

## DESCRIPTION

FSoE slave module for safe speed and position of up to 2 axes for further evaluation in a FSoE master module

- 14 Safe digital inputs
- Up to 4 safe digital outputs
- 8 Encoder interfaces
- 2 Relay / pulse outputs
- 2 Auxiliary outputs
- Safety controller up to PL e acc. to EN ISO 13849-1 or SIL3 acc. to IEC 61508

## CHARACTERISTIC OF THE MODULE

- » Decentralized safe axle assembly for the EtherCAT environment
- » Safe detection of speed and position of up to two axes
- » Fast response time with integrated Fast Channel Task with guaranteed processing time of 2 ms
- » Complete speed and position-related safety functions for drive monitoring IEC 61800-5-2 integrated into firmware
- » 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
- » 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
- » Functionplan-oriented parametrization
- » Parameter management for expansion modules in base device
- » Comprehensive diagnostics functions integrated
- » Coded status display via front-side 7-segment display and status LEDs
- » Allows the connection of 2 rotary encoders per axis ( SSI, SinCos, TTL, Proxy);  
2nd encoder interface also supports HTL (200 kHz), SinCos High-Resolution and Resolver

## SAFETY RELATED CHARACTERISTIC DATA

Performance Level	PL e (EN ISO 13849-1)
PFH / architecture	2,0* 10 <sup>-9</sup> / Cat. 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	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 Encoder specifications)	<p><b>D-SUB Enc 1.1 / Enc 2.1</b> SSI-Absolut, SinCos, Incremental-TTL</p> <p><b>D-SUB Enc 1.2 / Enc 2.2</b> SSI-Absolut, SinCos (HighRes), Incremental-TTL, Resolver</p> <p><b>Terminals (X27, X28 / X29, X30):</b> Incremental-HTL (200kHz)</p> <p><b>Terminal (X23):</b> HTL proximity sensor (10kHz)</p>
Cycle time PLC	8 ms
Fast Channel	2 ms
Safe Slave	FSoE

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

\*\* maximum 2 encoder / axis

## ELECTRICAL DATA

Supply voltage (tolerance)		24 VDC; 2A (-10%, +20%)
Fuse	X11.1 / 24+	min. 30 VDC; max. 3,15A
	X11.2 / AQ1+	min. 30 VDC; max. 10A
Max. Power consumption (logic)	SDU-22	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

## DERATING OUTPUTS

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

type of module	outputs	temperature 30°C / 50°C
SDU-22	QX 00 – QX 03	2A / 1,8A

2A outputs can be fully loaded at an ambient temperature of up to **30°C**.  
**From** a ambient temperature from **30°C** to maximum **50°C**, the 2A outputs  
 can be loaded to a maximum of **1.8A**.

The maximum total current is **10A**. (IO-Board)



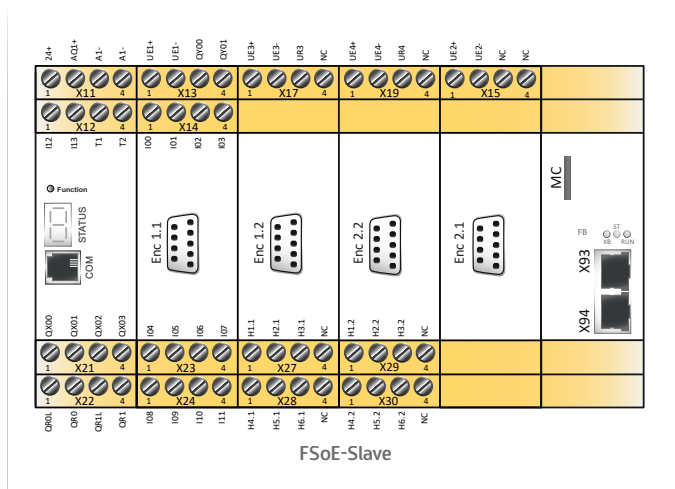
## ENVIRONMENTAL DATA

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])	SDU-22	100x115x135
Weight [g]	SDU-22	620
Mounting		to snap on top-hat rail
Min. terminal cross-section / AWG		0,2 mm <sup>2</sup> / 24
Max. terminal cross-section / AWG		2,5 mm <sup>2</sup> / 12

## DEVICE INTERFACES



Interface	Description of interface
X11 – X14 / X17 – X24	Voltage supply and I/O interface
COM	Diagnostic- and configuration interface
MC	Memory card for safety program
X93 - ECAT IN / X94 - ECAT OUT	Fieldbus interfaces
X23 / X27 – X30	Encoder interfaces
Enc1.1 - Enc 2.2	Encoder interfaces

## VOLTAGE SUPPLY AND I/O INTERACE

X11		
Pin	1 - 24+	Voltage supply device +24 VDC
	2 - AQ1+	Voltage supply device +24 VDC outputs
	3 - A1-	Voltage supply device 0 VDC
	4 - A1-	Voltage supply device 0 VDC
X12		
Pin	1 - I12	Safe digital inputs
	2 - I13	
	3 - T1	Clock outputs
	4 - T2	
X21		
Pin	1 - QX00	Safe output pn-/ pp-switching 00
	2 - QX01	Safe output pn-/ pp-switching 01
	3 - QX02	Safe output pn-/ pp-switching 02
	4 - QX03	Safe output pn-/ pp-switching 03
X22		
Pin	1 - QR0L	Safe relay input
	2 - QR0	Safe relay output
	3 - QR1L	Safe relay input
	4 - QR1	Safe relay output

X13		
Pin	1 - UE1+	Voltage supply encoder +24 VDC
	2 - UE1-	
	3 - QY00	Auxiliary outputs
	4 - QY01	
X14		
Pin	1 - I00	Safe digital inputs
	2 - I01	
	3 - I02	
	4 - I03	
X23		
Pin	1 - I04	Safe digital inputs
	2 - I05	
	3 - I06	
	4 - I07	
X24		
Pin	1 - I08	Safe digital inputs
	2 - I09	
	3 - I10	
	4 - I11	
X15		
Pin	1 - UE2+	Voltage supply encoder +24 VDC
	2 - UE2-	
	3 - NC	No function
	4 - NC	No function

X17		
Pin	1 - UE3+	Voltage supply Encoder +24V DC
	2 - UE3-	Voltage supply Encoder 0 VDC
	3 - UR3	Reference voltage Encoder
	4 - NC	No function

X19		
Pin	1 - UE4+	Voltage supply Encoder +24V DC
	2 - UE4-	Voltage supply Encoder 0 VDC
	3 - UR4	Reference voltage Encoder
	4 - NC	No function

## 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.

## FIELDBUS INTERFACES

### Pin assignment female connector

Safe EtherCAT interface (RJ45)				
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	

## INTEGRATED COMMUNICATION INTERFACE

» The integrated communication interface of the FSoE slave includes a safe EtherCAT interface for decentralized communication with an FSoE-Master unit.

General data			
Fieldbus interface			
X93 / X94	EtherCAT	2x RJ 45	
Memory Card (safety program)			
	MC	1x Mini SD (front side)	
Status LED's		3	



## ENCODER INTERFACES

### Pin assignment Enc 1.1 / Enc 2.1 , Enc 1.2 / Enc 2.2

Pin	Enc 1.1 / Enc 2.1 Inc / Sin/Cos / SSI	Enc 1.2 / Enc 2.2 Inc / Sin/Cos / SSI	Enc 1.2 / Enc 2.2 Resolver	Front side SDU
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	Terminals
1 – H1.1 (1.2)	A +	24V	
2 – H2.1 (2.2)	A -	A	
3 – H3.1 (3.2)	A +	GND	
4 – NC	—	—	

Pin	B+/B-	B+ Signal	Terminals
1 – H4.1 (4.2)	B +	24V	
2 – H5.1 (5.2)	B -	B	
3 – H6.1 (6.2)	B +	GND	
4 – NC	—	—	

## ENCODERSPECIFICATIONS

Incremental - TTL	
Physical Layer	RS-422 compatible
Measuring signal A/B	Track with 90 degree phase difference
Type of connection	D-SUB 9pole
Max. frequency of input cycles (Enc 1.1, Enc 2.1 / Enc 1.2, Enc 2.2)	200 kHz / 250 kHz
Sin/Cos	
Physical Layer	RS-422 compatible
Measuring signal A/B	Track with 90 degree phase difference
Type of connection	D-SUB 9pole
Standard Mode	
Max. frequency of input clock pulses (Enc 1.1, Enc 2.1 / Enc 1.2, Enc 2.2)	200 kHz / 250 kHz
High Resolution Mode	
Max. frequency of input clock pulses (Enc 1.2, Enc 2.2)	15 kHz



## SSI-Absolut

Data interface	<b>Serial Synchronous Interface (SSI)</b> with variable data length of 12 – 28 Bit
Data format	Binary, Gray code
Physical Layer	RS-422 compatible
Type of connection	D-SUB 9pole
<b>Mode</b>	<b>Listener</b>
<b>SSI-Listener Mode</b>	
Clock rate (Enc 1.1, Enc 2.1 / Enc 1.2, Enc 2.2)	100 kHz ... 200 kHz / 100 kHz ... 350 kHz
Min. clock pause time	150 µsec
Max. clock pause time	1 msec

## Resolver

Measuring signal	Sin/Cos – track with 90 degree phase difference
Signal frequency	max. 600 Hz (900 Hz Deep pass)
Input voltage	max. 8 Vss (at 4,7 kΩ)
Resolution	9 Bit / pole
Supported pole number	2 - 16
Type of connection (Enc 1.2, Enc 2.2)	D-SUB 9-pole
<b>Mode</b>	<b>Listener</b>
<b>Resolver-Listener operation</b>	
Reference frequency	4 kHz – 16 kHz
Reference amplitude	8 Vss – 28 Vss
Reference signal form	Sinusoidal, triangle, rectangle
Transformation ratio	2:1; 3:2; 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, X29, X30)	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

## ORDER INFORMATION

### FSoE SLAVES

item	description	item no.
SDU-22	Decentralized axis expansion module for 2 axes	2397

### ACCESSORIES

item	description	item no.
SMX91	Programming adapter	1010
SXxxx-x	Terminal connector, screw terminals (set), encoded for cabling SDU-22	on request
SXxxx-x	Terminal connector, spring terminals (set), encoded for cabling SDU-22	on request

### SOFTWARE

item	description	item no.
SafePLC <sup>2</sup> 1st	Programming software, 1st License incl. Hardlock	1244
SafePLC <sup>2</sup> 2nd	Programming software, 2nd License incl. Hardlock	1646
SafePLC <sup>2</sup> 3rd	Programming software, 3rd License incl. Hardlock	1647