

Безопасные мониторы скорости Safety-M compact SMC1.1, SMC2.2, SMC1.3, SMC2.4

Технические характеристики

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Safe speed monitors

**Safety-M compact
Basic module**

Speed monitoring – SMC2.4

1 axis / 2 encoder systems



SIL3
Functional Safety
PLe

SMC2.4 is a compact safety module of the Safety-M family with integrated drive monitoring for one axis with zwei (different) encoder systems. This standalone speed monitor can be operated without additional safe PLC.

SMC2.4 is the optimal solution for integration in existing safety circuits or for retrofitting old machines. For safe speed detection, solutions with 2 encoders / sensors (HTL differential, HTL/proximity switches, RS422) are supported.



TUV NORD

Push-Pull HTL differential HTL differential RS422

The integrated signal converter and splitter allows an easy connection of controllers, which can operate using the same encoder system. It offers in addition the possibility of issuing an analog rotational speed value, e.g. to replace tachometers or similar.

The device can be parameterized with a removable control and diagnostic display or with the PC software "OSxx". This allows comfortable, comprehensive and simple diagnostics and settings on a PC on site or at the workplace.

The removable operating display (touchscreen) displays various features such as:

- 2-channel frequency display.
- freely scalable for speed, production rates, rotational speeds, stops.
- operating mode and error code display.

- Extensive library of pre-configured safe sensors and command devices. This allows easy parameterizing without programming.
- Complete range of speed-related safe drive monitoring functions equivalent to EN 61800-5-2 already integrated in firmware (SS1, SS2, SDI, SLI, SBC, SMS, SOS, SLS, SSM, STO).
- Different encoder interfaces for RS422, HTL differential and HTL/ Push-Pull/proximity switch, for a wide range of sensors that can be freely combined.
- Integrated signal splitter to forward the encoder signals. No complex, interference-sensitive external wiring when the controller is to use the same signals.
- The signal converter can issue the encoder signal as HTL differential, HTL, RS422 or as a 4 ... 20 mA analog value.
- Easy snap-on installation on 35 mm C profile rail.
- 8/4 safe control inputs, 4x2 safe control outputs. 2 safe synchronized potential-free relay contacts.
- Contact multiplication or increase of power capability by external contactors in connection with the device-internal monitoring function for external contacts (EDM).
- LED on the front side indicates operating state.
- Removable control and diagnosis display (optional).
- Free "OSxx" parameterization software.

Order code

8 . SMC2 . 4 SA . 442

a Encoder interface
4 = 2 x screw terminals
HTL differential, HTL, RS422

b Internal signal splitting
S = with

c Analog output
A = 4 ... 20 mA

Safe speed monitors

Safety-M compact Basic module	Speed monitoring – SMC2.4	1 axis / 2 encoder systems
Accessories		Order no.
Control and diagnostic display, OLED touch screen		8.SMCB.100
"OSxx" parameterization software		
Shield terminal for encoder cable, C profile rail	Shield diameter 3.0 ... 12.0 mm	8.0000.4G06.0312

Technical data

General data	
Safe digital input lines	8 / 4
Safe digital lines	8 / 4
Safe relay outputs	2 synchronized
Type of connection	pluggable screw terminals
Max. terminal cross section	1.5 mm ² / AWG16, screw terminal
Drive monitoring	1 axis

Electrical characteristics	
Supply voltage	24 V DC / 2 A
Tolerance	±20 %
Current consumption (no load)	max. 150 mA
Power consumption	max. 48 W
Fuse on supply voltage	max. 3.15 A, delayed
Rated encoder power supply data	5 V or 24 V DC (approx. 2 V below the supply voltage) / max. 200 mA short-circuit proof

Environmental data	
Operating temperature	-20°C ... +55°C [-4°F ... +131°F] (non condensing)
Storage temperature	-25°C ... +70°C [-13°F ... +158°F] (non condensing)
Protection acc. to EN 60529	IP20
Climate class	3 acc. to DIN 50178 (non condensing)
CE compliant acc. to	EMC guideline 2014/30/EU Machinery directive 2006/42/EC Low voltage guideline 2014/35/EU RoHS guideline 2011/65/EU

Safety characteristics	
Classification	PL e / SIL3
System structure	2 channel (Cat. 3 / HFT = 1)
PFH _d value	5.73 x 10 ⁻⁹ h ⁻¹
DC _{avg}	98.7 %
SFF	98.99 %
MTTF _D	156.5 years
Mission time / Proof test interval	20 years
Reaction times	see operating instructions R60047
Relevant standards	EN ISO 13849-1:2008 EN 62061:2005 EN 61508:2011 EN 60947:2015

EMC	
Relevant standards	EN 61000-6-2:2006 EN 61000-6-4:2011 EN 61326-3-2:2008

Mechanical characteristics	
Size w x h x d	50 x 100 x 165 mm [1.97 x 3.94 x 6.50"]
Weight	390 g [13.76 oz]
Mounting	snap-on mounting on standard head rail
Material	housing plastic
Shock resistance acc. to EN 60068-2-27	300 m/s ² , 11 ms (3 shocks) 170 m/s ² , 6 ms (4000 shocks)
Vibration resistance acc. to EN 60068-2-6	70 m/s ² , 10 ... 200 Hz (20 cycles)

LED display	
ERROR (yellow)	steadily on error flashing slowly DIP 1 = OFF, factory setting DIP 3 = OFF, programming mode
ON (green)	steadily on power on

Safe speed monitors

Safety-M compact Basic module		Speed monitoring – SMC2.4	1 axis / 2 encoder systems
Incremental interface (IN1, IN2) X21, X22			
Type of connection	2 x pluggable screw terminals, 11-pin		
Signal	HTL differential, HTL, RS422		
Frequency	max. 500 kHz		
Digital inputs (IN1, IN2) X23, X24			
Type of connection	2 x pluggable screw terminals, 5-pin		
HTL signal (PNP)	proximity switches or digital inputs		
Frequency	max. 1 kHz (control signals)		
Signal level	PNP (10 ... 30 V DC / 15 mA)		
Design	4 x complementary, 8 x single-channel		
Relay outputs (OUT) X1, X2			
Type of connection	2 x pluggable screw terminals, 2-pin		
Wiring	2 x two internally in line, connected in parallel		
Type	positively driven (NO)		
Switching ability	5 ... 250 V AC/DC		
Switching capacity	5 ... 5000 mA		
Digital switching outputs (OUT) X4			
Type of connection	pluggable screw terminal, 12-pin		
Signal	HTL / push-pull		
Rated data digital output	HTL PNP 2 ... 3 V DC lower than the input voltage 500 mA / output (total 1000 mA)		
Design	4 x complementary 8 x single-channel, short-circuit proof		
Protective circuit	push-pull		
Incremental interface / RS422 (OUT) X5, internal signal splitter			
Type of connection	pluggable screw terminal, 9-pin		
Signal	RS422 / HTL differential		
Frequency	max. 500 kHz		
Signal delay	RS422 <-> RS422: 500 ns HTL <-> RS422: 500 ns RS422 <-> HTL: 500 ns HTL <-> HTL: 500 ns		
Source	incremental (X21)		
Analog interface (OUT) X5			
Type of connection	pluggable screw terminal, 9-pin		
Signal	analog		
Resolution	14 bits		
Accuracy	±0.1 %		
Output	1 ms		
Frequency	4 ... 20 mA		
Load	max. 270 Ω		
USB interface X12			
Type	USB-B female connector		
Standard	USB 1.0		
Operating system	WIN 7 / 8 / 9 (tested with 1511 build 0586.104)		

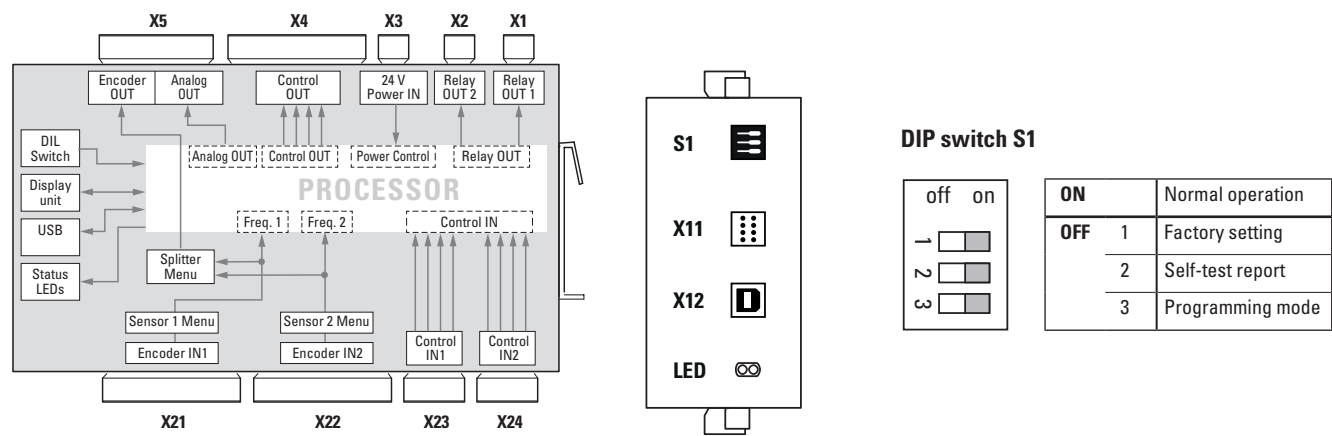
Safe speed monitors

Safety-M compact
Basic module

Speed monitoring – SMC2.4

1 axis / 2 encoder systems

Terminal assignment



X1		X2		X3		X4												X5																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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Relay OUT 1 (NO)		Relay OUT 2 (NO)		Power 24 V IN		Control OUT												Analog OUT			Encoder OUT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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X21											
1	2	3	4	5	6	7	8	9	10	11	
Encoder IN 1											
GND											
5 V OUT											
24 V OUT											
PWR SENSE											
A											
/A											
B											
/B											
Z											
/Z											
GND											

X22											
1	2	3	4	5	6	7	8	9	10	11	
Encoder IN 2											
GND											
5 V OUT											
24 V OUT											
PWR SENSE											
A											
/A											
B											
/B											
Z											
/Z											
GND											

X23				
1	2	3	4	5
Control IN 1				
GND				
IN 1				
/IN 1				
IN 2				
/IN 2				

X24				
1	2	3	4	5
Control IN 2				
GND				
IN 3				
/IN 3				
IN 4				
/IN 4				

Safe speed monitors

Safety-M compact Basic module

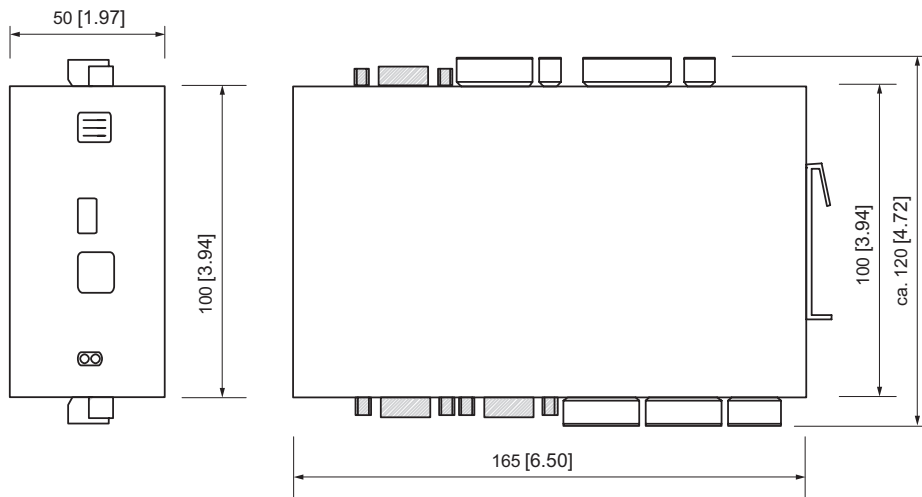
Speed monitoring – SMC2.4

1 axis / 2 encoder systems

Dimensions

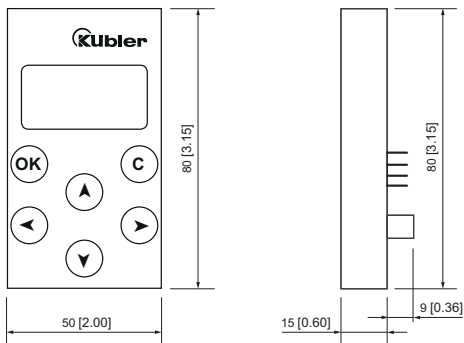
Dimensions in mm [inch]

Basic module



Control and diagnostic display – 8.SMCB.100

(further information can be found in the section accessories)



Safe speed monitors

Safety-M compact Basic module

Speed monitoring – SMC2.2

1 axis / 2 encoder systems



SIL3
Functional Safety
PLe

SMC2.2 is a compact safety module of the Safety-M family with integrated drive monitoring for one axis with 2 encoder systems. This standalone speed monitor (basic module) can be operated without additional safe PLC.

Safety-M compact is the optimal solution for integration in existing safety circuits or for retrofitting old machines. Two encoder solutions (HTL/proximity switch, TTL/RS422, SinCos) are supported for safe speed acquisition



TUV NORD

SinCos

RS422
TTL

Push-Pull
HTL

The integrated signal converter and splitter allows an easy connection of controllers, which can operate using the same encoder system. It offers in addition the possibility of issuing an analog rotational speed value, e.g. to replace tachometers or similar.

The device can be parameterized with a removable control and diagnostic display or with the PC software "OSxx". This way, setting and diagnostic can be performed conveniently at the office PC or totally and easily using the intuitive touchpad display in the field.

- Extensive library of pre-configured safe sensors and command devices. This allows easy parameterizing without programming.
- Complete range of speed-related safe drive monitoring functions equivalent to EN 61800-5-2 already integrated in firmware (e.g. SOS, SLS, SSM, STO).
- Different encoder interfaces for TTL/RS422, SinCos and HTL/Push-Pull/proximity switch, for a wide range of sensors that can be freely combined.
- Integrated signal splitter for SinCos signal forwarding (optional). No complex, interference-sensitive external wiring when the controller is to use the same signals.
- The signal converter can issue the encoder signal as SinCos, TTL/RS422 or as a 4 ... 20 mA analog value.
- Snap-on installation on 35 mm C profile rail.
- 4/2 safe input lines, 8/4 safe shut-off channels, 1 safe potential-free relay open contact.
- Contact multiplication or increase of power capability by external contactors in connection with the device-internal monitoring function for external contacts (EDM).
- LED on the front side indicates operating state.
- Removable control and diagnosis display (optional).
- Free "OSxx" parameterization software.

Order code

8 . SMC2 . 2 X A 241

a Encoder interface
2 = 2 x Sub-D SinCos

b Internal signal splitting
0 = without
S = with

c Analog output
A = 4 ... 20 mA

1) Safety-M compact basic module.

2) Optional control and diagnosis display – to be ordered separately (see the accessories).

Safe speed monitors

Safety-M compact Basic module		Speed monitoring – SMC2.2	1 axis / 2 encoder systems
Accessories			Order no.
Control and diagnostic display, OLED touch screen			8.SMCB.100
“OSxx” parameterization software			
Shield terminal for encoder cable, C profile rail		Shield diameter 3.0 ... 12.0 mm	8.0000.4G06.0312
Connection technology			Order no.
Cordset, pre-assembled 2 m ¹⁾ for Sendix FS encoders	cable, single-ended / 1 x Sub-D, 9-pin, male connector		8.0000.6V00.0002.0087
	cable, single-ended / 1 x Sub-D, 9-pin, female connector		8.0000.6V00.0002.0086
	cable with 1 x M12 / 1 x Sub-D, 9-pin, female connector		8.0000.6V00.0002.0084

Technical data			
General data		Safety characteristics	
Digital input lines	4 / 2	Classification	PLe / SIL3
Digital output lines	8 / 4	System structure	2 channel (Cat. 3 / HFT = 1)
Safe relay outputs	1	PFH _d value	3.76 x 10 ⁻⁸ h ⁻¹
Type of connection	pluggable terminals	Mission time / Proof test interval	20 years
Max. terminal cross section	1.5 mm ² [AWG 15]	Reaction times	see operating instructions R60719
Drive monitoring - number of axis	1 axis	Relevant standards	EN ISO 13849-1:2008 EN 62061:2005 EN 61508:2011
Electrical characteristics		EMC	
Supply voltage	24 V DC / 2.5 A	Relevant standards	EN 61000-6-2:2005 / AC:2005 EN 61000-6-4:2007 / A1:2011 EN 61326-3-2:2008
Tolerance	±20 %		
Current consumption (no load)	max. 150 mA		
Power consumption	max. 45 W		
Fuse on supply voltage	max. 2.5 A, medium time-lag		
Rated encoder power supply data	approx. 2V below the supply voltage / max. 200 mA		
Environmental data		Mechanical characteristics	
Operating temperature	-20°C ... +55°C [-4°F ... +131°F]	Size w x h x d	50 x 100 x 165 mm [1.97 x 3.94 x 6.50"]
Storage temperature	-25°C ... +70°C [-13°F ... +158°F]	Weight	390 g [13.76 oz]
Protection acc. to EN 60529	IP20	Mounting	snap-on mounting on standard head rail
Climate class	3 acc. to DIN 50178 (non condensing)	Material	housing plastic
CE compliant acc. to	EMC guideline 2014/30/EU Machinery directive 2006/42/EC Low voltage guideline 2014/35/EU RoHS guideline 2011/65/EU	Shock resistance acc. to EN 60068-2-27	300 m/s ² , 11 ms 170 m/s ² , 6 ms
		Vibration resistance acc. to EN 60068-2-6	70 m/s ² , 10 ... 200 Hz
LED display			
ERROR (yellow)	steadily on flashing quickly flashing slowly	error peripheral alarm DIP 1 = OFF, factory setting DIP 3 = OFF, programming mode	
ON (green)	steadily on	power on	

Safe speed monitors

Safety-M compact Basic module	Speed monitoring – SMC2.2	1 axis / 2 encoder systems
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SinCos interface (IN) X6, X7	
Type of connection	Sub-D, male connector, 9-pin
Signal	SinCos
Frequency	max. 500 kHz
Signal level	1 Vpp (±20 %)
Signal offset	2,5 V (±0,1 V)
Signal termination	120 Ω
Output voltage	2 V below the supply voltage
Output current	max. 200 mA

Incremental interface (IN) X8, X9	
Type of connection	pluggable screw terminals, 7-pin
Signal	RS422 / TTL
Frequency	max. 500 kHz
Signal termination	120 Ω, 220 pF

Digital inputs (IN) X10	
Type of connection	pluggable screw terminals, 5-pin
HTL signal	incremental interface, Proximity switches or digital inputs
Frequency	max. 250 kHz (incremental), max. 1 kHz (control signal)
Signal level	PNP (24 V DC / 15 mA)
Execution	complementary

Relay outputs (OUT) X1	
Type of connection	pluggable screw terminals, 2-pin
Wiring	two internally in line
Type	positively driven (NO)
Switching ability	5 ... 36 V DC
Switching capacity	5 ... 5000 mA

Digital switching outputs (OUT) X2	
Type of connection	pluggable screw terminals, 8-pin
Signal	HTL / push-pull
Rated data digital output	24 V DC / 30 mA

Incremental interface / RS422 (OUT) X4	
Type of connection	pluggable screw terminals, 7-pin
Signal	RS422 / TTL
Frequency	max. 500 kHz
Signal delay	SinCos <-> RS422: 600 ns RS422 <-> RS422: 600 ns HTL <-> RS422: 600 ns
Source	SinCos (X6, X7) incremental (X8, X9) HTL (X10)

Analog interface (OUT) X4	
Type of connection	pluggable screw terminals, 7-pin
Signal	analog
Resolution	14 bit
Accuracy	±0.1 %
Output	1 ms
Frequency	4 ... 20 mA
Load	max. 270 Ω

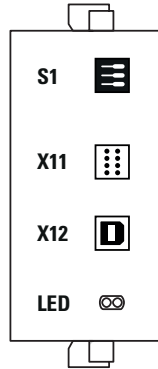
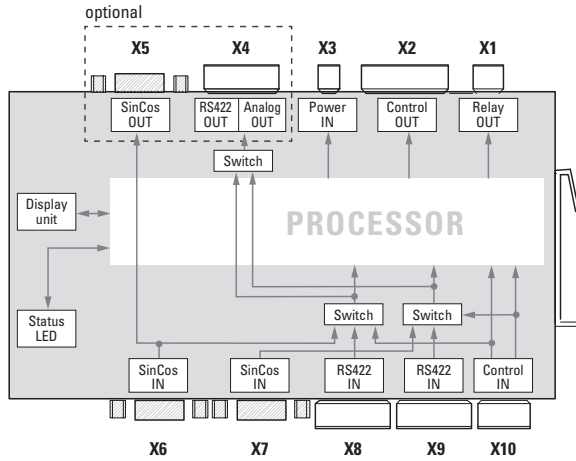
SinCos interface (OUT) X5	
Type of connection	Sub-D, female connector, 9-pin
Signal	SinCos
Signal level	1 Vpp (±20 %)
Signal offset	2.5 V (±0.1 V)
Frequency	max. 500 kHz
Signal delay	SinCos <-> SinCos 200 ns
Source	SinCos (X6)

USB interface X12	
Type	USB-B female connector
Standard	USB 1.0

Safe speed monitors

Safety-M compact Basic module	Speed monitoring – SMC2.2	1 axis / 2 encoder systems
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Terminal assignment



DIP switch S1

	off	on
1		
2		
3		

ON		Normal operation
OFF	1	Factory setting
	2	Self-test report
	3	Programming mode

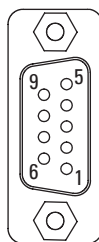
X1	X2	X3	X4	X8	X9	X10
1 2	1 2 3 4 5 6 7 8	1 2	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5
Relay OUT (NO)	Control OUT	Power 24 V IN	Analog OUT	RS422 IN 1	RS422 IN 2	Control IN
COM	OUT 1	GND	I OUT	GND	GND	GND
Relay	OUT 1	24 V IN	A GND	24 V OUT	24 V OUT	A1
	OUT 2		A	A	A	B1
	OUT 2		/ A	/A	/A	A2
	OUT 3		A	B	B	B2
	OUT 3		/ A	/B	/B	
	OUT 4		B	GND	GND	
	OUT 4		/ B			

If the analog output is not used, terminals X4.2 and X4.3 must be bridged.

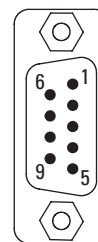
Interface	Sub-D female connector										
Terminal X5	Signal: SinCos	A	$\bar{B}$	B	—	0 V	—	—	—	$\bar{A}$	$\perp$
	Pin:	1	2	3	4	5	6	7	8	9	PH

Interface	Sub-D male connector										
Terminal X6, X7	Signal: SinCos	A	$\bar{B}$	B	+V	0 V	—	—	—	$\bar{A}$	$\perp$
	Pin:	1	2	3	4	5	6	7	8	9	PH

+V: Power supply encoder +V DC
 0 V: Encoder power supply ground GND (0V)
 A, $\bar{A}$: Cosine signal / Incremental channel A
 B, $\bar{B}$: Sine signal / Incremental channel B
 PH $\perp$: Plug connector housing (Shield)



**Sub-D female connector,
9-pin
terminal X5**



**Sub-D male connector,
9-pin
terminal X6, X7**

Safe speed monitors

Safety-M compact Basic module

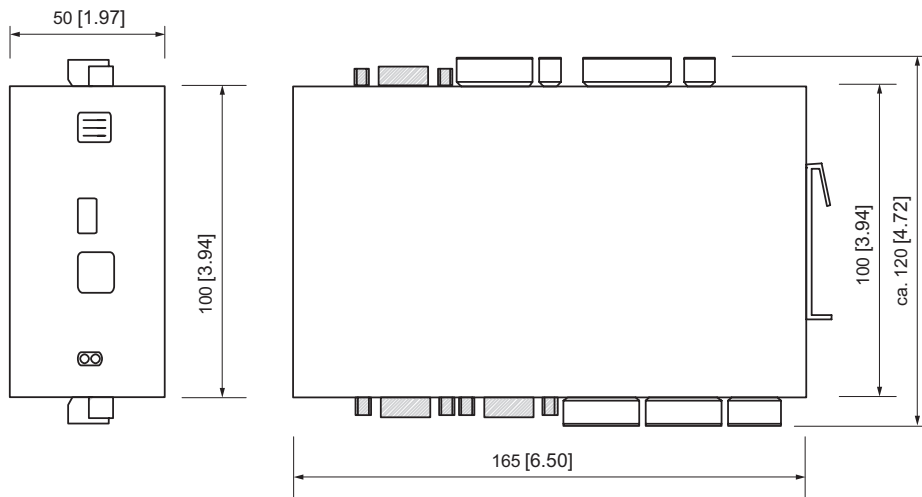
Speed monitoring – SMC2.2

1 axis / 2 encoder systems

Dimensions

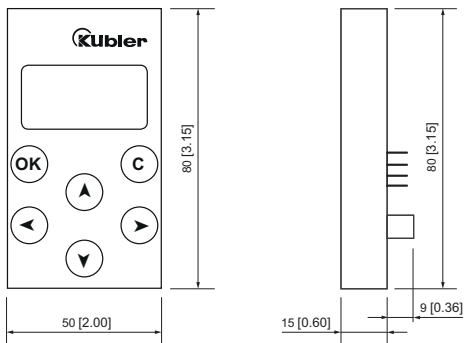
Dimensions in mm [inch]

Basic module



Control and diagnostic display – 8.SMCB.100

(further information can be found in the section accessories)



Safe speed monitors

Safety-M compact Basic module

Speed monitoring – SMC1.3

1 axis / 1 encoder system



SIL2
Functional Safety
PLd

SMC1.3 is a compact safety module of the Safety-M family with integrated drive monitoring for one axis with a safe encoder system. This standalone speed monitor (basic module) can be operated without additional safe PLC.

SMC1.3 is the optimal solution for integration in existing safety circuits or for retrofitting old machines. For safe speed detection, solutions with a safe encoder / incremental sensor (HTL differential, RS422) are supported.



TUV NORD

differential HTL differential RS422

The integrated signal converter and splitter allows an easy connection of controllers, which can operate using the same encoder system. It offers in addition the possibility of issuing an analog rotational speed value, e.g. to replace tachometers or similar.

The device can be parameterized with a removable control and diagnostic display or with the PC software "OSxx". This allows comfortable, comprehensive and simple diagnostics and settings on a PC on site or at the workplace.

The removable operating display (touchscreen) displays various features such as:

- 2-channel frequency display.
- freely scalable for speed, production rates, rotational speeds, stops.
- operating mode and error code display.

- Extensive library of pre-configured safe sensors and command devices. This allows easy parameterizing without programming.
- Complete range of speed-related safe drive monitoring functions equivalent to EN 61800-5-2 already integrated in firmware (SS1, SS2, SDI, SLI, SBC, SMS, SOS, SLS, SSM, STO).
- Integrated signal splitter to forward the encoder signals. No complex, interference-sensitive external wiring when the controller is to use the same signals.
- The signal converter can issue the encoder signal as RS422, HTL differential or as a 4 ... 20 mA analog value.
- Easy snap-on installation on 35 mm C profile rail.
- 8/4 safe control inputs, 4x2 safe control outputs. 2 safe synchronized potential-free relay contacts.
- Contact multiplication or increase of power capability by external contactors in connection with the device-internal monitoring function for external contacts (EDM).
- LED on the front side indicates operating state.
- Removable control and diagnosis display (optional).
- Free "OSxx" parameterization software.

Order code

8 . SMC1 . 3 SA . 442

a Encoder interface
3 = 1 x screw terminal
HTL differential, RS422

b Internal signal splitting
S = with

c Analog output
A = 4 ... 20 mA

Safe speed monitors

Safety-M compact Basic module	Speed monitoring – SMC1.3	1 axis / 1 encoder system
Accessories		Order no.
Control and diagnostic display, OLED touch screen		8.SMCB.100
"OSxx" parameterization software		
Shield terminal for encoder cable, C profile rail	Shield diameter 3.0 ... 12.0 mm	8.0000.4G06.0312

Technical data		
General data		
Safe digital input lines	8 / 4	
Safe digital lines	8 / 4	
Safe relay outputs	2 synchronized	
Type of connection	pluggable screw terminals	
Max. terminal cross section	1.5 mm ² / AWG16, screw terminal	
Drive monitoring	1 axis	
Electrical characteristics		
Supply voltage	24 V DC / 2 A	
Tolerance	±20 %	
Current consumption (no load)	max. 150 mA	
Power consumption	max. 48 W	
Fuse on supply voltage	max. 3.15 A, delayed	
Rated encoder power supply data	5 V or 24 V DC (approx. 2V below the supply voltage) / max. 200 mA short-circuit proof	
Environmental data		
Operating temperature	-20°C ... +55°C [-4°F ...+131°F] (non condensing)	
Storage temperature	-25°C ... +70°C [-13°F ...+158°F] (non condensing)	
Protection acc. to EN 60529	IP20	
Climate class	3 acc. to DIN 50178 (non condensing)	
CE compliant acc. to	EMC guideline 2014/30/EU Machinery directive 2006/42/EC Low voltage guideline 2014/35/EU RoHS guideline 2011/65/EU	
Safety characteristics		
Classification	PLd / SIL2	
System structure	2 channel (Cat. 3 / HFT = 1)	
PFH _d value	5.73 x 10 ⁻⁹ h ⁻¹	
DC _{avg}	98.7 %	
SFF	98.99 %	
MTTF _D	156.5 years	
Mission time / Proof test interval	20 years	
Reaction times	see operating instructions R60047	
Relevant standards	EN ISO 13849-1:2008 EN 62061:2005 EN 61508:2011 EN 60947:2015	
EMC		
Relevant standards	EN 61000-6-2:2006 EN 61000-6-4:2011 EN 61326-3-2:2008	
Mechanical characteristics		
Size w x h x d	50 x 100 x 165 mm [1.97 x 3.94 x 6.50"]	
Weight	390 g [13.76 oz]	
Mounting	snap-on mounting on standard head rail	
Material	housing	plastic
Shock resistance acc. to EN 60068-2-27	300 m/s ² , 11 ms (3 shocks) 170 m/s ² , 6 ms (4000 shocks)	
Vibration resistance acc. to EN 60068-2-6	70 m/s ² , 10 ... 200 Hz (20 cycles)	
LED display		
ERROR (yellow)	steadily on flashing slowly	error DIP 1 = OFF, factory setting DIP 3 = OFF, programming mode
ON (green)	steadily on	power on

Safe speed monitors

Safety-M compact Basic module		Speed monitoring – SMC1.3	1 axis / 1 encoder system
Incremental interface (IN1) X21			
Type of connection	1 x pluggable screw terminal, 11-pin		
Signal	HTL differential, RS422		
Frequency	max. 500 kHz		
Digital inputs (IN1, IN2) X23, X24			
Type of connection	2 x pluggable screw terminals, 5-pin		
HTL signal (PNP)	proximity switches or digital inputs		
Frequency	max. 1 kHz (control signals)		
Signal level	PNP (10 ... 30 V DC / 15 mA)		
Design	4 x complementary, 8 x single-channel		
Relay outputs (OUT) X1, X2			
Type of connection	2 x pluggable screw terminals, 2-pin		
Wiring	2 x two internally in line, connected in parallel		
Type	positively driven (NO)		
Switching ability	5 ... 250 V AC/DC		
Switching capacity	5 ... 5000 mA		
Digital switching outputs (OUT) X4			
Type of connection	pluggable screw terminal, 12-pin		
Signal	HTL / push-pull		
Rated data digital output	HTL PNP 2 ... 3 V DC lower than the input voltage 500 mA / output (total 1000 mA)		
Design	4 x complementary 8 x single-channel, short-circuit proof		
Protective circuit	push-pull		
Incremental interface / RS422 (OUT) X5, internal signal splitter			
Type of connection	pluggable screw terminal, 9-pin		
Signal	RS422 / HTL differential		
Frequency	max. 500 kHz		
Signal delay	RS422 <-> RS422: 500 ns HTL <-> RS422: 500 ns RS422 <-> HTL: 500 ns HTL <-> HTL: 500 ns		
Source	incremental (X21)		
Analog interface (OUT) X5			
Type of connection	pluggable screw terminal, 9-pin		
Signal	analog		
Resolution	14 bits		
Accuracy	±0.1 %		
Output	1 ms		
Frequency	4 ... 20 mA		
Load	max. 270 Ω		
USB interface X12			
Type	USB-B female connector		
Standard	USB 1.0		
Operating system	WIN 7 / 8 / 9 (tested with 1511 build 0586.104)		

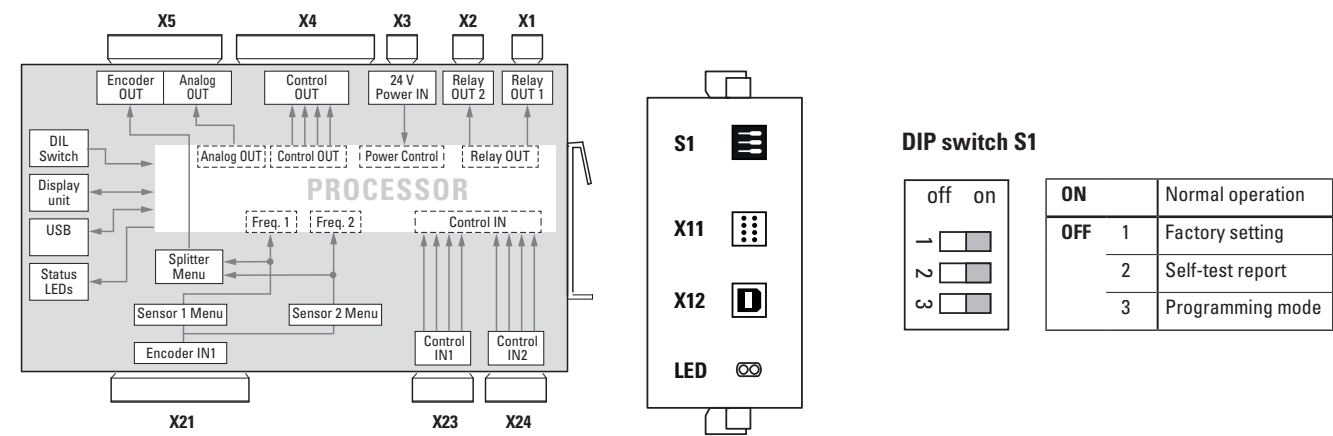
Safe speed monitors

Safety-M compact
Basic module

Speed monitoring – SMC1.3

1 axis / 1 encoder system

Terminal assignment



X1	
C1 (11)	Relay OUT 1 (NO)
C2 (21)	

X2	
NO1 (14)	Relay OUT 2 (NO)
NO2 (24)	

X3	
GND	Power 24 V IN
24 V IN	

X4												
OUT 1	Control OUT											
GND 1												
/OUT 1												
OUT 2												
GND 2												
/OUT 2												
OUT 3												
GND 3												
/OUT 3												
OUT 4												
GND 4												
/OUT 4												

X5								
GND	Analog OUT				Encoder OUT			
4 - 20 mA								
AGND								
A								
/A								
B								
/B								
Z								
/Z								

X21											
GND	Encoder IN 1										
5 V OUT											
24 V OUT											
PWR SENSE											
A											
/A											
B											
/B											
Z											
/Z											
GND											

X23				
GND	Control IN 1			
IN 1				
/IN 1				
IN 2				
/IN 2				

X24				
GND	Control IN 2			
IN 3				
/IN 3				
IN 4				
/IN 4				

Safe speed monitors

Safety-M compact Basic module

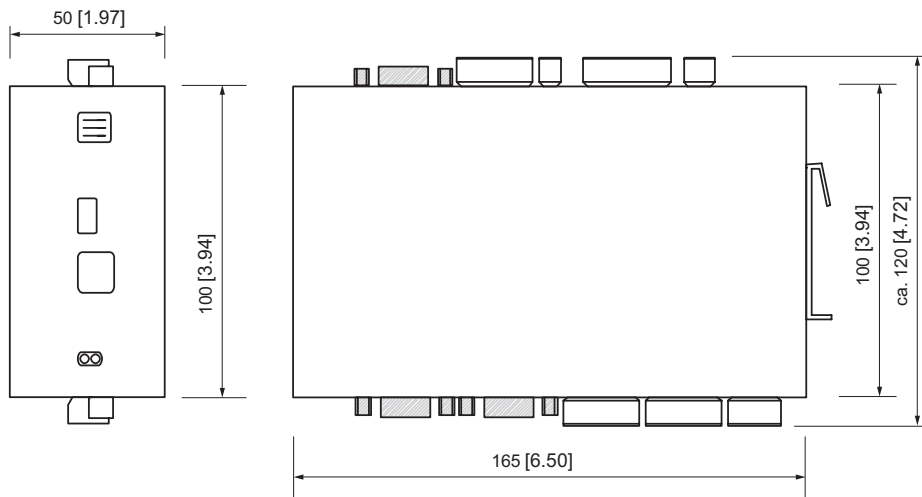
Speed monitoring – SMC1.3

1 axis / 1 encoder system

Dimensions

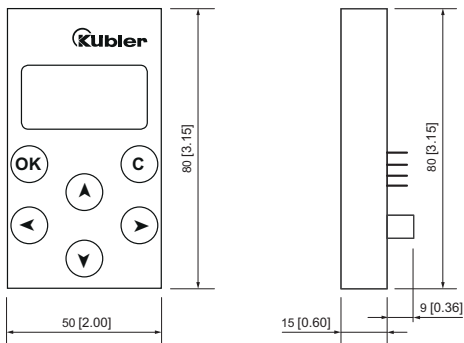
Dimensions in mm [inch]

Basic module



Control and diagnostic display – 8.SMCB.100

(further information can be found in the section accessories)



Safety-M compact Basic module

Speed monitoring – SMC1.1

1 axis / 1 encoder system



SMC1.1 is a compact safety module of the Safety-M family with integrated drive monitoring for one axis with a safe encoder system. This standalone speed monitor (basic module) can be operated without additional safe PLC.

Safety-M compact is the optimal solution for integration in existing safety circuits or for retrofitting old machines. Solutions with a safe encoder (SinCos) are supported for safe speed acquisition.

**TUV NORD**

SinCos

The integrated signal converter and splitter allows an easy connection of controllers, which can operate using the same encoder system. It offers in addition the possibility of issuing an analog rotational speed value, e.g. to replace tachometers or similar.

The device can be parameterized with a removable control and diagnostic display or with the PC software "OSxx". This way, setting and diagnostic can be performed conveniently at the office PC or totally and easily using the intuitive touchpad display in the field.

- Extensive library of pre-configured safe sensors and command devices. This allows easy parameterizing without programming.
- Complete range of speed-related safe drive monitoring functions equivalent to EN 61800-5-2 already integrated in firmware (e.g. STO, SS1, SS2, SOS, SLS, SSM, SDI).
- Integrated signal splitter for SinCos signal forwarding (optional). No complex, interference-sensitive external wiring when the controller is to use the same signals.
- The signal converter can issue the encoder signal as SinCos, TTL/RS422 or as a 4 ... 20 mA analog value.
- Snap-on installation on 35 mm C profile rail.
- 4/2 safe input lines, 8/4 safe shut-off channels, 1 safe potential-free relay open contact.
- Contact multiplication or increase of power capability by external contactors in connection with the device-internal monitoring function for external contacts (EDM).
- LED on the front side indicates operating state.
- Removable control and diagnosis display (optional).
- Free "OSxx" parameterization software.

Order code

8	.	SMC1	.	1	X	A	.	241
				a	b	c		

a *Encoder interface*
1 = 1 x Sub-D SinCos

b *Internal signal splitting*
0 = without
S = with

C *Analog output*
A = 4 ... 20 mA

1) Safety-M compact basic module.

- 1) Safety-M compact basic module.
- 2) Optional control and diagnosis display – to be ordered separately (see the accessories).

Safe speed monitors

Safety-M compact Basic module		Speed monitoring – SMC1.1	1 axis / 1 encoder system
Accessories			Order no.
Control and diagnostic display, OLED touch screen			8.SMCB.100
“OSxx” parameterization software			
Shield terminal for encoder cable, C profile rail		Shield diameter 3.0 ... 12.0 mm	8.0000.4G06.0312
Connection technology			Order no.
Cordset, pre-assembled 2 m ¹⁾ for Sendix FS encoders	cable, single-ended / 1 x Sub-D, 9-pin, male connector		8.0000.6V00.0002.0087
	cable, single-ended / 1 x Sub-D, 9-pin, female connector		8.0000.6V00.0002.0086
	cable with 1 x M12 / 1 x Sub-D, 9-pin, female connector		8.0000.6V00.0002.0084

Technical data			
General data		Safety characteristics	
Digital input lines	4 / 2	Classification	PLe / SIL3
Digital output lines	8 / 4	System structure	2 channel (Cat. 3 / HFT = 1)
Safe relay outputs	1	PFH _d value	3.76 x 10 ⁻⁸ h ⁻¹
Type of connection	pluggable screw terminals	Mission time / Proof test interval	20 years
Max. terminal cross section	1.5 mm ² [AWG 15]	Reaction times	see operating instructions R60719
Drive monitoring - number of axis	1 axis	Relevant standards	EN ISO 13849-1:2008 EN 62061:2005 EN 61508:2011
Electrical characteristics		EMC	
Supply voltage	24 V DC / 2.5 A	Relevant standards	EN 61000-6-2:2005 / AC:2005 EN 61000-6-4:2007 / A1:2011 EN 61326-3-2:2008
Tolerance	±20 %		
Current consumption (no load)	max. 150 mA		
Power consumption	max. 45 W		
Fuse on supply voltage	max. 2.5 A, medium time-lag		
Rated encoder power supply data	approx. 2V below the supply voltage / max. 200 mA		
Environmental data		Mechanical characteristics	
Operating temperature	-20°C ... +55°C [-4°F ... +131°F]	Size w x h x d	50 x 100 x 165 mm [1.97 x 3.94 x 6.50"]
Storage temperature	-25°C ... +70°C [-13°F ... +158°F]	Weight	390 g [13.76 oz]
Protection acc. to EN 60529	IP20	Mounting	snap-on mounting on standard head rail
Climate class	3 acc. to DIN 50178 (non condensing)	Material	housing plastic
CE compliant acc. to	EMC guideline 2014/30/EU Machinery directive 2006/42/EC Low voltage guideline 2014/35/EU RoHS guideline 2011/65/EU	Shock resistance acc. to EN 60068-2-27	300 m/s ² , 11 ms 170 m/s ² , 6 ms
		Vibration resistance acc. to EN 60068-2-6	70 m/s ² , 10 ... 200 Hz
		LED display	
		ERROR (yellow)	steadily on error flashing quickly peripheral alarm flashing slowly DIP 1 = OFF, factory setting DIP 3 = OFF, programming mode
		ON (green)	steadily on power on

1) Other lengths available

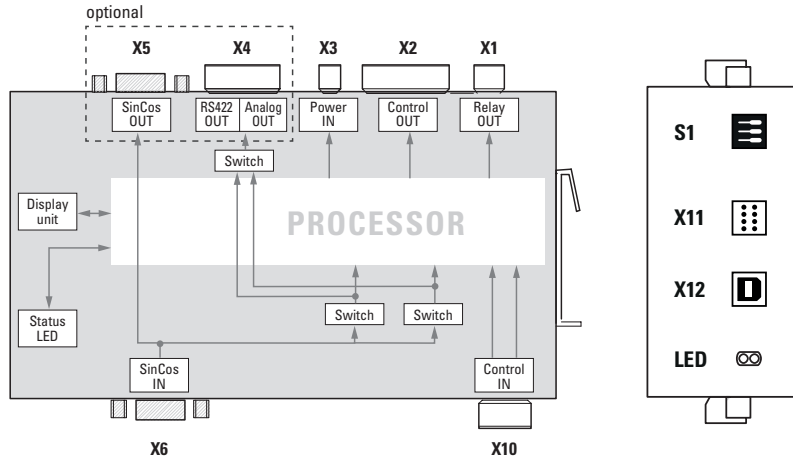
Safe speed monitors

Safety-M compact Basic module		Speed monitoring – SMC1.1	1 axis / 1 encoder system
SinCos interface (IN) X6			
Type of connection	Sub-D, male connector, 9-pin		
Signal	SinCos		
Frequency	max. 500 kHz		
Signal level	1 V _{pp} (±20 %)		
Signal offset	2.5 V (±0.1 V)		
Signal termination	120 Ω		
Output voltage	2 V below the supply voltage		
Output current	max. 200 mA		
Digital inputs (IN) X10			
Type of connection	pluggable screw terminals, 5-pin		
HTL signal	incremental interface, Proximity switches or digital inputs		
Frequency	max. 250 kHz (incremental), max. 1 kHz (control signal)		
Signal level	PNP (24 V DC / 15 mA)		
Execution	complementary		
Relay outputs (OUT) X1			
Type of connection	pluggable screw terminals, 2-pin		
Wiring	two internally in line		
Type	positively driven (NO)		
Switching ability	5 ... 36 V DC		
Switching capacity	5 ... 5000 mA		
Digital switching outputs (OUT) X2			
Type of connection	pluggable screw terminals, 8-pin		
Signal	HTL / push-pull		
Rated data digital output	24 V DC / 30 mA		
Incremental interface / RS422 (OUT) X4			
Type of connection	pluggable screw terminals, 7-pin		
Signal	RS422 / TTL		
Frequency	max. 500 kHz		
Signal delay	SinCos <=> RS422: 600 ns HTL <=> RS422: 600 ns		
Source	SinCos (X6), HTL (X10)		
Analog interface (OUT) X4			
Type of connection	pluggable screw terminals, 7-pin		
Signal	analog		
Resolution	14 bit		
Accuracy	±0.1 %		
Output	1 ms		
Frequency	4 ... 20 mA		
Load	max. 270 Ω		
SinCos interface (OUT) X5			
Type of connection	Sub-D, Buchse, 9-pin		
Signal	SinCos		
Signal level	1 V _{ss} (±20 %)		
Signal offset	2,5 V (±0,1 V)		
Frequency	max. 500 kHz		
Signal delay	SinCos <=> SinCos: 200 ns		
Source	SinCos (X6)		
USB interface X12			
Type	USB-B female connector		
Standard	USB 1.0		

Safe speed monitors

Safety-M compact Basic module	Speed monitoring – SMC1.1	1 axis / 1 encoder system
--	----------------------------------	----------------------------------

Terminal assignment



DIP switch S1

	off	on
1		
2		
3		

ON		Normal operation
OFF	1	Factory setting
	2	Self-test report
	3	Programming mode

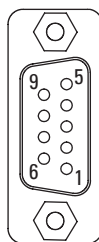
X1	X2	X3	X4	X10
1 2	1 2 3 4 5 6 7 8	1 2	1 2 3 4 5 6 7	1 2 3 4 5
Relay OUT (NO)	Control OUT	Power 24 V IN	Analog OUT	Control IN
COM	OUT 1	GND	I OUT	GND
Relay	OUT 2	24 V IN	A GND	A1
	OUT 3		A	B1
	OUT 4		/ A	A2
			B	B2
			/ B	

If the analog output is not used, terminals X4.2 and X4.3 must be bridged.

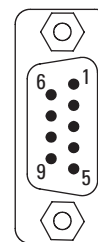
Interface	Sub-D female connector										
Terminal X5	Signal: SinCos	A	$\bar{B}$	B	–	0 V	–	–	–	$\bar{A}$	$\perp$
	Pin:	1	2	3	4	5	6	7	8	9	PH

Interface	Sub-D male connector										
Terminal X6	Signal: SinCos	A	$\bar{B}$	B	+V	0 V	–	–	–	$\bar{A}$	$\perp$
	Pin:	1	2	3	4	5	6	7	8	9	PH

+V: Power supply encoder +V DC
 0 V: Encoder power supply ground GND (0V)
 A, $\bar{A}$: Cosine signal / Incremental channel A
 B, $\bar{B}$: Sine signal / Incremental channel B
 PH $\perp$: Plug connector housing (Shield)



Sub-D female connector,
9-pin
terminal X5



Sub-D male connector,
9-pin
terminal X6

Safe speed monitors

Safety-M compact Basic module

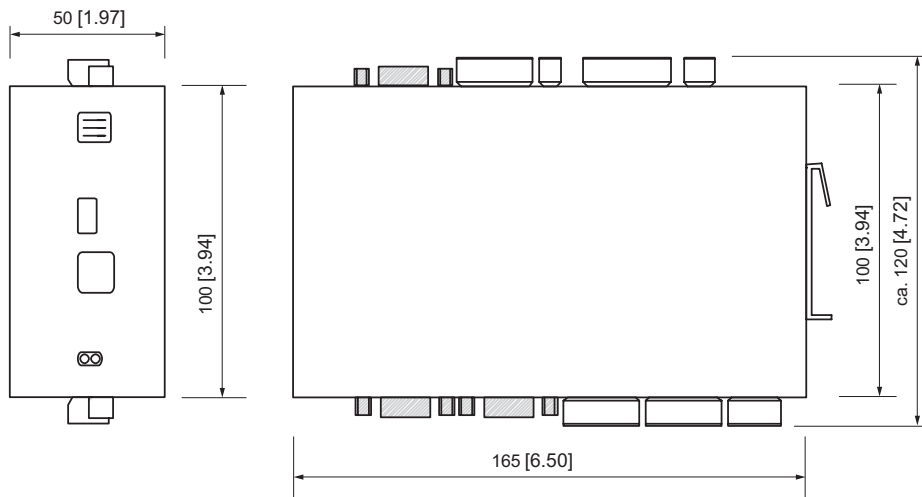
Speed monitoring – SMC1.1

1 axis / 1 encoder system

Dimensions

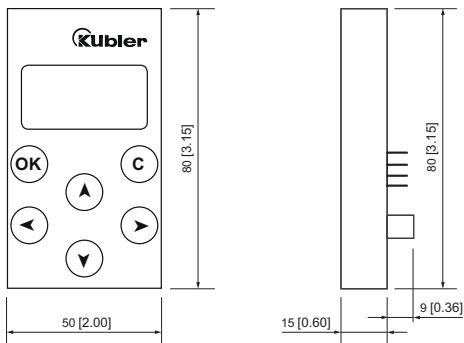
Dimensions in mm [inch]

Basic module



Control and diagnostic display – 8.SMCB.100

(further information can be found in the section accessories)



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