

BOX DIN - RELAYS MODULE

REL 011 - REL 012

for EFESTO4 and KEEPER ESPE

Instruction use and maintenance



IMPORTANT REMARKS ON SAFETY

The user is obliged to observe the new European international standards in order to make best use of the equipment for the safety of machines and plants to be protected. For this purpose it is necessary that a manager read this manual completely and follows the installation and setup of the system.

Please observe all the technical details and the suggestions reported in this manual without exception, and with strict compliance with local and national regulations to the safety of industrial machines.

This protecting system, is only a part of the entire safety equipment of the machine, the control unit described here, should be incorporated within the general electric circuit. The responsibility of the safety circuit is of the manufacturer of the machine and of the end user.

This documentation must accompany the product throughout its operating life. The people responsible must ensure that the maintenance staff, assistance and anyone is relevant to the use of the safety of the machine, have access to all the information provided by the manufacturer of these systems.

The GREIN company is not responsible for injury or damage resulting from failure to observe these directions in the use of its products.

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GENERAL INFORMATIONS

The BOX DIN module changes the EFESTO4 / KEEPER static outputs into relays output. The BOX DIN doesn't contain an internal circuit for check the relays state, so, only EFESTO4 / KEEPER barriers with EDM (External Device Monitor) can be connected to this module. In all other applications, an external circuit must check the status of the relays in order to reach the desired safety level.

In this manual will be analyzed the connections with EFESTO4 and KEEPER light curtains.

The connections are the same for both barriers.

The OSSD0 input controls the output relay 0, the OSSD1 input controls the output relay 1.

The MUTING lamp input changes the static input into ON / OFF output (with 1 second interval) on the NO relay contact. The BOX DIN outputs (relay zero and one) are two safety contacts potential free independent between them and a NC potential free.

TECHNICAL CHARATTERISTICS

GENERAL	
Working Temperatue	-5 ÷ 60 °C
Relative umidity	5 - 95%
IP	20
Weight	190 grams
Response Time	5 msec

SAFETY RELAY - OUTPUT CONTACT	
Contact material	AgSnO ₂
Working voltage	AC 230V; DC 300V
Max switching voltage	6 A
Max constant current	2 A
Max switching capability	1500 VA
Mechanical service life	10 ⁷
Electrical service life	10 ⁵

MUTING LAMP RELAY - OUTPUT CONTACT	
Contact material	AgPd/Au
Working voltage	AC 120V; DC 24V
Max switching current	2 A
CMax constant current	2 A
Max switching capability	120 VA
Mechanical service life	10 ⁷
Electrical service life	10 ⁵

MODELS

REL 011	safety relays module without flashing MUTING lamp driver
REL 012	safety relays module with flashing MUTING lamp driver

CONNECTIONS AND FUNCTIONS

The tables below summarize the electrical characteristics (input and output) and function of each input.

REL011					
PIN N	Function	Description	Type	Level	
1	Relay output N.C.	No Safety contact NC	OUT	AC15 230V 4A / DC13 24V 2A	
2	Relay output N.C..	No Safety contact NC	OUT	AC15 230V 4A / DC13 24V 2A	
3	Not connected	-	-	-	
4	Relay 0 output N.O.	Safety contact NO channel 0	OUT	AC15 230V 4A / DC13 24V 2A	
5	Relay 0 output N.O.	Safety contact NO channel 0	OUT	AC15 230V 4A / DC13 24V 2A	
6	Not connected	-	-	-	
7	Relay 1 output N.O.	Safety contact NO channel 1	OUT	AC15 230V 4A / DC13 24V 2A	
8	Relay 1 output N.O.	Safety contact NO channel 1	OUT	AC15 230V 4A / DC13 24V 2A	
9	Not connected	-	-	-	
10	Not connected	-	-	-	
11	Not connected	-	-	-	
12	OSSD1	PNP input channel 1	IN	0 - 24 Vdc	50mA
13	OSSD0	PNP input channel 0	IN	0 - 24 Vdc	50mA
14	EDM OUT	EDM output signal	OUT	0 - 24 Vdc	50mA
15	GND	0V power supply	IN	0V	
16	EDM IN	EDM input signal	IN	24 Vdc	50mA

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1	Relay output N.C.	No Safety contact NC	OUT	AC15 230V 4A / DC13 24V 2A	
2	Relay output N.C..	No Safety contact NC	OUT	AC15 230V 4A / DC13 24V 2A	
3	Not connected	-	-	-	
4	Relay 0 output N.O.	Safety contact NO channel 0	OUT	AC15 230V 4A / DC13 24V 2A	
5	Relay 0 output N.O.	Safety contact NO channel 0	OUT	AC15 230V 4A / DC13 24V 2A	
6	Not connected	-	-	-	
7	Relay 1 output N.O.	Safety contact NO channel 1	OUT	AC15 230V 4A / DC13 24V 2A	
8	Relay 1 output N.O.	Safety contact NO channel 1	OUT	AC15 230V 4A / DC13 24V 2A	
9	Relay lamp output N.O.	NO contact for MUTING lamp	OUT	120 Vac 1A / 24Vdc 1A	
10	Relay lamp output N.O.	NO contact for MUTING lamp	OUT	120 Vac 1A / 24Vdc 1A	
11	MUTE LAMP	IMUTING lamp input	IN	0 - 24 Vdc	50mA
12	OSSD1	PNP input channel 1	IN	0 - 24 Vdc	50mA
13	OSSD0	PNP input channel 0	IN	0 - 24 Vdc	50mA
14	EDM OUT	EDM output signal	OUT	0 - 24 Vdc	50mA
15	GND	0V power supply	IN	0V	
16	EDM IN	EDM input signal	IN	24 Vdc	50mA

The contact status are referred to the control unit without power or with OSSDs ESPE deactive.

WIRING CONNECTIONS

CONNECTION CABLES WARNING

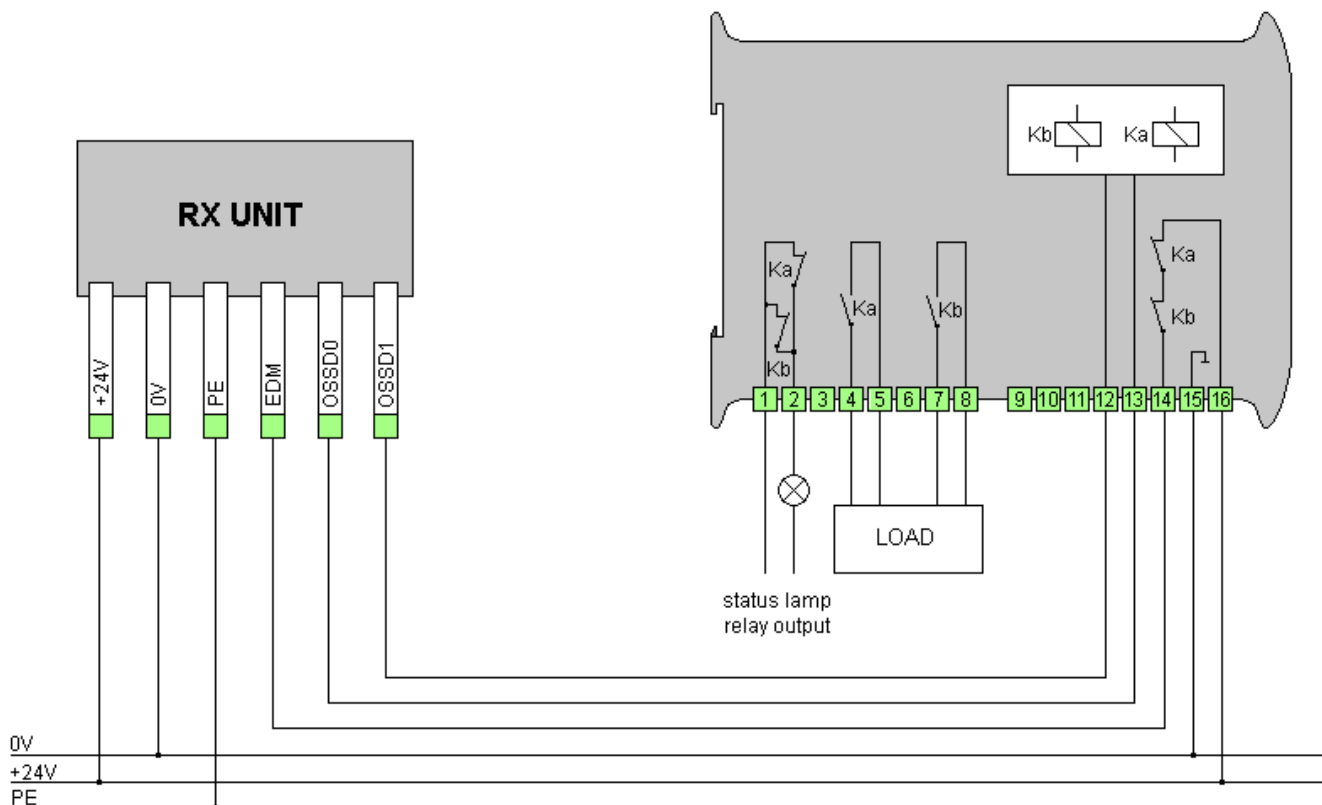
- 1 - BOX DIN cables shall be separated from power .
- 2 - BOX DIN power supply should be separated by power supply of the power equipment(i.e. inverters).
- 3 - If there is the possibility to damage the cables, take care to protect them against crushing or cutting.

EXAMPLE OF CONNECTION - REL011

In this connection example it is used BOX DIN model REL011 in conjunction with an ESPE EFESTO4 B connection (see manual instruction of the light curtain for more information).

The EDM signal is used for diagnostics of the relay inside the REL011. The EDM-IN input (pin 16) is brought to +24V.

The EDM-OUT output (pin 14) is connected to light curtain EDM input.



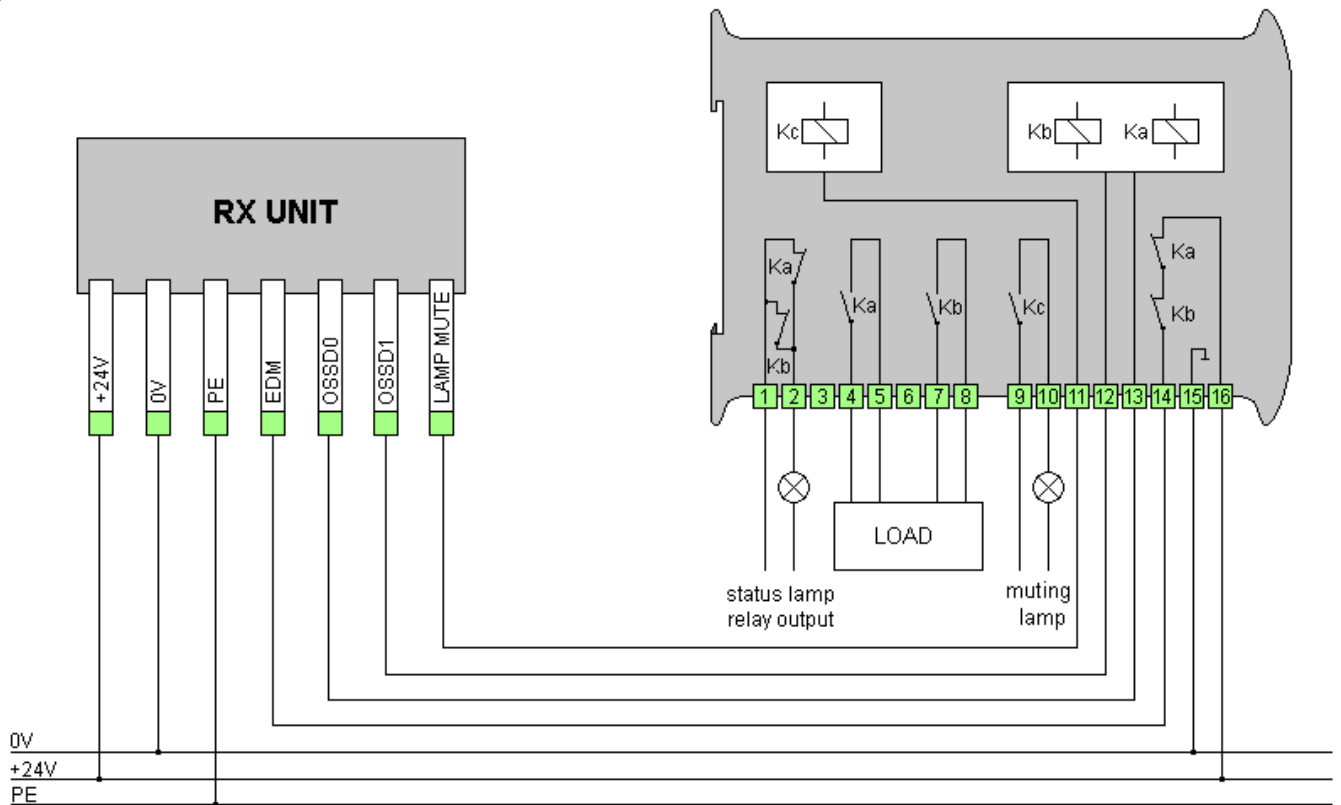
EXAMPLE OF CONNECTION - REL012

In this connection example it is used BOX DIN model REL012 in conjunction with an ESPE EFESTO4 E connection (see manual of the light curtain for more information).

The EDM signal is used for diagnostics of the relay inside the REL011.

The EDM-IN input (pin 16) is brought to +24V, the EDM-OUT output (pin 14) is connected to light curtain EDM input.

The MUTE lamp input (pin 11) is connected to light curtain LAMP MUTE output.



ARC SUPPRESSOR AND EXTERNAL CONTACTORS FEEDBACK

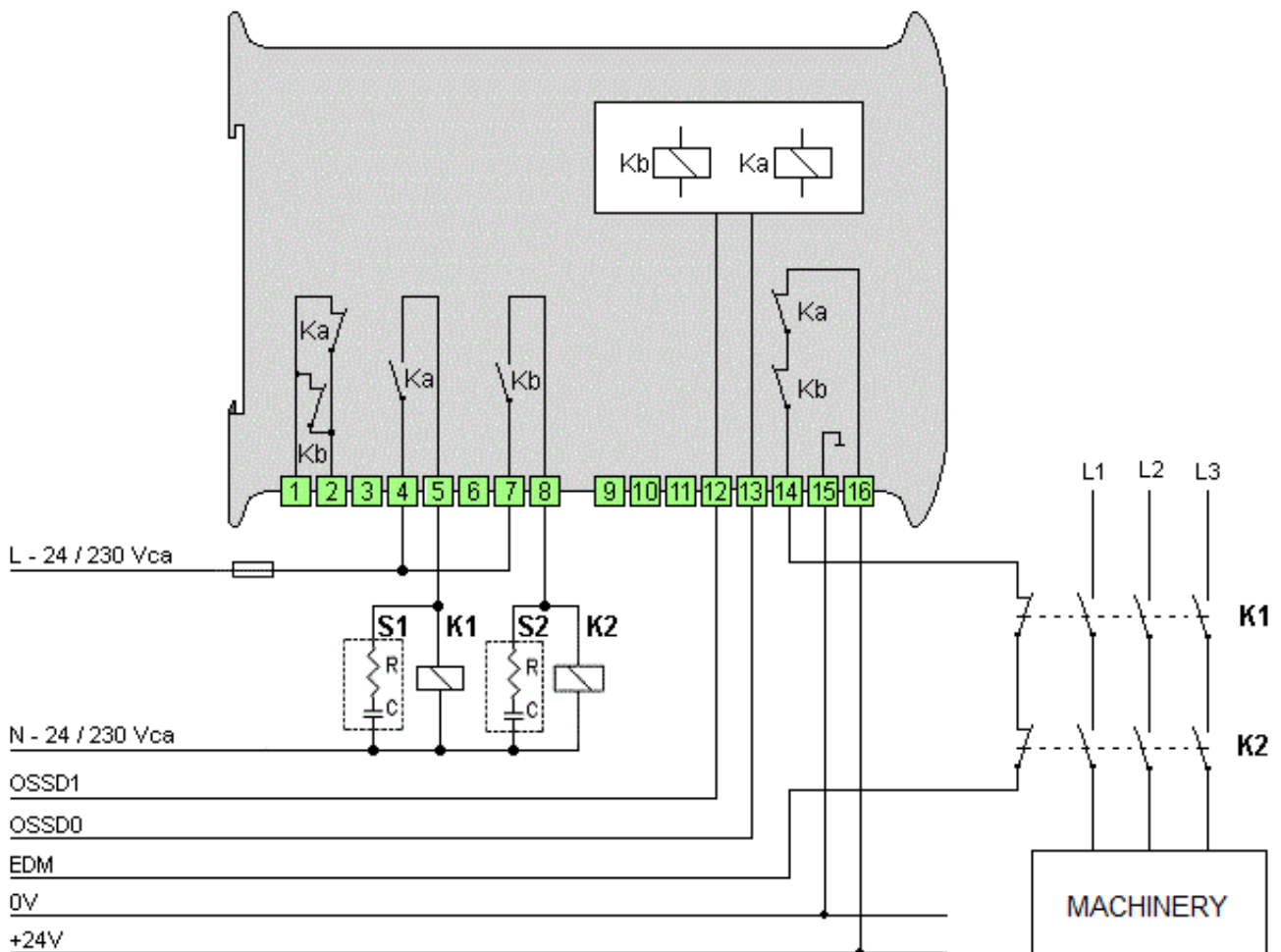
Two noise filter (S1 and S2) must be connected across the coil K1 and K2 of the machinery control device, to avoid spikes on the relay contacts and increase their life.

S1 and S2 must be connected always and only in parallel to the load, must never be connected in parallel on the safety contacts of the relay outputs.

The figure below shows the connection of external contactors and Efesto4 curtain with B type connection (powered with a voltage between 24 to 230 Vac), the feedback contacts and arc suppressors.

If the relays K1 and K2 do not have arc suppressors, we suggest to install the filters of the following value:

- for power supply 24 - 48 Vac / dc : R = 100 ohm, C = 1 μ F
- for power supply 115 - 230 Vac / dc: R = 220 ohm, C = 0.2 μ F



CONNECTION OF TWO BARRIERS

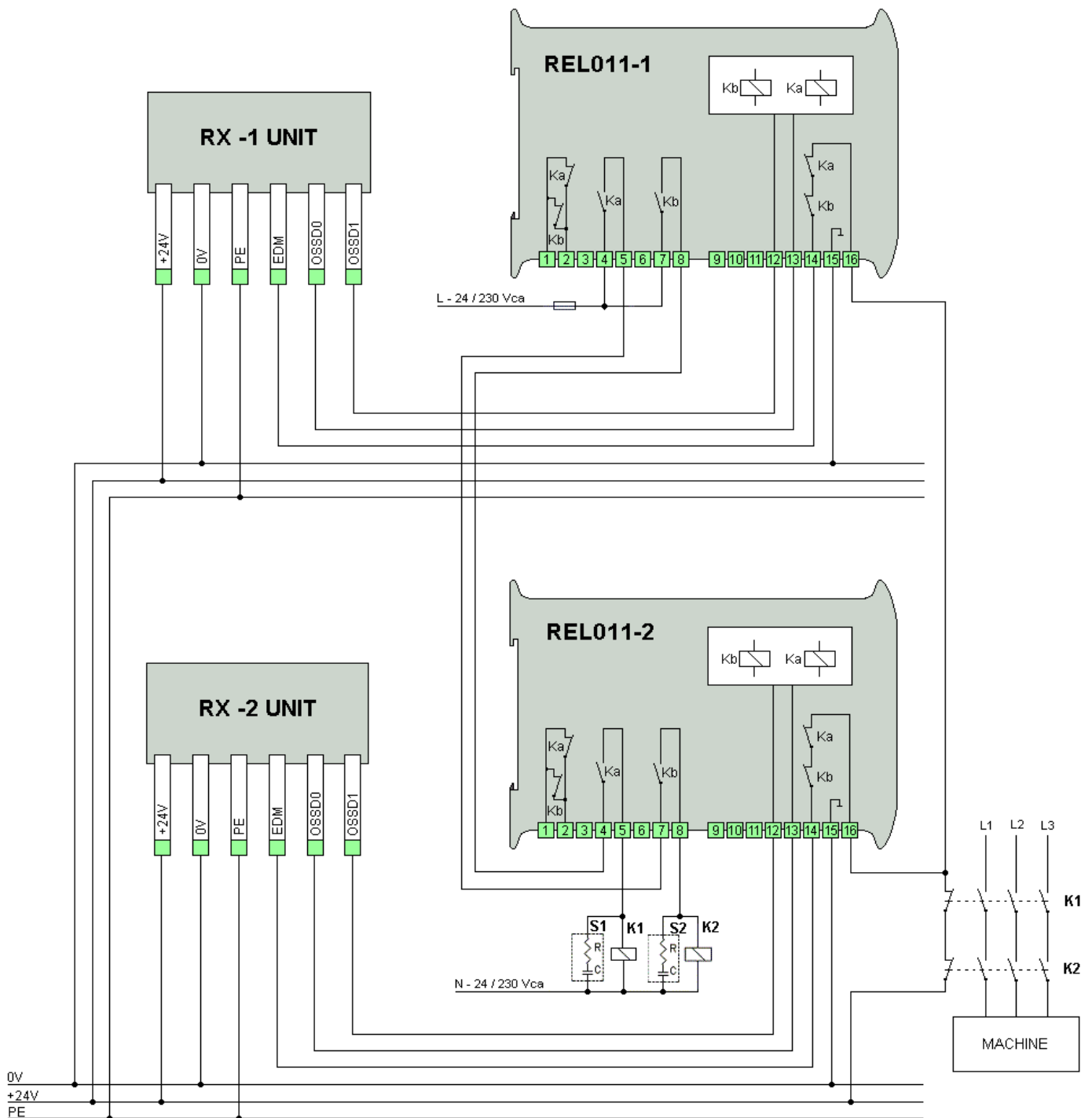
The following diagram shows the connection of 2 barriers Efesto4, connection B, as protection of a single machine, typical application of front / back protection.

Each barrier is connected to a REL 011 module.

The NO contacts are connected in series between the two modules.

The contactors control EDM is common to the two barriers.

NOTE: In case of manual reset, the two inputs can be connected in parallel to the same button.



MECHANICAL FITTING

The BOX DIN - Safety Relays Module, should be fixed properly following these guidelines:.

- 1) In a control cabinet protected from dust / moisture with a minimum IP54 protection degree.
- 2) Fix it in a DIN rail 35 mm according to EN 50 022
- 3) Do not mount the PS3 control unit near sources of intense heat.
- 4) The BOX DIN control unit can be mounted in any position

INDICATIONS

OSSD0	GREEN - OSSD0 output state
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If green light is ON, OSSD0 is active and vice-versa.

OSSD1	GREEN - OSSD1 output state
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If green light is ON, OSSD1 is active and vice-versa.

EDM	GIALLO - REL011 Power supply on EDM
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If yellow light is ON, the 24V is supplied on the EDM connection.

MUTING	RED - REL 012 MUTING state
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If red light is ON, MUTING is active and vice-versa.

DIAGNOSTIC

REL011 Diagnostic.

EDM	OSSD0	OSSD1	DESCRIPTION REL011
OFF	OFF	OFF	The relay outputs are deactivated, the power supply on EDM is not supplied.
ON	OFF	OFF	The power supply on EDM is supplied, OSSD are deactivated.
ON	ON	ON	The power supply on EDM is supplied, OSSD are activated.
OFF	ON	ON	The power supply on EDM is not supplied, OSSD are activated.
OFF	OFF	ON	OSSD0 is deactivated, damaged or wrong connection. Check the connections, if the problem is not solved contact the customer service.
ON			
OFF	ON	OFF	OSSD1 is deactivated, damaged or wrong connection. Check the connections, if the problem is not solved contact the customer service.
ON			

REL012 Diagnostic.

MUTING	OSSD0	OSSD1	DESCRIPTION REL012
OFF	OFF	OFF	The relay outputs are deactivated, the MUTING is deactivate. Normal condition of the ESPE if has activated the protection
OFF	ON	ON	The relay outputs are active, the MUTING is deactivate.
ON	ON	ON	The relay outputs are active, the MUTING is active.
OFF	OFF	ON	OSSD0 is deactivated, damaged or wrong connection. Check the connections, if the problem is not solved contact the GREIN customer service.
OFF	ON	OFF	OSSD1 is deactivated, damaged or wrong connection. Check the connections, if the problem is not solved contact the customer service.
ON	OFF	OFF	MUTING is active but the relay outputs are not active. Fault conditions or wrong connections. Check the connections, if the problem is not solved contact the customer service.

SERVICE AND TEST

Attention

Each repair operation should be performed only by GREIN authorized technicians.

Putting into service and tests at regular intervals

The installer that puts the equipment into service shall have all necessary information about the machine or the plant, of the installed BOX DIN and of the ESPE. The test shall cover the correct interaction BOX DIN / ESPE and the control system of the power operated working equipment, the safe state and the construction in compliance with the equipment specific safety rules. The test relevant information provided by the machine or plant manufacturer shall always be observed when testing. The frequency of the periodic tests must be in accordance with the requirements of national law.

A distinction is made between the following types of test:

Testing prior to put a device into service for the first time and after modifications

A person authorized and qualified, should test the BOX DIN , the ESPE connected to it, the first time it is put into service and all units involved in the safety function of the machinery. All changes on the configuration of the BOX DIN , the ESPE connected to it and the components / units that affect the safety function must always be checked. For proper interaction with the BOX DIN, the ESPE connected to it must be checked that all the external components to it are tested.

Periodical tests

Periodical tests serve the purpose of systematically detecting and removing safety-relevant deficiencies (e.g. in the event of modification or manipulation) of the protective equipment of the machine or facility which occur after the machine/facility having been put into service. Type, scope and time intervals to be followed are listed in clause "SETTING UP AND TEST" and shall be determined and specified for each individual machinery. For all tests, must be complied with the requirements of national law. The test results shall be recorded in a report which is to be signed by the inspector. The report shall be kept at the installation site of the machine or plant.

SETTING UP AND TEST

FINAL CHECK BEFORE STARTING

Before powering the ESPE connected to BOX DIN verify that:

- The ESPE OSSDs output voltage is coherent with the input voltage value of BOX DIN (see page 5 for more information);
- check the connections between ESPE and BOX DIN
- If necessary to increase the safety, set the ESPE in manual reset.

If the above steps are correct power the ESPE.

When the ESPE OSSDs are active, check that also the relays in the BOX DIN are active (the N.O. contacts change from open to close) and the green indicators of OSSD0 / OSSD1 are ON.

Otherwise check when the ESPE OSSDs are not active, the relays in the BOX DIN and the green indicators are OFF.

In the REL012 BOX DIN, also check that when the MUTING function on the ESPE is active, on the BOX DIN, the red indicator is ON and the lamp connected to BOX DIN blink with cadence equal to 1 second.

SPARE PARTS



Only parts approved by the manufacturer may be substituted; the use of unauthorized parts or if changes are made to the control unit edge or mat, the device performance may be affected.

PACKING AND UNPACKING



Always observe the standards and regulations regarding the prevention of accidents when handling the product.

PRODUCT PACKAGING

The shape, size and content of the package varies depending on the number of BOX DIN in the package.

UNPACKING GUIDELINES

When unpacking the product, follow these guidelines:

- 1 Inspect the package to check for damaged or missing items;
- 2 Proceed with unpacking paying particular attention to the opening of the package, if you use the cutter be careful not damage the products;

STORAGE

If the product is not installed immediately after delivery, store it as follows:

- 1) store the product in a dry place at a temperature range between -10 and 60 °C.

DISPOSAL

Dispose of this product and its components in accordance with state and local codes.

RESPONSE TIME CALCULATION

The total response time is given by the sum of the response time of the ESPE and the response time of BOX DIN

TOTAL RESPONSE TIME = ESPE RESPONSE TIME + BOX DIN RESPONSE TIME

EXAMPLE:

ESPE: EF-B-0750B = 11ms
BOX DIN: = 5ms

TOTAL RESPONSE TIME = 11ms + 5ms = 16ms

MTTF_d / DC_{avg}

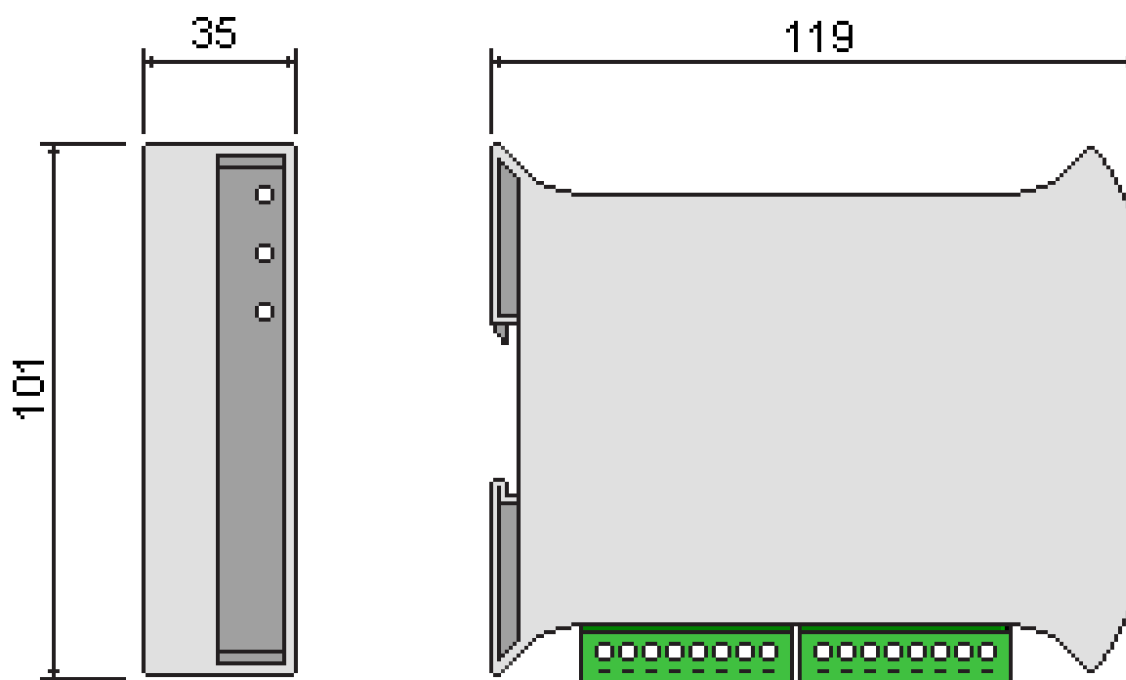
MTTF _d (anni) AC15-230V-0,6A	MTTF _d (anni) DC13-24V-0,5A	NOTE
137,31	89,96	1 commutation each minute
686,15	449,81	1 commutation each 5 minutes
8238,64	5397,73	1 commutation each hour
197727,27	129545,45	1 commutation each day

DC _{avg} AC15-230V-0,6A	DC _{avg} DC13-24V-0,5A	NOTE
99,00%	99,00%	1 commutation each minute
99,00%	99,00%	1 commutation each 5 minutes
99,00%	99,00%	1 commutation each hour
99,00%	99,00%	1 commutation each day



The DC_{avg} value becomes equal to zero if the EDM control is not used.

DIMENSIONS



Warranty

A guarantee is provided for a period of 12 months from the delivery date and terminates at the expiration of this term, even if the materials have not been used for any reason.

Our company undertakes to repair or replace, during this period, free of charge, within the shortest possible time, those parts which owing to poor quality of material or defective workman-ship or inaccurate assembly should prove defective. This is providing that defects are not due to:

- wear and tear
- failure caused by inexperience or negligence
- unauthorized intervention or tampering
- overloads behind contract limits
- accidental causes or "force major"

The repairs or replacements shall be carried out in our workshop in Milan, Italy.
Transport will be completely charged to the purchaser.

Nothing will be due to the customer for the time during which the plant may remain idle, nor shall he make claims or ask indemnity for charges, accidents or direct or indirect damages.

For anything else not specified or that becomes a subject of dispute, the ANIE (Italian Electrotechnical Industries Association) general sale conditions will be applied.

GREIN S.r.l. Milan

NOTE: characteristics and dimensions reported in this manual are for reference only and can be subject to change without notice.

**“CE” DECLARATION OF CONFORMITY
DICHIARAZIONE “CE” DI CONFORMITA’**

Il fabbricante**The manufacturer****GREIN S.r.l.**

Via S.G.B. de La Salle 4/A 20132 MILANO ITALY

Dichiara che**Declares that**

I moduli di sicurezza REL 011 e REL 012 sono fabbricati in conformità ai campioni esaminati dal laboratorio accreditato:

The safety module REL 011 and REL 012 are manufactured in accordance to the sample examined by the test laboratory accredited

Prima Ricerca & Sviluppo S.r.l.
Via Campagna, 92
22020 Faloppio Italy**Direttive applicate****Applied directives**2006/42/ EC Direttiva Macchine
2006 /95/EC Direttiva Bassa Tensione
2004/108/EC Compatibilità ElettromagneticaMachine Directive
Low Voltage Directive
ElectroMagnetic Compatibility Directive

Norme applicate

Applied standards

EN ISO 13849-1/2 (2008)

NAME : Perissinotto Antonio
POSITION : C E O GREIN S.r.l.

GREIN s.r.l.
Amministratore/Unico
A. Perissinotto

Milan, 23 mar 2015