

**Correct use**

The Coded Magnetic Safety switches from series VAA-2E...-IER-...-V1 are operated as slaves on the safety bus AS-Interface Safety at Work and function as safety equipment to monitor movable safety guards.

The system consists of read head and actuator. It forms a non-contact, magnetically coded interlocking device with low coding level (type 4).

In combination with a safety guard, this system prevents dangerous machine functions from being performed for as long as the safety guard is opened. A stop command is triggered if the safety guard is opened during the dangerous machine function.

Before safety components are used, a risk assessment must be performed on the machine, e.g. in accordance with:

- ▶ EN ISO 13849-1, Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
- ▶ EN ISO 12100, Safety of machinery – General principles for design – Risk assessment and risk reduction
- ▶ EN 62061, Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems.

Correct use includes observing the relevant requirements for installation and operation, e.g.:

- ▶ EN ISO 14119 (supersedes EN 1088), Safety of machinery – Interlocking devices associated with guards – Principles for design and selection
- ▶ EN 60204-1, Safety of machinery. Electrical equipment of machines. General requirements

**Important!**

- ▶ The user is responsible for safe integration of the device into a safe overall system. For this purpose, the overall system must be validated, e.g. in accordance with EN ISO 13849-2.
- ▶ Correct use requires observing the permissible operating parameters (see technical data).
- ▶ If a product data sheet is included with the product, the information on the data sheet applies in case of discrepancies with the operating instructions.

**Exclusion of liability and warranty**

In case of failure to comply with the conditions for correct use stated above, or if the safety instructions are not followed, or if any servicing is not performed as required, liability will be excluded and the warranty void.

**General safety instructions**

Safety components fulfill personal protection functions. Incorrect installation or tampering can lead to severe injuries to personnel.

Check the safe function of the safety guard particularly

- ▶ after any setup work
- ▶ each time after replacement of a VAA component
- ▶ after an extended period without use
- ▶ after every fault

Independent of these checks, the safe function of the safety guard should be checked at suitable intervals as part of the maintenance schedule.

**Warning!** Danger of fatal injury in the event of incorrect connection or incorrect use.

Safety components must not be bypassed (bridging of contacts), turned away, removed or otherwise rendered ineffective. Pay particular attention to EN ISO 14119: 2013, section 7, regarding the possibilities for bypassing an interlocking device.

The device may be installed and put into operation only by authorized personnel

who are familiar with the correct handling of safety components

- ▶ who are familiar with the applicable EMC regulations
- ▶ who are familiar with the applicable regulations on operational safety and accident prevention
- ▶ who have read and understood the operating instructions.
- ▶ All safety precautions and requirements stated in the operating instructions of the AS-Interface safety monitor used must be observed.

**Function**

The non-contact safety switch VAA-2E...-IER-...-V1 consists of two components:

- ▶ Coded actuator
- ▶ Read head

The read head includes reed contacts that are activated via the coded, magnetic actuator. It is equipped with a plug connector and is connected directly to the safety bus AS-Interface Safety at Work.

The read head is fastened to the fixed part of the safety guard. The actuator attached to the movable part of the safety guard is moved towards the read head by closing the door. When the activation distance is reached, a bit sequence is sent via the AS-Interface bus that signals that the safety device is closed.

The zero sequence 0000 is sent via the AS-Interface bus when the safety guard is opened.

**Mounting**

**Caution!** Risk of damage to equipment as a result of incorrect installation.

Read heads or actuators must not be used as a mechanical end stop. Fit an additional end stop for the movable part of the safety guard.

**Caution!** Read heads or actuators must not be used in an environment with strong magnetic fields.

**Important!** Read heads and actuators must be positively mounted to the safety guard, e.g. by using the safety screws supplied. Tighten the screws with a torque of max. 0.5 Nm.

The read head and actuator may be installed in any position. The alignment of the read head and the actuator must be kept in mind (see Figure 1).

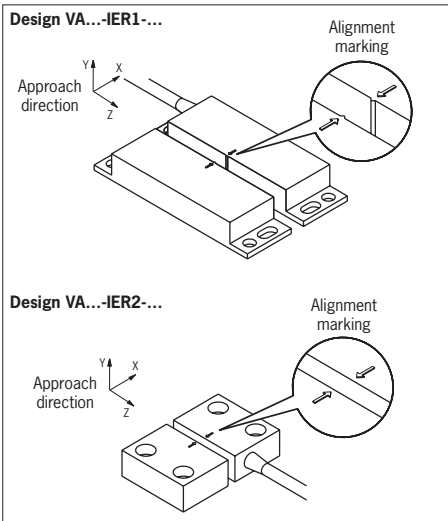


Figure 1: Alignment of read head and actuator

Install read head and actuator so that:

- ▶ they are accessible for inspection work and the installation of spare parts
- ▶ when the safety guard is closed, the active read head and actuator faces are exactly aligned (see Figure 1)
- ▶ the actuator is located in the read head's operating distance when the safety guard is closed.
- ▶ A guide and an additional end stop must be fitted for the movable part of the safety guard.
- ▶ In the closed position, a latching mechanism must be fitted to the safety door.
- ▶ If the read head and actuator are fitted flush, the switching distance is reduced in line with the installation depth and the safety guard material.
- ▶ If the read head and actuator are fitted on ferromagnetic material, the read distance is reduced.
- ▶ If the approach speed between the read head and the actuator is low, the approach direction Z (see Figure 1) should be avoided.

**Electrical connection**

The devices are tested according to the requirements of UL508.

Tests regarding EMC and FMEA or tests for use in safety circuits are performed by TÜV Süd.

For use and operation as per the requirements, a power supply with the feature "for use in class 2 circuits" must be used.

Alternative solutions must comply with the following requirements:

Electrically isolated power supply unit in combination with fuse as per UL248. This fuse should be designed for max. 3 A and should be integrated into the 33.3 V/DC voltage section.

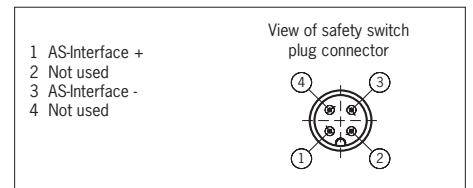


Figure 2: Terminal assignment, AS-Interface M12 plug connector

**Addressing**

The device can be addressed via the AS-Interface safety bus.

**Configuration in the AS-Interface safety monitor**

(see operating instructions for the AS-Interface safety monitor)

The safety switch is configured in the AS-Interface safety monitor with the AS-Interface address set as follows, for example:

- ▶ Dual-channel dependent
- ▶ With start-up test
- ▶ Synchronization time = 3 seconds

In this operation mode, the safety guard must be opened each time prior to restarting in order to perform the start-up test.

### AS-Interface status messages

(only for VAA-2E1A-IER1-...-V1)

A dual LED (red/green) displays the colors red, green and yellow. The following table provides assistance with troubleshooting.

State of ASI LED	Explanation
green	Normal operation
red	No data exchange between master and slave Cause: - Master in STOP mode - Slave not in LPS - Slave with wrong I/O/ID - Reset on slave active
red/yellow alternately flashing	No data exchange between master and slave Cause: Slave address = 0
red/green alternately flashing	Device fault in the slave. Contact the manufacturer

An additional function LED can be connected via the AS-Interface bus, e.g. to indicate the door state. The LED is connected as an output to the AS-Interface bus via bit D1.

### Function test

#### WARNING

Fatal injury due to faults during the function test. Before carrying out the function test, make sure that there are no persons in the danger area.

- ▶ Observe the valid accident prevention regulations.
- ▶ Check the device for correct function after installation and after every fault.

Proceed as follows:

Electrical function test

1. Switch on operating voltage.
2. Close all safety guards.
  - ➔ The machine must not start automatically.
3. Start the machine function.
4. Open the safety guard.
  - ➔ The machine must switch off and it must not be possible to start it as long as the safety guard is open.

Repeat steps 2 - 4 for each safety guard.


### Service and inspection

Remove iron swarf from the read head and actuator at regular intervals.

Use only solvent-free cleaning agents for cleaning the read heads and actuators!

Regular inspection of the following is necessary to ensure trouble-free long-term operation:

- ▶ correct switching function
- ▶ secure mounting of components
- ▶ loose connections.

 In the event of damage or wear and tear, the damaged system component must be replaced.

### Exclusion of liability under the following circumstances:

- ▶ incorrect use
- ▶ non-compliance with safety regulations
- ▶ installation and electrical connection not performed by authorized personnel
- ▶ failure to perform functional checks.

### EC declaration of conformity

The manufacturer named below herewith declares that the product fulfills the provisions of the directive(s) listed below and that the related standards have been applied.

Pepperl+Fuchs GmbH  
Lilienthalstr. 200  
68307 Mannheim, Germany

Directives applied:

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

Standards applied:

- ▶ EN 60947-5-3:2013
- ▶ EN ISO 13849-1:2015
- ▶ EN ISO 14119:2013
- ▶ EN 62026-2:2013 (AS-i)

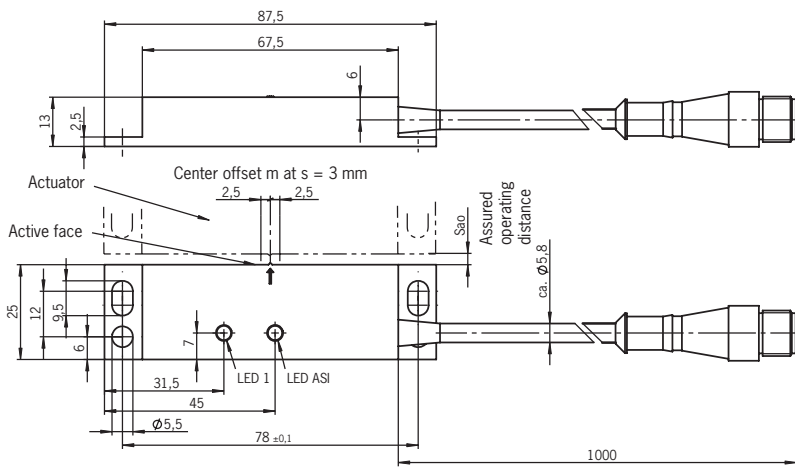
The original EC declaration of conformity can also be found at: [www.pepperl-fuchs.de](http://www.pepperl-fuchs.de)

### Technical data

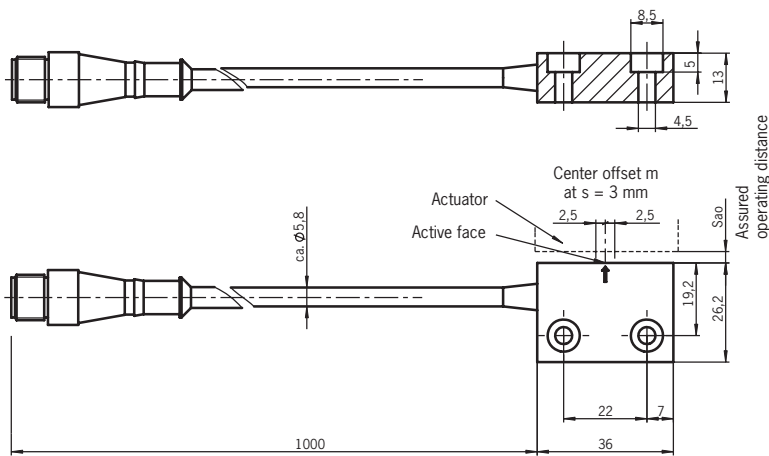
Parameter	Value
<b>Read head</b>	
Housing material	Fiber glass reinforced PPS
Ambient temperature	-20 ... +60 °C
Degree of protection acc. to EN 60529	IP 67
Installation position	Any, alignment with actuator should be kept in mind (markings)
Connection	Connection cable with M12 plug connector
Cable length	1 m
Cable material	PUR
Method of operation	Magnetic, reed contact
Mech. life	100 x 10 <sup>6</sup> operating cycles
Vibration resistance	10 ... 55 Hz, amplitude 1 mm
Shock resistance	30 g/11 ms
<b>Actuator</b>	
Housing material	Fiber glass reinforced PPS
Ambient temperature	-20 ... +60 °C
Degree of protection acc. to EN 60529	IP 67
Installation position	Any, alignment with read head should be kept in mind (markings)
Method of operation	Magnetic
Vibration resistance	10 ... 55 Hz, amplitude 1 mm
Shock resistance	30 g/11 ms
<b>AS-Interface data</b> acc. to AS-Interface specification 3.2	EA code: 7 D code: B
Operating voltage AS-Interface	DC 26.5 ... 31.6 V
Total current consumption, max.	30 mA
Valid AS-Interface addresses	1 - 31
<b>AS-Interface inputs</b>	
	Acc. to AS-Interface Safety at Work
Switch actuated	D0, D1, D2, D3 code sequence
Switch open	D0, D1, D2, D3 zero sequence
<b>AS-Interface outputs</b>	
	Acc. to AS-Interface Safety at Work
Output D1	D1 = 1 ➔ LED ON D1 = 0 ➔ LED OFF
<b>Distances</b>	
with read head	<b>VAA-2E1A-IER1-...</b> <b>VAA-2E-IER2-...</b>
Switch-on distance S <sub>so</sub>	9 mm 7 mm
Assured switch-off distance S <sub>sw</sub>	70 mm 40 mm
Center offset m between actuator and read head	± 2.5 mm at distance s = 3 mm
<b>Times</b>	
Max. time-delay from state change	5 ms
<b>Reliability values according to EN ISO 13849-1</b>	
Category	3
Performance Level (PL)	e
PFH <sub>d</sub>	4.29 x 10 <sup>-8</sup>
Mission time	20 years



VAA-2E1A-IER1-S-1M-V1  
VAZ-IER1-ACTUATOR1-S



VAA-2E-IER2-S-1M-V1  
VAZ-IER2-ACTUATOR2-S



The dimensions of the actuators are the same as those of the read heads, although the former have no connection cable.

Figure 3: Dimension drawings of read heads and actuators