

HR6S-EP Safety Module

HR9Z-B2194

Original instructions



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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use IDEC CORPORATION software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by IDEC CORPORATION for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

QUALIFICATION OF PERSONNEL

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation as well as all documentation of all components and equipment of the machine/process are authorized to work on and with this product.

The qualified person must be a certified expert in safety engineering.

The qualified person must be able to detect possible hazards that may arise from parameterization, modifying configurations, settings, and wiring, and generally from mechanical, electrical, or electronic equipment. The qualified person must be able to understand the effects that modifications to configurations, settings, and wiring may have on the safety of the machine/process.

The qualified person must be familiar with and understand the contents of the risk assessment as per ISO 12100-1 and/or any other equivalent assessment as well as all documents related to such risk assessment or equivalent assessments for the machine/process.

The qualified person must be familiar with the standards, provisions, and regulations for the prevention of industrial accidents, which they must observe when designing, implementing, and maintaining the machine/process.

The qualified person must be thoroughly familiar with the safety-related applications and the non-safety-related applications used to operate the machine/process.

INTENDED USE

This product described in the present document is a safety module intended to perform safety-related functions in a machine/process according to the present document, to the specified related documents, and to all other documentation of the components and equipment of the machine/process.

The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements and the technical data.

Prior to using the product, you must perform a risk assessment as per ISO 12100-1 in view of the planned application. Based on the results of the risk assessment, the appropriate safety-related measures must be implemented.

Since the product is used as a component in an overall machine or process, you must ensure the safety of persons by means of the design of this overall machine or process.

Operate the product only with the specified cables and accessories. Use only genuine accessories. Any use other than the use explicitly permitted is prohibited and can result in hazards.

About the Book



At a Glance

Document Scope

This manual describes technical characteristics, installation, commissioning, operation and maintenance of the safety module HR6S-EP.

Validity Note

The present document is valid for the products listed in the type code (*see page 19*).

Related Documents

Title of documentation	Reference number
HR6S-EP User Guide	HR9Z-B2194 (ENG) HR9Z-B2195 (JPN)
HR6S-EP Instruction Sheet	B-2175 (JPN, ENG, CHI)
HR6S-AF User Guide	HR9Z-B2192 (ENG) HR9Z-B2193 (JPN)
HR6S-AK User Guide	HR9Z-B2196 (ENG) HR9Z-B2197 (JPN)
HR6S-AT User Guide	HR9Z-B2198 (ENG) HR9Z-B2199 (JPN)
HR6S-DN User Guide	HR9Z-B2200 (ENG) HR9Z-B2201 (JPN)
HR6S-S User Guide	HR9Z-B2202 (ENG) HR9Z-B2203 (JPN)
HR6S-AF Instruction Sheet	B-2172 (JPN, ENG, CHI)
HR6S-AK Instruction Sheet	B-2178 (JPN, ENG, CHI)
HR6S-AT Instruction Sheet	B-2181 (JPN, ENG, CHI)
HR6S-DN Instruction Sheet	B-2184 (JPN, ENG, CHI)
HR6S-S Instruction Sheet	B-2187 (JPN, ENG, CHI)

Product Related Information

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Where 24 VDC or VAC is indicated, use PELV power supplies conforming to IEC 60204-1.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to this equipment.
- Use only the specified voltage when operating this equipment and any associated products.

Failure to follow these instructions will result in death or serious injury.

This equipment has been designed to operate outside of any hazardous location. Only install this equipment in zones known to be free of a hazardous atmosphere.

DANGER

POTENTIAL FOR EXPLOSION

Install and use this equipment in non-hazardous locations only.

Failure to follow these instructions will result in death or serious injury.

WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.¹
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

¹ For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

WARNING

INSUFFICIENT AND/OR INEFFECTIVE SAFETY-RELATED FUNCTIONS

- Verify that a risk assessment as per ISO 12100 and/or other equivalent assessment has been performed before this product is used.
- Before performing any type of work on or with this product, fully read and understand all pertinent manuals.
- Verify that modifications do not compromise or reduce the Safety Integrity Level (SIL), Performance Level (PL) and/or any other safety-related requirements and capabilities defined for your machine/process.
- After modifications of any type whatsoever, restart the machine/process and verify the correct operation and effectiveness of all functions by performing comprehensive tests for all operating states, the defined safe state, and all potential error situations.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Terminology Derived from Standards

The technical terms, terminology, symbols and the corresponding descriptions in this manual, or that appear in or on the products themselves, are generally derived from the terms or definitions of international standards.

In the area of functional safety systems, drives and general automation, this may include, but is not limited to, terms such as *safety*, *safety function*, *safe state*, *fault*, *fault reset*, *malfunction*, *failure*, *error*, *error message*, *dangerous*, etc.

Among others, these standards include:

Standard	Description
IEC 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2015	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
IEC 62061:2015	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2016	Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions.
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

In addition, terms used in the present document may tangentially be used as they are derived from other standards such as:

Standard	Description
IEC 60034 series	Rotating electrical machines
IEC 61800 series	Adjustable speed electrical power drive systems
IEC 61158 series	Digital data communications for measurement and control – Fieldbus for use in industrial control systems

Finally, the term *zone of operation* may be used in conjunction with the description of specific hazards, and is defined as it is for a *hazard zone* or *danger zone* in the *Machinery Directive (2006/42/EC)* and *ISO 12100:2010*.

Chapter 1

Introduction

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Device Overview	16
Front View and Side View	17
Nameplate	18
Type Code	19

Device Overview

Outline

The device is an extension module for compatible modules of the HR6S range. The extension module increases the number of safety-related outputs of the base safety module to which it is connected.

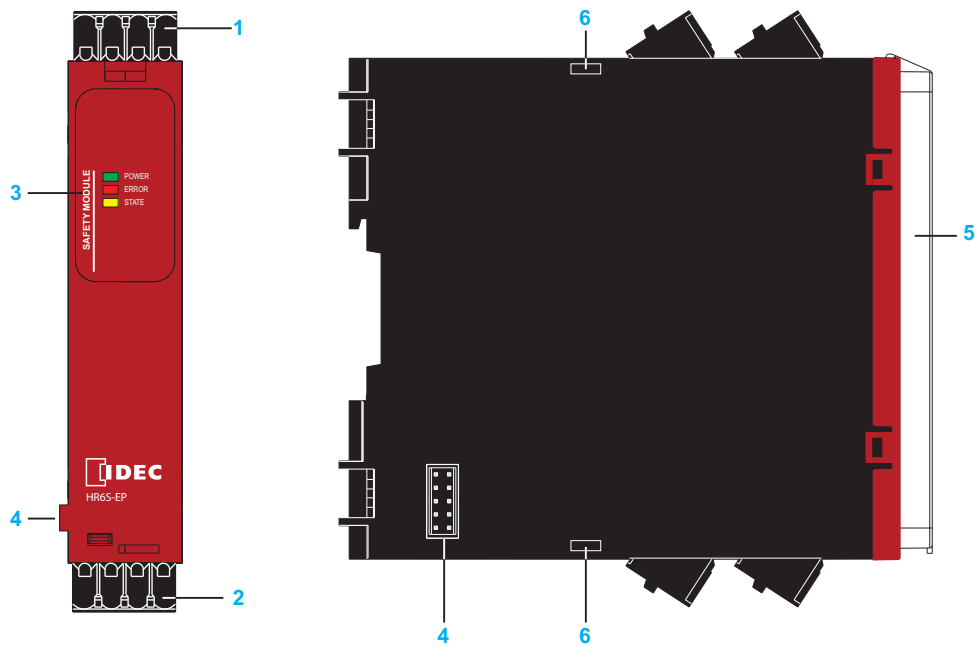
The device is available in two different types: Push-in terminals or screw terminals.

Feature summary:

- Supports the application functions of the base safety module to which the device is connected
- 6 safety-related relay outputs

Front View and Side View

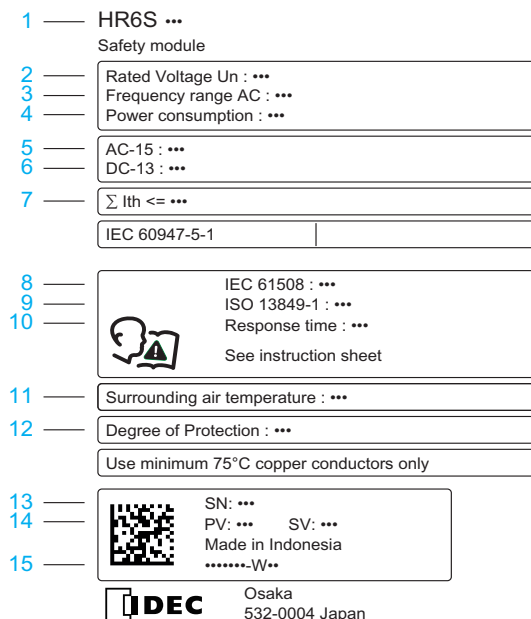
Front View and Side View



- 1 Removable terminal blocks, top
- 2 Removable terminal blocks, bottom
- 3 LED indicators
- 4 Connector for base safety module
- 5 Sealable transparent cover
- 6 Position of clips for mounting to base safety module

Nameplate

Nameplate



The nameplate contains the following data:

- 1 Device type (refer to chapter Type Code (*see page 19*))
- 2 Nominal voltage
- 3 Frequency range VAC supply
- 4 Input power
- 5 Maximum current of safety-related outputs with utilization category AC-15 (250 VAC)
- 6 Maximum current of safety-related outputs with utilization category DC-13 (24 VDC)
- 7 Maximum total thermal current
- 8 Maximum Safety Integrity Level (SIL) as per IEC 61508-1:2010
- 9 Maximum Performance Level and Category as per ISO 13849-1:2015
- 10 Maximum response time to request at safety-related input
- 11 Permissible ambient temperature range during operation
- 12 IP degree of protection
- 13 Serial number
- 14 Product version (PV), software version (SV)
- 15 Plant code and date of manufacture (example: PP-2019-W10 means plant code PP, year of manufacture 2019, week of manufacture 10)

Type Code

Type Code

Item	1	2	3	4		5	6	7	8
Type code (example)	H	R	6	S	–	E	P	1	C

Item	Meaning
1 ... 4	Product range HR6S: HR6S safety module
5 ... 6	Product version EP
7	Supply voltage 1 = 24 VAC/VDC
8	Terminal type C = Push-in terminals, removable P = Screw terminals, removable

If you have questions concerning the type code, contact your IDEC CORPORATION service representative.

Chapter 2

Technical Data

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Environmental Conditions	22
Mechanical Characteristics	24
Electrical Characteristics	26
Timing Data	28
Data Functional Safety	29

Environmental Conditions

Environmental Conditions For Storage

The device complies with class 1K5 as per IEC 60721-3-1 (climatic conditions):

Characteristic	Value
Ambient temperature	-40 ... 70 °C (-40 ... 158 °F)
Rate of change of temperature	1 °C/min (1.8 °F/min)
Ambient humidity	10 ... 100 % relative humidity

The device complies with class 1M2 as per IEC 60721-3-1 (mechanical conditions):

Characteristic	Value
Vibration, sinusoidal, displacement amplitude 2 ... 9 Hz	1.5 mm
Vibration, sinusoidal, acceleration amplitude 9 ... 200 Hz	5 m/s ²
Shock, shock response spectrum type L, peak acceleration	40 m/s ²

Environmental Conditions For Transportation

The device complies with class 2K5H as per IEC 60721-3-2 (climatic conditions):

Characteristic	Value
Ambient temperature	-25 ... 85 °C (-13 ... 185 °F)
Change of temperature, air/air	-25 ... 30 °C (-13 ... 86 °F)
Ambient humidity	5 ... 95 % relative humidity, no condensation

The device complies with class 2M2 as per IEC 60721-3-2 (mechanical conditions):

Characteristic	Value
Vibration, sinusoidal, displacement amplitude 2 ... 9 Hz	3.5 mm
Vibration, sinusoidal, acceleration amplitude 9 ... 200 Hz	10 m/s ²
Vibration, sinusoidal, acceleration amplitude 200 ... 500 Hz	15 m/s ²
Shock, shock response spectrum type I, peak acceleration	100 m/s ²
Shock, shock response spectrum type II, peak acceleration	300 m/s ²

Environmental Conditions For Operation

Characteristic	Value
Maximum installation altitude above mean sea level	2000 m (6562 ft)
Installation required in control cabinet/enclosure with degree of protection	IP54

The device complies with class 3K5 and special class 3Z11 as per IEC 60721-3-3 (climatic conditions):

Characteristic	Value
Ambient temperature	-25 ... 55 °C (-13 ... 131 °F), no icing
Rate of change of temperature	0.5 °C/min (0.9 °F/min)
Ambient humidity	5 ... 95 % relative humidity, no condensation

The device complies with class 3M4 as per IEC 60721-3-3 (mechanical conditions):

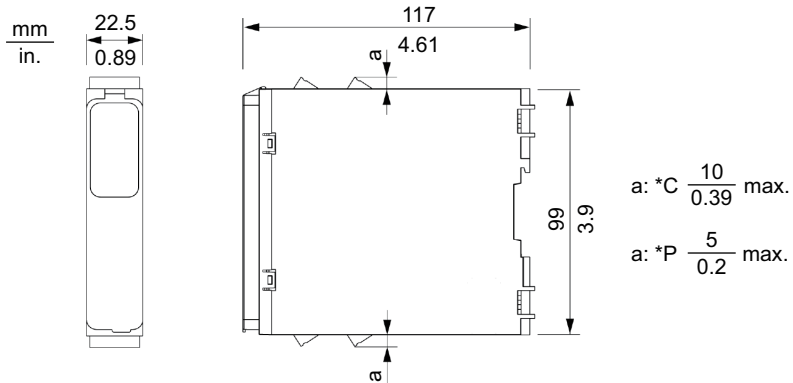
Characteristic	Value
Vibration, sinusoidal, displacement amplitude 2 ... 9 Hz	3 mm
Vibration, sinusoidal, acceleration amplitude 9 ... 200 Hz	10 m/s ²
Shock, shock pulse shape: half-sine, peak acceleration	100 m/s ²

The devices complies with the following vibration and shock values as per IEC 60947-1:

Characteristic	Value
Vibration, sinusoidal, displacement amplitude 2 ... 13 Hz	1 mm
Vibration, sinusoidal, acceleration amplitude 13.2 ... 100 Hz	7 m/s ²
Shock, shock pulse shape: half-sine, peak acceleration	150 m/s ²

Mechanical Characteristics

Dimensions



Characteristic	Value	
	HR6S-EP1C	HR6S-EP1P
Width	22.5 mm (0.89 in)	
Height without terminals	99 mm (3.9 in)	
Height with terminals	119 mm (4.7 in)	109 mm (4.3 in)
Depth	117 mm (4.61 in)	

Weight

Characteristic	Value
Weight	0.2 kg (0.44 lbs)

Degree Of Protection

Characteristic	Value
Housing	IP40
Terminals	IP20

Wire Cross Sections, Stripping Lengths, and Tightening Torques

Characteristic	Value
Stripping length for Push-in terminals	12 mm (0.47 in)
Stripping length for screw terminals	7 ... 8 mm (0.28 ... 0.31 in)
Wire cross section, single wire without wire ferrule ⁽¹⁾	0.2 ... 2.5 mm ² (24 ... 12 AWG)
Wire cross section, single wire with wire ferrule	0.25 ... 2.5 mm ² (24 ... 12 AWG)
Wire cross section, two wires without wire ferrule ⁽¹⁾	0.2 ... 1.5 mm ² (24 ... 16 AWG)
Wire cross section, two wires with uninsulated wire ferrule	0.25 ... 1 mm ² (24 ... 18 AWG)
Wire cross section, two wires with insulated wire ferrule	0.5 ... 1.5 mm ² (20 ... 16 AWG)
Tightening torque for screw terminals	0.5 ... 0.6 N m (4.4 ... 5.3 lb in)
(1) Stranded or solid	

Electrical Characteristics

Supply

Characteristic	Value
Supply voltage AC	24 VAC (-15 ... 10 %)
Supply voltage DC	24 VDC (-20 ... 20 %)
Nominal input power AC	3.5 VA (24 VAC)
Nominal input power DC	1.5 W (24 VDC)
Frequency range AC	50 ... 60 Hz
Overvoltage category	II
Pollution degree	2
Insulation voltage	300 V
Impulse withstand voltage	4 kV

Electromagnetic Compatibility (EMC)

Characteristic	Value
Conducted and radiated emissions as per IEC CISPR 11	Group 1/class B
Usage in environment as per IEC/UL 60947-1	Environment B

Common Reference Potential

Terminal B2 is provided to obtain a common reference potential for 24 VDC signals.

Safety-Related Outputs

Characteristic	Value
Number of relay contacts, Normally Open ⁽¹⁾	4
Number of relay contacts, Normally Closed ⁽¹⁾	2
Maximum short circuit current I _K	1 kA
Maximum continuous current, Normally Open relay contacts	6 A
Maximum continuous current, Normally Closed relay contacts	3 A
Maximum total thermal current $\sum I_{th}$	12 A
Minimum current	10 mA
Minimum voltage	5 V
Utilization category as per UL 60947-5-1	B300 and R300 for Normally Open contacts D300 and R300 for Normally Closed contacts
Utilization category as per IEC 60947-4-1 and IEC 60947-5-1)	AC-1: 250 V AC-15: 250 V DC-1: 24 V DC-13: 24 V
Maximum current, normally open relay contacts	AC-1: 5 A AC-15: 3 A DC-1: 5 A DC-13: 3 A
Maximum current, normally closed relay contacts	AC-1: 3 A AC-15: 1 A DC-1: 3 A DC-13: 1 A
External fusing	10 A, category gG, for Normally Open 4 A, category gG, for Normally Closed
(1) Depending on the configuration of the base safety module, the relay contacts can be used as instantaneous or delayed relay contacts.	

Timing Data

Maximum Response Times

Characteristic	Value
Maximum response time to request at safety-related input	20 ms
Maximum response time after power outage AC	140 ms
Maximum response time after power outage DC	100 ms

Recovery Time

Characteristic	Value
Recovery time after request at safety-related input of base safety module	200 ms

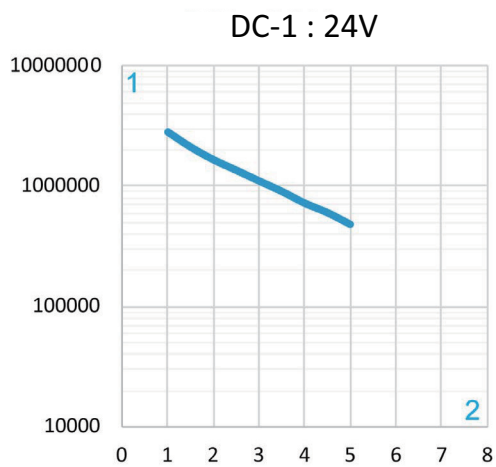
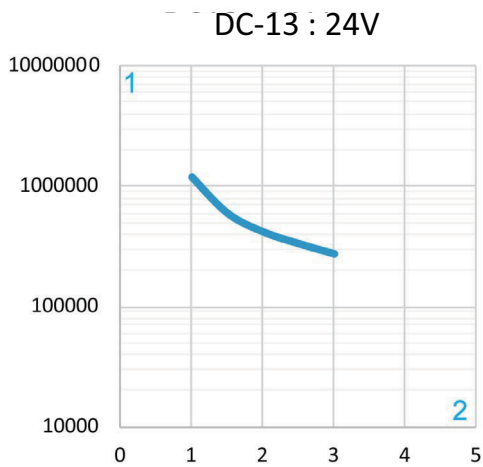
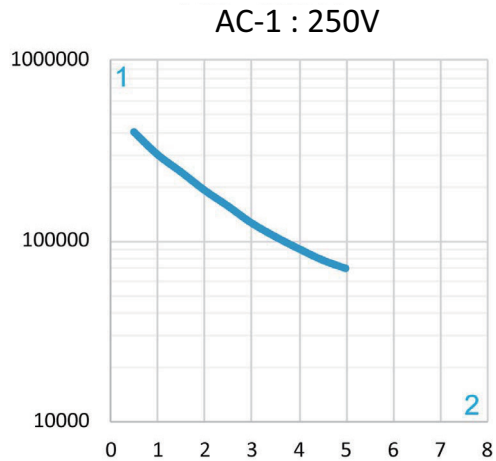
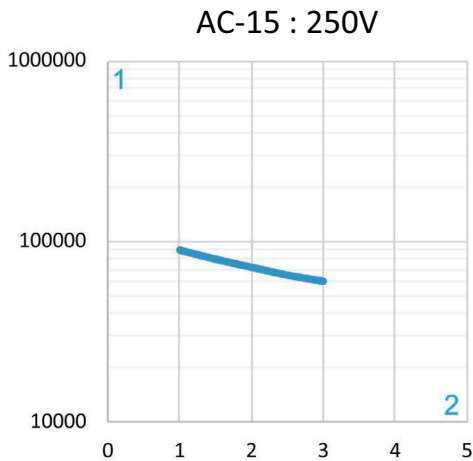
See Instruction Sheet and User Guide of the base safety module for other timing data.

Data Functional Safety

Data Functional Safety

Characteristic	Value
Defined safe state	Safety-related outputs are de-energized Normally Open: open Normally Closed: closed
Maximum Performance Level (PL), Category (as per ISO 13849-1:2015)	Normally Open: PL e, Category 4 Normally Closed: PL c, Category 1 Actual PL and category depend on wiring and configuration.
Maximum Safety Integrity Level (SIL) (as per IEC 61508-1:2010)	Normally Open: 3 Normally Closed: 1 Actual SIL depends on wiring and configuration.
Safety Integrity Level Claim Limit (SILCL) (as per IEC 62061:2005+AMD1:2012+AMD2:2015)	Normally Open: 3 Normally Closed: 1 Actual SILCL depends on wiring and configuration.
Type (as per IEC 61508-2)	A
Hardware Fault Tolerance (HFT) (as per IEC 61508 and IEC 62061)	1
Stop Category for Emergency Stops (as per ISO 13850 and IEC 60204-1)	0 or 1, depends on base safety module
Lifetime in years at an ambient temperature of 55 °C (131 °F) (as per IEC 61508)	20
Safe Failure Fraction (SFF) (as per IEC 61508 and IEC 62061)	>99 %
Probability of Dangerous Failure per hour (PFH _D) in 1/h (as per IEC 61508 and ISO 13849-1)	0.97×10^{-9}
Mean Time To Dangerous Failure (MTTF _D) in years (high as per ISO 13849-1)	>30
Average Diagnostic Coverage (DC _{avg}) (high as per ISO 13849-1)	≥99 %
Maximum number of cycles over lifetime	DC-13, 24 VDC 1 A: 1,200,000 DC-13, 24 VDC 3 A: 275,000 AC-1, 250 VAC 4 A: 90,000 AC-15, 250 VAC 1 A: 90,000 AC-15, 250 VAC 3 A: 60,000

Electrical durability of the safety-related output relay contacts as per IEC 60947-5-1



- 1 Operating cycles
- 2 Rated current in A

Refer to chapter Timing Data ([see page 28](#)) for additional technical data that may affect your functional safety calculations.

Chapter 3

Engineering

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Electromagnetic Compatibility (EMC)	32
Engineering	33

Electromagnetic Compatibility (EMC)

Conducted and Radiated Electromagnetic Emissions

WARNING

INSUFFICIENT ELECTROMAGNETIC COMPATIBILITY

- Verify compliance with all EMC regulations and requirements applicable in the country in which the device is to be operated and with all EMC regulations and requirements applicable at the installation site.
- Implement all required radio interference suppression measures and verify their effectiveness.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

According to IEC CISPR 11, device type HR6S-EP1* is a group 1, class B device. Class B as per IEC CISPR 11 corresponds to environment B as per IEC 60947-1.

Engineering

Overview

The device is an extension module for safety modules of the HR6S range featuring a matching extension module connector. The extension module increases the number of safety-related outputs of the base safety module to which it is connected.

Refer to the User Guide of the base safety module for information on engineering.

Application Functions and Start Functions

The device supports the application functions and start functions provided by the base safety module. Refer to the User Guide of the base safety module for details.

Delay Function

If the device is connected to the base safety module HR6S-AT, the delay function of the base safety module can be used. The delay function allows for delayed deactivation of the safety-related outputs. Refer to the User Guide of the base safety module for details.

Chapter 4

Installation

What Is in This Chapter?


This chapter contains the following topics:

Topic	Page
Prerequisites and Requirements	36
Mechanical Installation	38
Electrical Installation	40

Prerequisites and Requirements

Inspecting the Device

Damaged products may cause electric shock or unintended equipment operation.

 DANGER
ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION
<ul style="list-style-type: none">• Do not use damaged products.• Keep foreign objects (such as chips, screws or wire clippings) from getting into the product.
Failure to follow these instructions will result in death or serious injury.

Verify the product type by means of the type code (*see page 19*) and the data printed on the device.

Control Cabinet/Enclosure

Install the device in a control cabinet or enclosure with degree of protection IP54 that is secured by a keyed or tooled locking mechanism.

The ventilation of the control cabinet/enclosure must be sufficient to comply with the specified ambient conditions for the device and the other components operated in the control cabinet/enclosure.

Mechanical Installation

Connecting the Extension Module to the Base Safety Module.

DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Only mount the device to a base safety module after having removed all power from all devices and confirmed the absence of power using a properly rated voltage sensing device.

Failure to follow these instructions will result in death or serious injury.

Prior to mounting the extension module in the control cabinet or enclosure, connect it to the base safety module.

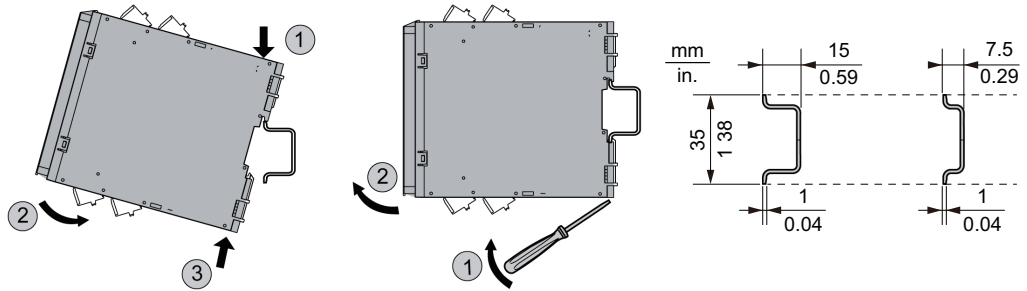
Procedure:

Step	Action
1	Remove the label from the extension module connector at the right-hand side of the base safety module.
2	Align the extension module with the base safety module.
3	Push the connector of the extension module into the connector of the base safety module until the two clips at the modules snap in.
4	Mount the connected extension module and the base safety module according to the required mounting method.

Mounting to DIN Rail

The device can be mounted to the following DIN rails as per IEC 60715:

- 35 x 15 mm (1.38 x 0.59 in)
- 35 x 7.5 mm (1.38 x 0.29 in)



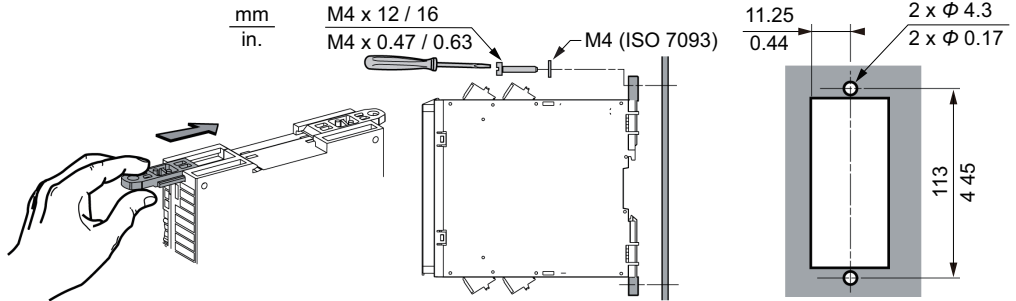
Mounting procedure (left illustration)

Step	Action
1	Slightly tilt the device and hook it onto the DIN rail.
2	Push the lower part of the device towards the DIN rail.
3	Snap in the DIN rail clip.

Dismounting procedure (center illustration)

Step	Action
1	Unlock the DIN rail clip using a screwdriver.
2	Pull the lower part of the device away from the DIN rail and lift the device towards the top to remove it from the DIN rail.

Screw-Mounting



Mounting procedure:

Step	Action
1	Push the additional fastener into the grooves at the device.
2	Prepare the holes on the mounting surface.
3	Screw the device to the mounting surface using the specified screws and a washer M4 as per ISO 7093 for each screw.

Disconnecting the Extension Module from the Base Safety Module

Procedure:

Step	Action
1	Push down the two clips of the device until they disengage from the locks at the base safety module.
2	Pull the device away from the base safety module.
3	Reattach the original label or an adhesive tape to the extension module connector at the right-hand side of the base safety module.

Electrical Installation

General Information

DANGER

FIRE, ELECTRIC SHOCK OR ARC FLASH

- Disconnect all power from all equipment of your machine/process prior to electrical installation of the device.
- Confirm the absence of power using a properly rated voltage sensing device.
- Place a "Do Not Turn On" or equivalent hazard label on all power switches and lock them in the non-energized position.

Failure to follow these instructions will result in death or serious injury.

The device is installed together with the base safety module to which it is connected. Refer to the User Guide of the base safety module (*see page 9*) for information on wiring the base safety module (safety-related inputs, additional, non-safety-related outputs, start input, common reference potential).

Connect the device to the base safety module (*see page 37*) before wiring it.

Wire the safety-related outputs and the power supply of the device as described in the following sections.

You can wire the device with the terminal blocks in the device or you can remove the terminal blocks. For the latter, pull the terminal blocks out of the device, connect the individual terminals and push the terminal blocks back into the device.

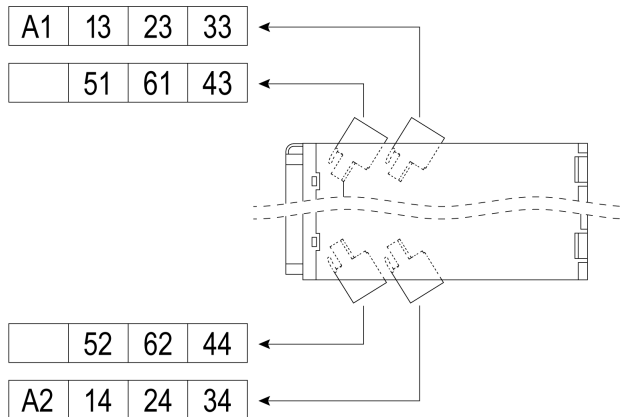
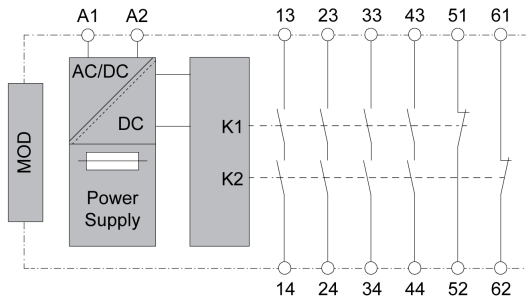
Use 75 °C (167 °F) copper conductors to wire the device.

Wire Cross Sections, Stripping Lengths, and Tightening Torques

Characteristic	Value
Stripping length for Push-in terminals	12 mm (0.47 in)
Stripping length for screw terminals	7 ... 8 mm (0.28 ... 0.31 in)
Wire cross section, single wire without wire ferrule ⁽¹⁾	0.2 ... 2.5 mm ² (24 ... 12 AWG)
Wire cross section, single wire with wire ferrule	0.25 ... 2.5 mm ² (24 ... 12 AWG)
Wire cross section, two wires without wire ferrule ⁽¹⁾	0.2 ... 1.5 mm ² (24 ... 16 AWG)
Wire cross section, two wires with uninsulated wire ferrule	0.25 ... 1 mm ² (24 ... 18 AWG)
Wire cross section, two wires with insulated wire ferrule	0.5 ... 1.5 mm ² (20 ... 16 AWG)
Tightening torque for screw terminals	0.5 ... 0.6 N m (4.4 ... 5.3 lb in)
(1) Stranded or solid	

Block Diagram and Terminals

The following drawings present the block diagram and the terminals with their designations in the removable terminal blocks.



Terminal Designation	Explanation
A1, A2	Power supply
13, 14, 23, 24, 33, 34, 43, 44, 51, 52, 61, 62	Terminals of the safety-related outputs
MOD	Connector for base safety module

Safety-Related Outputs

Install fuses with the rating specified in the chapter Electrical Characteristics (*see page 27*).

Power Supply

Connect the terminals A1 and A2 to a power supply providing the supply voltage specified for the device in the chapter Electrical Characteristics (*see page 26*).

For startup, power must be applied to the device and to the base safety module to which it is connected at the same time.

Chapter 5

Functions

Functions

Overview

The device supports the functions selected by means of the application function selector and the start function selector of the base safety module to which it is connected. If the device is connected to an HR6S-AT, the safety-related outputs can also be used as delayed outputs as configured with the delay function selectors of the HR6S-AT.

For details, refer to the User Guide of the base safety module (*see page 9*) to which the device is connected.

Chapter 6

Configuration and Commissioning

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Configuration	46
Commissioning	47

Configuration

Overview

The device is configured via the base safety module to which the device is connected. Refer to the User Guide of the base safety module (*see page 9*) for additional information.

The device must be installed and wired according to the requirements of the safety-related function to be implemented before you can configure it.

Commissioning

Overview

WARNING

INEFFECTIVE SAFETY-RELATED FUNCTION AND/OR UNINTENDED EQUIPMENT OPERATION

- Commission the device before it is used for the first time and after each configuration.
- Commission or recommission the machine/process pursuant to all regulations, standards, and process definitions applicable to your machine/process.
- Only start the machine/process if there are no persons or obstructions in the zone of operation.
- Verify correct operation and effectiveness of all functions by performing comprehensive tests for all operating states, the defined safe state, and all potential error situations.
- Document all modifications and the results of the commissioning procedure in compliance with all regulations, standards, and process definitions applicable to your machine/process.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The device is commissioned together with the base safety module to which the device is connected. Refer to the User Guide of the base safety module (*see page 9*) for additional information.

Chapter 7

Diagnostics

Diagnostics via LEDs

Overview

The device features various LEDs (*see page 17*) that provide status information and information on alerts and detected errors.

For diagnostics, also refer to the LEDs of the base safety module to which the device is connected.

LED POWER

State	Meaning
Off	No power supply
Solid on	Power supply on

LED STATE

This LED provides information on the state of the safety-related outputs.

State	Meaning
Off	Safety-related outputs deactivated
Solid on	Safety-related outputs activated

LED ERROR - Detected Errors

This LED lights solid in conjunction with additional LEDs to indicate detected errors. In the case of a detected error, the device transitions to the defined safe state. You must remove the cause of the detected error and perform a power cycle of the device and of the base safety module to which the device is connected to exit the defined safe state and resume operation. Ensure that power is applied to the device and to the base safety module at the same time. Contact your IDEC CORPORATION service representative if the condition persists.

State	In conjunction with additional LEDs		Meaning	Remedy
	Additional LEDs	State of additional LEDs		
Solid on	POWER and STATE	Flashing	General error detected.	<ul style="list-style-type: none"> • Verify correct wiring.
Solid on	POWER	Flashing	Power supply error detected.	<ul style="list-style-type: none"> • Verify correct wiring. • Use a suitable power supply.
Solid on	STATE	Flashing	Error detected at safety-related output.	<ul style="list-style-type: none"> • Perform a power cycle.

Chapter 8

Accessories, Service, Maintenance, and Disposal

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Accessories	52
Maintenance	53
Transportation, Storage, and Disposal	54
Service Addresses	55

Accessories

Accessories

The following accessories are available for the device:

Description	Type number
<p>Coding bits The coding bits are used if the terminal blocks are removed to help ensure correct insertion of the terminal blocks into the device. 30 pieces per packaging unit</p>	<p>HR9Z-EC</p>
<p>Sealing strips The uniquely numbered sealing strips are used to seal the transparent front cover of the device to help prevent unauthorized access to the configuration selectors. 10 pieces per packaging unit</p>	<p>HR9Z-ES</p>

Maintenance

Service and Repairs

The device contains no user-serviceable parts. Do not attempt to open, service, or repair the device.

Maintenance Plan

Maintenance plan:

- Ensure that a safety-related function implemented with the device is triggered at the minimum intervals required by the regulations, standards, and process definitions applicable to your machine/process.
- Inspect the wiring at regular intervals.
- Tighten the threaded connections at regular intervals.
- Verify that the device is not used beyond the specified lifetime (*see page 29*).

To determine the end of the lifetime, add the specified lifetime to the date of manufacture indicated on the nameplate (*see page 18*) of the device.

Example: If the date of manufacture indicated on the nameplate is 2019-W10, do not use the device after week 10, 2039.

As a machine designer or system integrator, you must include this information in the maintenance plan for your customer.

Transportation, Storage, and Disposal

Transportation and Storage

Ensure that the environmental conditions (*see page 22*) specified for transportation and storage are respected.

Disposal

Dispose of the product in accordance with all applicable regulations.

Service Addresses

If service support is required, please contact:

APEM SAS

55, Avenue Edouard Herriot BP1, 82303 Caussade Cedex, France

<http://eu.idec.com>

Additional Contact Addresses

See the homepage for additional contact addresses:

<http://www.idec.com>

HR6S Series

Safety module

HR6S-EP

- B-2194 (0)
- August, 2020
- 2-6-64 Nishimiyahara, Yodogawa-ku, Osaka, 532-0004 Japan

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