



HV DEMO BOX 10 kV

MI 3299

Instruction manual

Version 1.1, Code No. 20 751 482

Distributor:

Manufacturer:

METREL d.d.
Ljubljanska cesta 77
1354 Horjul
Slovenia

web site: <http://www.metrel.si>

e-mail: metrel@metrel.si

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1 Introduction

1.1 General Description

HV DEMO BOX 10 kV simulates typical electrical insulation usually met in the industrial environment. This demo box was design to be used preferably by sales personnel when demonstrating operation of Metrel's HV electrical insulation test equipment. It is also suitable for distributors and end users for learning basic principles of insulation or just for checking the operation of the insulation test equipment.

The demo box is placed into plastic carrying case. The front panel of this box is divided into four measurement segments. (See the **Fig. 1** bellow.)



Fig. 1: HV DEMO BOX 10kV

- 1 - HV resistance measurements;
- 2 - PI/DAR/DD measurements;
- 3 - Breakdown measurements;
- 4 - Capacitance measurements;

1.1.1 HV resistance measurements

This measurement segment consists of HV resistances from small (200k Ω) to very high values (2T Ω). Additional resistances can be assembled with serial or parallel connection of resistances. For values 200G and higher the guard terminal should be used to eliminate leakage currents!

1.1.2 PI/DAR/DD measurements

This segment consists of two models of insulation material. One simulates good insulation (good cable) and the other simulates bad insulation (bad cable). These two models of insulation material allowed the users to find out how real insulation behavior under high D.C. voltage. Specially it is useable with new Metrel's HV electrical insulation test equipment family, which enables modern diagnostic tests supported with graph R(t) functionality.

Note:

- After one measurement is finished, it takes at least 2 minutes that model returns to the initiate state!
- Due to Voltage coefficient of HV capacitor included in the insulation models, PI, DAR and DD results can be different for different nominal voltages.

General applicable values of polarization index are shown in **Table 1**.

PI value	Tested material status
1 to 1.5	Not acceptable (older types)
2 to 4 (typically 3)	Considered as good insulation (older types)
4 (very high insulation resistance)	Modern type of good insulation systems

Table 1: Typical values of polarization index

General applicable values of *dielectric absorption ratio* are shown in **Table 2**.

DAR value	Tested material status
< 1	Bad insulation
$1 \leq \text{DAR} \leq 1.4$	Acceptable insulation
> 1.4	Very good insulation

Table 2: Typical values of dielectric absorption ratio

General applicable values for dielectric discharge are shown in **Table 3**.

DD value	Tested material status
> 4	Bad
2 - 4	critical
< 2	good

Table 3: Typical values for dielectric discharge

1.1.3 Breakdown measurements

This part of demo box consists of a spark gap and a gas discharge tube. The spark gap allowed that user should test robustness of the HV insulation testers against sparking. The spark-over voltage is approximately 4 kV.

The gas discharge tube simulates breakdown effect in the insulation. Breakdown voltage is 1200 V, the arc voltage is approximately 120 V.

Note:

- **To increase the effect of sparking, you can connect the spark gap or the gas discharge tube parallel with capacitor 5 nF.**

1.1.4 Capacitance measurements



This segment includes two capacitors (5nF and 2,5 μ F). Maximum allowed DC voltage on the 5 nF capacitor is 10 kV. Maximum allowed DC voltage on the 2,5 μ F capacitor is 1000 V, this capacitor has internal overvoltage protection.

Both capacitors allowed parallel connection to the other segments. This is very useful, if the user wants to find out the influence of the capacitance on the accuracy of the resistance measurement.

1.2 Warnings

In order to reach the highest level of operator's safety while carrying out various measurements and tests using the HV Demo Box 10kV, as well as to ensure that the test equipment remains undamaged, it is necessary to consider the following warnings:

MEANING OF SYMBOLS

	Symbol on the instrument means "Read the User Manual with special care!".
	Symbol on the instrument means "Hazardous voltage higher than 70 V may be present at the test terminals!".

GENERAL PRECAUTIONS

- If the demo box is used in a manner not specified in this Users Manual, the protection provided by the equipment may be impaired!
- Do not use the demo box and accessories, if any damage is noticed!
- Service intervention procedure can be carried out only by a competent and authorized person!
- The demo box is made just for indoor operation (IP 20)!
- Measurements on the breakdown measurements segment cause high electromagnetic disturbances and can influence to the operation of the other electronic devices!

WORKING WITH THE DEMO BOX

- Use only standard or optional test accessories supplied by your distributor!
- Do not connect the demo box to the test voltage higher than 11 kV DC, to prevent any damage to the demo box!
- Do not connect the demo box to the instruments with short circuit current more then 5,5 mA, to prevent any damage to the demo box! All Metrel's HV insulation testers have short circuit current limited below 5 mA.

HANDLING WITH CAPACITIVE TEST

- Note that 40 nF charged to 1 kV or 8 nF charged to 5 kV or 4 nF charged to 10 kV are hazardous live!

1.3 Standards applied

The MI3299 HV DEMO BOX 10kV is manufactured and tested according to the European safety standard EN61010-1.

2 Specifications

2.1 Measurements

2.1.1 HV resistance measurements specifications

Specifications of the HV resistances are in the **Table 1** below.

Value	Rating	Tolerance	Voltage coefficient
200 kΩ	10 kV / 5,5 mA	±5 %	/
500 MΩ	10 kV	±5 %	< 5 ppm/V
200 GΩ	10 kV	±5 %	< 1 ppm/V
2 TΩ	10 kV	±5 %	< 1 ppm/V

Table 1

2.1.2 PI/DAR/DD measurements specifications

Specifications of the HV resistances and capacitors are in the **Table 2** below.

Value	Rating	Tolerance	Voltage coefficient
10 GΩ	10 kV	±10 %	< 5 ppm/V
20 GΩ	10 kV	±10 %	< 5 ppm/V
100 GΩ	10 kV	±5 %	< 1 ppm/V
200 GΩ	10 kV	±5 %	< 1 ppm/V
1 nF	10 kV	±20 %	*Voltage coefficient of capacitor
5 nF	10 kV	±20 %	*Voltage coefficient of capacitor
6 nF	10 kV	±20 %	*Voltage coefficient of capacitor

Table 2

2.1.3 Breakdown measurements specifications

Specifications of the spark gap and the gas discharge tube are in the **Table 3** below.

	Breakdown voltage	Arc voltage
Spark gap	> 4 kV	/
Gas discharge tube	1,2 kV	120 V

Table 3

2.1.4 Capacitance measurements specifications

Specifications of the HV capacitors are in the **Table 4** below.

Value	Rating	Tolerance	Voltage coefficient
2,5 μ F	1 kV	± 20 %	/
5 nF	10 kV	± 20 %	*Voltage coefficient of capacitor

Table 4

*Voltage coefficient of capacitor is shown in **Fig. 2** below.

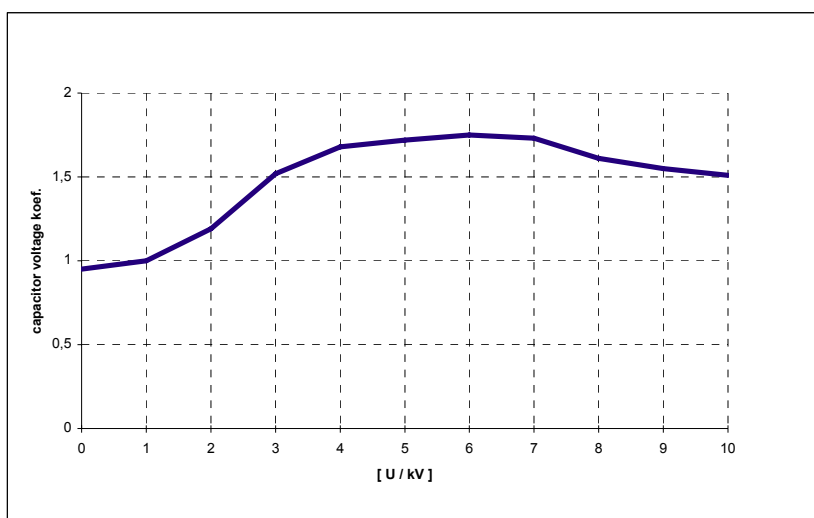


Fig. 2: Voltage coefficient of capacitor

2.2 General specifications

Dimensions (W × L × H) 440 × 320 × 110 mm
 Weight 4 kg
 Protection classification Basic insulation
 Over-voltage category 10kV CAT I
 Pollution degree 2
 Degree of protection IP 20

Reference conditions

Reference temperature range 10 °C ÷ 30 °C
 Reference humidity range 40 %RH ÷ 60 %RH

Operation conditions

Working temperature range 5 °C ÷ 40 °C
 Maximum relative humidity 90 %RH (5 °C ÷ 40 °C), non-condensing

3 Maintenance

3.1 Cleaning

Use a soft cloth slightly moistened with soapy water or alcohol to clean the surface of the board and then leave the board to dry totally before use.

Do not use liquids based on petrol!

Do not spill liquids over the board!

3.2 Service

In case of improper operation of Demonstration board or if there is any damage noticed, the product has to be taken to an authorised service. Consult the producer or your dealer for further information.

The product has no internal user serviceable parts (fuses, etc).

4 Standard set

- HV DEMO BOX 10kV MI 3299,
- HV test leads - 2 pieces, See **Fig. 3**,
- User manual (CD and book),
- Product verification data,
- Handbook Modern insulation testing;



Fig. 3: HV test leads

