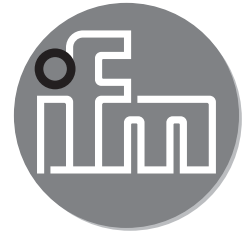


ifm electronic



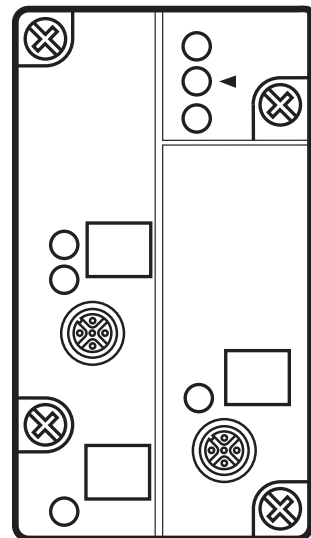
Original operating instructions  
Safe AS-i module

**AS interface**

**AC005S**

**UK**

80003234/00 05/2013



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# 1 Preliminary note

The instructions are part of the unit. They are intended for authorised persons according to the EMC, Low Voltage and Machinery Directive and safety regulations.

The instructions contain information about the correct handling of the product. Read the instructions before use to familiarise yourself with operating conditions, installation and operation.

Adhere to the safety instructions.

## 1.1 Explanation of symbols

▶ Request for action

● LED on

○ LED off

☒ LED flashes

☀ LED flashes quickly

 Important note

### WARNING

Warning of dangers which may lead to death or serious irreversible injuries.

## 2 Safety instructions

- Follow the operating instructions.
- In case of non-observance of notes or standards, specially when tampering with and/or modifying the unit, any liability and warranty is excluded.
- The unit must be installed, connected and put into operation by a qualified electrician trained in safety technology.
- The applicable technical standards for the corresponding application must be complied with.
- For installation the requirements according to EN 60204 must be observed.
- In case of malfunction of the unit please contact the manufacturer. Tampering with the unit is not allowed.

- Disconnect the unit externally before handling it. Also disconnect any independently supplied relay load circuits.
- After setup the system has to be subjected to a complete function check.
- Use the unit only in specified environmental conditions (→ chapter 11 Technical data). In case of special operating conditions please contact the manufacturer.
- In case of any questions - if required - contact the safety expert in charge of your country.

## **! WARNING**

**In case of improper handling of the product, the safety and physical integrity of operators and machinery cannot be guaranteed.**

Death or serious irreversible injuries may result.

- ▶ Note all remarks on installation and handling given in these instructions.
- ▶ The device must only be used under the specified operating conditions and in accordance with use as prescribed below.

## **2.1 Safety-related requirements regarding the application**

It must be ensured that the safety requirements of the respective application correspond to the requirements stated in these instructions.

Observe the following requirements:

- ▶ Adhere to EN 1088 for interlocking devices associated with guards.
- ▶ Adhere to the specified operating conditions (→ chapter 11 Technical data). Use of the unit in the vicinity of chemical and biological media is not permitted.
- ▶ In case of faults within the unit which result in the defined safe state: take measures to maintain the safe state when the complete control system continues to be operated.
- ▶ Replace damaged units.

## **3 Items supplied**

1 safe AS-i module AC005S, 1 flat cable lower part AC5000, 1 operating instructions AC005S, ident no. 80003234.


If one of the above-mentioned components is missing or damaged, please contact one of the ifm branch offices.

## 4 Functions and features

The safe AS-i module detects safety-related switching states, e.g. 1- or 2-channel E-stops, position switches, door contacts, etc. For this purpose a code table is transferred via the AS-i system with 8 x 4 bits which is evaluated by the safety monitor (e. g. AC001S ... AC004S, AC031S, AC032S, AC041S).

The safety function of the unit is achieved by the normally closed operation (input disconnected = safe state).

When operated correctly, the system can be used in applications up to Performance Level e to ISO 13849-1 (→ chapter 7 Electrical connection).


 Depending on the safety components used the complete safety system can also be classified for a lower control category.

UK

## 5 Function and electrical connection

Please also refer to all information in the description of the configuration software (e.g. E7050S) and the operating instructions of the safety monitor. The above documents provide all required instructions concerning installation, configuration, operation and maintenance of the AS-i Safety at Work system.

Information on the parameterizable safety functions of the safe AS-i module can be found in the chapter "Monitoring devices" of the configuration software manual.

 The products described herein are designed to be components of a safety-oriented machine or control system. A complete safety-related system normally includes sensors, evaluation units, actuators and signalling components and concepts for safe switch-off. It is the responsibility of each manufacturer of a machine or installation to ensure a correct functioning of the whole system. The manufacturer of the safe AS-i module, his subsidiaries and affiliates are not in a position to evaluate all of the characteristics of a given machine or product not designed by him.

The manufacturer accepts no liability for any recommendation that may be implied or stated herein.

The warranty contained in the contract of sale is the sole warranty. Any statements contained herein do not create new warranties or modify existing ones.

The complete description of the configuration software, the operating instructions of the AS-i safety monitor and the operating instructions of the safe AS-i module must be taken into account!



### Maintenance requirement

A minimum of one testing per year is compulsory by a demand on the safety function.

## 6 Installation

- ▶ Install the safe AS-i module onto an FC lower part (e.g. AC5000) and then fix it onto a 35 mm raised rail.
- ▶ Alternatively, fasten it onto a mounting device.

The mounting orientation has no adverse effect on the function.

- ▶ Carefully place the yellow flat cable (e.g. E74000) in the lower part; use the enclosed seals.

### To achieve the indicated protection rating IP 65

- ▶ insert the seal carefully.
- ▶ tighten the 4 screws of the upper part evenly crosswise with 0.6...0.8 Nm.
- ▶ cover the unused socket with the enclosed protective cap.
- ▶ tighten all connected M12 connectors and protective caps, tightening torque of 0.6...0.8 Nm.

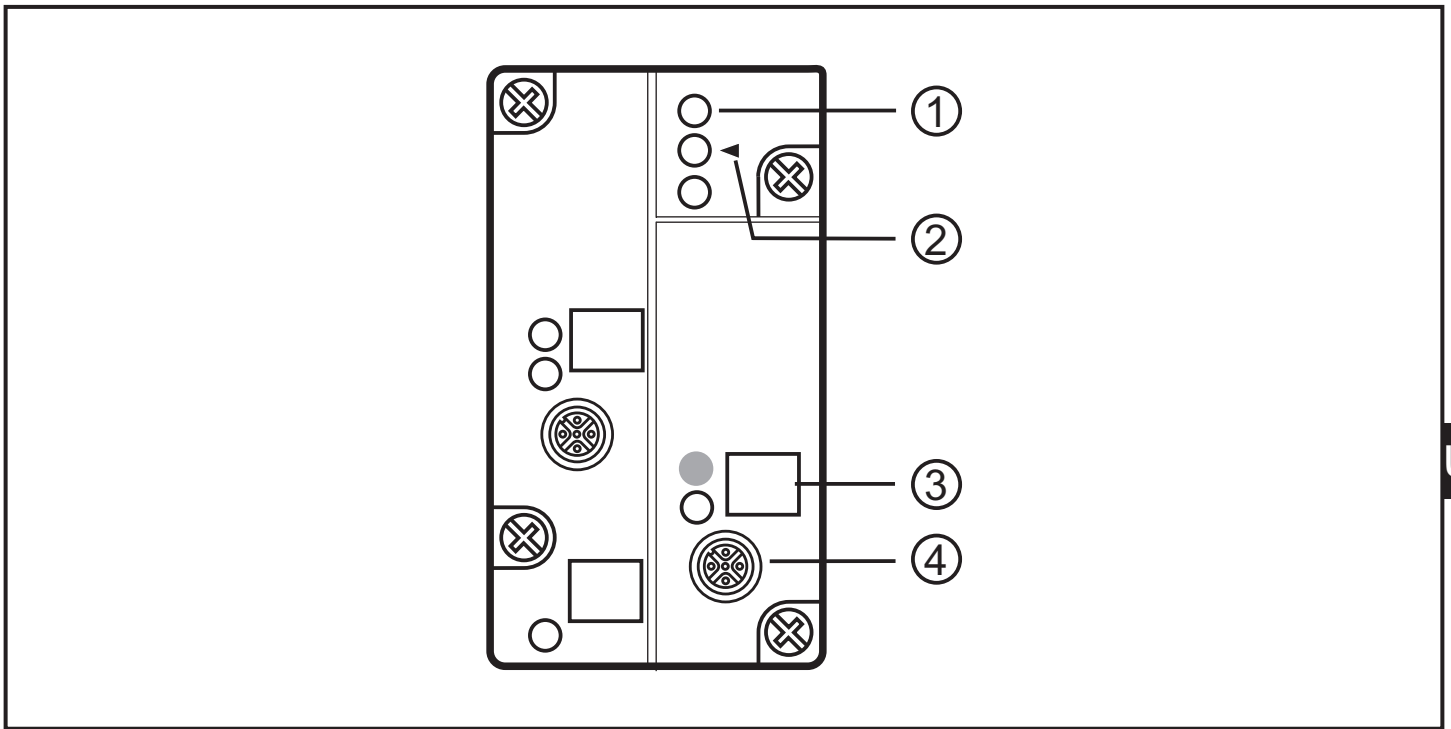
### WARNING

Non-observance of the installation instructions (e.g. non-observance of the tightening torque) can lead to a loss of the protection rating and consequently to the loss of the safety function.

Death or serious irreversible injuries may result.

- ▶ Note all remarks on installation and handling given in these instructions.
- ▶ The device must only be used under the specified operating conditions and in accordance with use as prescribed below.

## 6.1 Operating and display elements



- 1: LEDs
- 2: Fixture for infrared adapter
- 3: Labels
- 4: 2 M12 sockets

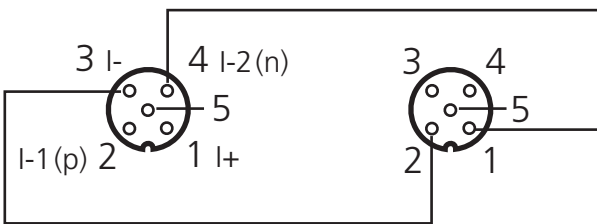
## 7 Electrical connection

► Disconnect power. Also disconnect any independently supplied relay load circuits.

**i** Do not connect the inputs to an external potential. Connect the safe switching contacts to the M12 sockets.

Use switching contacts with:

- a current rating  $\geq 1$  A.
- electrically isolated contact elements.
- contacts which open when there is a demand on the safety function.
- a safety function by positive opening to IEC / EN 60947-5-1 annex K

	M12 sockets	Socket I-1/2 / pin	Socket I-2 / pin
	Supply I+		1
Input I-1(p)		2	-
Supply I-		3	2
Input I-2(n)		4	1
not used		5	3,4,5

The connected switching contacts must be configured as normally closed. The connection of two **positively driven** or two **dependent** switching contacts must be made to the socket I-1/2.

- ▶ Connect the first switching contact I-1(p) to pin 1 and pin 2.
- ▶ Connect the second switching contact I-2(n) to pin 3 and pin 4.

The connection of two **independent** switching contacts is made to the socket I-1/2 (pin 1 and pin 2) and to the socket I-2 (pin 1 and pin 2). It is not allowed to connect switching contact I-2(n) to the sockets I-1/2 and I-2 at the same time.

Note:

If only **one** single-channel switch is to be connected to the module, it is to be connected to the input I-1(p). The second input I-2(n) must be bridged.

- ▶ Use the bridging plug E7005S \* for input I-2 (\*available as an option).
- ▶ Tighten the bridging plug with a tightening torque of 0.6...0.8 Nm.

This is the only way to ensure the maximum protection of IP 65.

**Note:** The wiring influences the achievable control category.

The requirements for Performance Level d according to ISO 13849-1 are met. Performance Level e to ISO 13849-1 can be achieved by wiring the contacts to be monitored to the module, so that cross faults between the wires can be excluded (incl. switch elements). This can for example be achieved if the contacts to be monitored are connected using separate sheathed cables which are protected against external damage.

## 8 Addressing

The module can be addressed via the addressing unit AC1154.

- ▶ Assign a free address between 1 and 31, on delivery the address is 0.

In connection with the FC lower part (e.g. AC5000 without addressing socket):

- ▶ First address the module via the addressing unit AC1154, then install it.

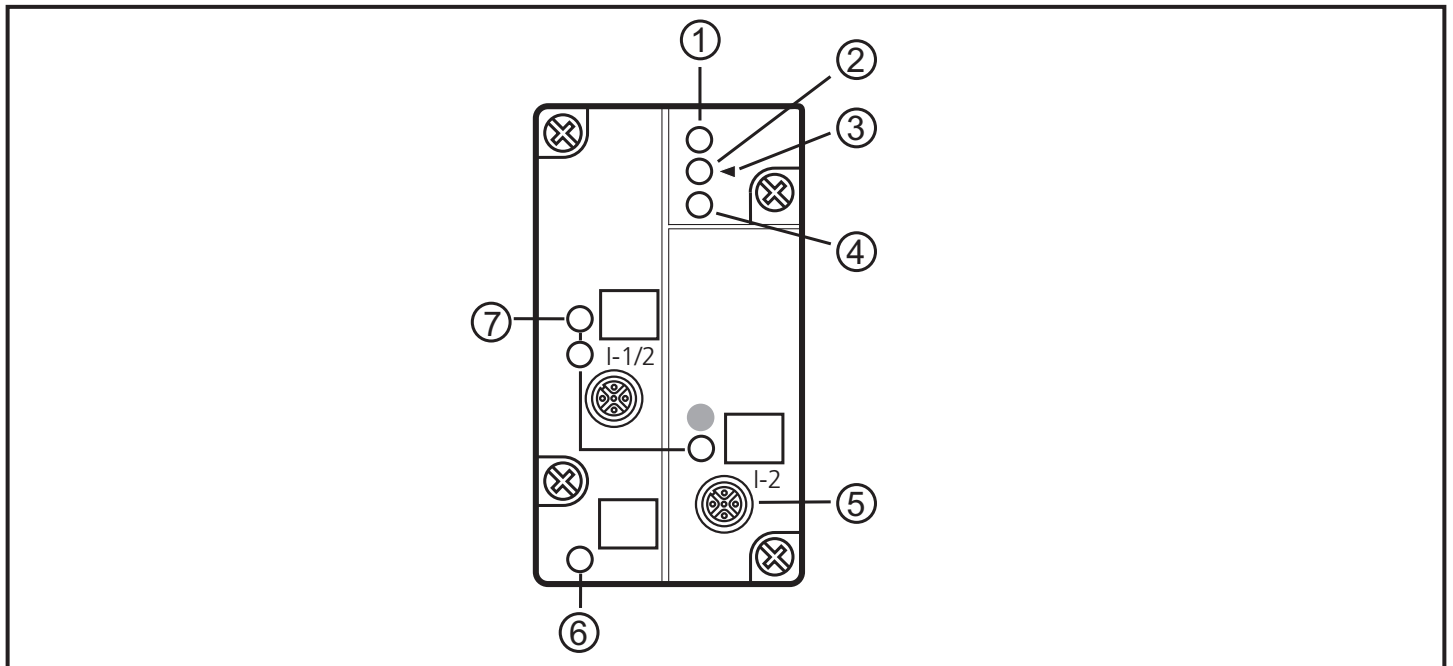
### 8.1 Infrared addressing

The safe AS-i module also offers the option of infrared addressing with the addressing unit AC1154. The AS-i communication (yellow cable) must be switched off during the infrared addressing. **UK**

- ▶ Disconnect the master.
- ▶ Supply the slaves with voltage via the AS-i power supply.

Addressing is carried out via the IR addressing cable E70211. When the ifm AS-i power supplies type SL are used, the communication can be deactivated via a jumper on the power supply.

## 9 Operation



- 1: LED infrared receiver
- 2: LED red FAULT
- 3: Fixture for infrared adapter
- 4: LED green PWR
- 5: 2 M12 sockets
- 6: LED red, alarm output
- 7: LEDs yellow, inputs

LED Description	LED state / colour	Operating state
Infrared	Infrared	Infrared receiver
FAULT	⊗ red	Peripheral fault, e.g. overload or short circuit of the sensor supply
FAULT	● red	AS-i communication error, slave does not participate in the "normal" exchange of data, e.g. slave address 0
PWR	○ green ● green	No voltage Supply voltage ok
Alarm	● red	Alarm output O-1 (unsafe) Through the host system the alarm output LED can be set as a static or dynamic output
Switching status	○ yellow ● yellow	Inputs not switched Inputs switched

## 9.1 Data bits

Data bit	D3	D2	D1	D0
In/Out	I-2(n)	I-2(n)	I-1(p)	I-1(p) /O-1

Activated input channel	Bit sequence D3-D0
I-1(p)	XX00
I-2(n)	00XX
I-1(p) and I-2(n)	0000
none	XXXX

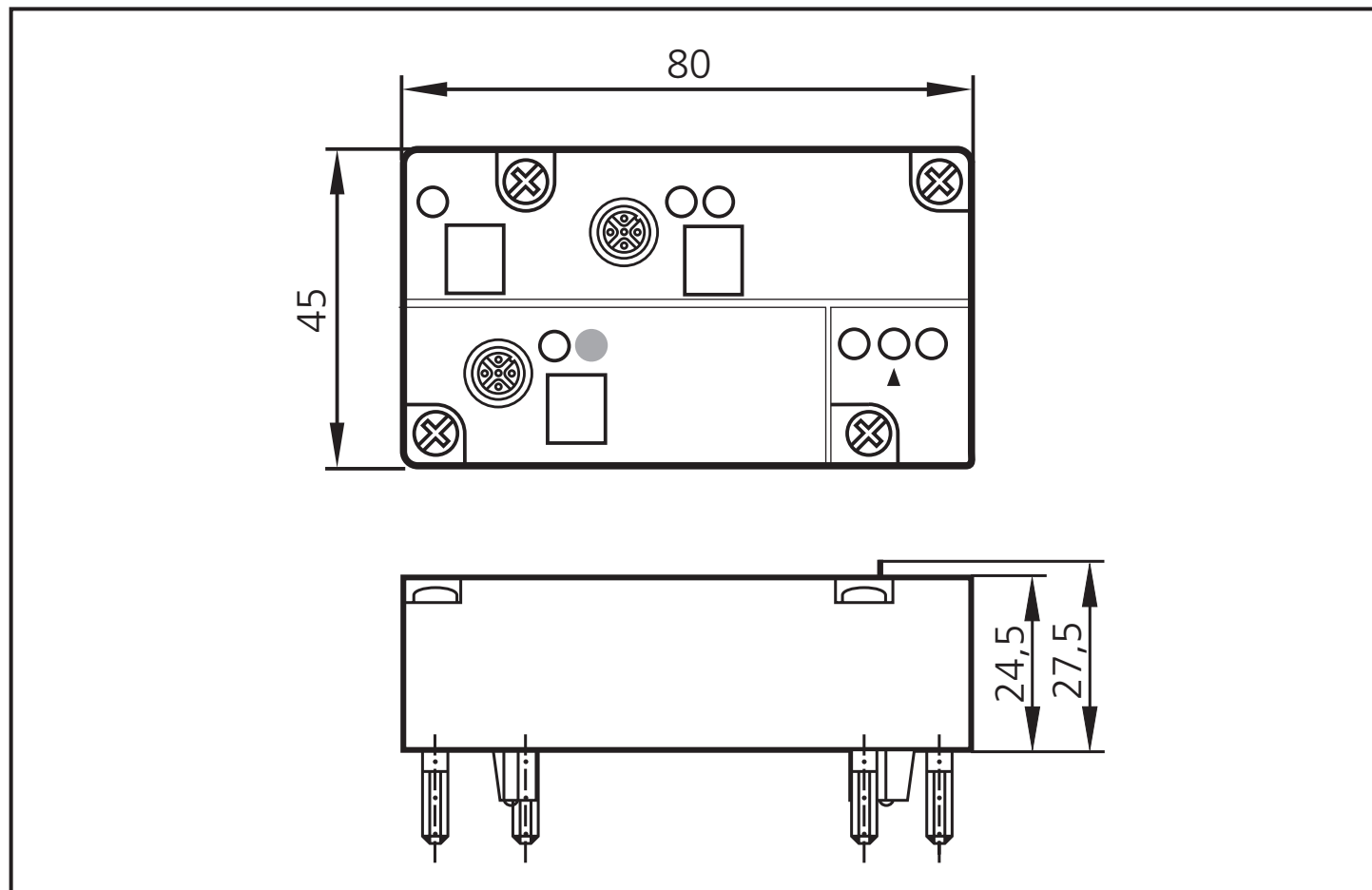
Activated alarm output	Bit sequence D3-D0
O-1	XXX1

X = random

The code words 0000, XX00 and 00XX cause the AS-i safety monitor to bring the installation into the safe state.

For more details on the effect of the data bits on the transmission sequence refer to the configuration software manual (see the chapter "Monitoring devices").

## 10 Scale drawing



# 11 Technical data

<b>AC005S</b>	
Safe AS-i module / 2 safe inputs / 1 non-safe LED output	
Operating voltage	26.5 ... 31.6 V DC
Current consumption	typ. 60 mA
<b>Inputs</b>	
Wiring	DC PNP / NPN
Voltage supply	via AS-i
Short circuit detection	yes
Input current	typ. 10 mA
Cross fault monitoring	< 20 Ω
<b>LED output</b>	
Supply via AS-i	yes
Integrated watchdog	yes
<b>LED function display</b>	
Operation / fault / function	green / red / yellow
Ambient temperature	-25 ... +65°C
Protection rating	IP 65 in connection with FC lower part and AS-i flat cable (e.g. E74000)
AS-Interface / extended addressing mode possible	Version 2.1 / no
AS-i profile	S-7.B.0
I/O configuration / ID code	7 [Hex] / B.0 [Hex]
AS-i certificate	61901
Maximum number of safe modules per master	31
EMC	EN 61000-6-3; EN 62061 annex E
Housing materials	PBTP (Pocan)
Housing dimensions	80 x 45 x 24 mm (H X W X D)
Cable length between module and mechanical contacts	≤ 5m
Protection	IP 65 (to EN 60529), III

## 11.1 Safety characteristics

Characteristics	Value
Life time T	20 years
Performance Level PL	d / e*
Category	Cat. 3 / 4 * * Cat. 4, PL e only if the fault exclusions described in the manual are used. (→ chapter 7 Electrical connection)
DC <sub>avg</sub>	90...99 %
MTTF <sub>d</sub>	6300 years

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These calculations were made on the basis of an ambient temperature of 40 °C. The device meets the requirements of EN ISO 13849-1: 2008 category 3/4 and can be used in applications up to PL d/e.

The PFD / PFH values and MTTF<sub>d</sub> values of the other components, especially of the AS-i safety monitor, can be found in the corresponding documentation.

## 11.2 Response times

The response time of the safe AS-i module for a safety request is max. 10 ms.

Calculation of the total response time

For the calculation of the response time of the complete system the response times of the other components also have to be added (mechanical contacts, safety monitor and external relays or contactors possibly connected to the safety monitor output).

## 12 Troubleshooting

The LEDs of the safe AS-i module indicate faulty operating states (→ chapter 9 Operation).

## 13 Maintenance, repair and disposal

If used correctly no maintenance and repair measures are necessary.

Only the manufacturer is allowed to repair the unit.

After use dispose of the unit in an environmentally friendly way in accordance with the applicable national regulations.

## 14 Terms and abbreviations

PL	Performance Level	Capability of safety-related parts to perform a safety function at predictable conditions to fulfil the expected risk reduction.
$PFD_{avg}$	Average Probability of Failure on Demand	Average probability of dangerous failures of a safety function in the case of request
PFH ( $PFH_D$ )	Probability of (dangerous) Failure per Hour	
$DC_{avg}$	Average Diagnostic Coverage	
SIL	Safety Integrity Level	Safety Integrity Level SIL 1-4 to IEC 61508. The higher the SIL the lower the probability that a safety function will fail.
$SIL_{cl}$	Safety Integrity Level <sub>claim limit</sub>	Safety Integrity Level <sub>claim limit</sub> (to IEC 62061)
T	Life time	(= max. service life)
T1	Test Interval (between life testing of the safety function)	
$MTTF_d$	Mean Time To Dangerous Failure	

## 15 Standards

The following standards and directives have been applied:

- - Machinery Directive 98/37/EC (until 30 December 2009)
- - Machinery directive 2006/42/EC (as of 31 December 2009)
- - EMC Directive 2004/108/EC
- - ISO 13849-1: 2008  
Safety of machines - safety-related parts of control systems
- - EN 50295
- - UL 508

UK

### 15.1 Approvals / Certificates

- EC declaration of conformity
- AS-Interface
- TÜV Rheinland
- UL (cULus) see [www.ifm.com](http://www.ifm.com)

#### **For units with cULus approval and the scope of validity cULus:**

The device shall be supplied from an isolating transformer having a secondary Listed fuse rated either a) max 5 amps for voltages 0~20 Vrms (0~28.3 Vp) or b) 100/Vp for voltages of 20~30 Vrms (28.3~42.4 Vp).

# 15.2 EC declaration of conformity

ifm electronic



## EG – Konformitätserklärung

EC Declaration of Conformity

Déclaration de conformité CE

ifm electronic gmbh

Friedrichstraße 1

45128 Essen

Germany

Telefon: +49 (0)201 / 24 22 - 0

Telefax: +49 (0)201 / 24 22 - 1200

Internet: www.ifm.com

Die EG-Konformitätserklärung gilt für folgendes Gerät:

The EC declaration of conformity applies to the following unit:

La déclaration de conformité CE s'applique à l'appareil suivant:

**AS-i Safety Modul  
AS-i Safety module  
Modules AS-i Safety**

**AC005S**

Wir bestätigen die Übereinstimmung mit den wesentlichen Anforderungen der europäischen Richtlinie(n):

We confirm the conformity to the essential requirements of the European directive(s):

Nous confirmons la conformité aux exigences essentielles de la (des) directive(s) européenne(s):

**2004/108/EG  
2006/42/EG**

**2004/108/EC  
2006/42/EC**

**2004/108/CE  
2006/42/CE**

Folgende Norm(en) wurde(n) angewandt:

The following standard(s) was (were) applied:

La (Les) norme(s) suivante(s) a (ont) été appliquée(s):

**EN 50295 : 1999  
DIN EN 954-2 : 2000  
EN60204-1 : 2006  
EN ISO 13849-1 : 2008  
EN 60204-1 : 2006**

Bevollmächtigte Person zur Zusammenstellung der technischen Unterlagen

Person authorised for the compilation of the technical documents

Personne autorisée de rassembler les documents techniques

**Volker Wiesemann, ifm ecomatic gmbh, Im Heidach 18, 88079 Kressbronn**

Kressbronn, 12.01.2010

(Ort und Datum der Ausstellung)

(Place and date of issue)

(Lieu et date de l'établissement)

(Unterschrift) i. V. Wolfgang Striegel,

Entwicklungsleiter

(Signature)

(Signature)

Dokument-Nr.: 8000658

## 15.3 AS-i certificate



# Certificate

The AS-Interface product

**AS-i Safety Module ClassicLine 45  
1DI/2DI M12**

of the company

**ifm electronic gmbh**

at D-45128 Essen

has been developed according to the Complete  
Specification (V 3.0) with the slave profile **S-7.B.0.**

The Product has the designation

**AC005S**

The Certificate is based on the Complete Specification (V 3.0), the actual test requirements and the certification guideline of AS-International Association e.V..

The type test of the reference product was performed by the AS-Interface test laboratory at the Steinbeis Transferzentrum Leipzig.

The type test and the manufacturer declaration have been approved to be good.

The manufacturer is responsible for his product.

This product may be marked with the certification Logo and the Number of the certification document (ZU-No.).



Gelnhausen, Germany, 04.November 2009

Zertifizierungsstelle – certification office  
AS-International Association

# 15.4 TÜV certificate



## ZERTIFIKAT CERTIFICATE

Nr./No.: 968/EZ 379.01/09

<b>Prüfgegenstand</b> Product tested	Sicheres AS-i Eingangsmodul Safe AS-i Input Module  ClassicLine AS-i Safety Module	<b>Zertifikats- inhaber</b> Licence holder	ifm electronic GmbH Friedrichstraße 1 45128 Essen
<b>Typbezeichnung</b> Type designation	AC005S	<b>Hersteller</b> Manufacturer	ifm ecomatic GmbH Im Heidach 18 88079 Kressbronn
<b>Prüfgrundlagen</b> Codes and standards forming the basis of testing	EN ISO 13849-1:2008 EN 50178:1997 EN 50295:1999		
<b>Bestimmungsgemäße Verwen- dung</b> Intended application	Das AC005S erfüllt die Anforderungen bis zu Kategorie 3, PL d nach EN ISO 13849-1 ohne Anwendung von Fehlerausschlüssen. Es erfüllt die Anforderungen bis zu Kategorie 4, PL e bei Anwendung der in der Betriebsanleitung beschriebenen Fehlerausschlüsse.  The AC005S fulfils the requirements up to safety category 3, PL d according to EN ISO 13849-1, without applying fault exclusions. It fulfils the requirements up to category 4, PL e, if the fault exclusions, described in the manual, are applied.		
<b>Besondere Bedingungen</b> Specific requirements	Die Festlegungen in der Betriebsanleitung und die Auflagen des Prüfberichtes müssen eingehalten werden.  The provisions defined in the user manual and the conditions of the test report shall be maintained.		
Dieses Zertifikat ist gültig bis 26.10.2014. This certificate is valid until 2014-10-26.			



Der Prüfbericht-Nr.: 968/EZ 379.00/09 vom 26.10.2009 ist Bestandteil dieses Zertifikates.

Der Inhaber eines für den Prüfgegenstand gültigen Genehmigungs-Ausweises ist berechtigt, die mit dem Prüfgegenstand übereinstimmenden Erzeugnisse mit dem abgebildeten Prüfzeichen zu versehen.

The test report-no.: 968/EZ 379.00/09 dated 2009-10-26 is an integral part of this certificate.

The holder of a valid licence certificate for the product tested is authorized to affix the test mark shown opposite to products, which are identical with the product tested.

**TÜV Rheinland Industrie Service GmbH**  
Geschäftsfeld ASI

Automation, Software und Informationstechnologie

Am Grauen Stein, 51105 Köln  
Postfach 91 09 51, 51101 Köln

Köln, 26.10.2009

Zertifizierungsstelle bei der TÜV Rheinland Industrie  
Service GmbH

Dipl.-Ing. Stephan Häb