



**CARLO GAVAZZI**

**ESI**

**Electromagnetic safety interlock  
with separated actuator**

**Instruction manual**

**Manuale d'istruzione**

**Betriebsanleitung**

**Manuel d'instructions**

**Manual de instrucciones**

**Brugervejledning**

**使用手册**

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# ESI - Instruction manual

## Electromagnetic safety interlock with separated actuator


### Ownership


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### Safety messages


The following symbols are used in this document to indicate warning concerning the user and/or the safety device:

 **Danger!** a potentially risky situation which could lead to death or serious physical injury.

 **Warning:** indicates actions that if not observed may lead to damage to the device.

 **Attention:** Only CARLO GAVAZZI technical service personnel are authorized to open the safety device.

### General information

 **Information:** This manual should be consulted for all situations related to installation and use. It must be kept in good condition and in a clean location accessible to all operators.

### Service and warranty

In the event of malfunction or requests for information please contact the CARLO GAVAZZI branch or distributor in your country.

# 1. Introduction

## 1.1 Description

The Carlo Gavazzi safety switches are devices designed and manufactured in accordance with IEC international standards and EN European regulations.

This device is used on machines where the hazardous conditions remain for a while after the stop signal generation and is helpful for the realization of safety systems in accordance with ISO14119, performing a personal protection function.

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## 1.2 Validity of documentation

This documentation is valid only for ESI products and until new documentation is published. This instruction manual describes the function, operation and installation of the product. It is the user responsibility to decide if the interlock is correctly suited to the application.

## 1.3 How to use the documentation

This user manual must be read and completely understood by personnel dealing with all the uses of the safety switches prior to carrying out any operation involving the interlock.

Please keep this document for future reference.

All the operations described in this manual must be carried out exclusively by specialized personnel, carefully following all the instructions given.

## 1.4 Use of the product

This device is useful for guarantee the safety of the operator in case of machines where the hazardous conditions remains for a while time after the generation of the stop signal, because of the mechanical inertia of moving parts, components under pressure or with high temperatures.

Use the switch by following its instructions, observing its operations limits and using it in accordance with the safety standards in force.

The manufacturer refuse all responsibility in case of non-respect of safety instruction, installation and repairs not performed by qualified staff, use not in accordance with the destination and omission of test.

A wrong installation or a tampering device can cause serious injury. The installation therefore must be performed according to the standards in effect and by qualified staff only. It is also recommended to check the operation before putting the machine into service and verify periodically the proper operation of the device.

## 2. Safety

### 2.1 Functional safety

The EC machinery directive stipulates that machinery should not pose a danger (risk assessment in accordance with EN ISO 12100). Given that there is no such thing as zero risk in technology, the aim is to achieve an acceptably low level of risk. If safety is dependent on control systems, these must be designed so that the probability of functional faults is sufficiently low.

To meet this requirement, it makes sense to use harmonized standards like EN ISO 13849-1 and/or EN 62061.

Before using an electromagnetic safety interlock it is necessary to perform a safety assessment in accordance with the Machinery Directive.

Functional safety is guaranteed for the product as a single component. However, this does not guarantee the functional safety of the overall system. In order to achieve the required safety level for the overall system, the safety requirements for the plant/machine must be defined, and then how these requirements must be implemented from a technical standpoint.

Electromagnetic safety interlocks are built to the following safety levels: SIL 3, PL e, Interlock type 2, in accordance with the applicable standards. However, the definitive SIL and PL of the application will depend on the number of safety components, their parameters and the connections that are made, as per the risk analysis.

An in-depth risk analysis must be performed to determine the appropriate safety level for each specific application, on the basis of all the applicable standards.

Installation of the ESI is the sole responsibility of the installer or the user.

The device must be installed in accordance with the specific risk analysis of the application and all the applicable standards.




Carlo Gavazzi is not responsible for these operations or for any risks in connection with them. Reference should be made to the manual and to the relative product and/or application standards to ensure correct use of any devices connected to the safety interlock within the specific application. The ambient temperature where the system is installed must be compatible with the operating temperature parameters stated on the product label and in the specifications.

For all matters concerning safety, if necessary contact your country's official safety authority or trade association.

### 3. Features

The Carlo Gavazzi safety switches are devices designed and manufactured in accordance with IEC international standards and EN European regulations.

This device is used on machines where the hazardous conditions remain for a while after the stop signal generation and is helpful for the realization of safety systems in accordance with ISO14119, performing a personal protection function.

Features	Description
<b>Enhancing safety</b>	Ideal for applications that require access to remain closed and locked until potential hazards have stopped or come to a predetermined safe state.
<b>Easy to install and cost effective</b>	Protecting machines from interruptions in production
<b>Standards compliance</b>	SIL 3 in accordance with EN 62061, PL e in accordance with EN ISO 13849-1, interlock type 2 in accordance with EN ISO 14119.
<b>High performance</b>	Reinforced polymeric casing with a protection degree IP65, operation range from -25°C to +55°C, retention force 1200N.
<b>Approvals</b>	  

### 4. Technical data

4.1 General	
<b>Casing</b>	Polimeric
<b>Weight</b>	440g
4.2 Performance	
<b>Max actuating speed</b>	20 m/min
<b>Switching frequency</b>	600 cycles/h
<b>Load factor</b>	0.5
<b>Retention force at locked actuator</b>	1200N
<b>Resistance between contacts</b>	25 mΩ
<b>Mechanical durability</b>	1 million of operations
<b>B10d</b>	4 million of operations

### 4.3 Contact block

<b>Rated operating current AC-15</b>	24V - 10A
<b>Rated operating current AC-15</b>	230V - 4A
<b>Rated operating current DC-13</b>	24V - 4A
<b>Rated impulsive withstand voltage Uimp</b>	2,5 kV
<b>Conventional free air thermal current Ith</b>	10A

### 4.4 Connection specifications




<b>Connecting terminals</b>	M3 screws with cable clamp
<b>Wiring dimensions</b>	0.34 - 1.5 mm <sup>2</sup>



#### Warning:

Use only copper conductors 60/70°C, AWG14-18, stranded and solid conductor. Clamps tightening torque 0.8Nm.

### 4.5 Compatibility and conformity

<b>Standard compliance</b>	Low Voltage Directive 2014/35/EU in accordance with EN/IEC 60947-5-1 Machinery Directive 2006/42/CE in accordance with EN ISO 14119 SIL 3 in accordance with EN 62061 PL e in accordance with EN ISO 13849-1 Interlock type 2 in accordance with EN ISO 14119
<b>Terminal marking</b>	In accordance with IEC 60947-5-1
<b>Approvals</b>	  

### 4.6 Environmental

<b>Operating temperature</b>	-25 ÷ 55°C
<b>Environmental designation</b>	Type-1 enclosure
<b>Protection against electrical shock</b>	Classe II
<b>IP protection degree</b>	IP65
<b>Rated insulation voltage Ui</b>	250V
<b>Utilization category according to UL508</b>	A300 - Q300



#### Information:

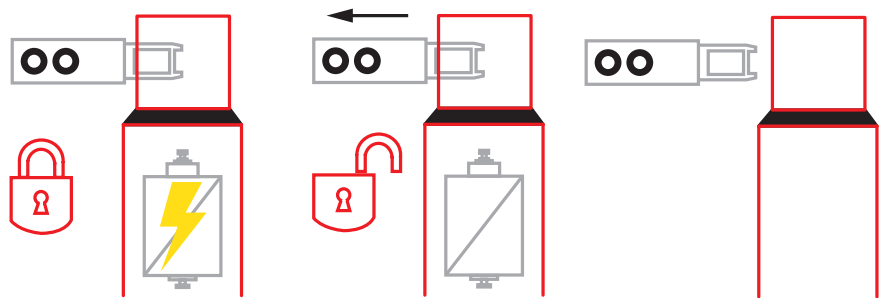
You must comply with the safety-related parameters in order to ensure the required safety level for your plant/machine. All the units which use a safety function must be considered when calculating the overall safety level.

## 5. Types of interlock

### 5.1 Electrical interlock

<b>Locking</b>	Actuator locked when the solenoid is activated.
<b>Unlocking</b>	The release is possible by switching off the power supply.

Situation	DANGEROUS	SAFETY	
<b>Example</b>	Mechanical parts in movement	Turn off machinery, end of inertia	
<b>Actuator</b>	Inserted and locked	Inserted and unlocked	Not inserted
<b>Solenoid</b>	Excited	Not-excited	-



Type	Actuation			
ESI31	1NC actuator	11 ——— 12	11 ——— 12	11 ——— 12
	1NC solenoid	21 ——— 22	21 ——— 22	21 ——— 22
	1NO solenoid	33 ——— 34	33 ——— 34	33 ——— 34
	1NC solenoid	41 ——— 42	41 ——— 42	41 ——— 42
ESI22	1NO actuator	13 ——— 14	13 ——— 14	13 ——— 14
	1NC solenoid	21 ——— 22	21 ——— 22	21 ——— 22
	1NO solenoid	33 ——— 34	33 ——— 34	33 ——— 34
	1NC solenoid	41 ——— 42	41 ——— 42	41 ——— 42
ESI13	1NO actuator	13 ——— 14	13 ——— 14	13 ——— 14
	1NC solenoid	21 ——— 22	21 ——— 22	21 ——— 22
	1NC solenoid	31 ——— 32	31 ——— 32	31 ——— 32
	1NC actuator	41 ——— 42	41 ——— 42	41 ——— 42



#### Attention:

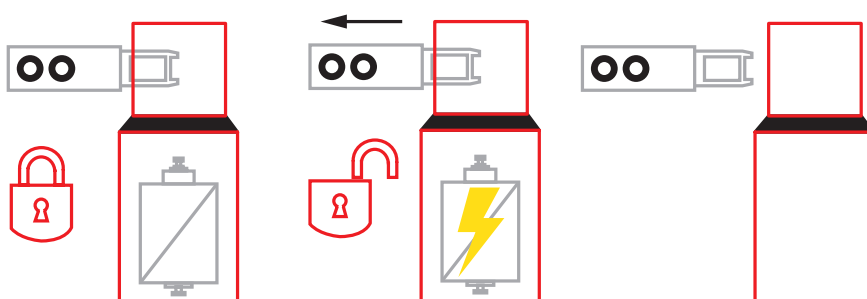
In case of lack of voltage the device allows the immediate access to the protected area



## 5.2 Mechanical interlock

<b>Locking</b>	Actuator locked when the solenoid is not activated.
<b>Unlocking</b>	The release is possible by supplying the device.

Situation	DANGEROUS	SAFETY	
<b>Example</b>	Mechanical parts in movement	Turn off machinery, end of inertia	
<b>Actuator</b>	Inserted and locked	Inserted and unlocked	Not inserted
<b>Solenoid</b>	Not-excited	Excited	-




















Type	Actuation			
ESI31	1NC actuator	11		12
	1NC solenoid	21		22
	1NO solenoid	33		34
	1NC solenoid	41		42
ESI22	1NO actuator	13		14
	1NC solenoid	21		22
	1NO solenoid	33		34
	1NC solenoid	41		42
ESI13	1NO actuator	13		14
	1NC solenoid	21		22
	1NC solenoid	31		32
	1NC actuator	41		42



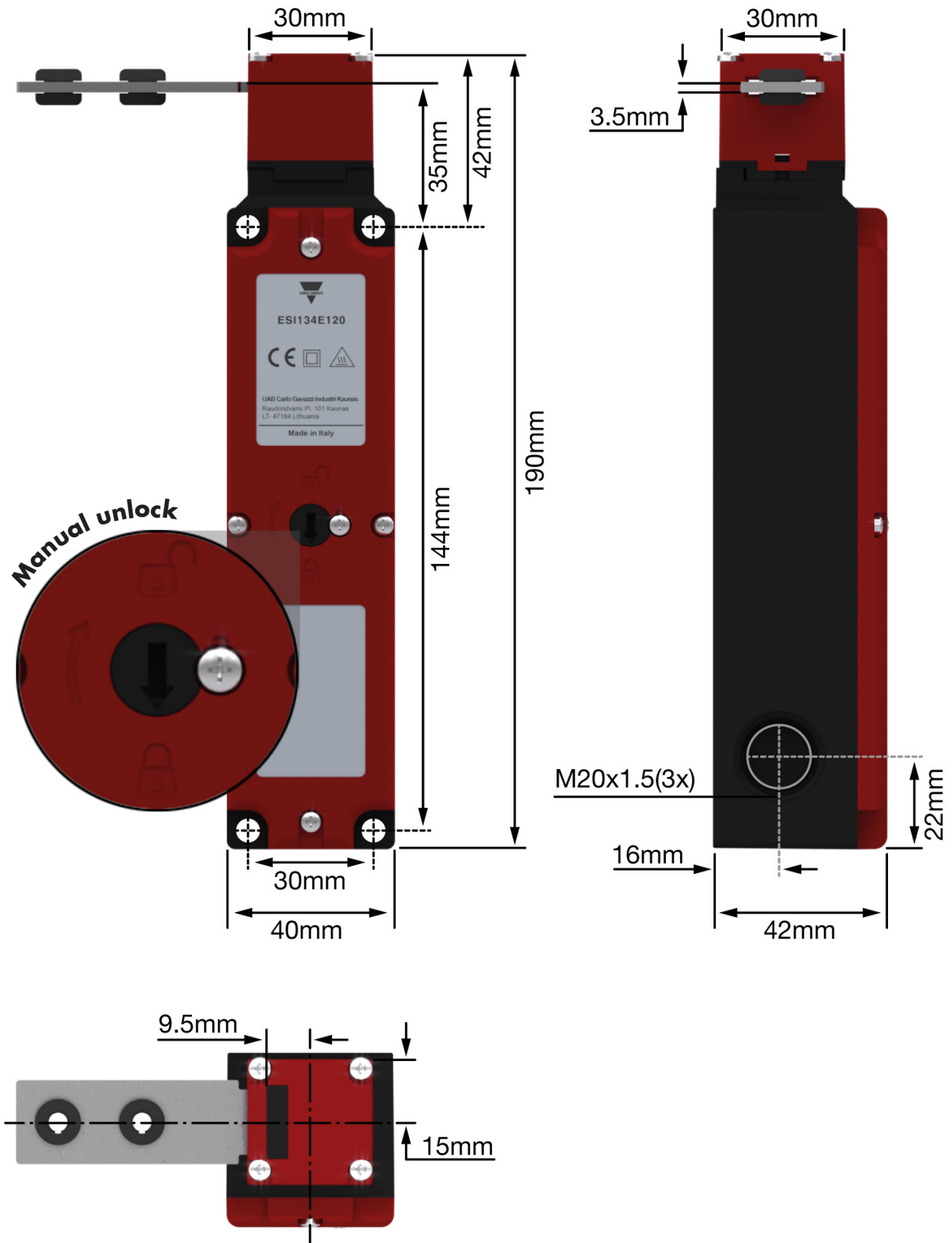
### Information:

The devices are equipped with a manual unlock device with security screw. The arrow on the cover shows the device status. The unlock can be activated by unscrewing the security screw and turning of 180°. In order to avoid misuse the devices with the security screw sealed by paint. **See paragraph 7. Dimensions**


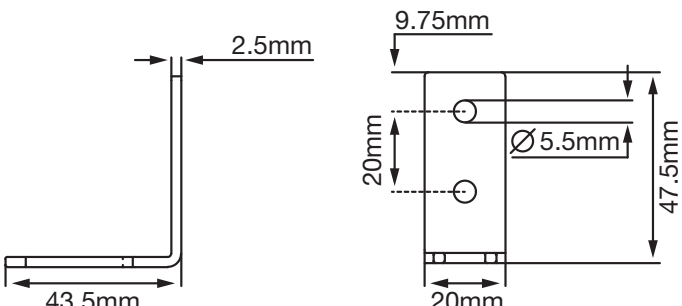
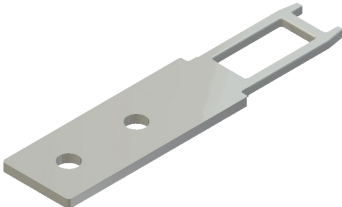
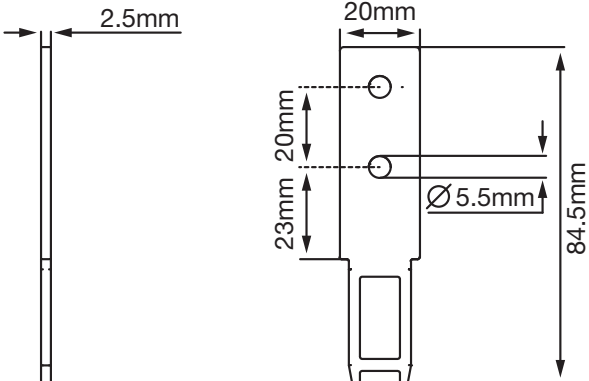
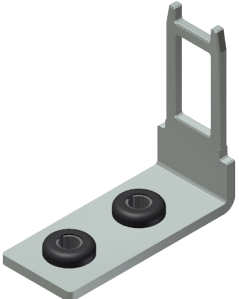
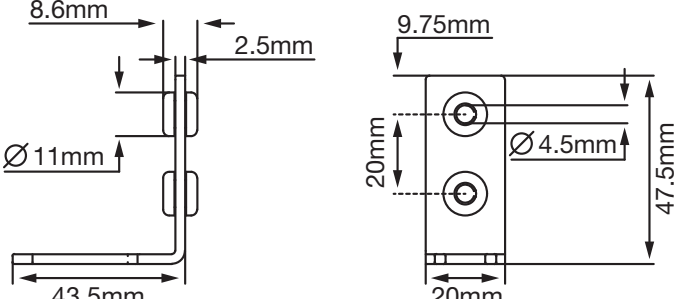
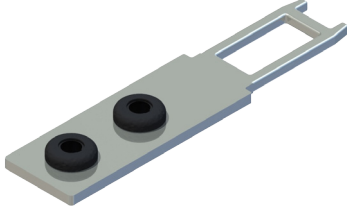
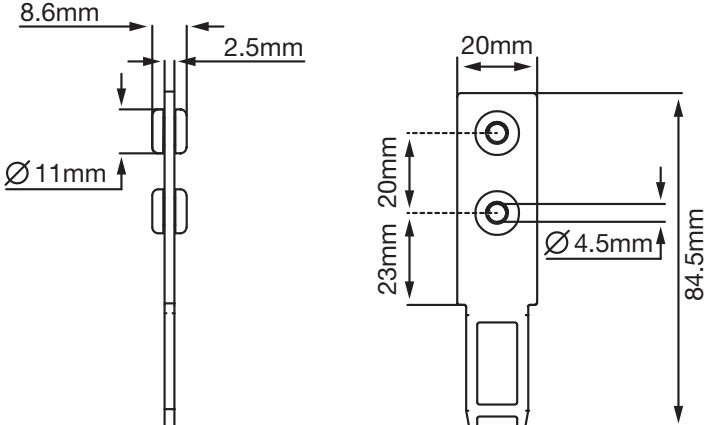
## 6. Installation and environmental conditions

	<b>Danger!</b> Do not install in presence of explosive or inflammable gas.
	<b>Danger!</b> Turn off the power supply before approaching to the switch contacts, also during the wiring.
	<b>Warning:</b> Do not use in environments with presence of dust and dirtiness.
	<b>Warning:</b> Do not install in presence of strong vibrations. Shocks and vibrations can in fact preclude the proper operations of the device.
	<b>Warning:</b> Do not disassemble and reassemble the operating head: this operation, if done so not suitable, can cause malfunctions.
	<b>Warning:</b> Do not remove the microswitch inside: a rough placement can preclude the proper operations.
	<b>Warning:</b> Take care to us only actuators manufactured by Carlo Gavazzi. The use of any other actuator does not guarantee the safety of the system. Do not use with damaged or deformed actuator.
	<b>Warning:</b> Install in way that the actuator cannot damage the operator in condition of open door.
	<b>Warning:</b> In case of damaged or worn actuator, replace itself.
	<b>Warning:</b> In case of damaged or worn microswitch (or any part of the device), replace the complete device.
	<b>Attention:</b> During the installation (and the operations) absolutely avoid the penetration of dust and dirtiness inside the head when the key actuator is not inserted.
	<b>Attention:</b> Insert the protection cap in the not used key inlet.
	<b>Attention:</b> Before any painting cover the key inlets and the identification label.
	<b>Attention:</b> Tighten the screws with the indicated torque.
	<b>Attention:</b> Ensure the connection of the safety contacts to a protection fuse.
	<b>Information:</b> During the wiring, keep the load under the value given in utilization categories.
	<b>Information:</b> Replace the complete device after 1M of operations.

# 7. Dimensions



## 8. Keys

<p><b>K25</b></p>		
<p><b>K26</b></p>		
<p><b>K27</b></p>		
<p><b>K28</b></p>		
<p><b>K29</b></p>	