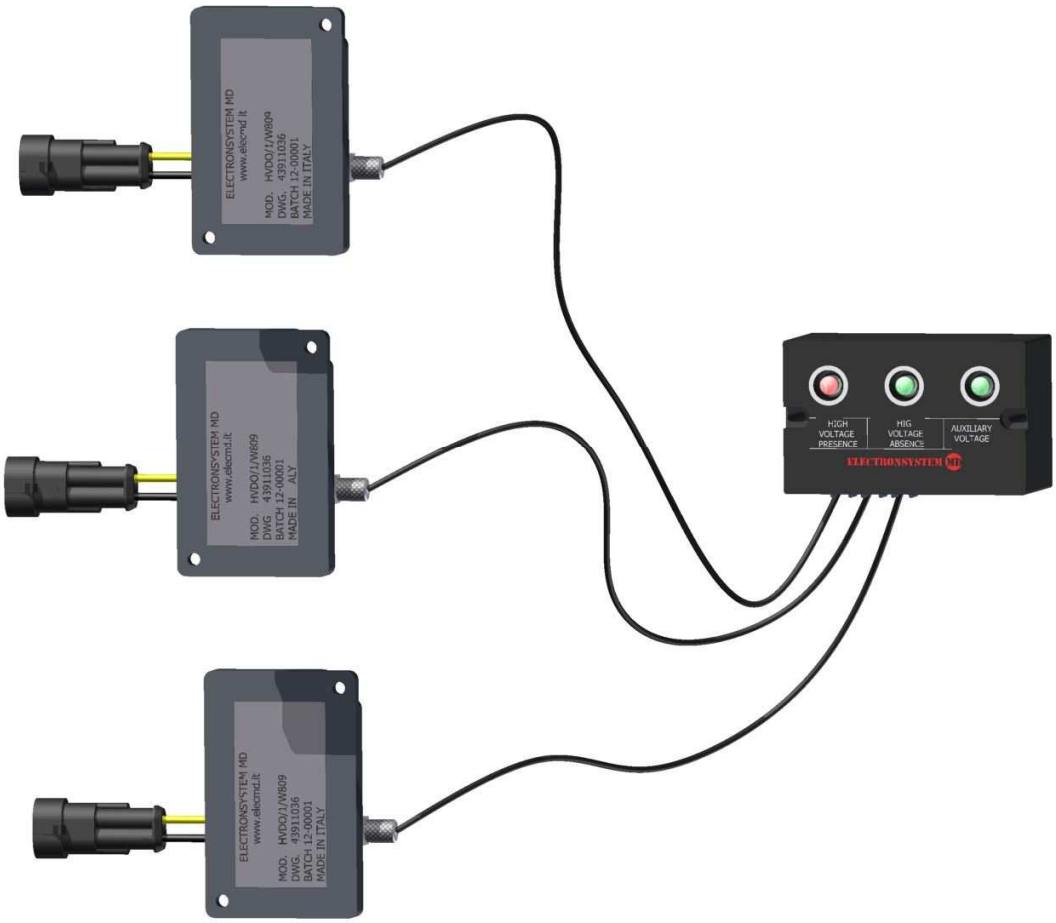
INTEGRATED OPTOELECTRIC SYSTEM OF VOLTAGE DETECTION WITH TOTAL SAFETY GUARANTEED BY GALVANIC INSULATION AND INTERNAL FAULT SUPERVISION



INDEX

1. PREVIEW

Following instructions are intended for:

- a guide for mounting and setting up the apparatus;
- indicate a series of control and operations that allow to maintain efficient the supervision and indication of high voltage presence in order to work in safe condition;
- indicate the principal elements and devices composing the complex.

2. GENERAL

Optoelectric complex is able to detect high voltage presence and activate a change-over contact to remote this condition for far control.
The low power signal generated by capacitor divider is only of few uA but is sufficient to power the high voltage detecting device (HVDO/1) which gives a led indication on front of presence/absence of high voltage and another synchronous signal for optical link with relay (RHV/R/DI).
RHV/R/DI is also provided with internal continuous supervision diagnostic control which watches the correct work of all electronic circuit and changeover contact and more over the optical signal coming from HVD3/RC/DI and compare the state of absence or presence of high voltage optical information coming from HVD3/RC/DI with its state and the state of contact; possible mismatch , symptom of fault, are brought out by a contact.
Another type of fault which can be found by the complex is the breakdown of each part composing the chain from divider capacitor to optical light generation; this because each fault causes a sudden loss of light of one phase which is a not valid condition in a three phase system.
The principle before described is based on the similarity of state of presence or absence of high voltage in three phase system, so the three phases are all always on or off but is not possible to have different state on different phases.
It is clear that according to the previous principle a simultaneous fault on the three phases can't be detect, even if this is a very remote possibility.
To decrease the probability of lack of the fault revelation is necessary that the fault signal is not only made visible locally on the synoptic panel of the cabinet via a light signal, but must also be carried out remotely via a changeover contact to be able to have a situation in real time the efficiency of the system and to intervene promptly in the presence of a fault.

3. STANDARD REFERENCES

Valid both for HVDO/1 and RHV/R/DI

ENEL: GLI, R EMC 01 and R CLI 01

- INSULATION & DIELECTRIC TEST
GLI 1: Impulse voltage test (MC-5kV, MD-2kV)
GLI 2: Dielectric test (MC-2kV)
GLI 3: Insulation resistance (R>100Mohm)

- CEI EN 61000-4-2 ESD (Electrostatic discharge)
HV substation environment (H): level 4 (8kV/contact - 15kV/air)

- CEI EN 61000-4-4 EFT (Electrical fast transient)
HV substation environment (H)
Power and signal port: level 4 (4kV)

- CEI EN 61000-4-5 SURGE
HV substation environment (H)
Power port: level 4 (MC-4kV, MD-2kV)

- CEI EN 61000-4-8 ELECTROMAGNETIC FIEDS 50Hz
HV substation environment (H)
Case: level 5 (1000A/m)

- CEI EN 61000-4-10 ELECTROMAGNETIC FIELDS 0,1-1MHz
HV substation environment (H)
Case: level 5 (100A/m)

- CEI EN 61000-4-12 RING-WAVE AND ARRESTED WAVE 0,1-1MHz
HV substation environment (H)
Power port: c.c.-c.a.: arrested wave level 3 (MC-2,5kV,MD-1kV)
Signal port: arrested wave level 2 (MC-1kV,MD-0,5kV)
Signal port: ring-wave level 3 (MC-2kV,MD-1kV)

4. DESCRIPTION

The complex is mounted on a metallic plate which must be screwed on front panel; the two devices are on their turn mounted on the plate from top to bottom following this order:

- HVDO/1 Optoelectric high voltage detector auto powered
- RHV/R/DI Relay for remote control, actuation and continuous supervision of the state of presence/absence of high voltage

4.1 HVDO/1

This VDS is based on the sharing of voltage between capacitor C1 (high voltage) and capacitor C2 (low voltage) ; the signal at C2 terminals is transformed in an optical signal, which separately points out voltage and phase of the line involved.
Thanks to this new system the signals of voltage get to the operator through a galvanic (optical) insulation, which never transfers voltage, even in case of failure of capacitor C1.
The IEC Standard 61243-5 1997-06 is applicable to our Voltage indicator. At page 11 point 1.2, the standard concerns VDS "based on fundamentally different principles (for examples optical systems, " ...) ; they "should meet the requirements of this standard where applicable."

Technical features
High voltage :..... 3 - 170 KV
Primary Capacitance* :.....0.5 - 300 pF
Power supply :.....no auxiliary power reqested
Power consumption :.....< 1mW
Led :.....3000mcd/20mA
Dielectric strength :.....275KV
Surge Strength :.....650KV
Suitable for K152SR ELASTIMOLD BUSHING
Conform to ENEL: GLI, R EMC 01 and R CLI 01
IP degree protection :.....IP64
***Versions with customized features can be provided.**

Material
Box :..... Polyurethan resin (2-component)
Connection input : .AMP waterproof connectors(*)
Cable with AMP connector (*)
.....faston 6.3X0.8 (IP30)
output :.....optical fiber
Cable : .....Reiter Lappkabel 0015703 approved
VDE(NYSLYCYö-J)
SEV(CH-NO5VC4V5-F)
UL(AWM Style 2587)
CSA(AWM I A/B II A/B) (*)
(*) on request

4.2 RHV/R/DI

This device receives the optical signal synchronous from each device HVDO / 1 and activates a control relay that allows the remote control of the states of presence / absence of high voltage through an exchange contact.
On the front of the indicator, lights are useful to the operator, namely:
1. presence auxiliary voltage
2. presence of high voltage
3. absence of high voltage

Operator safety is ensured by galvanic isolation of optical fibers which allows to guarantee complete safety insulation even in the worst case of primary capacitor breakdown.
A self-test internal supervision which controls the electronic circuitry, the state of the relay contacts for remote control and the situation of the optical inputs allows you to manage a contact for the timely reporting of real-time fault situations both for the equipment and for all cabling upstream.

Technical features

Rated voltage :.....24 ; 48÷220 VDC
Input :.....optical fibres
Temperatur :..... -30°C ÷ 80°C

IP protection :.....IP64(*)
Output contacts :.....2 NO + 2 NC
Dielectric insulation :.....2KV
Surge level :.....4KV

Relay tecnica features

Contacts Material :.....Ag. CdO
Nominal Value :.....5A 250VAC (cosf=1.0)
:.....3A 250VAC (cosf=0.4)
:.....5A 30VDC
Max changeover current :.....5 A
Max changeover voltage :.....250 VCA, 100VDC
Electric live :.....5A/250 VCA cosf 1 1 x 10^5 cycles
Mechanical live :.....5 x 10^6 cycles
Dielectric strength (open contacts) :.....1000VAC 1min
(coil-contacts) :.....5000VAC 1min
Surge strength :.....min 10000V/1.2X50us

(*) except for fast-on connection

Material

Box :..... Polyurethan resin (2-component)
Connection input :.....optical fiber
output :.....FASTON 6.3X0.8

Output contacts timing

Contact for voltage presence indication:
voltage presence – voltage absence: …...500ms
voltage absence – voltage presence: ….1,2 s

Contact for fault indication:
fault absence – fault presence: ……..2 s
fault presence – fault absence:……..800ms

5. MODE OF USE

The complex is able to verify the presence of high voltage and excite the change-over contact of relay for remote control and to avoid mistaken automatic switching.
Locally is present a led indication for quick indication of high voltage presence both on HVDO/1 and RHV/R/DI.
HVDO/1 gives single local phase indication by flashing light (Fig. 1) to monitor if each phase is on high voltage or not. This indication appear even with no auxiliary voltage.
Even RHV/R/DI gives locally the state of high voltage presence/absence by a red or green led respectively.
When led red of high voltage presence is on the related change-over contact of remote control is excited. The indication of high voltage presence is on even if only one phase is on in order to have the best safety condition for personnel maintenance and avoid mistaken switching.
RHV/R/DI has moreover a change-over contact for fault remote indication. In the following page we show how to connect this contact in order to have a local yellow indication of fault so is possible to have a real time net situation and supervision.

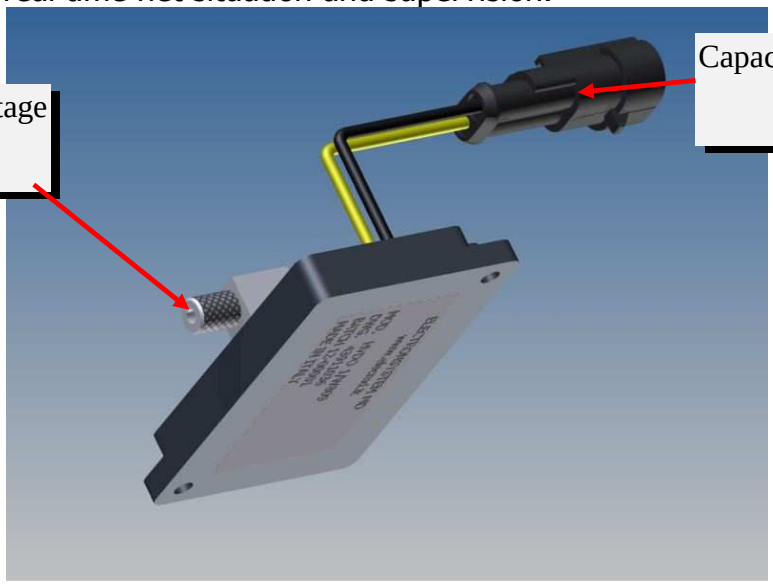


Fig. 1 Voltage presence/absence indicating system

5.1 SAFETY PRECAUTIONS FOR PERSONNEL MAINTENANCE ENGINEER E

The maintenance personnel to work safely must comply with the following procedure when replacing the device HVDO / 1

5.2 FAULT SITUATION PROCEEDING

The staff of facility, in presence of fault, have to do the following preventive control:

- The green LED "presence of auxiliary voltage" on relay RHV/R/DI must be turned on, and if it is not, check for auxiliary voltage 110 V DC or the circuit breaker which protects the electronic device , which must be closed. If the green LED is on but there is still the fault message there are two cases depending on the presence / absence HV voltage in the power circuit.

5.2.1 HV PRESENCE IN POWER CIRCUIT

-Visually inspect inside the low voltage cabinet by checking if the optical fibers are intact, not bent at angle and that the terminations are correctly inserted in the relay RHV/R/DI.
- Remove each optical fiber termination point, one at a time, from its connector in the relay, verifying the presence of red light coming through the fiber from the device HVDO / 1. The red light, being very weak, imay not be visible to the human eye in bright outdoor lighting.
- After executing all of the above checks, if the fault still persist, before proceeding with additional testing is necessary to secure over the stalemate: remove HV power and connect to ground. **Only with the stalemate connected to ground you can safely can make other checks described in the next section. 5.2.2**

5.2.2 HV ABSENCE IN POWER CIRCUIT

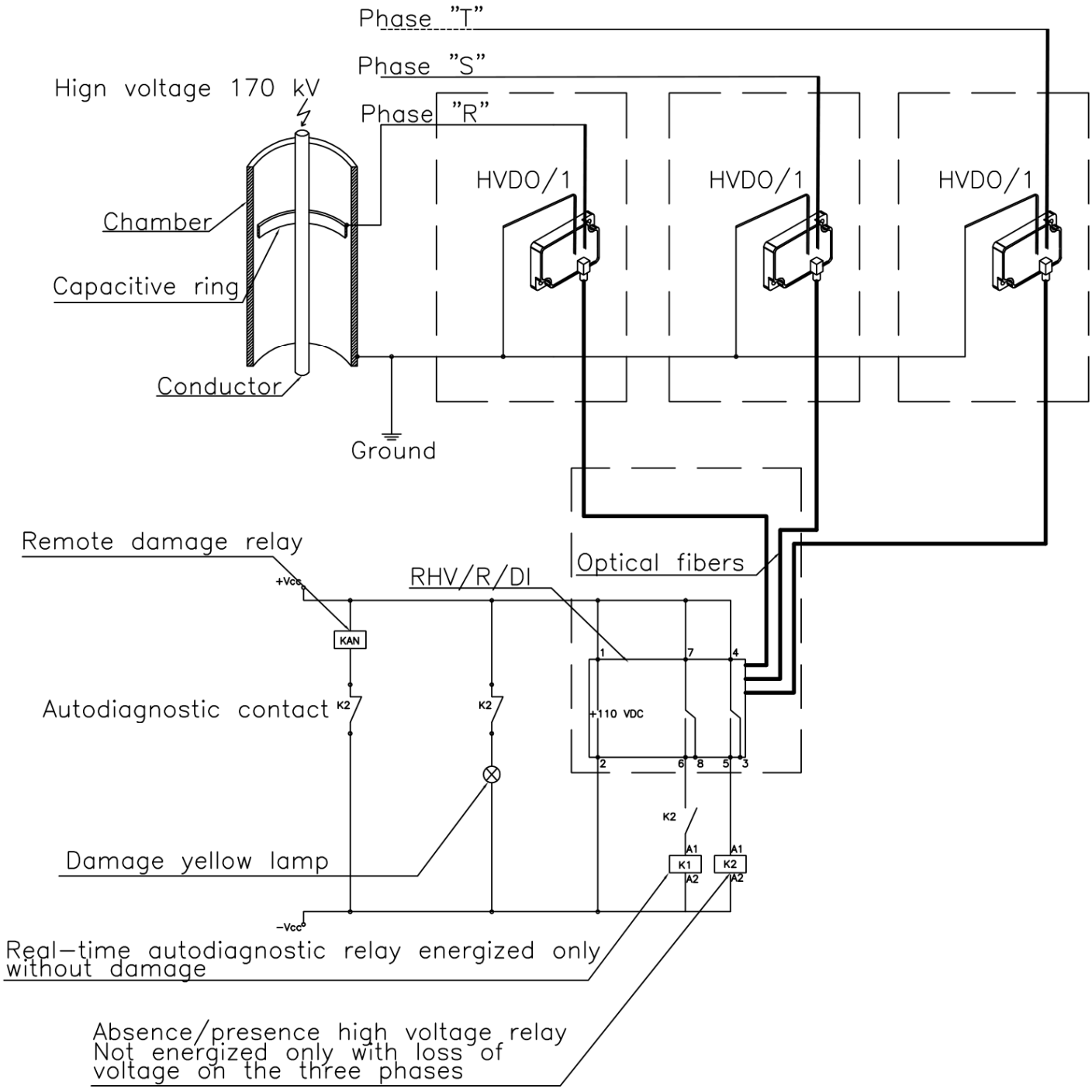
- The proceeding described below **must exclusively be done by personnel belonging to the manufacturer of HV facility**.

- When the stalemate is safety connected (means without HV power and connected to ground) is possible to get access to voltage presence indicators HVDO/1.

- Discover the fault situation by following the same instructions/proceedings normally used during internal routine test of apparatus before commissioning

5.3 WORKING PRINCIPLE

Schematic s represented without aux voltage



Notes:

The relay K1 is excited only if there is no tension on the three phases.
RHV/R/DI has an internal logic that allows to detect this and only this voltage absence situation.
All the other situations in which even only a phase is live the indication given is the presence of high voltage.

The relay K2 is used both for remote indication of failure condition of equipment or wiring and also for local indication inside the cabinet.

Continuous electronic supervision allows the diagnosis of proper operation of both HVDO/1 & RHV/R/DI and also of wiring coming from capacitive dividers by a check of optical information of the three related phases.
A fault is highlighted when the information of the three phases are not uniform or contacts of relay K1 are not in the right position.

Inputs situation			Output signals	
High Voltage Phase R	High Voltage PHASE S	High Voltage Phase T	Fault	High voltage
X	X	X	--	X
X	--	--	X	X
X	X	--	X	X
--	--	X	X	X
--	--	--	--	--
X	X	X	X	--
X		--	X	--
--	X	--	X	--
--	--	X	X	--
--	--	--	X	X

X: PRESENT
-- : NOT PRESENT

6. SHIPMENT

The complex is shipped completely mounted on the plate and with optical cables between device HVDO/1 and relay RV/R/DI already assembled.

7. STORAGE

If the complex must be storage before use, please keep dry and repaired from cold and hot climates, respecting the original position of case. Move and take care to prevent injures.

8. CONTROL

Opening the case, control the complex is no damaged and if optical fibers are present

9. DIELECTRIC TEST PROCEEDING

The devices HVDO / 1 and RHV / R / DI do not require dielectric strength tests as they are already tested one by one in the factory with specific emission test report. **Therefore, the user must remove previously all terminals during the dielectric verification tests of the wiring cabinet.**

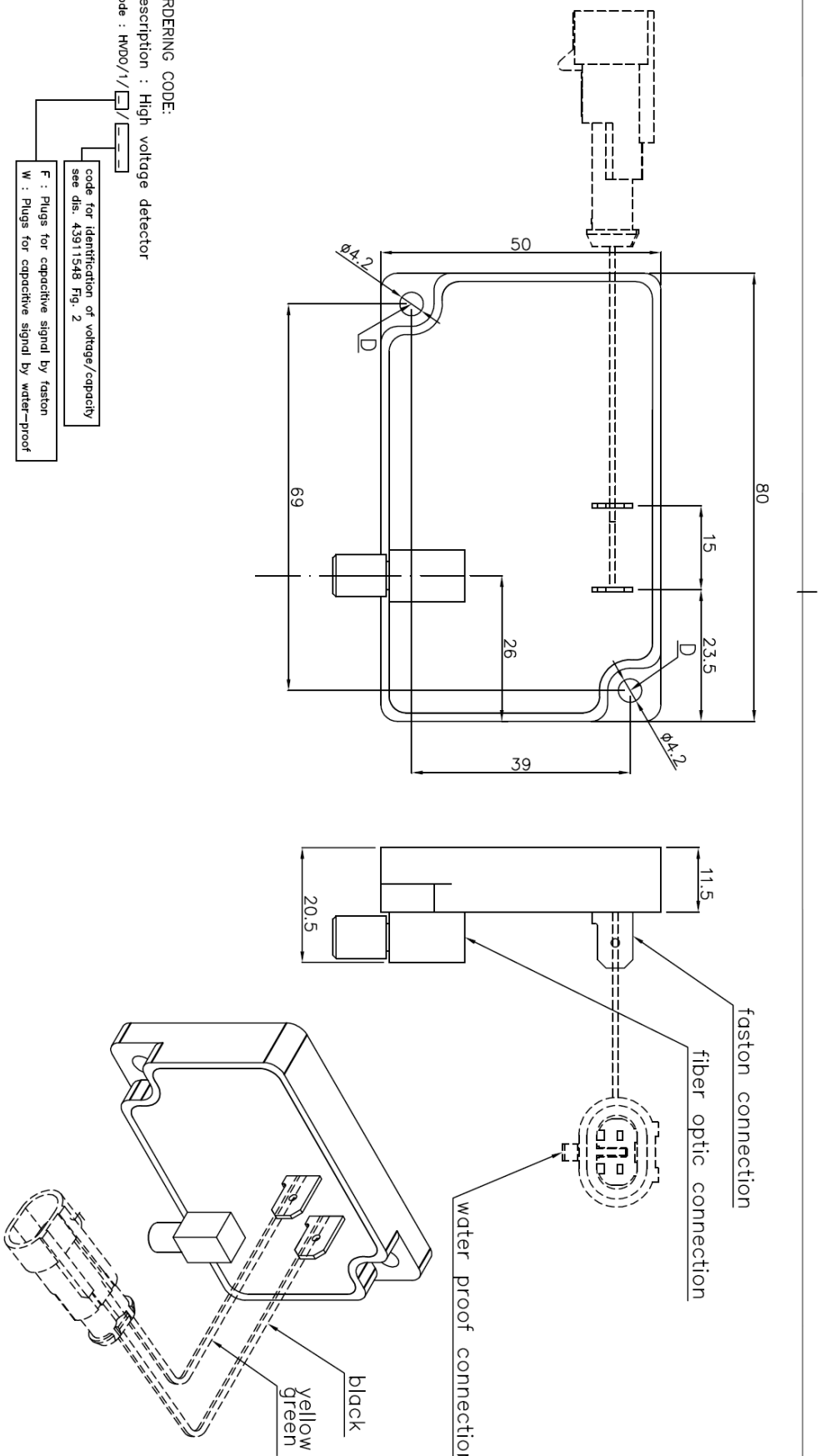
10. OVERLOAD PROTECTION

The device RHV/R/DI is internally provided with a protection circuit that is activated in case of surges in the power supply terminals.
To ensure the integrity and efficiency of the protection device is also required that the user should provide in series to the supply terminals a device that limits the overload to max 3A.

Rev./Mod A Data 01.10.2009	Rev./Mod B Data 24.06.2010	Rev./Mod Data	Rev./Mod Data	Rev./Mod Data	Rev./Mod Data
Descrizione: FIXED DIMENSION	Descrizione: FIX POSITION OF OPTICAL CONNECTOR, ADD CABLE MARK	Descrizione:	Descrizione:	Descrizione:	Descrizione:

ORDERING CODE:
Description : High voltage detector
Code : HVD0/1/□/ _ _ _
code for identification of voltage/capacity see dis. 43911548 Fig. 2
F : Plugs for capacitive signal by faston
W : Plugs for capacitive signal by water-proof

NOTE :
-During order define capacity of divider and rated voltage (not requested in case of use of Electronsystem MD divider).
- FIXING HOLES ON FRONT: D-D POINTS
-Suitable for connection with relè type RHV/M, RHV/R, RHV/R/DI by dedicated fiber optic connection.



Piano di Campionamento (UNI ISO 2859)		
LIVELLO	LQA	
L2	1	

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Fig.
Materiali/Materiale
N° Series / Serie
Finishing / Finitura
Filing Room
Archivio
Thread quality tolerance
Tolleranza filetti qualità
"6g-6S" UNI 5541-65
General tolerance for machining / Tolleranze generali per lavorazioni meccaniche:
Coord.Punching N.C. mach.
Coord. punzon. a C.N.
JS11
Extra fine / Fine JS12
Median / Media JS13
Coarse / Grossolana JS15
Quality for linear dimension
Qualità per quote lineari

Prep. Dis.	G. FORLANI	Resp. Dep. Uff. Resp.	Uff. Tecnico
App. App.	P. GUZZETTI		
Rev./Mod.	0 13.11.2007 : Emissione nuovo disegno		

ELECTRONSYSTEM MD S.r.l.

Title
Titolo
HIGH VOLTAGE DETECTOR
HVD0/1/_ _ _ _
-DIMENSION AND FEATURES-

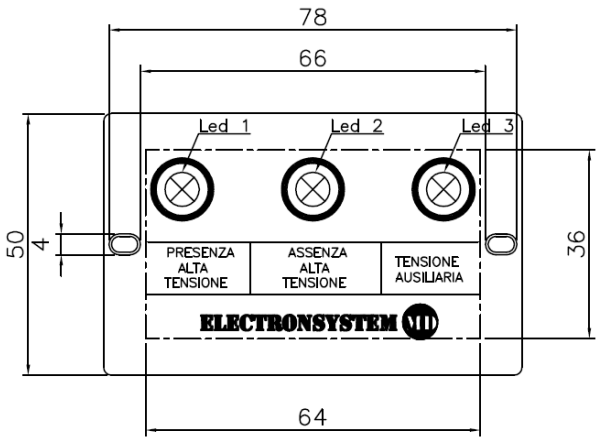
Apparatus
Apparecchio

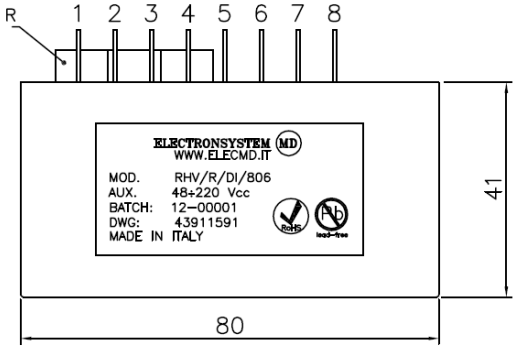
Doc. No.
N° Doc.
43911036

Lang.
Lingua

Scale
Scala
1:1

Sh. No.
Pag.
1/1





CODICE DI ORDINAZIONE:

Codice : RHV/R/DI/ ___

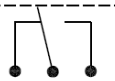
802: Tensione AUX 24 Vdc
806: Tensione AUX 48÷220 Vdc

DESCRIZIONE:

–Led 1 : PRESENZA ALTA TENSIONE
–Led 2 : ASSENZA ALTA TENSIONE
–Led 3 : TENSIONE AUSILIARIA
–R : RICEVITORE OTTICO (da collegare al segnalatore presenza tensione mediante fibra ottica)
–Contatti USCITA (faston AMP 6.3x0.8) da collegare come segue :

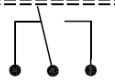
1 : Polo positivo (+)
2 : Polo negativo (–)

3 : NC in caso di guasto
4 : COM
5 : NO in caso di guasto



CONTATTO PER INDICAZIONE DI GUASTO

6 : NO in presenza di alta tensione
7 : COM
8 : NC in assenza di alta tensione



CONTATTO PER INDICAZIONE ALTA TENSIONE

Nota : Lo stato dei contatti è indicato in condizioni di presenza alta tensione e con ausiliaria presente

	TENSIONE AUX PRESENTE	TENSIONE AUX ASSENTE
ALTA TENSIONE PRESENTE	RELE' : OFF LED 1 : ON LED 2 : OFF LED 3 : ON	RELE' : OFF LED 1 : OFF LED 2 : OFF LED 3 : OFF
ALTA TENSIONE ASSENTE	RELE' : ON LED 1 : OFF LED 2 : ON LED 3 : ON	RELE' : OFF LED 1 : OFF LED 2 : OFF LED 3 : OFF

Rev./Mod	Data	Descrizione
A	31/07/01	MODIFICA FUNZIONI E DIMENSIONI
B	20.09.2002	AGGIUNTA CODIFICA ABB ADDA
C	01.07.2005	AGGIUNTA CODIFICA P05 ABB ADDA
D	14/09/2007	AGGIORNATO TABELLE
E	23.10.2008	RIMOSSO GRUPPI 801,803, 804,805 E INSERITO GRUPPO 806
F	29/05/2012	ELIMINATI CODICI CLIENTE

Fig. | Material/Materiale | N° Series / Serie | Finishing / Finitura

Filing Room / Archivio

Thread quality tolerance / Tolleranza filetti qualita' "6g–6S" UNI 5541–65

General tolerance for machining / Tolleranze generali per lavorazioni meccaniche:

Coord.Punching N.C. mach. / Coord. punzon. a C.N. JS11

Quality for linear dimension / Qualita' per quote lineari

~~Extra fine / Fine~~	JS12
Median / Media	JS13
~~Coarse / Grossolana~~	JS15

Prep. Dis. G. FORLANI

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Resp. Dep. Uff. Resp. Uff. Tecnico

Title / Titolo: RHV/R/DI/___
RELE' FOR HIGH VOLTAGE INDICATION WITH INTERNAL DIAGNOSTIC

Lang. / Lingua

Rev./Mod. 0 | 24/02/2000 : Emissione nuovo disegno

Apparatus / Apparecchio

Doc. No. / N° Doc. 43911591

Scale / Scala 1:1

Sh.No. / N° Pag.

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