



PRCD Adapter
A 1722
Instruction manual
Version 1.1.3, Code No. 20 752 968

Distributor:

Manufacturer:

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Mark on your equipment certifies that it meets requirements of all subjected EU regulations.

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1 General description


PRCD Adapter is a multi-function test adapter intended for safety and functional testing of different types of 1-phase and 3-phase PRCDs.

Available functions and features offered by the **PRCD Adapter**:

- Simulation of errors on input mains;
- Accessible Inputs/ Outputs for easy connection of safety testers;
- Enables testing Continuity in PRCDs with the PE wire monitored

1.1 Warnings and notes

In order to maintain the highest level of operator safety while carrying out various tests and measurements Metrel recommends keeping your **PRCD Adapter** in good condition and undamaged. When using the adapter, consider the following general warnings:

- › The  symbol on the test equipment means »Read the Instruction manual with special care for safe operation«. The symbol requires an action!
- › If the test equipment is used in a manner not specified in this Instruction manual, the protection provided by the equipment could be impaired!
- › Follow the instructions in Instruction manual carefully, otherwise the use of the test equipment may be dangerous for the operator, the test equipment itself or for the tested object!
- › Do not use the test equipment or any of the accessories if any damage is noticed!
- › The input / output sockets are intended for test purposes only! Do not connect any other devices except appropriate test equipment.
- › Do not connect the test equipment to a mains voltage different from the one defined on the label adjacent to the mains connector, otherwise it may be damaged.
- › Use only earthed 1 – phase or 3 – phase mains supply system to power A 1722. PE must have low impedance to earth!
- › A switch or circuit breaker must be included in the 3-phase installation that is supplying A 1722 PRCD adapter! It must be suitably located and easily reached!
- › All normal safety precautions must be taken in order to avoid risk of electric shock while working on electrical installations!
- › Only adequately trained and competent persons may operate the equipment.
- › Service intervention or adjustment is only allowed to be carried out by competent authorized personnel!

1.1.1 Markings on the instrument:



Read the Instruction manual with special care to safety operation«. The symbol requires an action!



Mark on your equipment certifies that it meets requirements of all subjected EU regulations.



This equipment should be recycled as electronic waste.



This equipment is protected by reinforced insulation.

1.1.2 Notes related to measurement functions

R iso

- › The resistances in OUTPUT area, between terminals L/L1-N, L2-N, L3-N, Lx-Ly are ca 66 MΩ. This should be considered if Riso is measured.
- › The OUTPUT voltage LED indicators can light on during the insulation test. This has no particular meaning and has no influence on the measurement.

Rlow

- › The recommended test current is 200 mA and the maximum test current is 10 A.
- › The PE INPUT, N INPUT and PE OUTPUT 4 mm safety sockets are internally fused.
- › A test current higher than 10 A will blow internal fuses that cannot be changed by the user.
- › The internal resistance of PE connections of the PRCD Adapter, between INPUT and OUTPUT terminals when using standard test cables are ca 0.15 Ω. If this is too high, compensation is required. Refer to chapter 4.3.1 *Compensation of internal resistances before the Rlow measurement* for more information.

1.2 Standards applied

The A 1722 adapter is manufactured and tested in accordance with the following regulations:

Electromagnetic compatibility (EMC)

EN 61326 - 1 Electrical equipment for measurement, control and laboratory use - EMC requirements – Part 1: General requirements

Safety (LVD)

EN 61010 - 1 Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements

EN 61010 - 2 - 030 Safety requirements for electrical equipment for measurement, control and laboratory use – Part 2-030: Particular requirements for testing and measuring circuits

EN 61010 - 031 Safety requirements for hand-held probe assemblies for electrical measurement and test

Note about EN and IEC standards:

- Text of this manual contains references to European standards. All standards of EN 6XXXX (e.g. EN 61010) series are equivalent to IEC standards with the same number (e.g. IEC 61010) and differ only in amended parts required by European harmonization procedure.

2 Accessories

The accessories consist of standard and optional accessories. Optional accessories can be delivered upon request. See *attached* list for standard configuration and options or contact your distributor or see the METREL home page: <http://www.metrel.si>.

2.1 Standard set

- ❑ PRCD Adapter A 1722
- ❑ Mains supply cord 1-phase 10 A plug to 3-phase 16 A plug adapter A 1633
- ❑ 1-phase test cable adapter (cable Y) A 1723
- ❑ Test lead 2 mm / 4 mm safety banana plug adapter, red, length 1 m, A 1635
- ❑ Test probe, red
- ❑ Protective bag for accessories (mounted on the case)
- ❑ Instruction manual

2.2 Optional accessories

See the attached sheet for a list of optional accessories and licence keys that are available on request from your distributor.

3 Adapter description

3.1 Front panel

The operator's panel is shown on Figure 3.1 below.

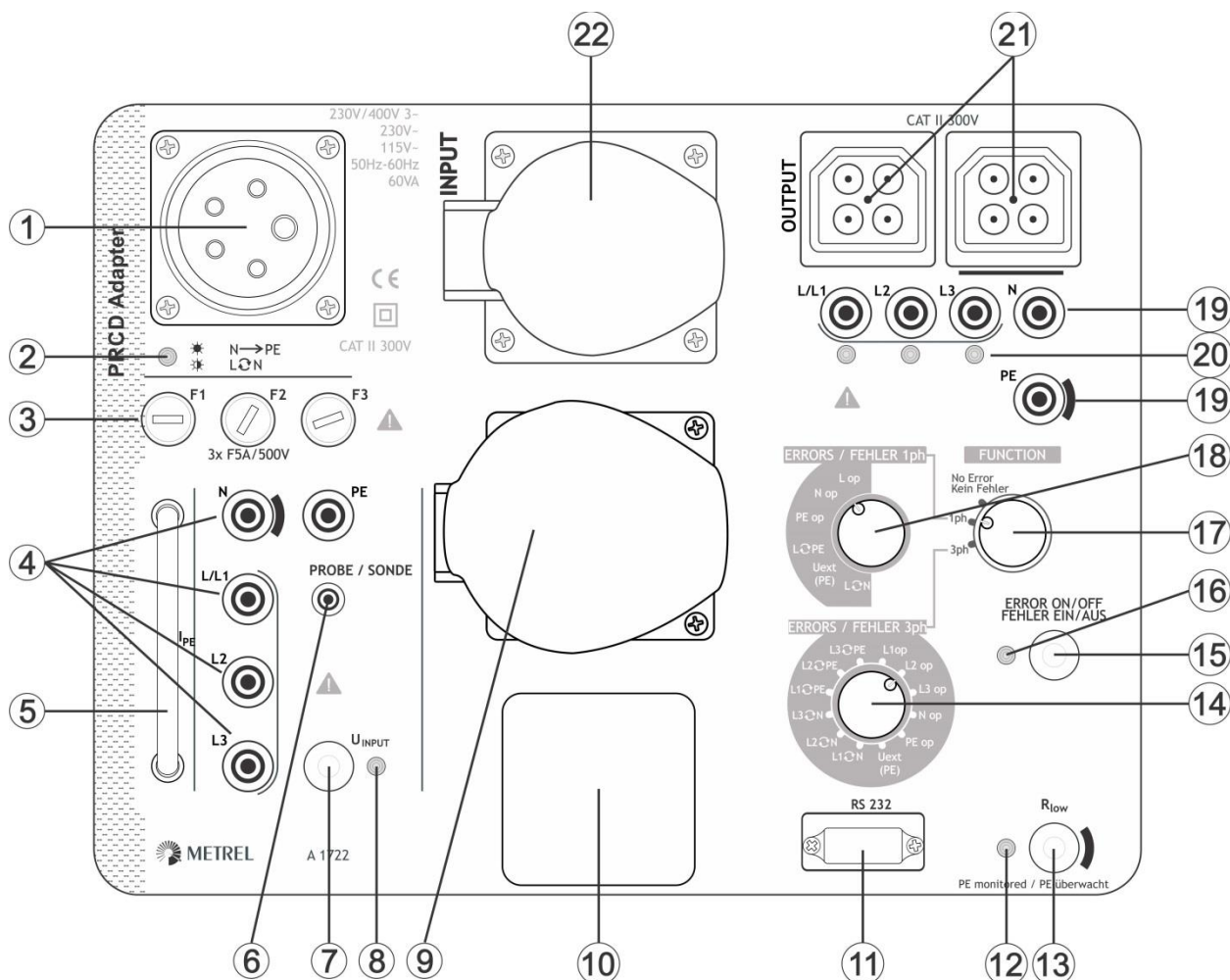


Figure 3.1: Front panel

- | | |
|---|---|
| 1 | Mains power supply inlet (CEE 16 A). |
| 2 | Mains red LED indicates connection to mains.
See chapter 3.2 <i>Power supply consideration</i> for more information. |
| 3 | Input fuses (see chapter 6.2 <i>Fuses</i> for more information). |
| 4 | L/L1, L2, L3, N and PE INPUT 4 mm safety sockets for connection of a safety tester. |
| 5 | Current loop for connection of leakage current clamp for measuring I_{PE} . |
| 6 | PROBE 2 mm safety socket for connection of test probe.
See chapter 4.3.3 <i>Probe test</i> for more information. |

7	U _{INPUT} key. Toggle to apply / not apply voltage to the INPUT connectors (1-phase socket, 3-phase (CEE 16 A and CEE 32 A) sockets and INPUT 4 mm safety sockets).
8	U _{INPUT} LED indicator. ON = voltage applied, OFF = voltage not applied.
9	3-phase CEE 32 A INPUT socket for connection of a 3-phase PRCDs.
10	1-phase INPUT socket for connection of 1-phase PRCDs.
11	RS232 connection port (intended for firmware upgrade and service purposes).
12	Rlow - PE monitored test connection LED indicator. ON = test connection is on, OFF = test connection is off. See chapter 0 Note: <i>The sum of RPE and RN wires resistance is compensated if RPE monitored is enabled.</i> Rlow on PRCDs with monitored IPE for more information.
13	Rlow - PE monitored test connection switch. Switches On/Off the test connection.
14	Rotary switch for selection of different simulated errors (on 3-phase mains). See chapter 7.1 Errors for more information.
15	Error ON / OFF key. Switching On/Off the selected error on mains.
16	Error ON LED indicator. ON = Error applied, OFF = Error not applied.
17	Rotary switch for selecting between 1-phase and 3-phase mains errors and normal operation.
18	Rotary switch for selection of different simulated errors (on 1-phase mains). See chapter 7.1 Errors for more information.
19	L/L1, L2, L3, N and PE OUTPUT 4 mm safety sockets for connection of a safety tester.
20	L/L1, L2 and L3 OUTPUT LED's. ON = mains voltage at the OUTPUT test connection present, OFF = mains voltage at the OUTPUT test connection not present.
21	OUTPUT connectors for test cable adapter for connection to the output of PRCD.
22	3-phase CEE 16 A INPUT socket for connection of 3-phase PRCDs.

Notes:

- The INPUT 4 mm safety sockets L/L1, L2, L3, N, PE (**4**) are connected parallel to INPUT 1-phase socket (**10**), and INPUT 3-phase CEE 16 A and CEE 32 A sockets (**22**), (**10**).
- The OUTPUT 4 mm safety sockets L/L1, L2, L3, N, PE (**19**) are connected parallel to OUTPUT connectors (**21**).

3.2 Power supply consideration



The 3-phase 16 A CEE inlet is intended for connection to single-phase and 3-phase Mains supply.

Single-phase connection

1-phase 10 A plug to 3-phase 16 A CEE cable connector adapter A 1633 should be used for single-phase connection. It is suitable for internal battery charging and for single-phase supply to INPUT section for testing of 1-phase PRCDs.

3-phase connection

Testing of 3-phase PRCDs requires 3-phase Mains power supply to the PRCD Adapter and its INPUT section, neutral N wire connection is mandatory. Ordinary 3-phase CEE 16 A 5-wire extension cord can be used for Mains power supply.

Symbol	LED indication	Description
 N → PE	ON	Correct connection
 L ↻ N	Blinking (~0.3 s cycle)	L – N crossed or wrong voltage system

Note:

- If mains voltage is outside declared ranges for 115 V~, 230 V~ and 230 V / 400 V 3~, the MAINS LED will be fast blinking, the PRCD Adapter cannot be switched ON, and operation with the adapter is not possible.

4 Measurements

4.1 Adapter operation

With the PRCD adapter following test conditions can be set:

Keys, Switches, LEDs	Relates to connections	Test condition
$U_{\text{INPUT}} = \text{Off}$	INPUTs (9),(10),(22) L/L1, L2, L3, N, PE (4)	INPUT connections are disconnected from mains.
$U_{\text{INPUT}} = \text{On}$ Error ON / OFF = Off	INPUTs (9),(10),(22) L/L1, L2, L3, N, PE (4)	Mains voltage is in NORMAL condition on the INPUT connections.
$U_{\text{INPUT}} = \text{On}$ Error ON /OFF = On	INPUTs (9),(10),(22) L/L1, L2, L3, N, PE (4)	Mains voltage is in selected ERROR condition on the INPUT connections.
Any combination	OUTPUT (21) L/L1,L2,L3,N,PE (19)	Condition on the OUTPUT connections depends on the selected state of the PRCD adapter and tested PRCD.

Note:

- There are two types of errors on INPUT terminals that can be simulated. Errors indicated with white colour on ERRORS 1ph and 3ph rotary switch are applied before mains voltage is applied to INPUT. Errors indicated with blue colour are applied after mains voltage is applied to INPUT. Disconnection of each error is applied in reverse order.

4.2 Connection of 1-phase and 3-phase PRCDs

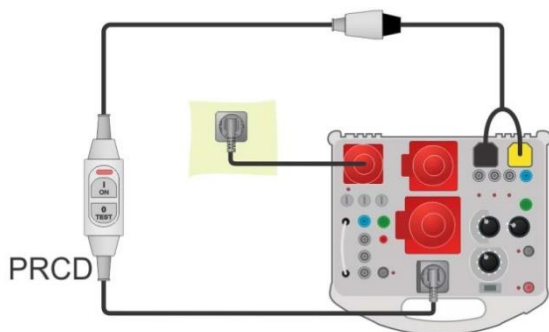


Figure 4.1: Example of connection of a 1-phase PRCD

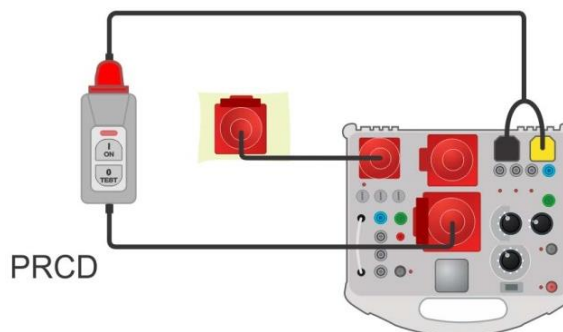


Figure 4.2: Example of connection of a 3-phase PRCD

4.3 Safety and functional tests

In general, safety single tests and inspections can be carried out in combination with any safety testers. For more information how to carry out single tests and inspections refer to Instruction manual of the applied safety tester. Following examples include METREL EurotestXD (MI 3155) test instrument.

Test connections

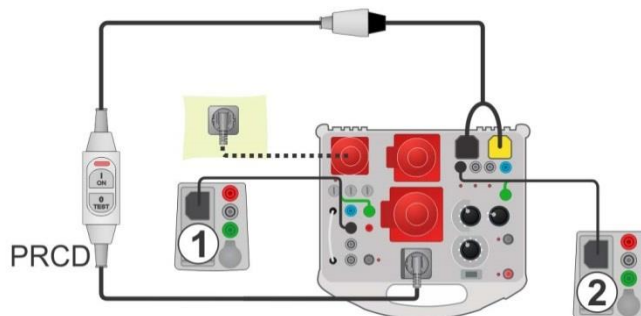


Figure 4.3: Example of R_{ISO} tests, measurement of both sides of PRCD

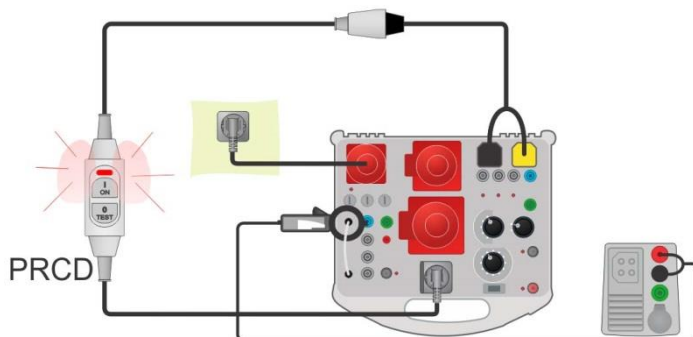


Figure 4.4: Example of Leakage test

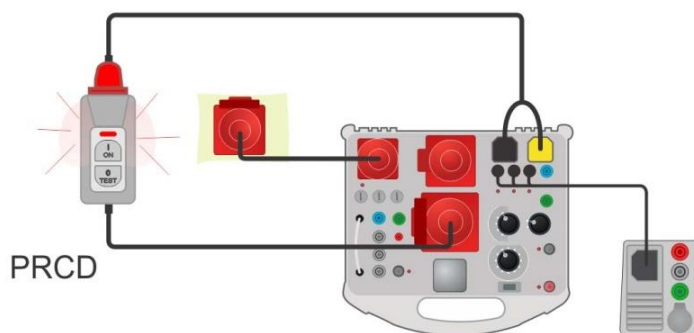


Figure 4.5: Example of 3-phase rotary field direction test

Measurement procedure

- › Connect the tested device to the PRCD Adapter (see test circuit examples above).
- › Select the measurement or inspection on the safety tester.
- › Set test parameters / limits of the selected measurement on the test instrument.
- › Put the tested device into proper operating mode by setting the PRCD Adapter.

- › Connect the instrument test leads to the adapter's sockets (optional), see examples of test circuits above and Instruction manual of test instrument.
- › Carry out the measurement or inspection.
- › Save results (optional).

For information about test parameters and displayed results refer to Instruction manual of the master instrument.

4.3.1 Compensation of internal resistances before the R_{low} measurement

This chapter describes how to carry out the compensation before testing R_{low} measurements. Compensation enables to eliminate the influence of test leads resistance and the internal resistances of the adapter and measuring instrument on the measured resistance.

Connection for compensating the resistance of test leads

In figures below the connections for compensation of the resistance before testing 1-phase and 32 A 3-phase PRCDs is shown.

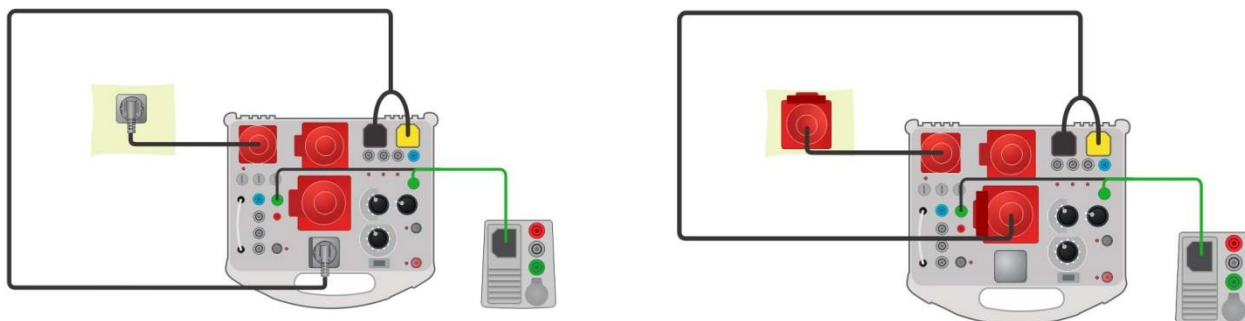


Figure 4.6: Connections for internal resistance compensation

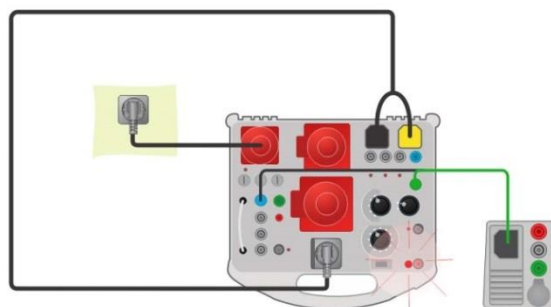


Figure 4.7: Connection for internal resistance compensation (R_{PE} monitored)

For further information about the compensation refer to Instruction manual of the master instrument.

Note:

- › The sum of R_{PE} and R_N wires resistance is compensated if R_{PE} monitored is enabled.

4.3.2 Rlow on PRCDs with monitored I_{PE}

According to IEC/EN 61557-4 the continuity of the PE conductor of the PRCD should be verified with a test current of at least 200 mA. If the PE conductor current is monitored in the PRCD it could trip because the test current is higher than $I_{\Delta N}$. The PRCD Adapter enables two options how to avoid the unwanted tripping.

4.3.2.1 Using a modified (with slow on, off ramps) test current

Tripping of a.c. sensitive residual current sensors can be avoided by using a modified d.c. test current with slow on and off ramps. Newer Metrel test instruments support this test.

Note:

- This method will not be effective if the measured PRCD monitors the current in the PE conductor and is d.c. sensitive.

For information about test parameters and displayed results refer to Instruction manual of the master instrument.

4.3.2.2 Rlow – R_{PE} monitored

This test is applicable for PRCD that are monitoring the PE wire, for example PRCD- 3 pole.

Test principle

Tripping of a.c. and d.c sensitive residual current sensors can be avoided by using the test connection as shown on figure below.

In this test connection the test current is flowing through the N and PE conductors. The resulting residual current in the PRCD's current sensor is therefore close to zero and the PRCD will not trip.

Switch ON PE monitored test connection switch (13), to set this test mode (to establish short-circuit connection between INPUT PE terminal and OUTPUT N terminal).

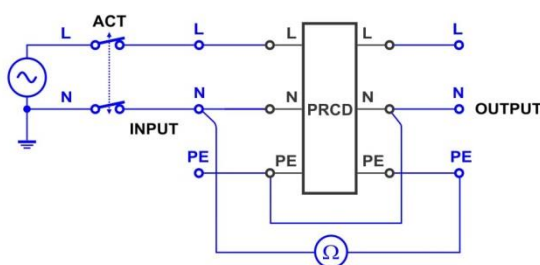


Figure 4.8: The Rlow – R_{PE} monitored operating principle

Test connection

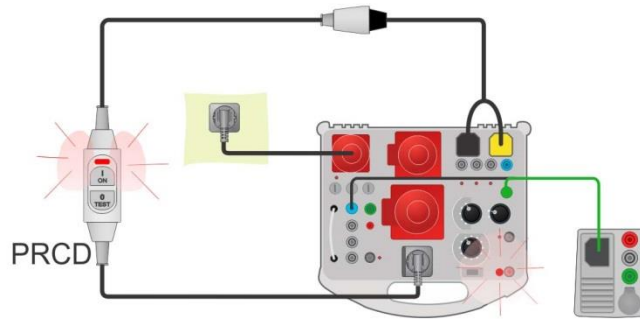


Figure 4.9: The Rlow test – 2 wire connection

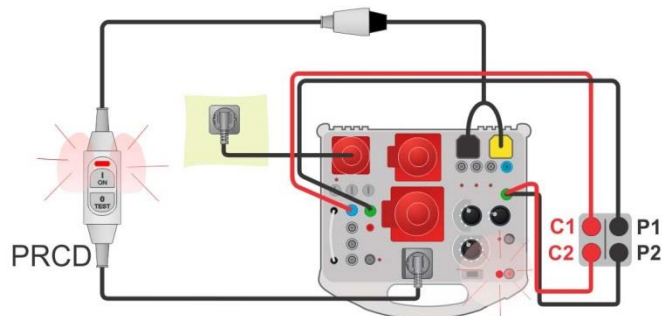


Figure 4.10: The Rlow test – 4 wire connection

Measurement procedure

- › Connect the tested device to the PRCD Adapter (see test circuit examples above).
- › Select the measurement or inspection on the safety tester.
- › Set test parameters / limits of the selected measurement on the test instrument.
- › Connect the instrument test leads to the adapter's sockets (optional), see examples of test circuits above and Instruction manual of test instrument.
- › Carry out the measurement as described in the flowchart below.
- › Save results (optional).

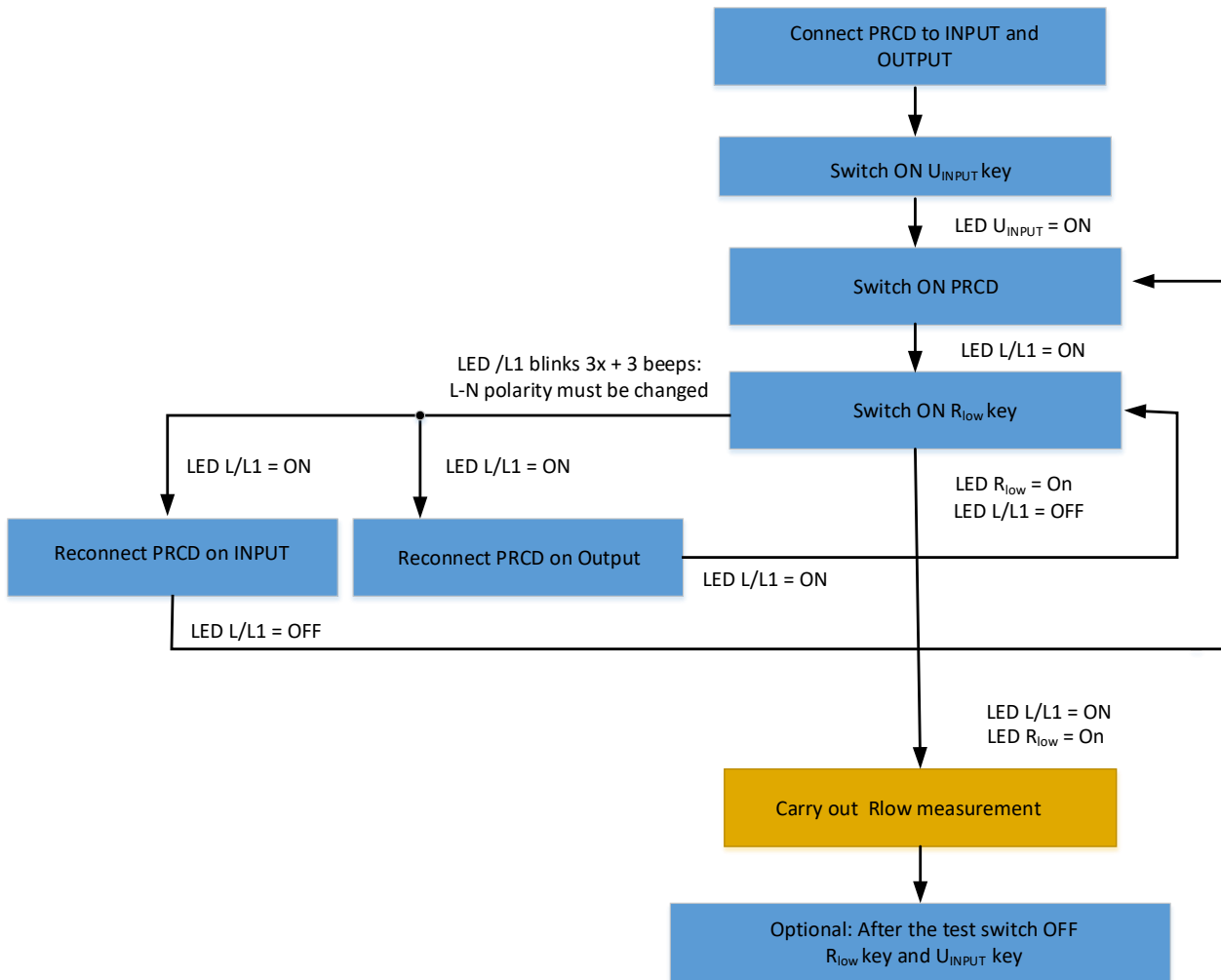


Figure 4.11: R_{low} test flowchart

Notes:

- › Rotary switch (17) should be set to normal operation.
- › This test connection can be used regardless of PRCD's current sensor sensitivity.
- › With a 4-wire R_{low} test it is possible to get the exact R_{PE} result.
- › With a standard 2-wire R_{low} test the sum of R_{PE} and R_N wires resistance is measured. The results must be appropriately interpreted.
- › For information about test parameters and displayed results refer to Instruction manual of the master instrument.

4.3.3 Probe test

Some PRCDs can detect if there is a dangerous external voltage on the PE. In the example on the figure below a touch electrode is integrated in the ON switch of the PRCD and prevents switching the device on if there is a voltage present on PE.

The proper operation of the PRCD's touch electrode can be checked with the Probe test.

Test connections

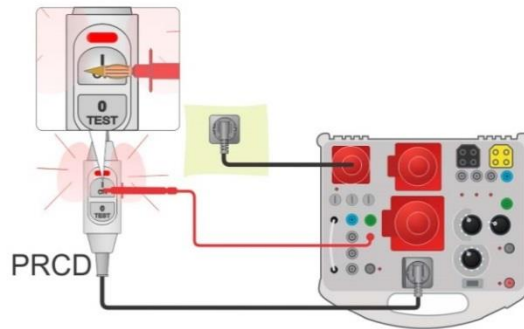


Figure 4.12: The Probe test connection

Measurement procedure

- › Connect the tested device to the PRCD Adapter (see test circuit above).
- › Power on the tested device.
- › Touch the ON button of the PRCD with the test probe. If the PRCD has built in detection for high voltage on PE it will trip.

4.4 Simulation of Errors

Types of errors

With PRCD Adapter typical error conditions on the input mains can be simulated.

The adapter can simulate following two types of errors on mains voltage:

- › the error happens after while the PRCD is plugged in and is in operation.
This error type is marked with D.O. (**D**uring **O**peration after plug-in)
- › the error is already present when the PRCD is plugged in and the user switches it on.
This error type is marked with A.P. (**A**lready **P**resent at plug-in)

For more information see chapter 7.1 *Errors in Technical specifications*.

Test connections

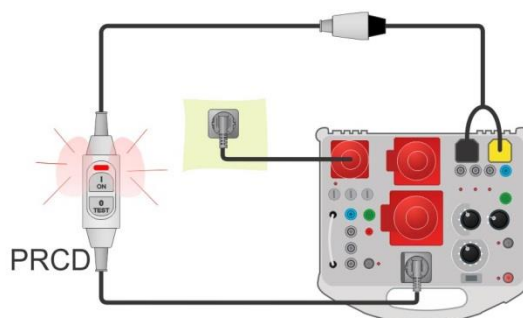


Figure 4.13: The Error (D.O. type) test connection

Measurement procedure (error type is D.O.)

- › Connect the tested device to the PRCD Adapter. Use appropriate Test cable adapter.
- › Select FUNCTION rotary switch to 1ph or 3ph (17) regarding the type of PRCD.
- › Select Error with ERRORS 1ph or 3ph rotary switch (18)(14).
- › Switch U_{INPUT} (7) ON, if not already.
- › Switch ON the tested device.
- › Press the Error ON/OFF key (15) and observe the PRCD's action.
(Error is applied if Error ON LED indicator (16) is lit.)

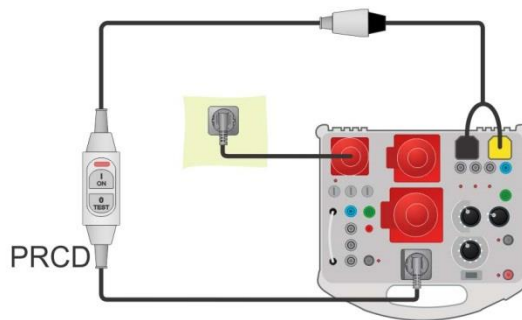


Figure 4.14: The Error test (A.P. type) connection

Measurement procedure (error type is A.P.)

- › Connect the tested device to the PRCD Adapter. Use appropriate Test cable adapter.
- › Select FUNCTION rotary switch to 1ph or 3ph (17) regarding the type of PRCD.
- › Select Error with ERRORS 1ph or 3ph rotary switch (18)(14).
- › Press the Error ON/OFF key (15). (Error is applied if Error ON LED indicator is lit. Mains voltage will automatically be applied to the INPUT after the error.)
- › Try to switch ON the PRCD and observe its action.

5 Upgrading the adapter

The PRCD Adapter can be upgraded from a PC via the RS 232 communication port. This enables to keep the adapter up to date even if the standards or regulations change. Download the latest firmware on the Metrel download centre: <https://www.metrel.si/en/downloads/>

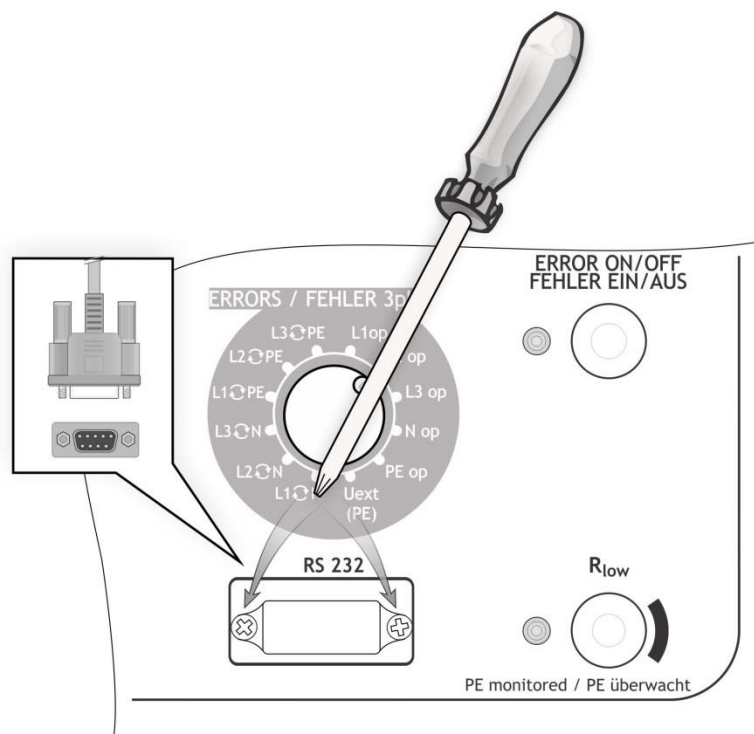


Figure 5.1: Upgrading the PRCD adapter

Procedure

- › Unscrew two screws (as indicated in *Figure 5.1*) and remove RS 232 connector protection cover.
- › Connect standard DB9 RS232 interface cable on A 1722 and PC. (USB to RS232 adapter should be used if serial PC port is not available.)
- › Special upgrading software - **FlashMe** will guide you through the upgrading procedure.
- › When upgrade is finished, insert the RS 232 connector protection cover back.

Note:

- › Contact your dealer for more information.

Warning:

- › **Disconnect all test accessories before removing RS 232 connector protection cover and upgrading A 1722.**

6 Maintenance

6.1 Periodic calibration

It is essential that all measuring instruments are regularly calibrated in order for the technical specification listed in this manual to be guaranteed. We recommend an annual calibration.

6.2 Fuses

F1, F2, F3: F 5 A / 500 V / (32 × 6.3) mm (Breaking capacity: 50 kA)

Mains fuses intended for adapter protection.

Warnings!

- › **Disconnect all test accessories and mains cord from the PRCD adapter, before replacing the fuses.**
- › **Replace blown fuses with the same type as defined in this document.**

6.3 Service

For repairs under or out of warranty please contact your distributor for further information.

Unauthorized person is not allowed to open the PRCD adapter. There are no user replaceable parts inside the instrument.

6.4 Cleaning

Use a soft, slightly moistened cloth with soap water or alcohol to clean the surface of analyser. Leave the instrument to dry totally before using it.

Notes:

- › Do not use liquids based on petrol or hydrocarbons!
- › Do not spill cleaning liquid over the instrument!

7 Technical specifications

7.1 Errors

Error	Phases	Type ¹⁾	Description
L op	1	D.O., A.P.	L conductor opened
N op	1,3	D.O., A.P.	N conductor opened
PE op	1,3	D.O., A.P.	PE conductor opened
L↻PE	1	A.P.	L and PE conductors crossed ²⁾
L↻N	1	A.P.	L and N conductors crossed
U _{EXT} (PE)	1,3	A.P.	External voltage on PE ²⁾
L1 op	3	D.O., A.P.	L1 conductor opened
L2 op	3	D.O., A.P.	L2 conductor opened
L3 op	3	D.O., A.P.	L3 conductor opened
L1↻PE	3	A.P.	L1 and PE conductors crossed ²⁾
L2↻PE	3	A.P.	L2 and PE conductors crossed ²⁾
L3↻PE	3	A.P.	L2 and PE conductors crossed ²⁾
L1↻N	3	A.P.	L1 and N conductors crossed
L2↻N	3	A.P.	L2 and N conductors crossed
L3↻N	3	A.P.	L2 and N conductors crossed

¹⁾ Definition: **D.O.** = **D**uring **O**peration after plug-in
A.P. = **A**lready **P**resent at plug-in

²⁾ Mains voltage is connected to PE via a 1 MΩ resistor.

7.2 Other


Output voltage LEDs..... ON: $U_{Lx-N} > 50 \text{ V}$

Probe mains voltage is connected to Probe output via a 1 MΩ resistor

R_{low} – R_{PE} monitored max test current is 10 A (internally fused)

R_{low} (PE input – PE output) .. max test current is 10 A (internally fused)

7.3 General data

Mains power supply	115 V ~ ± 10 % 230 V ~ ± 10 % 230 V / 400 V 3~ ± 10 % 50 Hz - 60 Hz, 60 VA
Protection category	300 V CAT II
Protection classification.....	reinforced insulation 
Measuring category	300 V CAT II
Pollution degree	2
Degree of protection	IP 65 (case closed), IP 40 (case open) IP 20 (mains test socket)
Dimensions (w × h × d)	36 cm x 16 cm x 33 cm
Weight	4.8 kg, (without accessories)
Sound / Visual warnings	yes

Reference conditions:

Reference temperature range	25 °C ± 5 °C
Reference humidity range	40 %RH ... 60 %RH

Operation conditions:

Working temperature range	-10 °C ... 50 °C
Maximum relative humidity.....	90 %RH (0 °C ... 40 °C), non-condensing
Working nominal altitude.....	up to 3000 m

Storage conditions:

Temperature range	-10 °C ... 70 °C
Maximum relative humidity.....	90 %RH (-10 °C ... 40 °C) 80 %RH (40 °C ... 60 °C)

RS 232 communication:

RS 232 serial communication	galvanic separated
Baud rate:	115200 baud rate, 1 stop bit, no parity
Connector:	standard RS232 9-pin D female

EMC

Emission	EN 55011 Class B (Group 1)
Immunity	Industrial environment