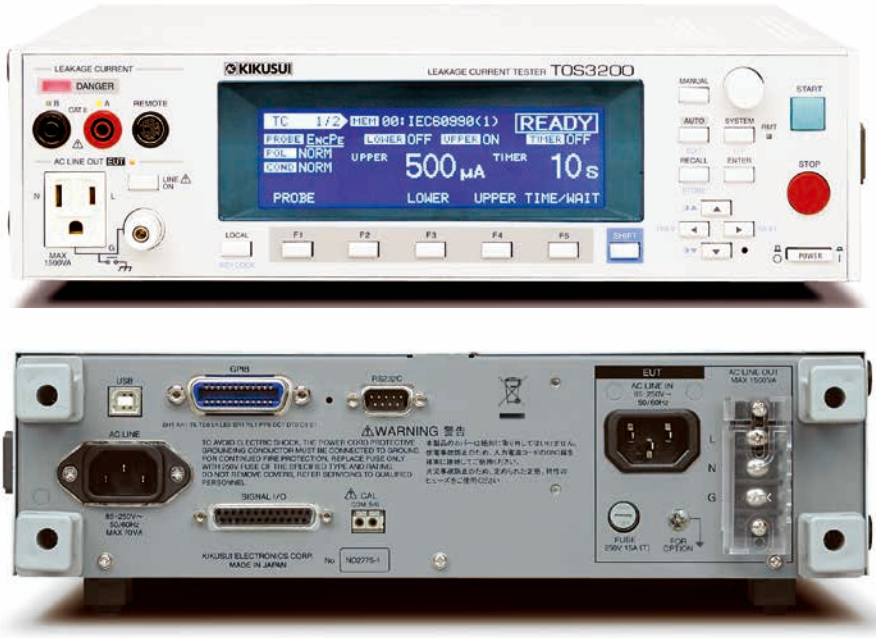
TOS3200

Leakage Current Tester

Supports touch current and protective conductor current (earth leakage current) tests



TOS3200

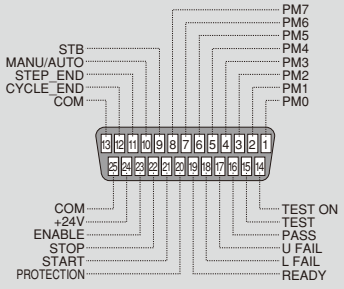
GPIB RS232C USB

A leakage current tester has now been added to the TOS Series... Conforms to international standard IEC 60990 ("Methods of measurement of touch current and protective conductor current").

The Leakage Current Tester TOS3200 is designed to test for leakage current (Touch Current and Protective Conductor Current) of general electrical apparatuses, excluding those used for medical purposes. With this tester, you can conduct tests conforming to various standards including IEC, UL, JIS and Electrical Appliance and Material Safety Law (Japan). You can set test conditions through simple operations on the panel because this tester holds in its memory the 51 types of test conditions for IT-related electrical equipment, electrical appliances, audio & visual equipment, lighting fixtures, power tools, and measuring and control instruments, accordingly with the standards of IEC/JIS and Electrical Appliance and Material Safety Law.

- Capable of measuring leakage current in three modes
- Eight built-in measurement circuit networks
- Up to 30 mA for RMS measurement
- Easy-to-understand operation
- Enables the continuous execution of tests
- Capable of saving test results
- 51 types of standard test conditions are preset
- Lets you manage the calibration time limit
- USB interface provided as standard

[Pin Configuration for the SIGNAL I/O Connector]



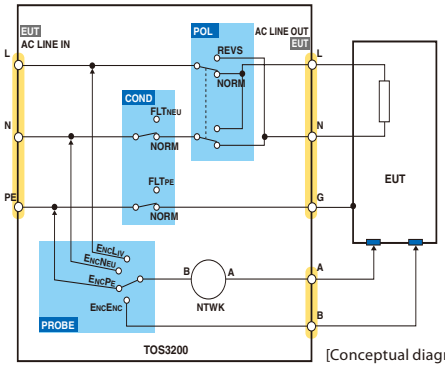
TOS3200

Leakage Current Tester

Capable of measuring leakage current in three modes

● Touch current (TC) operating mode*

Enables you to measure the touch current flowing between the enclosure (accessible portion) of the electrical equipment under test (EUT) and the power line incorporating the earth wire, via Measuring Devices. For Measuring Devices, eight measurement circuit networks (NTWKs) conforming to the applicable standards are provided as standard. The switching of the polarities of the power line to the EUT, as well as single-fault conditions, are automatically set with relays inside the tester.



[Conceptual diagram of the TC measurement]

● Protective conductor current (PCC) operating mode*

Enables you to measure the current flowing through the protective conductor (earth wire) by connecting the power plug (NEMA5-15 or an equivalent) of an item of 100 V electrical equipment to the socket on the front panel. A multi-outlet is available as an option (sold separately) to accommodate the different plugs used around the world.

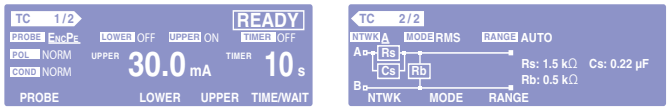
● Meter (METER) operating mode

In the same way as an ordinary multimeter, enables you to measure voltage and current using measurement terminals A and B on the front panel. For voltage measurement, it offers a "safety extra low voltage" (SELV) detection function; for current measurement, it offers a measurement function using measurement circuit networks (NTWKs).

*TC=Touch Current PCC=Protective Conductor Current

Easy-to-understand operation

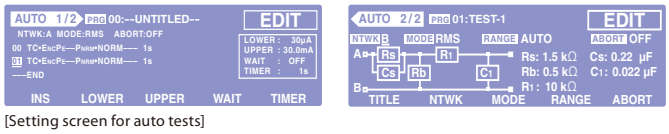
Simple operation is possible thanks to the intuitively understandable test condition menu and the function keys/rotary knobs.



[Setting screen for touch current (TC) measurement]

Enables the continuous execution of tests

Allows you to automatically conduct TC and PCC tests as a single sequence program by setting their test conditions as up to 100 independent tests (steps). You can set up to 100 sequence programs, with up to 500 steps in total. To support automation test, measurement point (probe setting) can be switched over without turning off EUT power line.



[Setting screen for auto tests]

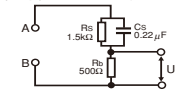
Up to 30 mA for RMS measurement

Capable of measuring 30 µA to 30 mA for DC/RMS measurement and 50 µA to 90 mA for PEAK measurement, both in three ranges. Two range switching functions are provided, namely, a fixed range function (FIX) and auto range function (AUTO), which conform to the current to be measured.For RMS measurement, the "true root-mean-square value" is achieved.

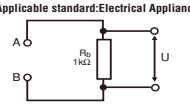
Eight built-in measurement circuit networks

It offers built-in eight measurement circuit networks for measuring the touch current of general electrical equipment.

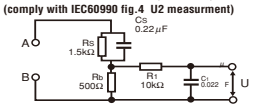
●Measurement circuit network(network A)
(comply with IEC60990 fig.3 U1 measurment)



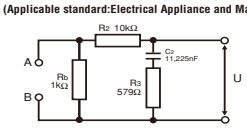
●Measurement circuit network(network D)
(Applicable standard:Electrical Appliance and Material Safety Law)



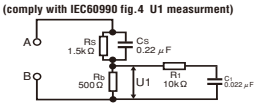
●Measurement circuit network(network B)
(comply with IEC60990 fig.4 U2 measurment)



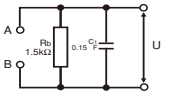
●Measurement circuit network (network E)
(Applicable standard:Electrical Appliance and Material Safety Law)



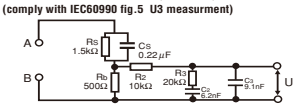
●Measurement circuit network(network B1)
(comply with IEC60990 fig.4 U1 measurment)



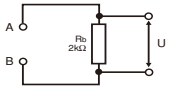
●Measurement circuit network (network F)
(Applicable standard:IEC61029 etc.)



●Measurement circuit network(network C)
(comply with IEC60990 fig.5 U3 measurment)



●Measurement circuit network (network G)
(Applicable standard:IEC60745 etc.)



Capable of saving test results

For independent tests, enables you to save not only test results but also the test date and time and the test conditions for up to 50 tests; for auto tests, you can save this data for up to 50 programs. You can also save the test results as external records using the USB and other interfaces.

51 types of standard test conditions are preset

The memory in the main unit is pre-written with 51 types of test conditions for general electrical equipment, which conform to IEC 60990 and the standards listed below. You can set the standard test conditions merely by calling them.

[Standards covered by the memory]

Standard No.	Applicable electrical equipment
IEC60950	Information technology equipment
IEC60335	Household and similar electrical appliances
IEC60065	Audio, video and similar electronic apparatus
IEC60745	Hand-held motor-operated electric tools
IEC60598	Luminaires
IEC61010	Electrical equipment for measurement, control, and laboratory use
Electrical Appliance and Material Safety Law	Electrical appliances
IEC61029	Transportable motor-operated electric tools

Lets you manage the calibration time limit

For independent tests, enables you to save not only test results but also the test date and time and the test conditions for up to 50 tests; for auto tests, you can save this data for up to 50 programs. You can also save the test results as external records using the USB and other interfaces.

USB interface provided as standard

In addition to the SIGNAL I/O, GPIB, and RS232C interfaces, a USB interface is also provided as standard.

Range of other functions

- "MAX function," which retains the largest current measured.
- "CONV function," which converts the measured current value into the corresponding value for the preset power voltage.
- "SELV function," which causes the DANGER lamp to turn ON if a preset safety extra low voltage (SELV) is exceeded in meter measurement mode.
- "CHECK function," which performs self-analysis of the measurement circuit networks.

TOS3200

Leakage Current Tester

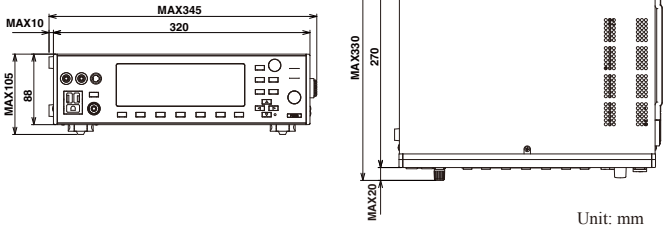
Measurement item, measurement mode			
Measurement item			3 types, namely, touch current (TC) measurement, protective conductor current (PCC) measurement, and METER
Measurement method	TC		Measure the voltage drop across the reference resistor, using a measurement circuit network (NTWK), and then calculate the current.
	PCC		Measure the voltage drop across the reference resistor connected to the protective earth wire, and then calculate the current.
	METER		Measure the voltage and current using the measurement terminals.
Measurement mode			DC/RMS/PEAK (RMS being the true root-mean-square value)
Measurement network (NTWK)	Network A (IEC 60990 compliant)		Basic measurement element:(1.5 kΩ // 0.22 μF) + 500 Ω
	Network B/B1 (IEC 60990 compliant)		Basic measurement element:(1.5 kΩ // 0.22 μF) + 500 Ω // (10 kΩ + 22 nF)
	Network C (IEC 60990 compliant)		Basic measurement element:(1.5 kΩ // 0.22 μF) + 500 Ω // (10 kΩ + (20 kΩ + 6.2 nF) // 9.1 nF)
	Network D		Basic measurement element: 1 kΩ
	Network E		Basic measurement element: 1 kΩ//(10 kΩ + 11.225 nF + 579 Ω)
	Network F		Basic measurement element: 1.5 kΩ//0.15 μF
	Network G		Basic measurement element: 2 kΩ
Network constant tolerance			Resistance: ±0.1%, capacitor 0.15 μF: ±2%, other: ±1%
Current measurement section			
Measurement range	Range 1		DC/RMS: 30 μA to 600 μA, PEAK: 50 μA to 850 μA *1
	Range 2		DC/RMS: 125 μA to 6.00 mA, PEAK: 175 μA to 8.50 mA *1
	Range 3		DC/RMS: 1.25 mA to 30.0 mA, PEAK: 1.75 mA to 90.0 mA *1
Range switching			AUTO/FIX
Measurement current (i) display/resolution			i < 1mA: □□□ μA/1 μA, 1 mA ≤ i < 10 mA:□.□□ mA/0.01 mA 10 mA ≤ i < 100 mA: □□.□ mA/0.1 mA
Measurement accuracy *2	Range 1	DC	±(5.0% of rdng + 20 μA)
		RMS	15 Hz ≤ f ≤ 10 kHz: ±(2.0% of rdng + 8 μA)
			10 kHz < f ≤ 1 MHz: ±(5.0% of rdng + 10 μA)
		PEAK	15 Hz ≤ f ≤ 1 kHz: ±(5.0% of rdng + 10 μA)
			1 kHz < f ≤ 10 kHz: ±(5.0% of rdng + 10 μA)
	Range 2	DC	±(5.0% of rdng + 50 μA)
		RMS	15 Hz ≤ f ≤ 10 kHz: ±(2.0% of rdng + 20 μA)
			10 kHz < f ≤ 1 MHz: ±(5.0% of rdng + 20 μA)
		PEAK	15 Hz ≤ f ≤ 1 kHz: ± (2.0% of rdng + 50 μA)
			1 kHz < f ≤ 10 kHz: ± (5.0% of rdng + 50 μA)
	Range 3	DC	±(5.0% of rdng + 0.5 mA)
		RMS	15 Hz ≤ f ≤ 10 kHz: ±(2.0% of rdng + 0.2 mA)
			10 kHz < f ≤ 1 MHz: ±(5.0% of rdng + 0.2 mA)
		PEAK	15 Hz ≤ f ≤ 1 kHz: ± (2.0% of rdng + 0.5 mA)
			1 kHz < f ≤ 10 kHz: ± (5.0% of rdng + 0.5 mA)
Input resistance, input capacitance			1 MΩ ±1%, < 200 pF
Common mode rejection ratio			≤ 10 kHz: 60 dB or more. 10 kHz to 1 MHz: 40 dB or more
Judgement function			
Judgement method			Pass/fail judgement by setting upper and lower current limits in window comparator mode
Judgement			U-FAIL for currents above the upper limit; L-FAIL for currents below the lower limit.
Display, etc.			U-FAIL/L-FAIL/PASS display, buzzer sounding
PASS hold			The time for which a PASS judgement is retained can be set to 0.2 s to 10.0 s or to HOLD
Setting range	Range 1		DC/RMS: 30 μA to 600 μA, PEAK: 50 μA to 850 μA *3
	Range 2		DC/RMS: 151 μA to 6.00 mA, PEAK: 213 μA to 8.50 mA *3
	Range 3		DC/RMS: 1.51 mA to 30.0 mA, PEAK: 2.13 mA to 90.0 mA *3
Judgement accuracy			Conforms to the measurement accuracy. Read rdng as UPPER setting in the measurement accuracy.
Measurement of voltage between A and B			
Measurement range			DC/RMS: 10.00 V to 300.0 V, PEAK: 15.00 V to 430.0 V
Accuracy			±(3% of rdng + 2 V), measurement range fixed at AUTO
Input impedance			Approx. 40 MΩ
SELV detection			Set the SELV to detect; if this value is exceeded, the DANGER lamp is turned ON
SELV setting range			10 V to 99 V, in 1-V steps, OFF function provided
Timer, test execution function, memory			
Timer	Test wait time		Setting range: 0 s to 999 s, accuracy: ±(100 ppm of set + 20 ms)
	Test time		Setting range: 1 s to 999 s/ OFF function, accuracy: ±(100 ppm of set + 20 ms)
Test function			Auto test (AUTO): Automatic execution of up to 100 steps (test conditions) Independent test (MANUAL): Independent execution of TC, PCC, or METER measurement
Memory	Test conditions		AUTO: Up to 100 sequence programs can be saved (up to 500 steps in total). MANUAL: Up to 100 sequence programs can be saved.
	Test results		The user can select whether to save the judgement results when they are output at the end of the tests. AUTO: Test results for up to 50 programs can be recorded. MANUAL: Test results for up to 50 tests can be recorded.

*1: The maximum range is indicated. The range differs depending on the measurement circuit network.
*2: Current converted value in Network A,B,C and PCC measurement,based on built-in voltmeter accuracy.
*3: The maximum range is indicated. The range differs depending on the measurement circuit network. Also, the UPPER setting in each range when the FIX range is selected is indicated.
*4: May not apply to custom-made or modified products.
*5: This is a Class I equipment. Be sure to ground this product's protective conductor terminal. The safety of this product is only guaranteed when the product is properly grounded.
*6: Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielectric strength or surface resistivity. Pollution Degree 2 assumes that only non-conductive pollution will occur except for an occasional temporary conductivity caused by condensation.

Other functions		
Measured value conversion (CONV)		Converts the measured current value into the corresponding value at the preset power voltage
		Setting range: 80.0 V to 300.0 V, OFF function provided
MEASURE MODE		Selects a measured value from those below
		NORM: Displays the measured value in the measurement period
		MAX: Displays the largest measured value in the measurement period
Power positive/negative phase selection (POL)		NORM: Positive phase connection, REVS: Negative phase connection
Single fault selection (COND)		NORM: Normal, FLTNEU: Disconnection of the neutral wire, FLTPE: Disconnection of the protective earth wire
Earth check		Generates CONTACTFAIL if the enclosure is grounded in a TC (EncLiv, EncNeu) test
MEASURE CHECK		Checks the measurement function between measurement terminals A and B, and places the tester in the PROTECTION state if an error is detected
Voltage measurement(EUT)		Measurement range: 80.0 V to 250.0 V, resolution: 0.1 V, accuracy: ±(3% of rdng + 1 V)
Current measurement(EUT)		Measurement range: 0.1 A to 15.00 A, resolution: 0.01 A, accuracy: ±(5% of rdng + 30 mA)
Power measurement (effective power)		Measurement range: 10 W to 1500 W
		Accuracy (at a power voltage of 80 V or higher and a load power factor of 1): ±(5% of rdng + 8 W)
System clock	Recording	Items: Calibration date and time, test date and time, permissible date and time: Up to 2099
	Calibration time limit management(CAL PROTECT)	Enables the setting of a calibration time limit. Once this time has passed, a warning is output at power on
		ON: Places the tester in the PROTECTION state (disables the use of the tester), OFF: Displays warning.
Protective operation		Relay operation error, overload, over range, measurement function check, failure of internal battery, etc.
Interface		
RS232C		D-Sub 9-pin connector (conforming to EIA-232D), baud rate: 9600/19200/38400 bps (For connection to a PC, use a "9-pin female-female reverse" cable.)
GPIB		Conforms to IEEE Std. 488-1978. (SH1,AH1,T6,TE0,L4,LE0,SR1,PP0,DC1,DT0,C0,E1)
USB		USB Specification2.0
REMOTE		6-pin MINIDIN connector (for HP21-TOS (separately sold option) only)
SIGNAL I/O		25-pin D-Sub connector
General		
Measurement terminal	Rated voltage/current	Terminals A to B: 250 V, terminal to chassis: 250 V, 100 mA
	Measurement category	CAT II
	Active terminal display	Displays the active terminals for the measurement using LED lamps.
Environment	Spec assured range	Temperature: 5 °C to 35 °C (+41 °F to +95 °F), Humidity: 20% rh to 80% rh (no condensation)
	Operating range	Temperature: 0 °C to 40 °C (+32°F to +104 °F), Humidity: 20% rh to 80% rh (no condensation)
	Storage range	Temperature: -20 °C to 70 °C (-4 °F to +158 °F), Humidity: 90% rh or less (no condensation)
	Installation location	Indoors, altitude of 2000 m or less
Power	Input power	Nominal input rating:100Vac to 240Vac, 50/60Hz, power consumption: 70 VA max.
	for EUT	Nominal input rating:100Vac to 240Vac, 50/60Hz
		Rated output capacity: 1500 VA, maximum current: 15 A, rush current: 70 A peak max. (within 20 ms)
Insulation resistance		30 MΩ or greater (500 Vdc) (between AC line and chassis, between measurement terminal and chassis)
Withstand voltage		1390 Vac, 2 seconds/20 mA or less (between AC line and chassis)
Ground bond		25 Aac/0.1 Ω or less
Safety *4		Complies with the requirements of the following standard. IEC 61010-1 (Class I *5 , Pollution degree 2 *6)
Outside dimensions, weight		320[12.60 inch] (345[13.58 inch]) W × 88[3.46 inch] (105[4.13 inch]) H × 270[10.63 inch] (335[13.19 inch]) D mm, approx. 5 kg(approx. 11.02 lbs)
Accessories		Test lead (TL21-TOS): 1 set (red and black with alligator clip), Flat probe (FP01-TOS): 1 set, Spare fuse: 1 pc., CD-ROM: 1 pc., Quick Reference (English: 1pc., Japanese: 1pc.), Setup guide: 1 pc., Safety information: 1 pc., Circuit principle diagram label: 1 pc., Power cord: 2 pcs.

• The warm-up time must be 30 minutes or longer.
• rdng denotes a reading, set denotes the set value, and EUT is the electrical equipment under test.

External dimensional diagrams



Unit: mm