BERNSTEIN

AS-INTERFACE
SAFETY AT WORK

BERNSTEIN
AS-i Safety at Work Program

What is AS-i?

Overview of the BERNSTEIN AS-i safety components

Safety sensors		Safety switches with separate actuator				Safety hinge switch
RFID	Reed				+ Interlock	
CSMS	MAK's	ENK (VTU)	SK	SKT	SLK	SHS3

AS-Interface is the innovative solution for sensor and actuator wiring, regardless of whether standard or safety-relevant applications are concerned.

Modern systems must nowadays be inexpensive, flexible, service-friendly and able to detect faults. All these properties are incorporated in the AS-Interface right from the start.

The simplicity and safety in installation, operation and maintenance as well as the long-term potential for reducing costs speak for themselves.

Only one yellow, two-wire ribbon cable with reverse polarity protected profiling is laid to transmit the energy and data to up to 248 inputs and 248 outputs.

Suitable slaves can be plugged in any position according to the "plug & play" principle. The contact between the device connection and the cable is made by the so-called piercing technology.

Here, the contacts pierce the insulation through to the wire. The given geometry of the BUS adapter and the cable cross-section prevent installation errors.

The AS-Interface cannot and is not intended to replace the existing and proven bus systems. AS-Interface is a standalone solution **or** an extension of the existing system.

Linking to PROFIsafe, PROFIBUS, PROFINET, Ethernet, CAN, EtherCAT, DeviceNet, Interbus, RS-232 and CC-Link is possible without any problems by gateways. AS-Interface and every sensor/actuator connected to it then behave as slaves of the master bus system.

The high integration capability into other networks simplifies the modular set-up of automation networks.

Owing to the many providers of components of this non-proprietary system, almost every type of sensor and actuator is available with AS-i interface.

This enables AS-i systems to be established in all conceivable branches, from automation technology and process technology, ship building and commercial vehicles to building technology.

AS-Interface is standardised in accordance with EN 50295 and IEC 62026-2.

In addition to the advantages already mentioned, safety systems up to PL e/SIL 3 can also be implemented with AS-i as described on the following pages.

Safety at Work, the Safety Bus

Safety functions up to PL e according to EN 13849 and SIL 3 according to 62061 can be implemented with AS-Interface Safety at Work.

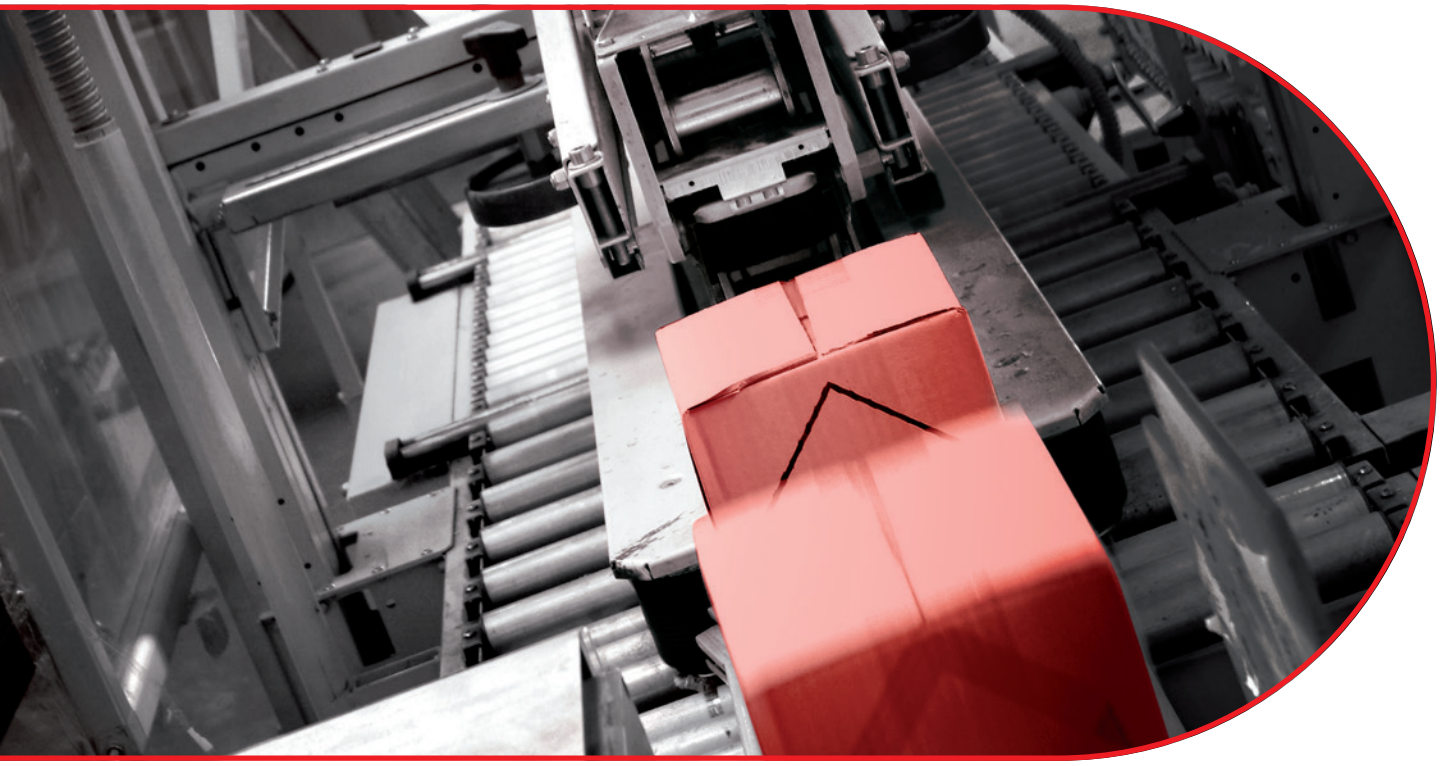
The safety-relevant data is transmitted on a two-wire ribbon cable and therefore minimises the wiring effort.

This along with the simplicity in planning, installation and maintenance is one of the main reasons why AS-i Safety at Work is the most frequently used safety bus.

For a Safety at Work system you only require the safety-oriented slaves, a master and a safety monitor. The latter dynamically monitors the safe users and switches off the safety path in the event of an error or at the prompting of a safety function.

The safety application is created with the Windows program "ASIMON" and then loaded into the safety monitor. Changes and extensions to the safety application can be made by a software adaptation combined with the piercing connection technology in a few seconds, even in a safety application program.

There are two possible system structures for setting up an AS-i Safety at Work system. (see page 6/7).



With ASIMON the safety application is created quickly and easily on the PC by drag & drop

System Structure 1:
Safety Gateway in Stainless Steel

For large and medium safety applications

The standard master safety monitor combinations with the AS-i power supply unit are used for large and medium safety applications.

Up to **62 safety-relevant users** (31 per circuit, two circuits contained in the safety monitor) such as emergency stop, door and hood monitors, holds, light grids, two-hand operation and, of course, also safe outputs can be integrated into such systems and linked with ASIMON.

Status information or, in the case of a PROFIsafe interface, the safety-relevant information of the safety slaves can be transmitted directly to a suitable controller with the gateway of the master.

General features

- 2 safety relay outputs, 2 safety semiconductors
- 4 EDM input
- Profibus field bus interface
- 2 AS-i circuits
- Diagnostic and adjustments facilities via display
- Diagnostic and configuration interface
- Robust stainless steel enclosure
- 16 enable circuits

Comparison of Safety Tech

AS-i Safety previously only paid off when used in systems with a greater safety requirement.

Costs	Safety	Big * / ** 20 safety signals	Average ** 10 safety signals
Equipment costs	Conventionally	60 %	67 %
	AS-i Safety	53 %	78 %
	F-SPS	65 %	75 %
Labour costs (50 €/h)	Conventionally	40 %	33 %
	AS-i Safety	3 %	6 %
	F-SPS	27 %	25 %
Result	Conventionally	100 %	100 %
	AS-i Safety	**56 %**	**84 %**
	F-SPS	92 %	100 %

* F-SPS in combination with PROFIsafe
** AS-i with gateway and integrated safety monitor

Conclusion: AS-i Safety already

System Structure 2: Safety Basis Monitor

For the smallest safety applications

The Safety Basis Monitor is used for the smallest safety applications with only a few safety-relevant users. This device not only unites master and monitor in one housing with a width of just 22.5 mm but also needs only one standard 24 Volt power supply unit for applications with a current consump-tion of less than 0.5 Ampere. It also has safe outputs and safe and standard inputs on board.

Because of the consistent design on compact machines, it is also of economic interest to implement the smallest safety applications with AS-i Safety at Work with this safety monitor. An AS-Interface Safety at Work system also reduces the number of I/Os on a controller in addition to reducing the wiring effort and completes a large part of the documentation automatically and incidentally with ASIMON.

nology System Costs

Compared to conventional wiring AS-i Safety even pays off in small funtion blocks with four safe signals for example.

Costs	Safety	**Small** *** 4 safety signals
Equipment costs	Conventionally	77 %
	AS-i Safety	86 %
	F-SPS	121 %
Labour costs (50 €/h)	Conventionally	23 %
	AS-i Safety	9 %
	F-SPS	19 %
Result	Conventionally	100 %
	AS-i Safety	**95 %**
	F-SPS	140 %

*** AS-i with Safety Basis Monitor

pays off in small machines!

General features

- 2 safety semiconductors
- 4 safety inputs or optionally 8 standard inputs + 8 standard outputs
- Diagnostic facilities via LEDs
- IP 20 plastic enclosure
- 8 enable circuits
- AS-i Power24 capacity

System Benefits

The use of the AS-i Bus considerably reduces the planning and documentation effort because only minimum circuit digrams have to be drawn.
In addition to the drastic reduction in the installation time in comparison with standard wiring, numerous components such as safety relays, terminal boxes and thus their processing as well as integrated screw connections and terminals and PLC I/Os plus an enormous quantity of cables are saved. This leads in turn to a reduction in the amount of space required in the control cabinet, cable ducts and machines.

The systems can be commissioned fast thanks to the simple and reliable connection technology.
If changes have to be made sooner or later, this is no problem as long as the maximum number of slaves has not been reached.

Just connect the necessary slave to the cable and transfer it to the configuration by laptop or directly on the master. Finished.

Since it is only a two-wire cable, the AS-i system can be adapted optimally to a modular machine. This can be done by connecting two wires to a complete system or by separate sub-systems which are networked by a master bus system (e. g. PROFIBUS).

System data can also be read out of the slaves or changed by connecting with a master bus system. This enables remote maintenance to the smallest element of an automation safety system.

This also enables prevention of unwanted machine failures. If this does happen, the excellent diagnostic properties show the error directly on the monitor.

These properties of the AS-i ultimately lead to substantial advantages for the machine user.
The commissioning and maintenance costs as well as machine downtimes are considerably reduced. And if the system needs to be extended or modified after a time, the existing system can be disassembled quickly.

General Information about BERNSTEIN AS-i Products

- The safety switches Ti2, I88, Bi2 and ENK can be fitted with all actuators for the respective product series on request
- The mechanical switches are always equipped with 2 positive break contacts ⊖ as a slow action element
- Jump switch systems are available on request
- Metal switches of the ENM2, GC and SN2 series and D switches can be equipped with AS-Interface on request

General technical data

- Voltage range: 26,6 V to 31,6 V
- AS interface specification: Profile S-0.B
  - IO-Code: 0 x 0
  - ID-Code: 0 x B
  - ID-Code 1: 0 x F
  - ID-Code 2: 0 x E
- Plug assignment

	Without Aux	Including Aux
- Pin 1	AS-i +	AS-i +
- Pin 2	Frei	Aux –
- Pin 3	AS-i –	AS-i –
- Pin 4	Frei	Aux +

- AS-i address: Preset address 0

Direct Connection Technology

The direct connection allows the switch to be connected directly to the two-pole AS-Interface cable. This saves the coupling module and the M12 connection cable.

The direct connection technology is recognisable by a "D" at the end of the article designation.
Switches of the type 1 and 2, such as Ti2, I88, SK, SKT etc. are available with the direct connection technology.

Safety figures

	PL according to EN 13849 / SIL according to EN 62061 up to	Cat.	B10d Action
Ti2	c*	1	6 Mio
I88, Bi2, ENK	c*	1	20 Mio
SKT, SK, ENK VTU	c*	1	2 Mio
SLK	c*	1	2 Mio
SHS3	c*	1	2 Mio
SRM	c / e**	1 / 4**	0,2 Mio
MAK 42, MAK 52, MAK 53	e	4	20 Mio
CSMS Reed	e	4	20 Mio
Emergency stopping	e	4	0,1 Mio
F1	c	1	20 Mio
F1 ZS	c	1	0,1 Mio
CSMS	e/3	4	
Safety Basis Monitor	e/3	4	
Safety monitor	e/3	4	

* By fault exclusion according to EN 13849-1 and EN 13849-2, PL d can be achieved. By using 2 safety switches and mutual monitoring, Cat. 4, PL e can be achieved.
** By maximum actuation of 6050 cycles over the total product life.

Application Example

E.C.H. Will, Hamburg

E.C.H. Will is a leading provider of machines for paper producing and processing companies and small format cutters, format cutting systems and processing lines for manufacturing school excercise books.

Use of CSMS to monitor safety doors of a format cutting machine.

The machines run at a very high process speed. The doors need to be opened frequently for maintenance or to clear paper jams.

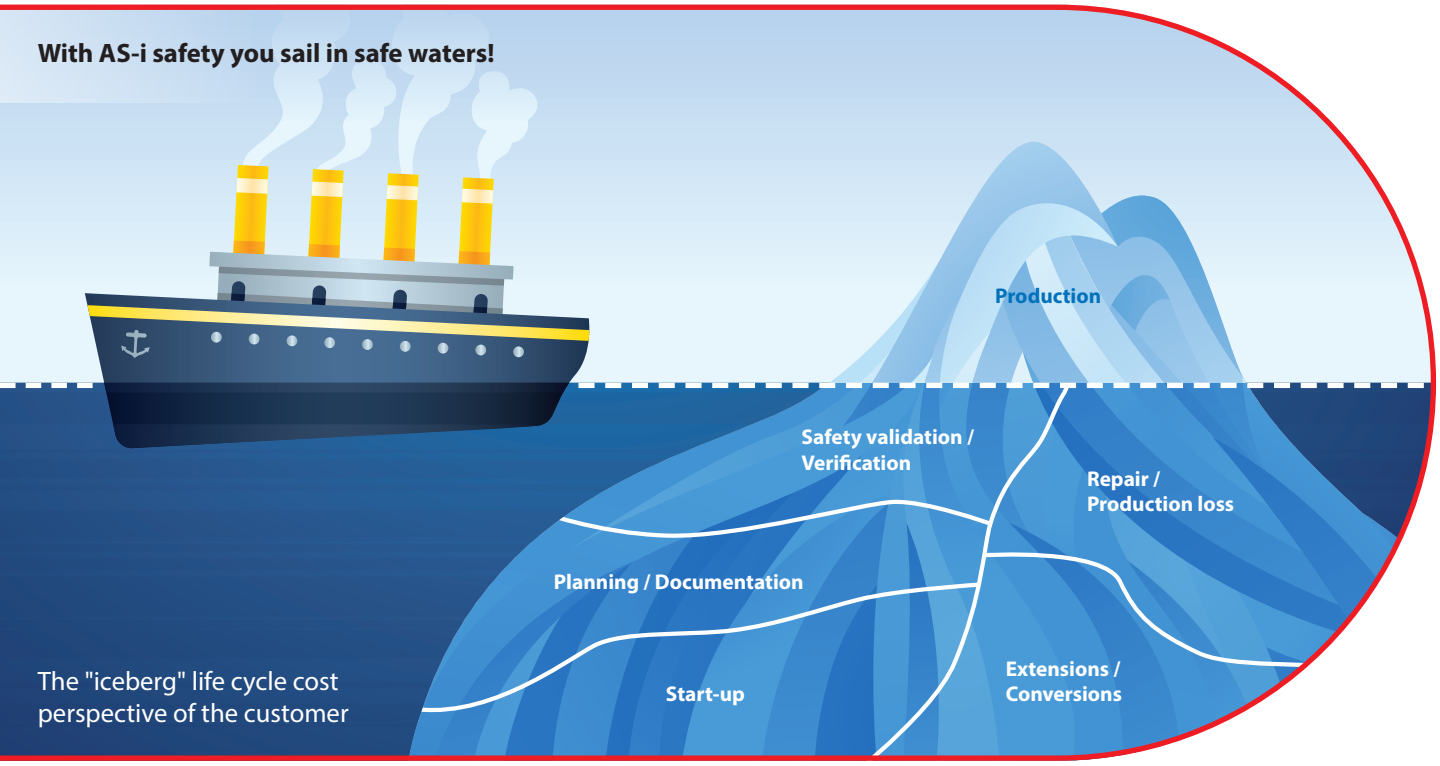
A non-contact system is the ideal solution because wear is not a problem. Before our CSMS systems were used, various products were installed, none of which supplied reliable switching signals in the long term.

"There were frequent error messages on the bus," the site technical manager says. "Standstills are downtimes and are to be avoided at all cost."

The compact design which has the system disappear invisibly behind the door profiles is just one of the advantages which convinced the customer, in addition to the reliable application for all safety doors.

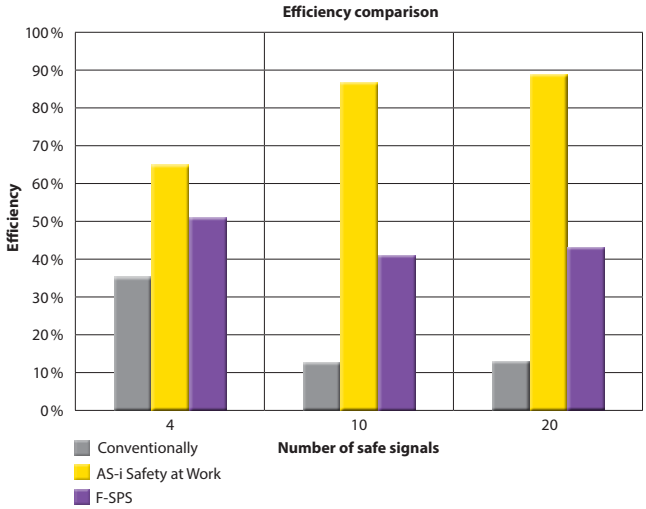
Safety technology with AS-i Safety at Work gains efficiency via benchmarking

Strive for an acceptable balance of costs versus benefits over the complete machine life cycle.
Take the opportunity to gain a competitive advantage through the technological values of modern safety technology!



The "iceberg" life cycle cost perspective of the customer

A recent study[1] indicated:
If AS-Interface Safety at Work is used, this safety technology is the most cost effective choice over the complete machine life cycle!



Change today to a modern flexible and effective system for your specific safety needs. We can help you to optimize your machines and installations when using AS-Interface Safety at Work products from BERNSTEIN.

If you want to experience the efficient features of AS-i Safety at Work in your machines and installations, then simply talk to us!

[1] Master thesis on the topic of "Erarbeitung eines Bewertungsmodells für Anlagen mit einer AS-i Sicherheitskette" at the Ostwestfalen-Lippe University.

AS-i Slaves

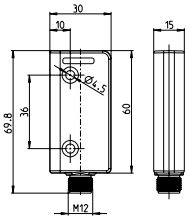
Contactless Safety Sensors

Transponder technology

CSMS
Contactless Safety
Monitoring Sensor

6073200060 AS-i CSMS-M-ST
6073200061 AS-i CSMS-S
6073200062 AS-i CSMS-SET

- Safety slave
- Dynamically coded signal transmission
- Tamperproof operation
- Switching status and function reserve indicator
- AS-i status display
- Can be conspicuously mounted
- Suitable for harsh environments
- Non-contact operation gives superior life expectancy
- M12 connector
- Switching distance 13 mm

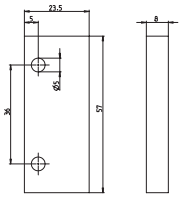


Spacer
(CSMS Accessories)

6073900070
CSMS Spacer 8 mm

6073900090
CSMS Spacer ITEM 8 mm

- Spacer 8 mm
- Material: Plexiglas GS colourless
- For installing the CSMS on metal bases

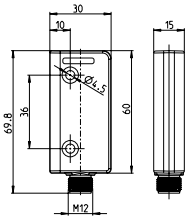


Magnetic technology

CSMS Reed

6073200071 AS-i CSMS-R-M-ST
6073200072 AS-i CSMS-R-S
6073200077 AS-i CSMS-R-SET

- Safety slave
- Coded actuator
- Switching status indicator
- AS-i status display
- Suitable for concealed installation
- Suitable for harsh environments
- Non-contact operation gives superior life expectancy
- M12 connector

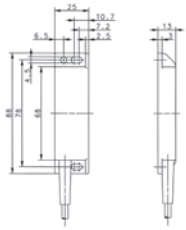


MAK 42

Sensor
6073200067 AS-i MAK 42

Actuator
6402042053 TK-42-CD/2

- Safety slave
- Coded actuator (magnetic)
- Switching status indicator
- AS-i status display
- Suitable for concealed installation
- Suitable for harsh environments
- Non-contact operation gives superior life expectancy

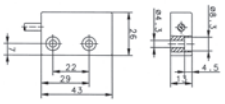


MAK 52

Sensor
6073200068 AS-i MAK 52

Actuator
6402052307 TK-52-CD/2

- Safety slave
- Coded actuator (magnetic)
- Switching status indicator
- AS-i status display
- Suitable for concealed installation
- Suitable for harsh environments
- Non-contact operation gives superior life expectancy

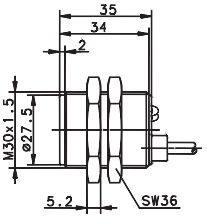


MAK 53

Sensor
6073200091 AS-i MAK 53
6073200092 AS-i MAK 53 ST

Actuator
6402043064 TK-43-CD/2 (plastic)
6408043065 TN-43-CD/2 (stainless steel)

- Safety slave
- Coded actuator (magnetic)
- Switching status indicator
- AS-i status display
- Suitable for concealed installation
- Suitable for harsh environments
- Non-contact operation gives superior life expectancy



AS-i Slaves

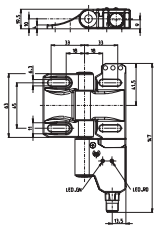
Safety Hinge Switch

SHS3

Stainless steel hinge:
6073200011 AS-i SHS3 SA R
6073200013 AS-i SHS3 SR R

Die-cast zinc hinge:
6073200081 AS-i SHS3Z SA R
6073200082 AS-i SHS3Z SR R

- Safety slave
- Hinge Switch
- AS-i status display
- Switching point freely adjustable by user over a range of 270°
- Fine adjustment +/- 1,5°
- Freely and repeatedly adjustable switching point
- Stainless steel or die-cast zinc hinge



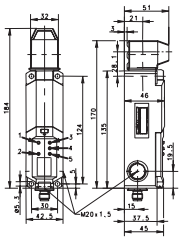
Safety interlock

SLK

Locking principle spring force:
6073200058 AS-i SLK-F-R1-A0-0

Locking principle magnetic force:
6073200057 AS-i SLK-M-R0-A0-0

- Safety slave
- Interlock switch for safety doors and protective hoods
- Spring force (closed-circuit current) type F and magnetic force (working current) type M
- Status display for the actuating and interlock position
- The status LEDs could alternatively be switched by the control system
- AS-i status display
- Feed-in of the interlock by external power supply system

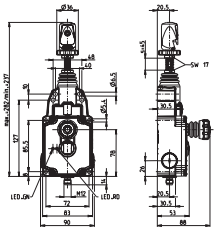


Safety Rope Pull Switch

SRM

6073200009 AS-i SRM-LU-175
6073200010 AS-i SRM-LU-300
6073200007 AS-i SRM-QF-175
6073200008 AS-i SRM-QF-300

- Safety slave
- Rope-pull switch in metal housing
- AS-i status display
- Tensioned length up to 75 meters (version 300) (37,5 meters version 175)
- Quick-Fix quick action clamping head QF available

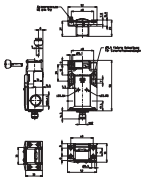


Safety switch with separate actuator

SK

6073205050 AS-i SK F30 M
6073205028 AS-i SK M
6073205039 AS-i SK M D

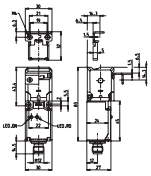
- Safety slave
- Safety switch with separate actuator
- AS-i status display
- Plastic housing
- Variable actuator with two actuator openings



SKT

6073200006 AS-i SKT
6073200029 AS-i SKT D

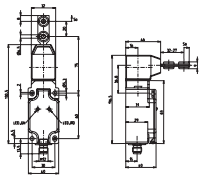
- Safety slave
- Safety switch with separate actuator
- Slim and short switch design
- AS-i status display
- Plastic housing
- Rotary head in 90° steps
- 2 actuating entries



ENK VTU

6073504025 AS-i ENK VTU
6073504038 AS-i ENK VTU D

- Safety slave
- Safety switch with separate actuator
- Especially robust switch design
- AS-i status display
- Plastic housing
- Rotary head in 90° steps



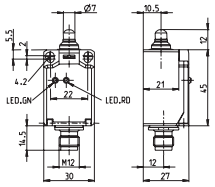
AS-i Slaves

Position safety switches

Ti2

6073403020 AS-i Ti2 Hw
6073403035 AS-i Ti2 Hw D
6073402019 AS-i Ti2 Riw
6073402034 AS-i Ti2 Riw D
6073401018 AS-i Ti2 w
6073401033 AS-i Ti2 w D

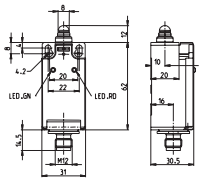
- Safety slave
- Smallest switch with integrated AS-i Safety at Work interface
- AS-i status display
- Actuator of the standard program available
- Plastic housing
- Fixing measures according to DIN EN 50047



I88

6073303017 AS-i I88 Hw
6073303032 AS-i I88 Hw D
6073302016 AS-i I88 RiwK
6073302031 AS-i I88 RiwK D
6073301015 AS-i I88 w
6073301030 AS-i I88 w D

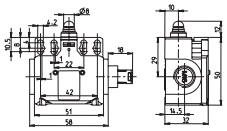
- Safety slave
- Switch design according to industry standard DIN EN 50047
- AS-i status display
- Actuator of the standard program available
- Plastic housing



Bi2

6073201052 AS-i Bi2 w
6073201051 AS-i Bi2 w D

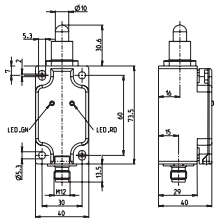
- Safety slave
- Side-positionned M12 connection
- AS-i status display
- Actuator of the standard program available
- Plastic housing



ENK

6073501023 AS-i ENK iw
6073501036 AS-i ENK iw D
6073502024 AS-i ENK Riw
6073502037 AS-i ENK Riw D
6073504025 AS-i ENK VTU
6073504038 AS-i ENK VTU D

- Safety slave
- AS-i status display
- Actuator of the standard program available
- Especially robust switch design
- Fixing measures according to DIN EN 50041

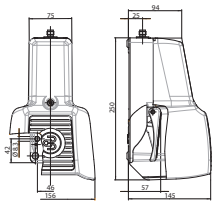


Foot switches

F1

6073700076 AS-i F1 UN

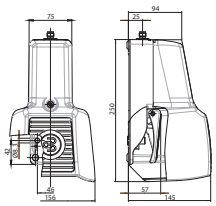
- Safety slave
- Protective shroud UN
- M12 connection
- Other types on request



F1 (enabling function)

6073700085 F1-ASI-ZSD UN
6073700086 F1-ASI-ZSDR UN

- Safety slave
- Enabling function
- Pressure point D
- Latching R (optional)
- Protective shroud UN
- M12 connection
- Other types on request



AS-i Slaves

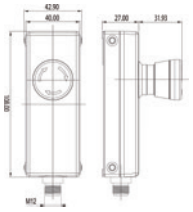
Emergency stop switches and control elements

Emergency stop buttons, illuminated pushbuttons and indicator lamps are available in the new, elegant housing. The housing **is specially designed for 40 mm profile rails** and features a special assembly concept. It can also be used outside the profile rails of course. Start, enable and request buttons can also be connected decentrally to the AS-i system with the control elements. The status of the process can be displayed by the illuminated pushbuttons. With these AS-i solutions, the necessary functions can be placed exactly where they are needed.

Emergency stopping

6073100074
AS-i EMERGENCY
STOPPING BUTTON

- Emergency stopping button with integrated safety AS-i slave
- With 30 mm emergency stopping button
- Reset via right hand rotation
- 2 coloured status display of emergency stopping button
- M12 connector

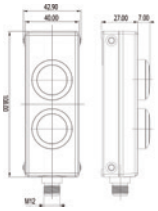


Press button / Signal lamp

Control element

6073100075
AS-i CONTROL ELEMENT

- Illuminated push button with AS-i interface slave
- 2 x 22 mm illuminated push button
- M12 connector
- 2 coloured status display per button (programmable via AS-i)



E/A module

Turning-on box

6073100027
AS-i TURNING-ON-BOX 4 IN

- AS-i Slave
- 4 digital input PNP
- Status display of inputs via LED
- AS-i status display
- Via ASI cable connectable
- Connectors M12

Master / Safety Monitor / Power Supply Unit

Safety basis monitor

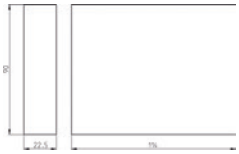
This safety monitor is intended for the smallest AS-i safety systems. With this safety monitor, the smallest safety applications can be implemented with AS-i, something which was previously unthinkable for cost reasons. The programming of the safety application is done quickly and simply with the Windows program ASIMON as is usual in AS-i Safety at Work.

Basis monitor

6073100073
AS-i BASIS MONITOR

6073100084
AS-i BASIS MONITOR
enhanced functions

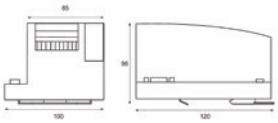
- Integrated master
- A special power supply unit AS-i is not necessary (up to 0,5 ampere)
- Integrated safety outputs
- Integrated safety inputs
- Integrated standard inputs
- Only 22,5 mm installation width



Safety monitor

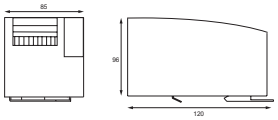
6073100089
AS-i MST PROFIBUS SMON

- 2 safety relay outputs, 2 safety semiconductors
- 4 EDM input
- PROFIBUS field bus interface
- 2 AS-i circuits
- Diagnostic and adjustments facilities via display
- Diagnostic and configuration interface
- Robust stainless steel enclosure
- 16 enable circuits
- Other types on request



6073100004
AS-i SMON B+W

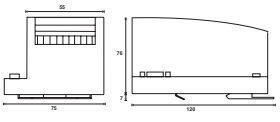
- Safety monitor for 2 AS-i circuits
- 16 enable circuits
- 2 x two channel relay enable circuits in the device
- 2x EDM and 2 x start input in the device
- Display for addresses and exact fault location
- Configuration storable on chip card



Gateway with integrated master

6073100001
AS-i MST PROFIBUS

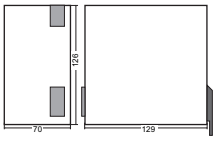
- AS-i master with PROFIBUS slave
- AS-i master integrated
- Double address recognition
- Earth fault monitor integrated
- Display for ASI slaves addresses and exact fault location
- LEDs for status display
- Simple use with only 4 integrated buttons
- Gateways for PROFIBUS, PROFINET, Ethernet, EtherCAT, CANopen, DeviceNet, Modbus, CC-Link, RS-232, Master for Allen-Bradley ControlLogix available



Power supply

6073100003
AS-i NT 4A B+W

- 90 V AC up to 265 V AC multi voltage power supply unit
- 4 A primarily clocked power supply unit
- LED operating mode display
- AS-i data decoupling
- SELV



Software + USB cable

6073800021
AS-i PROG SOFTWARE

- ASIMON for programming the safety monitor
- AS-i Control Tool for addressing, diagnostic and testing of the AS-i bus syste

6073100078
USB CA. F. AS-i BASIS MONITOR

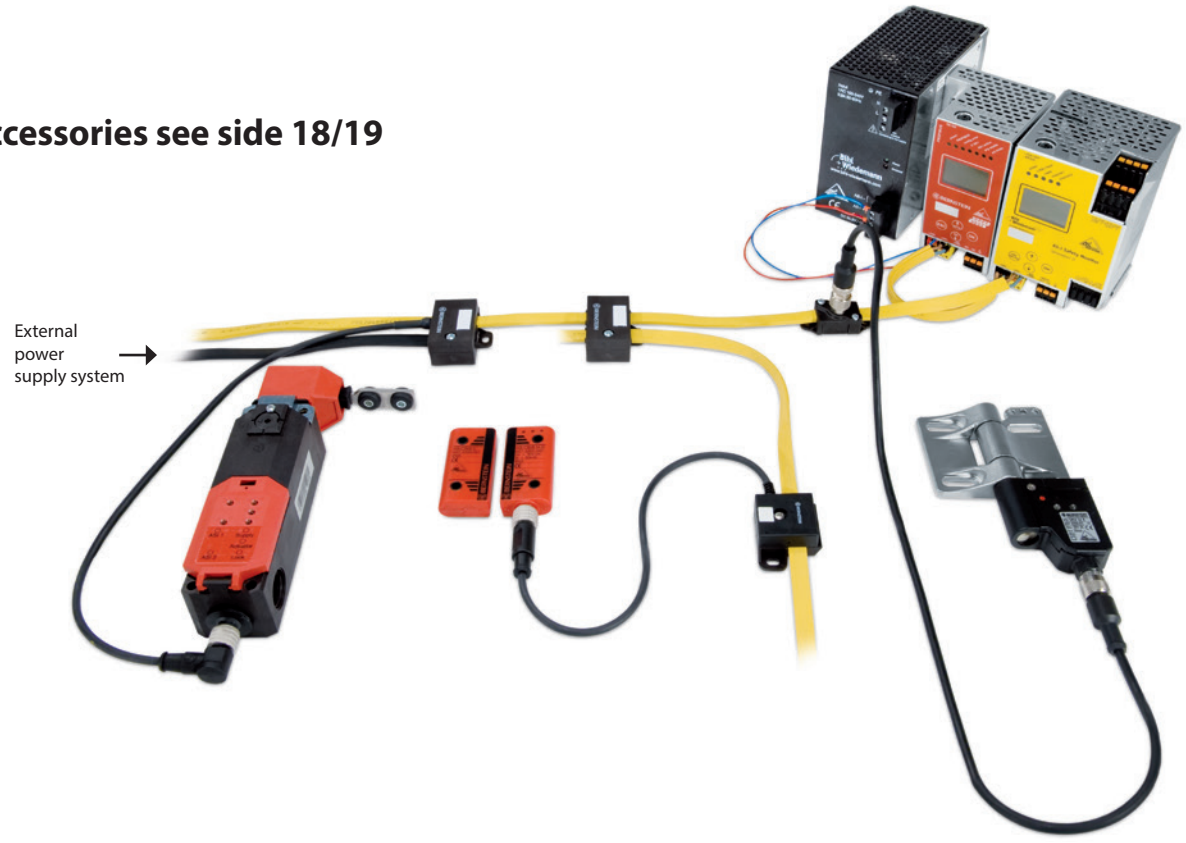
- USB cable for connecting the basis monitor to the computer

Hand-held programming device

6073100005
AS-i HND PRG

- Addressing / Programming up to 62 slaves max.
- Display of all existing slaves in the bus system
- Reading and writing of slave datas
- LCD Display
- Rechargeable battery integrated
- Charging device is included in delivery

Accessories see side 18/19

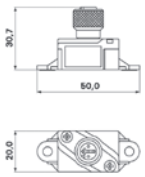


Accessories

Connecting module 3

6073900042
AS-i CONNECTING MODULE
M12 SCREW

- For connecting AS-i devices on AS-i profile cable with M12 connecting line
- Codification of the M12 connector turnable over a range of 90°



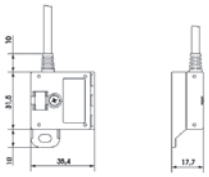
Connecting module 4

6073900043
AS-i CONNECTING MODULE 1M M12G

- For connecting AS-i devices on AS-i profile cable with an integrated, 1 meter long, ready-made connecting line and M12 straight connecting box

6073900087
AS-i CONNECTION MODULE 0,3M
M12G

- For connecting AS-i devices on AS-i profile cable with an integrated, 0,3 meters long, ready-made connecting line and M12 straight connecting box



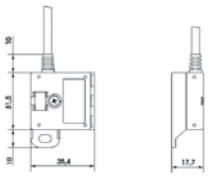
Connecting module

6073900044
AS-i CONNECTING MODULE 2M M12W

- For connecting AS-i devices on AS-i profile cable with an integrated, 2 meters long, ready-made connecting line and M12 angled connecting box

6073900088
AS-i CONNECTION MODULE 1M M12W

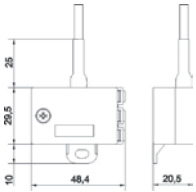
- For connecting AS-i devices on AS-i profile cable with an integrated, 1 meter long, ready-made connecting line and M12 angled connecting box



Connecting module + double 1

6073900045
AS-i DOUBLE CONNECTING MODULE
2M M12G

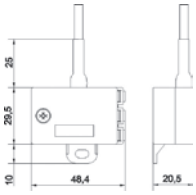
- For connecting AS-i devices on AS-i profile cable with an integrated, 2 meters long, ready-made connecting line and M12 straight connecting box



Connecting module + double

6073900046
AS-i DOUBLE CONNECTING MODULE
2M M12W

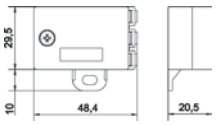
- For connecting AS-i devices on AS-i profile cable with an integrated, 2 meters long, ready-made connecting line and M12 angled connecting box



Cable bridge 2

6073900047
AS-i CABLE BRIDGE

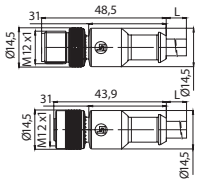
- Branch for AS-i profile cable
- The connection under the cables is effected when opening the cover



Connecting cable 5

6073900048
AS-i CONNECTING C.M12 1M G/G

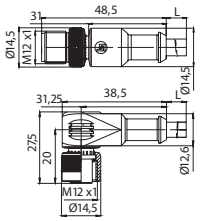
- Connecting cable for the connection of the ASi Slave and the connecting module
- Double-sided ready-made straight M12 connecting units (connector/socket)



Connecting cable

6073900049
AS-i CONNECTING C.M12 1M G/W

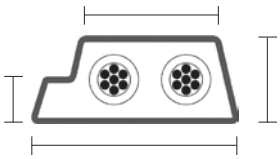
- Connecting cable for the connection of the ASi Slave and the connecting module
- Double-sided ready-made M12 connecting units, straight connector/angled socket



Yellow cable EPDM

6073900040
AS-i KABEL EPDM YELLOW

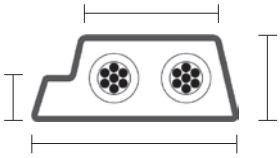
- Yellow AS-i profile cable EPDM



Black cable EPDM

6073900041
AS-i KABEL EPDM BLACK

- Black AS-i profile cable EPDM



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Contact

International Headquarters
BERNSTEIN AG
Hans-Bernstein-Str. 1
D-32457 Porta Westfalica
Phone +49 571 793-0
Fax +49 571 793-555
info@de.bernstein.eu
www.bernstein.eu

Denmark
BERNSTEIN A/S
Phone +45 7020 0522
Fax +45 7020 0177
info@dk.bernstein.eu

France
BERNSTEIN S.A.R.L.
Phone +33 1 64 66 32 50
Fax +33 1 64 66 10 02
info@fr.bernstein.eu

Italy
BERNSTEIN S.r.l.
Phone +39 035 4549037
Fax +39 035 4549647
info@it.bernstein.eu

United Kingdom
BERNSTEIN Ltd
Phone +44 1922 744999
Fax +44 1922 457555
info@uk.bernstein.eu

Austria
BERNSTEIN GmbH
Phone +43 2256 62070-0
Fax +43 2256 62618
info@at.bernstein.eu

Switzerland
BERNSTEIN (Schweiz) AG
Phone +41 44 775 71-71
Fax +41 44 775 71-72
info@ch.bernstein.eu

Hungary
BERNSTEIN Kft.
Phone +36 1 4342295
Fax +36 1 4342299
info@hu.bernstein.eu

China
BERNSTEIN Safe Solutions
(Taicang) Co., Ltd.
Phone +86 512 81608180
Fax +86 512 81608181
info@bernstein-safesolutions.cn