

VOLTAGE DETECTING SYSTEMS

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



VOLTAGE DETECTING SYSTEMS

INDICE

1.PREVIEW.....	3
2.GENERAL.....	3
3.STANDARD REFERENCES	4
4.DESCRPTION.....	4
4.1 HVD3/RC/DI.....	5
4.2 RHV/R/DI/2.....	6
5.MODE OF USE.....	7
5.1 FAULT SITUATION.....	8
5.2 WIRING HARNESS.....	9
6.SHIPMENT.....	10
7.STORAGE.....	10
8.CONTROL.....	10

VOLTAGE DETECTING SYSTEMS

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 μA but is sufficient to power the high voltage detecting device (HVD3/RC/DI) 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 brackdown of each part composing the chain from divider capacito to optical light generation; this because each fault causes a sudden loss of light of one phase wich 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.

VOLTAGE DETECTING SYSTEMS

3. STANDAR REFERENCES

Valid both for HVD3/RC/DI 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 FIELDS 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:

- HVD3/RC/DI 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

VOLTAGE DETECTING SYSTEMS

4.1 HVD3/RC/DI

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."

- Optical Integrated VDS - Voltage detecting system in accordance with IEC 61243-5
- The VDS supplies continuously :
 - ◇ an impulsive optical signal for local voltage indication
 - ◇ a synchronous optical signal to be analysed by phase comparator (HVFD) or to be connected for remote voltage indication by special relay (RHV or 3RHV)
- LED life time guaranteed - min. 30 years
- Surge arresters does not applied because only optical signals are available on the front of panel

Technical features

High voltage :..... 3 - 170 KV
Primary Capacitance* :.....0.5 - 300 pF
Power supply :.....no auxiliary power requested
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

VOLTAGE DETECTING SYSTEMS

4.2 RHV/R/DI

With this device you can achieve the better protection because of the galvanic insulation guaranteed by optical link, moreover with the continuous internal fault supervision you are sure the information you get is correct.

Due to its reliability is approved in high voltage hybrid by ENEL customer such as ABB Adda, Siemens, Alstom.

The possibility of control of same voltage condition of the optical signal coming from phases assures that any danger situation such as a fault in voltage detector or a breakdown of an optical fiber or the contact loss of a faston are quickly noticed by a contact of alarm.

The fully sealed resin incapsulated box is a winning choice to avoid problems with temperature variation, humidity, shocks and all the typical stress of electromechanical environments.

- **Optical relay for local and remote indication of voltage presence with an extra contact for fault**
- **The device supplies continuously :**
 - **A front indication by led of auxiliary power on;**
 - **A front indication of high voltage presence by a led: this condition is true if even only one optical rear input is on or one phase is present;**
 - **A front indication of high voltage absence by a led: this condition is true if all the three rear optical inputs are off simultaneously**
 - **A rear change-over contact for remote indication of voltage presence/absence**
 - **A rear change over contact for remote indication of internal fault or the all 3 optical input have not the same voltage condition**

Technical features

Nominal voltage :.....24, 48-220 Vdc
Input :.....optical synchronous signal
Temperature range :..... -30°C + 70°C
Conform to ENEL: GLI, R EMC 01 and R CLI 01

Dielectric strength :.....275KV
Surge strength :.....650KV
IP degree protection :.....IP64(*)

Relè features

Contacts Material :.....Ag. CdO
Nominal Value :.....5A 250VAC (cos ϕ =1.0)
:.....3A 250VAC (cos ϕ =0.4)
:.....5A 30VDC
Max changeover current :.....5 A
Max changeover voltage :.....250 VCA, 100VDC
Electric live :.....5A/250 VCA cos ϕ 1 1 x 10⁵ cycles
Mechanical live :.....5 x 10⁶ cycles
Dielectric strength (open contacts) :..1000VAC 1min
(coil-contacts) :....5000VAC 1min
Surge strength :.....min 10000V/1.2X50us

(*) output connector IP30

Material

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

VOLTAGE DETECTING SYSTEMS

5 OPERATION

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 HVD3/RC/DI and RHV/R/DI.

HVD3/RC/DI 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.

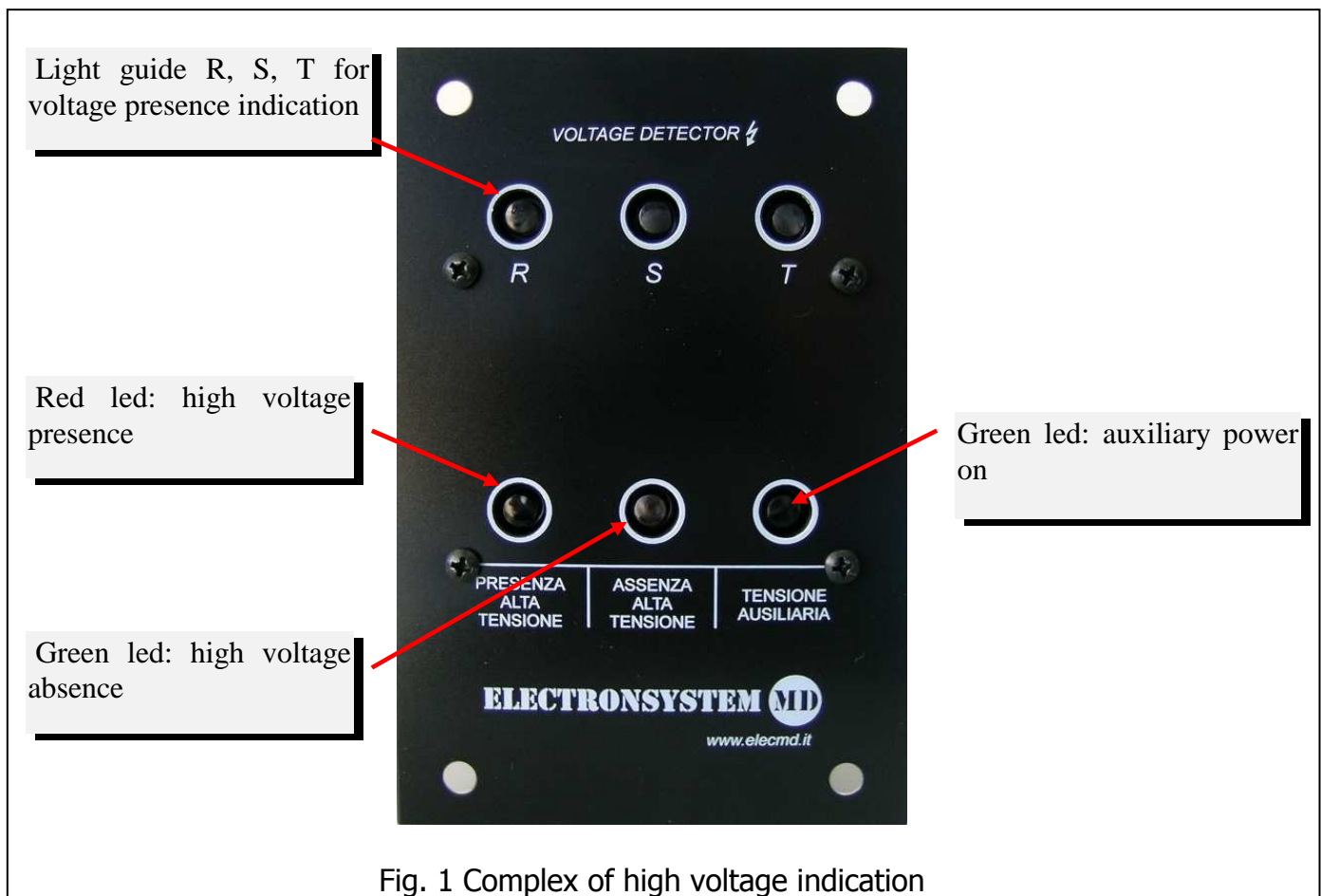


Fig. 1 Complex of high voltage indication

5.1 FAULT SITUATION PROCEEDING

In case of fault you must preliminary control:

- Green led of RHV/R/DI "auxiliary voltage" must be on, otherwise turn on auxiliary voltage.

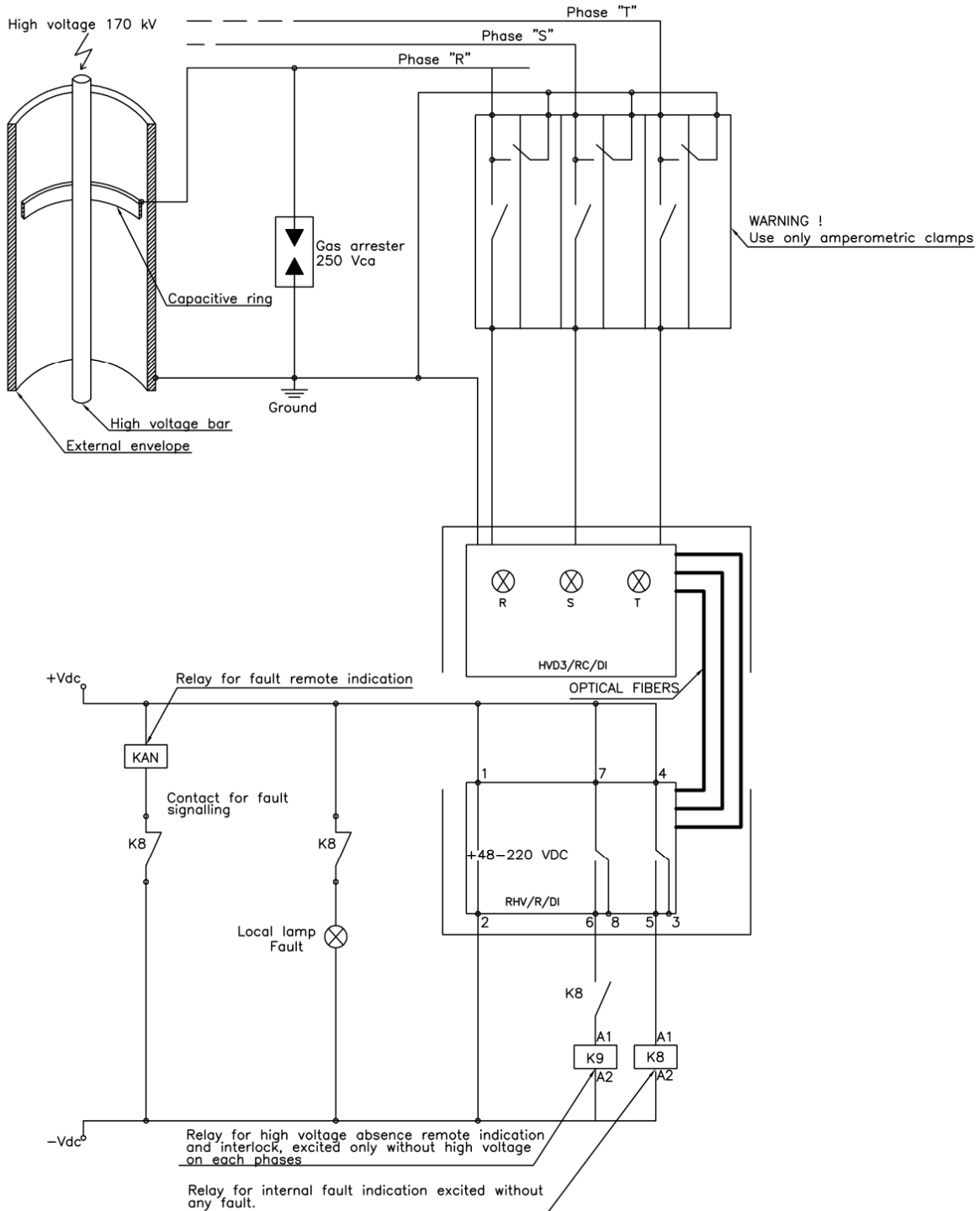
Fault condition: research of interested phase

The following proceedings indicate how to individuate the phase under fault and which can be the possible causes :

1. Control that each light guide of phase R, S, and T of HVD3/RC/DI are flashing (Fig. 1); if one of the phases is not flashing jump at point 7).
2. Control optical fibers are integer , not bent at corner and well inserted into optical receivers present on the back of RHV/R/DI and well inserted into optical connectors present on back of HVD3/RC/DI.
3. Unlink optical fibers from the three blue optical receivers of RHV/R/DI and verify they are illuminated at the end by red light; if one or more fibers are dark or dim light jump to point 4) otherwise jump to point 6).
4. Unlink the dark fiber/s from complex and control if the fiber is broken or doesn't guide the light ; if the fiber is not good replace it, otherwise jump to 5).
5. Control that the phase from which you have unlink the previous fiber is flashing both on front and back of device HVD3/RC/DI with red light; if the phase is not flashing replace HVD3/RC/DI (BE CAREFUL IN HVD3/RC/DI REPLACEMENT: before unlink cable coming from divider capacitor from plugs be sure you have short circuit the amperometric plugs to earth).
6. Control that inside the blue optical receive of RHV/R/DI there is no dirt; is the connector is clear replace RHV/R/DI.
7. Control that electrical cable coming from divider capacitors are not broken or cut, well plugged and integer. If the cables are good replace HVD3/RC/DI.

VOLTAGE DETECTING SYSTEMS

5.2 SCHEMA DEI COLLEGAMENTI



VOLTAGE DETECTING SYSTEMS

6 SHIPMENT

The complex is shipped completely mounted on the plate but with optical fibers unlinked to avoid injuries.

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 injuries.

8 CONTROL

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

VOLTAGE DETECTING SYSTEMS

Rev./Mod A Data 31.07.01 Descrizione: MODIFICA INCOMBRO	Rev./Mod B Data 20.09.2002 Descrizione: AGGIUNTA CODIFICA ABB ADDA	Rev./Mod C Data 30.07.2003 Descrizione: MODIFICATA TABELLA	Rev./Mod D Data 17.04.2007 Descrizione: AGGIUNTO PROTEZIONE RESISTENZA	Rev./Mod E Data 10/07/2007 Descrizione: AGGIUNTO RESISTENZA IN TABELLA	Rev./Mod F Data 14/08/2007 Descrizione: MODIFICATO GRUPPO 804
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Rev./Mod G Data 17.03.2008 Descrizione: MODIFICA FIATRA, TOLTO RESISTENZA	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>NOTE: THE DRILLING TEMPLATE IS INDICATED BY DASHED LINES</p> <p>DATA: _____</p> <p>_____ FIRMA UFF. ACQUISTI</p> </div> <div style="width: 45%; text-align: right;"> <p>Fig. _____</p> <p>Material/Materiale _____</p> <p>N° Series / Serie _____</p> <p>Finishing / Finitura _____</p> </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <p>Fig. _____</p> <p>Filing Room _____</p> <p>Archivio _____</p> <p>Tiread quality tolerance Tolleranza filea qualità 6g-6s UNI 564-55</p> <p>Coord Punching N.C. mach. Coord. punzon. a C.N. JST1</p> <p>General tolerance for machining / Tolleranza generali per lavorazioni meccaniche:</p> </div> <div style="width: 45%;"> <p>Prep. G. FORLANI</p> <p>App. P. GUZZETTI</p> <p>Rev./Mod. 0122.04.2000 : Emissione nuovo disegno</p> <p>Resp. Dep. Uff. Tecnico</p> <p>Titolo COMPLEX CAPRESE</p> <p>Apparatura HVD3/RC/DI + RHV/R/DI</p> <p>Doc. No. 43911622</p> <p>Scale 1:1</p> <p>Scale 1:1</p> <p>Scale 1:3</p> </div> </div>
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L2

LIVELLO

LQA

1

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HVD3/RC/DI - DWG. 43911521

PLUGS TO CAPACITOR DIVIDER

CONTACTS OF RELAY

OPTICAL FIBER - DWG. 43922224

RHV/R/DI - DWG. 43911591

PANEL - DIS. 43911564

VOLTAGE DETECTOR

R S T

TENSIONE ALTA TENSIONE ALTA TENSIONE ALTA TENSIONE

www.electrod.it

N°4 HOLES Ø 6.5

90
75
100
115
130
150
10

VOLTAGE DETECTING SYSTEMS

Rev./Mod A	Data 01.10.2001	Rev./Mod B	Data 20.09.2002	Rev./Mod C	Data 10.01.2005	Rev./Mod	Data	Rev./Mod	Data
Descrizione: MODIFICATO INGOMBRO		Descrizione: AGGIUNTA CODIFICA ABB ADDA		Descrizione: MODIFICA TABELLA		Descrizione:		Descrizione:	

CODICE PER L'ORDINE:
 Descrizione : Segnalatore presenza tensione e concordanza fasi
 Codice : HVD3/RC/DI/

Codice di identificazione tensione di servizio/capacità
 vedi tabella dis. 43911548 Fig. 2

F: per presa segnale capacitivo con faston sul dispositivo
 W: per presa segnale capacitivo con connettore water-proof
 A: per presa segnale capacitivo con connettore faston AMP a 3 vie

NOTE :

- Presa per segnali dai capacitivi con faston tipo AMP 6.3x0.8 oppure con connessione water-proof AMP
- Lunghhezza cablaggi: 200 mm. circa
- Definire nell'ordine capacità del divisore capacitivo (tranne quando vengono forniti da Electronsistem MD) e tensione di servizio.
- La ditta di foratura per le lamiere è evidenziata in tratto-punto.

Fig.	Filing Room	Tolerance quality	Tolleranza qualità	Coord. Punching N.C. mach.	Qualità per quote lineari	Finishing / Finitura
Archivio	Thread quality	Tolleranza qualità	95-95 UNI 5541-65	Coord. punching N.C. mach.	Qualità per quote lineari	ES12 Medio / Medio CS13 Coarse / Grossolano JS15

Rev./Mod.	01.10.2001	Emissione nuovo disegno	Apparatus	43911521	Scale	1:1
App.	P. CIBOLDI	Resp. Dep.	Uff. Tecnico	Doc. No.	43911521	Sp. Psp.
Dis.	P. P. GUZZETTI	Uff. Resp.				

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