring of connected switchgear (EMU)

» Monitored relay outputs for safety relevant functions

» Switchable safe semi-conductor outputs pn-, pp-switching for safety-relevant functions

» Comprehensive diagnostics functions integrated

» Status monitoring by coded 7-segment-display and status LEDs

» Multifunction button (quit, start, reset) can be operated from the front side

» Configurable via SafePLC² Seriel USB-adapter or ethernet-based fieldbus

» Optional fieldbus interface (Expansion module for PROFIBUS, PROFINET, DeviceNet, CANopen, EtherNET/IP, EtherCAT, Modbus TCP/IP, PROFIsafe, FSoE)

» **Optional: Communication interface (/DNM, /DBM):**
  - Standard and safe field bus protocols for communication with a higher level controller (PROFIBUS, PROFINET, DeviceNet, CANopen, EtherNET/IP, EtherCAT, Modbus TCP, PROFIsafe, FSoE)
  - Safe cross communication (SMMC) for data exchange between multiple base devices
  - Field bus protocols with the same hardware can be switched with SafePLC²
  - Safe remote I/O communication for data exchnage with distrubted I/O systems

» The mechanical construction of the SMX100-2/2 (/x*) is dependent on the respective forms of the base module

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## SAFETY RELATED CHARACTERISTIC DATA

| | |
|---|---|
| Performance Level | PL e (EN ISO 13849-1) |
| PFH / architecture | 12,2 FIT / Cat 4 |
| Safety Integrity Level | SIL 3 (IEC 61508) |
| Proof test interval | 20 years = max. operating period |

## GENERAL DATA

| | | |
|---|---|---|
| Max. no. of expansion modules * | | 8 |
| Interface for expansion modules | | T-bus connector, pluggable in top-hat rail, RJ-45 (Ethernet) |
| Number of safe digital inputs | | 14 |
| Number of safe digital outputs | | |
| | pp-switching ** | 4 |
| | pn-switching ** | 2 |
| Number of safe digital I/O | | 20 |
| Number of relay outputs | | 2 |
| Number of safe analogue inputs | | - |
| Number of auxiliary outputs | | 6 |
| Number of pulse outputs (clock outputs) | | 2 |
| Type of connection | | Plug-in terminals with spring or screw connection |
| Axis monitoring | | - |
| Encoder interfaces (D-Sub / screw terminals) | | - |

* Of which maximum of 6 axis modules
** pn/pp are configurable via SafePLC²

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## ELECTRICAL DATA

| | | | |
|---|---|---|---|
| Supply voltage (tolerance) | | | 24 VDC; 2A (-15%, +20%) |
| Fuse | X41.1 / A1.1 | | min. 30 VDC; max. 3,15A |
| | X41.2 / A1.2, X45.1 / A1.3, X49.1 / A1.5 | | min. 30 VDC; max. 10A |
| Max. Power consumption (logic) | | | |
| | SMX100-2/2 | | 3,5 W |
| | SMX100-2/2/x | | 6,9 W |
| Rated data safe digital inputs | | | 24 VDC; 20 mA Typ1 acc. to IEC 61131-2 |
| Rated data digital outputs | | | |
| | pn-switching | | 24 VDC; 2A * |
| | pp-switching | | 24 VDC; 2A * |
| | auxiliary outputs | | 24 VDC; 250mA |
| | pulse outputs (clock outputs) | | 24 VDC; 250 mA |
| | Safe digital I/O | 01 - 05<br>11 - 15 | 24 VDC; 0,5A |
| | | 06 - 10<br>16 - 20 | 24 VDC; 2A* |
| Rated data relays | | | |
| Normally open | DC 13 | | 24 VDC; 2A |
| | AC 15 | | 230 VAC; 2A |

* see „Derating outputs“

## DERATING OUTPUTS

» **Maximum current load based on temperature.**
» **The maximum total current is 10A.**

| type of module | outputs | temperature 30°C / 50°C |
|---|---|---|
| SMX100-x/2/x | Q 1 – Q 4 / IQx6 – IQx0 | 2A / 1,8A |

## ENVIRONMENTAL DATA

| | |
|---|---|
| Temperature | 0°C … +50°C operation |
| | -25°C … +70°C storage and transport |
| Class of protection | IP 20 |
| Climatic category | 3K3 acc. to DIN EN 60721-3 |
| Min-, Maximum relative humidity (no condensation) | 5% - 85% |
| EMC | DIN EN 61000-6-2, DIN EN 61000-6-4, DIN EN 61000-6-7, DIN EN 61800-3, DIN EN 61326-3, DIN EN 62061 |
| Operating altitude | 2000m |

## MECHANICAL DATA

| | | |
|---|---|---|
| Dimension (HxDxW [mm]) | SMX100-2/2 | 100x115x90 |
| | SMX100-2/2/x * | 100x115x112,5 |
| Weight [g] | SMX100-2/2 | 530 |
| | SMX100-2/2/x * | 630 |
| Mounting | | to snap on top-hat rail |
| Number of T-Bus | | |
| | SMX100-2/2 | 4 |
| | SMX100-2/2/x * | 5 |
| Min. terminal cross-section / AWG | | 0,2 mm² / 24 |
| Max. terminal cross-section / AWG | | 2,5 mm² / 12 |

* Specification, see: „ Optional integrated communication interface“

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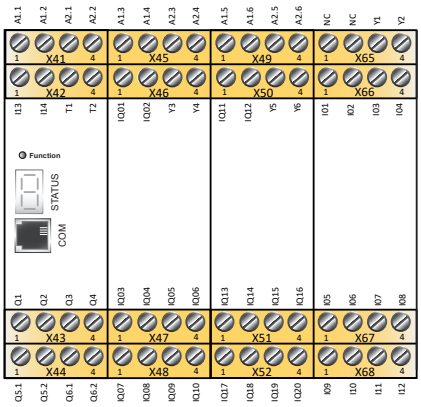
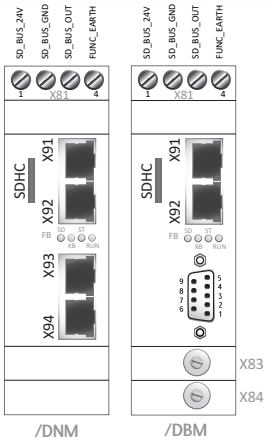
## DEVICE INTERFACES




Basic module




optional communication interface

| Interface | Description of interface |
|---|---|
| X41 – X44 / X45 – X52 / X65 - X68 / X81 | Voltage supply and I/O interface |
| SDHC | Memory Card for safety program |
| COM | Diagnostic- and configuration interface |
| X91 / X92 | Decentralised SDDC ETH and SMMC interface |
| X93 / X94 | Fieldbus interfaces |

## VOLTAGE SUPPLY AND I/O INTERFACE

| X 41 | | |
|---|---|---|
| Pin | 1 - A1.1 | Voltage supply device +24 VDC |
| | 2 - A1.2 | Voltage supply device +24 VDC outputs |
| | 3 - A2.1<br>4 - A2.2 | Voltage supply device 0 VDC |

| X 42 | | |
|---|---|---|
| Pin | 1 - I13<br>2 - I14 | Safe digital inputs |
| | 3 - T1<br>4 - T2 | Clock outputs |

| X 43 | | |
|---|---|---|
| Pin | 1 - Q1 | Output of the pn-switching Q1_PP / pp-switching Q1 |
| | 2 - Q2 | Output of the pn-switching Q2_PN / pp-switching Q2 |
| | 3 - Q3 | Output of the pn-switching Q3_PP / pp-switching Q3 |
| | 4 - Q4 | Output of the pn-switching Q4_PN / pp-switching Q4 |

| X 44 | | |
|---|---|---|
| Pin | 1 - Q5.1<br>2 - Q5.2 | Safe relay output |
| | 3 - Q6.1<br>4 - Q6.2 | Safe relay output |

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| X 45 | | |
|---|---|---|
| Pin | 1 – A1.3<br>2 – A1.4 | Voltage supply device<br>+24 VDC outputs |
| | 3 - A2.3<br>4 - A2.4 | Voltage supply device<br>0 VDC |

| X 46 | | |
|---|---|---|
| Pin | 1 - IQ01<br>2 - IQ02 | Safe digital inputs,<br>outputs pp-switching |
| | 3 - Y3<br>4 - Y4 | Auxiliary outputs |

| X 47 | | |
|---|---|---|
| Pin | 1 - IQ03<br>2 - IQ04<br>3 - IQ05<br>4 - IQ06 | Safe digital inputs,<br>outputs pp-switching |

| X 48 | | |
|---|---|---|
| Pin | 1 - IQ07<br>2 - IQ08<br>3 - IQ09<br>4 - IQ10 | Safe digital inputs,<br>outputs pp-switching |

| X 49 | | |
|---|---|---|
| Pin | 1 - A1.5<br>2 - A1.6 | Voltage supply device<br>+24 VDC outputs |
| | 3 - A2.5<br>4 -A2.6 | Voltage supply device<br>0 VDC |

| X 50 | | |
|---|---|---|
| Pin | 1 - IQ11<br>2 - IQ12 | Safe digital inputs,<br>outputs pp-switching |
| | 3 - Y5<br>4 - Y6 | Auxiliary outputs |

| X 51 | | |
|---|---|---|
| Pin | 1 – IQ13<br>2 – IQ14<br>3 – IQ15<br>4 – IQ16 | Safe digital inputs,<br>outputs pp-switching |

| X 52 | | |
|---|---|---|
| Pin | 1 - IQ17<br>2- IQ18<br>3 - IQ19<br>4 - IQ20 | Safe digital inputs,<br>outputs pp-switching |

| X 65 | | |
|---|---|---|
| Pin | 1 - NC<br>2 - NC | No function |
| | 3 - Y1<br>4 - Y2 | Auxiliary outputs |

| X 66 | | |
|---|---|---|
| Pin | 1 - I01<br>2 – I02<br>3 - I03<br>4 – I04 | Safe digital inputs |

| X 67 | | |
|---|---|---|
| Pin | 1 - I05<br>2 - I06<br>3 - I07<br>4 - I08 | Safe digital inputs |

| X68 | | |
|---|---|---|
| Pin | 1 - I09<br>2 - I10<br>3 - I11<br>4 - I12 | Safe digital inputs |

| X 81 * | | |
|---|---|---|
| Pin | 1 – SD_BUS_24V | Power supply<br>SD-BUS +24 VDC |
| | 2 – SD_BUS_GND | Power supply<br>SD-BUS 0 VDC |
| | 3 – SD_BUS_OUT | SD-BUS Output |
| | 4 – FUNC_EARTH | Funktional Earth |

* only available at fieldbus interfaces

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## DIAGNOSTIC AND CONFIGURATION INTERFACE

### Pin assignment

**RJ 10, 4-pin**

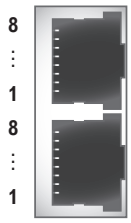
| Pin | Description | COM Front side |
|---|---|---|
| 1 | GND |  |
| 2 | RS485- | |
| 3 | RS485+ | |
| 4 | VCCH | |



» With existing Ethernet-based fieldbus interface, it can be used as a diagnostic and configuration interface.

## DECENTRALISED SDDC ETH AND SMMC INTERFACE

### Pin assignment female connector

| Communication interface (RJ45) | | | | Front side |
|---|---|---|---|---|
| Pin | Name | Description | Colour | X91 / X92 |
| 1 | TX+ | Transmit Data + | white-orange |  |
| 2 | TX- | Transmit Data - | orange | |
| 3 | RX+ | Receive Data + | white-green | |
| 4 | nc | not used | blue | |
| 5 | nc | not used | white-blue | |
| 6 | RX- | Receive Data - | green | |
| 7 | nc | not used | white-brown | |
| 8 | nc | not used | brown | |



**Safe Master – Master Communication (SMMC)**

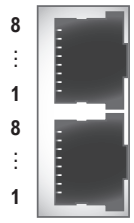
SMMC communication enable a secure data exchange of 2 bytes between multiple SDDC masters. Communication takes place without a master for coordinating the data. This means that data exchange between available subscribers is always possible. This principle means that an incomplete or separates network can work in part areas without chnaging the configuration.

Each port can be configured in the SafePLC².

## FIELDBUS INTERFACES

### Pin assignment female connector

| Ethernet-based fieldbus interface /xNx (RJ45) | | | | Front side |
|---|---|---|---|---|
| Pin | Name | Description | Colour | X93 / X94 |
| 1 | TX+ | Transmit Data + | white-orange | |
| 2 | TX- | Transmit Data - | orange | |
| 3 | RX+ | Receive Data + | white-green | |
| 4 | nc | not used | blue | |
| 5 | nc | not used | white-blue | |
| 6 | RX- | Receive Data - | green | |
| 7 | nc | not used | white-brown | |
| 8 | nc | not used | brown | |




| CAN-based fieldbus interface /DBM, /xBM (D-Sub) | | | | Front side |
|---|---|---|---|---|
| Pin | CANopen | PROFIBUS | DeviceNet | |
| 1 | — | — | V- | |
| 2 | CAN_L | — | CAN_H | |
| 3 | isoGND | RXD/TXD-P (B) | DRAIN | |
| 4 | — | CNTR-P | CAN_L | |
| 5 | — | GND | V+ | |
| 6 | — | VP (+5V) | — | |
| 7 | CAN_H | — | — | |
| 8 | — | RXD/TXD-N (A) | — | |
| 9 | — | CNTR-N | — | |


## OPTIONAL INTEGRATED COMMUNICATION INTERFACE

» Subsequent expansion capability of standard to safe field bus via additional Mini SD card on the back of the module is possible *(/xNx und /xBx)*
» Different specifications can be combined

| General data | | |
|---|---|---|
| Decentralised communication interface | | |
| | /D | 2x RJ 45 * |
| Field bus interface | | |
| | /xN | 2x RJ 45 ** |
| | /xB | 1x Sub-D *** |
| MemoryCard (safety program) | | |
| | /xxM | 1x Mini SD (front side, SDHC) |
| Memory Card (license for safe field bus) | | |
| | /xNx<br>/xBx | 1x Mini SD (rear side) |
| SD bus | | plug-in terminals |
| status LEDs | | 4 |
| Field bus adress rotary switch | | |
| | /xBx | 2 |

* optional for SDDC or SMMC
** available field buses PROFINET, EtherCAT, Modbus TCP and Ethernet TCP/IP
*** available field buses PROFIBUS, CANopen und DeviceNet

## Combination options

| /D | /DNM | /xNM | /xxM | /DBM | /xBM |
|---|---|---|---|---|---|

| Field bus protocols | /DBM | /xBM | /DNM | /xNM |
|---|---|---|---|---|
| PROFIBUS | X | X | | |
| DeviceNet | X | X | | |
| CANopen | X | X | | |
| PROFINET | | | X | X |
| Ethernet IP | | | X | X |
| EtherCAT | | | X | X |
| Modbus TCP | | | X | X |
| PROFIsafe * | X | X | X | X |
| FSoE * | | | X | X |

* Specification required in your order
» The CAN-based and Ethernet-based fieldbus interfaces can be switched via the SafePLC² between the fieldbus protocols

## ORDER INFORMATIONS

### BASIC MODULES

| | item | description | item no. |
|---|---|---|---|
| | SMX100-2/2 | Modular Basic module with 20 safe I/O´s, without Safe Motion | 1615 |
| | SMX100-2/2/D | Modular Basic module + decentralised communication | 1635 |
| | SMX100-2/2/DNM | Modular Basic module + decentralised communication + Ethernet-based field bus interface + Memory Card | 1626 |
| | SMX100-2/2/DNM -FSoE | Modular Basic module + decentralised communication + Ethernet-based field bus interface + Memory Card | 2099 |
| | SMX100-2/2/xNM | Modular Basic module + Ethernet-based field bus interface + Memory Card | 2100 |
| | SMX100-2/2/xNM -FSoE | Modular Basic module + Ethernet-based field bus interface + Memory Card | 2103 |
| | SMX100-2/2/xxM | Modular Basic module + Memory Card | 2104 |
| | SMX100-2/2/DBM | Modular Basic module + decentralised communication + CAN-based field bus interface + Memory Card | 2105 |
| | SMX100-2/2/xBM | Modular Basic module + CAN-based field bus interface + Memory Card | 2106 |

### ACCESSORIES

| | item | description | item no. |
|---|---|---|---|
| | SMX91 | Programming adapter SMX | 1010 |
| | SX0300-1 | Terminal connector, screw terminals (set), encoded for cabling SMX100-1/2 | 1578 |
| | SX*xxxxx-x* | Terminal connector, spring terminals (set), encoded for cabling SMX100-1/2 | on request |
| | SX0000-9 | T-Bus connector voltage-carrying (grey) | 1015 |
| | SX*xxxx-x* | Y-cable for encoder splitting | on request |
| | FSoE License | Fieldbus license for FSoE | 2366 |
| | PROFIsafe License | Fieldbus license for PROFIsafe | 2319 |

### EXTENSIONS

| | item | description | item no. |
|---|---|---|---|
| | SMX131/2 | I/O expansion module | 1616 |
| | SMX131R/2 | I/O expansion module with relay option | 1617 |
| | SMX131R-4/2 | I/O expansion module with relay option | 2232 |
| | SMX132-0/2/D | Decentral I/O expansion module | 1573 |
| | SMX132-0R/2/D | Decentral I/O expansion module with relay option | 2233 |
| | SMX132-1/2/D | Decentral I/O expansion | 1577 |
| | SMX132-1R/2/D | Decentral I/O expansion with relay option | 1634 |
| | SMX121/2 | Axis extension module for 1 axis | 2186 |
| | SMX121-2/2 | Axis extension module for 1 axis + extended encoder functionality | 2187 |
| | SMX121-PXV/2 | Axis extension module for 1 axis with safePXV encoder interface | 2610 |
| | SMX122/2 | Axis extension module for up to 2 axes | 2188 |
| | SMX122-2/2 | Axis extension module for up to 2 axes + extended encoder functionality | 2189 |
| | SMX122-1-PXV/2 | Axis extension module for up to 2 axes with extended encoder functionality + safePXV encoder interface | 2658 |
| | SMX122A/2 | Axis extension module for up to 2 axes + analog option (voltage + current) | 2169 |
| | SMX122A-I/2 | Axis extension module for up to 2 axes + analogue option (current) | 2170 |
| | SMX122A-U/2 | Axis extension module for up to 2 axes + analog option (voltage) | 2311 |
| | SMX122-2A/2 | Axis extension module for up to 2 axes with extended encoder functionality + analog option (voltage + current) | 2190 |
| | SMX122-2A-I/2 | Axis extension module for up to 2 axes with extended encoder functionality + analog option (current) | 2312 |

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| | item | description | item no. |
|---|---|---|---|
| | SMX122-2A-U/2 | Axis extension module for up to 2 axes + extended encoder functionality + analogue option (voltage) | 2313 |
| | SMX111/2/D | Decentral Axis extension module for 1 axis | 2191 |
| | SMX111-2/2/D | Decentral Axis extension module for 1 axis + extended encoder functionality | 1631 |
| | SMX111-PXV/2/D | Decentral Axis extension module for 1 axis with safePXv encoder interface | On request |
| | SMX112/2/D | Decentral Axis extension module for up to 2 axes | 2192 |
| | SMX112-1-PXV/2/D | Decentral Axis extension module for up to 2 axes + extended encoder functionality + safePXV encoder interface | On request |
| | SMX112-2/2/D | Decentral Axis extension module for up to 2 axes + extended encoder functionality | 2230 |
| | SMX112A/2/D | Decentral Axis extension module for up to 2 axes + analogue option (voltage + current) | 2167 |
| | SMX112A-I/2/D | Decentral Axis extension module for up to 2 axes + analogue option (current) | 2168 |
| | SMX112A-U/2/D | Decentral Axis extension module for up to 2 axes + analogue option (voltage) | 2314 |
| | SMX112-2A/2/D | Decentral Axis extension module for up to 2 axes + extended encoder functionality + analogue option (voltage + current) | 2231 |
| | SMX112-2A-I/2/D | Decentral Axis extension module for up to 2 axes + extended encoder functionality + analogue option (current) | 2315 |
| | SMX112-2A-U/2/D | Decentral Axis extension module for up to 2 axes + extended encoder functionality + analogue option (voltage) | 2316 |

## SOFTWARE

| | item | description | item no. |
|---|---|---|---|
| | SafePLC² 1st | Programming software, 1te License incl. Hardlock | 1244 |
| | SafePLC² 2nd | Programming software, 2te License incl. Hardlock | 1646 |
| | SafePLC² 3rd | Programming software, 3te License incl. Hardlock | 1647 |

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