



**PAT Demoboard**  
**MI 3300**  
**Instruction manual**  
*Version 1.0, Code No. 20 751 070*

*Distributor:*

*Manufacturer:*

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Mark on your equipment certifies that this equipment meets the requirements of the EU (European Union) concerning safety and interference causing equipment regulations

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# 1. Introduction

PAT Demoboard is intended for demonstration of electrical equipment safety management. Typical applications are:

- Presentation of safety management of electrical equipment on seminars, courses.
- Presentation of typical safety problems on electrical equipment.
- Practical demonstration of measuring instruments (performing tests, making right connections, analysis of measured results).

Different values of electrical parameters that are usually checked during an electrical equipment safety test can be simulated. Error states can be switched On or Off.

Electrical parameters that can be simulated are:

- Continuity of equipotential bonding
- Insulation resistance
- Leakage current
- Touch leakage current
- Polarity of cables
- Functional operation

A practically unlimited number of different equipment (portable and handheld appliances, machines, switchgears) can be simulated by using different demonstration tables. Eight tables are included in the standard set.

On demand the PAT Demoboard can be simple upgraded with new demonstration tables (special applications, country design etc) For eventual upgrades contact METREL or your local distributor.

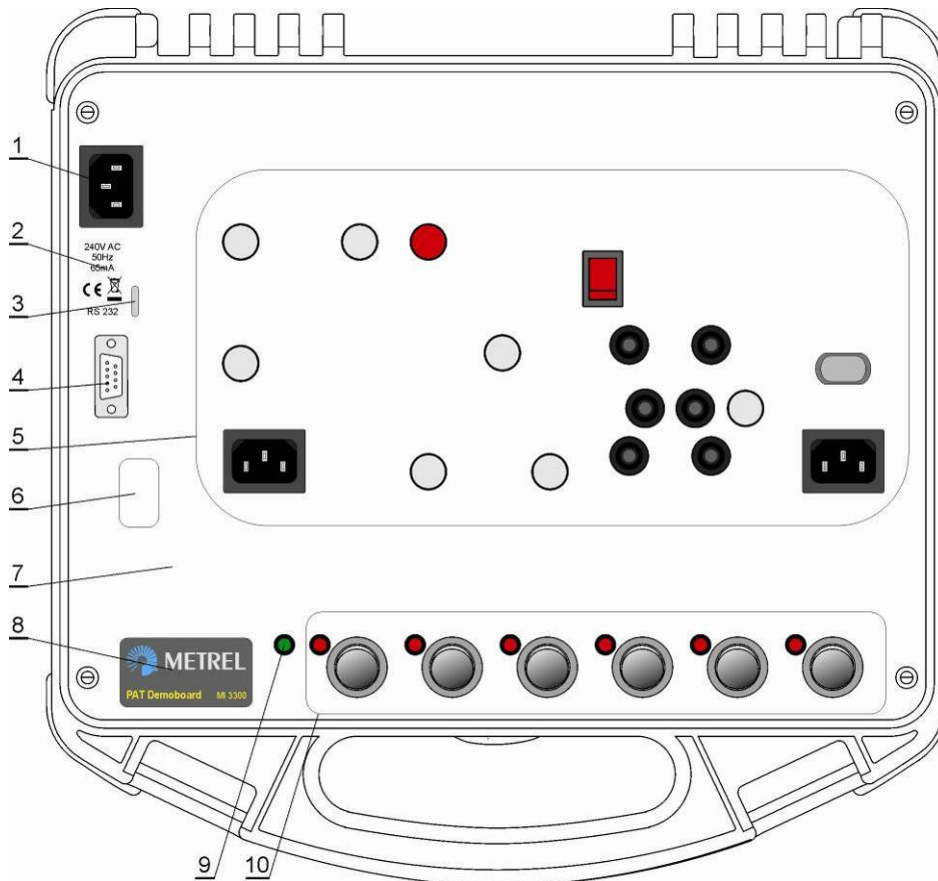
## 2. Safety warnings



- **Only qualified personnel who are familiar with the demoboard and measuring instruments may use PAT Demoboard!**
- **Use only original demonstration tables provided by the manufacturer!**
- **The PAT Demoboard must be considered as a real piece of electrical equipment. The simulated faults are real ones. Despite of the fact that the simulated leakage currents are kept at relatively low levels it is strictly forbidden to touch any of the accessible metal parts inside the simulation area during the demonstration!**
- **The PAT Demoboard will work only if connected to a properly earthed TN or TT outlet. The Ready lamp must lit green for normal operation of the Demoboard.**  
If red light is blinking and buzzer sounds immediately disconnect the demoboard from the mains and check the supply connections !
- **Special care must be taken if performing HV (withstanding) tests. All safety measures must be considered as if testing real electrical equipment.**
- **Always check that the current of HV test equipment is limited to a low level (<3.5mA) when performing withstanding tests on PAT Demoboard.**
- **If the equipment is not used in a manner specified by manufacturer, the protection provided by equipment may be impaired.**
- **Use of Demonstration board in a way not specified in this User Manual could damage the board.**
- **Do not use Demonstration board in case of any damage noticed!**
- **Only an authorised person may carry out servicing of Demonstration board!**

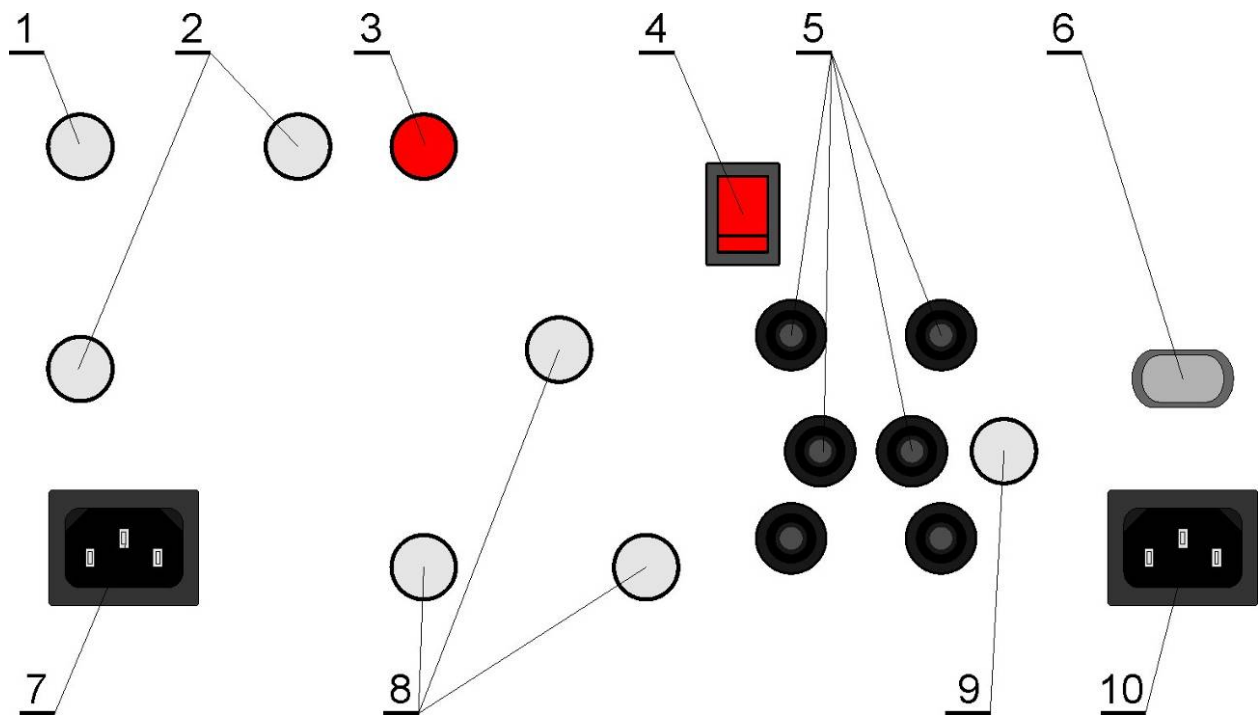
## 3. Description

### 3.1. Front panel



1. Mains supply socket for powering the demoboard.
2. Demoboard data.
3. Cover holder.
4. RS232 socket (not used for PAT Demoboard normal operation).
5. Electrical equipment simulation area.
6. Groove for placing demonstration tables.
7. Front plate.
8. Manufacturer label.
9. Ready indicator:
  - Red light – demoboard is not ready.
  - Blinking red light, buzzer sounds – improper mains connection.
  - Green light – demoboard is ready for demonstration .
10. Error switches:
  - Red light on – simulation of error is On.
  - Red light off – simulation of error is Off.

## 4. Simulation area description



1. Accessible insulated metal part.
2. Grounded metal parts #1,#2.
3. Power ON signal light.
4. ON / OFF switch.
5. Sockets for simulation of various fixed connections.
6. Class II mains socket.
7. Socket for simulation of IEC cords.
8. Grounded metal part #3.
9. Grounded metal part #4.
10. Class I mains socket.

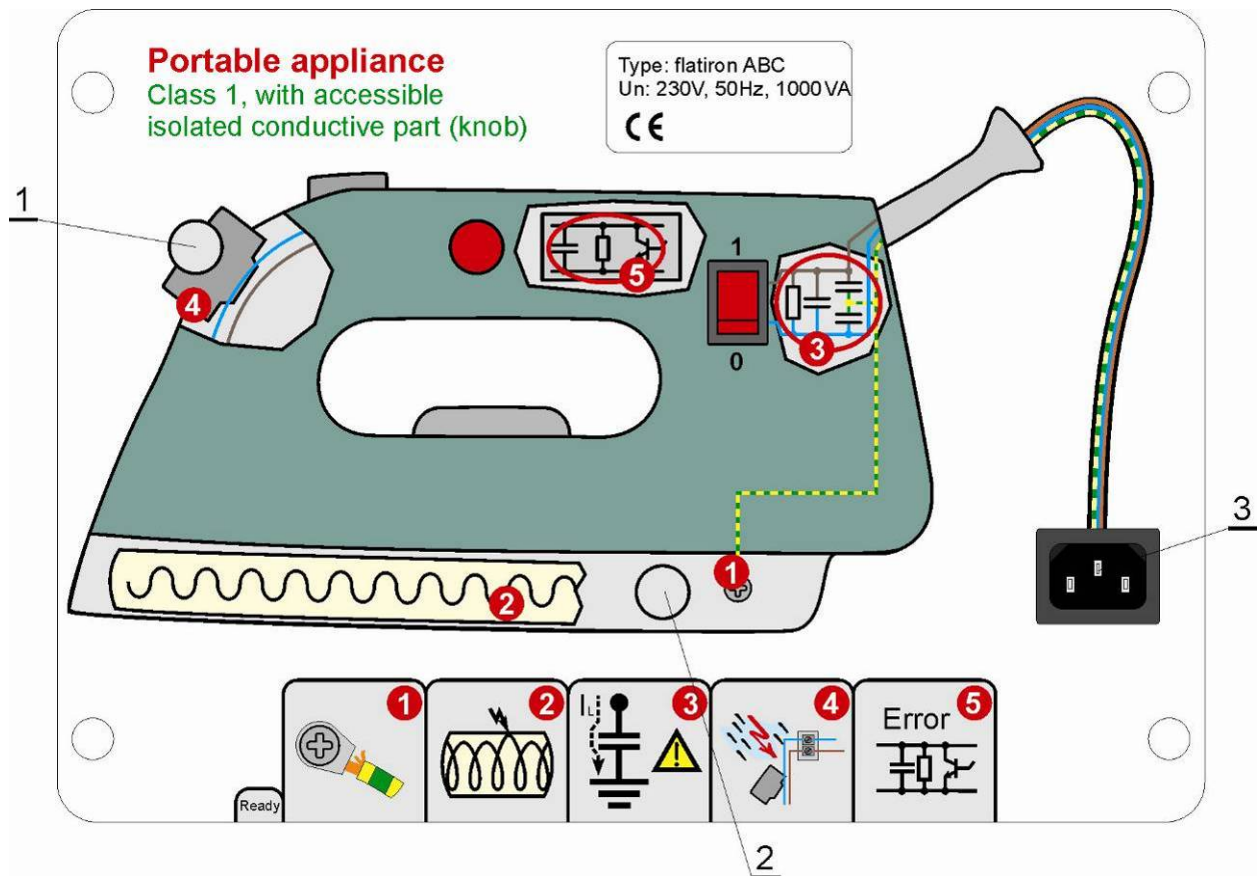
## 5. Demonstration tables information

### 5.1. General notes:

- The description tables contain following information:
  - Simulated values for normal and error conditions (“Error values”).
  - Indicative test results for typical measurements.
  - Position where simulated are applied in brackets under “Simulation between contacts”
- The “Error values” (simulated values, shown in error fields of the tables) in the description tables are valid only for one fault switched ON at the same time. If more than one fault is simultaneously the “Error values” are summarized.
- Individual demonstration tables are recognized on basis of the information stored in the RFID TAG (legend of errors, simulation values). The TAGs are placed in the lower left corner of each table. The TAG information is read by the PAT Demoboard if it is put correctly on the instrument.
- The values of errors (resistances and capacitances) in description tables are informative only. The actual inaccuracy is up to  $\pm 10\%$ .
- If the outputs of measuring instruments are not galvanically isolated an additional error of up to 10% can occur on instrument’s reading.



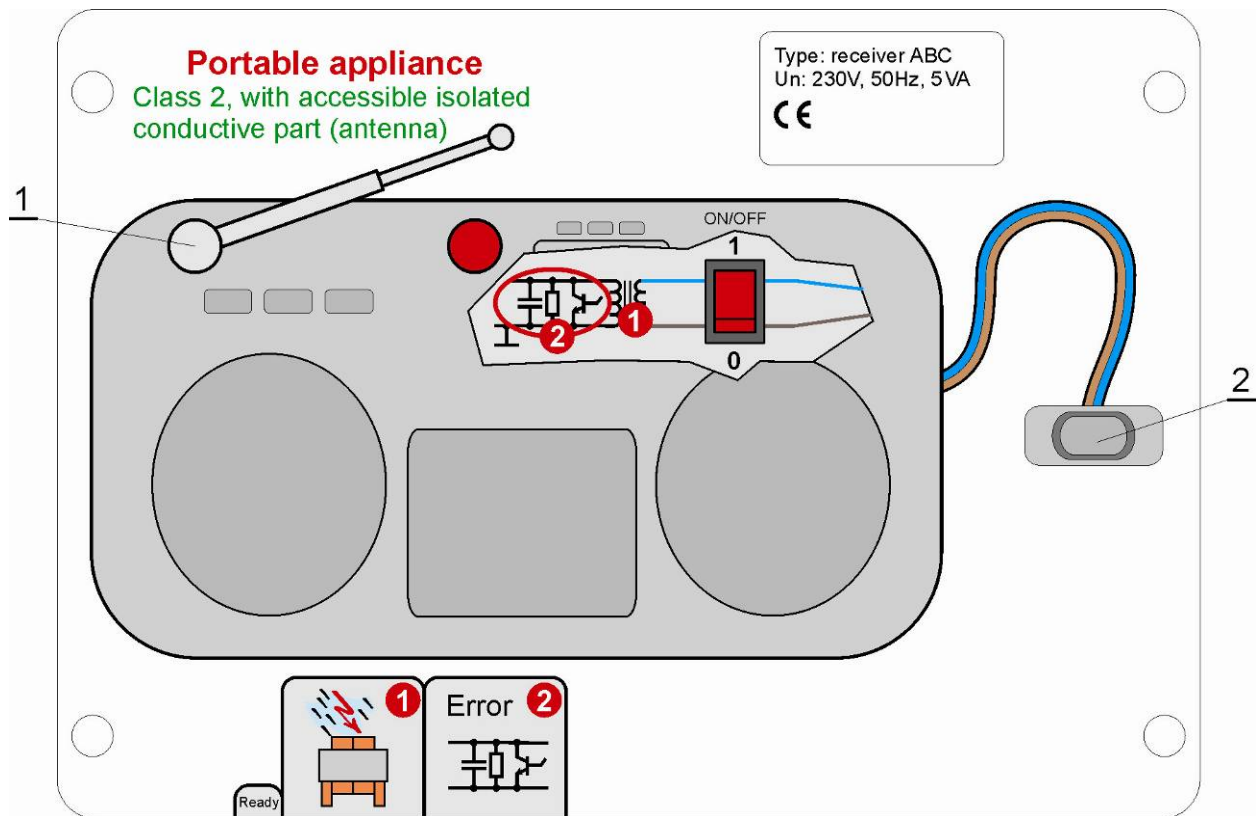
### 5.2. Portable appliance of class 1 (flatiron)



	Simulates	Error value	Error off	Error on
	Simulation between contacts	Measurement taken	Error off	Error on
<b>Error 1</b>	Loose contact of PE conductor	Error value	0,02 Ω	0,84 Ω
	Earthed metal part (2) and PE pin on socket (3)	Earth Bond	0,02 Ω	0,84 Ω
<b>Error 2</b>	Insulation fault	Error value	>20 MΩ	106 kΩ
	L and PE pins on socket (3)	Insulation 500 V DC	>20 MΩ	0,106 MΩ
		Leakage 230 V, 50 Hz	0,00 mA	2,17 mA
Subleakage	0,00 mA	2,17 mA		
<b>Error 3</b>	Excessive capacitive current	Error value	/	33 nF
	L and PE pins on socket (3)	Insulation 500 V DC	>20 MΩ	>20 MΩ
		Leakage 230V 50 Hz	0,00 mA	2,12 mA
Subleakage	0,00 mA	2,12 mA		
<b>Error 4</b>	Insulation fault	Error value	>20 MΩ	238 kΩ
	Accessible isolated metal part (1) and L pin on socket (3)	Insulation 500 V DC	>20 MΩ	0,238 MΩ
		Touch Leakage 230 V	0,00 mA	0,97 mA
Subleakage	0,00 mA	0,97mA		
<b>Error 5</b>	Functional fault	Functional	/	interruptions
	Functional	Functional	/	interruptions

Table 5.1: Description of simulated faults / relevant tests

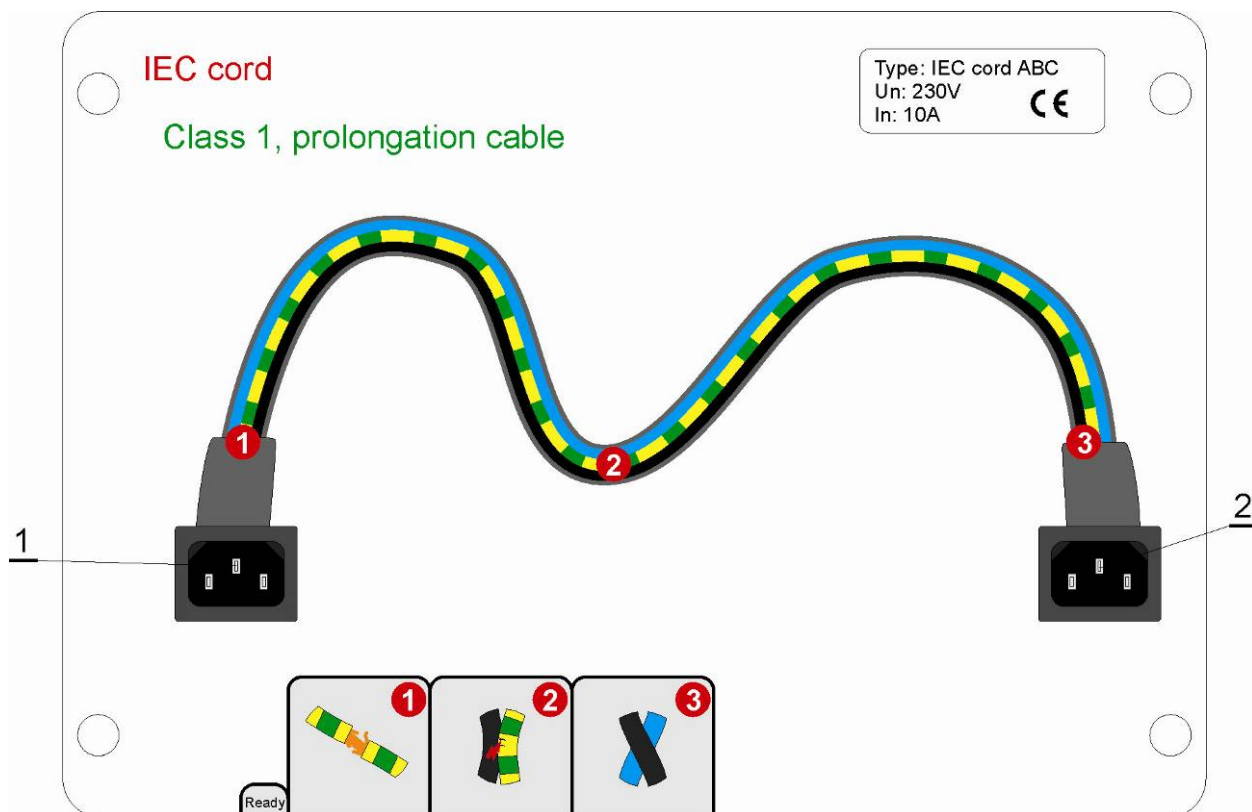
### 5.3. Portable appliance of class II – receiver



	Simulates	Error value	Error off	Error on
	Simulation between contacts	Measurement taken	Error off	Error on
<b>Error 1</b>	Insulation fault	Error value	>20 MΩ	238 kΩ
	L pin on socket (2) and accessible isolated metal part (1)	Insulation 500V DC (probe)	>20 MΩ	0,238 MΩ
		Touch Leakage 230 V AC	0,00 mA	0,97 mA
		Subleakage (probe)	0,00 mA	0,97 mA
<b>Error 2</b>	Functional fault	Functional	/	interruptions
	Functional	Functional	/	interruptions

Table 5.2: Description of simulated faults / relevant tests

### 5.4. IEC cord



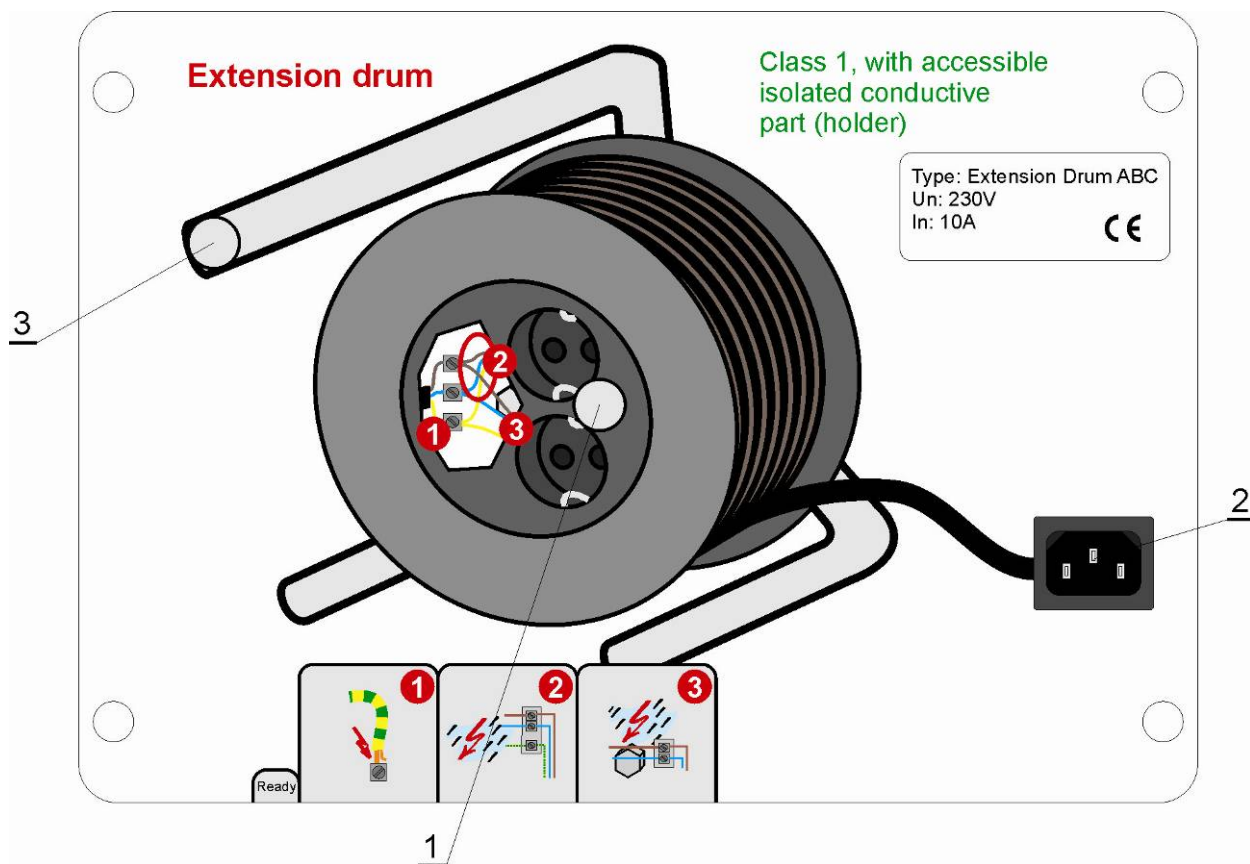
	Simulates	Error value	Error off	Error on
	Simulation between contacts	Measurement taken	Error off	Error on
<b>Error 1</b>	Loose contact of PE conductor	Error value	0,02 Ω	0,84 Ω
	PE pin on socket (1) and PE pin on socket (2)	Earth Bond	0,02 Ω	0,84 Ω
<b>Error 2</b>	Insulation fault	Error value	>20 MΩ	106 kΩ
	L and PE pins on socket (2)	Insulation 500 V DC	>20 MΩ	0,106 MΩ
<b>Error 3</b>	Crossed L and N wire	Polarity	/	L, N crossed
	Polarity	Polarity	/	"L, N crossed"

Table 5.3: Description of simulated faults / relevant tests

**Note:**

For safety reasons there is a serial resistance between L/N pins of socket 1 and socket 2. Some test instruments can therefore return a fail on the Polarity test !

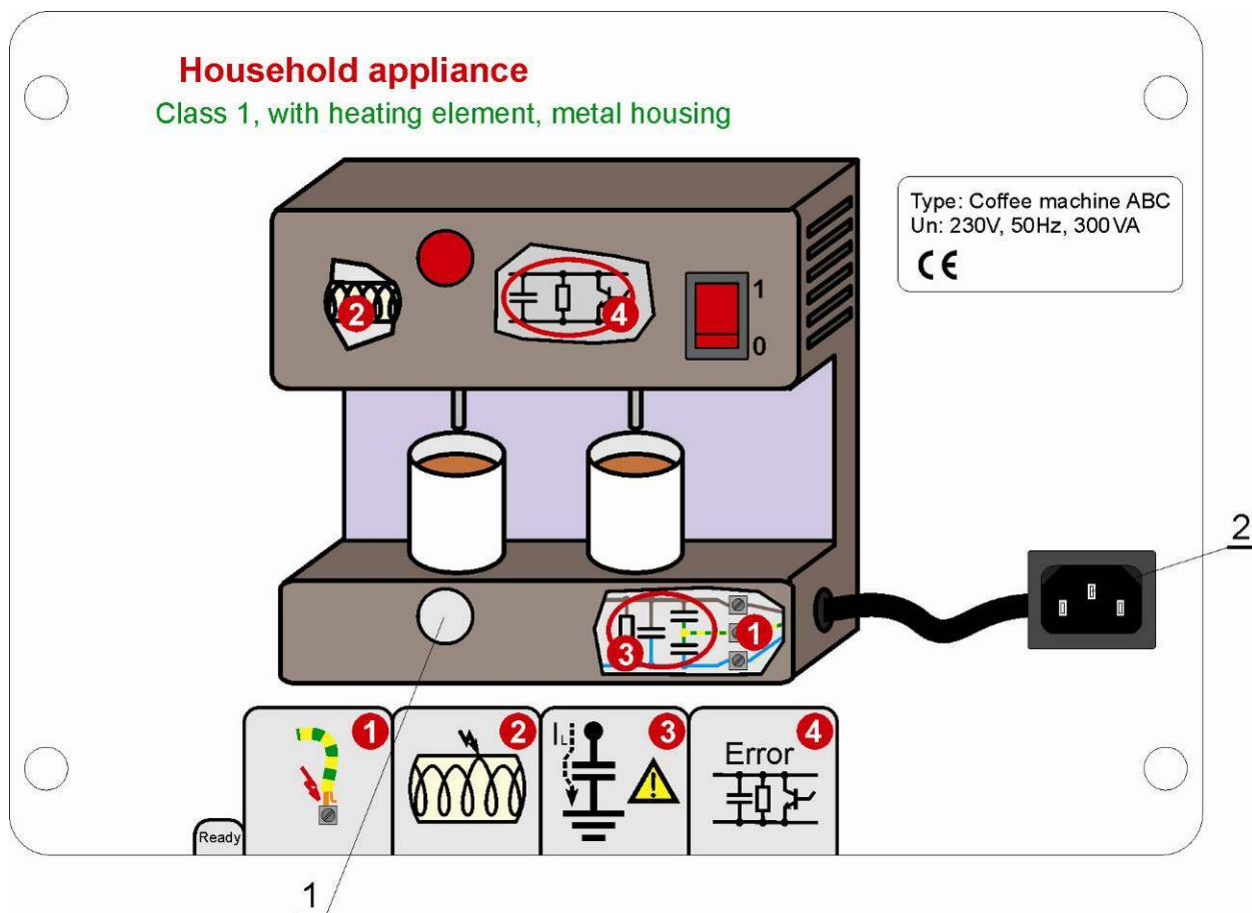
### 5.5. Portable appliance of class 1 (extension drum)



	Simulates	Error value	Error off	Error on
	<b>Simulation between contacts</b>	<b>Measurement taken</b>	<b>Error off</b>	<b>Error on</b>
<b>Error 1</b>	Loose contact of PE conductor	Error value	0,02 Ω	0,84 Ω
	PE connection on output socket (1) and PE connection on mains socket (2)	Earth Bond	0,02 Ω	0,84 Ω
<b>Error 2</b>	Insulation fault	Error value	>20 MΩ	106 kΩ
	L and PE pins on socket (1)	Insulation 500 V DC	>20 MΩ	0,106 MΩ
		Leakage 230 V, 50 Hz	0,00 mA	2,17 mA
		Subleakage	0,00 mA	2,17 mA
<b>Error 3</b>	Insulation fault	Error value	30 MΩ	238 kΩ
	Isolated accessible metal part (3) and L, pin on socket (2)	Insulation 500V DC (probe)	13 MΩ	0,237 MΩ
		Touch Leakage 230 V AC	0,00 mA	0,97 mA
		Subleakage (probe)	0,00 mA	0,97 mA

Table 5.4: Description of simulated faults / relevant tests

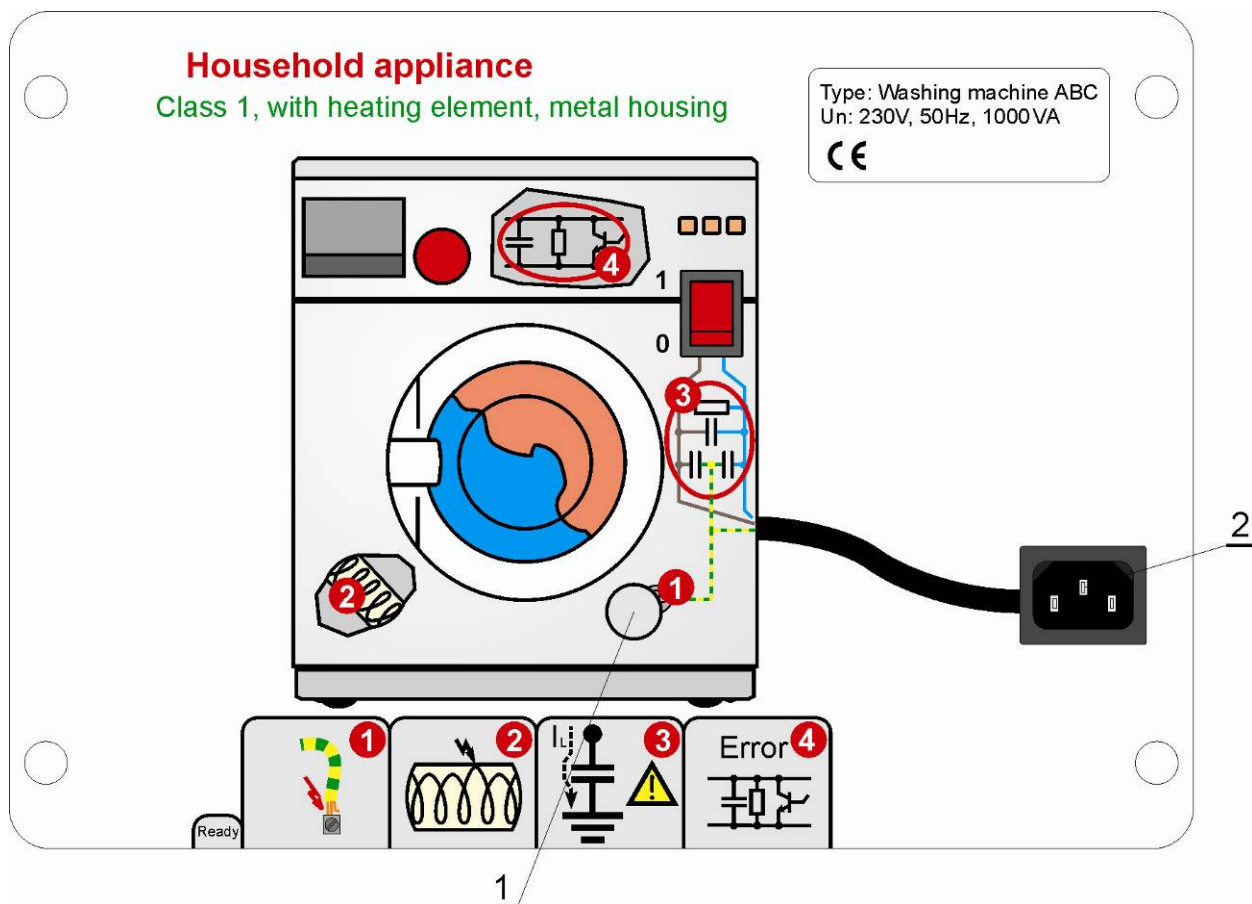
### 5.6. Portable appliance of class 1 (coffee machine)



	Simulates	Error value	Error off	Error on
	Simulation between contacts	Measurement taken	Error off	Error on
<b>Error 1</b>	Loose contact of PE conductor	Error value	0,02 Ω	0,43 Ω
	Earthed metal part (1) and PE pin on socket (2)	Earth Bond	0,02 Ω	0,43 Ω
<b>Error 2</b>	Insulation fault	Error value	>20 MΩ	106 kΩ
	L and PE pins on socket (2)	Insulation 500 V DC	>20 MΩ	0,106 MΩ
		Leakage 230 V, 50 Hz	0,00 mA	2,17 mA
	Subleakage	0,00 mA	2,17 mA	
<b>Error 3</b>	Excessive capacitive current	Error value	/	33 nF
	L and PE pins on socket (2)	Insulation 500 V DC	>100 MΩ	>100 MΩ
		Leakage 230V 50 Hz	0,00 mA	2,12 mA
	Subleakage	0'00 mA	2,12 mA	
<b>Error 4</b>	Functional fault	Functional	/	interruptions
	Functional	Functional	/	interruptions

Table 5.5: Description of simulated faults / relevant tests

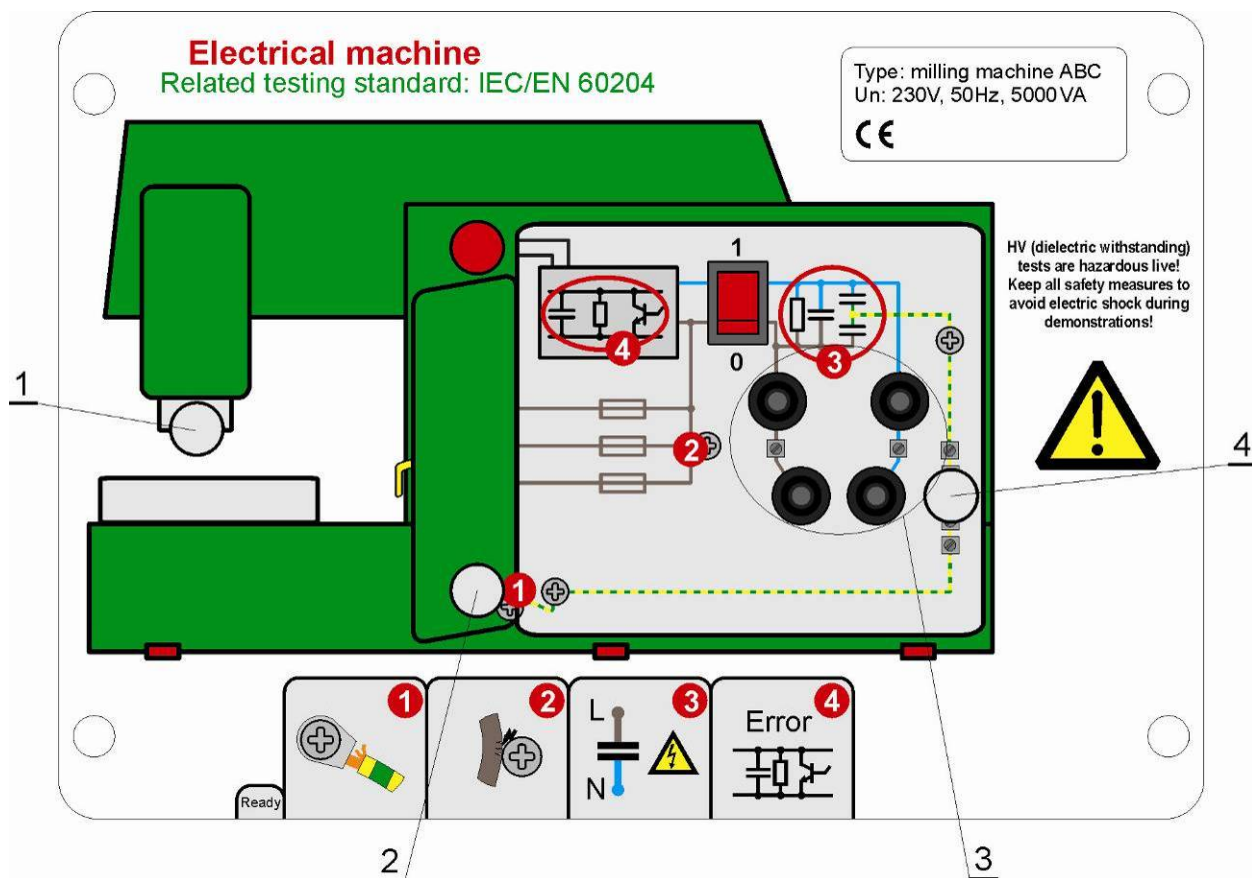
### 5.7. Portable appliance of class 1 (washing machine)



	Simulates	Error value	Error off	Error on
	Simulation between contacts	Measurement taken	Error off	Error on
<b>Error 1</b>	Loose contact of PE conductor	Error value	0,02 Ω	0,84 Ω
	Earthed metal part (1) and PE pin on socket (2)	Earth Bond	0,02 Ω	0,84 Ω
<b>Error 2</b>	Insulation fault	Error value	>20 MΩ	106 kΩ
	L and PE pins on socket (2)	Insulation 500 V DC	>20 MΩ	0,106 MΩ
		Leakage 230 V, 50 Hz	0,00 mA	2,17 mA
	Subleakage	0,00 mA	2,17 mA	
<b>Error 3</b>	Excessive capacitive current	Error value	/	33 nF
	L and PE pins on socket (2)	Insulation 500 V DC	>100 MΩ	>100 MΩ
		Leakage 230V 50 Hz	0,00 mA	2,12 mA
	Subleakage	0'00 mA	2,12 mA	
<b>Error 4</b>	Functional fault	Functional	/	interruptions
	Functional	Functional	/	interruptions

Table 5.6: Description of simulated faults / relevant tests

### 5.8. Electrical machine

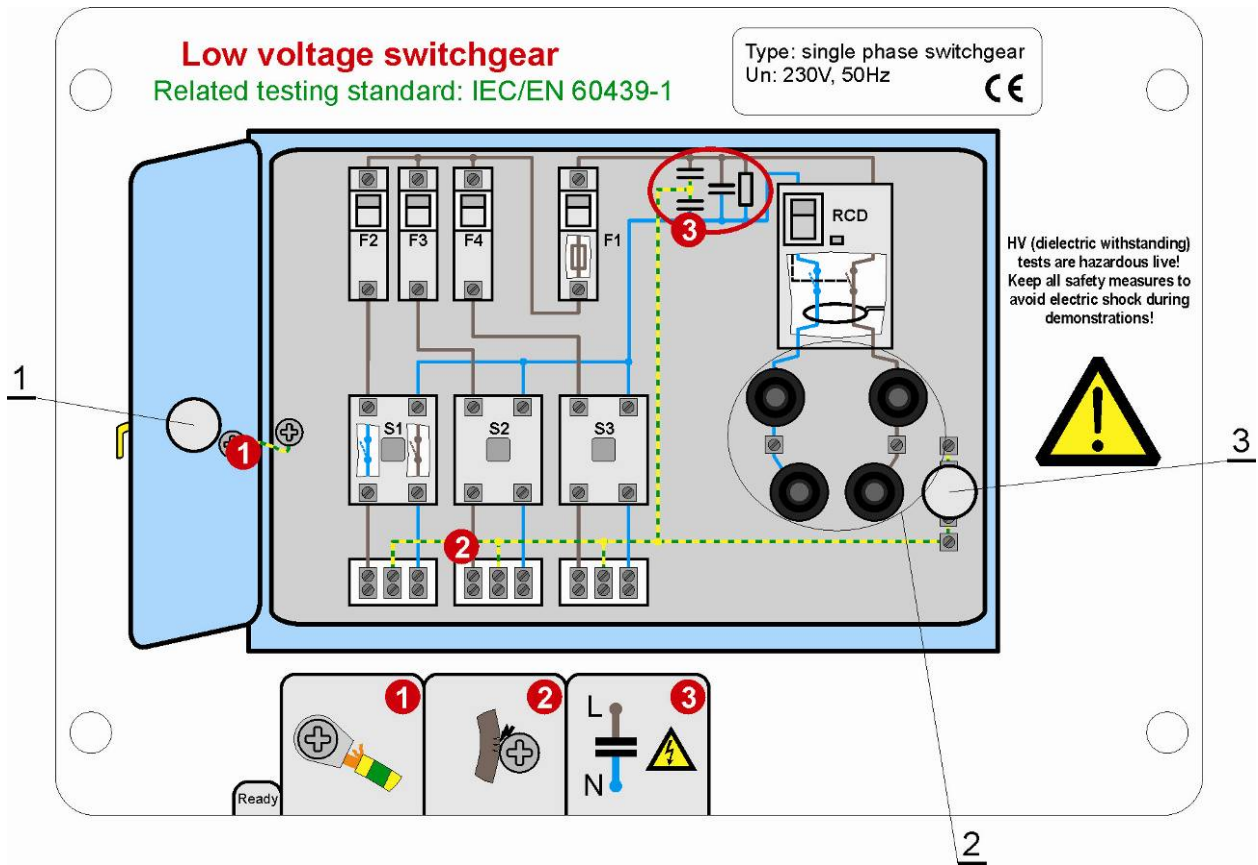


	Simulates	Error value	Error off	Error on
	Simulation between contacts	Measurement taken	Error off	Error on
<b>Error 1</b>	Loose contact of PE conductor	Error value	0,02 Ω	0,43 Ω
	PE input connection (4) and earthed metal part (2)	Earth Bond	0,02 Ω	0,43 Ω
	PE input connection (4) and earthed metal part (1)	Earth Bond	0,02 Ω	0,02 Ω
<b>Error 2</b>	Insulation fault	Error value	>20 MΩ	1.88 MΩ
	L (3) and PE (4) input connections	Insulation 1000 V DC	>20 MΩ	1.880 MΩ
		Withstanding 1000 V AC	0,1 mA	0,6mA
<b>Error 3</b>	Excessive charge on filter capacitors	Error value	4.7nF	100nF
	L and N on input connection (3)	Discharging time*	cca 0,4 s	cca 9 s
<b>Error 4</b>	Functional fault	Functional	/	interruptions
	Functional	Functional	/	interruptions

Table 5.7: Description of simulated faults / relevant tests

\* Measured with CE Multitester (resistance of measuring circuit 40MΩ). Discharging times for other test instruments can vary, depending on their internal resistance.

### 5.9. Low voltage switchgear



	Simulates	Error value	Error off	Error on
	Simulation between contacts	Measurement taken	Error off	Error on
<b>Error 1</b>	Loose contact of PE conductor	Error value	0,02 Ω	0,41 Ω
	PE input connection (1) and earthed metal part (2)	Earth Bond	0,02 Ω	0,41 Ω
<b>Error 2</b>	Insulation fault	Error value	>20 MΩ	1.88 MΩ
	L, (2) and PE connection (3)	Insulation 1000 V DC	>20 MΩ	1.880 M Ω
		Withstanding 2500 V AC	0,1 mA	1,4 mA
<b>Error 3</b>	Excessive charge on filter capacitors	Error value	4.7nF	100nF
	L and N on input connections (2)	Discharging time*	cca 0,4 s	cca 9 s

Table 5.8: Description of simulated faults / relevant tests

\* Measured with CE Multitester (resistance of measuring circuit 40MΩ). Discharging times for other test instruments can vary, depending on their internal resistance.



## 6. Specification

### 6.1. Technical specification

Protection classification (except simulation area)...	Class I
Nominal input voltage: .....	230 V (+6 %, -10 %)
Optional on request: .....	115 V (+6 %, -10 %)
Power consumption: .....	15 VA max.
Over-voltage category: .....	CAT II 300 V
Frequency range:.....	45 Hz to 66 Hz
Pollution degree.....	2
Dimensions (w × h × d).....	350 mm x 335 mm x 160 mm
Mass (without accessories) .....	7 kg
Working temperature range .....	10 °C ÷ 36 °C
Storage temperature range.....	-20 °C ÷ +50 °C
Maximum humidity .....	95 % RH (10 °C ÷ 36 °C) non-condensing

Given simulation resistance and capacitance values (description tables 5.1 to 5.8) are informative only. Actual inaccuracy is <math>\pm 10\%</math> of given "Error values".

If the outputs of measuring instruments are not galvanically isolated an additional error of up to 10% can occur on instrument's reading.

### 6.2. Content of PAT Demoboard set (Ordering code MI 3300)

- Instrument PAT Demoboard.
- 8 demonstration tables (iron, receiver, IEC cord, extension drum, coffee machine, washing machine, switchgear).
- CD with User Manual and Electrical equipment testing handbook.
- Jumper for shorting L and N connections.
- Prolongation cord for demonstration of testing IEC prolongation cords.
- Mains supply cable.
- Class I mains cable for connecting PAT testers to PAT Demoboard.
- Class II mains cable for connecting PAT testers to PAT Demoboard.
- Measuring cable for testing discharging time.
- Carrying bag for demonstration tables.
- Production Verification Data.





