

## Operation and Maintenance Manual

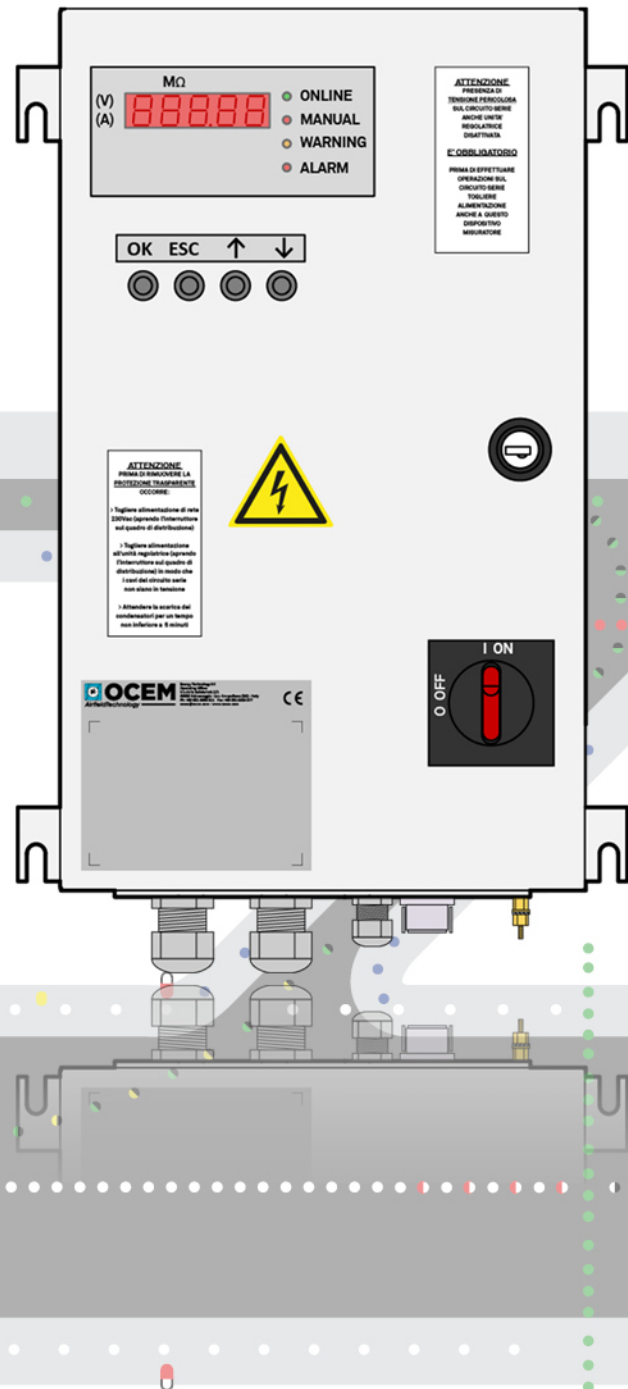
# Insulation Resistance Measurement

## INSULATION RESISTANCE MEASUREMENT

## SERIES CIRCUITS 6.6A UP TO 30 KVA

## FIELD BUS CONNECTION LONWORKS

## MANAGEMENT SOFTWARE SERVER AND CLIENT



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| Editions |            |                |
|----------|------------|----------------|
| Release  | Date       | Notes          |
| 1.0      | 14/12/2020 | First emission |
| 1.1      | 03/02/2021 | Content review |
| 1.2      | 22/04/2021 | Content review |

UT-MT-0930\_1.3\_22-04-2021 (EN) | These specifications may be subject to change.  
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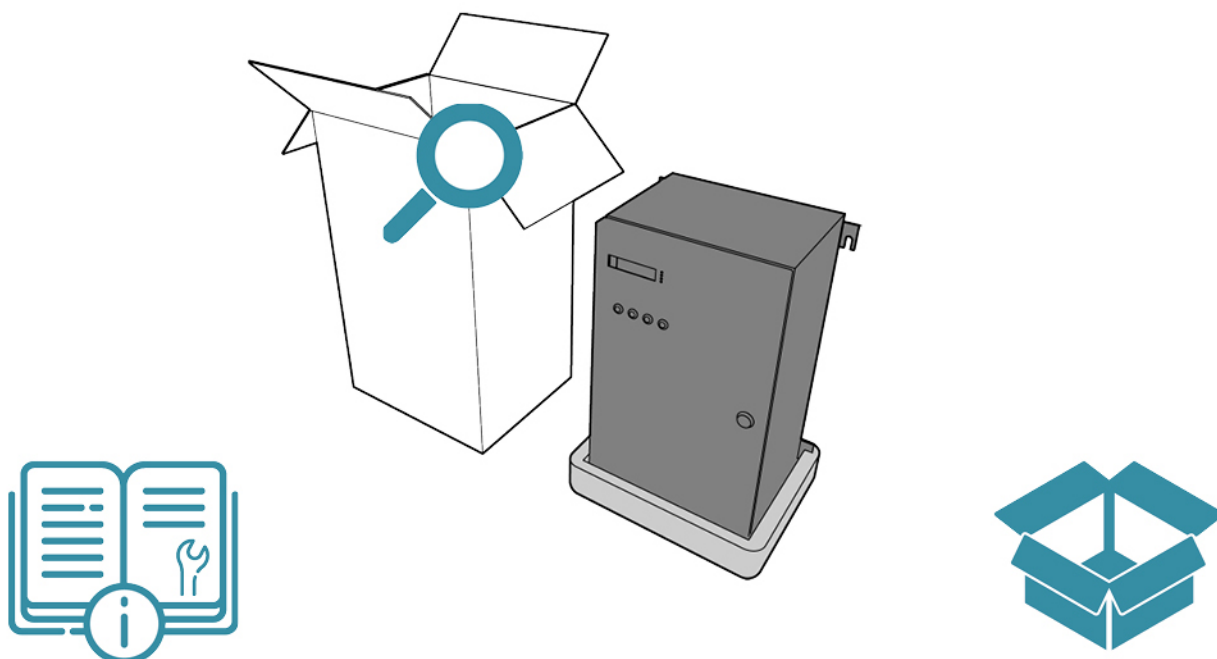
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## 1 GENERAL INFORMATION

### 1.1 Package content



The IRM of Energy Technology S.r.L. is a measurement device designed for the monitoring of the insulation resistance on a circuit airport series. The device is designed in compliance with:

- IEC: 61010-1 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.

The measurement can be performed on a series circuit powered by a regulator unit compliant with:

- IEC 61822: Electrical installations for lighting and signalling in aerodromes - Constant current regulator
- FAA AC 150/5345-10: L-828 Constant current regulator unit without monitoring; L-829 Constant current regulator unit with monitoring
- ICAO: Annex 14, Manual of airports Part 5.

Immediately check for visible damages of the containing box. Carefully remove the device and check for visible damages. Before proceeding read all warnings on the packaging.



**Store the device in its original packaging until the time of installation.  
Pay attention not to damage the cables or the watertightness of the device.**



**The device described in this manual has been designed to be installed on series circuits, powered by constant current regulators from 2,8 A to 6,6 A.**

## 1.2 Manual reference guide

This document contains all the information related to the equipment and describes the procedures to follow during the installation of the product and during ordinary maintenance. The document is intended for all operators that must intervene on the equipment.

The precautions provided in the manual are always preceded by a symbol as illustrated below:



Indicates the warnings, the notes, the suggestions and other points on which is intended to draw the attention of the reader.



Indicates the operations to be carried out mandatorily or the informations which should be carefully watched to avoid possible risks.



Indicates particular risks connected with the power supply. Are reported the operations to be carried out mandatorily or the informations which should be carefully watched to avoid possible risks.

These precautions safeguard the personal security of everyone who works and/or are present in the buffer area of the equipment and of the relative supply circuits.

The failure to comply with the instructions (in particular those preceded by danger, warning, caution precautions) can cause serious injury or death.

## 1.3 Safety instructions



### CAREFULLY READ THIS DOCUMENT.

The improper use of the equipment or the failure to comply all the precautions indicated implies life danger and serious injury to persons and damages to things.



### HAZARD OF ELECTRICAL SHOCK, EXPLOSION OR ELECTRIC ARC

Carefully read the enclosed documentation before installing or starting to use the equipment. Do not install the equipment until the completion of all construction works required to carry out the work.



### DO NOT OPERATE ON POWERED CIRCUITS

Do not carry out any operation on powered circuits.

Before every access, inspection or intervention on the equipments, ensure to have switched off the equipment by opening the main power switch and by removing the supply from the unit by opening the power switch at the beginning of the line.

The failure to comply all the precautions indicated implies life danger and serious injury to persons.



### RESIDUAL ENERGIES

Always wait for the discharging time (at least 5 min) before operating on the equipments. Check the complete de-energization of the equipments before accessing the potentially active parts. The failure to comply all the precautions indicated implies life danger and serious injury to persons.



### IN CASE OF MULFUNCTION OF THE EQUIPMENTS

Do not leave the devices who have expressed evidence of deterioration or of malfunction. Disconnect the energy sources and proceed as soon as possible to repair/replacement of devices.

## 1.4 Safety symbols

The symbols illustrated in the following table are used in the user and maintenance manual and on the device. These symbols serve to indicate the existence of any dangerous situations, to indicate provisions and prohibitions in relation to the situations that may represent an hazard for the operator or indicate the behaviour to adopt to minimize the risk for the operator.

| Warning signs                                                                      |                               | Prohibition and obligation signs                                                   |                                                             |
|------------------------------------------------------------------------------------|-------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------|
|   | W001   General warning sign   |   | P001   General prohibition sign                             |
|   | W004   Laser beam             |   | M001   General mandatory sign                               |
|   | W005   Non-ionizing radiation |   | M002   Refer to instruction manual/booklet                  |
|   | W006   Magnetic field         |   | M005   Connect an earth terminal to the ground              |
|   | W012   Electricity            |   | M009   Wear protective gloves                               |
|   | W017   Hot surface            |   | M015   Wear high visibility clothing                        |
|  | W027   Optical radiation      |  | M021   Disconnect before carrying out maintenance or repair |

## 1.5 Definition of operator

All operations on devices and on its internal parts must be performed by professional staff, properly formed and aware of the risks connected with the power supply and to the use of low and high voltage circuits.



**Take all the precautions in compliance with the safety standards for the work carried out on electrical installations and however for the works carried out using electrical installations or in buffer zones of the installations and of the electrical devices.**

All operations on equipments and on its internal parts must be performed by professional staff, properly trained for Cardio Pulmonary Resuscitation (CPR) techniques.



**Never operates on devices if there is not at least another operator properly trained for CPR techniques.**

Check that Operators do not operate outside their own specific fields of competence and responsibility. Energy Technology S.r.L. declines any and all liability arising from wrong operations carried out by untrained personnel in the use of the devices, or deriving from the non compliance of general safety standards.

## 1.6 Limited warranty

Energy Technology S.r.L. assures that all the IRM products marketed are free of manufacturing defects at the time of shipment. This limited warranty will be valid for the period indicated in the sales agreement. **THIS LIMITED WARRANTY IMMEDIATELY DECAYS IF THE PRODUCT IS USED FOR PURPOSES OTHER THAN ORIGINALLY INTENDED.**

This limited warranty is provided by Energy Technology S.r.L. to the original purchaser of IRM products as identified by the documents issued at the time of purchase. This limited warranty can be transferred to the subsequent purchasers of the Product, only on condition that this Product is resold as NEW and with the original packaging.



**Each change and/or tampering made to the product immediately ends of the warranty. Energy Technology S.r.L. cannot be held responsible for any damage to items or persons deriving from the failure to comply with instructions relating to installation, use and maintenance of the product, and to the installation and storage environmental conditions stipulated by the Manufacturer or by applicable rules regarding electrical devices and systems.**

In case of potential defects or non-usability of the Goods supplied, the applicable warranty that excludes any other legal warranty and agreement - applies to the defects of materials, in the design, and/or in the installation of the Goods supplied. The warranty consists, depending on the Supplier, in the repair or replacement, at the expense of the Supplier, of each faulty component or malfunctioning component from the beginning, but is not extended to damages arising from negligence or wear.

This warranty lasts for at least 12 months after the date on which the received Goods are put into service, but will not in any case exceed 24 months from the shipping date.

**FAA**

**For FAA certified products this warranty lasts for at least 4 years after the date on which the received Goods are put into service, but will not in any case exceed 5 years from the shipping date.**

The Supplier undertakes to repair or replace the components in the shortest possible time without prejudice to the fact that for the so called commercial components and more generally for the components supplied by third-party manufacturers, will only be applied the terms of the respective original manufacturer's warranties.

The warranty absolves from all liability the Supplier and does not apply to the damage of any kind, caused by: improper use by the Customer or by the Customer's staff, use of inadequate materials, or incorrect or insufficient treatments; installation of equipments or spare parts not approved by the Supplier; installation and operating working of the Goods received without following the indications and the instructions provided by the Supplier's Technical staff; improper or excessive use, insufficient maintenance, and/or works not carried out in conformity with the information provided in the use and maintenance instructions; any other reason not attributable to the Supplier. The Customer must shoulder, at its own cost and employing its own staff, without involving the Supplier, those repairs that on the base of the Supplier's opinion are considered compliant at a moderate level of technical know-how.

The Customer must, under penalty of expiration, communicate the complaint concerning the defect or the non-conformity to the Supplier **within 8 days from the date of discovery of the defect**, and must send a written request to activate the intervention under warranty. The intervention request under warranty must be sent to:

**Energy Technology S.r.L. | via della Solidarietà, 2/1 | 40056 Valsamoggia BO (Italia)  
info@ocem.com**

The Customer must bear the travel and accommodation costs borne by the technical staff of the Supplier that must complete on the installation site any intervention associated with the guarantee.

The warranty excludes any other damage, included those resulting from economic loss and from low production capacity; direct, indirect or consequential damages; and the Contract termination.

The Supplier is not in any manner responsible for any other compensation or indemnity, including damage derived from missed or reduced production, from the loss of chance, from the missed or reduced profit, from the loss of contracts, impossibility of use or in general the partial use, in addition to indirect and/or consequential damages.

## 1.7 CE marking



This equipment complies with the requirements of European legislation for the CE marking. The user should carefully read this document and respect all the requirements quoted.

This equipment meet the requirements in relation to health and safety of the main EC directives, and in particular of the EMC Directive on electromagnetic compatibility (2014/30/UE) and of the LV Directive relating to electrical equipment designed for use within certain voltage limits (2014/35/UE).

## 1.8 Confidentiality, industrial property rights

The Customer needs to adopt the maximum confidentiality with respect to all the information of technical nature (including, by way of example and not exhaustively, plans, programmes, documentation, formulas, recipes, setting and correspondence) received by the Supplier or in any case assimilated or gained during the conclusion of the Contract of sale.

Any right regarding intellectual and industrial property connected to equipments and to any other element included in the supplied Goods as indicated in the Contract remain exclusive property of the Supplier.

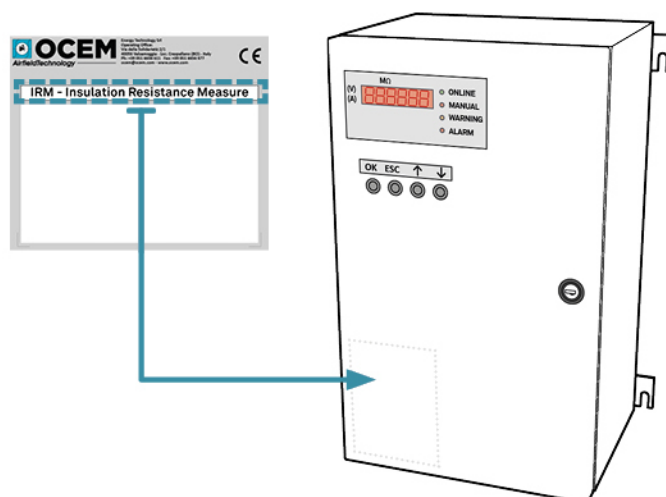
## 1.9 Disposal



At the end of use, the user must confer all the waste in suitable differentiated waste collection centres. It is the responsibility of the user the correct disposal of the equipment in accordance with the WEEE Directive and with the respective national laws in force at the time of disposal. These equipments must never be disposed of in the household waste.

## 1.10 Article identification

On the equipments there is an identification plate of the article, where is reported the article code; on the plate there are additional data: the name of the model, employments or use, power supply features, any trademarks and/or marks that attest the agreement of the equipment to specific regulations or legislations.



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## 2 DESCRIPTION OF THE DEVICE

### 2.1 General characteristics

The measurement device IRM is designed for the purpose of performing the monitoring of the insulation resistance on a circuit airport series powered by a regulator unit compliant with:

- IEC 61822: Electrical installations for lighting and signalling in aerodromes - Constant current regulator
- FAA: AC150/5345-10 L-828 series circuit with CCR current regulator unit without monitoring; L-829 series circuit with CCR current regulator unit with monitoring;
- ICAO: Annex 14.

IRM is compliant with the rule

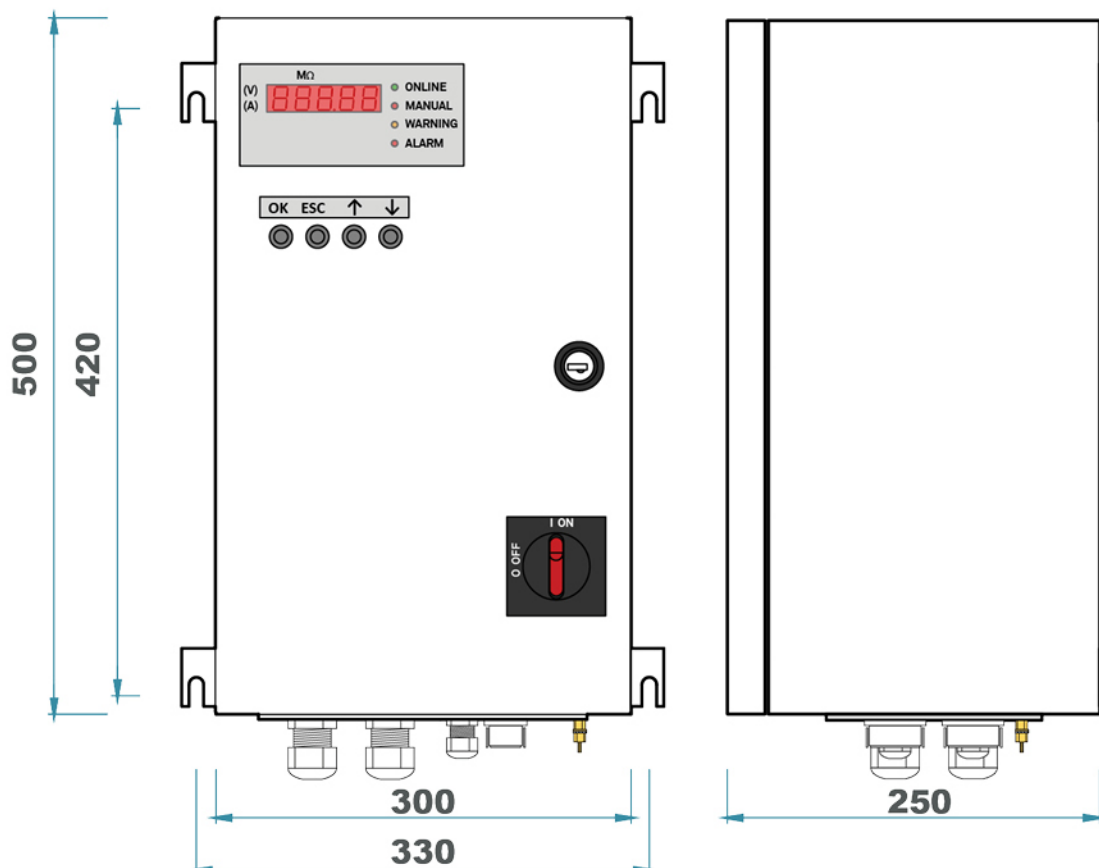
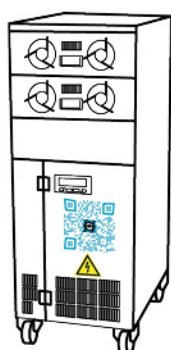
IEC (61010-1)



The device IRM described in this manual has been designed to be installed on L-828 or L-829 series circuit powered by regulator units compliant with FAA AC150/5345-10.



Each series circuit to be monitored must be associated with a device IRM, installable in the cabin.



IEC 61822  
FAA AC150/5345-10  
ICAO (9157 Part 5)

### 2.1.1 Generality

The device IRM performs measure of the insulation resistance of the circuit airport series through the periodic application of a voltage of about  $800 V_{DC}$  to an end of the series circuit by measuring the leakage current to the ground. The measuring interval can be customised (default: 60 sec). The device IRM can be inserted on the series circuit independently on the type of regulator unit and without the need to make changes to the circuit. A disconnect switch easily accessible allow the supply control.

A LED display positioned on the front of the device IRM allows to locally view the measured insulation resistance value AND alternatively the current values (and voltage, optional) on the series circuit, and the main alarms. All the threshold values (pre-alarm and alarm) can be customised.

The internal connection between the measurement card and the interface card is realized through a pair of optical fibres.

The device IRM allows the remote monitoring (optional) of the measured values.

The device is suitable at monitoring series circuits powered by power regulator units not higher than 30 kVA/6.6 A, in the measuring field  $10 k\Omega \div 500 M\Omega$ .

### 2.1.2 Construction detail

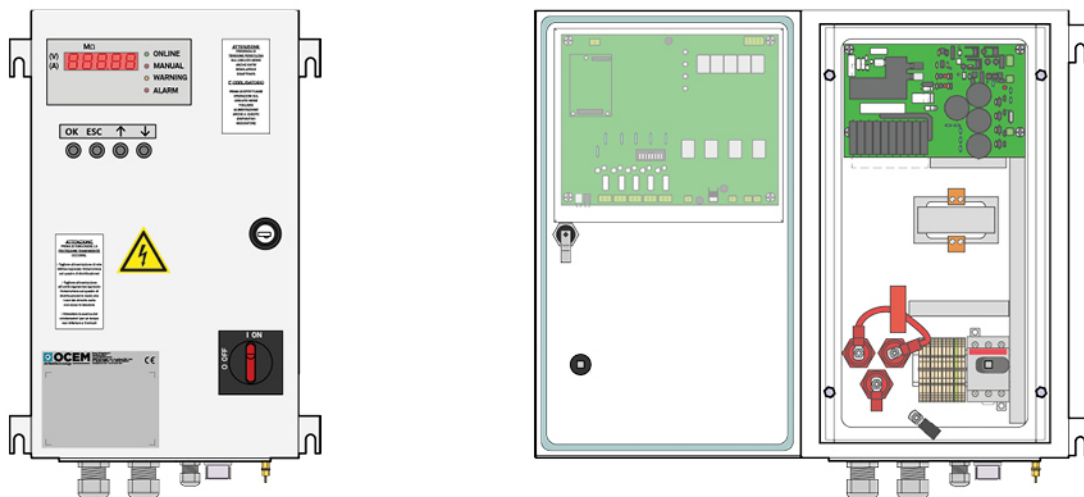
The device consists of a case in zinc-coated steel, painted with thermosetting epoxy powders (colour RAL 7032). The internal sides of the device are segregated by panels in polycarbonat, removable only in safety conditions for the operator (as indicated on the monitoring plates).

The intake and outlet of the cables of the series circuit and of the supply circuit is foreseen from below through suitable cable gland. The protective conductor (min.  $10 mm^2$ ) must be attested through a terminal stud to the screw M8 present on the container. On the bottom in addition there are connectors or cable entry systems for the connection of signals (optionals).

The device is predisposed for the wall fastening through suitable fastening system through screws and plugs (not provided). A template  $330 \times 420$  mm allows an easier realization of support holes properly aligned.

### 2.1.3 Optional devices

- Series circuit rated voltage reading: the device allows the measuring of the voltage on the series circuit, making them available on the local display and on the remote reading.
- Electromechanical remote signalling: a terminal board on the card or a connector make available the reverse contacts (NC, C, NA) to repeat the WARNING, ALARM and MANUAL status.
- IRMS remote control option: is possible remote monitoring of the values measured from the device, through a LONTALK network (standard ISO/IEC 14908-2). A connector type HARTING 5 pin (2 conductors twisted pair + shield) -supplied- allows to easily connect the device to the network.



## 2.2 Article number

| example: <b>IRM -1-1-RC-0-B</b>                                                                                                                                         |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>Infeed Cut-Out:</b><br>1 = Cut-Out present                                                                                                                           |  |
| <b>Voltage measuring on the series circuit</b><br>0 = Voltage on the series circuit not detectable<br>1 = TV for voltage measuring on the series circuit                |  |
| <b>Electromechanical remote signalling (NO/NC):</b><br>00 = No remote signalling<br>RM = Remote signalling with terminal board<br>RC = Remote signalling with connector |  |
| <b>Voltage loop:</b><br>0 = Voltage loop not present<br>1 = Voltage loop present                                                                                        |  |
| <b>CNT data interface:</b><br>A = LonTalk (4P+GND)<br>B = Ethernet (RJ45)                                                                                               |  |

### 2.2.1 Infeed Cut-Out

The device IRM is equipped with a cut-out for an easier disconnection of the device.



**The disconnection of the supply circuit does not prevent the normal operation of the series circuit.**

### 2.2.2 Voltage measuring on the series circuit

The device IRM can provide the reading of the actual voltage value on the series circuit. The voltage value is locally available and is communicated to the cabin supervision system.

### 2.2.3 Remote signalling

The device IRM can be equipped with a signalling system of electromechanical remote signalling of the anomalies: FAULT, WARNING and ERROR.



**For each type of anomaly detected is made available a dry reverse contact (NC+NO).**

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### 3 INSTALLATION

#### 3.1 Insulation measurement device

The measurement devices IRM, installed to the series circuit, display locally informations through the display and the signalling LED on the front and provide information to the supervision central unit with respect to all the operating condition of the insulation of the circuit. This measurement device can be installed as autonomous element or as an element of an integrated monitoring system.

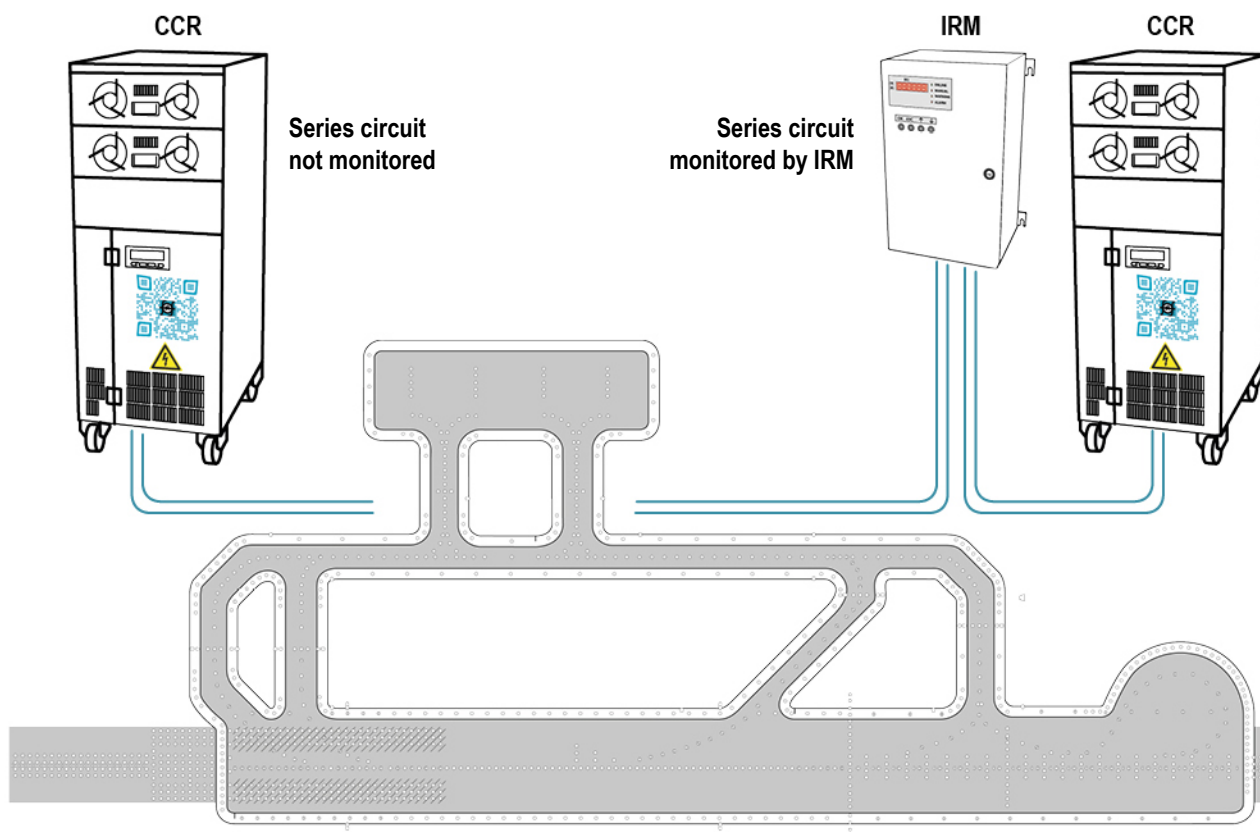
The features of series circuit subject to monitoring must be compliant with the dispositions of competent bodies and with the regulations in force. The device periodically performs the measure of the insulation resistance of the series circuit in order to monitor the deterioration of the features of the materials installed over time to ensure the efficiency of the system.

The measurement device IRM is able to generate warning and alarm messages to be integrated in the mandatory reporting for the proper management and maintenance of the airport (FAA AC 150/5340-30). The measurement device IRM is an equipment useful for the management of faults and for an easier identification of the cabin problems.



**For the features of the CCR regulator units always refer to the requirements of the relevant standard:**

- IEC 61822 Electrical installations for lighting and signalling in aerodromes - Constant current regulator
- FAA AC 150/5345-10 Specification for Constant Current Regulators and Regulator Monitors;
- ICAO Annex 14.



### 3.2 Installation of the device



**Store the device in its original packaging until the time of installation.  
Check the supply features before installing the device.**

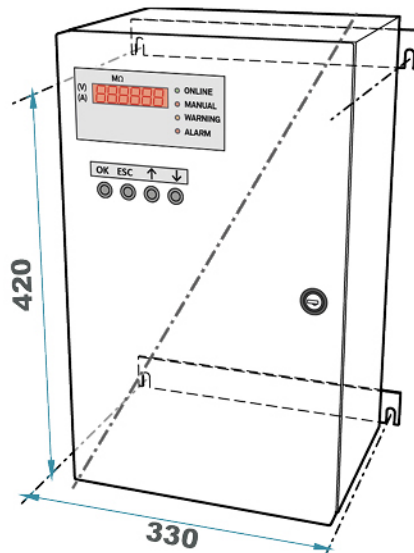
Use the device only in combination with series circuit powered by CCR regulator units by power not higher than 30 kVA, compliant with the standard IEC 61822, FAA AC 150/5345-10 (L-828, L-829) and ICAO Annex 14.



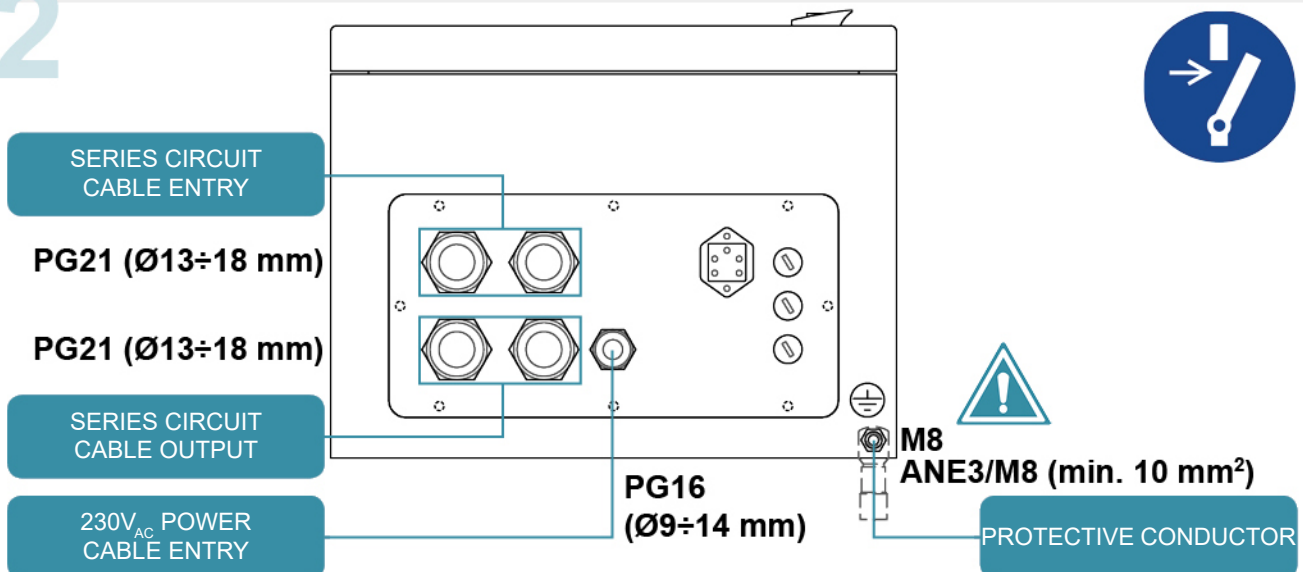
**Before proceeding with the operation, check the conditions of the device:**

- check that the mechanical fixing of the components are steady;
- check that the internal connections are properly configured;
- check that the internal equipotential connections are all realized;

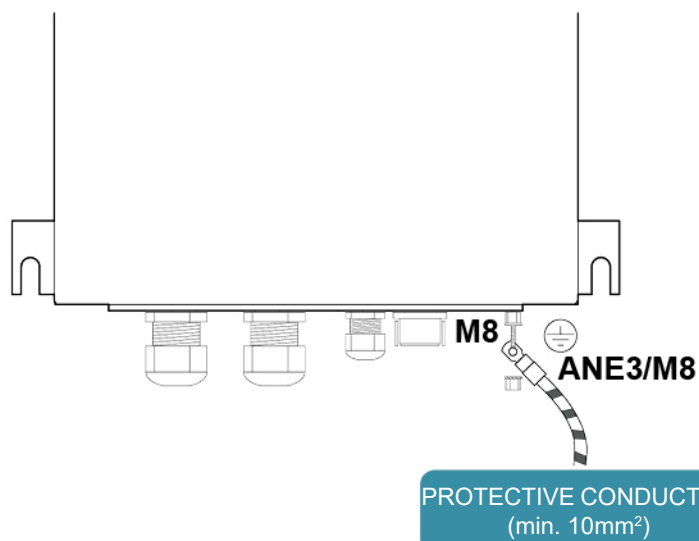
# 1



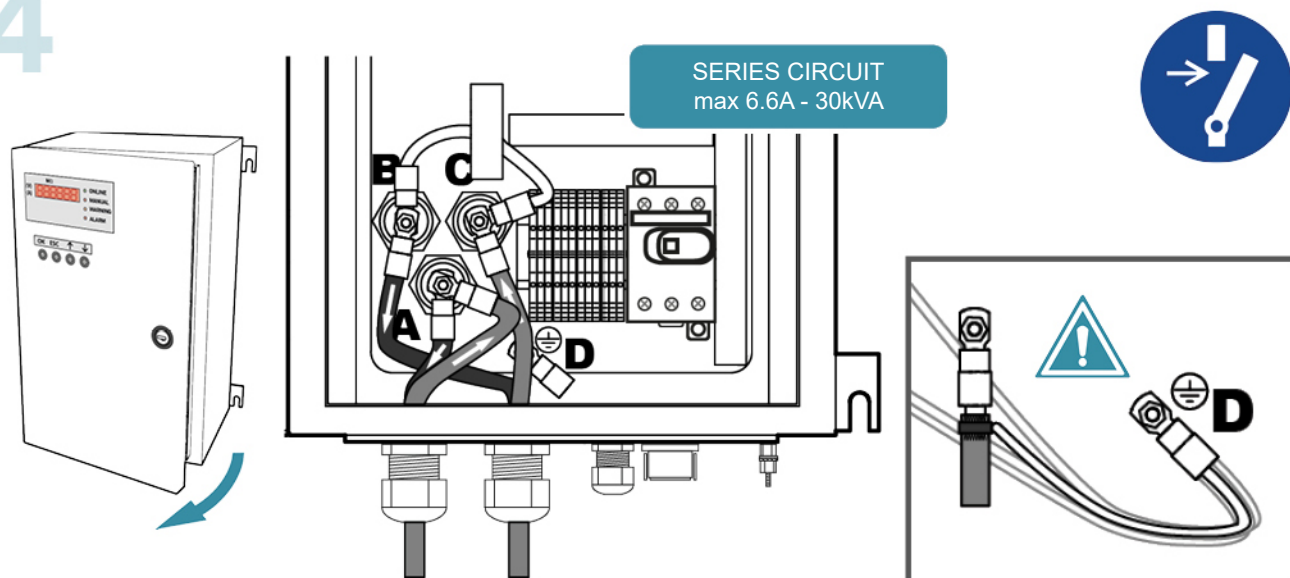
# 2



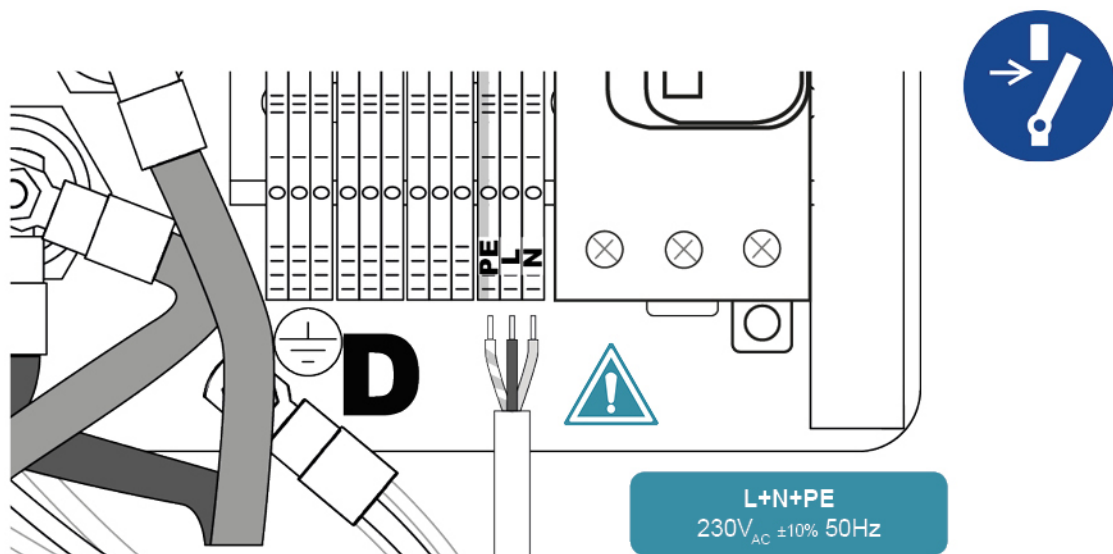
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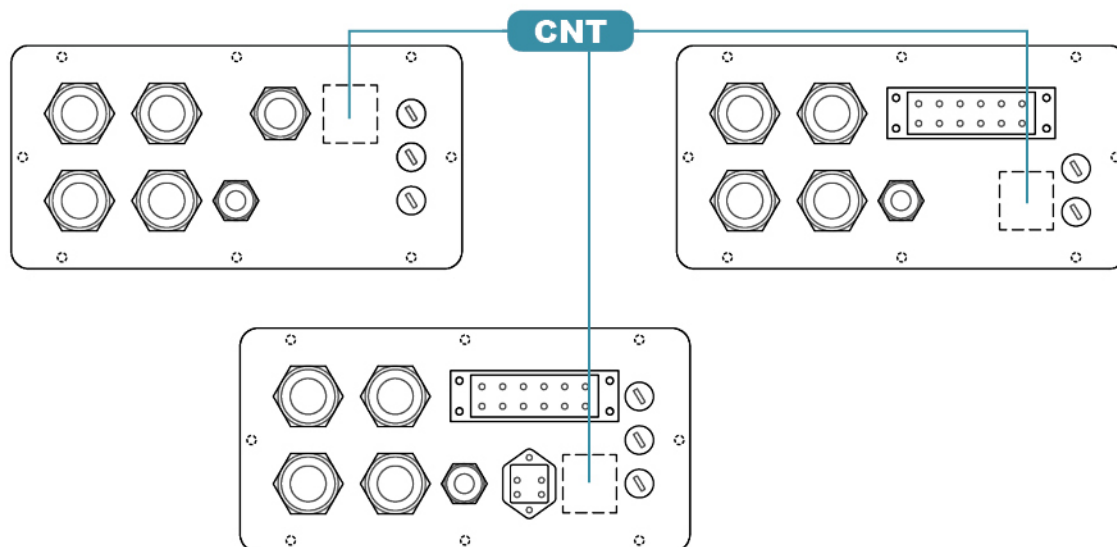
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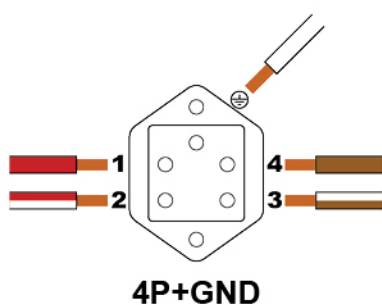
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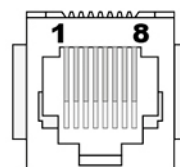
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### A CNT LONTALK

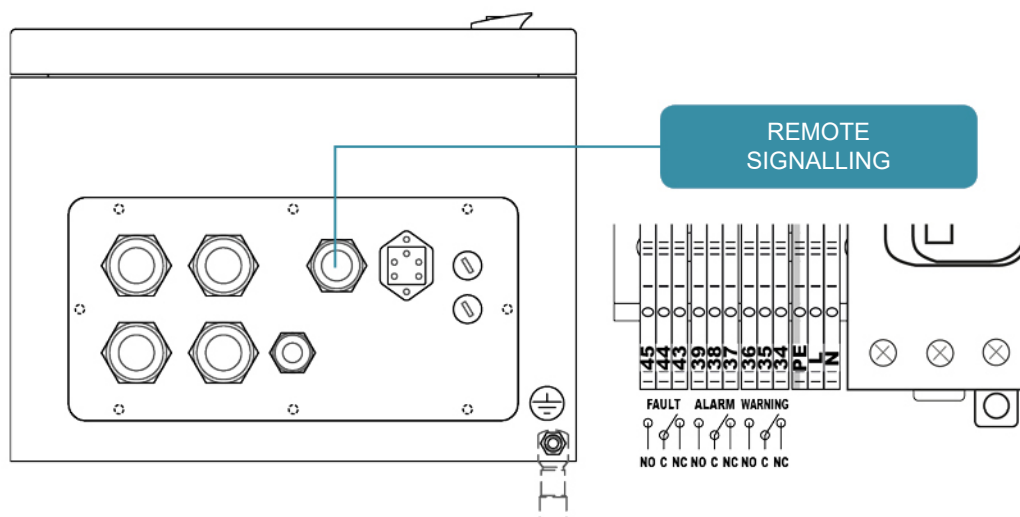


### B CNT ETHERNET

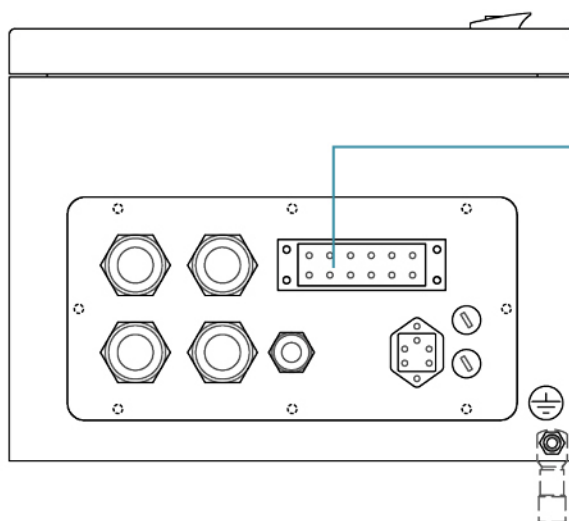


ETHERNET

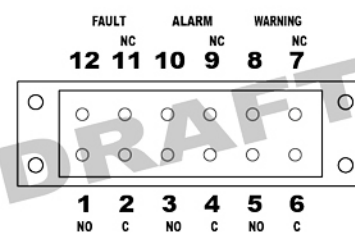
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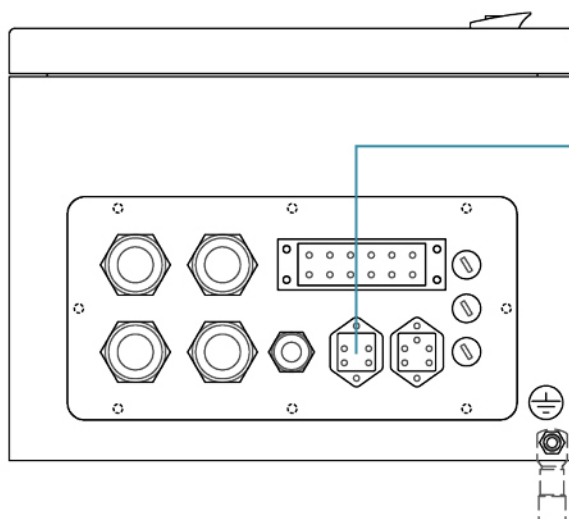
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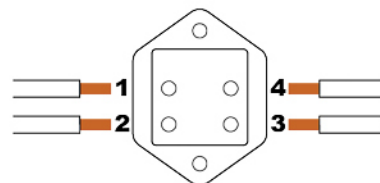
**CNS**  
REMOTE  
SIGNALLING



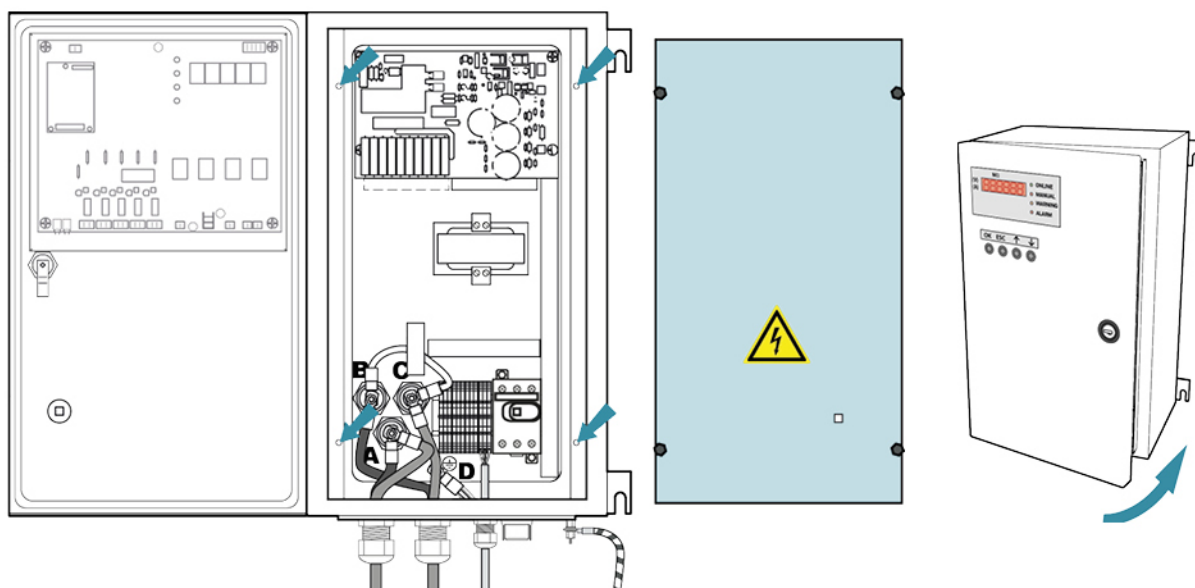
9



**CNL**  
VOLTAGE LOOP



9



INSTALLATION

### 3.3 IRMS remote control

The IRMS software allows the supervision of the system of meters with CNT interface LONTALK type.



The measurement devices IRM - \_ - \_ - \_ -A are equipped with the LonTalk network interface. The supervision software must be installed on a PC connected through router to the fieldbus LonTalk to communicate with the measurement devices IRM. Through Ethernet connection it interfaces with the LAN.

The cabin PC collects data and log from cabin devices and makes them available to the supervision server of the whole system.

#### 3.3.1 Cabin supervision software

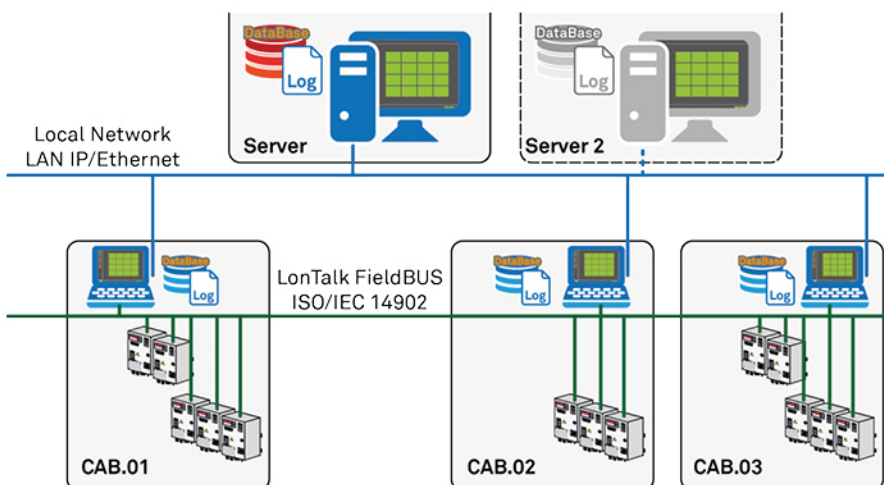
All the monitoring devices IRM installed in each electric cabin transfer the measurement data to local database with the configured interval. The supervision software focuses on realizing the calculation of statistics (average, standard deviation, maximum and minimum,...) and of providing a graphic interface to the operator, with authentication system. Through software interface is possible to view the progress of the measures in time and consult the status of each device.

The main measurement parameters can be updated, by the only authorized operators, on the basis of the needs: saving frequency in the local DB, alarm threshold value, warning threshold value. The data are then sent to the aggregation client station.

#### 3.3.2 Aggregation client station

The client station receive the measurement data from all the supervisory applications active on the Ethernet network. The measures are saved in the global DB.

The interface, similarly to the supervision software, allows the visualization of data and the management of the measures.



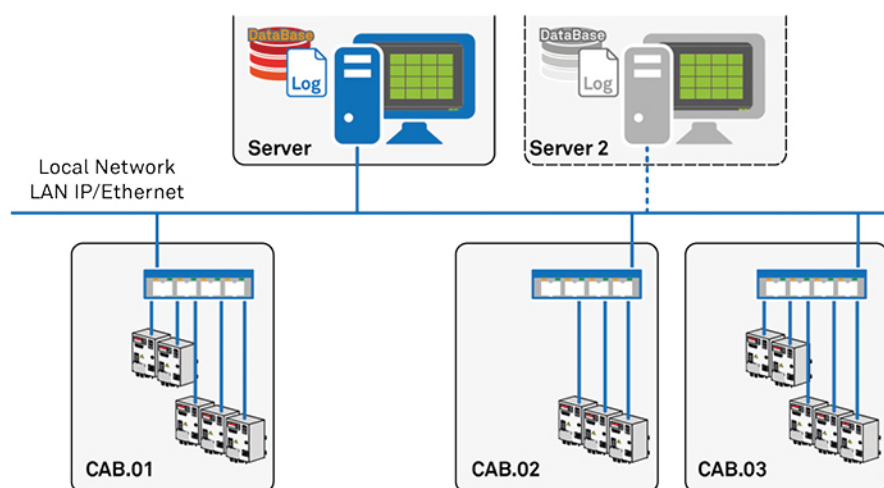
### 3.4 Ethernet connection

The meters with CNT interface ETHERNET type may be interfaced directly with the network structure.



The IRM - - - - -B measurement devices are equipped with ETHERNET network interface and may be configured with an own IP address to be easily reached on the existing LAN data network.

The supervision server of the whole system directly reach the devices and can collect data and log from the units.



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## 4 ADJUSTMENTS AND MAINTENANCE



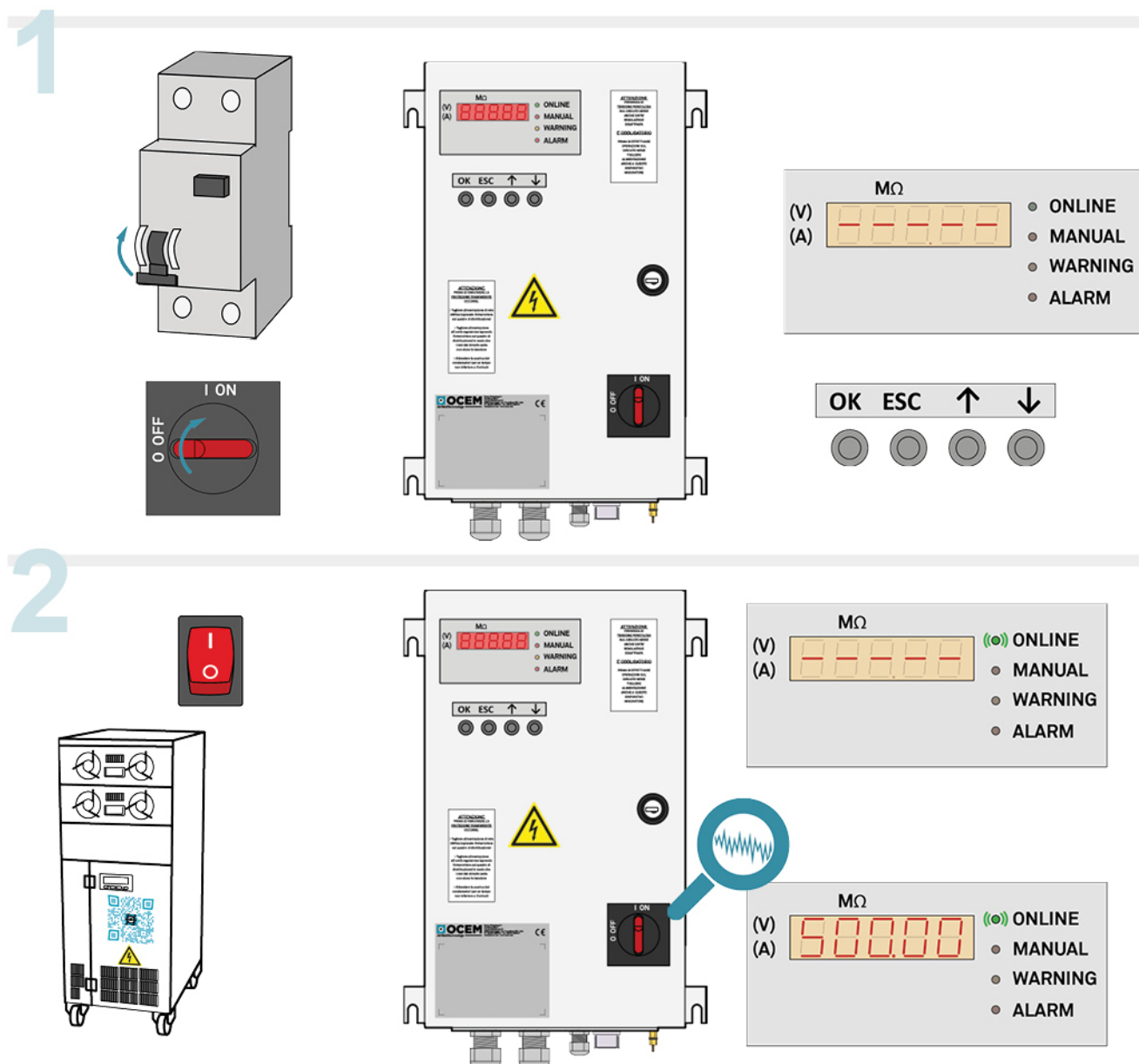
**After completing the installation, close the device with the key.  
Only now is possible to close the upstream cut-out to supply the device.**

## 4.1 Preliminary operations



**If the device is equipped with a local cut-out, rotate it in ON position.**

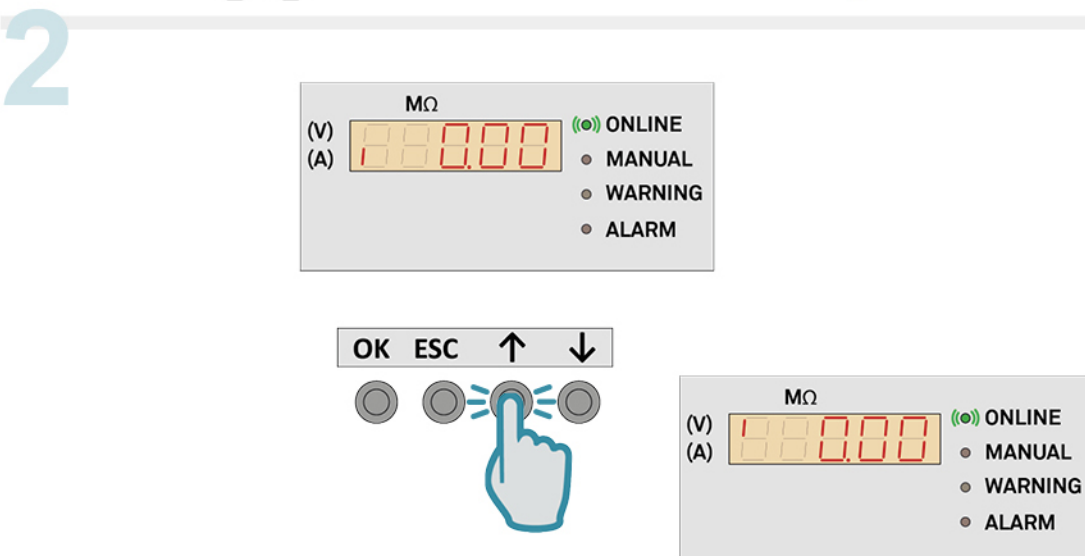
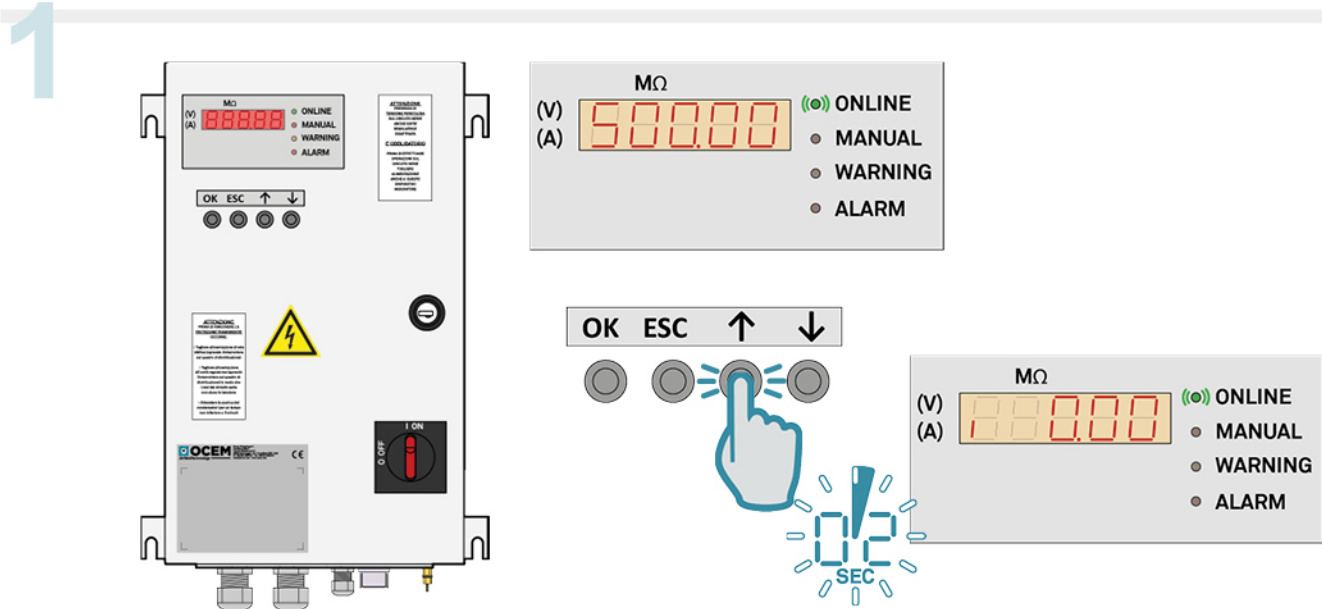
When the device is ONLINE (series circuit powered) the system periodically performs the measure of the leakage current: the meter applies a voltage of about 800 V<sub>DC</sub> to an end of the series circuit by measuring the leakage current to the ground.



## 4.2 Visualization current value (and voltage - optional)



The device can monitor the actual current value on the connected series circuit. If the device is equipped with the voltage measurement device (optional) is possible to monitor also the actual voltage value on the connected series circuit.



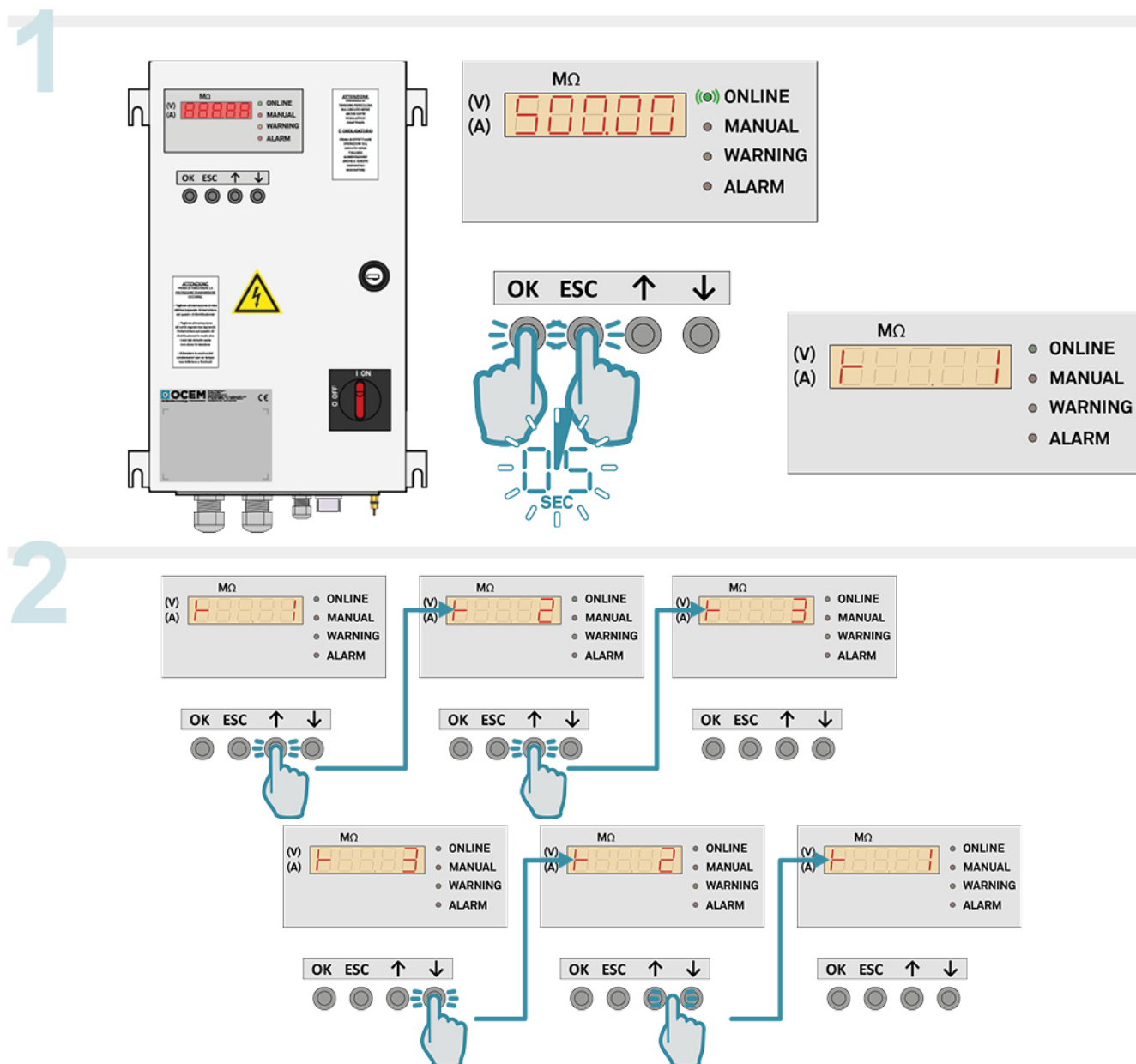
### 4.3 Parameter management



The device is provided already configured with the default values.  
All the parameters can be freely customised on the basis of the customer needs.

The configurable parameters are the following:

- pre-alarm threshold;
- alarm threshold;
- measuring interval



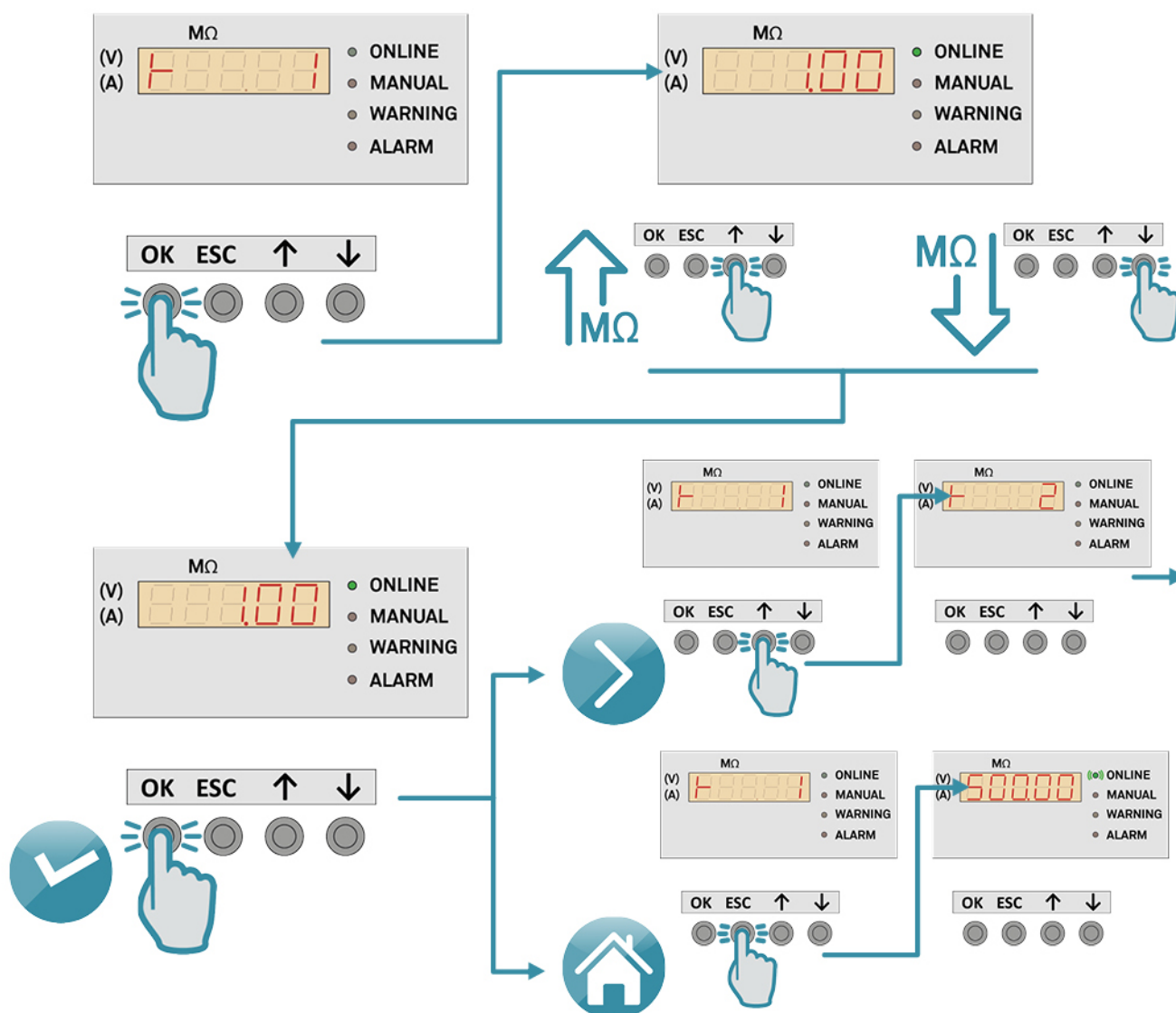
#### 4.3.1 Pre-alarm threshold

Pre-alarm limit value (default value: 1.00 MΩ).

If the resistance value if the insulation value falls below the set threshold, the WARNING signal activates.



The overcoming of the threshold is locally signalled by turning on the LED WARNING (yellow). The same information is transferred to the supervisor through the data connection. If present, the remote signalling system (optional) activates the relay by exchanging the status of the respective contacts NO-NC.

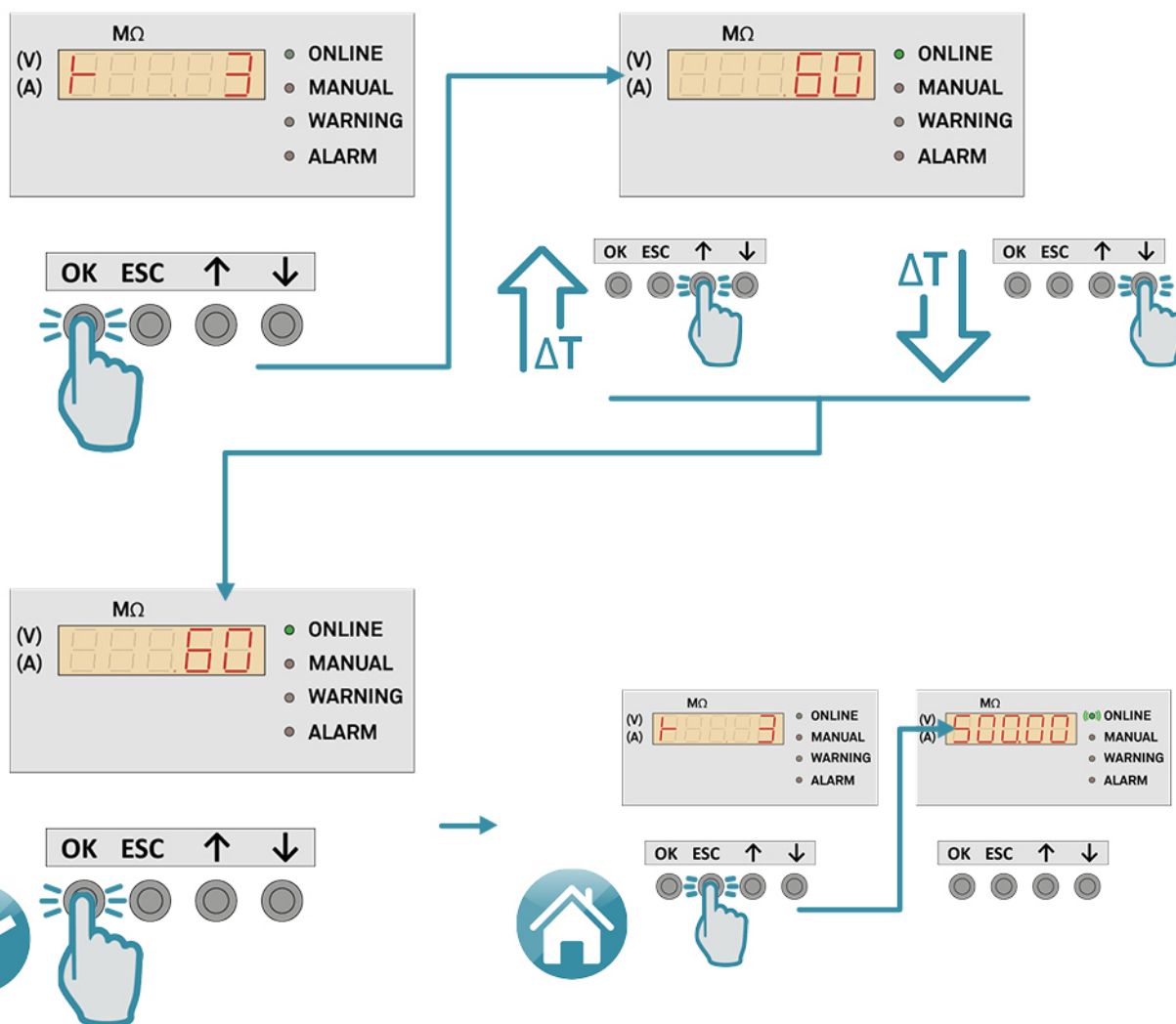




### 4.3.3 Measuring interval

The operator can customise the interval of time between one measure of the insulation resistance and the subsequent one (default: 60 s).

5



#### 4.4 Scheduled maintenance



**Before carrying out any intervention on the device, cut off all external power sources and place appropriate work-in-progress warnings on the systems. Wait for the discharging time (at least 5 min) and check using appropriate instruments that there are no residual energies before accessing the electrical equipment.**

To minimize operations, always pay the greatest attention to handling and storage of devices and carry out installation procedures with extreme precision.

In accordance with the suggestions contained in the document ICAO Airport Service Manual - Part 9: Airport Maintenance Practices, or on the basis of what reported in the document FAA AC 150 5340-30, the devices IRM must be subjected to regular maintenance.

In order to assure the proper functioning and the maximum duration of the operating lifetime of the device all the checks and periodical audits must be carried out and, if necessary, the necessary corrective procedures must be activated to restore and ensure operative safety levels foreseen by the standards.



**Do not let running devices not properly maintained or fixtures presenting signs of damage or fault.**

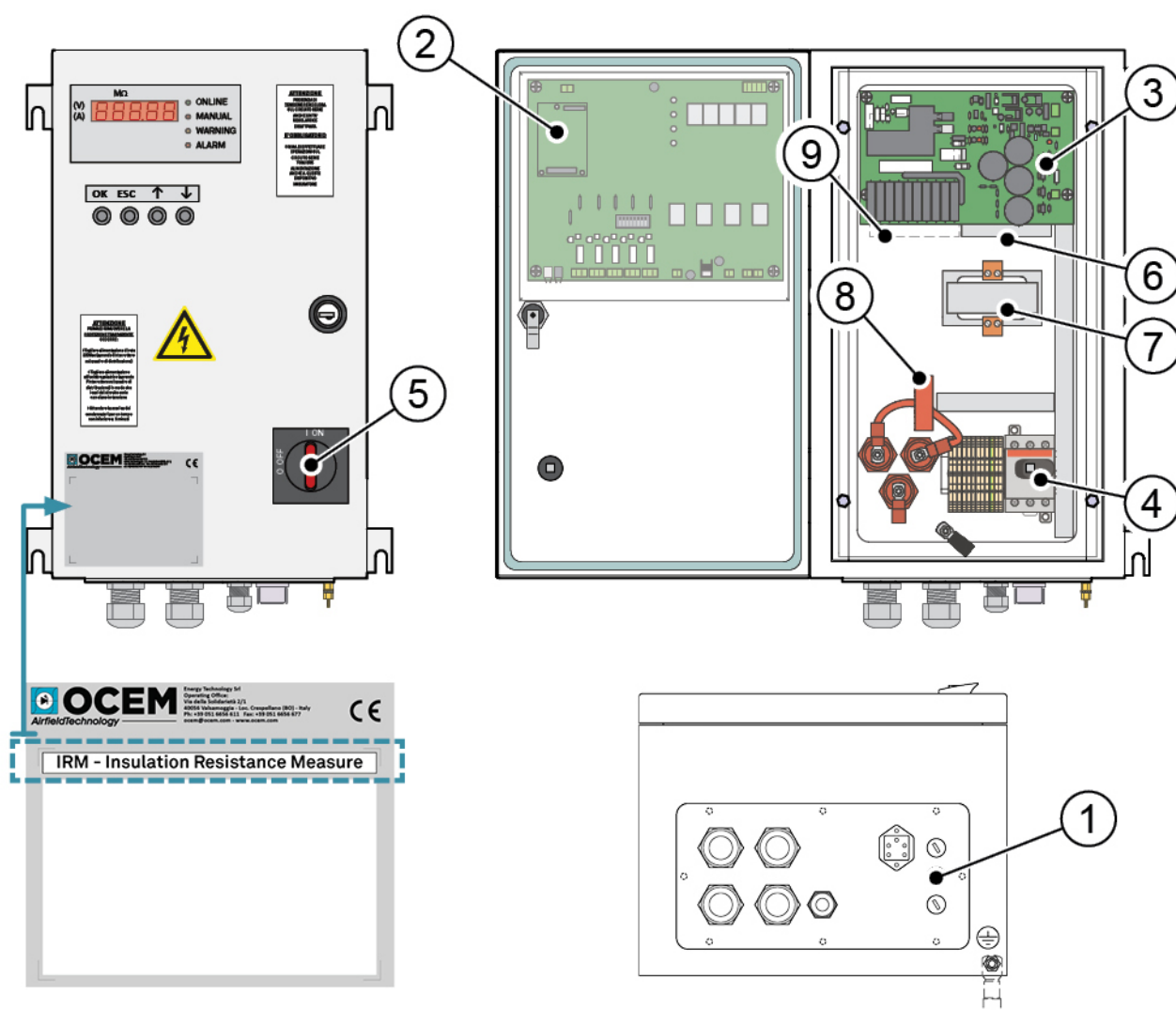
Each maintenance operation carried out on the devices must be noted on the maintenance register.

## 4.5 Spare parts



Always check the version of the device installed and the accessories present.

| Pos | Description                                                  | Code Article        |
|-----|--------------------------------------------------------------|---------------------|
| 1   | Auxiliary fuses 5x20 - 1A Delayed                            | 487.0015            |
| 2   | Interface/display card (F077) - version with relay           | SESMC0004           |
|     | Interface/display card (F077) - base version (without relay) | 150.3794            |
| 3   | Measurement card (F058)                                      | 150.2876            |
| 4   | Main cut-out                                                 | CESZR0005           |
| 5   | Control lever cut-out + shaft                                | CE1ZA0003+CE1ZL0004 |
| 6   | Auxiliary transformer 230V/400V (17-0-17V)                   | 100.1395            |
| 7   | Auxiliary transformer 230V/9V                                | 100.1396            |
| 8   | Amperometric Transformer                                     | 100.1248            |
| 9   | Voltmetric Transformer                                       | 100.1397            |



### Contact us

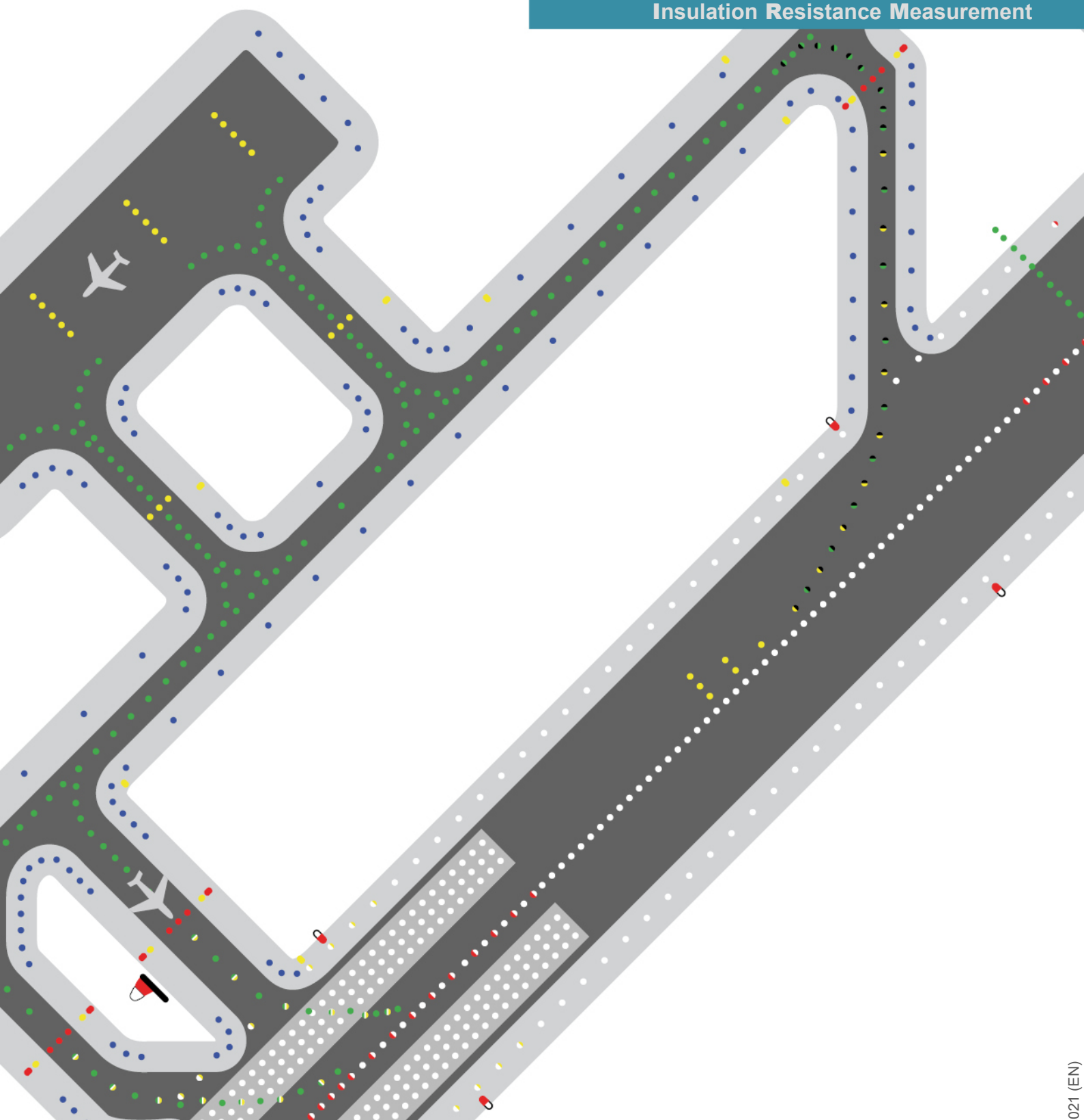
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