



## DESCRIPTION

Decentral axis extension module for safe speed and position of up to 2 axes for further evaluation in SMX<sub>MODULAR</sub> - basic modules and with extended encoder functionality

- 14 Digital inputs
- 8 Encoder interfaces \*
- 2 Relay outputs
- 2 Auxiliary / 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

## CHARACTERISTIC OF THE MODULE

- » Decentralised axis expansion module
  - Decentralised: Communication with base module SMX100-x via communication interface (/D)
  - Central: Communication with base module SMX 100-x via backplane bus
- » Safe detection of speed and position of one or two axes
- » Movement monitoring of one or two axes up to PL e EN ISO 13849-1 or SIL 3 acc. to IEC 61508
- » Speed monitoring:
- » RPM-monitoring
- » Standstill monitoring
- » Sense of rotation monitoring
- » Safe incremental dimension
- » Emergency Stop monitoring
- » Position monitoring
- » Position range monitoring
- » Trend range monitoring
- » Target position monitoring
- » Logic diagram oriented programming via SafePLC<sup>2</sup>
- » Pulse outputs for cross-shortening detection of digital input signals
- » External contact monitoring of connected switchgear (EMU)
- » Switchable safe semi-conductor outputs pn-, pp- switching for safety-relevant functions
- » Monitored relay outputs for safety relevant functions
- » Comprehensive diagnostics functions integrated
- » Parameter management for expansion modules in base device
- » Coded status display via front-side 7 segment display and status LEDs
- » Extended functionality:
  - Allows the connection of 2 rotary encoders per axis (SSI-Absolut, SinCos, Incremental-TTL,HTL-proximity sensor)
  - 2nd encoder interface also supports HTL (200 kHz), Sin/Cos High-Resolution and Resolver

## SAFETY RELATED CHARACTERISTIC DATA

Performance Level	PL e (EN ISO 13849-1)
PFH <sup>1)</sup> / architecture	12,6 FIT / at 4
Safety Integrity Level	SIL 3 (IEC 61508)
Proof test interval	20 years = max. operating period

## GENERAL DATA

Max. no. of expansion modules	–
Interface for expansion modules	Communication interface (/D) or 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	–
Number of relay outputs	2
Number of safe analogue inputs	–
Number of auxiliary outputs	2
Number of pulse outputs (clock outputs)	2
Type of connection	Plug-in terminals with spring or screw connection
Axis monitoring	2
Encoder interfaces (D-Sub / screw terminals)	4 / 4 *
Encoder technology (See table Encoder specifications)	<p><b>D-SUB X31 / X32:</b> SSI-Absolut, SinCos, Incremental-TTL</p> <p><b>D-SUB X33 / X34:</b> SSI-Absolut, SinCos, SinCos (HighRes), Resolver</p> <p><b>Terminal X23:</b> HTL-proximity sensor (10 kHz),</p> <p><b>Terminals X27, X28, X29, X30:</b> Incremental-HTL (200 kHz)</p>

\* Maximum 2 Encoder / Axis

\*\* pn/pp are configurable via SafePLC<sup>2</sup>

<sup>1)</sup> Value applies only for extension module. For total assessment in accordance with EN ISO 13849-1 one must use a series connection with the corresponding basic device =>  $PFH_{Logic} = PFH_{Basic} + PFH_{Extension}$

# SMX 112-2/2/D

SMXSERIES » Modular » Decentral expansion » 2 Axes modula

## ELECTRICAL DATA

Supply voltage (tolerance)		24 VDC; 2A (-15%, +20%)
Fuse	X11.1	min. 30 VDC; max. 3,15A
	X11.2	min. 30 VDC; max. 10A
Max. Power consumption (logic)		
	SMX112-2/2/D	5,4 W
Rated data 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; 250mA
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
SMX1xx/2/x	Q 1 – Q 4	2A / 1,8A



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SMXSERIES » Modular » Decentral expansion » 2 Axes module

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## 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])	SMX112-2/2/D	100x115x135
Weight [g]	SMX112-2/2/D	620
Mounting		to snap on top-hat rail
Number of T-Bus		6
Min. terminal cross-section / AWG		0,2 mm <sup>2</sup> / 24
Max. terminal cross-section / AWG		2,5 mm <sup>2</sup> / 12

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Böttgerstraße 40  
D- 92637 Weiden

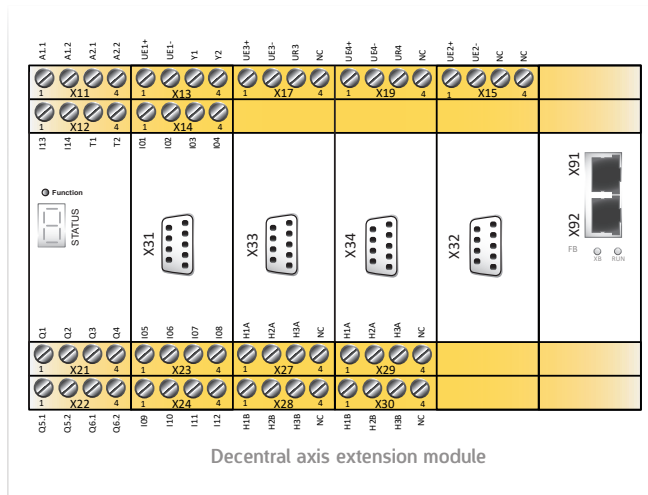
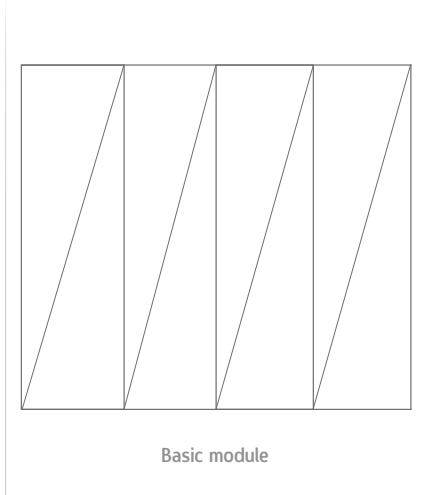
Tel.: + 49 961/4 82 44-0  
Fax: + 49 961/4 82 44-35

[www.bbh-products.de](http://www.bbh-products.de)

[contact@bbh-products.de](mailto:contact@bbh-products.de)

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## DEVICE INTERFACES



Interface	Description of interface
X11 – X14 / X17 – X24	Voltage supply and I/O interface
X91 / X92	Decentralised SDDC ETH and SMMC interface
X31 / X32 / X33 / X34	Encoder interfaces *
X23 / X27 - X30	Encoder interfaces *

\* can be configured in the SafePLC?

## VOLTAGE SUPPLY AND I/O INTERFACE

X 11		
Pin	1 - A1.1	Voltage supply device +24 VDC
	2 - A1.2	Voltage supply device +24 VDC outputs
	3 - A2.1	Voltage supply device 0 VDC
	4 - A2.2	Voltage supply device 0 VDC
X 12		
Pin	1 - I13	Safe digital inputs
	2 - I14	
	3 - T1	Clock outputs
	4 - T2	

X 13		
Pin	1 – UE1+	Voltage supply Encoder +24V DC X31
	2 – UE1-	Voltage supply Encoder 0V DC X31
	3 - Y1	Auxiliary outputs
	4 - Y2	
X 14		
Pin	1 - I01	Safe digital inputs
	2 - I02	
	3 - I03	
	4 - I04	

# SMX 112-2/2/D

SMXSERIES » Modular » Decentral expansion » 2 Axes modular

X 15		
Pin	1 - UE2+	Voltage supply Encoder +24V DC X32
	2 - UE2-	Voltage supply Encoder 0V DC X32
	3 - NC 4 - NC	No functions
X17		
Pin	1 - UE3+	Voltage supply Encoder +24V DC X33
	2 - UE3-	Voltage supply Encoder 0V DC X33
	3 - UR3	Reference voltage Encoder X33
	4 - NC	No function
X19		
Pin	1 - UE4+	Voltage supply Encoder +24V DC X34
	2 - UE4-	Voltage supply Encoder 0V DC X34
	3 - UR4	Reference voltage Encoder X34
	4 - NC	No function
X21		
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

X22				
Pin	1 - Q5.1 2 - Q5.2	Safe relay output		
	3 - Q6.1 4 - Q6.2		Safe relay output	
	X 23			
	Pin	1 - I05 2 - I06 3 - I07 4 - I08	Safe digital inputs	
X 24				
Pin		1 - I09 2 - I10 3 - I11 4 - I12		Safe digital inputs

## 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 SafePLC<sup>2</sup>.

## INTEGRATED COMMUNICATION INTERFACE

### General data

Decentralised communication interface

/D

2x RJ 45 \*

\* optional for SDDC or SMMC



## ENCODER INTERFACES

### Pin assignment X31 / X32 , X33 / X34

Pin	X31 / X32 Inc / Sin/Cos / SSI	X33 / X34 Inc / Sin/Cos / SSI	X33 / X34 Resolver	Front side SMX
1	n.c.	n.c.	Ref_Out +	
2	GND_ENC	GND_ENC	GND_ENC	
3	n.c.	n.c. / n.c. / Clk +	Ref_In +	
4	B- / COS - / Clk -	B- / COS - / n.c.	COS -	
5	A+ / SIN + / Data +	A+ / SIN + / Data +	SIN +	
6	A- / SIN - / Data -	A- / SIN - / Data -	SIN -	
7	n.c.	n.c. / n.c. / Clk -	Ref -	
8	B+ / COS + / Clk +	B+ / COS + / n.c.	COS +	
9	U_ENC	U_ENC	U_ENC	

### Pin assignment X23 , X27 / X29 , X28 / X30

Pin	Z1 – Z1 / Z2 – Z2	Terminals
1	A ( $\bar{A}$ ) / A ( $\bar{A}$ )	
2	-- / B ( $\bar{B}$ )	
3	A ( $\bar{A}$ ) / A ( $\bar{A}$ )	
4	-- / B ( $\bar{B}$ )	

Pin	A+/A-	A+ Signal	
1 – H1A	A+	24V	
2 – H2A	A-	A	
3 – H3A	A+	GND	
4 – NC	—	—	

Pin	B+/B-	B+ Signal	
1 – H1B	B+	24V	
2 – H2B	B-	B	
3 – H3B	B+	GND	
4 – NC	—	—	

## ENCODER SPECIFICATIONS

<b>Incremental - TTL</b>	
Physical Layer	RS-422 compatible
Measuring signal A/B	Track with 90° phase difference
Type of connection	D-SUB 9pole
Max. frequency of input cycles (X31, X32 / X33, X34)	200 kHz / 250 kHz
<b>Sin/Cos</b>	
Physical Layer	RS-422 compatible
Measuring signal A/B	Track with 90° phase difference
Type of connection	D-SUB 9pole
<b>Standard Mode</b>	
Max. frequency of input clock pulse (X31, X32 / X33, X34)	200 kHz / 250 kHz
<b>High Resolution Mode</b>	
Max. frequency of input clock pulse (X33, X34)	15 kHz
<b>SSI-Absolut</b>	
Data interface	Serial Synchronous Interface (SSI) with variable data length of 12 – 28 Bit
Data format	Binary, Gray code



Physical Layer RS-422 compatible

Type of connection D-SUB 9pole

**Mode Master or Listener**

SSI-Master operation

Clock rate 150 kHz

SSI-Listener operation

Clock rate (X31, X32 / X33, X34) 100 kHz ... 200 kHz / 100 kHz ... 250 kHz

Min. clock pause time 150 µsec

Max. clock pause time 1 msec

## Resolver

Measuring signal Sin/Cos – track with 90° phase difference

Signal frequency max. 600 Hz (900 Hz Deep pass)

Input voltage max. 8 V<sub>ss</sub> (an 16 kΩ)

Resolution 9 Bit / pole

Supported pole number 2 - 16

Type of connection (X33, X34) D-SUB 9-pole

**Mode Master or Listener**

Resolver-Master operation

Reference frequency 8 kHz

Resolver-Listener operation

Reference frequency 4 kHz – 16 kHz

Reference amplitude 8 V<sub>ss</sub> – 28 V<sub>ss</sub>

Reference signal form Sinusoidal, triangle

Transformation ratio 2:1; 3:1; 4:1

Phase fault max. 8°

## Incremental - HTL

Signal level 24V / 0V

Physical Layer PUSH / PULL

Max. counting pulse frequency 200 kHz

Type of connection (X27 / X28) Plug-in terminals with spring or screw connection

## HTL proximity sensor

Signal level 24V / 0V

Max. counting pulse frequency (circuit logic de-bounced) 10 kHz

Pulse width 50 µsec

Type of connection (X23) Plug-in terminals with spring or screw connection

## HTL proximity switch - extended monitoring

Signal level 24V / 0V

Max. counting frequency (circuit logic de-bounced) 4 kHz

Physical Layer PUSH / PULL

Measuring signal A/B Track with 90 degree phase difference

Type of connection (X23) Plug-in terminals with spring or screw connection

# SMX 112-2/2/D

SMXSERIES » Modular » Decentral expansion » 2 Axes module



## ORDER INFORMATION

### EXTENSIONS

item	description	item no.
SMX112-2/2/D	Decentral Axis extension module for up to 2 axes + extended encoder functionality	2230

### ACCESSORIES

item	description	item no.
FSoE License	Fieldbus license for FSoE	2366
SXxxx-x	Terminal connector, screw terminals (set), encoded for cabling SMX112-2/2/D	on request
SXxxx-x	Terminal connector, spring terminals (set), encoded for cabling SMX112-2/2/D	on request
SX0000-9	T-Bus connector voltage-carrying (grey)	1015

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Böttgerstraße 40  
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Tel.: + 49 961/4 82 44-0  
Fax: + 49 961/4 82 44-35

[www.bbh-products.de](http://www.bbh-products.de)

[contact@bbh-products.de](mailto:contact@bbh-products.de)

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