

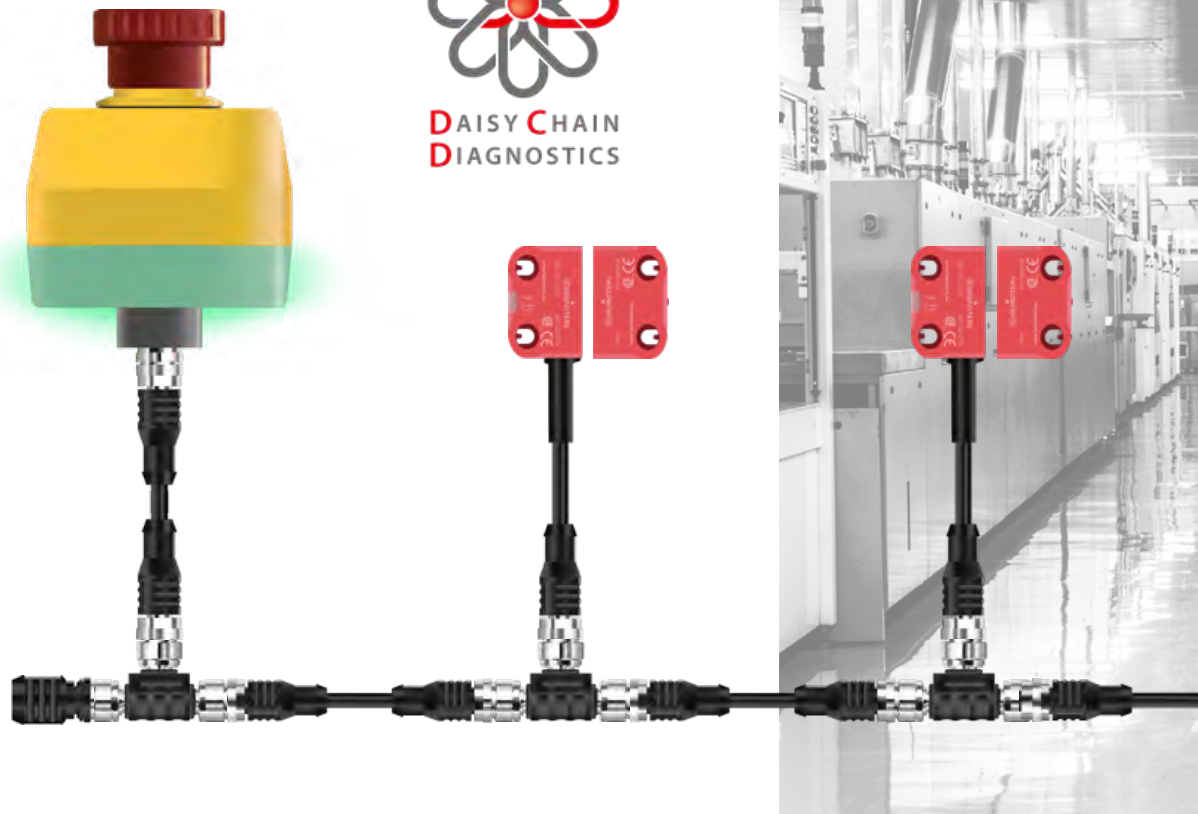


**DAISY CHAIN
DIAGNOSTICS**

SMART Safety System

The smart solution for safeguarding machines

Industry 4.0 in safety technology



SMART Safety by BERNSTEIN

If a machine or system is equipped with BERNSTEIN **SRF safety sensors** and/or **SEU emergency stop switches**, a series-switchable variant is very often selected in order to reduce the wiring effort and costs of the system. Together with the programmable **safety controller SCR DI**, BERNSTEIN provides the basis of a smart complete system for safeguarding machines and systems: The SMART Safety System.

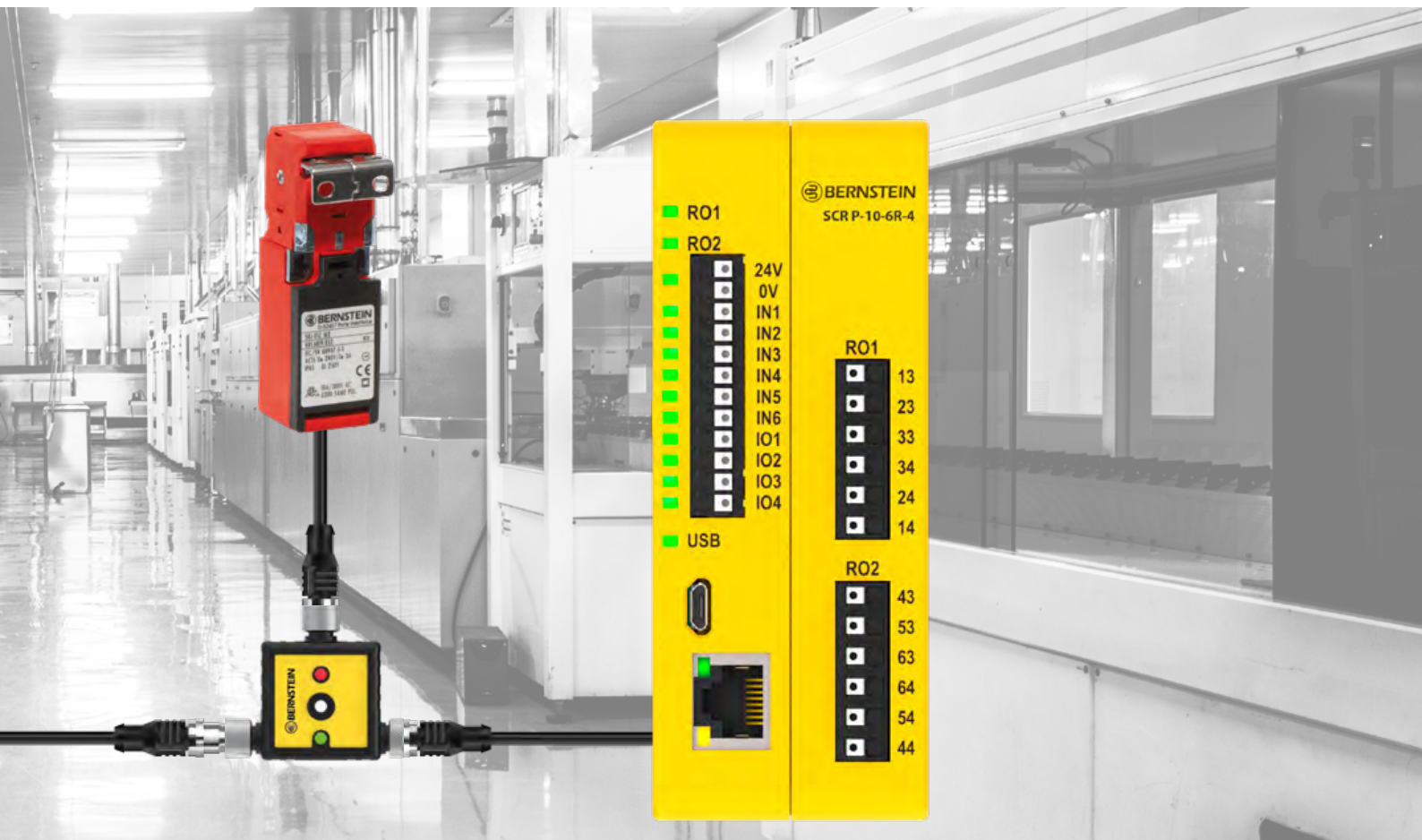
During the development phase, BERNSTEIN paid particular attention to the patented **DCD diagnostic system**, which provides comprehensive data of each connected unit.

BERNSTEIN has consistently been developing this "SMART Safety System" and added further components.

In connection with the retrofit of older systems, for example, it is necessary to integrate the mechanical emergency stop devices that are often still present into the series connection. BERNSTEIN's **smart T-adapter** solves this dilemma: it enables series connection in order to reduce the number of safety relays without having to comply with TR24119 (fault masking). Incidentally, it also makes the mechanical emergency stop switch DCD-capable.

We see ourselves as a solution provider and offer you scalable electronic security solutions.

Contact us and ask your questions.
We will be happy to advise you.



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Diagnostic system DCD

The Daisy Chain Diagnostic System (DCD) provides a wealth of information to make the machines more efficient by avoiding downtime.

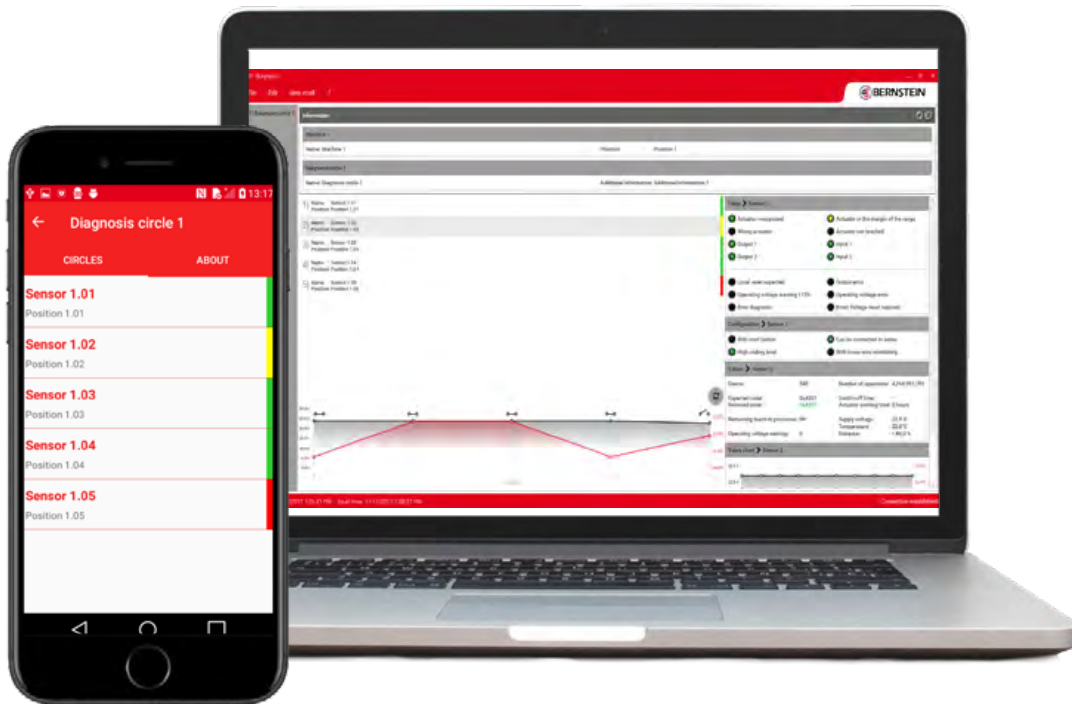
The DCD system is supported by the sensors (SRF-5), the emergency stop (SEU) and the safety relay (SCR DI). The data of each device are collected in the SCR DI (or stand-alone diagnostic device) and can be sent via ...

- IO-Link to a control unit
- USB to a laptop
- NFC to a smartphone

Depending on the device, different data are available:

Information	Sensors SRF-5	Emergency stop and Connection box SEU	SCR DI
Actuator detected	x		
Incorrect actuator	x		
Actuator code not taught in	x		
Actuator at the edge of the detection range	x		
Safety input 1	x	x	x
Safety input 2	x	x	x
Safety output 1	x	x	
Safety output 2	x	x	
Safety contact input 1		x	
Safety contact input 2		x	
Local reset expected	x	x	x
Operating voltage warning	x	x	
Operating voltage 24 V	x	x	x
Status Safe relay output			x
Status internal feedback loop			x
Status external feedback loop			x
Sensor functions	x		x
Number of remaining actuator teach-in operations	x		
Received actuator code	x		
Saved actuator code	x		
Time Actuator in detection limit	x		
Output fault Switch-off time	x	x	x
Operating voltage warning	x	x	x
Device temperature	x	x	
Current supply voltage	x	x	x
Actuator distance	x		
Switching cycles internal relay			x
Switching cycles relay output			x
Order number of the SCR DI			x

None of the diagnostic information is safety-relevant!



In order to simplify the assignment of information, it is possible to permanently assign a name and descriptive text to each device, safety chain and machine, making it easier for users to identify the corresponding device.

In addition, there is a fault memory that stores typical fault data in order to simplify the search.



Go to the download area of the SRF IODD as well as the SRF diagnosis as an app or PC software under the tab "Software".

Diagnostic data of the fault memory

Here at the example of an SRF-5

Information	Meaning
Operating voltage 24V	Operating voltage OK / Operating voltage out of specification range (24V +/- 20%)
Incorrect actuator	Actuator code OK/ Actuator code not OK
Actuator at the edge of the detection area	Actuator distance OK / Actuator at the edge of the detection area
Status safety output 1	On / Off
Status safety output 2	On / Off

The error messages are stored in the diagnostics module using a time stamp and can be retrieved via all interfaces if needed. Thanks to the NFC function, this information can be read even if there is no voltage on the diagnostic module. This unique feature allows efficient troubleshooting and accelerates restarting of defective machines.

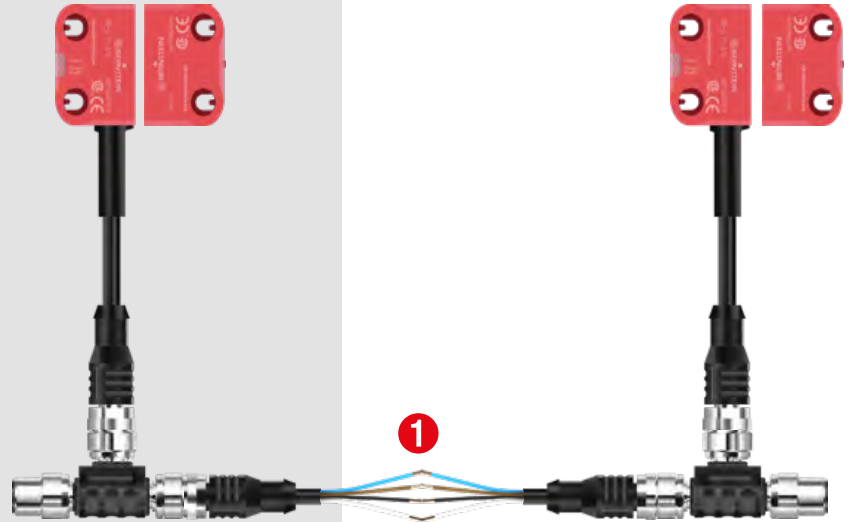
The SRF

Benefits and features



reddot award 2018
winner

- **Cost-saving** thanks to a four-wire unshielded standard connection cable from sensor to sensor ❶
- **Compact and flexible** in application thanks to small design
- **Safe up to PL e** even in series connection, with high defeat protection (according to ISO 14119)



Coding types

- **Low coding level:**
Sensor accepts any SRF actuator; no teach-in procedure.
- **High coding level:**
Sensor accepts taught-in SRF actuators only; an SRF actuators can be taught-in up to 12 times.
- **Unique coding:**
An SRF actuator can only be taught-in once.

Diagnostics (not safety related)

- **PNP diagnostics:**
Signalling contact as PNP signal indicating whether the safety guard is closed.
- **DCD System:**
Detailed diagnostic system DCD that submits a complete status image of a sensor, even in series connection.

Reset function

Local reset of the sensor to enable restarting of the machine.

Fault-tolerant outputs

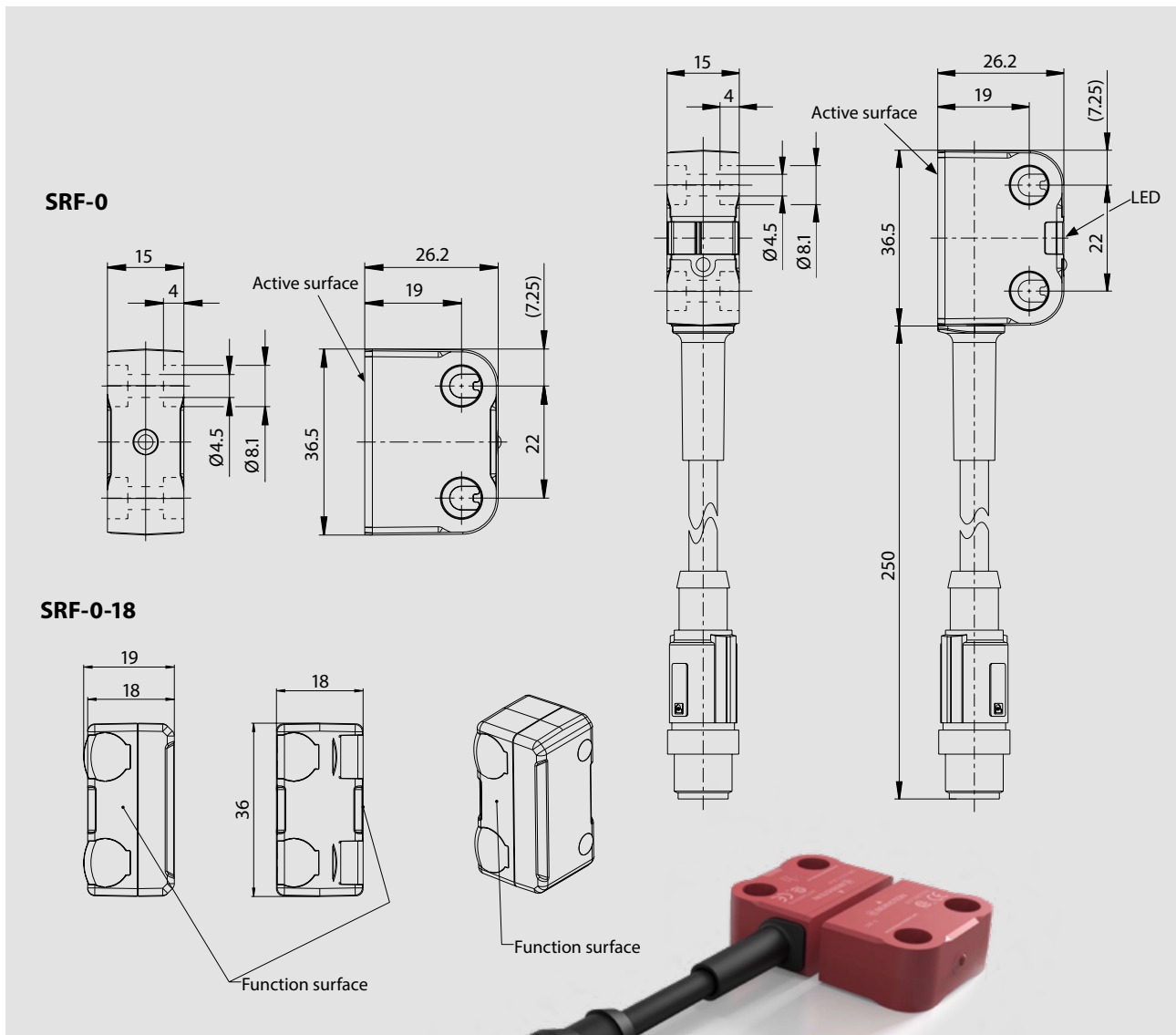
The fault-tolerant outputs prevent unexpected machine stops and allow to run down the machine in a controlled manner.

This is how it works:

If an error is detected at one output, the sensor indicates this with a flash code – whilst simultaneously transmitting the information via the DCD system. After 20 minutes, the second still intact output will switch off.

Intelligent sensor inputs

The status of the safety inputs is checked for plausibility and prevents the system from being switched on again in the event of a fault. This makes it possible to integrate mechanical contacts into the series connection, taking the TR 24119 into account.



Technical data

Electrical data

- Rated operational voltage U_e : 24 V DC
- Output current of the signal output I_e : 10 mA
- Output current of the safety outputs I_s : 100 mA

Mechanical data

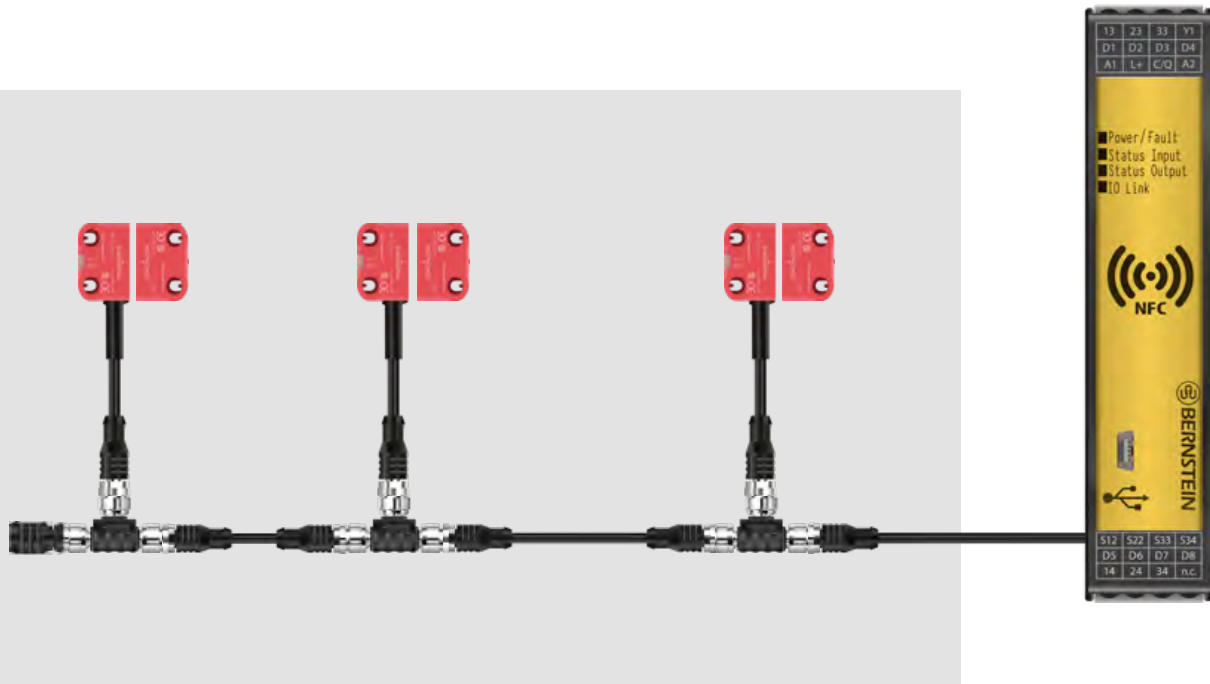
- Enclosure: PA66 + PA6, red, self-extinguishing
- Connection cable: PUR
- Mounting holes: $\varnothing 4.5$ (for M4 screws)
- Displays: 1 \times LED red/green operating status
1 \times LED yellow actuation status
- Ambient temperature: -25°C bis $+70^\circ\text{C}$
- Protection class: IP69

Safety data

- PL e / Cat. 4 (according to EN ISO 13849-1)
- SIL CL 3 (according to DIN EN 62061)
- $\text{PFH}_D = 6 \times 10^{-9}$ 1/h
- Mission time: 20 years
- Switching distance
 - Rated operating distance S_n : 13 mm
 - Assured switching distance – On S_{ao} : 10 mm
 - Assured switching distance – Off S_{ar} : 25 mm
 - Hysteresis: 2 mm
- Switch-off delay t_a : max. 100 ms + 7 ms/add. sensor
- Ready delay t_v : max. 2 s

SRF

Series connection

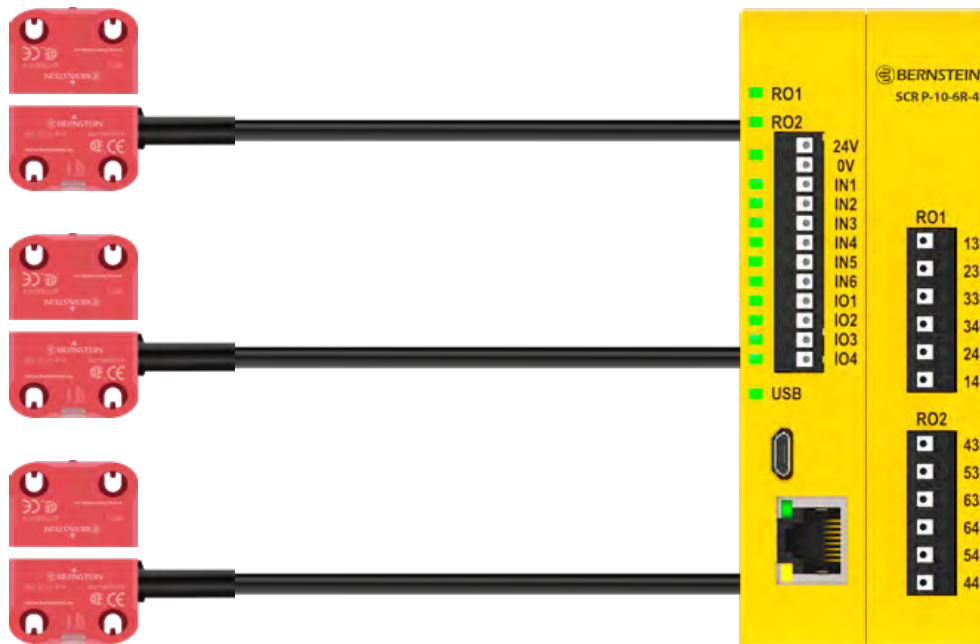


Designation	Article number	Unique coding level	High coding level	Low coding level	PNP diagnostics	Daisy Chain diagnostics (DCD)	Reset input	M12 8-pin connection with 25 cm cable	M8 8-pin connection with 25 cm cable
SRF-4/1/1-E0,25-U	6075685094	x				x		x	
SRF-4/1/1-E0,25-H	6075685095		x			x		x	
SRF-4/1/1-E0,25-L	6075685096			x		x		x	
SRF-4/2/1-E0,25-U	6075685097	x				x	x	x	
SRF-4/2/1-E0,25-H	6075685098		x			x	x	x	
SRF-4/2/1-E0,25-L	6075685099			x		x	x	x	
SRF-5/1/1-E0,25-U	6075685100	x				x		x	
SRF-5/1/1-E0,25-H	6075685101		x			x		x	
SRF-5/1/1-E0,25-L	6075685102			x		x		x	
SRF-5/2/1-E0,25-U	6075685080	x				x	x	x	
SRF-5/2/1-E0,25-H	6075685103		x			x	x	x	
SRF-5/2/1-E0,25-L	6075685104			x		x	x	x	
SRF-5/1/1-D0,25-H	6075685112		x			x			x
SRF-5/1/1-D0,25-L	6075685113			x		x			x
SRF-0	6075687078	Actuator SRF, suitable for all coding levels *							
SRF-0-18	6075687144	Actuator SRF (rectangular design), suitable for all coding levels *							

* The actuators are not included in delivery – please order separately!

SRF

Single connection



Designation	Article number	Unique	High coding level	Low coding level	PNP diagnostics	M12 5-pin connection with 25 cm cable	2 m cable with open cable end	M8 8-pin connection with 25 cm cable
SRF-2/1/1-A2-U	6075685117	x			x		x	
SRF-2/1/1-A2-H	6075685079		x		x		x	
SRF-2/1/1-A2-L	6075685118			x	x		x	
SRF-2/1/1-E0,25-U	6075685119	x			x	x		
SRF-2/1/1-E0,25-H	6075685120		x		x	x		
SRF-2/1/1-E0,25-L	6075685121			x	x	x		
SRF-2/1/1-D0,25-H	6075685142		x		x			x
SRF-0	6075687078	Actuator SRF, suitable for all coding levels *						
SRF-0-18	6075687144	Actuator SRF (rectangular design), suitable for all coding levels *						

* The actuators are not included in delivery – please order separately!

The emergency stop switches SEU for direct integration into an SRF sensor chain

Illuminated emergency stops SEU 3 and 4 Available in round or square design

In order to simply and intelligently implement the requirement of the Machinery Directive that every machine has to be equipped with at least one Emergency Stop device, BERNSTEIN AG launches a new generation of emergency stop buttons offering modern and smart features that are perfectly suited for a variety of applications.



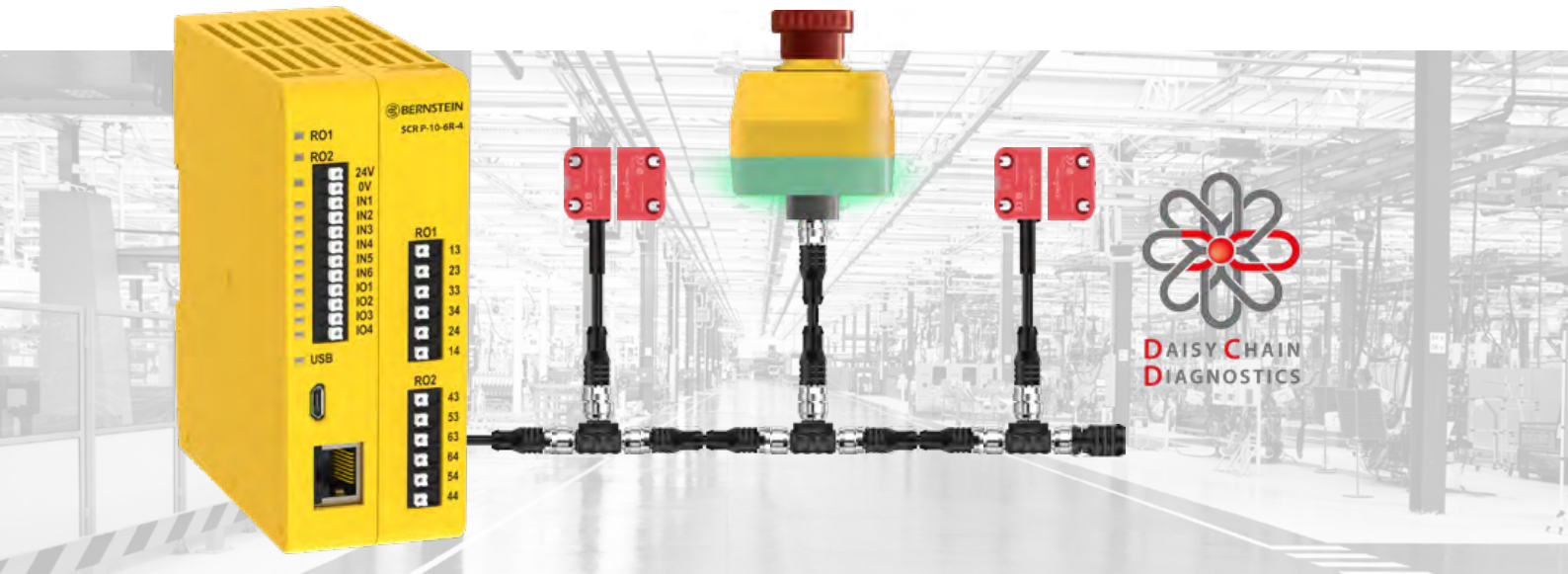
PRODUCT HIGHLIGHTS

- **Current status clearly visible** through large LED display
- **Comprehensive diagnostic possibilities** thanks to patented BERNSTEIN DCD Technology
- **Reduction of downtimes** due to visible status display and extensive DCD diagnostic data
- **Simple wiring** thanks to integrated M12 connector
- **Optional local reset function** maximises user safety

Order data SEU – Illuminated E-Stop

Picture	Designation	Article number	Reset Function	Illumination colour *
	SEU-4/0/3-P86-C	6075689166	No	yellow/red
	SEU-4/0/1-P86-C	6075689167	No	off/red
	SEU-4/0/2-P86-C ¹	6075689168¹	No	green/red
	SEU-4/3/3-P86-C	6075689172	Yes	yellow/red
	SEU-4/3/1-P86-C	6075689173	Yes	off/red
	SEU-4/3/2-P86-C ¹	6075689174¹	Yes	green/red
	SEU-3/0/3-P81-C	6075689169	No	yellow/red
	SEU-3/0/1-P81-C	6075689170	No	off/red
	SEU-3/0/2-P81-C ¹	6075689171¹	No	green/red
	SEU-3/3/3-P81-C	6075689175	Yes	yellow/red
	SEU-3/3/1-P81-C	6075689176	Yes	off/red
	SEU-3/3/2-P81-C ¹	6075689177¹	Yes	green/red

* First colour indicates released state; second colour indicates operated state
¹ **In-stock items:** immediately available



Technical Data

Electrical data

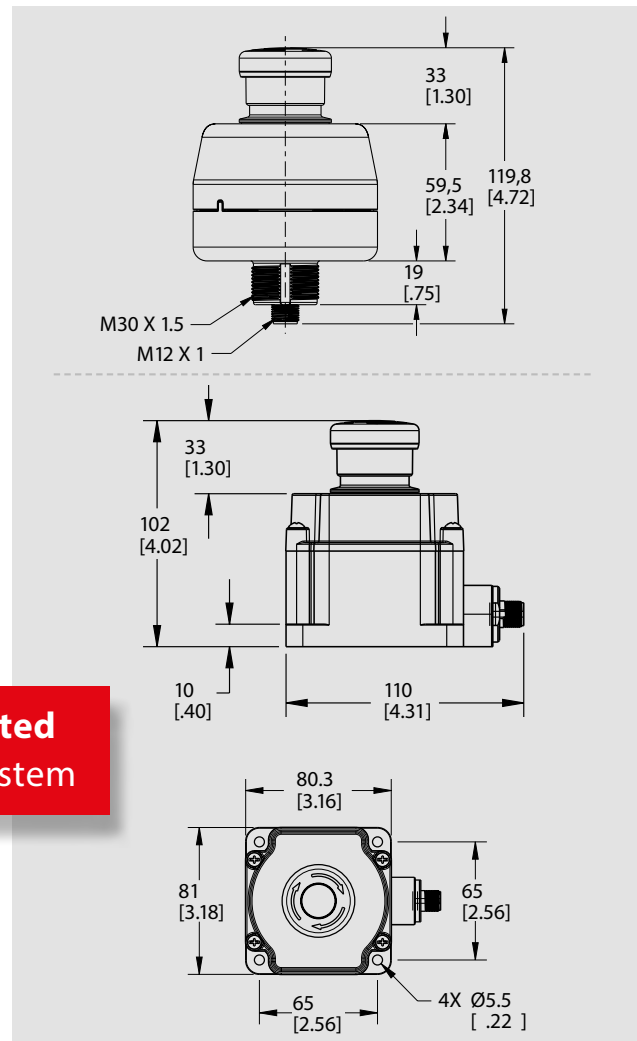
- Rated operational voltage (U_e): 24 V DC

Mechanical data

- Housing/button material:
Polycarbonate / Polyamide
- Ambient Temperature: -25°C to $+50^{\circ}\text{C}$
- Protection class: IP65 / with WDC IP67 / IP69 (EN 60529)

Safety data

- Up to PL e / Cat.4 and SIL CL 3
- Certifications:



Simple. Perfect. Integrated
into the SMART Safety System

Accessories on page 25

The emergency stop switches SEU for direct integration into an SRF sensor chain

Emergency stop SEU 2


The emergency stop offers an optical status display via LED as well as the transmission of the device status via DCD diagnostic to the machine control system. To reset after activating, simply rotate the button.

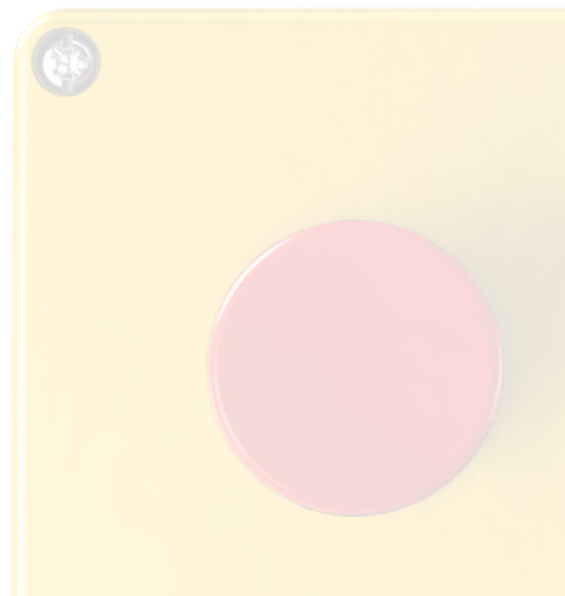


PRODUCT HIGHLIGHTS

- **Simple integration** of the emergency stop into the sensor chain via M12 plug connection
- **Diagnostic information** of every emergency stop device available
- **Identification** of whether the switch-off signal is caused by the emergency stop or by a sensor
- **Monitoring of compliance with test cycles** for emergency stop possible in a simple manner
- **TR 24119 (fault masking)** doesn't have to be considered
- **Saves** input of a fail-safe PLC or an entire safety relay

Order data SEU 2

Picture	Designation	Article number	Description
	SEU-2/0-P80-C	6075689138	Emergency stop switch





Technical Data

Electrical data

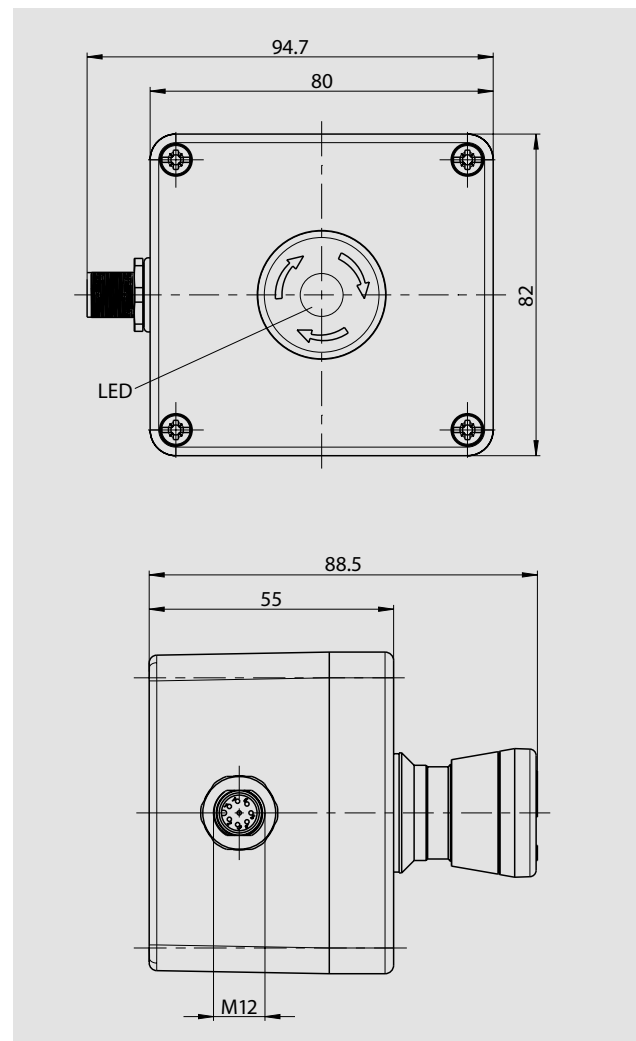
- Rated operational voltage U_e : 24 V DC
- Output current of the message output I_e : 10 mA
- Output current of the safety outputs I_e : 100 mA

Mechanical data

- Enclosure material: Polycarbonate
- Ambient temperature: -25°C to $+70^{\circ}\text{C}$
- Protection class: IP65

Safety data

- up to PL e / Cat. 4 (according to EN ISO 13849-1)
- up to SIL CL 3 (according to DIN EN 62061)



The smart T-adapter

A particularly small connection box

The T-adapter and connection box have been combined into one device. The smart T-adapter is significantly smaller than the connection box and can therefore easily be installed in control cabinets and operating enclosures. In order to be able to quickly recognise the status of the smart T-adapter and the connected mechanical switch, clearly visible LEDs are also integrated on the front and back, which makes troubleshooting considerably faster.

PRODUCT HIGHLIGHTS

- **Saving components**
- **Possible series connection** to reduce the number of safety relays
- **Diagnostic data is provided** to enable quick commissioning and troubleshooting
- **Significantly smaller** and therefore well suited for concealed installation
- **Standard T-adapter not needed**
- **Fast error detection** through LEDs



Smaller.Smarter.

Order data T-adapter

Picture	Designation	Article number	Connection for input devices					Display
			Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	
	SEU-1/0-T45-C	6075689190	CH1a	CH1b	CH2a	CH2b	-	green / red
	SEU-1/0-T45-AB	6075689191	CH1a	CH1b	-	CH2a	CH2b	green / red



Technical Data

Electrical data

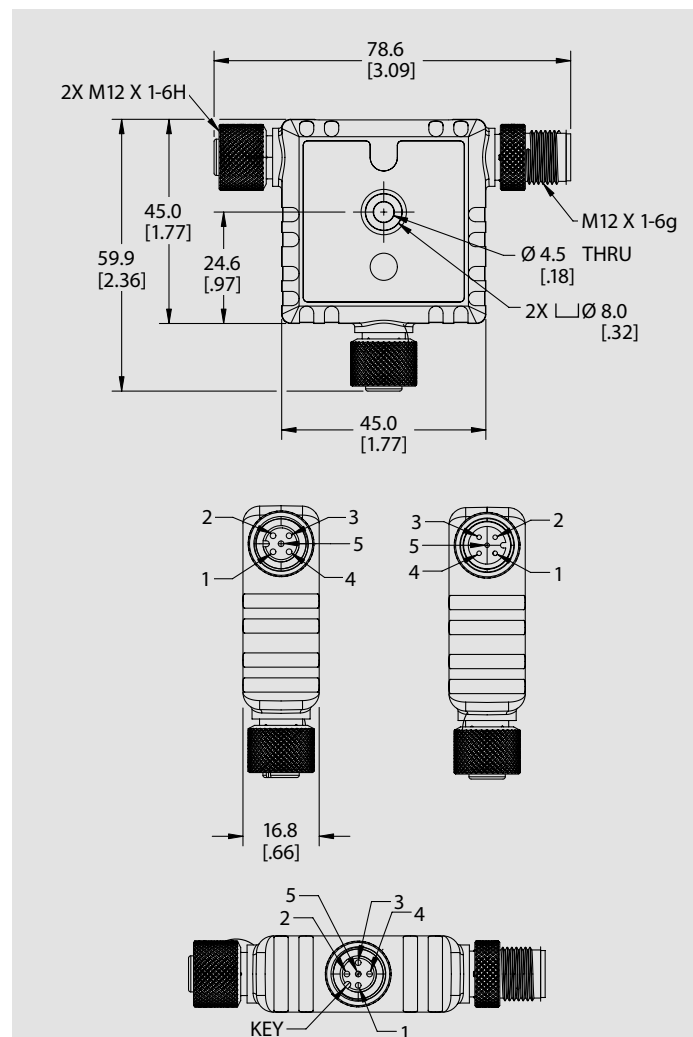
- Rated operational voltage U_e : 24 V DC
- Output current of the safety outputs I_e : 100 mA

Mechanical data

- Housing material: polyvinyl chloride (PVC), black
- Ambient temperature: $-25\text{ }^{\circ}\text{C}$ to $+55\text{ }^{\circ}\text{C}$
- Protection class: IP67

Safety data

- up to PL e / Cat. 4 (according to EN ISO 13849-1)
- up to SIL CL 3 (according to DIN EN 62061)
- $\text{PFH}_D = 6.56 \times 10^{-9}$ 1/h
- Service life: 20 years

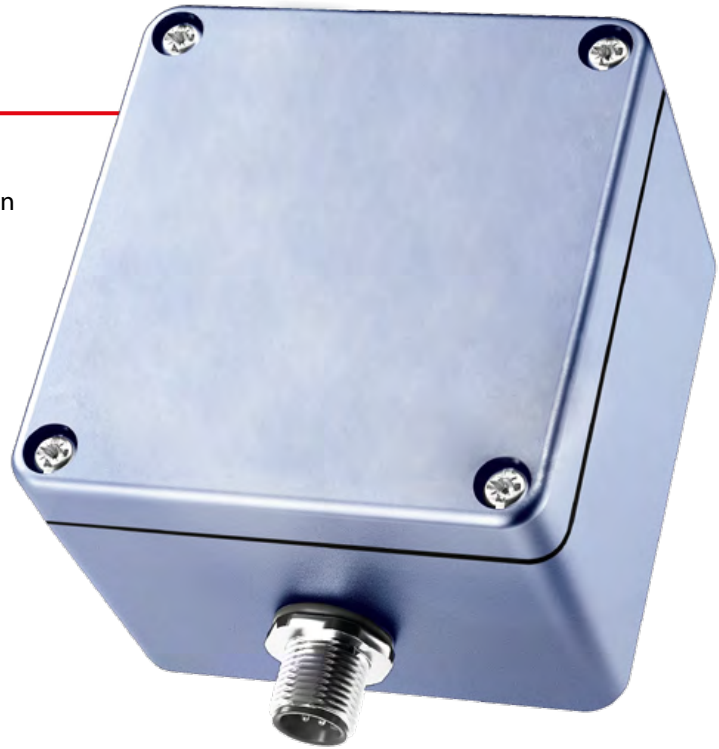


The connection box


With the SEU connection box, existing electromechanical safety switches, such as safety interlocks or emergency stop devices, can be integrated into the SRF safety chain with ease. In addition, mechanical switches with the connection box can be integrated into the sensor chain. The status data is also transmitted to the connection box via DCD diagnosis.

PRODUCT HIGHLIGHTS

- **Easy integration** of electromechanical safety switches into the sensor chain via the connection box via M12 plug connection
- **Diagnostic information** of each connected safety switch available
- **Saving of a safe input or a safety relay** by integration into the sensor chain



Order data connection box

Picture	Designation	Article number	Description
	SEU-1/0-M64-C	6075689137	Connection box



Technical Data

Electrical data

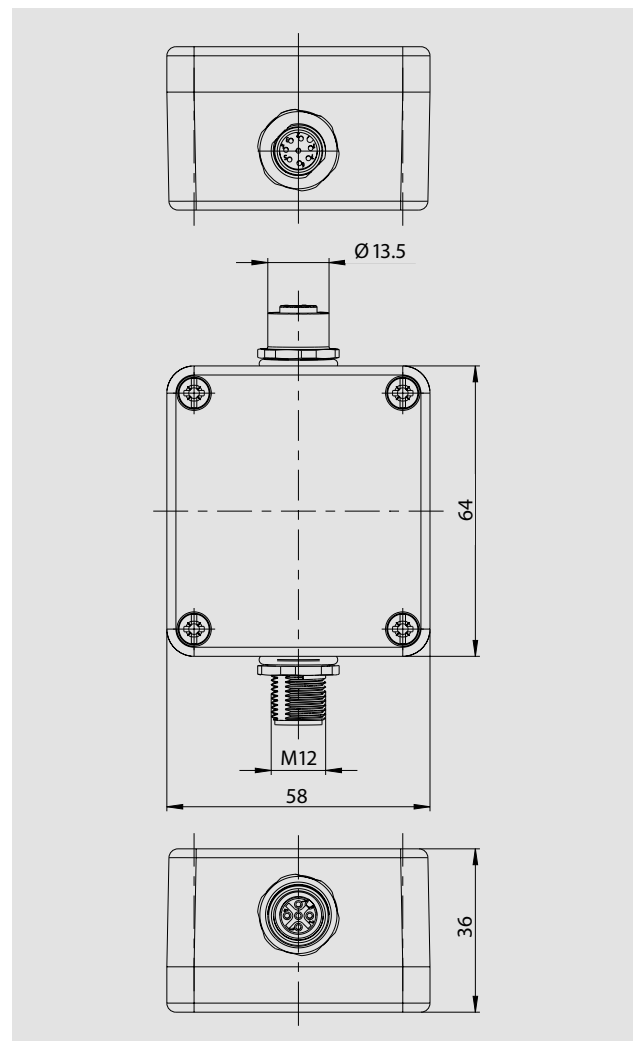
- Rated operational voltage U_e : 24 V DC
- Output current per message output I_e : 10 mA
- Output current of the safety outputs I_e : 100 mA

Mechanical data

- Enclosure material: Die-cast aluminium
- Ambient temperature: -25°C bis $+70^\circ\text{C}$
- Protection class: IP67

Safety data

- up to PL e / Cat. 4 (according to EN ISO 13849-1)
- up to SIL CL 3 (according to DIN EN 62061)

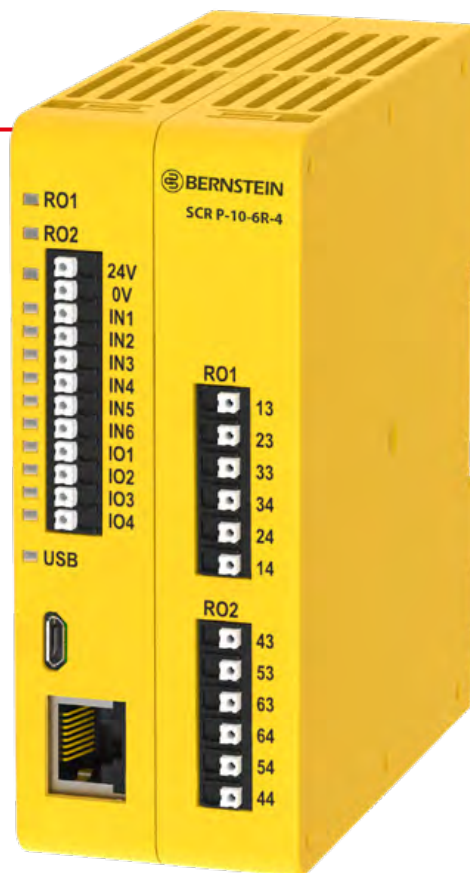


Safety controller SCR P

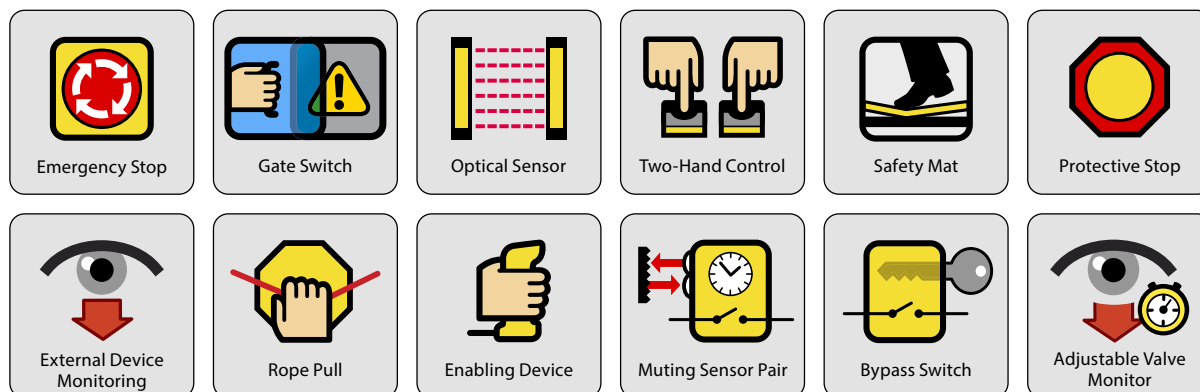
The smart solution for machine safety

PRODUCT HIGHLIGHTS

- **Reduction** of downtimes
- **Reduce** hardware costs
- **Quick and simple** configuration
- **Testing the configuration** in simulation mode
- **Simple troubleshooting** in live mode
- **Configuration cloning** via programming flash drive
- **Provision of DCD diagnostic data** via selectable Ethernet protocols
- **Two independent enabling paths**
- **Intuitive user interface**
- **Simple program creation** via Drag & Drop
- **Live and simulation mode**

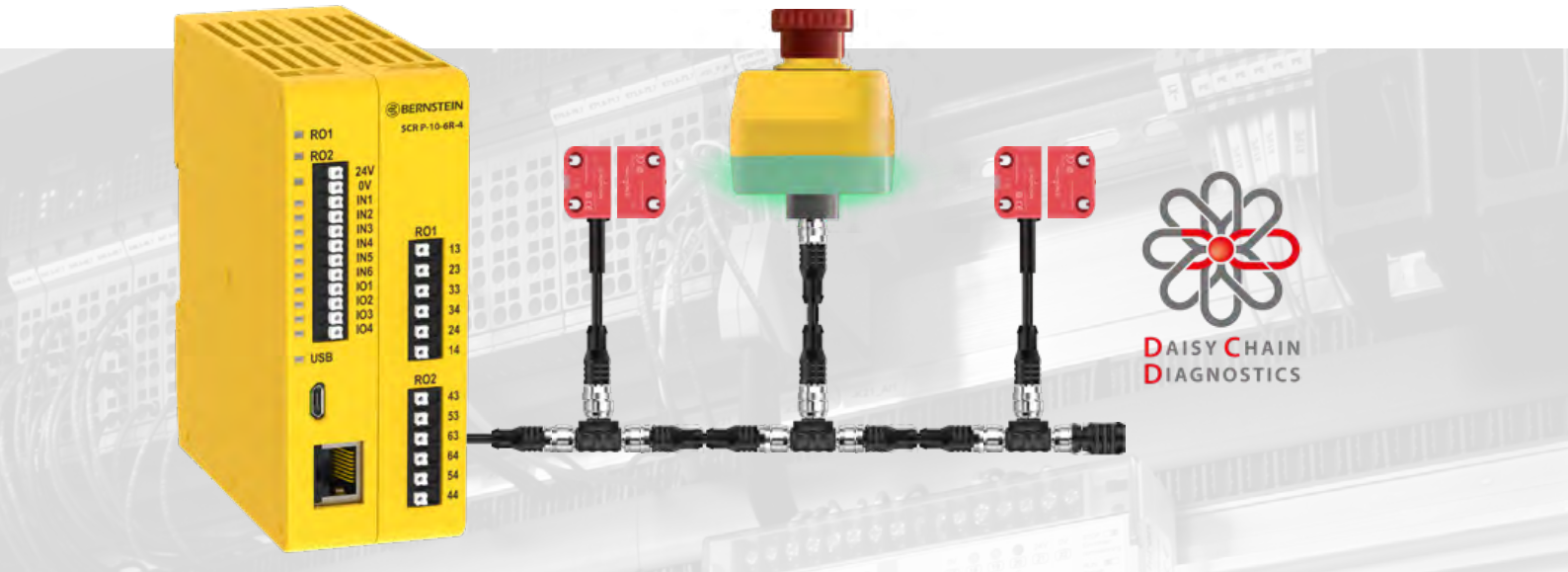


Various application possibilities



Order data SCR P

Picture	Designation	Article number	Description
	SCR P-10-6R-4	6075133159	Programmable safety controller



Technical Data

RO1 and RO2 enabling paths

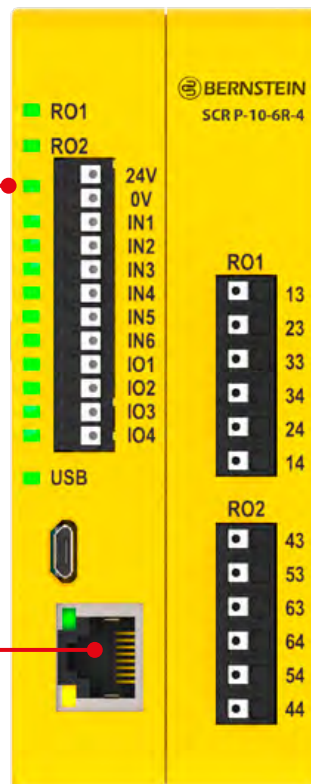
24 V DC Power

6 Safe Inputs

**4 Safe Inputs or
4 Non-Safe Outputs**

Micro-USB

Ethernet-Port



Relay Output 1 (RO1)

- 240 V AC/6 A
- 3 NO sets of contact

Relay Output 2 (RO2)

- 240 V AC/6 A
- 3 NO sets of contact



To the SCR P configuration software tutorials

Accessories on page 25

Safety Controller SCR DI with IO-Link

The safety relay (SCR DI) combines three devices in one: it is a safety controller for the OSSD outputs of the sensor chain (SRF and SEU), a diagnostic module and an IO-Link gateway. It can safely monitor a series connection consisting of SRF and / or SEU and provides the diagnostic data.


- Safety monitoring module for OSSD signals
- Simple and fast retrieval of diagnostic information via smartphone with NFC
- Time and cost savings during commissioning, maintenance and troubleshooting
- Transmission of DCD diagnostic data via IO-Link
- Three devices combined in one:
 - Diagnostic device
 - Safety controller
 - IO-Link device

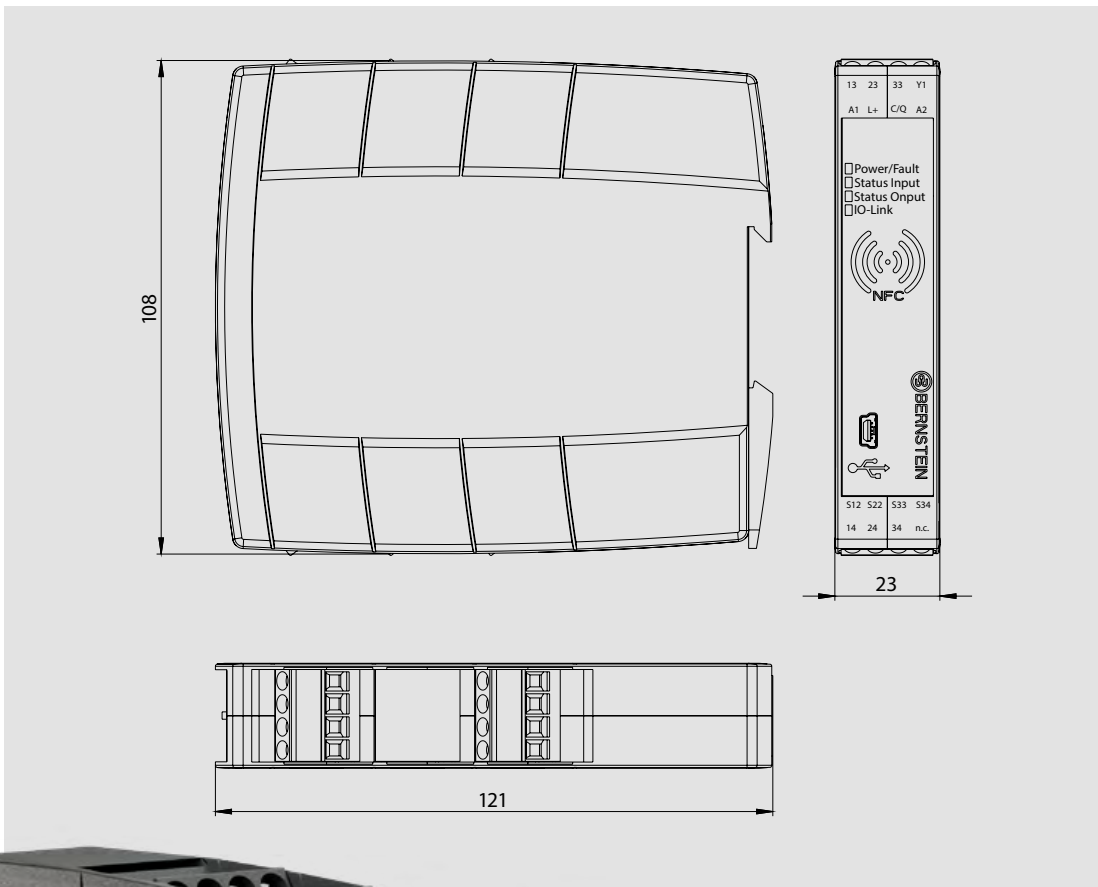


PRODUCT HIGHLIGHTS

- **Safety monitoring, diagnostics and IO-Link communication** in one device
- **Saves space** in the control cabinet thanks to slim design
- **Provides all relevant information** of each device in the chain and delivers available data
- **Permanent exchange** of all data
- **Three enabling paths**
- Category 4 / PL e according to EN ISO 13849-1

Order data SCR DI

Picture	Designation	Article number	Enabling paths	Signalling contact Feedback circuit	Digital outputs	Automatic/ manual reset	Interfaces		
							IO-link	NFC	USB 2.0
	SCR DI-1/0/3-T	6075113139	3	1	–	auto/button	x	–	–
	SCR DI-1/8/3-T	6075113140	3	1	8	auto/button	x	–	–
	SCR DI-1/0/1-T	6075113141	3	1	–	auto/button	x	x	x
	SCR DI-1/8/1-T	6075113147	3	1	8	auto/button	x	x	x
	SCR DI-2/8/1-T	6075113149	3	0	8	auto/button	x	x	x



Technical data

Product information

- Dimensions: 108×22.5×121 mm (W×H×D)
- IO-link protocol: V1.1
- For semiconductor outputs
BERNSTEIN SMART Safety System

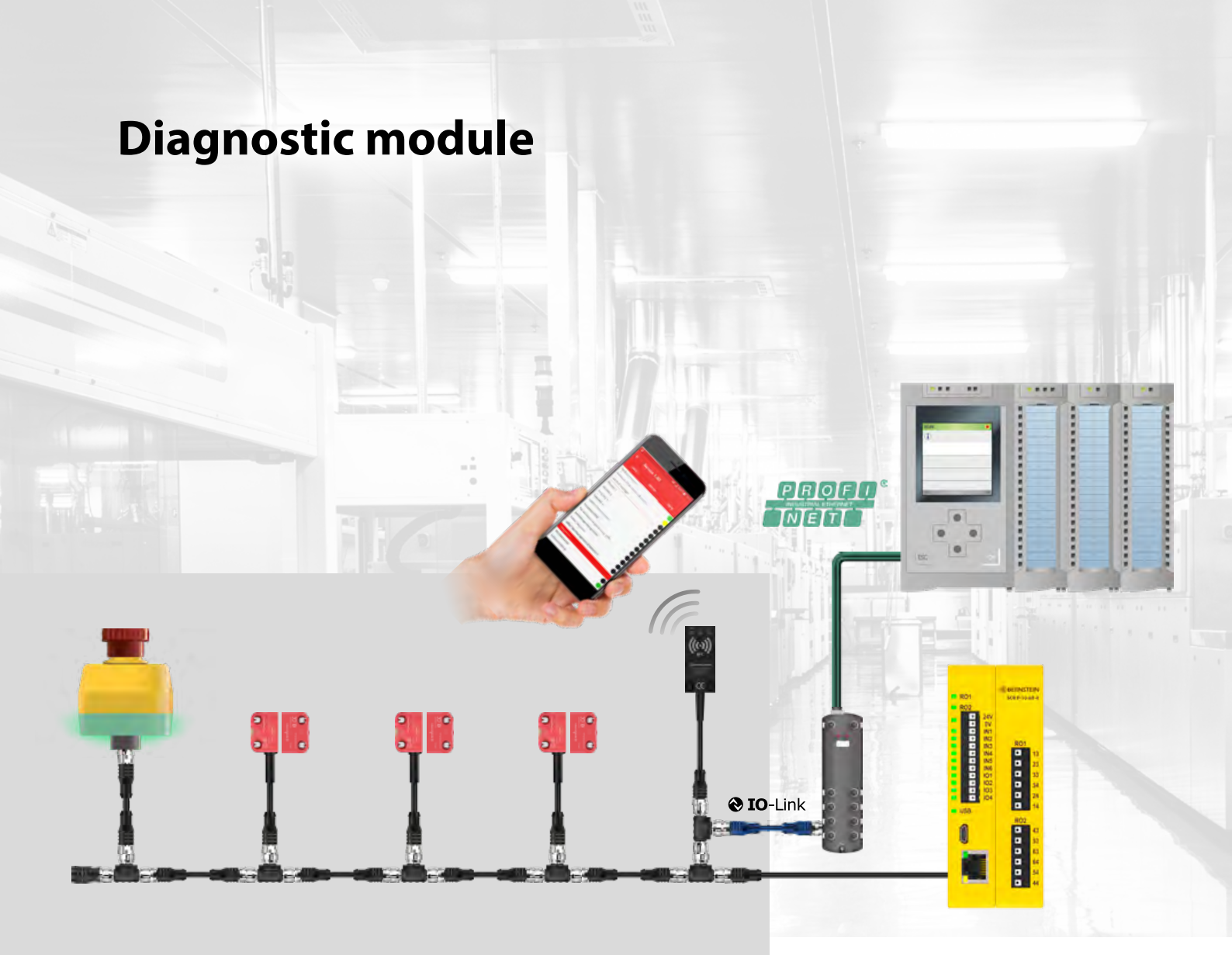
Electrical data

- Rated operational voltage U_e : 24 V DC
- Three enabling paths with up to 6A switching current per path



Mechanical data

- Enclosure material:
Glass fibre reinforced polyamide PA-GF
- Ambient temperature: 0°C to +60°C
- Protection class: IP20

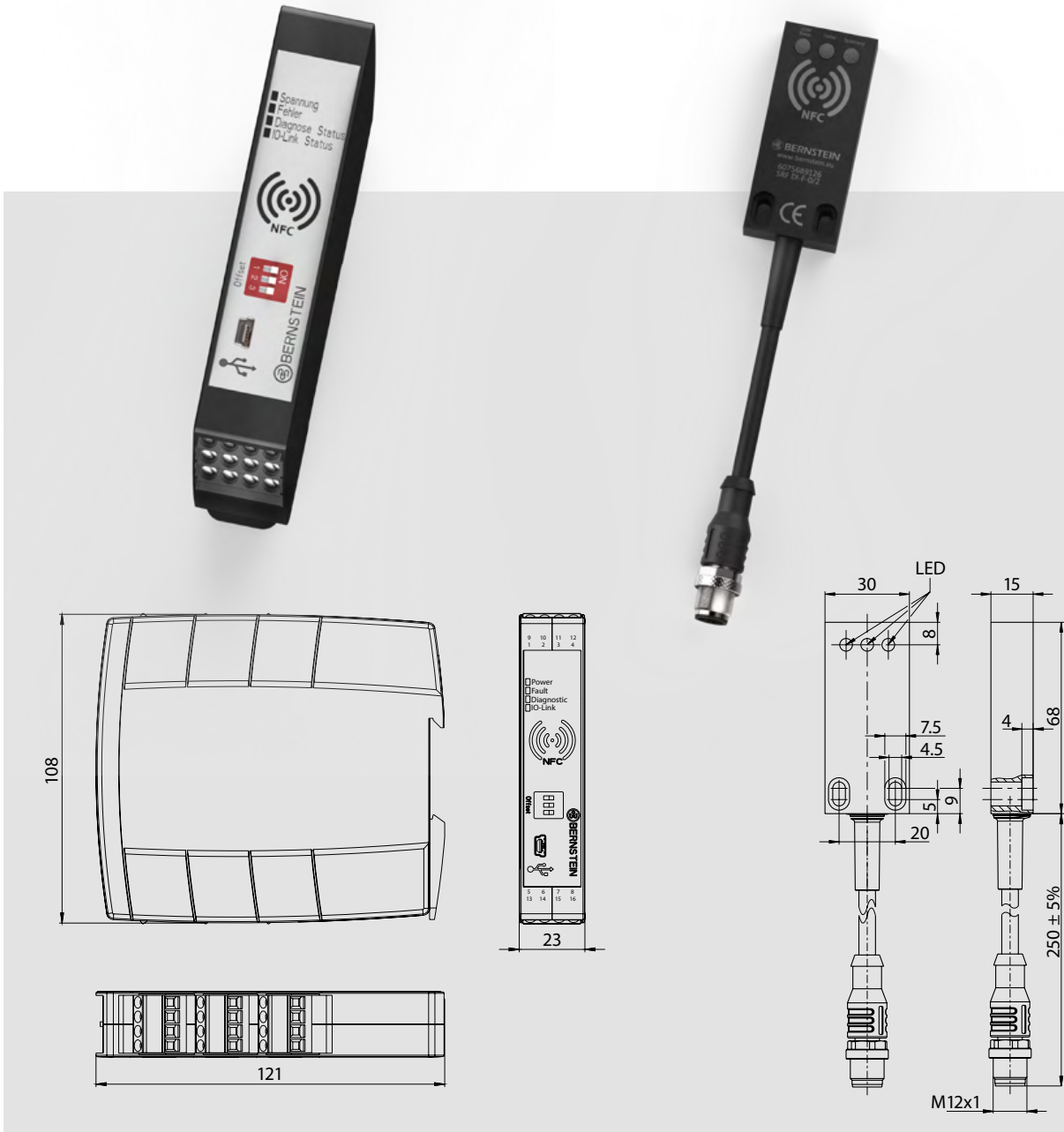
Diagnostic module



Order data diagnostic modules

Picture	Designation	Article number	Enclosures	Number of diagnostic circuits	Digital outputs	Interfaces		
						IO-link	NFC	USB 2.0
	SRF DI-C-0/1-T	6075619122	DIN rail housing 22.5 mm	1	–	x	x	x
	SRF DI-C-8/1-T	6075619123	DIN rail housing 22.5 mm	1	8	x	x	x
	SRF DI-C-16/1-T	6075619124	DIN rail housing 22.5 mm	1	16	x	x	x
	SRF DI6-C-0/1-T	6075619125	DIN rail housing 22.5 mm	6	–	x	x	x
	SRF DI-F-0/2-E0,25	6075689126	Rectangular sensor enclosure (Use directly on the machine)	1	–	x	x	

Technical data



Control cabinet module

- Rated operational voltage U_e : 24 V DC
- IO-Link protocol: V1.1
- Output current per signal output I_e : 50 mA
- Ambient temperature: 0 °C to +60 °C
- Protection class: IP20

Field module

- Rated operational voltage U_e : 24 V DC
- IO-Link protocol: V1.1
- Ambient temperature: -25 °C to +70 °C
- Protection class: IP69

Accessories



Connection cable and connecting cable

Pos. no.	Designation	Article number	Description	Plug alignment	Plug 1	Plug 2	Number of pins	Cable length [m]
1	S1W-M12A8/BW-1PU	6075689085	Connecting cable	straight	M	F	8	1
1	S1W-M12A8/BW-2PU	6075689086	Connecting cable	straight	M	F	8	2
2	S1W-M12C4/AW-2PU	6075689087	Connecting cable	straight	M	F	4	2
2	S1W-M12C4/AW-5PU	6075689088	Connecting cable	straight	M	F	4	5
2	S1W-M12C4/AW-10PU	6075689089	Connecting cable	straight	M	F	4	10
	SFW-M12A8/BW-2PU	6075689185	Connection cable (flying leads)	straight	F		8	2
	SFW-M12A8/BW-5PU	6075689186	Connection cable (flying leads)	straight	F		8	5
	SFW-M12A8/BW-10PU	6075689187	Connection cable (flying leads)	straight	F		8	10
3	SFW-M12B5/AW-2PU	6075689092	Connection cable (flying leads)	straight	F		5	2
3	SFW-M12B5/AW-5PU	6075689093	Connection cable (flying leads)	straight	F		5	5
3	SFW-M12B5/AW-10PU	6075689183	Connection cable (flying leads)	straight	F		5	10
3	SFW-M12B5/AW-20PU	6075689184	Connection cable (flying leads)	straight	F		5	20
3	SFW-M12C4/AW-0,5PU	6075689090	Connection cable (flying leads)	straight	F		4	0,5
3	SFW-M12C4/AW-2PU	6075689091	Connection cable (flying leads)	straight	F		4	2
3	SFW-M12C4/AW-10PU	6075689188	Connection cable (flying leads)	straight	F		4	10
3	SFW-M12C4/AW-20PU	6075689189	Connection cable (flying leads)	straight	F		4	20



T-adapter, termination plug and fixing screws

Pos.no.	Designation	Article number	Description
4	ATS-M12/4-M12/8	6075989082	T-adapter for series connection of sensors
5	ATD-M12/8-M12/4	6075989083	T-adapter for IO-Link connection and reset button
6	AEP-M12/4	6075689084	Termination plug M12
	AT-CLIP-M12	6075689127	Fixing clip for T-adapter
	One-way-screw M4 × 16	6075689128	10 × fixing screws M4 × 16 one-way-screw

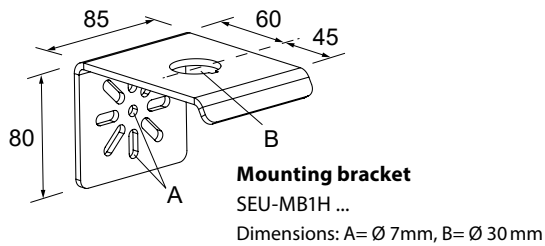
Accessories SEU

Mounting bracket and silicone protection cover



Picture	Designation	Article number	Description
	SEU-MB1H ¹	6075689178¹	E-Stop mounting bracket, metal, black
	SEU-MB1H-S ¹	6075689179¹	E-Stop mounting bracket, stainless steel
	SEU-WDC ¹	6075689182¹	Silicone Washdown Cover IP67/69 for SEU-4

1 Stock items: Items available for immediate delivery



Silicone protection cover
SEU-WDC



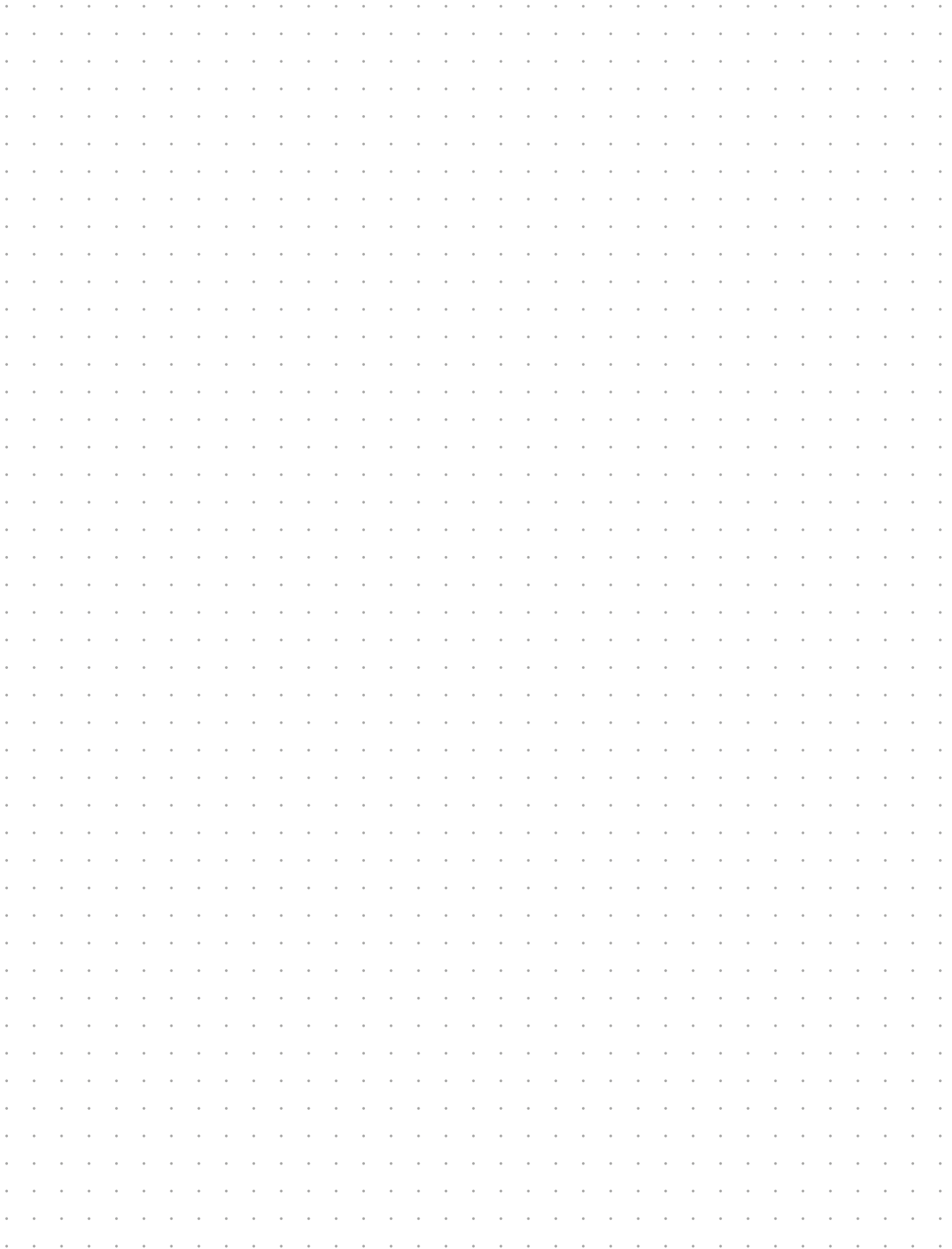
Accessories SCR P

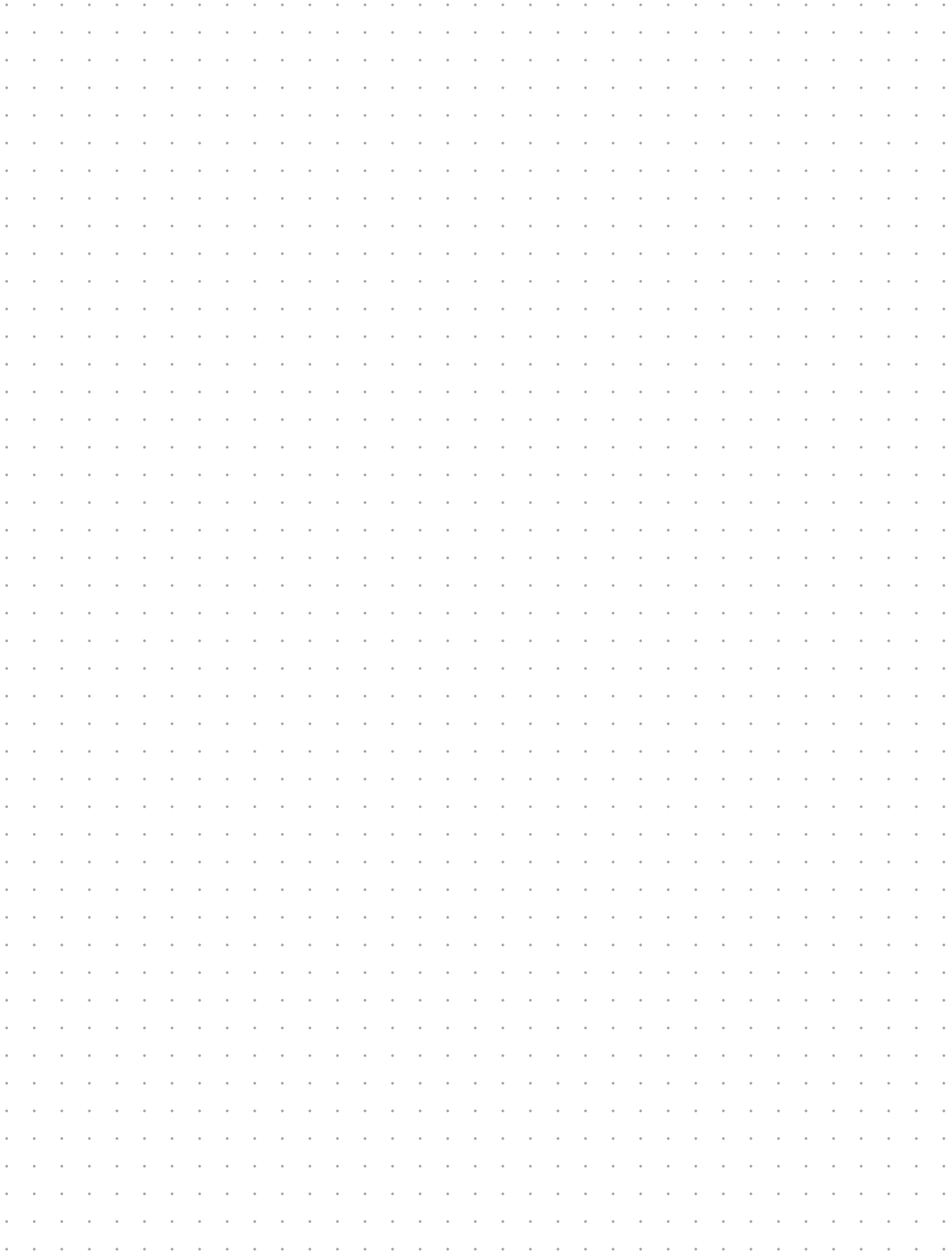
Picture	Designation	Article number	Description
	SCR P-PA	3991000250	USB programming adapter
	USB-cable A/ Micro-B	3991000251	USB cable
	SCR P-FPS	3991000252	Programming flash drive



Notes

Diagrams. Sketches. Ideas.







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