SCHMERSAL

EN Operating instructions. . . . . .pages 1 to 6
Original

Content

1. About this document

1.1 Function

This operating instructions manual provides all the information you need for the mounting, set-up and commissioning to ensure the safe operation and disassembly of the safety switchgear. the operating instructions must be available in a legible condition and a complete version in the vicinity of the device.

1.2 Target group: authorised qualified personnel

All operations described in this operating instructions manual must be carried out by trained specialist personnel, authorised by the plant operator only.

Please make sure that you have read and understood these operating instructions and that you know all applicable legislations regarding occupational safety and accident prevention prior to installation and putting the component into operation.

The machine builder must carefully select the harmonised standards to be complied with as well as other technical specifications for the selection, mounting and integration of the components.

1.3 Explanation of the symbols used

Information, hint, note:
This symbol is used for identifying useful additional information.

Caution: Failure to comply with this warning notice could lead to failures or malfunctions.
Warning: Failure to comply with this warning notice could lead to physical injury and/or damage to the machine.

1.4 Appropriate use

The products described in these operating instructions are developed to execute safety-related functions as part of an entire plant or machine. It is the responsibility of the manufacturer of a machine or plant to ensure the correct functionality of the entire machine or plant.

The safety switchgear must be exclusively used in accordance with the versions listed below or for the applications authorised by the manufacturer. Detailed information regarding the range of applications can be found in the chapter "Product description".

1.5 General safety instructions

The user must observe the safety instructions in this operating instructions manual, the country specific installation standards as well as all prevailing safety regulations and accident prevention rules.

Further technical information can be found in the Schmersal catalogues or in the online catalogue on the Internet: www.schmersal.net.

The information contained in this operating instructions manual is provided without liability and is subject to technical modifications.

If multiple safety components are wired in series, the Performance Level to EN ISO 13849-1 will be reduced due to the restricted error detection under certain circumstances. The entire concept of the control system, in which the safety component is integrated, must be validated to EN ISO 13849-2.

There are no residual risks, provided that the safety instructions as well as the instructions regarding mounting, commissioning, operation and maintenance are observed.

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1.6 Warning about misuse

In case of improper use or manipulation of the safety switchgear, personal hazards or damages to machinery or plant components cannot be excluded. The relevant requirements of the standard EN 1088 must be observed.

1.7 Exclusion of liability

We shall accept no liability for damages and malfunctions resulting from defective mounting or failure to comply with this operating instructions manual. The manufacturer shall accept no liability for damages resulting from the use of unauthorised spare parts or accessories.

For safety reasons, invasive work on the device as well as arbitrary repairs, conversions and modifications to the device are strictly forbidden; the manufacturer shall accept no liability for damages resulting from such invasive work, arbitrary repairs, conversions and/or modifications to the device.

2. Product description

2.1 Ordering code

This operating instructions manual applies to the following types:

AST ①②-AS③ ④

No.	Option	Description
①	02	1 NC contact / 1 NC contact
	11	1 NO contact / 1 NC contact
②		AS-i connection:
	ST	M12 connector:
	L	Connecting cable (2 m)
③		**Sensor connection:**
	2	2 x 2-strand connecting cable
	4	1 x 4-strand connecting cable
	6	1 x 6-strand connecting cable with output
④	ST	**Sensor connection:**
		M12 connector at the connecting cables
		2 x 2 and 1 x 4 (optional)

2.2 Special versions

For special versions, which are not listed in the order code below 2.1, these specifications apply accordingly, provided that they correspond to the standard version.

2.3 Purpose

The AS-Tube (AST) is a safe connecting module with two safe inputs and an optional semi-conductor output
for non-safety-relevant functions. One or multiple switches to IEC/EN 60947-5-1 or sensors to IEC/EN 60947-5-3 with potential-free NC/NC or NC/NO contacts can be connected to the safe AST module. The AST module is equipped with an additional semi-conductor output for using solenoid interlocks and magnet control. The AS-Tube must only be used in combination with the ASM safety monitor.

The user must evaluate and design the safety chain in accordance with the relevant standards and the required safety level.

LED display

The LED's have the following meaning (to EN 50295):

LED green:	AS-Interface supply voltage
LED red:	AS-Interface communication error
	flashing = cross-wire short
LED yellow:	enabling status (LED 1: contact 1, LED 2: contact 2)

2.4 Technical data

Standards:	EN 50295, EN 60947-5-1, EN ISO 13849-1, IEC 61508
Enclosure:	glass-fibre reinforced thermoplastic, self-extinguishing
AS-Interface connection:	M12 connector or connecting cable (2 m)
Protection class:	IP67 to IEC/EN 60529
AS-Interface voltage range:	26.5 ... 31.6 VDC, through AS-Interface, reverse polarity-proof
AS-interface power consumption:	≤ 50 mA
AS-Interface specification:	Profile: S-7.B IO-Code: 0 x 7 ID-Code: 0 x B IO-Code1: 0 x 7 IO-Code2: 0 x E
AS-interface inputs:Contact 1:	Data bits D0 / D1 = static 00 or dynamic code transmission Contact 2: Data bits D2 / D3 = static 00 or dynamic code transmission
Outputs:	A0 solenoid control (AST ... 6) (24 VDC, max. 500 mA), A1 ... A3 no function
Parameter bits:	P0 ... P3 no function
Input module address:	preset to address 0, can be changed through AS-interface bus master or hand-held programming device
Diagnostic information:	
LED indication:	LED green: AS-Interface supply voltage LED red: AS-Interface communication error flashing = crosswire short LED yellow: enabling status (LED 1: contact 1, LED 2: contact 2)
EMC rating:	to EMC-Directive
Ambient temperature:	−25 °C ... +55 °C
Storage and transport temperature:	−25 °C ... +85 °C

2.5 Safety classification

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to e
Control category:	up to 4
PFH value:	2.04 x 10^{-9} /h
SIL:	up to 3
Service life:	20 years

3. Mounting

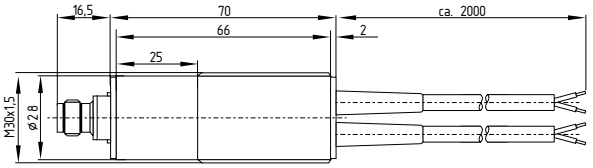
3.1 General mounting instructions

The component can be mounted in any position. The cylindrial AS-i slave can be fitted in an M30 mounting hole; alternatively, the H 30 clamp (accessory) can be used. Avoid sharp edges or buckling in the connecting cables of the safety components and the bus connection.

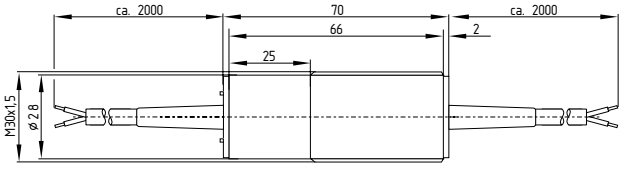
3.2 Dimensions

All measurements in mm.

AST ... ST-AS



AST ... L-AS



4. Rear side Electrical connection

4.1 General information for electrical connection

The electrical connection to the AS-i system may only be carried out by authorised personnel in a de-energised condition (refer to EN 50295).

Connection to the AS-Interface system
The connection to the AS-Interface system is realised through an M12 connector (ST) or an open connecting cable (L). For the different AS-i slaves, the following wiring configurations are available:

ST variant with (*) or without semi-conductor output
(Wiring to EN 50295):

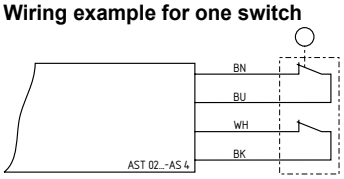
1: AS-i +
2: Aux – (*)
3: AS-i –
4: Aux + (*)

L variant with (*) or without semi-conductor output
(Wiring to EN 50295):

1: BN (brown) AS-i +
2: White (WH)* Aux –
3: Blue (BU) AS-i –
4: Black (BK)* Aux +

The supply voltage (stabilised PELV unit, IEC 364-4-41 with 24 VDC, +10/–-15%) for the interlocking solenoids is externally supplied (Aux) for the AST .. ST-AS 6 or AST .. L-AS 6 variants. The switching output for the interlocking solenoid can be loaded with max. 0.5 A.

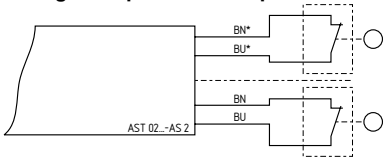
Wiring example for one switch



Module variants: AST .. ST/L-AS 4

Colour:		Description:
1:	BN (brown)	NC/NO
2:	Blue (BU)	NC/NO
3:	White (WH)	NC contacts
4:	BK (black)	NC contacts

Wiring example for two separated switches

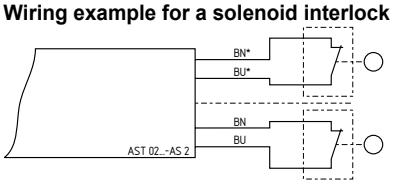


Module variants:

Colour:		Description:
1:	BN (brown)	NC/NO*
2:	Blue (BU)	NC/NO*
3:	BN (brown)	NC contacts
4:	Blue (BU)	NC contacts

* Cable for NO contacts labelled "13-14"

Wiring example for a solenoid interlock



Module variants: AST .. ST/L-AS 6

Colour:		Description:
1:	BN (brown)	NC/NO
2:	Blue (BU)	NC/NO
3:	WH (white)	NC contacts
4:	BK (black)	NC contacts
5:	Red (RD)	Solenoid (+) disabled
6:	Grey (GY)	Solenoid GND

Wiring configuration switch (contacts & solenoid)
The safety components are connected through open connecting cables in different versions depending on the AST variant. The length of the cable between the AS-Tube and the components must be 5 metres at the most.

5. Configuration

5.1 Programming the slave address

The slave address is programmed through the M12 connector (ST) or through the open connecting cable (L). Any address from 1 to 31 can be set by means of the AS-i bus master or a hand-held programming device.

5.2 Configuration of the safety monitor

The AST module can be configured application-dependent in the ASM safety monitor. To this effect, the following monitoring devices are recommended: Double channel with positive break, double channel dependent with and without filtering, double channel independent as well as in addition to the monitoring device double channel conditionally dependent. Each of these safety-monitoring modules can be used in conjunction with the AS-Tube, anyhow with different behaviour of the safety monitor (refer to asimon software manual).

The configuration of the safety monitor must be tested and confirmed by a qualified and authorised safety expert/safety engineer.

5.3 Cross-wire short diagnostic

In case of cross-wire short between the connecting cables of both contacts, a safety shutdown of the ASM safety monitor is performed. The fault is signaled to the user by a red LED flashing on the slave concerned (AST) and on the ASM. The error message is deleted after elimination of the cross-wire short and a manual reset using the "service button" on the ASM. The information regarding a "cross-wire short" in a slave (AST) can be read out in the AS-i master in the corresponding status registry, flag S1 (FID input).

5.4 Semi-conductor output for the solenoid control

When door locking devices without integrated AS-i Safety at Work interface are used, the AST module additionally provides for the solenoid control in addition to the transmission of the safe switching signals. The solenoid is enabled or disabled through output bit A0 of the addressed AS-i slave AST, thus locking or unlocking the corresponding guard depending on the solenoid interlock variant. The solenoid control of the AST module is reverse polarity-proof as well as short circuit-proof.

5.5 Status signal "safety release"

The "safety release" status signal from a Safety at Work slave can be cyclically queried by the control system through the AS-i master. To that effect, the 4 input bits with the varying SaW code of a Safety at Work slave are evaluated through an OR operation with 4 inputs in the control system.

In order for the AS-Tube (AST) to function correctly, the parameter port must be set to the default value Fhex (1111) according to the AS-i specification. During the project planning with AS-Tube devices with connecting cable (L), please observe that the cable length of every individual AST module is included in the overall length of the AS-i network. For nonwired safe inputs, a bridge must be established. The contact inputs have a filter time of ≥ 10 ms. This could lead to a dropout delay of up to 24 ms.

6. Set-up and maintenance

6.1 Functional testing

The safety function of the AS-Tube (AST) connecting module must be tested. The following conditions must be previously checked and met:
1. Check for damages
2. Check the integrity of the cables and connections

6.2 Maintenance

A regular visual inspection and functional test, including the following steps, is recommended:
1. Check for damages
2. Remove particles of dust and soiling
3. Check the integrity of the cables and connections

Damaged or defective components must be replaced.

7. Disassembly and disposal

7.1 Disassembly

The safety switchgear must be disassembled in a de-energised condition only.

7.2 Disposal

The safety switchgear must be disposed of in an appropriate manner in accordance with the national prescriptions and legislations.

8. EU Declaration of conformity

EU Declaration of conformity

SCHMERSAL

Original

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Germany
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We hereby certify that the hereafter described components both in their basic design and construction conform to the applicable European Directives.

Name of the component: AST … AS

Type: See ordering code

Description of the component: Connecting module with two safe inputs and one optional output for non-safety-relevant functions with integrated AS-i Safety at Work interface.

Relevant Directives:

Machinery Directive	2006/42/EC
EMC-Directive	2014/30/EU
RoHS-Directive	2011/65/EU

Applied standards: DIN EN 60947-5-1:2010,
DIN EN ISO 13849-1:2016,
IEC 61508 parts 1-7:2010

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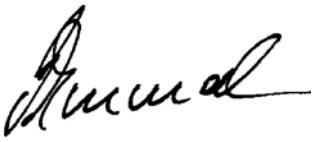
Place and date of issue: Wuppertal, January 30, 2017



Authorised signature
Philip Schmersal
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AST AS-C-EN

The currently valid declaration of conformity can be downloaded from the internet at www.schmersal.net.

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