

KEWTECH

KT41/KT42 digital multi function testers



Instruction manual

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The KT42 incorporates Anti Trip Technology (ATT) which electronically by-passes most passive RCDs at Distribution Boards. This saves time and money by not having to take the RCD out of circuit during testing and is a safer procedure to follow.

The ATT circuits may not by-pass some RCDs and this will result in the RCD tripping out as they would with a conventional loop tester. Also, in the case of high sensitivity RCDs rated at 10mA or less the ATT circuits may not function. If there is doubt as to whether this tester will by-pass a particular RCD, contact Kewtech with details of manufacturer, model no., rating and sensitivity. Please read this instruction manual carefully before using this tester.

I Safety Notice

Electricity can cause severe injuries even with low voltages or currents. Therefore it is extremely important that you read the following information before using this Tester.

- I.1 This instrument must only be used by a competent trained person and in strict accordance with the instructions. Kewtech will not accept liability for any damage or injury caused by misuse or non-compliance with instructions or safety procedures.
- I.2 This instrument is only intended for single phase operation, 230V AC + 10%-15% phase to earth or phase to neutral operation. It must **never** be connected phase to phase - damage will result.
- I.3 When conducting a test, particularly on earth spikes, do not touch any exposed metal work. This is because the earth has a current flowing through it for the duration of the test (approx.) 20ms).
- I.4 **Never open the instrument case** - there are dangerous voltages present. Only trained, competent Electronic engineers should open the case. Send the unit to Kewtech if a fault develops.
- I.5 This instrument is primarily protected by HRC Ceramic fuses. Do not attempt to replace them if they fail. If they do contact Kewtech.
- I.6 If the overheat symbol appears in the display disconnect the instrument from the mains and allow to cool down.
- I.7 When using the KT41 all RCDs in the circuit must be by-passed for the duration of the test. Do **not** operate the RCD Test button with the RCD by-passed.
- I.8 This unit is designed to give minimum 'splash' when connecting to an earth point when using the external earth probe. To reduce the effect further, always connect the

probe in a firm and positive manner. The external earth probe, when used, should always be considered and treated as a hazardous live part.

- I.9 External earth probe. The tip is at mains potential (low current). Be careful to keep your hands behind the finger guard and make a firm and positive contact with the surface to be tested. Always keep your hands and fingers behind all finger guards on test leads with this meter.
- I.10 Always inspect your Insulation Tester and test leads before use for any sign of abnormality or damage. If any abnormal conditions exist (broken test leads, cracked case, display faulty, inconsistent readings, etc) do not attempt to take any measurements. Return to Kewtech for rectification.
- I.11 This meter has been designed with your safety in mind. However, no design can completely protect against incorrect use. Electrical circuits can be dangerous and/or lethal when a lack of caution or poor safety practice is used. Use caution in the presence of voltages above 50V as these pose a shock hazard.
- I.12 Pay attention to cautions and warnings which will inform you of potentially dangerous procedures.
- I.13 If at anytime during testing there is a momentary degradation of reading, this may be due to excessive transients or discharges on the system or local area. Should this be observed, the test should be repeated to obtain a correct reading. If in doubt always contact Kewtech.
- I.14 Never assume an installation circuit is not live. Confirm it is de-energised before commencing testing.
- I.15 Replace worn and/or damaged leads with new ones approved by Kewtech immediately. Only use accessories recommended by Kewtech as they are designed to work with the tester. The use of any other items is prohibited as

they may not have the same safety features built in.

1.16 User of this equipment and/or their employers are reminded that Health and Safety Legislation require them to carry out valid risk assessments of all electrical work so as to identify potential sources of electrical danger and risk of electrical injury such as from inadvertent short circuits. Where the assessments show that the risk is significant then the use of fused test leads constructed in accordance with HSE guidance note GS38 Electrical test Equipment for use by Electricians should be used.

2 Features and Principles of Measurement

2-1 Features

- ▲ KT42 with ATT avoids the need to by-pass most passive RCDs
- ▲ Large high contrast display
- ▲ Auto lock out if test resistor overheats
- ▲ Voltage indication
- ▲ Microprocessor controlled
- ▲ Measures PSC
- ▲ Measure low loop with 0.01Ω resolution
- ▲ High loop ranges permit measurement of ground spikes
- ▲ Bright colour coded LED mains status indicators
- ▲ Distribution board lead included as standard

2-2 Principles of Measurement (Fault Loop Impedance)

If an electrical installation is protected by over-current protective devices including circuit breakers or fuses, the earth loop impedance should be measured.

In the event of a fault the earth fault loop impedance should be low enough (and the prospective fault current high enough) to

allow automatic disconnection of the electrical supply by the circuit protection device within a prescribed time interval.

Every circuit must be tested to ensure that the earth fault loop impedance value does not exceed that specified or appropriate for the over-current protective device installed in the circuit.

For a TT system the earth fault loop impedance is the sum of the following impedances;

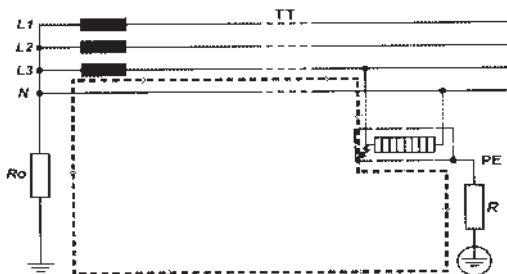
Impedance of the power transformer secondary winding.

Impedance of the phase conductor resistance from the power transformer to the location of the fault.

The impedance of the protective conductor from the fault location to the earth system.

Resistance of the local earth system (R).

Resistance of the power transformer earth system (R_0).

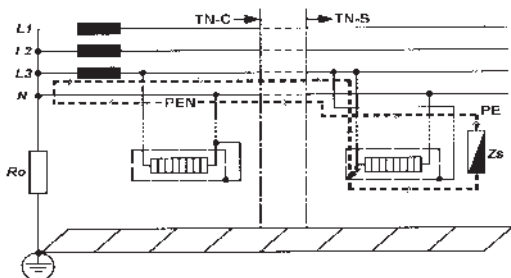


For TN systems the earth fault loop impedance is the sum of the following impedances.

Impedance of the power transformer secondary winding.

Impedance of the phase conductor from the power transformer to the location of the fault.

Impedance of the protective conductor from the fault location to the power transformer.



In accordance with the international standard IEC 60364 for a TT system the following condition shall be fulfilled for each circuit.

R_A must be $\leq 50/I_a$ where;

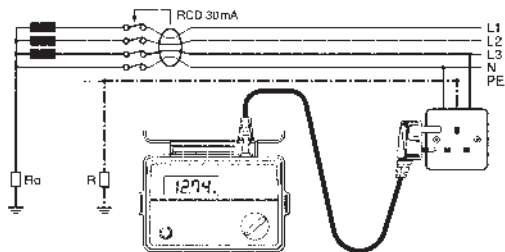
R_A is the sum of the resistances of the local earth system R and the protective conductor connecting it to the exposed conductor part. 50V is the maximum voltage limit (it may be 25V in certain circumstances). I_a is the value of current that causes automatic disconnection of the protective device within 5 seconds.

When the protective device is a residual device (RCD), I_a is the rated residual operating current $I_{\Delta n}$. For example in a TT system protected by an RCD the maximum R_A values are as follows:

Rated residual operating current $I_{\Delta n}$ mA	10	30	100	300	300	1000
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R_a (at 50V) Ω	5000	1667	500	167	100	50
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R_a (at 25V) Ω	2500	833	250	83	50	25
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For this example the maximum value is 1667Ω , the loop tester reads 12.74Ω and consequently the condition R_A is $\leq 50/I_a$ is met. It is also important to test the operation of the RCD using a dedicated RCD tester in accordance with the international standard IEC60364 for a TN system. The following condition shall be fulfilled for each circuit.

$Z_s \leq U_0/I_a$ where Z_s is the earth fault loop impedance voltage is the nominal voltage between phase and earth and I_a is the current that causes the automatic disconnection of the protective device within the time stated in the following table.

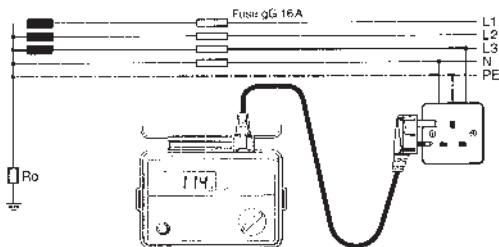
U_0 (Volts)	T (seconds)
120	0.8
230	0.4
400	0.2
>400	0.1

Note:

When the protective device is a residual current device (RCD), I_a is the rated residual operating current $I_{\Delta n}$. For instance in a TN system with a nominal mains voltage of $U_0 = 230V$ protected by type gG fuses the I_a and maximum Z_s values could be:

Rating (A)	Disconnecting time 5s		Disconnecting time 4s	
	I _a (A)	Z _s (Ω)	I _a (A)	Z _s (Ω)
6	28	8.2	47	4.9
10	46	5	82	2.8
16	65	3.6	110	2.1
20	85	2.7	147	1.56
25	110	2.1	183	1.25
32	150	1.53	275	0.83
40	190	1.21	320	0.72
50	250	0.92	470	0.49
63	320	0.71	550	0.42
80	425	0.54	840	0.27
100	580	0.39	1020	0.22

If the prospective fault current is measured, its value must be higher than the I_a value of the protective device concerned.



The maximum value of Z_s for this example is 2.1 Ω (16 amp gG fuse, 0.4 seconds). The loop tester reads 1.14 Ω and consequently the condition $Z_s \leq U_o/I_a$ is met.

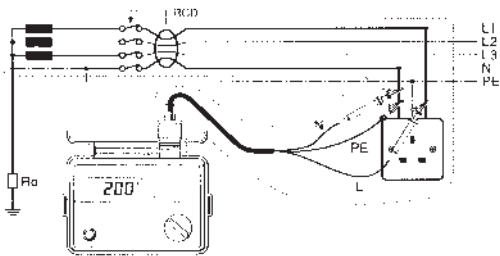
2.3 Principles of the measurement of line impedance and prospective short circuit current

Line impedance on a single phase system is the impedance measured between phase and neutral terminals.

Measurement principles for line impedance are exactly the same as for earth fault loop impedance measurement with the exception that the measurement is carried out between phase and neutral.

The protective short circuit or fault current at any point within an electrical installation is the current that would flow in the circuit if no circuit protection operated and a complete (very low impedance) short circuit occurred.

The value of this fault current is determined by the supply voltage and the impedance of the path taken by the fault current. Measurement of prospective short circuit current can be used to check that the protective devices within the system will operate within safety limits and in accordance with the safe design of the installation. The breaking current capacity of any installed protective device should be always higher than the prospective short circuit current.



3 Specifications

Measurement specification

Loop impedance

Range	Measuring range	Nominal test current at 0 Ω external loop/Period applied	Intrinsic accuracy
20 Ω	0.00-19.99 Ω	25A/20ms	$\pm(2\%rdg+3dgt)$
200 Ω	0.0-199.9 Ω	2.3/40ms	
2000 Ω	0-1999 Ω	15mA/280ms	

Prospective Short-circuit Current

Range	Measuring range	Nominal test current at 0 Ω external loop/Period applied	Intrinsic accuracy
200A	0.0-19.99A	2.3A/40ms	PSC accuracy is derived from the loop impedance accuracy
2000A	0-1999	25A/20ms	
20kA	0.00-4.00kA	25A/20ms	

Voltage

Measuring range	Intrinsic accuracy
180-260V	$\pm(2\%rdg+2dgt)$

Reference conditions

Ambient temperature:	23 \pm 5 $^{\circ}$ C
Relative humidity:	60 \pm 15%
Nominal system voltage and frequency:	230V, 50Hz
Altitude:	Less than 2000m

Operating error


Loop impedance

Range	Operating range compliant with EN61557-3 operating error
20 Ω	0.35 to 19.99 Ω
200 Ω	20.0 to 199.9 Ω
2000 Ω	200 to 1999 Ω

The influencing variations used for calculating the Operating error are:

Ambient temperature:	0° and 35°C
Phase angle:	0° to 18°
System frequency:	49.5Hz to 50.5Hz
System voltage:	195V to 253V

General specification

Storage temperature:	-5°C to 60°C
Storage humidity:	85% maximum
Dimensions:	175 x 115 x 85.7mm
Weight:	KT41 - 500g KT42 - 700g
Maximum altitude:	2000m
Over range indication:	'OL'
Input voltage greater than 260V indication:	'VP-E Hi'
Over temperature indication	

Applied standards

Instrument operating standard	IEC/EN61557-1 IEC/EN61557-3
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Safety standard IEC/EN 61010-1, CATIII (300V)
instrument

Protection degree IEC 60529 (IP40)

Accessories

KAMP10UK, ACC016E, ACCEP5 mains test lead with IEC
Connector

SLP5 Earth probe

SLI6E Distribution board fused test lead

(Fuse: 10A/600V fast acting ceramic)

Test lead carry pouch

Model	KT42	KT41
Anti trip technology*	✓	X
Loop 0-19.99Ω/ 0-199.9Ω/0-1999Ω	✓	✓
PSC 0-199.9A/ 0-1999A/0-4.00kA	✓	✓
Mains Lead for Sockets KAMP10UK	✓	✓
ACC016E ACCEP5	✓	✓
External Earth Probe SLP5	✓	✓
Distribution Board Lead SLI6E	✓	✓

*ATT does not operate on the 2000Ω ranges

This manual and product may use the following symbols adopted from International Safety Standards;



Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION;



Caution; risk of electric shock;

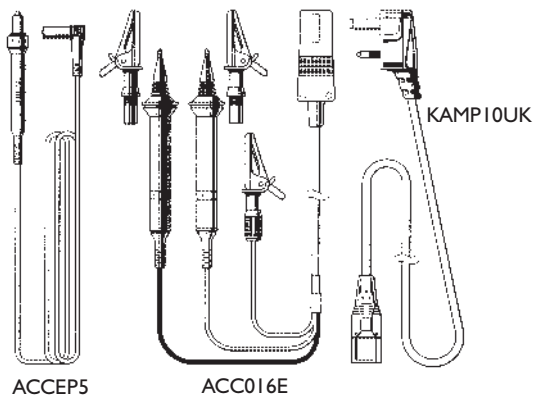


Caution (refer to accompanying documents)

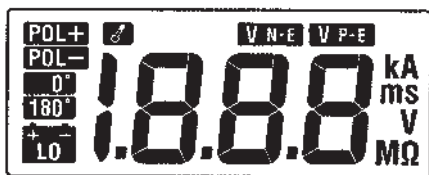
4 Instrument layout



Test leads



LCD display



5 Operating Instructions

5.1 Initial Checks: to be carried out before any testing;

Always inspect your test instrument and lead accessories for abnormality or damage-

If abnormal conditions exist **DO NOT PROCEED WITH TESTING**. Have the instrument checked by Kewtech.

Before pressing the test button, always check the LED's for the following sequence:

P-E Green LED must be ON

P-N Green LED must be ON

Red LED must be OFF

If the above sequence is **NOT** displayed or the **RED LED** is on for any reason, **DO NOT PROCEED AS THERE IS INCORRECT WIRING**. The cause of the fault must be investigated and rectified.

Voltage Measurement

When the instrument is first connected to the system, it will display the phase-earth voltage which is updated every 1s. This mode is cancelled the first time the test button is pressed. If this voltage is not normal or as expected, **DO NOT PROCEED**.

NOTE: This is a single phase (230V AC) instrument and **under no circumstances** should it be connected to 2-phases or a voltage exceeding 230VAC+ 10%-15%.

If the input voltage is greater than 260V the display will indicate 'VP-E Hi' and Loop or PSC measurements can not be made even if the Test button is pressed.

5.2 Measurement of Loop impedance

a. Loop Impedance at Mains Socket Outlet

Select the 20 Ω , 200 Ω or 2000 Ω range as desired

Connect the mains lead to the IEC socket of the instrument

Plug the moulded plug of the mains lead into the socket to be tested

Carry out the initial checks


Press the test button. A beep will sound as the test is conducted and the value of loop impedance will be displayed

Wait for the display to indicate the input voltage before conducting another test or before disconnecting the instrument from the socket

If the display shows 'OL' then this usually means the value measured exceeds the range selected, e.g. if the 20Ω range was selected then the loop impedance is greater than 19.99Ω and you must switch up a range to the 200Ω range.

5.2.1 External Earth Probe

The phase-earth loop impedance of exposed metal work (e.g. pipes/conduit etc.) can be tested using the external earth probe.

Connect the unit to the socket as normal. Plug the external earth probe into the instrument external earth probe socket, ensuring the probe is held with fingers behind the finger guard. This will break the earth continuity at the socket and the red LED  will switch on. The point at which the probe is now connected becomes the new earth point instead of at the socket. When the probe is placed in contact with the earthed surface to be measured, the LED mains status should revert to the correct sequence described in initial checks. When this happens, press the test button to measure the loop impedance.

- b Loop impedance at the distribution board

Warning: never connect 2 phases to this instrument

Select the 20Ω , 200Ω or 2000Ω range as required

Connect the distribution board lead model ACC016E to the IEC socket on the instrument

Connect the red phase lead of the ACC016E to I phase of the distribution board, the black neutral lead to the neutral of the distribution board and the green crocodile clip to the earth

Carry out the initial checks

Press the test button. A beep will sound as the test is conducted and the value of loop impedance will be displayed

Wait for the display to indicate the input voltage before conducting another test or disconnecting from the distribution board. When disconnecting from the distribution board, it is good practice to disconnect the phase first

- c Loop impedance at 3-phase equipment

Use the same procedure as (b) ensuring only **1-phase is connected at a time** i.e. FIRST test-red prod to phase 1, black prod to neutral, green crocodile clip to earth;

SECOND test-red prod to phase 2, black prod to neutral, green crocodile clip to earth etc.

- d. **The ACC016E can also be used for testing at luminaires**

Testing as described in (a), (b), (c) and (d) will measure the Phase-Earth loop impedance. If you wish to measure the Phase-Neutral loop impedance in items (b), (c), (d), then same procedure should be followed except the earth clip should be con-

nected to the neutral of the system i.e. the same point as the black neutral probe.

If the system has no neutral then you must connect the black neutral probe to the earth i.e. same point as the green earth clip. This will only work if there is no RCD in this type of system.

5.3 Measurement of PSC (Prospective Short Circuit Current)

Warning: Never connect 2 phases to this instrument

This is normally measured at the distribution board between the phase and neutral.

Select the 20kA, 2000A or 200A range

Connect the ACC016E distribution board lead to the IEC socket on the instrument

Connect the red phase probe of the ACC016E to the phase of the system, the **black probe to the neutral of the system** and the **green crocodile clip to the neutral of the system**

Carry out the initial checks

Press the test button. A bleep will sound as the test is conducted and the value of PSC will be displayed

Wait for the display to indicate the input voltage before conducting another test or disconnecting the instrument. It is good practice to disconnect the phase lead first

Note: For loop impedances greater than 50Ω (PSC less than 5A approx.) it is not possible to obtain an accurate PSC reading and the unit will lock out the PSC range by displaying the VN-E Hi over-range symbol.


PSC function has a power factor correction of 0.84.

$$\text{PSC} = \frac{\text{V}}{\text{A}} \times 0.84$$

If the PSC ranges are selected whilst connected to a socket

outlet via the mains lead KAMP10UK, a test will take place between Phase and Earth due to the fixed wiring of the moulded mains plug i.e. a **Phase-Earth fault current test**.

5.4 General

5.4.1 If the  symbol appears, this means that the test resistor is too hot and the automatic cut out circuits have operated. Allow the instrument to cool down before proceeding. The overheat circuits protect the test resistor against heat damage.

5.4.2 The test button may be turned clockwise to lock it down. In this auto mode, when using distribution board lead ACC016E, tests are conducted by simply disconnecting and reconnecting the red phase prod of the ACC016E avoiding the need to physically press the test button i.e. 'hands free'

6 Servicing and Calibration

If this tester should fail to operate correctly, return it to Kewtech marked for the attention of the Service Department. stating exact nature of fault. Make sure that:

- a. operating instructions have been followed
- b. leads have been inspected
- c. the unit is returned with all accessories

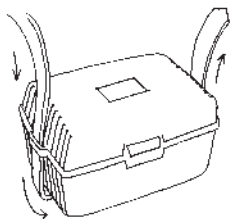
Regular re-calibration is recommended for this instrument. We recommend that with normal use, the instrument is calibrated at least once in every 12 month interval. When this is due for re-calibration return it to Kewtech marked for the attention of the Calibration Department and be sure to include all accessory leads, as they are part of the calibration procedure.

The mains lead supplied with this instrument (model KAMP10UK) for testing at sockets is part of the instrument. It

accuracy of the loop and PSC readings. As such always keep it with the instrument and remember to return it with the instrument when servicing and calibration is required. In a similar way the ACC016E is part of the instrument. The ACC016E leads are fused and fuses are rated at 10A/600V high rupture ceramic types. If they should blow always return the instrument to Kewtech for checking. The fuses are special and should only be replaced by equivalent types. Returning the product to Kewtech will ensure this. If other leads are used then reading may not be true unless they are calibrated with the instrument. If this product needs cleaning use a damp cloth to wipe its surfaces. DO NOT use strong cleaning agents as these may damage the plastic surfaces. Kewtech reserve the right to change specifications and design without notice and without obligation.

Case, strap, shoulder-pad and test lead pouch assembly

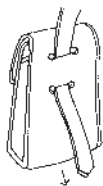
Assemble the shoulder strap through the case lugs and the test lead pouch in the following sequence:



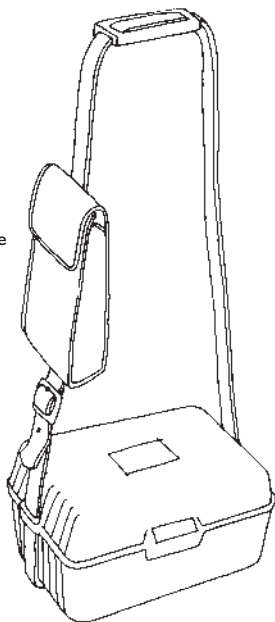
1 Pass the strap **down** through the first lug, under the case and **up** through the other lug.



2 Slide the shoulder pad onto the strap



3 Feed the strap **down** through the slots in the back of the test lead pouch.



4 Pass the strap through the buckle, adjust the strap for length and secure.

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