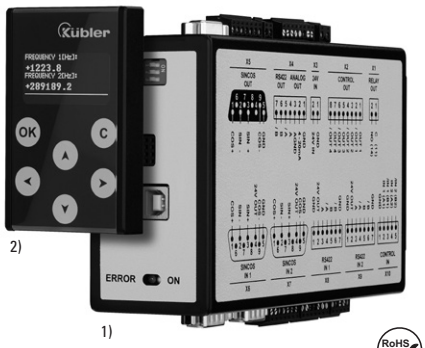
Safety-M compact Basic module | Speed monitoring – SMC1.1 | 1 axis / 1 encoder system



2)

1)

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.

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 SafeConfig OS6.0. 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 “SafeConfig” parameterization software.

Order code

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

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

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.000**
Programming cable, Multi-USB adapter		**05.C162RK1**
SafeConfig parameterization software	download at	**www.kuebler.com/safeconfig**
Shield terminal for encoder cable, C profile rail		**8.0000.4G06.0000**

Connection technology		Order no.
Cordset, pre-assembled 2 m [1]	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**
for Sendix SIL encoders	cable with 1 x M23 / 1 x Sub-D, 9-pin, female connector	**8.0000.6V00.0002.0085**
	cable with 1 x M12 / 1 x Sub-D, 9-pin, female connector	**8.0000.6V00.0002.0084**

Further accessories can be found in accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.
You will find an overview of our systems and components for Functional Safety under www.kuebler.com/safety.

Technical data

General data	
Digital input lines	4 / 2
Digital output lines	8 / 4
Safe relay outputs	1
Type of connection	pluggable screw terminals
Max. terminal cross section	1.5 mm² [AWG 15]
Drive monitoring - number of axis	1 axis

Electrical characteristics	
Power supply	24 V DC / 2.5 A
Tolerance	±20 %
Current consumption (no load)	max. 150 mA
Power consumption	max. 45 W
Fuse on power supply	max. 2.5 A, medium time-lag
Rated encoder power supply data	approx. 2V below the supply voltage / max. 200 mA

Environmental data	
Operating temperature	-20°C ... +55°C [-4°F ...+131°F]
Storage temperature	-25°C ... +70°C [-13°F ...+158°F]
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	PLe / SIL3
System structure	2 channel (Cat. 3 / HFT = 1)
PFH_d value	3.76 x 10^{-8} h^{-1}
Mission time / Proof test interval	20 years
Reaction times	see operating instructions R60719
Relevant standards	EN ISO 13849-1:2008 EN 62061:2005 EN 61508:2011

EMC	
Relevant standards	EN 61000-6-2:2005 / AC:2005 EN 61000-6-4:2007 / A1:2011 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/s², 11 ms 170 m/s², 6 ms
Vibration resistance acc. to EN 60068-2-6		70 m/s², 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

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 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

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-polig
Signal	RS422 / TTL
Frequency	max. 500 kHz
Signal delay	SinCos <–> RS422: 600 ns HTL <–> RS422: 600 ns
Source	SinCos (X6), HTL (X10)

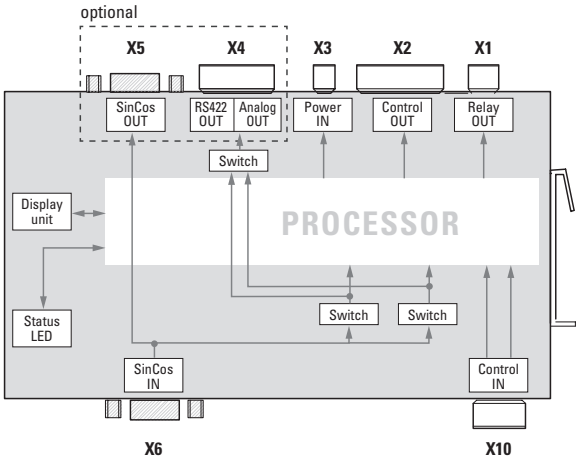
Analog interface (OUT) X4	
Type of connection	pluggable screw terminals, 7-pin
Signal	analog
Resolution	14 bit
Accuracy	±0.1 %
Output	1 ms
Frequency	4 ... 20 mA
Load	max. 270 Ω

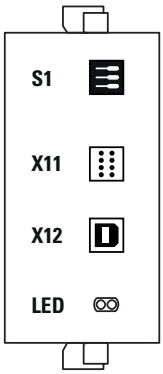
SinCos interface (OUT) X5	
Type of connection	Sub-D, Buchse, 9-polig
Signal	SinCos
Signal level	1 Vss (±20 %)
Signal offset	2,5 V (±0,1 V)
Frequency	max. 500 kHz
Signal delay	SinCos <–> SinCos: 200 ns
Source	SinCos (X6)

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

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

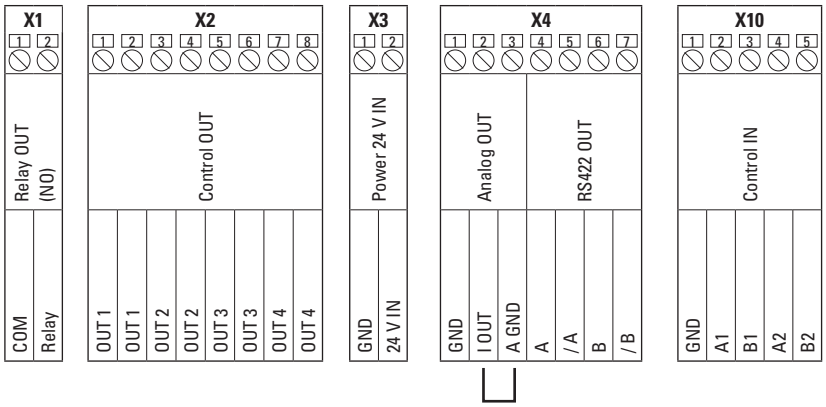
Terminal assignment





DIP switch S1

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

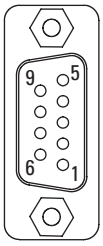


If the analog output is not used, terminals X4.2 and X4.3 must be bridged.

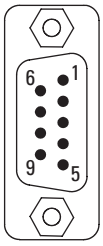
Interface	Sub-D female connector										
Terminal X5	Signal: SinCos	A	$\overline{B}$	B	–	0 V	–	–	–	$\overline{A}$	⏚
	Pin:	1	2	3	4	5	6	7	8	9	PH

Interface	Sub-D male connector										
Terminal X6	Signal: SinCos	A	$\overline{B}$	B	+V	0 V	–	–	–	$\overline{A}$	⏚
	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, $\overline{A}$: Cosine signal / Incremental channel A
B, $\overline{B}$: Sine signal / Incremental channel B
PH ⏚: Plug connector housing (Shield)



Sub-D female connector, 9-pin
terminal X5



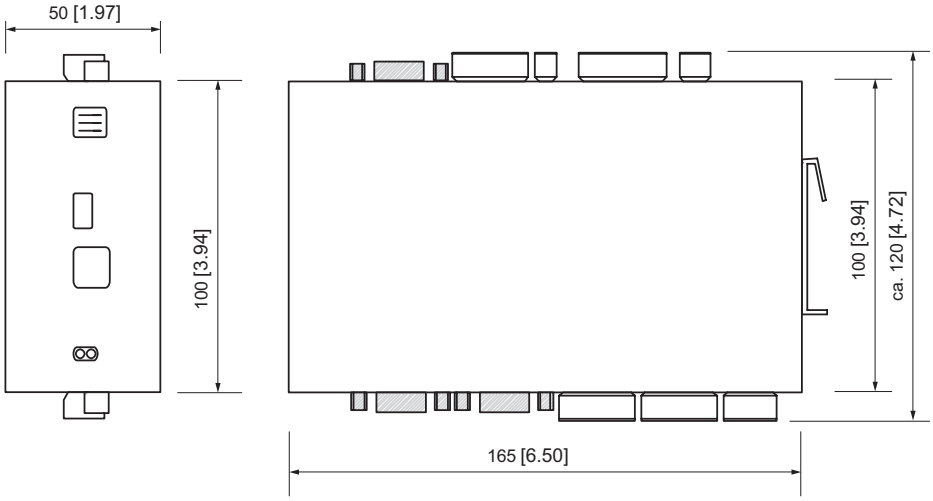
Sub-D male connector, 9-pin
terminal X6

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

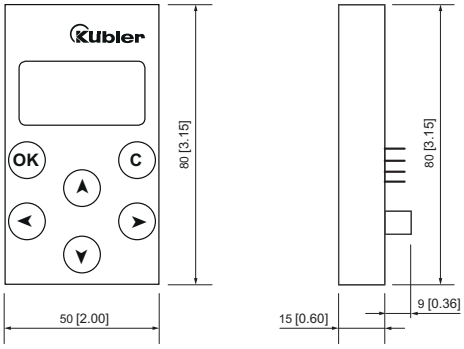
Dimensions

Dimensions in mm [inch]

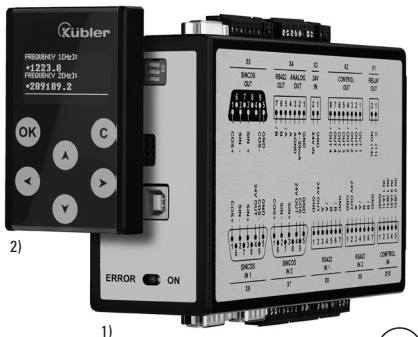
Basic module



Control and diagnostic display – 8.SMCB.000
(further information can be found in the section accessories)



Safety-M compact Basic module | Speed monitoring – SMC1.3 | 1 axis / 1 encoder system



2)

1)

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.

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 SafeConfig OS6.0. 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 “SafeConfig” parameterization software.

Order code

8	.	SMC1	.	3 (a)	S (b)	A (c)	.	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

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

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.000**
Programming cable, Multi-USB adapter		**05.C162RK1**
SafeConfig parameterization software	download at	**www.kuebler.com/safeconfig**
Shield terminal for encoder cable, C profile rail		**8.0000.4G06.0000**

Further accessories can be found in accessories area of our website at: www.kuebler.com/accessories.
You will find an overview of our systems and components for Functional Safety as well as the appropriate software under www.kuebler.com/safety.

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

Power supply	24 V DC / 2 A
Tolerance	±20 %
Current consumption (no load)	max. 150 mA
Power consumption	max. 48 W
Fuse on power supply	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	error
	flashing slowly	DIP 1 = OFF, factory setting DIP 3 = OFF, programming mode
ON (green)	steadily on	power on

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

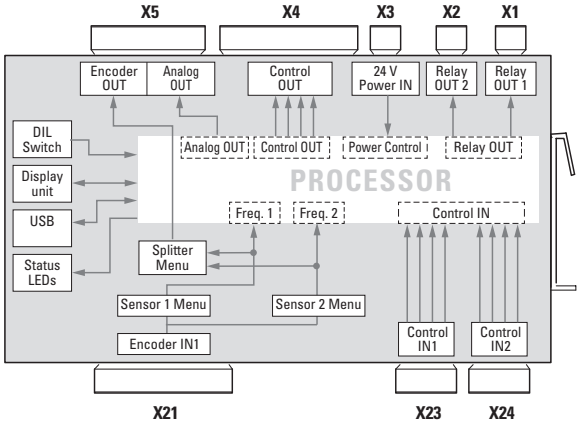
Incremental interface / RS422 (OUT) X5, internal signal splitter	
Type of connection	pluggable screw terminal, 9-pin
Signal	RS422 / HTL differential
Frequency	max. 500 kHz
Signal delay	RS422 <–> RS422: 500 ns HTL <–> RS422: 500 ns RS422 <–> HTL: 500 ns HTL <–> HTL: 500 ns
Source	incremental (X21)

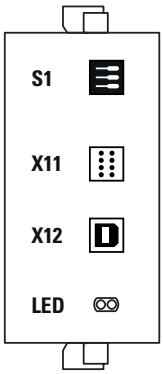
Analog interface (OUT) X5	
Type of connection	pluggable screw terminal, 9-pin
Signal	analog
Resolution	14 bits
Accuracy	±0.1 %
Output	1 ms
Frequency	4 ... 20 mA
Load	max. 270 Ω

USB interface X12	
Type	USB-B female connector
Standard	USB 1.0
Operating system	WIN 7 / 8 / 9 (tested with 1511 build 0586.104)

Safety-M compact
Basic module | **Speed monitoring – SMC1.3** | **1 axis / 1 encoder system**

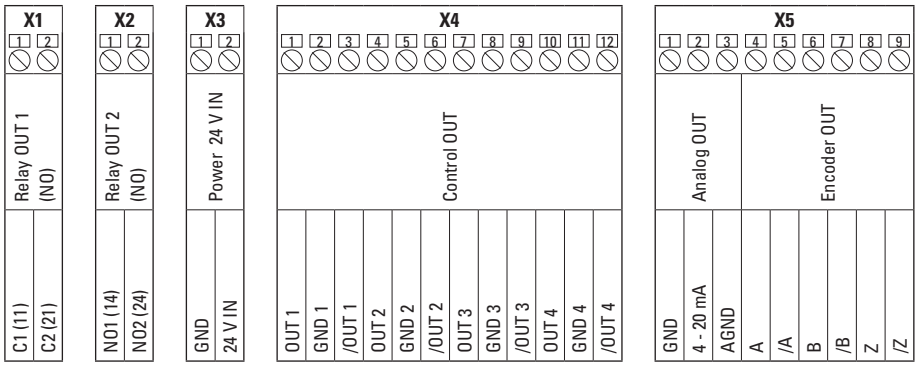
Terminal assignment

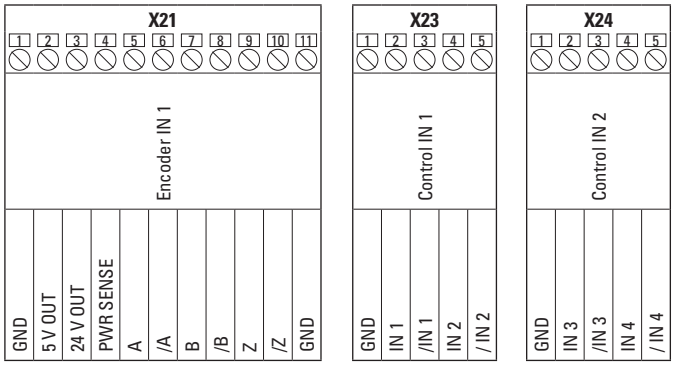




DIP switch S1

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



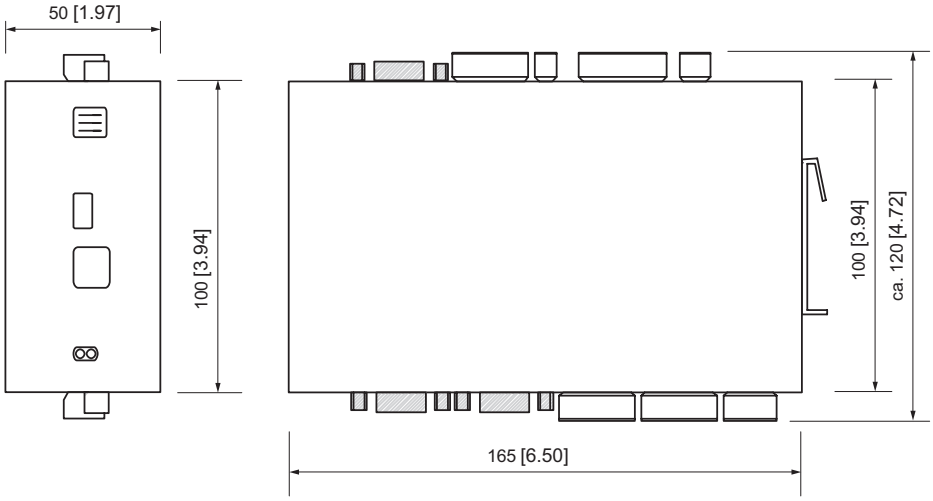


Safety-M compact Basic module | **Speed monitoring – SMC1.3** | **1 axis / 1 encoder system**

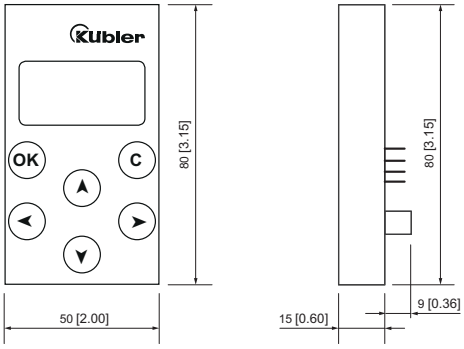
Dimensions

Dimensions in mm [inch]

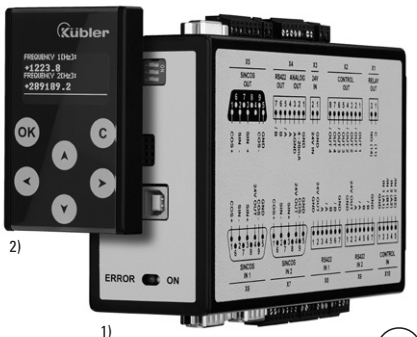
Basic module



Control and diagnostic display – 8.SMCB.000
(further information can be found in the section accessories)



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



2)

1)

SMC2.2 is a compact safety module of the Safety-M family with integrated drive monitoring for one axis with 2 encoder sytems. 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

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 SafeConfig OS6.0. 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 “SafeConfig” parameterization software.

Order code

8	.	SMC2	.	2 (a)	X (b)	A (c)	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).

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.000**
Programming cable, Multi-USB adapter		**05.C162RK1**
SafeConfig parameterization software	download at	**www.kuebler.com/safeconfig**
Shield terminal for encoder cable, C profile rail		**8.0000.4G06.0000**

Connection technology		Order no.
Cordset, pre-assembled 2 m [1]	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**
for Sendix SIL encoders	cable with 1 x M23 / 1 x Sub-D, 9-pin, female connector	**8.0000.6V00.0002.0085**
	cable with 1 x M12 / 1 x Sub-D, 9-pin, female connector	**8.0000.6V00.0002.0084**

Further accessories can be found in accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.
You will find an overview of our systems and components for Functional Safety under www.kuebler.com/safety.

Technical data

General data	
Digital input lines	4 / 2
Digital output lines	8 / 4
Safe relay outputs	1
Type of connection	pluggable terminals
Max. terminal cross section	1.5 mm² [AWG 15]
Drive monitoring - number of axis	1 axis

Electrical characteristics	
Power supply	24 V DC / 2.5 A
Tolerance	±20 %
Current consumption (no load)	max. 150 mA
Power consumption	max. 45 W
Fuse on power supply	max. 2.5 A, medium time-lag
Rated encoder power supply data	approx. 2V below the supply voltage / max. 200 mA

Environmental data	
Operating temperature	-20°C ... +55°C [-4°F ...+131°F]
Storage temperature	-25°C ... +70°C [-13°F ...+158°F]
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	PLe / SIL3
System structure	2 channel (Cat. 3 / HFT = 1)
PFH_d value	3.76 x 10^{-8} h^{-1}
Mission time / Proof test interval	20 years
Reaction times	see operating instructions R60719
Relevant standards	EN ISO 13849-1:2008 EN 62061:2005 EN 61508:2011

EMC	
Relevant standards	EN 61000-6-2:2005 / AC:2005 EN 61000-6-4:2007 / A1:2011 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/s², 11 ms 170 m/s², 6 ms
Vibration resistance acc. to EN 60068-2-6		70 m/s², 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

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

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)

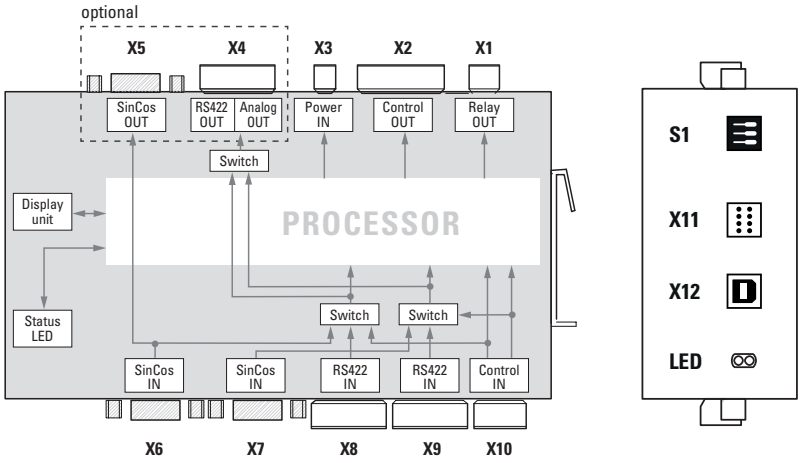
Analog interface (OUT) X4	
Type of connection	pluggable screw terminals, 7-pin
Signal	analog
Resolution	14 bit
Accuracy	±0.1 %
Output	1 ms
Frequency	4 ... 20 mA
Load	max. 270 Ω

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)

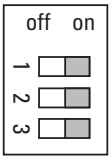
USB interface X12	
Type	USB-B female connector
Standard	USB 1.0

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

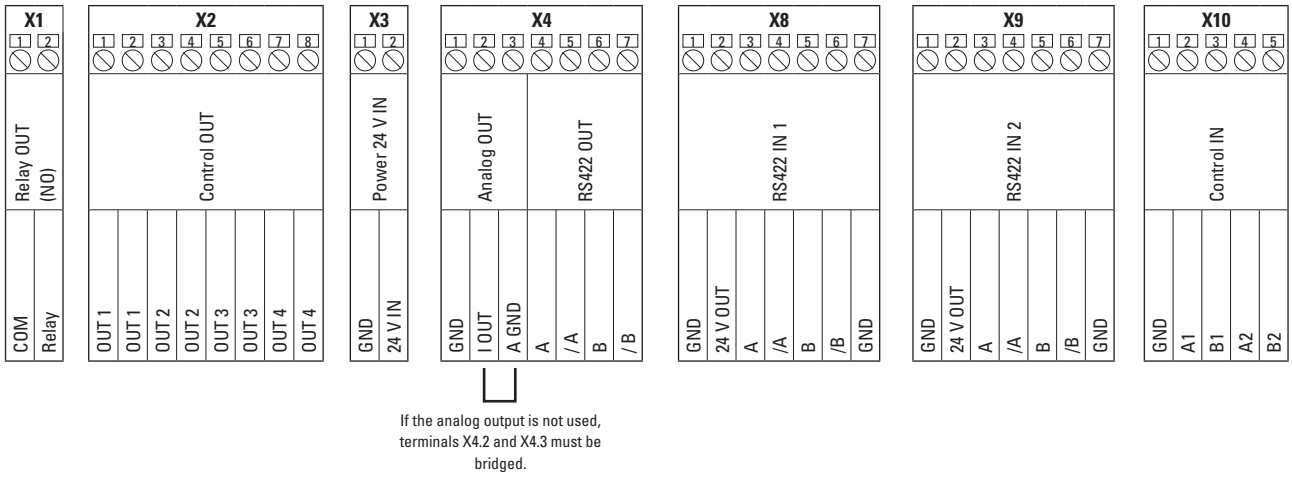
Terminal assignment



DIP switch S1



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

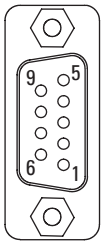


If the analog output is not used, terminals X4.2 and X4.3 must be bridged.

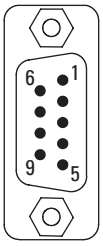
Interface	Sub-D female connector										
Terminal X5	Signal: SinCos	A	$\overline{B}$	B	–	0 V	–	–	–	$\overline{A}$	⏚
	Pin:	1	2	3	4	5	6	7	8	9	PH

Interface	Sub-D male connector										
Terminal X6, X7	Signal: SinCos	A	$\overline{B}$	B	+V	0 V	–	–	–	$\overline{A}$	⏚
	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, $\overline{A}$: Cosine signal / Incremental channel A
B, $\overline{B}$: Sine signal / Incremental channel B
PH ⏚: Plug connector housing (Shield)



Sub-D female connector, 9-pin
terminal X5



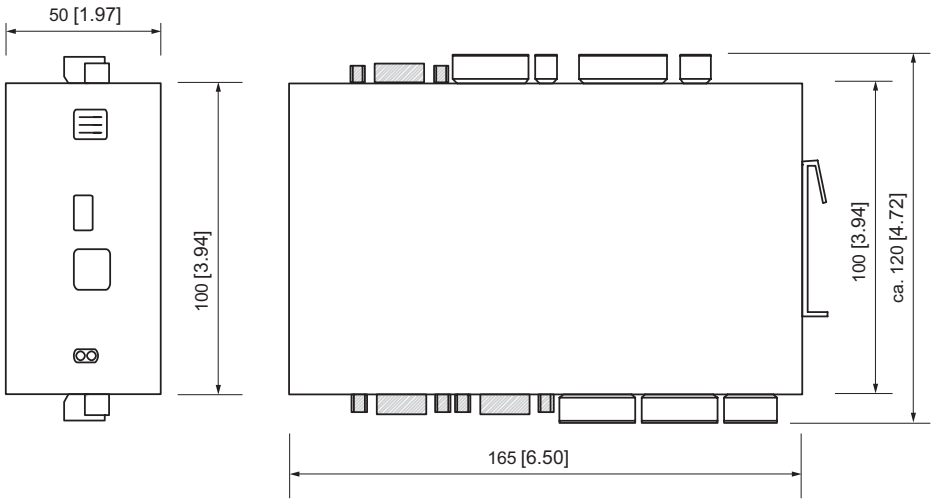
Sub-D male connector, 9-pin
terminal X6, X7

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

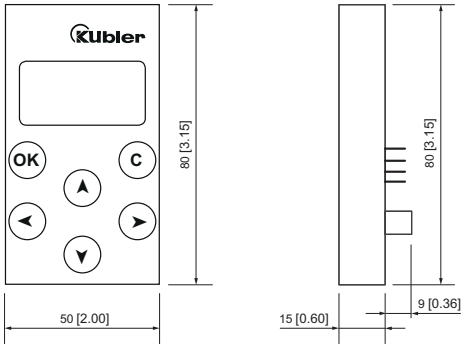
Dimensions

Dimensions in mm [inch]

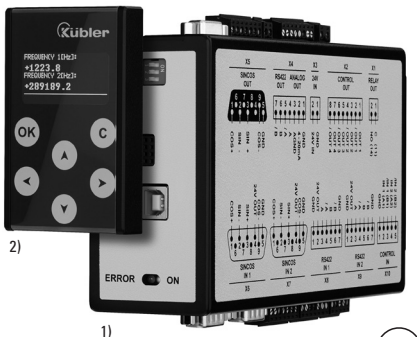
Basic module



Control and diagnostic display – 8.SMCB.000
(further information can be found in the section accessories)



Safety-M compact Basic module | Speed monitoring – SMC2.4 | 1 axis / 2 encoder systems



2)

1)

SMC2.4 is a compact safety module of the Safety-M family with integrated drive monitoring for one axis with zwei (different) encoder sytems. 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.

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 SafeConfig OS6.0. 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 “SafeConfig” parameterization software.

Order code

8	.	SMC2	.	4 (a)	S (b)	A (c)	.	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

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

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.000**
Programming cable, Multi-USB adapter		**05.C162RK1**
SafeConfig parameterization software	download at	**www.kuebler.com/safeconfig**
Shield terminal for encoder cable, C profile rail		**8.0000.4G06.0000**

Further accessories can be found in accessories area of our website at: www.kuebler.com/accessories.
You will find an overview of our systems and components for Functional Safety as well as the appropriate software under www.kuebler.com/safety.

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 mm² / AWG16, screw terminal
Drive monitoring	1 axis

Electrical characteristics

Power supply	24 V DC / 2 A
Tolerance	±20 %
Current consumption (no load)	max. 150 mA
Power consumption	max. 48 W
Fuse on power supply	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	PLe / SIL3
System structure	2 channel (Cat. 3 / HFT = 1)
PFH_d value	$5.73 \times 10^{-9}\ h^{-1}$
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/s², 11 ms (3 shocks) 170 m/s², 6 ms (4000 shocks)
Vibration resistance acc. to EN 60068-2-6	70 m/s², 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

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

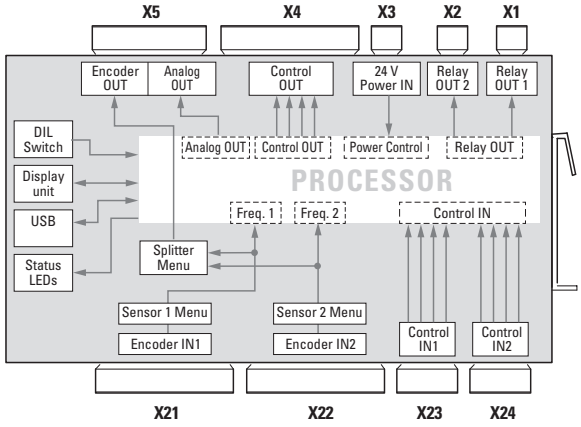
Type of connection	pluggable screw terminal, 9-pin
Signal	analog
Resolution	14 bits
Accuracy	±0.1 %
Output	1 ms
Frequency	4 ... 20 mA
Load	max. 270 Ω

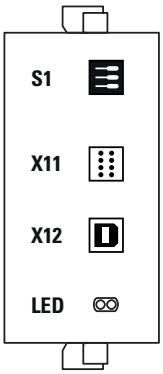
USB interface X12

Type	USB-B female connector
Standard	USB 1.0
Operating system	WIN 7 / 8 / 9 (tested with 1511 build 0586.104)

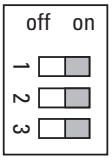
Safety-M compact Basic module | **Speed monitoring – SMC2.4** | **1 axis / 2 encoder systems**

Terminal assignment

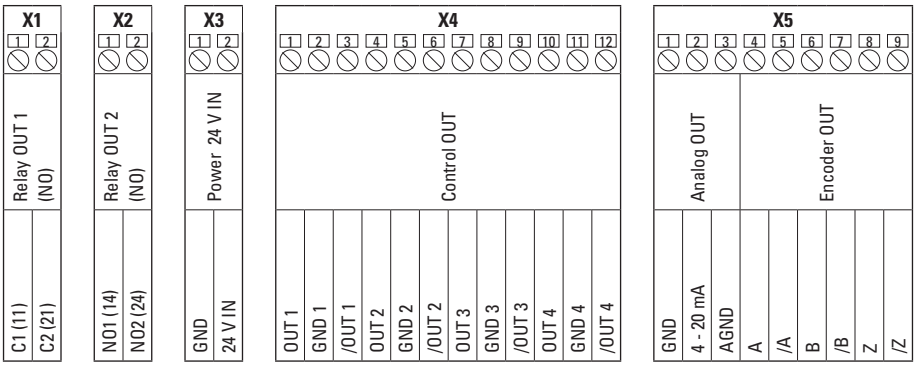


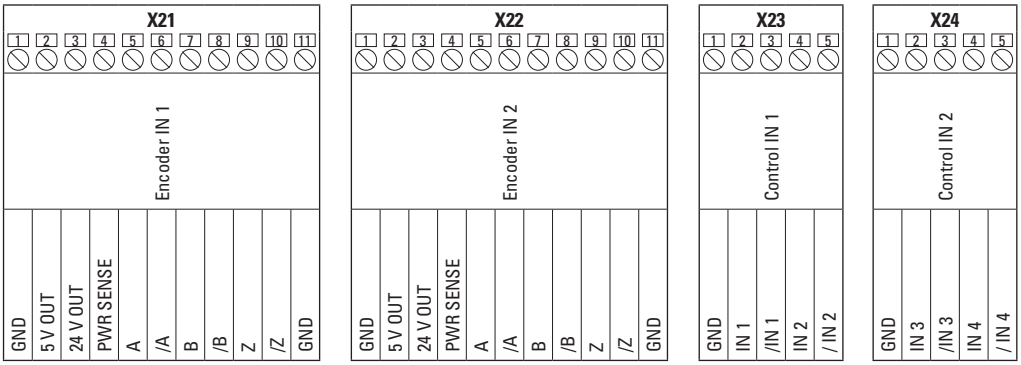


DIP switch S1



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



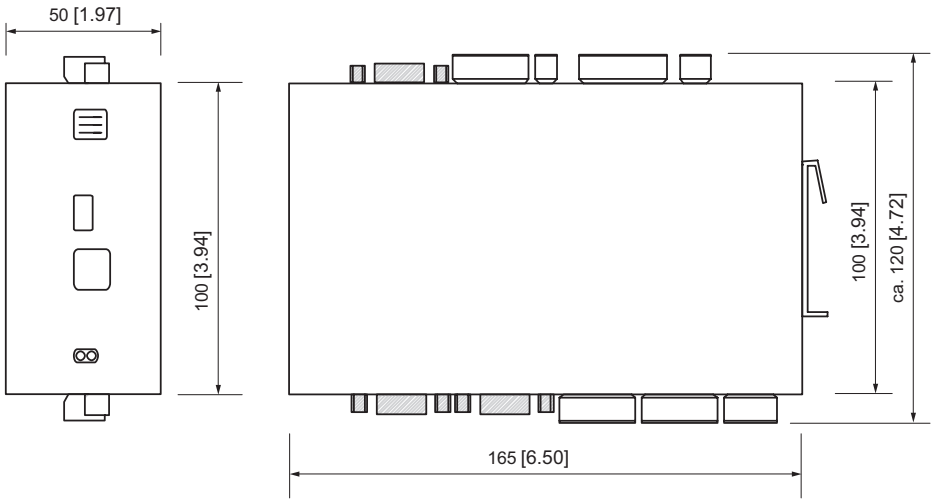


Safety-M compact Basic module | **Speed monitoring – SMC2.4** | **1 axis / 2 encoder systems**

Dimensions

Dimensions in mm [inch]

Basic module



Control and diagnostic display – 8.SMCB.000
(further information can be found in the section accessories)