



# Industry's Fastest Testing Speed

## Unmatched Speeds

Industry-beating test time

Rapidly assess in as fast as 50 ms

High-speed auto discharge function

Quick discharge of residual voltage

## Outstanding features

Contact check function

Prevents errors due to poor contact

Freely configurable test voltage

Set from 25 V to 1000 V (1 V resolution)

Short-circuit check function

Stops potential defects from reaching the market

# Unmatched Speeds

## Industry's Fastest Testing Speed



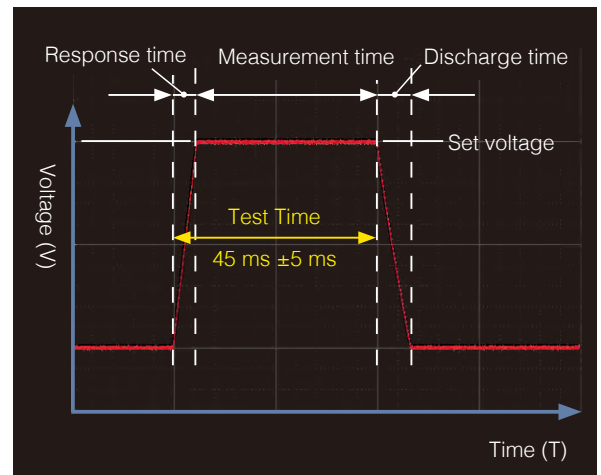
The Insulation Tester ST5520 delivers the fastest insulation resistance testing in the industry, meeting all the requirements of production lines thanks to rapid takt times.

## Industry-beating test time

### Rapidly assess in as fast as 50 ms

Testing is complete in as little as 50 ms — the fastest time in the industry. This is 700 ms faster than legacy Hioki models.

- ★ Discharge time varies according to the sample's capacitance
- ★ The pictured waveform reflects use of a test time of 45 ms
- ★ The waveform shows the test result for a 9 MΩ, 10 pF sample



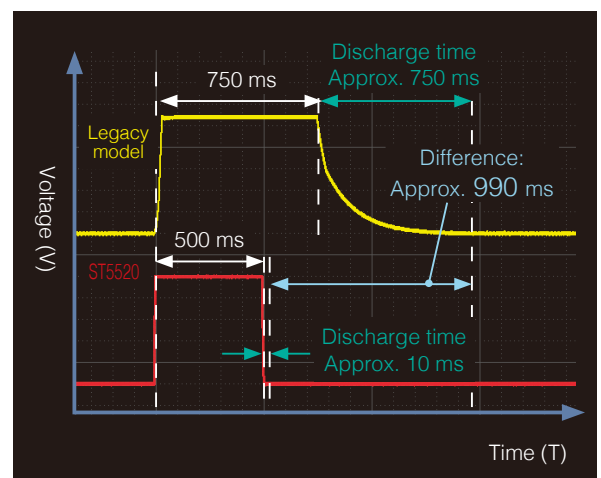
Applied Voltage Waveform at Fastest Test Time

## High-speed auto discharge function

### Quickly discharge residual voltage

The post-test residual voltage discharge time has been reduced significantly compared with legacy models. As a result, when comparing an identical sample under the following conditions, a takt time improvement of 990 ms is estimated.

- ★ Discharge time varies according to the sample's capacitance
- ★ The waveform shows the test result for a 9 MΩ, 10 pF sample



Comparison of Discharge Time with Previous Model

# Outstanding features

## Contact check function

### Prevents errors due to poor contact

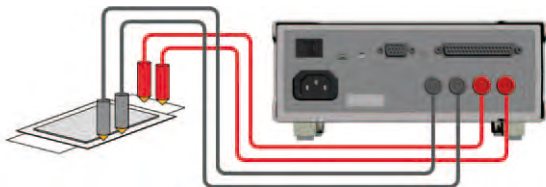
The contact check function allows you to check that proper contact has been made with the device under test prior to the testing. This ensures that resistance testing is not carried out without proper contact, as this can result in erroneous assessment.

There are two methods: 4-wire contact check and comparator contact check.



#### 4-Wire Contact Check

Continuity between the low contact check terminal and the low output terminal, and between the high contact check terminal and the high output terminal, is verified.



#### Comparator Contact Check

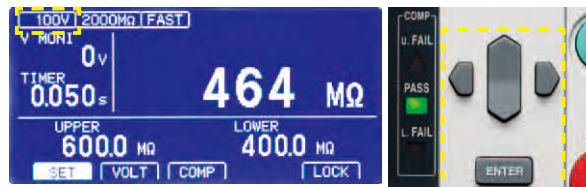
If the comparator result exceeds a previously set upper limit after a normal connection, the instrument reports an "upper fail," indicating a contact failure.



## Freely configurable test voltage

### Configure from 25 V to 1000 V (1 V resolution)

In insulation resistance testing of lithium-ion and other batteries, the specific test voltage used varies with the manufacturer. In addition, the test voltage for electronic components, such as relays and connectors, is likely to change in the future along with revisions to various standards. ST5520 allows the test voltage to be freely configured.



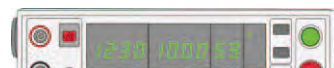
The test voltage can be changed simply by pressing the keys and verified on the screen.



#### With legacy models...

Legacy products provided a smaller number of choices, for example 25 V / 50 V / 100 V / 250 V / 500 V / 1000 V.

25 V/50 V/100 V/250 V/500 V/1000 V

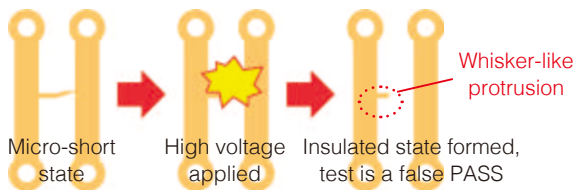


## Short-circuit check function

**Stops potential defects from reaching the market**

With this function, a low voltage (2 V to 4 V DC) is applied to the test patterns to check for micro-shorting prior to insulation testing.

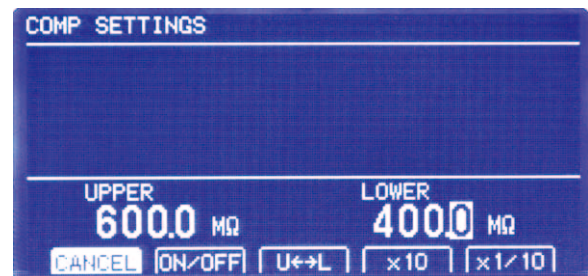
If insulation testing is performed incorrectly, remaining protrusions could cause issues after the product ships.



## Comparator Function

**Freely set upper and lower limit values**

You can select from three types: upper limit, lower limit and upper-lower limit value assessment. Comparator operation can also be delayed for a certain period of time by specifying the preferred response time.



## Switched Probe

**Safe, easy operation at your fingertips**

The use of optional Switched Probe 9299 lets you to operate the ST5520 while holding the probe.



## Panel Save/Load Function

**Saving and loading measurement conditions**

Up to ten measurement conditions can be saved, and they are retained even if the power supply is off. The saved conditions can be loaded via key operation, RS-232C and EXT. I/O.

| MEAS | SYS      | PANEL     | I/O | IF | INFO            |
|------|----------|-----------|-----|----|-----------------|
| 01   | PANEL_01 | VOLTAGE   |     |    | 0100V           |
| 02   | PANEL_02 | RANGE     |     |    | HOLD 2000MΩ     |
| 03   | PANEL_03 | SPEED     |     |    | FAST            |
| 04   | PANEL_04 | TIMER     |     |    | ON 000.050s     |
| 05   | PANEL_05 | DELAY     |     |    | OFF             |
| 06   | PANEL_06 | COMP U/L  |     |    | 600.0 / 400.0MΩ |
| 07   | PANEL_07 | COMP MODE |     |    | CONTINUE        |

# External interfaces

Compatible with 38400 bps transmission speed

## Built-in RS-232C interface

Use the RS-232C interface to capture measurement and assessment results from a PC, PLC or other system. The ST5520 is also equipped with a "data output function" for automatically sending the measurement values and assessment results at the end of each test.

### RS-232C Specifications

|                                |                                                                                                                                                                                                                                         |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Transmission method            | Communication method: Full duplex<br>Synchronization method: Asynchronous                                                                                                                                                               |
| Transmission speed             | 9600 bps (default)/19200 bps/38400 bps                                                                                                                                                                                                  |
| Data length                    | 8-bit                                                                                                                                                                                                                                   |
| Parity                         | N/A                                                                                                                                                                                                                                     |
| Stop bit                       | 1-bit                                                                                                                                                                                                                                   |
| Message terminator (delimiter) | Receiving: CR+LF, CR/sending: CR+LF                                                                                                                                                                                                     |
| Flow control                   | N/A                                                                                                                                                                                                                                     |
| Electrical Specifications      | Input voltage level 5 to 15 V: ON, -15 to -5 V: OFF<br>Output voltage level 5 to 9 V: ON, -9 to -5 V: OFF                                                                                                                               |
| Connector                      | Interface connector pin arrangement (D-sub9 pin, male-type fixing screws #4-40)<br>I/O connector specifications: terminal (DTE)<br>Recommended cables:<br>RS-232C Cable 9637 (for PC)<br>RS-232C Cable 9638 (D-sub25 pin for connector) |

Flexible support for control circuits

## NPN / PNP switch

All signals are isolated using a photocoupler. (The input/output common terminal is shared). The input circuit can be switched to support current sinking output (NPN) or current sourcing output (PNP) by configuring the switch.



Recording time variation

## Analog output of measurement values

During testing, analog output is generated at the same timing as the instrument's measured value display. Once the test is complete, the instrument will continue to output the last value through its analog output terminal.



**0 to 4 V is output in all measured resistance ranges (FULL)**

| Test voltage                             | Resistance value range               | Output voltage (DC) |
|------------------------------------------|--------------------------------------|---------------------|
| $25\text{ V} \leq V < 100\text{ V}$      | 0.000 M $\Omega$ to 400.0 M $\Omega$ | 0 V to 4 V          |
| $100\text{ V} \leq V < 500\text{ V}$     | 0.000 M $\Omega$ to 4000 M $\Omega$  | 0 V to 4 V          |
| $500\text{ V} \leq V \leq 1000\text{ V}$ | 0.000 M $\Omega$ to 4000 M $\Omega$  | 0 V to 4 V          |
| Full measurement voltage                 | Over.F                               | 4 V                 |
|                                          | Under.F                              | 0 V                 |

**0 to 4 V is output according to each resistance ranges (EACH)**

| Resistance range                                            | Resistance value range               | Output voltage (DC) |
|-------------------------------------------------------------|--------------------------------------|---------------------|
| 2 M $\Omega$                                                | 0.000 M $\Omega$ to 4.000 M $\Omega$ | 0 V to 4 V          |
| 20 M $\Omega$                                               | 0.00 M $\Omega$ to 40.00 M $\Omega$  | 0 V to 4 V          |
| 200 M $\Omega$                                              | 0.0 M $\Omega$ to 400.0 M $\Omega$   | 0 V to 4 V          |
| 2000 M $\Omega$<br>( $100\text{ V} \leq V < 500\text{ V}$ ) | 0 M $\Omega$ to 4000 M $\Omega$      | 0 V to 4 V          |
| 4000 M $\Omega$                                             | 0 M $\Omega$ to 4000 M $\Omega$      | 0 V to 4 V          |

Also available with BCD output  
I/O terminals for external control

### Control I/O signal no. table

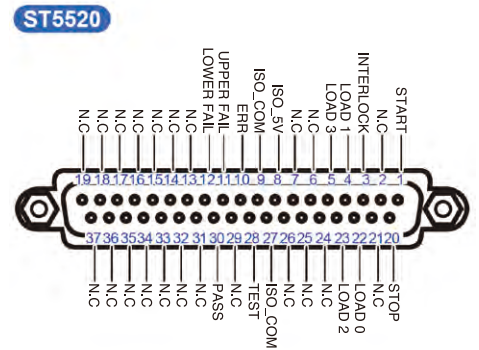
ST5520/ST5520-01

| Pin | Signal name | I/O | Function                                                                 | Logic |
|-----|-------------|-----|--------------------------------------------------------------------------|-------|
| 1   | START       | IN  | Start measurement                                                        | Edge  |
| 2   | (Not used)  | —   | —                                                                        | —     |
| 3   | INTERLOCK   | IN  | Interlock                                                                | Level |
| 4   | LOAD1       | IN  | Select panel number                                                      | Level |
| 5   | LOAD3       | IN  | Select panel number                                                      | Level |
| 6   | (Not used)  | —   | —                                                                        | —     |
| 8   | ISO_5V      | —   | Isolated mains +5 V (-5 V) output                                        | —     |
| 9   | ISO_COM     | —   | Isolated mains common                                                    | —     |
| 10  | ERR         | OUT | Contact check error<br>Short circuit check error<br>Output voltage error | Level |
| 11  | UPPER FAIL  | OUT | Comparator Assessment                                                    | Level |
| 12  | LOWER FAIL  | OUT | Comparator Assessment                                                    | Level |
| 20  | STOP        | IN  | End measurement                                                          | Edge  |
| 21  | (Not used)  | —   | —                                                                        | —     |
| 22  | LOAD0       | IN  | Select panel number                                                      | Level |
| 23  | LOAD2       | IN  | Select panel number                                                      | Level |
| 27  | ISO_COM     | —   | Isolated mains common                                                    | —     |
| 28  | TEST        | OUT | Measuring                                                                | Level |
| 30  | PASS        | OUT | Comparator Assessment                                                    | Level |

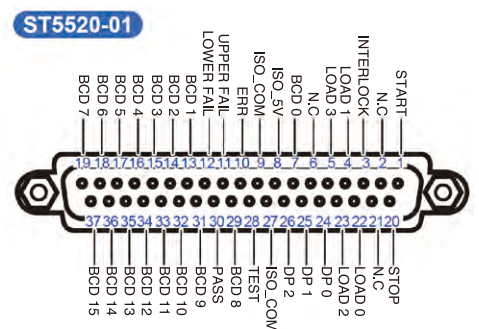
ST5520-01 (BCD function)

| Pin | Signal name | I/O | Function       | Logic |
|-----|-------------|-----|----------------|-------|
| 7   | BCD0        | OUT | BCD            | Level |
| 13  | BCD1        | OUT | BCD            | Level |
| 14  | BCD2        | OUT | BCD            | Level |
| 15  | BCD3        | OUT | BCD            | Level |
| 16  | BCD4        | OUT | BCD            | Level |
| 17  | BCD5        | OUT | BCD            | Level |
| 18  | BCD6        | OUT | BCD            | Level |
| 19  | BCD7        | OUT | BCD            | Level |
| 24  | DP0         | OUT | Decimal output | Level |
| 25  | DP1         | OUT | Decimal output | Level |
| 26  | DP2         | OUT | Decimal output | Level |
| 29  | BCD8        | OUT | BCD            | Level |
| 31  | BCD9        | OUT | BCD            | Level |
| 32  | BCD10       | OUT | BCD            | Level |
| 33  | BCD11       | OUT | BCD            | Level |
| 34  | BCD12       | OUT | BCD            | Level |
| 35  | BCD13       | OUT | BCD            | Level |
| 36  | BCD14       | OUT | BCD            | Level |
| 37  | BCD15       | OUT | BCD            | Level |

### ST5520 pin arrangement



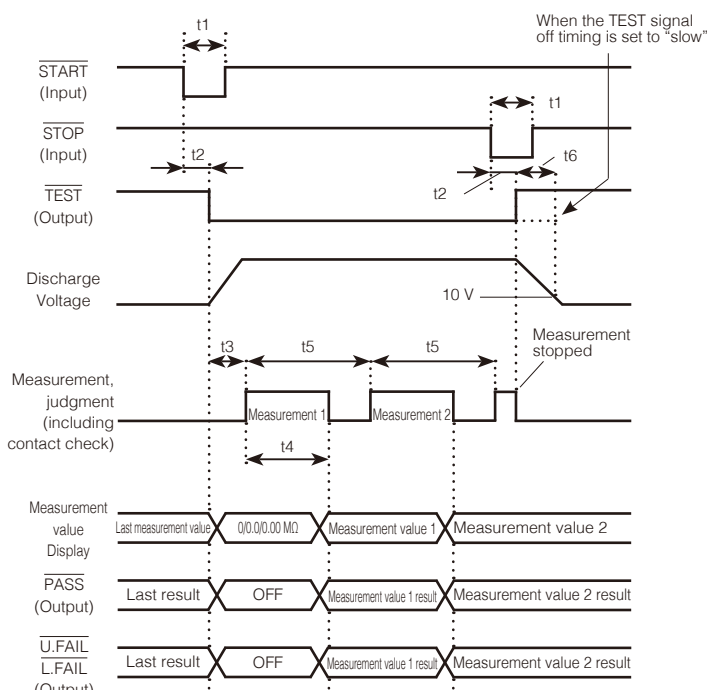
### ST5520-01 pin arrangement



### ST5520 timing chart

|    | Content                                                     | Time                                            |
|----|-------------------------------------------------------------|-------------------------------------------------|
| t1 | START, STOP signal pulse width                              | 5 ms MIN.                                       |
| t2 | START, STOP signal detection time                           | 5 ms MAX.*                                      |
| t3 | Response time (DELAY)                                       | AUTO, 5 ms to 999.9 s                           |
| t4 | Measurement time                                            | Contact check: OFF 30 ms (FAST), 480 ms (SLOW)  |
|    | Contact check: ON                                           | 80 ms (FAST), 480 ms (SLOW)                     |
| t5 | Measurement interval                                        | Contact check: OFF 50 ms (FAST), 500 ms (SLOW)  |
|    | Contact check: ON                                           | 100 ms (FAST), 500 ms (SLOW)                    |
| t6 | Discharge time (time until output voltage is 10 V or lower) | 20 ms MAX.<br>(When measuring pure resistance)* |

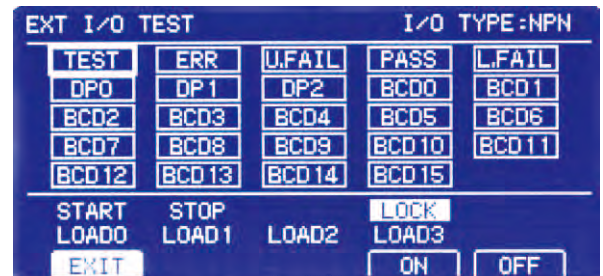
\*If the START signal is input after the test voltage is changed, the START signal detection time will increase by a maximum of 500 ms.



### Checking the Control I/O Signal No.

#### EXT. I/O Test & Monitoring Function

The output signal can be switched ON or OFF manually, and the output signal state can be viewed on-screen.



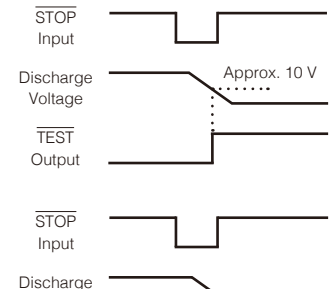
### Checking and controlling voltage during discharge

#### Setting the TEST signal OFF timing

You can choose between the following two settings to determine the timing at which the EXT I/O TEST signal output returns from low to high at the completion of testing:

[SLOW]: The low signal (the same as during testing) is maintained until the voltage of the device under test falls to about 10 V as a result of the operation of the discharge function.

[FAST]: The signal returns to high at about the same time as the test is completed.



# ST5520 Specifications (Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year)

| Specifications                                 |                                                                                                                                                                                                                                                            |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Measurement items                              | Insulation resistance (DC voltage application method)                                                                                                                                                                                                      |
| Output voltage                                 | 25 V to 1000 V (user-configurable), 1 V resolution                                                                                                                                                                                                         |
| Sampling                                       | FAST: 30 ms/time, SLOW: 500 ms/time (switch)                                                                                                                                                                                                               |
| Memory function                                | Saved items: rated measurement voltage, comparator upper limit/lower limit values, test mode, beep sound to distinguish the result, test time, response time, resistance range, measurement speed<br>Memory capacity: up to 10 items (can be saved/loaded) |
| Test modes                                     | Continuous mode, PASS STOP mode, FAIL STOP mode, force quit assessment mode (switchable)                                                                                                                                                                   |
| Check function                                 | Contact check function (ON/OFF)<br>Short-circuit check function (ON/OFF)                                                                                                                                                                                   |
| Operating temperature / humidity range         | 0°C to 40°C, 80% rh or lower (non-condensing)                                                                                                                                                                                                              |
| Storage temperature/ humidity range            | -10°C to 50°C, 80% rh or lower (non-condensing)                                                                                                                                                                                                            |
| Guaranteed accuracy temperature/humidity range | 23°C ±5°C, 80% rh or lower (non-condensing)                                                                                                                                                                                                                |
| Usage location                                 | Indoor use, pollution degree 2, up to a height of 2000 m                                                                                                                                                                                                   |
| Rated power supply voltage                     | 100 V AC to 240 V ±10%                                                                                                                                                                                                                                     |
| Rated power supply frequency                   | 50 Hz/60 Hz                                                                                                                                                                                                                                                |
| Max. rated power                               | 25 VA                                                                                                                                                                                                                                                      |
| Withstand voltage                              | 1.62 kV AC (sensed current 10 mA) 1 min<br>Between power supply L/N (together) and protective grounding terminal                                                                                                                                           |
| Excessive input protection                     | 1100 V DC (positive polarity only)                                                                                                                                                                                                                         |

|                     |                                                                                          |
|---------------------|------------------------------------------------------------------------------------------|
| Dimensions          | 215 (8.46 in) W x 80 (3.15 in) H x 166 (6.54 in) D mm (excluding protruding parts)       |
| Mass                | 1.1 kg ± 0.1 kg (38.8 oz ± 3.5 oz)                                                       |
| Compliant Standards | Safety EN61010 EMC EN61326 Class A<br>EN61000-3-2, EN61000-3-3                           |
| Accessories         | Instruction manual, power cord, EXT. I/O connector (male), connector cover (one of each) |

| Comparator Function |                                                                                                                                                                                                                                                      |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Assessment          | UPPER_FAIL, PASS, LOWER_FAIL, UL_FAIL<br>UPPER_FAIL: Measured value $\geq$ upper limit value<br>PASS: Upper limit value $>$ measured value $>$ lower limit value<br>LOWER_FAIL: Measured value $\leq$ lower limit value<br>UL_FAIL: Unable to assess |
| Assessment Process  | Beep sound, PASS/U.FAIL/L.FAIL light up on LED display<br>When UL_FAIL, U.FAIL/L.FAIL light up simultaneously<br>EXT. I/O output, assessment result can be obtained via RS-232C                                                                      |

| Test duration               |                                                                  |
|-----------------------------|------------------------------------------------------------------|
| Definition of test duration | Test duration = Response time + Measurement time                 |
| Function                    | Set the time from voltage application until pass/fail assessment |
| Configuration range         | 0.045 s to 999.999 s (0.001 s resolution)                        |

| Response time timer function |                                                                                                                                                                                                                                                                                  |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Function                     | The response time is the time during which comparator assessment operation is prohibited from the start of the test until the set response time has elapsed.<br>No measurement values are displayed during the response time.<br>The response time is included in the test time. |
| Configuration range          | 0.005 s to 999.999 s (0.001 s resolution)                                                                                                                                                                                                                                        |

| Measurement voltage/resistance range (can be switched between Auto Range/Manual Range) |                  |              |            |                                             |                |
|----------------------------------------------------------------------------------------|------------------|--------------|------------|---------------------------------------------|----------------|
| Rated measurement voltage                                                              | Resistance range | Max. display | Resolution | Guaranteed accuracy range                   | Accuracy       |
|                                                                                        |                  |              |            |                                             | FAST/SLOW      |
| 25 V ≤ V < 100 V                                                                       | 2 MΩ             | 4.000 MΩ     | 0.001 MΩ   | 0.002 MΩ to 2.000 MΩ                        | ±2%rdg. ±5dgt. |
|                                                                                        | 20 MΩ            | 40.00 MΩ     | 0.01 MΩ    | 1.90 MΩ to 20.00 MΩ                         |                |
|                                                                                        | 200 MΩ           | 999.9 MΩ     | 0.1 MΩ     | 19.0 MΩ to 200.0 MΩ<br>200.1 MΩ to 999.9 MΩ |                |
| 100 V ≤ V < 500 V                                                                      | 2 MΩ             | 4.000 MΩ     | 0.001 MΩ   | 0.002 MΩ to 2.000 MΩ                        | ±2%rdg. ±5dgt. |
|                                                                                        | 20 MΩ            | 40.00 MΩ     | 0.01 MΩ    | 1.90 MΩ to 20.00 MΩ                         |                |
|                                                                                        | 200 MΩ           | 400.0 MΩ     | 0.1 MΩ     | 19.0 MΩ to 200.0 MΩ                         |                |
|                                                                                        | 2000 MΩ          | 9990 MΩ      | 1 MΩ*      | 190 MΩ to 2000 MΩ<br>2010 MΩ to 9990 MΩ     |                |
| 500 V ≤ V ≤ 1000V                                                                      | 2 MΩ             | 4.000 MΩ     | 0.001 MΩ   | 0.002 MΩ to 2.000 MΩ                        | ±2%rdg. ±5dgt. |
|                                                                                        | 20 MΩ            | 40.00 MΩ     | 0.01 MΩ    | 1.90 MΩ to 20.00 MΩ                         |                |
|                                                                                        | 200 MΩ           | 400.0 MΩ     | 0.1 MΩ     | 19.0 MΩ to 200.0 MΩ                         |                |
|                                                                                        | 4000 MΩ          | 9990 MΩ      | 1 MΩ*      | 190 MΩ to 4000 MΩ<br>4010 MΩ to 9990 MΩ     |                |

\*When displaying 1000 MΩ and above, resolution of 10 MΩ with rightmost digit set to 0



## Model : INSULATION TESTER ST5520

Model No. (Order Code) (Note)

ST5520 (with external I/O output)

ST5520-01 (with BCD output)

Note: The ST5520 and ST5520-01 cannot be operated alone. Please select and purchase the optional test leads to accommodate your application.

| Input/Output cords                                                                                                                               |                                                                |                                                              |                                                                                                    |                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| <p><b>TEST LEAD L2200</b><br/>70 cm (2.30ft) length, detachable large alligator clips or needle tips are bundled, CAT IV 600V, CAT III 1000V</p> | <p><b>CONNECTION CORD L9257</b><br/>1.2 m (3.94 ft) length</p> | <p><b>SWITCHED PROBE 9299</b><br/>80 cm (2.62 ft) length</p> | <p><b>OUTPUT CORD L9094</b><br/>3.5 mm (0.14in) dia. mini plug to banana, 1.5m (4.92ft) length</p> | <p><b>CONVERSION ADAPTER 9199</b><br/>Receiving side banana (female), output BNC (male)</p> |

\*Please contact your HIOKI distributor for extending the L2200 cable length

| PC communication                                                                           |
|--------------------------------------------------------------------------------------------|
| <p><b>RS-232C CABLE 9637</b><br/>For the PC, 9pin - 9pin, cross, 1.8m (5.91 ft) length</p> |