IWATSU

Test and Measuring Instruments Catalog

Vol. 5

Semiconductor Curve Tracer

Digital Oscilloscope

Isolation Measurement System

Isolation Probe

Probe

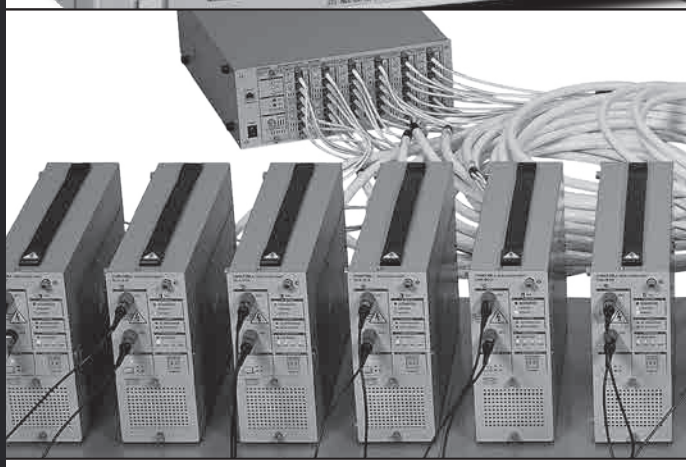
Digital Multimeter

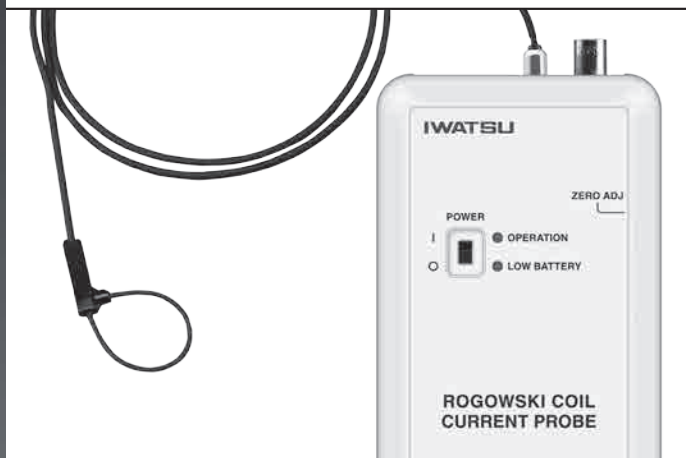
Universal Counter

Function Generator

Delay Pattern Generator

B-H Analyzer





Targeting tomorrow's electronics

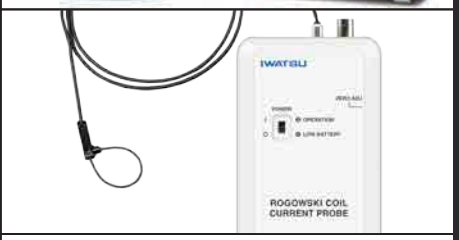
At IWATSU, our focus is always on the future. With the relentless pace of development in the electronics industry, success demands innovation, creativity, and an unwavering commitment to research and development. Building on our solid base of accumulated basic research, we are expanding our cutting-edge R&D with high technology both domestically and overseas.

In addition to power electronics and it's managements such as inverters for train, PV(photovolatics), etc. we manufacture a wide range of electronic equipment and systems to cover various types of demands from industries and research for energy-efficient power managements.

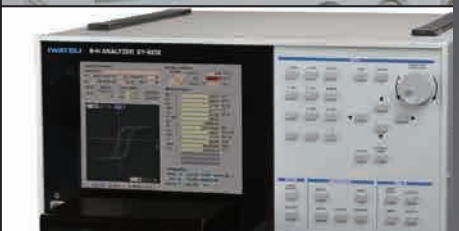
1930's	1938	Iwatsu Electric Co., Ltd. founded in Shibuya, Tokyo.
1950's	1952	Grant-in-aid for industrial technology research was offered to our design of shock-wave measurement device.
		Two years later, Japan's first domestic oscilloscope was put on the market (trademark registered as SYNCHROSCOPE).
	1957	Listed on the first section of the Tokyo Stock Exchange.
1960's	1961	Development and manufacture of proprietary CRT for waveform observation started.
	1962	Development and manufacture of proprietary IC started.
1970's	1970	The first domestic IC oscilloscope released, providing a compact and light oscilloscope.
	1974	Colona-Denshi Co., Ltd., (present name: Iwatsu Test Instruments Corporation, Aizu factory) was established in Wakamatsu, Aizu, Fukushima as a production base for electric measurement equipment.
1980's	1980	World's fastest analog storage oscilloscope released.
1990's	1991	An overseas affiliate Iwatsu (Malaysia) Sdn. Bhd. (presently a consolidated subsidiary of Iwatsu Electric Co., Ltd.) was established.
	1999	Digital oscilloscopes were joint-developed with LeCroy Corporation.
2000's	2000	Iwatsu TME Service Co., Ltd., (present name: Iwatsu Test Instruments Corporation), a service company specializing in measurement equipment, was established.
	2002	Iwatsu Test Instruments Corporation was established from the measurement division of Iwatsu Electric Co., Ltd.
		The world's only 1GHz bandwidth analog storage oscilloscope, TS-81000 was released, featuring high speed high brightness writing.
	2004	50th anniversary of oscilloscope sales.
		Digital oscilloscopes to support Microsoft® Windows® OS were released.
		Digital multi-meter with two-channel input, VOAC7520 was released.
	2005	Full-scale entry into the field of measurement for the automobile industry.
	2006	Four models of digital oscilloscope DS-5100 series were released, providing high performance with low cost.
		Full-scale entry into the field of measurement for high performance electromagnetic steel sheets with the world's first V-H analyzer IE-1131B.
	2007	An isolation system for power electronics, DM-8000 was released, providing highly accurate measurement of ultra-high voltages.
	2009	Full-scale entry into the field of measurement for power semiconductors, with three models of CS-3000 series, a semiconductor curve tracer supporting high current at 1,000A.
		Capacitance displacement meter with high resolution and high stability, the ST-3541 series were released.
2010's	2010	Eight models of digital oscilloscope DS-5300 series were released.
	2011	Two models of CS-10000 series, a semiconductor curve tracer supporting ultra-high voltage high current, and three models of CS-5000 series were released, providing support to all needs in the field of measurement for power semiconductors.
		Genuinely domestic highly accurate measurement equipment, radiation dosimeter SV-1000/SV-2000 were released.
		B-H analyzer SY-8218 was released and eight models of digital oscilloscope DS-5500 series were released.
	2012	Rogowski-coil current probe SS-280 series and High voltage differential probe SS-320 were launched.
		Universal Counter SC-7217/7215 were released.
	2013	New Function Generator SG-4322/4321 were launched.
	2014	Eight models of digital oscilloscope DS-5600 series, new functions providing additional power, were released.
	2015	DS-5600A series with new functions, Isolation Probe system SE-6000 series were released.











IWATSU
Test and Measuring Instruments

Multipurpose Unit Measures Leakage Current and High Current. Auto Measurement Supported!

The best solution to properly measure semiconductors such as IGBTs, MOSFETs, TRANSISTORs and DIODEs from small to large quantities.

Semiconductor Curve Tracer

CS-10000 Series 10kV to 15kV, ~8,000A
CS-5000 Series 5kV, ~1,500A
CS-3000 Series 3kV, ~1,000A

Order Information

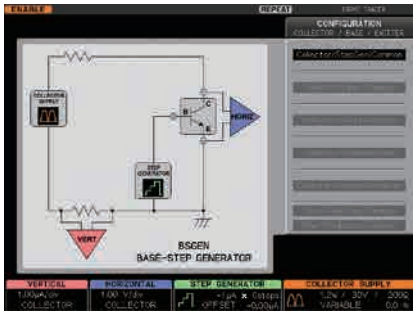
	Model Name	Model Number	Remarks
Main unit	Semi-conductor Curve tracer	CS-3100	3kV
		CS-3200	3kV, 400A
		CS-3300	3kV, 1,000A
		CS-5100	5kV
		CS-5200	5kV, 400A
		CS-5300	5kV, 1,000A
		CS-5400	5kV, 1,500A
		CS-10400	10kV, 4,000A
		CS-10800	10kV, 8,000A
		CS-12800	12kV, 8,000A
		CS-15800	15kV, 8,000A
Fixture	Fixture S	CS-301	Comes with CS-3100
	Fixture M	CS-302	Comes with CS-3200/3300
		CS-303	Comes with CS-5100/5200/5300
		CS-304	Comes with CS-5400
	Large Fixture	CS-305	
		CS-307	
Prober Cable	Prober cable	CS-306	for CS-3000 / CS-5000 except CS-5400
	Prober cable for CS-5400	CS-308	for CS-5400
Alligator Clip	Small alligator clip Red 10pcs	CS-001	
	Small alligator clip Black 10pcs	CS-002	
Cable	High voltage wire Red 5pcs	CS-003	Banana clip, 5kV, 30cm
	Wire Black 5pcs	CS-004	Banana clip, 30cm
	Standard Lead Set	CS-005	Comes with Main unit except CS-3100, Banana cable 30cm (Red 2pcs for HV, Black 2pcs, Green 2pcs, and Yellow 1pc. Alligator Clip (Red 2pcs, Green 2pcs, Black 2pcs, and Yellow 1pc)
	Cable for High Current	CS-006	20cm,2pcs come with CS-5400
	Cable for High Current	CS-007	30cm,2pcs come with CS-10400/10800
Software	Semi-conductor parameter search	CS-800	Built in Main unit
	Double sweep	CS-801	Built in Main unit
	Semi-conductor parameter measurement	CS-810	Install in PC
Test Adapter	Test adaptor	CS-500	Comes with Main unit
	TO type test adaptor	CS-501A	
	AXIAL type adaptor	CS-502	
	TO-263-3(D2PAK) type adaptor	CS-503	
	TO-252-3 type adaptor	CS-504	
	TO-263-7 type adaptor	CS-505	
	TO-252-5 type adaptor	CS-506	
	SC-70-3(SOT-323-3) type adaptor	CS-507	
	SMD type adaptor	CS-508	
	SC-59A/SOT-23-3 type adaptor	CS-509	
	SC-62/SOT-89 type adaptor	CS-510	
Scanner unit	Switch control unit	CS-701	Integrated controller for Relay unit (Up to 8 units)
	LV Relay unit	CS-702	300V/30A 10CH
	HV Relay unit	CS-703	5kV/3A 10CH
	HC Relay unit	CS-704	2kV/1,500A 10CH
	HV-HC Switch unit	CS-705	5kV/1,000A, Extension unit with HV/HC switch function
	Extension unit	CS-706	5kV/15A
	Gate/Short unit	CS-707	Curve tracer side:300V/8A Device side:5kV/8A 10CH
	HV-HC Relay unit 2CH	CS-708	5kV/1,500A 2CH
	HV-HC Relay unit 4CH	CS-709	5kV/1,500A 4CH
	HV-HC Switch unit (for CS-5400)	CS-710	5kV/1,500A, Extension unit with HV/HC switch function
	Fixture with hotplate function	CTJ1050	Heater surface 5kV insulating, Max. Temperature:200℃, Interlock function
	Hotplate	PA3020	Dimension of Plate portion:200 x 200mm
		PA3040	Dimension of Plate portion:200 x 400mm

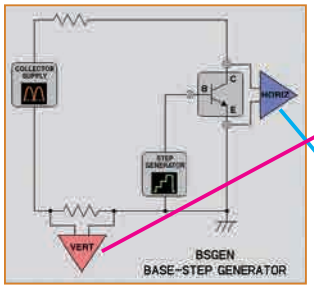
Advanced functions for your ease of use

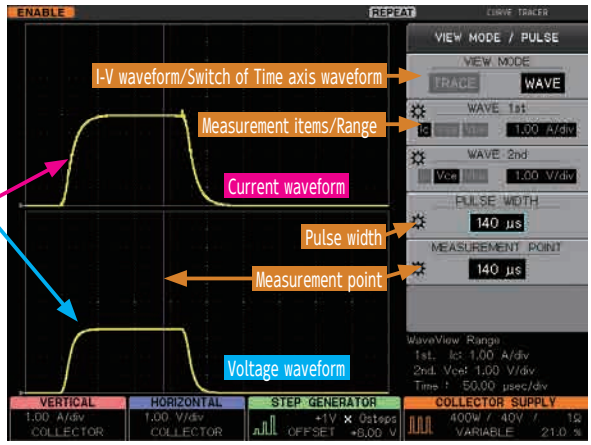
The configuration is displayed in the setup display area under CONFIGURATION key sets.
Appropriate configuration can be selected for each device test.

Confirm applied voltage and current with waveforms in Wave mode.

- The pulse width and the measurement point can be specified even when you are confirming the applied waveform (current and voltage) to the device based on the time axis as with oscilloscopes.
- By confirming the waveform, appropriate pulse width and measurement timing can be decided.
- Since our products give no waveform influences such as probing of oscilloscopes, etc., abnormal signals are confirmable.
- This function also helps to confirm the anomalies caused by heat such as a oscillation, etc.

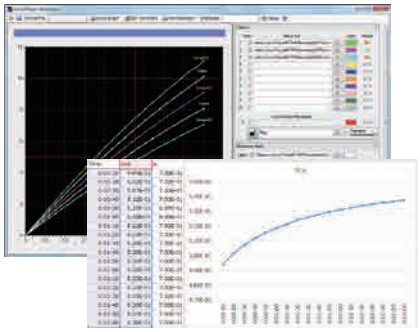


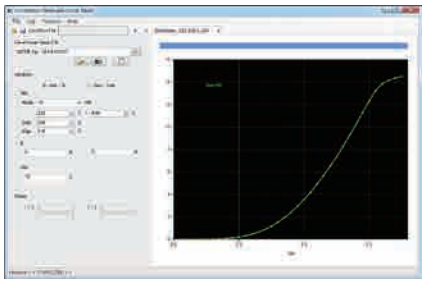




Full detailed automation with PC

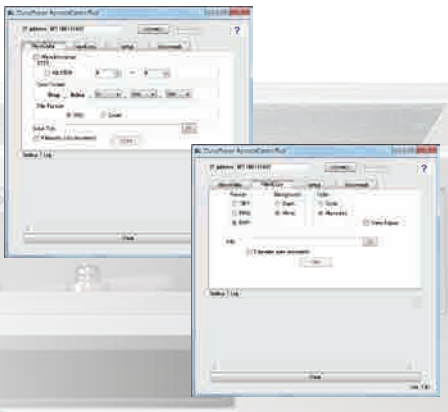
Semiconductor parameter measurement with CS-810 (optional)
This software application performs various kinds of auto measurements through remote control of the main unit. This software can execute stress test; which is difficult using traditional curve tracers, and can measure temperature characteristics of many devices, while controlling at the same time a hotplate and a thermostatic chamber.

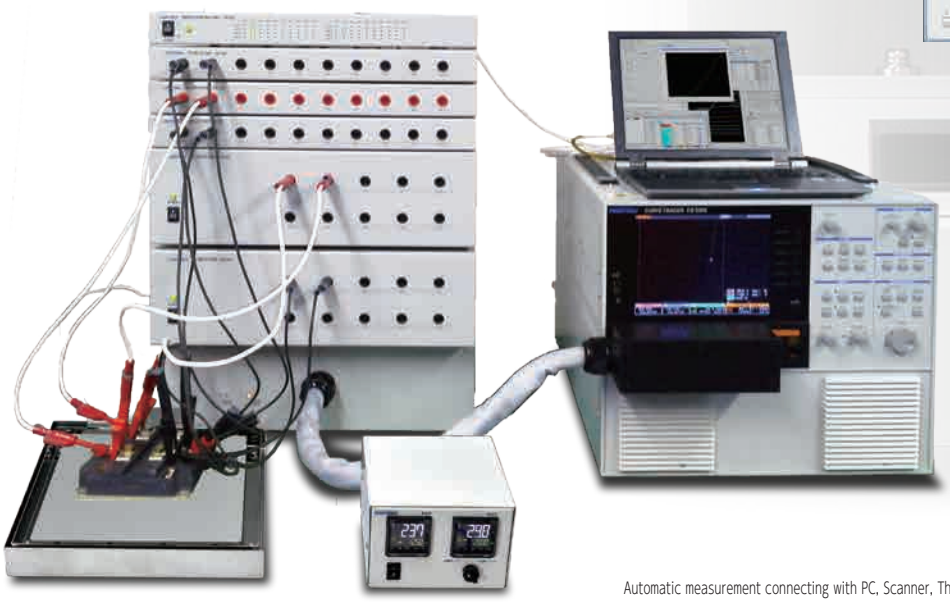




USB memory:
Graphic Images, Data, and Setup conditions can be saved. Graphic Images can be saved in various formats: TIFF,BMP,PNG. Black/White selection for color of background, color/monochrome selection are available. Waveform data can be saved in Text and in Binary at the same time.

Remote Control tool (free download)
Where security policy restricts use of USB, the remote control tool for PC can be used.





Ethernet:
Ethernet socket provided as a standard function (on the back side of Main unit)

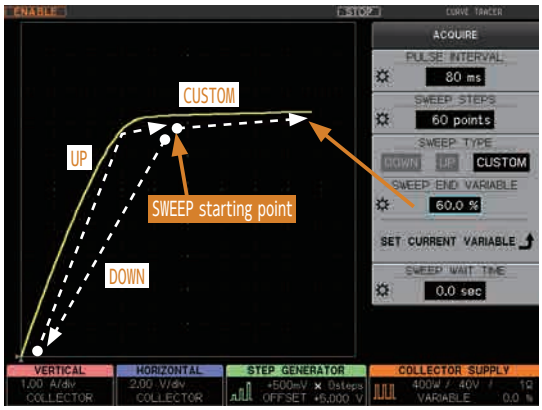
Automatic measurement connecting with PC, Scanner, Thermostatic chamber, etc. are available.

Sweep

Number of points, sweeping speed, the resolution, and the direction of sweeping can be configured as needed. The custom sweep mode performs sweeping only on the specified range, high speed resolution measurement is performed at auto-measurement.

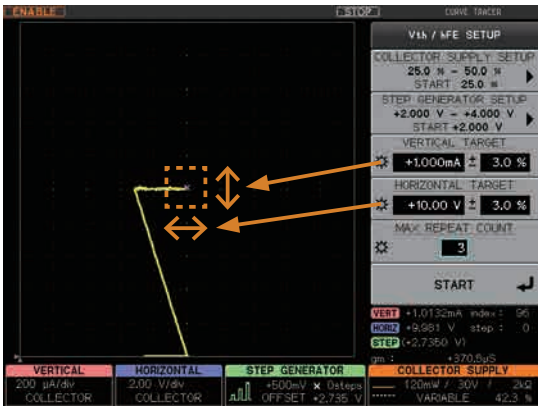
Limit-SWEEP function (requires optional CS-800)

This function puts limits on current and voltage produced through usual sweep measurement for device protection and stopping the sweep at the targeted value.



Vth-hFE auto search function (requires optional CS-800)

This function automatically finds the Vth-hFE. No complicated operations are needed.



Separate knobs for easy operations

CONSTANT function with CS-800 & CS-810 (optional)

Bias constant voltage or constant current.
With combination of semiconductor parameter measurement software CS-810, the curve tracer supports Auto stress test.

Semiconductor Curve Tracer 5kV

CS-5000 Series

Best suited for measuring the breakdown of a power device having 3,300V withstanding voltage

- Max. Peak Voltage: 5,000V (High-Voltage mode)
- Max. Peak Current: 1,500A (CS-5400 High-Current mode)
- All models support the LEAKAGE mode (Cursor resolution:1pA)

5kV
CS-5400
1,500A (HC mode pulse)
CE

5kV
CS-5300
1,000A (HC mode pulse)
CS-5200
400A (HC mode pulse)
CE

5kV
CS-5100
(HC mode not equipped)
CE

Collector supply HV mode

Model	CS-5000 series
Mode/Polarity	Full-wave rectification/+ −, DC/+ −, LEAKAGE/+ −, AC
Max. Peak Voltage/Current	Max. Peak Voltage: 5kV (2.5kV at AC) — Max. Peak Current (Max. Peak Pulse Current): 25mA (25mA) Max. Peak Voltage: 300V — Max. Peak Current (Max. Peak Pulse Current): 750mA (1.5A) Max. Peak Voltage: 30V — Max. Peak Current (Max. Peak Pulse Current): 7.5A (15A)
Max. Peak Power	At 5kV : 320mW/3.2W/32W At 30V,300V : 120mW/1.2W/120W/390W
Horizontal axis range	50mV to 500V/div

Collector supply HC mode (CS-5100 does not equip with HC mode)

Model		CS-5100	CS-5200	CS-5300	CS-5400
HC mode	Mode/Polarity		Pulse / + −		
	Max. Peak Current Max. Peak Power Max. Peak Voltage	No HC Mode equipped	Max. Peak Current/Power: 400A / 4kW, Max. Peak Voltage: 40V Max. Peak Current/Power: 40A / 400W, Max. Peak Voltage: 40V	Max. Peak Current/Power: 1,000A / 10kW, Max. Peak Voltage: 40V Max. Peak Current/Power: 400A / 4kW, Max. Peak Voltage: 40V Max. Peak Current/Power: 40A / 400W, Max. Peak Voltage: 40V	Max. Peak Current/Power: 1,500A / 12kW, Max. Peak Voltage: 30V Max. Peak Current/Power: 600A / 4.5kW, Max. Peak Voltage: 30V Max. Peak Current/Power: 60A / 450W, Max. Peak Voltage: 30V
	Pulse width		Pulse width : variable between 50 μs and 400 μs (Resolution :10 μs)		
	Measurement point		Measurement point can be specified. (Resolution :10 μs)		
	Vertical range		100mA to 50A/div	100mA to 100A/div	100mA to 200A/div
Fixture		CS-303			CS-304

Semiconductor Curve Tracer 3kV

CS-3000 Series

Standard models suitable for parameter measurement of various semi-conductors including IGBTs, MOSFETs, transistors and diodes, etc.

- Max. Peak Voltage 3,000V (High-Voltage mode)
- Max. Peak Current 1,000A (CS-3300 High-Current mode)
- All models support the LEAKAGE mode (Cursor resolution:1pA)

3kV **CS-3300** 1,000A (HC mode pulse) CE

3kV **CS-3200** 400A (HC mode pulse) CE

3kV **CS-3100** (HC mode not equipped) CE

CS-3300 with CS-302

CS-3100 with CS-301

CS-3100 with CS-302

Collector supply HV mode

Model	All CS-3000 Series
Mode/Polarity	Full-wave rectification/+−, DC/+−, LEAKAGE/+−, AC
Max. Peak Voltage/Current	Max. Peak Voltage: 3kV (2.5kV at AC) — Max. Peak Current (Max. Peak Pulse Current): 75mA (150mA) Max. Peak Voltage: 300V — Max. Peak Current (Max. Peak Pulse Current): 750mA (1.5A) Max. Peak Voltage: 30V — Max. Peak Current (Max. Peak Pulse Current): 7.5A (15A)
Max. Peak Power	120mW / 1.2W / 120W / 390W* (*Setup is not available when Max. Peak Voltage 3kV is used.)
Horizontal axis range	50mV to 500V/div

Collector supply HC mode (CS-3100 does not equip with HC mode)

Model		CS-3100	CS-3200	CS-3300
HC mode	Mode/Polarity		Pulse / +−	
	Max. Peak Current Max. Peak Power Max. Peak Voltage	No HC Mode equipped	Max. Peak Current/Power: 400A / 4kW — Max. Peak Voltage: 40V Max. Peak Current/Power: 40A / 400W — Max. Peak Voltage: 40V	Max. Peak Current/Power: 1,000A / 10kW — Max. Peak Voltage: 40V Max. Peak Current/Power: 400A / 4kW — Max. Peak Voltage: 40V Max. Peak Current/Power: 40A / 400W — Max. Peak Voltage: 40V
	Pulse width		Pulse width: Changeable between 50 μs to 400 μs (Resolution: 10 μs)	
	Measurement point		Measurement point can be specified. (Resolution: 10 μs)	
	Vertical range		100mA to 50A/div	100mA to 100A/div
Fixture		CS-301	CS-302	

Analog Curve Tracer 10kV～

Best suited for the measurement of high voltage diodes and thyristors

Output	Voltage waveform	Commercial Power supply half-wave rectification waveform
	Max.Voltage	10kV Peak (when no loading)
	Max. Current	100mA Peak or 400mA
Display	Voltage range	50V/div to 1,000V/div (1-2-5 steps)
	Current range	0.1mA/div to 10mA/div or 50mA/div

Customers' special specifications are welcome. Please contact us.

Semiconductor Curve Tracer **10kV, 12kV and 15kV**

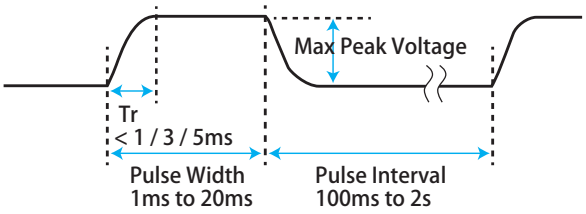
CS-10000 Series

Best suited for the chips with very high voltage and very high current, CS-3100 + UHV + HC

CS-15800 15kV / 8,000A
CS-12800 12kV / 8,000A
CS-10800 10kV / 8,000A
CS-10400 10kV / 4,000A

This series is sold-on-demand.
Please confirm the specification and
the delivery date at the time of estimation.
Requests for customization are welcome.

Optional Pulse Unit
This optional unit minimizes parameter variation caused by heat. Pulse rise time can be configured for 1, 3, or 5ms; pulse duration from 1ms to 20ms; and pulse interval from 100ms to 2 seconds. This option is installed at the factory. Any changes desired after purchase will require return to IWATSU factory.



Collector supply HV mode

Model	CS-10000 series
Mode/Polarity	Full-wave rectification/+ −, DC/+ −, LEAKAGE/+ −, AC
Max. Peak Voltage/Current	Max. Peak Voltage: 3kV (2.5kV at AC) — Max. Peak Current (Max. Peak Pulse Current): 75mA (150mA) Max. Peak Voltage: 300V — Max. Peak Current (Max. Peak Pulse Current): 750mA (1.5A) Max. Peak Voltage: 30V — Max. Peak Current (Max. Peak Pulse Current): 7.5A (15A)
Max. Peak Power	120mW / 1.2W / 120W / 390W* (*Setup is not available when Max. Peak Voltage 3kV is used.)

Collector Supply UHV mode

Model	CS-10400/CS-10800		CS-12800		CS-15800	
Mode/Polarity	DC / +					
Max. Peak Voltage/Current	Max. Peak Voltage	Max. Peak Current	Max. Peak Voltage	Max. Peak Current	Max. Peak Voltage	Max. Peak Current
	10kV	400mA	12kV	266mA	15kV	266mA
Max. Peak Power	40W / 400W / 4kW		32W / 320W / 3.2kW		40W /400W / 4kW	

Collector Supply HC mode

Model	CS-10400	CS-10800/12800/15800
Mode/Polarity	Pulse / + −	
Max. Peak Current Max. Peak Power Max. Peak Voltage	Max. Peak Current / Power: 4,000A / 60kW — Max. Peak Voltage: 60V Max. Peak Current / Power: 400A / 6kW — Max. Peak Voltage: 60V Max. Peak Current / Power: 40A / 600W — Max. Peak Voltage: 60V	Max. Peak Current / Power: 8,000A / 80kW — Max. Peak Voltage: 40V Max. Peak Current / Power: 4,000A / 60kW — Max. Peak Voltage: 60V Max. Peak Current / Power: 400A / 6kW — Max. Peak Voltage: 60V Max. Peak Current / Power: 40A / 600W — Max. Peak Voltage: 60V
Pulse width	50 μs~900 μs , 50 μs~120 μs (at 8,000A) (Resolution:10 μs)	
Measurement point	Measurement point can be specified. (Resolution :10 μs)	
Horizontal axis range	100mA to 1,000A/div	

Test adaptors

Test adaptors for discrete packages

Test adaptor
CS-500 *(Standard)*
Test adaptor to connect your device to Fixture.

Heat resistant TO Socket
200℃、350A (500 μ s)

Adaptor for TSSOP 14
※Not available for CS-301 fixture

Adaptor for SMD type
CS-508
※Not available for CS-301 fixture

CS-501A
TO-220/247

CS-502
AXIAL

CS-503
TO-263-3/
D2PAK

CS-504
TO-252-3

CS-505
TO-263-7

Example:
Adaptor attached to Patch-panel

CS-506
TO-252-5

CS-507
SC-70-3/
SOT-323-3

CS-509
SC-59A/
SOT-23-3

CS-510
SC-62/
SOT-89

Connector portion on
the bottom of Socket

Contact us if other types of sockets are needed.

Standard accessories

Use test adaptors on measurements of devices. Fixtures equips the safety mechanism in which the measurement stops when the cover opens.

Fixture S

Fixture S
CS-301
comes with CS-3100

Fixture M

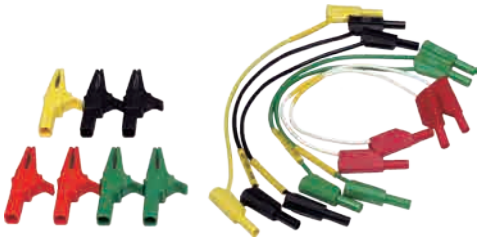
This fixture can measure a device up to 235mm x 180mm. Place the patch panel attached when TO adaptor used.

Fixture M
CS-302
comes with CS-3200/3300
CS-303
comes with CS-5100/5200/5300

Fixture M
CS-304
comes with CS-5400

(Note: Test adaptor is optional and does not come with the unit.)

Patch-panel for Fixture M
(comes with all units except for CS-3100)



Standard set of leads
CS-005
come with all units except for CS-3100
Banana cables (2 red for HV, 2 green, 2 black, 1 yellow)
Alligator clip (2 Red , 2 green, 2 black, 1 yellow)

Small alligator clip
CS-001
Red 10 pieces

Small alligator clip
CS-002
Black 10 pieces

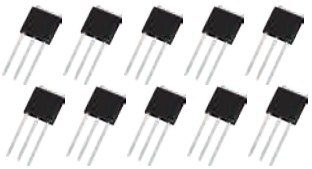
Cable for High Current (a set of two)
CS-006
comes with CS-5400
20cm

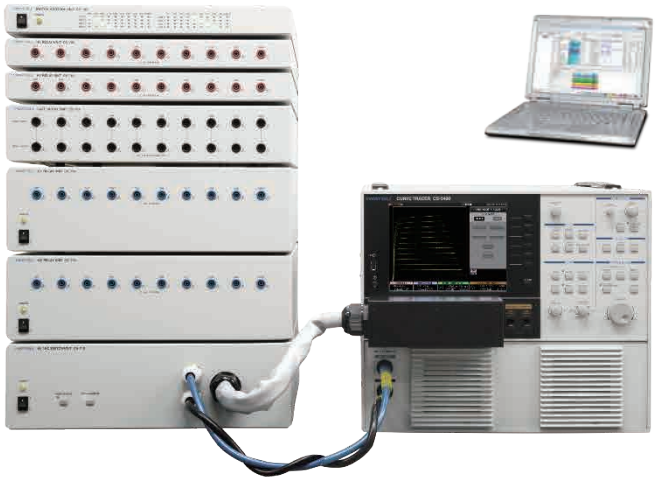
CS-007
comes with CS-10400/10800/12800/15800
30cm

Contact us for custom-made cables. We can change clips, lengths, withstand voltages, etc.

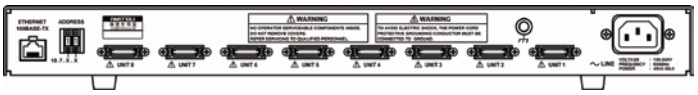
Scanner System
CS-700

The CS-810 software application provides automatic connection for multiple devices in a single package including commonly available modules containing 6 devices. It can also be used to individually connect to and test up to 10 single devices. CS -810 also controls relay units, thermostatic chambers and hot plates, so it can measure the temperature characteristics of each chip in 6 in 1 modules. (CS-800 and CS-810 required for scanner operation)





Switch Controlling Unit

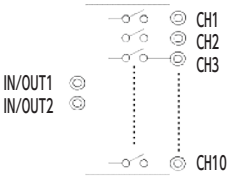


Switch Controlling Unit

CS-701

SC-701 is required so the CS810 software can control each CS-700 scanner unit up to 8 units, by connecting a PC through Ethernet. Multiple CS-701 (Max.10 units) can operate in parallel if given IP addresses.

Relay Unit



LV Relay Unit

CS-702

300V/7.5A/30A (Pulse)
10CH

HV Relay Unit

CS-703

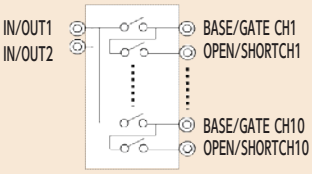
5kV/3A
10CH

HC Relay Unit

CS-704

2kV/7.5A/1,000A (Pulse)
10CH

When 6 in 1 module is measured, this unit can short-circuit G and E, or C and G on unused circuits on the device.



Gate/Short Unit

CS-707

Curve racer side: 300V/7.5A/15A (Pulse)
Device side: 5kV/7.5A/15A (Pulse)
10CH

HV-HC Relay Unit

CS-708

5kV/7.5A/1,500A (Pulse)
2CH

HV-HC Relay Unit

CS-709

5kV/7.5A/1,500A (Pulse)
4CH

Extension Unit

Extension Unit

CS-706

5kV/1,000A (Pulse)
In case CS-5400 is used, modifications are required.

HV/HC Switch Unit

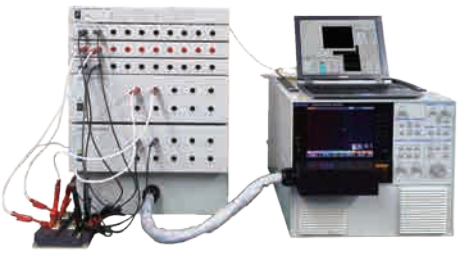
CS-705

5kV/1,000A (Pulse)
HV/HC switching (Auto/Manual) supported
・For CS-3200/3300/5200/5300

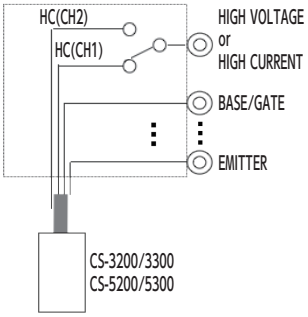
HV/HC Switch Unit

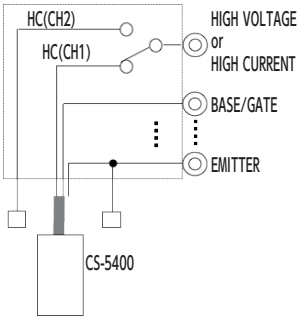
CS-710

5kV/1,500A (Pulse)
HV/HC switching (Auto/Manual) supported
・For CS-5400



Example: connecting the unit to IGBT 2 in 1 module.



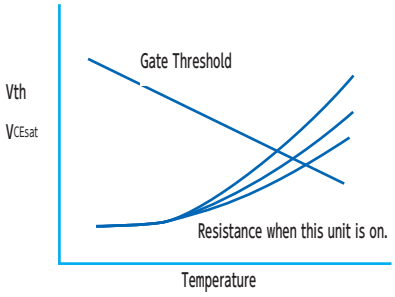


Hotplates, Fixtures, thermostatic chambers that support establishment of Automatic temperature measurement system

Temperature characteristics measurement

CS-810 automatically measures temperature characteristics, controlling the scanner system and hotplates, etc.

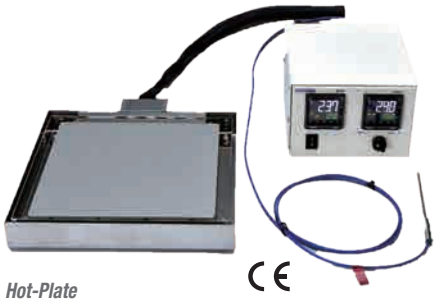
The picture on the right is a hotplate controllable combination of curve tracers, hotplates, and scanners. It provides a means to perform automatic measurement of multiple devices, 6 in 1 module, etc.



Fixture with hotplate functions

CTJ1050

Maker : CATS Inc.
Max. Temperature : 200℃
Max Voltage on devices 5kV (Insulating surface of heater 5kV)
Max. Current : 1,000A
Interlocking (when you open the cover, curve tracer stops outputting.)



Hot-Plate

PA3020/PA3040

Maker : MSA Factory Co., Ltd.
Max. Temperature : 300℃
Hot plate measurement : PA3020 : 200 x 200 (mm)
PA3040 : 200 x 400 (mm)
Monitor Temperature by External temperature sensor.
C/W controller, Temp. senser, RS485-USB converter

Thermostatic chambers are available.

Contact us for the details.

Large Fixture

CS-307 / CS307H *(for CS-5400)*

Interlock equipped
External dimensions: 500Wx520Hx520D

For CS-5400

Prober cable

CS-308

This is used to equip terminals of curve tracers inside Probers and large fixture.

For CS-3xxx/5xxx
(Except CS-5400)

Prober cable

CS-306

This is used to equip terminals of curve tracers inside Probers and large fixture.

Temperature withstand cables

Orderable : RUG, Banana plug, Crocodile clip,etc. and length

High temp. cable for HV&HC (400℃, 5kV,1500A)

High temp. cable for HV (400℃ , 5kV)

Large Fixture

CS-305

Cooling fan, LED light, Warning light, Power supply outlet and Interlock are equipped.
External dimensions: 630Wx520Hx530D

Internal terminals portion of CS-307 with Probe cable CS-306

Software Application for parameter measurement of semiconductors : CS-810

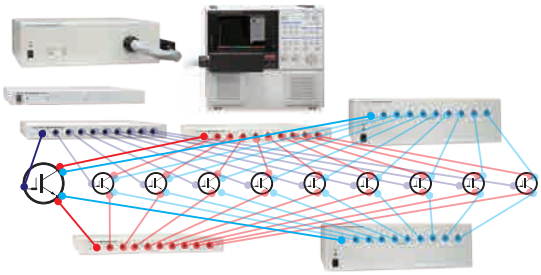
CS-810 is an optional Software application that controls curve tracers, scanners, hotplates performing measurement and thereby automates the measurement. This makes improvement great in work efficiency.

Automates :

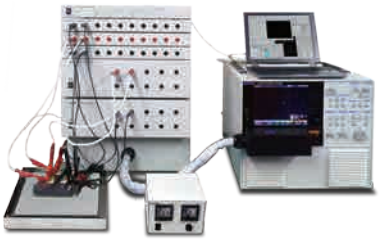
Measurement → Recording → Judgment Improvements in efficiency to replace task that was traditionally performed manually

	Ices	Vces	VF	Vth	····
Sample-1	xxxxA	xxxxV	xxxxV	xxxxV	····
Sample-2	xxxxA	xxxxV	xxxxV	xxxxV	····
Sample-3	xxxxA	xxxxV	xxxxV	xxxxV	····
⋮	⋮	⋮	⋮	⋮	⋮

Switches automatically multiple-semiconductor modules and discrete devices to be targeted when you perform measurement

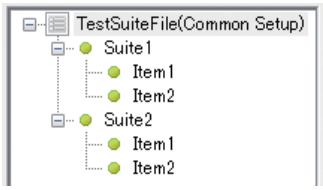


Hotplates are also remote-controllable, so Automatic measurement of 6 in 1 module can be performed too.



Easy to transfer the configuration measured to PC

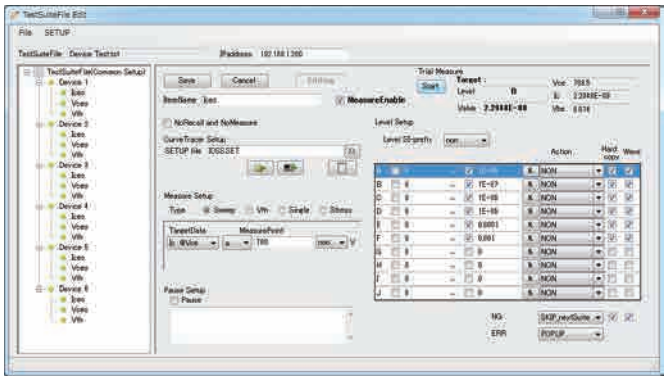
By transferring the configuration measured manually on curve tracer to PC, you can set up the sequence. Programming knowledge is not required and anyone can set up it easily.



This key copies the configurations in the curve tracer to PC.

This key copies the configurations in PC to the Curve tracer.

This window is useful when you specify the threshold for the levels.

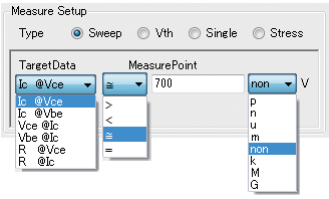


Categorization to the levels based on the measured value.
You can set 10 levels to which acquired result will be categorized.
For each levels, events to be performed, such as halting the measurement, skipping the measurement of such item
Showing an alert, Copying the waveform as an image, exporting to CSV files.

Measurement of static characteristics (Leakage current, Saturation voltage, VF, Vth, etc.)

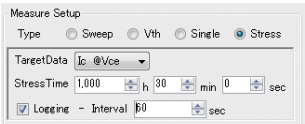
Measurement type : Sweep

- > Point with the larger data than the specified value.
- < Point with the smaller data than the specified value.
- ≅ Point with the data closer to the specified value.
- = Point with data equal to the specified value under interpolation.



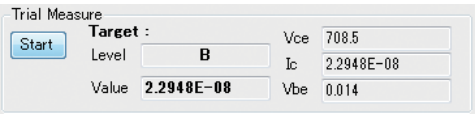
Measurement type : Stress

Logging of voltage or current is available by biasing constant voltage or constant current for a long time. This is used for Stress test and reliability test.



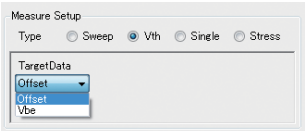
Trial Measurement :

This is a function for debugging and the sequence can be confirmed.



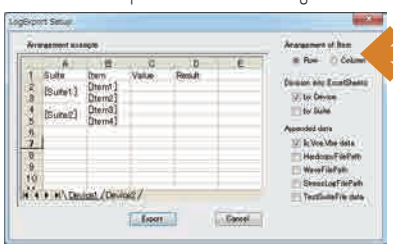
Measurement type : Vth

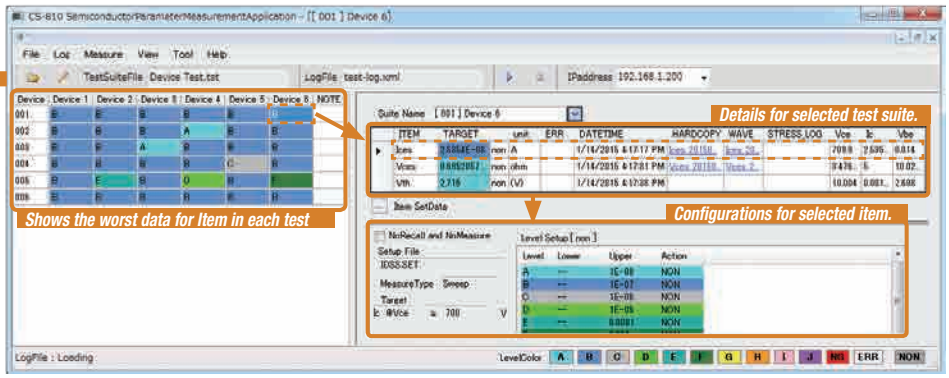
Makes measurement with the curve tracer's Vth Search function.



Output Window

A selection of export formats For the log file.

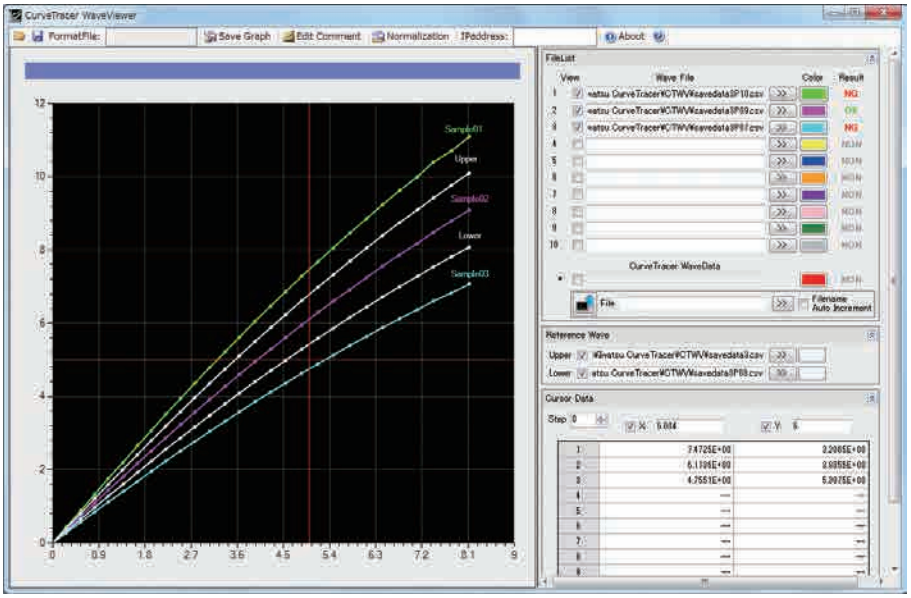




Software Application for parameter measurement of semiconductors : CS-810

Comparison among the curves

This application can compare a number of waveforms stored for the purpose of analysis of variation of characteristics and defects as well as Pass/Fail judgment.



Comparison between the waveforms and Judgment functions

This application can compare a waveform with reference waveform and judge whether the first waveform meets the specified condition.

Waveforms display

CSV files stored during past use, recall-waveforms stored in Curve tracer, and the waveforms currently monitored can be compared on the same graph up to 10 waveforms at the same time.

Rescaling

The displaying waveform can be stored in a CSV file at an arbitrary interval in voltage axis.

Cursor function

The displaying numerical numbers of waveforms are shown in a list. Besides the sampling points, this function interpolates the measured data.

Annotations

Annotations can be attached to the curves respectively.

Saving the images

Saving the images in various image format (PNG/BMP/JPG/TIFF) with a set of cursor values.

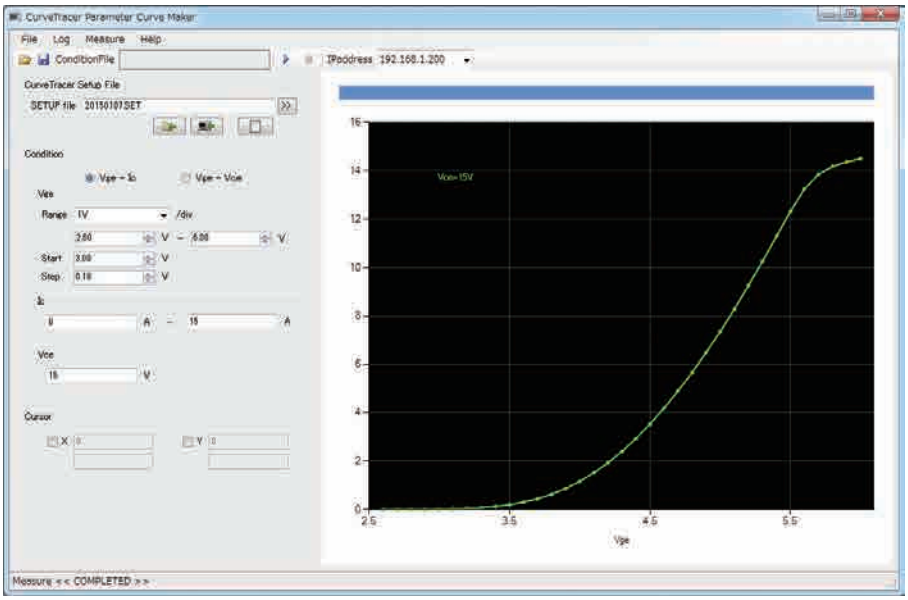
A selection of Graph styles

- Settable items

Chart title, background color, cursor color, line style (solid, dotted, broken)
For X and Y axes: Title, what data to be assigned, Scale (Log, linear) For Y axis only, intervals, min value, max value and grids.

The measuring function for the transfer characteristics (Vge-Ic/Vge-Vce)

It used to be difficult for a curve tracer to measure transfer characteristics, however IWATSU can measure it now.



Various formats to save curves for characteristics

- Save the measured characteristics to CSV files.
- Save the curve image as PNG/BMP/JPG/TIFF

Cursor function

Cursors are displayed in X axis and Y axis interpolated value is displayed.

Customizable chart area

Chart title, axis label, background-color, and the axis ranges are all customizable.

Load/Save function of Configurations

This software can load/save the configurations for characteristics measurement and the customize done to the chart area.

Software Application for parameter measurement of semiconductors : CS-810

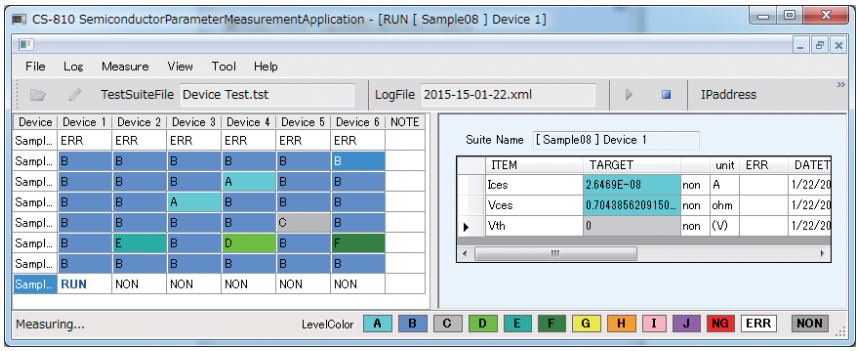
Measurement of devices

Multiple devices measurement and recordings can be performed in a short time.

This software performs tests for multiple measurement items .
Operator simply need to input sample name according to the device replacements and connection changes, following the instructions on popups, to repeat measurement under the same conditions. Judgments (Pass/Fail) based on the requirements given will be shown for each measurement, and images and waveforms data also will be stored automatically.

1 Input sample name and set it to Fixture.

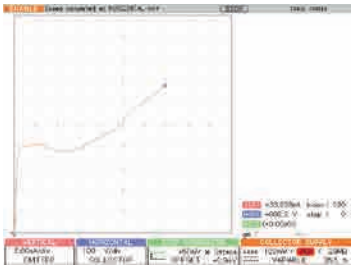
2 Displays the measured value and the judgment results during measurement.

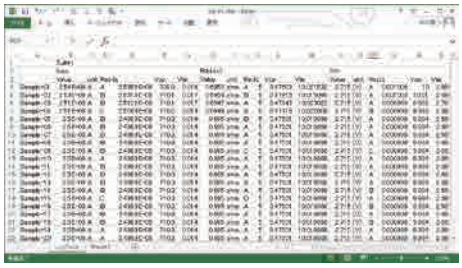


3 Popup stops the measurement or gives instructions based on the measurement results.

4 Popup stops the measurement or gives Instructions based on measured items.

5 Logs on the measurement can be exported to CSV file or Excel file afterwards. Logs on Stress test will be saved on separate files. Re-measurement of the selected item can be performed.

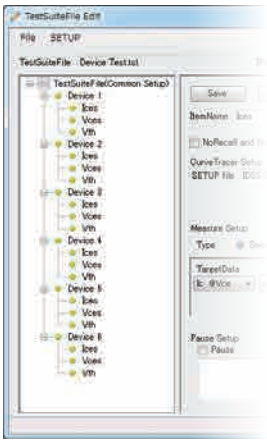




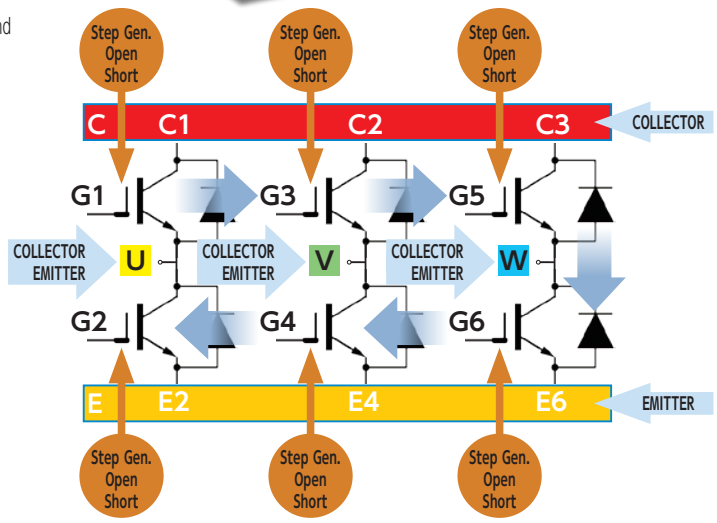
Measurement function of circuit modules

This software controls the scanner system as well as the curve tracer. The software also controls open/short and HV/VC. All the measurements for a module can be fully automatically performed without a need for unplugging.

Configuration on one-circuit can be applied to the other circuit as the application supports copy & paste.



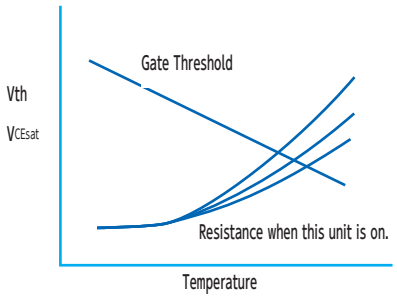
Unused Gates and Emitters can be short-circuited.

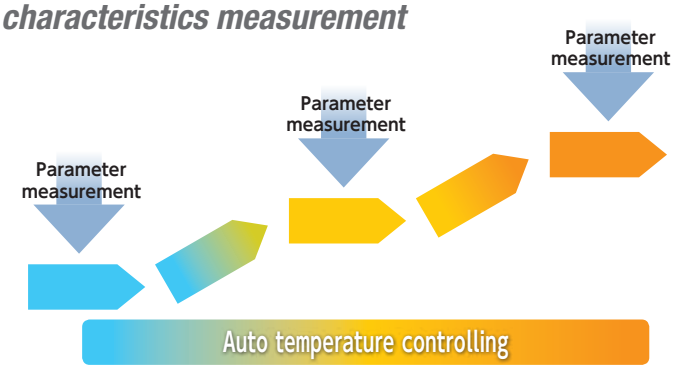


Software Application for parameter measurement of semiconductors : CS-810

Evaluation of Semiconductor Temperature characteristics measurement

CS-810 controls hotplates too. Even measurement that takes a long time such as per temperature can also be performed automatically.





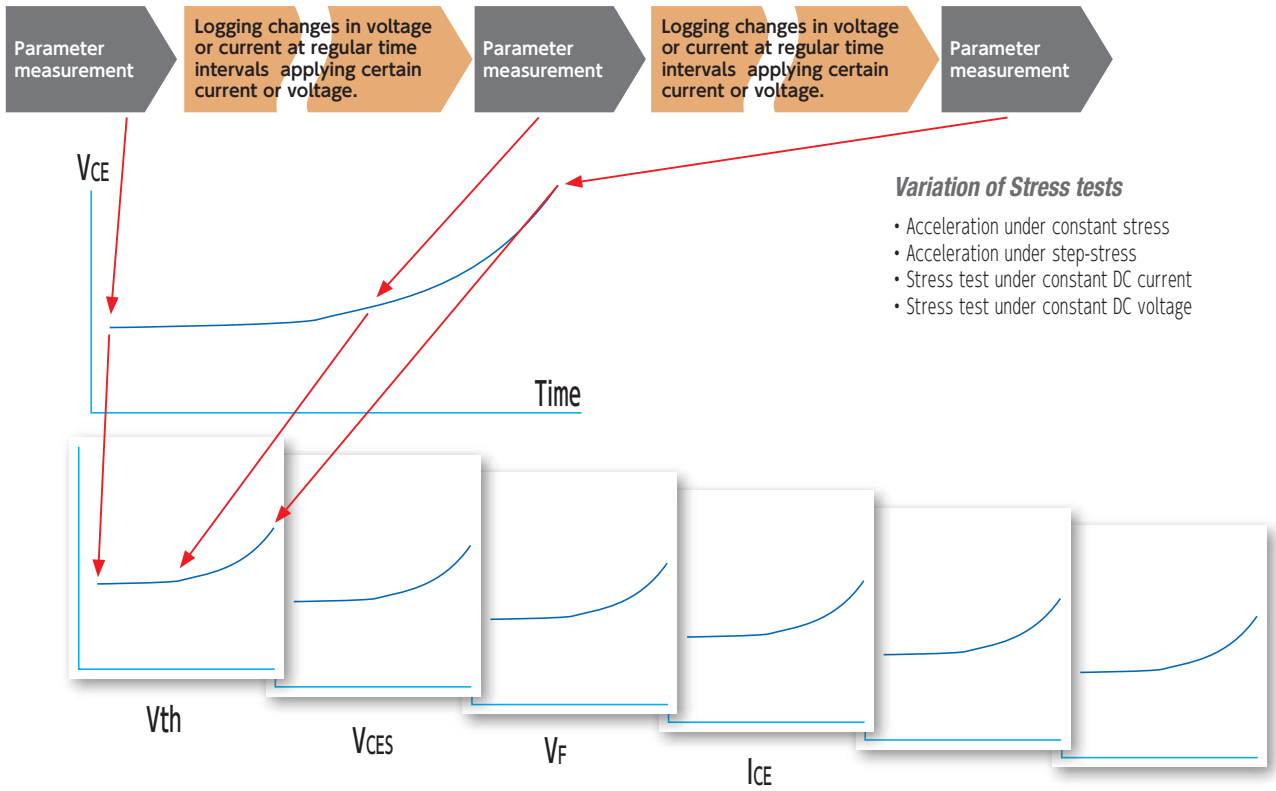
Currently, we just offer fixtures with hotplates, but we are trying our best to offer a unit simply provides hotplates or fixed-temperature chamber. For details on supported units, feel free to ask us.

Stress test

A wide variety of parameters can be incorporated in stress test.

This software supports long-time reliability tests. While the software monitors the voltage and the current via curve traces, differences of those traces are logged. Auto measurement of a wide variety of parameters is available for the stress test as illustrated below. The biasing will stop in excess of the limit value which is set for current or voltage as a lower and upper limit.

The software measures Ic or Vce (Interval: 10s to 2h) keeping a certain voltage or current (10s to 1,000h)



Variation of Stress tests

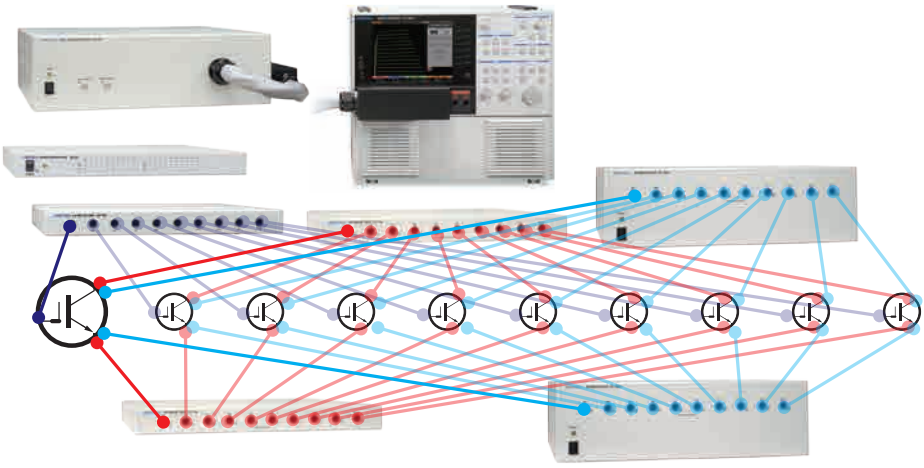
- Acceleration under constant stress
- Acceleration under step-stress
- Stress test under constant DC current
- Stress test under constant DC voltage

Software Application for parameter measurement of semiconductors : CS-810

Test of Discrete devices

Measurement of multiple devices with one touch operation after cable connection

CS-810 will let us copy the configuration for one circuits to the others up to 10CH*, making it easier to iterate the circuits and perform measurement for each Circuit.



* Up to 10 systems operate in parallel on CS-700 Series.

HEATUP system

Semiconductor Temperature Characteristics Measurement System

CS-810 controls Curve tracer and ThermoStream®.

Configuration example with ThermoStream® system

Interlock function equipped

Gate resistance selecting switch

Gate-Sense on/off switch

Temperature Test JIG

To-type adaptor

Output range for each model

HV mode Max. Peak Voltage/Max. Peak Current (Pulse current)

Mode \ Model	CS-3300 CS-3200 CS-3100	CS-5400 CS-5300 CS-5200 CS-5100	CS-10800 CS-10400	CS-12800	CS-15800
DC / +	–	–	10kV/400mA	12kV/266mA	15kV/266mA
LEAKAGE/DC full-wave rectification	3kV/75mA (150mA)	5kV/25mA (25mA)	3kV/75mA (150mA)*		
	300V/750mA (1.5A)				
	30V/7.5A (15A)				
AC	2.5kV				

*Base model: CS-3100 (5kV: CS-5100 also available)

HC mode Max. Peak Current/Max. Peak Power/Max. Peak Voltage

Mode \ Model	CS-5100 CS-3100	CS-5200 CS-3200	CS-5300 CS-3300	CS-5400	CS-10400	CS-10800 CS-12800 CS-15800
Pulse / + -	– (HC mode not equipped)	–	1,000A/10kW/40V	1,500A/12kW/30V	–	8,000A/80kW/40V
					4,000A/60kW/60V	
		400A/4kW/40V		600A/4.5kW/30V	400A/6kW/60V	
		40A/400W/40V		60A/450W/30V	40A/600W/60V	

Common Specifications

Loop Correction	Hardware		Correction of floating capacitance between collector supply and ground
	Software		Simulated loop procedure by software thinning process
Step Generator	Offset	Setup range Resolution	-10 times to +10 times of SETTING UP of STEP AMPLITUDE 1% of SETTING UP of STEP AMPLITUDE
	Current mode	Amplitude range	21 steps /50nA to 200mA, 1-2-5 switchable
		Max. Current	2A
		Max. Voltage	More than 10V
	Voltage mode	Amplitude range	6 steps/50mV to 2V, 1-2-5 switchable
		Max. Current	± 40V
		Max. Voltage	500mA ~ (~ 8V), 200mA ~ (~ 15V), 10mA ~ (~ 40V)
	Step rate		Twice of 50Hz or 60Hz (the same rate when AC mode), Pulse interval when HC mode
	Pulse step	Pulse width	50 μ s to 400 μ s (10 μ s step) When HC mode set, approx.100 μ s wider-pulse width against collector supply pulse
	Number of steps		0 to 20 steps
AUX Output	Range		OFF, − 40V to 40V (Switchable at 100mV step)
Measurement Mode			REPEAT, STOP/SINGLE, SWEEP (UP SWEEP, DOWN SWEEP, CUSTOM SWEEP, DOUBLE SWEEP at DC mode with CS-801 option)
Vertical axis (Full scale:10div)	Collector current	Range	HV Mode : 1 μ A/div to 2A/div, 20steps 1-2-5 switchable (HC mode written separately)
		Accuracy	Add 2% of Readout+0.05 × VERT/div to the loop correction error of the following max. peak voltage 0.5 μ A (30V), 1 μ A (300V), 6 μ A (3kV), 12 μ A (5kV), 30V,300V,3kV More than 10% of Max. Peak voltage, More than 30% (5kV)
	Emitter current(LEAKAGE)	Range	1nA/div to 2mA/div, 20steps 1-2-5 switchable (Collector Supply mode: LEAKAGE)
		Accuracy	2% of Readout + 0.05 × VERT/div + less than 1nA
Horizontal axis (Full scale:10div)	Collector voltage	Range	HC mode : 50mV/div to 5V/div, 7 steps 1-2-5 switchable (HV mode written separately)
		Accuracy	2% of Readout less than +0.05 × HORIZ/div
	Base/Emitter voltage	Range	50mV/div to 5V/div, 7 steps 1-2-5 switchable
		Accuracy	2% of Readout less than +0.05 × HORIZ/div
Screen	Display		8.4 inch TFT LCD
	Number of Data		1,000 points/trace (AC, Full-wave rectification) 20 to 1,000 points/trace (SWEEP mode)
	Trace display		Interpolation display between points, Dot display
	Average		OFF, 2 to 255 times
	Persistence		OFF, SHORT, LONG, unlimited length
	Internal waveform storage (REF)		4 screens
Cursor measurement	DOT		Vert, Horiz, β or gm
	fLINE		Vert, Horiz, 1/grad, intercept
	FREE		Vert, Horiz, β or gm
	WINDOW		Vert in WINDOW area, Horiz, β or gm
Data recording/Readout	Internal memory		Setup:256, REF : 4 screens
	External memory		USB1.1 : Setup, Waveform, Screen hardcopy (BMP,TIFF, PNG)
Remote			Remote on LAN 10BASE-T/100BASE-TX 1 port
Power supply	CS-3xxx,5xxx		AC100V-AC240V 50/60Hz, Max Power:500VA (operation), 7W Max (stand-by)
	CS-1xxxx		AC200V single phase 50/60Hz, Max Power:10kVA (operation)
External dimensions (mm) (excluding projection portion and accessories) Weight (excluding accessories)	CS-3100,5100		424W x 220H x 555D, approx.28kg
	CS-3200,3300,5200,5300,5400		424W x 354H x 555D, approx.43kg
	CS-10400,10800,12800,15800		1,110W x 1,216H x 1,150D, approx.370kg

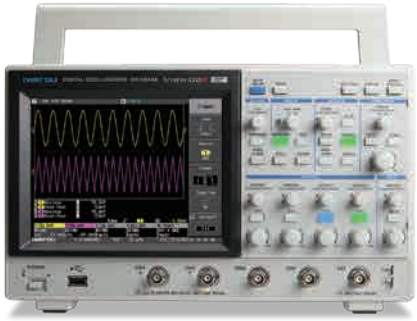
Digital Oscilloscope ViewGo II

New DS-5600A Series
DS-5400A Series

3-year warranty when registered as a web user

DS-5600A Series	
500MHz 4ch 2GS/s Max 5M points	DS-5654A
500MHz 2ch 2GS/s Max 5M points	DS-5652A
350MHz 4ch 2GS/s Max 5M points	DS-5634A
350MHz 2ch 2GS/s Max 5M points	DS-5632A
200MHz 4ch 2GS/s Max 5M points	DS-5624A
200MHz 2ch 2GS/s Max 5M points	DS-5622A
100MHz 4ch 2GS/s Max 5M points	DS-5614A
100MHz 2ch 2GS/s Max 5M points	DS-5612A
DS-5400A Series	
200MHz 4ch 2GS/s 500k points	DS-5424A
200MHz 2ch 2GS/s 500k points	DS-5422A
100MHz 4ch 2GS/s 500k points	DS-5414A
100MHz 2ch 2GS/s 500k points	DS-5412A

Commonly-used Functions Enhanced



4-channel model DS-5654A

4-channel model DS-5424A

NEW FUNCTIONS

DS-5600A New Functions

- *Supports 50Ω Inputs for all models*
  This function can employ a wide variety of probes.
- *Supports AUX OUT as a standard function*
  In addition to Trigger Signal Output, the result can be output at the Pass or Fail timing with Pass/Fail judgment function.
- *Displays performed averaging count*
  This function displays how many times the averaging was performed, during the averaging stage.
- *Displays each bit of Max.12 bits at High resolution mode*
  Measuring status can be recognized at a glance during the high resolution operation.
- *Enable/Disable Auto-setup*
  This function locks the configurations and prevents unintentional change in Panel settings even when Auto-setup button is miss-operated. This is useful for educational purpose.

DS-5400A New Functions

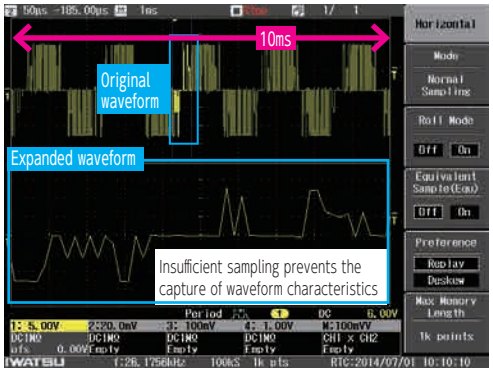
- *Supports PNG format*
  Transparency attributes can be saved when the PNG format is selected and the charts can be layered in documents.
- *Supports Max. Sampling rate 2GS/s for all models*
  Sampling rate 2GS/s is available when 2 channels are interleaved.

* We accept requests for calibration certificates, traceability network diagrams and inspection results on a chargeable basis.

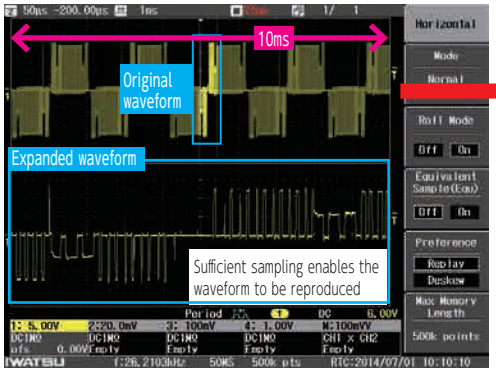
Long Memory up to a Maximum of 5M points DS-5600A Series

[2.5M points/CH when all channels being used]
(Maximum of 500k/CH with the DS-5400A Series)

Enables long-term waveforms to be captured while maintaining high-speed sampling.



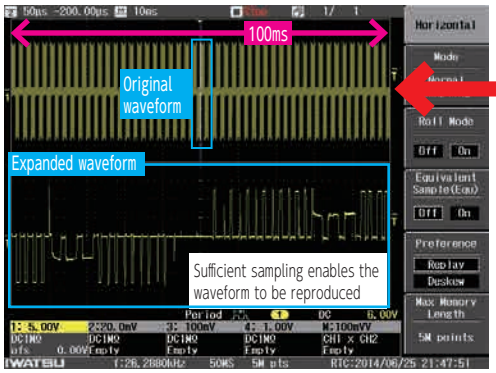
Memory Length: 1k points
Sampling Rate: 100kS/s



Memory Length: 500k points
Sampling Speed: 50MS/s

Waveform Capture Time x 10

The long memory is able to reproduce an even longer waveform capture time to ensure that the entire waveform is acquired so that it can be proportionally checked later.



Memory Length: 5M points
Sampling Speed: 50MS/s

Maximum Sampling Rate for the Waveform Capture Time (DS-5600A Series)

Waveform Capture Time	5M points when the channels are interleaved	2.5M points when all channels are in use
1s	5MS/s	2.5MS/s
100ms	50MS/s	25MS/s
10ms	500MS/s	250MS/s
2ms	2GS/s	1GS/s
1ms	2GS/s	1GS/s

Waveform Capture Time: The s/div x 10div time on the time axis range at the width of the time axis displayed on the oscilloscope.

Probe Selection Function DS-5600A Series DS-5400A Series

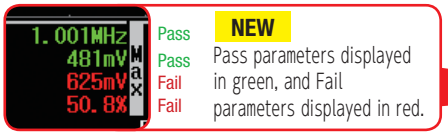
Selecting probes manufactured by Iwatsu enables attenuation ratios and coupling to be automatically set. The model number, bandwidth of the vertical range and input coupling are displayed.

Eligible Probes

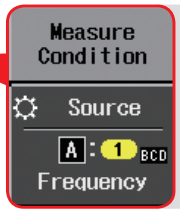
Current Probes:	SS-280A Series, SS-240A, SS-250, SS-260, SS-270
Voltage Probes:	SS-320, SFP-5A, SFP-4A, HV-P30A, HV-P60A, etc.

Four Waveform Parameter Simultaneous Judgment / Waveform Mask Judgment Functions DS-5600A Series

Pass/Fail judgment will be carried out automatically on masks and waveform parameters. Performing this on four parameters simultaneously enables strict conditions to be set.



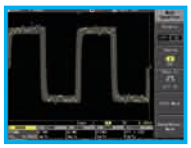
NEW
Pass parameters displayed in green, and Fail parameters displayed in red.



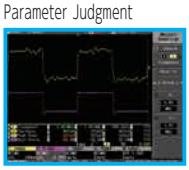
It is possible to perform judgment on a maximum of four waveform parameters set between A and D simultaneously.

Pass/Fail Judgment

Mask Judgment



Parameter Judgment



Operations during Pass/Fail Judgment

- Waveform capturing halted
- Data automatically saved

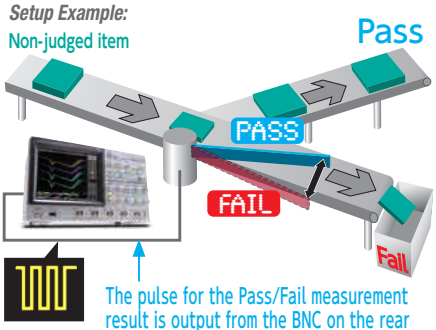
- Pulse output

When the AUX I/O option (DS-578) is used
* Only supported by the DS-5600A Series

- Screen automatically saved.

- Beep tone

Setup Example:
Non-judged item



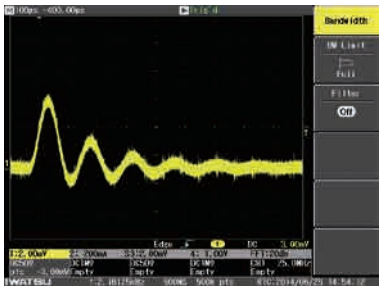
The pulse for the Pass/Fail measurement result is output from the BNC on the rear of the unit and automated.

Reinforced Noise Reduction Functions DS-5600A Series

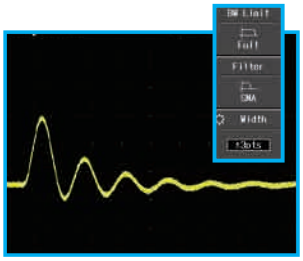
Simple Moving Average

The Simple Moving Average (SMA) enables smoothing and noise reduction at the sampling points of the specified width, through the digital filters that can be set for each channel.

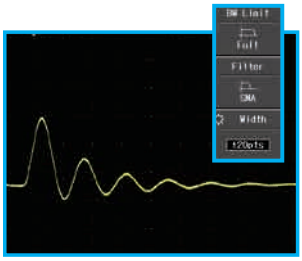
This can also be used on non-repetitive single signals.



SMA: When OFF



SMA: When ON: Width = ± 3pts

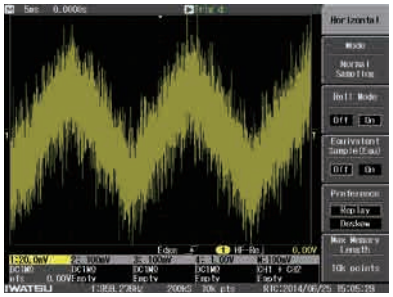


SMA : When ON: Width = ± 20pts

Averaging Count Increased

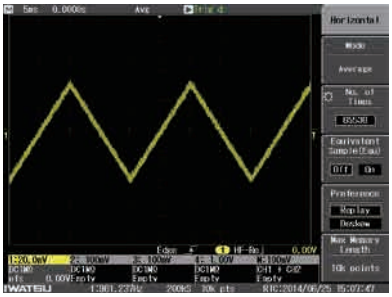
The averaging count setting has been increased from 256 times to 65,536 times. This enables non-synchronized random noise signals to be effectively reduced from measured repetitive signals.

- When the amplitude ratio for the signal (triangular wave: 50Hz) and noise (random) is 1:1
- The example of the right shows a measurement with the sampling speed set at 200kS/s and the memory length set at 10k points.



Averaging process OFF

Avg 1279

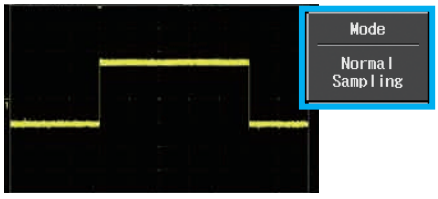


Averaging process ON (averaging count at 65,536)

High Resolution

When measurements are taken at a sampling speed lower than the maximum sampling speed, it is possible to average the data captured at the maximum sampling speed, capture the waveforms, reduce random noise, and increase vertical resolution to a level equivalent to a maximum of 12 bits.

This can also be used on non-repetitive single signals.



Normal Sampling
(Sampling speed of 5MS/s, voltage range of 2mV/div)

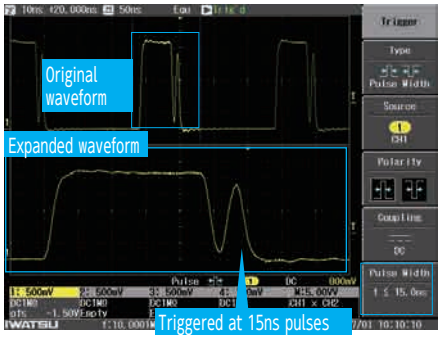
HR 12.0bit

When resolution is the equivalent of 12-bit high resolution
(Sampling speed of 5MS/s, voltage range of 2mV/div)

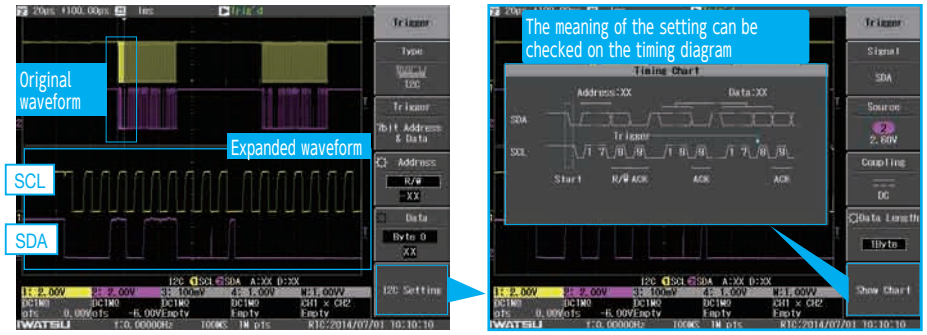
Improved Trigger Functions DS-5600A Series DS-5400A Series

The trigger function has been reinforced so that waveforms can be triggered with optimal conditions, even for complex logic signals and serial data signals.
Complex settings performed with pattern triggers can be smoothly set with the use of touch screen operations.

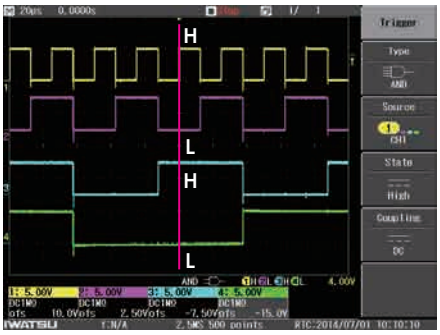
Trigger Types	DS-5600A	DS-5400A
Edge ALT, Edge OR	✓	
Cycle, Pulse width, Dropout, Edge, Pulse count, TV	✓	✓
Pattern	✓	
Serial (UART, SPI, I²C)	✓	



Pulse Width Trigger
(Example: Detecting abnormal waveforms caused by glitches, etc.)



Serial Trigger
(Example: Observing I²C signals on the serial control bus)



Pattern Trigger
(Example: Counter logic output signal)

Waveform Calculation Function DS-5600A Series DS-5400A Series

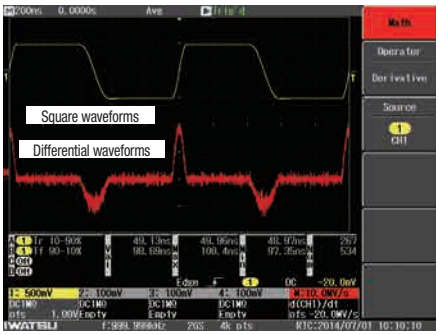
Adds, subtracts and multiplies two waveforms, and performs frequency analysis (FFT) on channel waveforms.
The DS-5600A Series supports differential and integral calculations.
The calculated waveforms can be saved as data, and can be set as the source for the automatic measurement of waveform parameters.

NEW *Supports double calculations*
(DS-5600A Series)
In addition to the results of addition, subtraction and multiplication, this function also supports the double calculation of FFT, differential calculus and integral calculus.

CH Waveforms	Single Operations	Double Operations
1 to 4CH (4CH unit) 1 to 2CH (2CH unit) 2CH among the above	Addition Subtraction Multiplication	FFT Differential calculus Integral calculus
1 to 4CH (4CH unit) 1 to 2CH (2CH unit) 1CH among the above	FFT Differential calculus Integral calculus	
DS-5600A	✓	✓
DS-5400A	✓ (Excluding differential calculus and integral calculus)	

[Examples of Usage]
- Addition/Subtraction: Evaluation of differential signals
- Multiplication: Evaluation of power waveforms from Voltage x Current
- FFT: Analysis of cyclic noise and vibrations, etc., in frequency domains

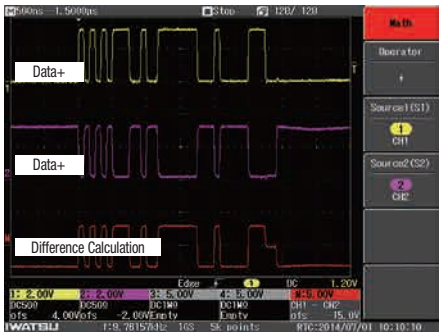
Supported by the DS-5600A Series



Differential calculation waveforms for square waveforms (rising 50ns, falling 100ns)
(Displays the size of the time fluctuations (dv/dt) for square waveform edges.)

Supported by the DS-5600A Series

Integral calculation waveforms for square waveforms (Displays the results of integral calculus by time (∫ vdt) for the area of square waveforms.)



Measuring Differential Serial Signals

Frequency spectrum analysis (FFT calculations of switching voltage waveforms).

Remote Control

Enables vast amounts of data to be collected and high-level analysis to be carried out on PCs.

■ *Scope Viewer (Supplied with Iwatsu Test Instruments Tools)*

Download the Iwatsu Test Instruments Tools (free of charge) from the Iwatsu website download page to enable the use of utility software for easily controlling ViewGo Ⅱ remotely.
Functions: Oscilloscope operations, cursor measurement, waveform data file output, screen hard copies, printing, etc.

Optional Accessories

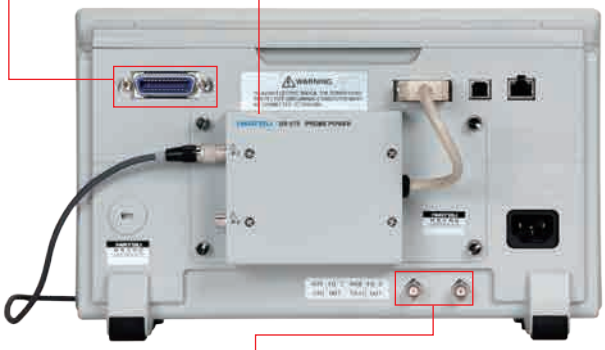
* DS-576, 577, 578 and IE-1226 are factory-delivered options, so it is necessary to specify them when place your order.

GPIB Interface
DS-576

AUX I/O Option (2-way probe power source option)
DS-579

Can be used as a power source for probes
Supported Models: SS-240A/SS-250/SS-260/SS-270/ SS-320/SFP-5A/SFP-4A

Rear of DS-5654A



AUX I/O Option (CH1/CH2 Output)
DS-577

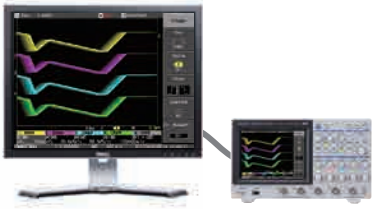
AUX I/O Option (CH1/TRIG Output)
DS-578

* DS-5600A Series only
* The DS-577 and DS-578 cannot be mounted together.

VGA Video OUT
IE-1226 Made to order

VGA output on external displays for ViewGo Ⅱ is possible. In the inspection lines of factories, the efficiency will be improved and in schools, the image onto a large projector screen can be shown.

* The DS-579 cannot be used after the IE-1226 has been mounted.



Photograph of the Rear

Recommended for ViewGo II
Carrying Bag

Models Supported
- DS-5600ASeries
- DS-5600Series
- DS-5500ASeries
- DS-5500Series
- DS-5400ASeries
- DS-5400Series

Probe Accessories

*The specifications here show the individual characteristics of each probe.(Contact our sales or distributor for details.)

Standard Probe
SS-0130R

Frequency BW: DC to 200MHz
Input RC: 10M Ω //12.5pF
Attenuation Ratio: 10:1
Length: 1.5m

SS-101R

Frequency BW: DC to 500MHz
Input RC: 10M Ω //12pF
Attenuation Ratio: 10:1
Length: 1.2m

High-Voltage Probe
SS-0170R

Frequency BW: DC to 400MHz
Maximum Input Voltage: 6kV (DC+ACpk, CAT Ⅰ)
Input RC: 66.7M Ω± 1%//4pF or less
Attenuation Ratio: 100:1,
Cable Length: 2m

SS-0171R

Frequency BW: DC to 400MHz
Maximum Input Voltage: 4kV(DC+ACpk, CAT Ⅰ)
Input RC: 66.7M Ω± 1%//4pF or less
Attenuation Ratio: 100:1,
Cable Length: 2m

High-Voltage Probe
PHV/PHVS Series

Type	BW	Length	Attenuation Ratio	Maximum Input Voltage	
				AC rms (CAT Ⅱ)	Impulse peak
PHV1000-RO	400MHz	2m	100:1	1kV	4kV
PHVS1000-RO	400MHz	2m	1000:1	1kV	6kV
PHV641-LRO	380MHz	1.2m	100:1	2kV	4kV
PHV642-LRO	300MHz	2m			
PHV643-LRO	150MHz	3m			
PHV661-LRO	380MHz	1.2m	100:1	2.8kV	6kV
PHV662-LRO	300MHz	2m			
PHV663-LRO	150MHz	3m			
PHVS662-LRO	400MHz	2m	1000:1	2.8kV	6kV
PHVS663-LRO	250MHz	3m			

* Contact us with regard to specifications not listed

High-Voltage Probe
HV-P30A

30kV DC+AC peak or single-pulse 40kV

HV-P60A

60kV DC+AC peak or single-pulse 80kV

* Check the de-rating characteristics of the high-voltage probes before selecting them.

High-Voltage Differential Probe
SS-320

DC to 100MHz (1kVrms)

FET Probe

Model	Attenuation	Input RC	Bandwidth
SFP-5A	10:1	Approx. 1.9pF, Approx. 1M Ω	DC to 1GHz
SFP-4A	10:1	Approx. 2.15pF, Approx. 1M Ω	DC to 800MHz
PS-25	Power supply for SFP-4A, SFP-5A and SS-320 (Input voltage AC100V only)		

SFP-5A

PS-25

Current probe (Clamp type)

SS-250

Frequency Bandwidth : DC to 100MHz(-3dB), Maximum input range : 30A rms, Maximum peak current : 50A peak, Measurable wire diameter : ϕ 5mm

SS-240A

Frequency Bandwidth : DC to 50MHz(-3dB), Maximum input range : 30A rms, Maximum peak current : 50A peak, Measurable wire diameter : ϕ 5mm

SS-270

Frequency Bandwidth : DC to 2MHz(-3dB), Maximum input range : 500A rms, Maximum peak current : 700A peak, Measurable wire diameter : ϕ 20mm

SS-260

Frequency Bandwidth : DC to 10MHz(-3dB), Maximum input range : 150A rms, Maximum peak current : 300A peak, Measurable wire diameter : ϕ 20mm

PS-26 *Power Source for Current Probes*

Power supply for SS-240A, SS-250, SS-260 and SS-270(Input voltage AC100V(AC120V/AC200V/ AC220V are factory- delivered options.)

Rogowski Coil Current Probe
SS-280A Series

Model	BW(-3dB)	Maximum current
SS-281A	110Hz to 30MHz	30A peak
SS-282A	65Hz to 30MHz	60A peak
SS-283A	32Hz to 30MHz	120A peak
SS-284A	9Hz to 30MHz	300A peak
SS-285A	6Hz to 30MHz	600A peak
SS-286A	3Hz to 30MHz	1,200A peak
SS-287A	2Hz to 30MHz	3,000A peak
SS-288A	2Hz to 30MHz	6,000A peak
SS-289A	2Hz to 30MHz	12,000A peak

ex. probe on TO-220 package

Common to all SS-280A series

Item	Specifications
Cable length	1.5m
Sensor Coil length	80mm
Sensor Coil wire diameter	ϕ 1.7mm
Temerature range	
Amplifier	0deg. to 40deg.
Coil&cable	-40deg. to 125deg.
Output	BNC connector
Power supply	AA battery *4pcs. or AC adaptor

*Distribution of DS-5600A series and DS-5400A series are limited in Japan and Asian markets.

DS-5600A Series Specifications

	DS-5654A	DS-5652A	DS-5634A	DS-5632A	DS-5624A	DS-5622A	DS-5614A	DS-5612A
Frequency bandwidth (-3dB)	500MHz		350MHz		200MHz		100MHz	
Rise time (Typical)	750ps		1ns		1.75ns		3.5ns	
Input Channel Count	4	2	4	2	4	2	4	2
Maximum Sampling Rate, Equivalent Sampling Rate	2GS/s (when 2 channels interleaved), 1GS/s (when all channels are in use), 100GS/s							
Peak detect resolution	1ns							
Averaging	2 to 65536 times (exponent of 2 step), Display of number of runs							
Maximum Memory Length/Vertical Resolution	5M points (when 2 channels interleaved), 2.5M points (when all channels are in use)/8-bit (When high-resolution calculation is valid: Maximum 12-bits)							
Input Voltage Range	2mV/div to 10V/div(1M Ω), 2mV/div to 2V/div(50 Ω)							
Offset Voltage	2mV/div to 50mV/div : ± 1V, 50.2mV/div to 500mV/div : ± 10V, 502mV/div to 10V/div : ± 100V							
DC Gain Accuracy	± (1.5% + 0.5% full scale)							
Maximum Input Voltage	± 400Vpeak (1M Ω), 5Vrms (50 Ω)							
Band-Limiting Filter	Analog Form: 100MHz, 20MHz, 2MHz, 200kHz Digital Form: Select either LPF, HPF or SMA, 4 independent channels				Analog Form: 20MHz, 2MHz, 200kHz Digital Form: Select either LPF, HPF or SMA, 4 independent channels			
Input Coupling/Input Impedance	GND, DC 1M Ω , AC 1M Ω , DC 50 Ω / 1M Ω ± 1% // 16pF, 50 Ω ± 1%							
Probe Sense	Automatic Detection: 1:1, 10:1, 100:1, 1000:1, Manual Settings: 1:1, 5:1, 10:1, 20:1, 50:1, 100:1, 200:1, 500:1, 1000:1, 2000:1							
Time Axis Range	500ps/div to 50s/div		1ns/div to 50s/div		2ns/div to 50s/div		5ns/div to 50s/div	
Standard Probe	SS-101R (multi-channel supplied as standard)				SS-0130R (multi-channel supplied as standard)			
Roll Mode/Clock Accuracy	50ms/div to 50s/div(100kS/s max)/ ± 10ppm							
Clock Accuracy	± 10ppm							
Trigger Function	Edge, Edge ALT, Edge OR, Pulse Count, Pulse Width, Cycle, Dropout, TV, Pattern (OR, NOR, AND, NAND), Serial (UART, SPI, I^2C)							
TV Trigger (Rated) / Line setting range selection / Field selection	NTSC, PAL, Custom / Up to 3,000 / 1, 2, 4, 8							
Pulse Count Trigger Setting Range / Pulse Width Trigger Time Setting Range	1 to 9,999 events/15ns to 50s							
Cycle Trigger Time Setting Range / Dropout Trigger Time Setting Range	40ns to 50s/50ns to 50s							
Pattern Trigger	OR, NOR, AND, NAND							
Trigger Source / State / Threshold Level	All Channels / HIGH, LOW, Don't Care / All Channel Independent Setting							
Serial Trigger								
UART — Trigger Selection/Bit Rate	START, STOP, Parity Error, Data Pattern/1,000bps to 1Mbps (set in units of 100bps)							
UART — Comparative Data Length / Signal Source	5 to 8 bits/CH1 to CH4, EXT (CH1, CH2, EXT for 2 channel function)							
SPI * CH1 input is reserved for SCK signal input: Maximum 20MHz — Trigger Selection/CS Selection	Data Pattern/Idling time specified when no positive logic/negative logic or CS							
SPI — Comparative Data Length / Signal Source	4 to 64 bits/CH1 to CH4, EXT (CH1, CH2, EXT for 2 channel function)							
I^2C — Trigger Selection/address mode	START, STOP, RESTART, NACK, Data Pattern/Selected from 7-bit / 10-bit / EEPROM read							
I^2C — Comparative Data Length / Signal Source	1 to 5bytes when the address is 7-bit/10-bit, 1byte when EEPROM read (with shift comparison)/CH1 to CH4, EXT (CH1, CH2, EXT for 2 channel function)							
Trigger Source	All channels, EXT (± 0.5V), EXT10 (± 5.0V), Line							
Trigger Slope / Coupling	+, - / AC, DC, High Frequency Rejection, Low Frequency Rejection, Noise Rejection							
Display / Resolution	7.5-inch Color TFT LCD (touch screen) / VGA: 640 × 480 Pixels							
Display Mode/Vector Connection / Analog Persistence	Y-T, XY, XY Trigger/Sample Point Interpolation Display, Dot Display/Monochrome Grayscale Display, Spectrum Display							
Persistence Display Time	100ms, 200ms, 500ms, 1s, 2s, 5s, 10s, infinite							
Internal Waveform Storage (REF Memory) / Front Panel Setting Storage	5 Waveforms/Possible to save five settings in the internal memory, USB memory							
AUTO SETUP function	Switchablle SETUP button Effective/Invalid							
Parameter Measurement, Cursor, Zoom, Calculation, Replay Functions								
Parameter Measurement	Maximum Value, Minimum Value, Peak-Peak, RMS, Cycle RMS, Average, Cycle Average, Top, Base, Top-Base, Rising Overshoot, Falling Overshoot, Rising Time 20-80%, Falling Time 80-20%, Rising Time 10-90%, Falling Time 90-10%, Frequency, Cycle, + Pulse Count, - Pulse Count, + Pulse Width, - Pulse Width, Duty Ratio, Integral, Skew (+, -), Skew at level							
Simultaneous Measurement Count / Statistic Value Display	Maximum 4 Parameters / Maximum Value, Minimum Value, Measurement Count							
Logging Items, Output Destination	Time, Parameter Measurement Results (Conditions A, B, C, D), Pass/Fail Judgment Results Recording Time: Pop-up menu, internal memory (maximum 86,400 records), After Recording: USB memory							
Pass/Fail Judgment	Judgment Mode: Parameter Judgment or Mask Judgment, Judgment Results: Saved on USB, Beep Tone, Pulse Output (DS-578 option required), Logging Page Search Function: Select Pass or Fail and search in ascent or descent							
Cursor/Zoom	Time, Amplitude, Time & Amplitude, Value at Cursor Position/Press the Zoom button on the front panel to display an enlarged waveform on a new grid							
Calculation Function	Addition, Subtraction, Multiplication, Differential Calculus, Integral Calculus, (FFT (maximum 8k points, rectangular, hanning, flat-top window functions) Double calculation of the results of either addition, subtraction or multiplication possible with either differential calculus, integral calculus or FFT (9 patterns)							
Rescale / Unit Conversion	A: x + b (x: Input voltage, a, b: User defined) / volt, ampere, watt, ° C, no display							
Replay	Automatic waveform logging, storage for a maximum of 2,048 waveforms, replay possible							
Frequency Counter	6 characters							
Interface	Supports USB 2.0HS (device, host), LAN (100Base-TX), GPIB (factory-delivered option DS76),AUX Interface (Connector for optional external connector)							
AUX OUT	Selection from Trigger output or Pass/Failure judgment							
Optional Accessories								
DS-577 AUX IO CH1/CH2 Output* (factory-delivered option)	AUX IO1: Outputs the CH1 input signal to which offset voltage has been applied, AUX IO2: Outputs the CH2 input signal to which offset voltage has been applied							
DS-578 AUX IO CH1/TRIG Output* (factory-delivered option)	AUX IO1: Outputs the CH1 input signal to which offset voltage has been applied							
DS-576 GPIB Interface (factory-delivered option)	GPIB : IEEE488.2							
Power source options for the DS-579 probe	Two-way power source for use with Iwatsu active probes							
Waveform Data Storage	Saved on the USB with binary, ASCII, Mathcad, calculation (ASCII), calculation (Mathcad)							
Hard copy Output	TIFF, BMP and PNG (supporting transparency) images saved on the USB or output to printers that support PictBridge®							
Calibration Signal Output	Square Waveform 1kHz, 3Vp-p							
Power Source / Power Consumption	AC90V to 264V(47Hz to 63Hz), AC90V to 132V(380Hz to 420Hz) / 95VA(60W)max							
Dimensions / Unit Weight	Approximately 330W x 190H x 124D mm / Approximately 3.7kg							
Guaranteed Performance Temperature	10°C to 35°C							
Operating Temperature / Humidity / Altitude	Temperature 0 to 40° C / Humidity 5% to 80% RH ≦ 30° C (no condensation), RH 55% or less at 40° C or less (no condensation) / Altitude 2,000m or less							

DS-5400A Series Specifications

	DS-5424A	DS-5422A	DS-5414A	DS-5412A
Frequency bandwidth (-3dB)	200MHz		100MHz	
Rise time(Typical)	1.75ns		3.5ns	
Input Channel Count	4	2	4	2
Maximum Sampling Rate	2GS/s (when 2 channels interleaved), 1GS/s (when all channels are in use) 1GS/s			
Equivalent Sampling Rate	100GS/s			
Peak Detect Resolution	1ns			
Averaging Function	2 to 256 times, Display of number of runs			
Maximum Memory Length	500k points/ch			
Vertical Resolution	8-bit			
Input Voltage Range	2mV/div to 10V/div			
Offset Voltage	2mV/div to 50mV/div: ± 1V, 50.2mV/div to 500mV/div: ± 10V, 502mV/div to 10V/div: ± 100V			
DC Gain Accuracy	± (1.5% + 0.5% full scale)			
Maximum Input Voltage	± 400Vpeak			
Band-Limiting Filter	Analog Form: 20MHz, 2MHz, 200kHz			
Input Coupling	GND, DC 1M Ω , AC 1M Ω			
Input Impedance	1M Ω ± 1% // 20pF ± 2PF (DC1M Ω)			
Probe Sense	Automatic Detection: 1:1, 10:1, 100:1, 1000:1, Manual Settings: 1:1, 5:1, 10:1, 20:1, 50:1, 100:1, 200:1, 500:1, 1000:1, 2000:1			
Time Axis Range	2ns/div to 50s/div		5ns/div to 50s/div	
Standard Probe	SS-0130R (multi-channel supplied as standard)			
Roll Mode	50ms/div to 50s/div (100kS/s max)			
Clock Accuracy	10ppm or less			
Trigger Function	Edge, Pulse Count, Pulse Width, Cycle, Dropout, TV			
TV Trigger (Rated) / Line setting range selection / Field selection	NTSC, PAL, Custom / Up to 3,000 / 1, 2, 4, 8			
Pulse Count Trigger Setting Range	1 to 9,999 events			
Pulse Width Trigger Time Setting Range	15ns to 50s			
Cycle Trigger Time Setting Range	40ns to 50s			
Dropout Trigger Time Setting Range	50ns to 50s			
Trigger Source	All channels, EXT (± 0.5V), EXT10 (± 5.0V), Line			
Trigger Slope / Coupling	+, - / AC, DC, High Frequency Rejection, Low Frequency Rejection, Noise Rejection			
Display / Resolution	7.5-inch Color TFT LCD (touch screen) / VGA: 640 x 480 Pixels			
Display Mode	Y-T, XY, XY Trigger			
Vector Connection	Sample Point Interpolation Display, Dot Display			
Analog Persistence	Monochrome Grayscale Display, Spectrum Display			
Persistence Display Time	100ms, 200ms, 500ms, 1s, 2s, 5s, 10s, infinite			
Internal Waveform Storage (REF Memory)	5 Waveforms			
Front Panel Setting Storage	Possible to save five settings in the internal memory, USB memory			
AUTO SETUP	Switchable SETUP button Effective/Invalid			
Parameter Measurement, Cursor, Zoom, Calculation, Replay Functions				
Parameter Measurement	Maximum Value, Minimum Value, Peak-Peak, RMS, Cycle RMS, Average, Cycle Average, Top, Base, Top-Base, Rising Overshoot, Falling Overshoot, Rising Time 20-80%, Falling Time 80-20%, Rising Time 10-90%, Falling Time 90-10%, Frequency, Cycle, + Pulse Count, - Pulse Count, + Pulse Width, - Pulse Width, Duty Ratio, Integral, Skew (+, -), Skew at level			
Simultaneous Measurement Count / Statistic Value Display	Maximum 4 Parameters / Maximum Value, Minimum Value, Measurement Count			
Cursor	Time, Amplitude, Time & Amplitude, Value at Cursor Position			
Zoom	Press the Zoom button on the front panel to display an enlarged waveform on a new grid			
Calculation Function	Addition, Subtraction, Multiplication, FFT (maximum 8k points, rectangular, hanning, flat-top window functions)			
Rescale / Unit Conversion	a * x + b (x: Input voltage, a, b: User defined) / volt, ampere, watt, ˚ C, no display			
Replay	Automatic waveform logging, storage for a maximum of 1,024 waveforms, replay possible			
Frequency Counter	6 characters			
AUX Interface	Supports USB 2.0HS (device, host), GPIB (factory-delivered option DS576), AUX Interface (Connector for optional external connector)			
AUX OUT	Optional external connector			
Optional Accessories				
DS-576 GPIB Interface	GPIB : IEEE488.2 (factory-delivered option)			
Power source options for DS-579 probe	Two-way power source for use with Iwatsu active probes			
Waveform Data Storage	Saved on the USB with binary, ASCII, Mathcad, calculation (ASCII), calculation (Mathcad)			
Hard copy Output	TIFF, BMP and PNG images saved on the USB or output to printers that support PictBridge®			
Calibration Signal Output	Square Waveform 1kHz, 3Vp-p			
Power Source / Power Consumption	AC90V to 264V(47Hz to 63Hz), AC90V to 132V(380Hz to 420Hz) / 95VA(60W)max			
Dimensions / Unit Weight	Approximately 330W x 190H x 124D mm / Approximately 3.7kg			
Guaranteed Performance Temperature	10˚C to 35˚C			
Operating Temperature / Humidity / Altitude	Temperature 0 to 40˚ C / Humidity 5% to 80% RH ≦ 30˚ C (no condensation), RH 55% or less at 40˚ C (no condensation) / Altitude 2,000m or less			

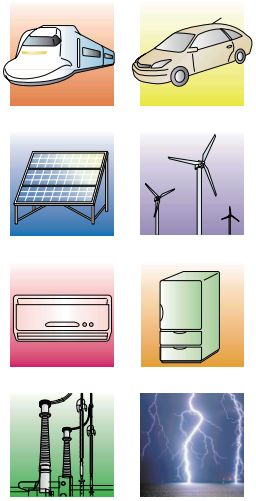
*The DS-577 and DS-578 cannot be mounted together.
* When DS-577 is in use, Trigger output (a standard function) / Pass Fail judgment function can not be used.
●External appearances and certain performance levels are subject to modification without prior notice for the purpose of product improvement, etc.

Standard Probes Supplied Accessories

Model		DS-5654A	DS-5652A	DS-5634A	DS-5632A	DS-5624A	DS-5622A	DS-5614A	DS-5612A	DS-5424A	DS-5422A	DS-5414A	DS-5412A
Standard Probes Supplied	Quantity	4	2	4	2	4	2	4	2	4	2	4	2
	Type	SS-101R				SS-0130R							
Standard Accessories (Miscellaneous)		• Power Cord x1、• Front Panel Cover x1、• CD (containing Instruction Manual, Remote Control Manual) x1、• User Guide x1											

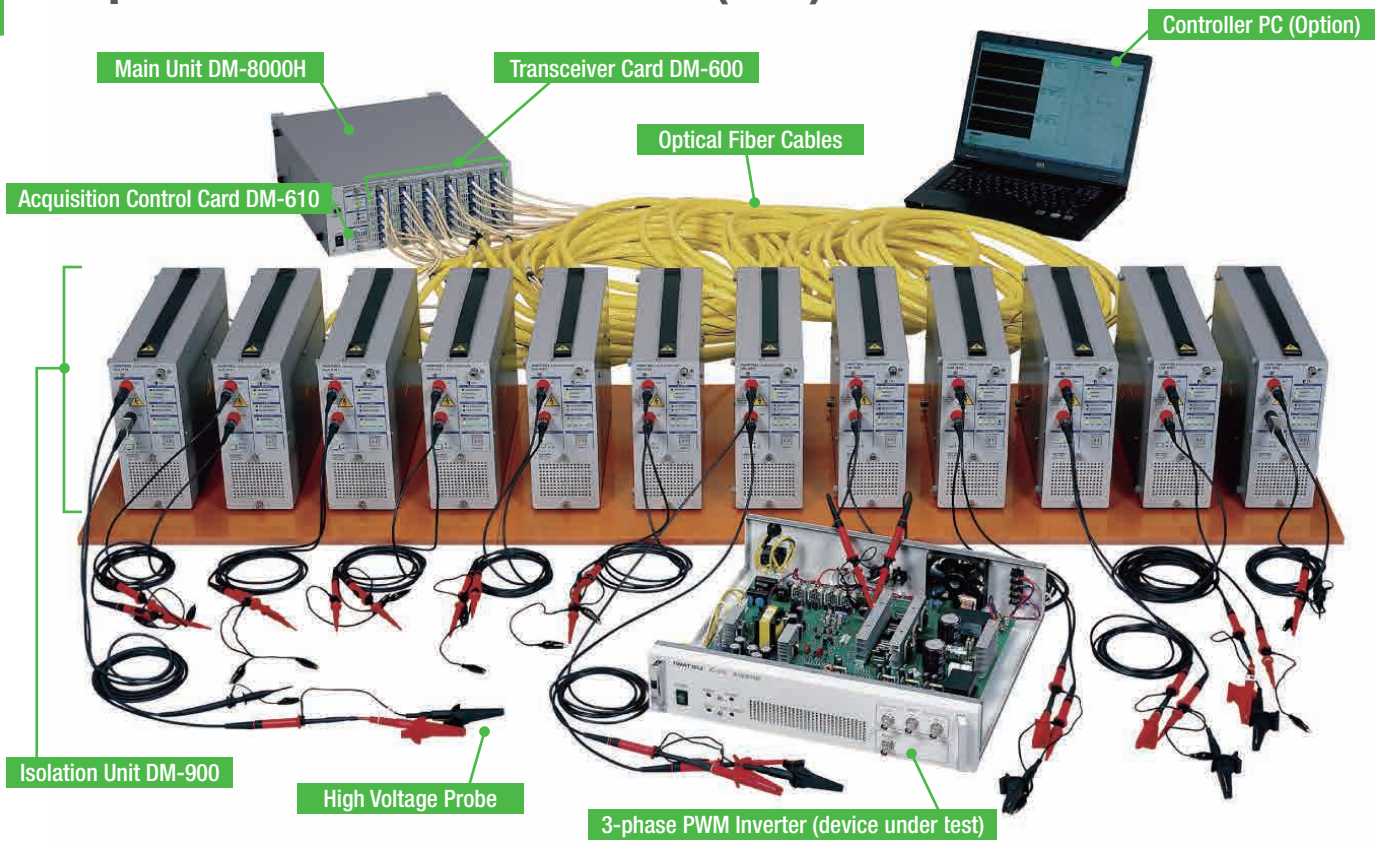
Isolation measurement system

DM-8000H



- The input block, control block and display block are isolated with optical fiber cables. (DM-900/L, DM-910/L)
- Frequency bandwidth: DC to 500MHz.
- Simultaneous multi-channel measurement of many channels of different reference potentials. (2 to 24 channels) (DM-900/L, DM-400/L)
- Long-life battery drive. (The system can be driven by three batteries for about 12 hours) (DM-900/L, DM-910/L)
- Measurement using long memory. (DM-900/L, DM-910/L, DM-400/L)
- Simultaneous measurements of the inverter's switching waveform and ON-voltage. (DM-910/L)
- Also supports synchronous measurements with the non-isolated unit. (DM-400/L)

Example: Isolation Unit DM-900 x 12units (24ch)



Lineup

Items	Model
Main unit	DM-8000H
Acquisition control card	DM-610
Transceiver card (optical x 2)	DM-600
Transceiver card (optical x 1, metal x 1)	DM-620
Transceiver card (metal x 2)	DM-630
Isolation unit (500k points) *1	DM-900
Isolation unit (16M points) *1	DM-900L
Isolation unit (high resolution, 500 k points) *2	DM-910
Isolation unit (high resolution, 16 M points) *2	DM-910L
Acquisition unit (500k points) *3	DM-400
Acquisition unit (16M points) *3	DM-400L

*1 With insulation case
*2 With insulation case. Optional probe is required for voltage measurements.
*3 Non-isolation type unit driven by AC power only.

Items	Model
Optical fiber cable S (2m) *4	DM-002
Optical fiber cable S (5m) *4	DM-004
Optical fiber cable (5m)	DM-005
Optical fiber cable (10m)	DM-006
Optical fiber cable (20m)	DM-007
Optical fiber cable (50m)	DM-008
Optical fiber cable (100m)	DM-009
Optical fiber cable (200m) [Custom Order]	DM-010
Acquisition cable (2m)	DM-105
Acquisition cable (5m)	DM-106
Battery pack	DM-551
Battery pack (set of three battery packs) *5	DM-553

*4 Optical cable set without sheath.
*5 Standard item for isolation unit.
*Distribution of DM-8000H series is limited in Japan and Asian markets.

Isolation with Optical Fiber cable (2 to 200 m)

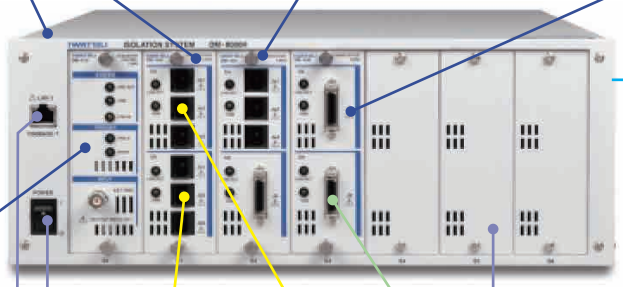
The input block, control block and display block are isolated by an optical fiber cable. Owing to the fact that isolation units are isolated from each other by optical fiber cables, it is possible to simultaneously measure signals that have different reference potentials, such as signals from the high and low-side switch of an inverter or from the primary and secondary sides of a power converter.

DM-8000H main unit
Up to 12 isolation units and acquisition units can be connected. An acquisition control card for capture control and up to 6 specially designed transceiver cards can be installed onto the main unit. The gigabit Ethernet-enabled high-speed main unit improves the waveform update speed when using 3 or more units. The interlock control terminal is on the rear panel.

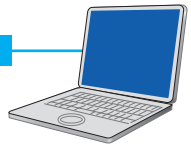
DM-600 transceiver card
Two isolation units can be connected per card.

DM-620 optical and metal transceiver card
One isolation unit and one acquisition unit can be connected per card.

DM-630 metal transceiver card
Two acquisition units can be connected per card.



LAN cable



Control PC (optional)

DM-610 acquisition control card
This card controls waveform capture in measurement units. It also provides a non-isolated external trigger input, which can be changed to an external trigger output terminal.

External trigger terminal

LAN terminal

Blank panel

LAN terminal

Interlock contact

Optical fider cable | Optical fider cable | Acquisition cable

DM-900 (500k)/DM-900L (16M) isolation units

The units are operated by a built-in battery to perform floating measurements.
Frequency bandwidth: DC to 500MHz, highest sampling rate: 2GS/s, memory length: 500k points (DM-900), 16M points (DM-900L), input: 2channels (not isolated), interface: optical interface (set of three interfaces)

Insulation case
Withstand voltage: 10kV
(Standard accessory)

DM-910 (500k)/DM-910L (16M) isolation units (high resolution)

The units are operated by a built-in battery to perform floating measurements.
The high resolution enables the simultaneous measurement of switching waveforms and on-voltage.
Frequency bandwidth: DC to 500MHz, highest sampling rate: 2GS/s, memory length: 500k points (DM-910), 16M points (DM-910L), input: 1channel, interface: optical interface (set of three interfaces)

Insulation case
Withstand voltage: 10kV (Standard accessory)

DM-400 (500k)/DM-400L (16M) acquisition units

The units can continuously operated with an AC power source. These units are best suited to the non-isolated measurement of grounded power probes, for example.
Frequency bandwidth: DC to 500MHz, highest sampling rate: 2GS/s, memory length: 500k points (DM-400), 16M points (DM-400L), input: 2channels (not isolated), interface: electric interface (one set)

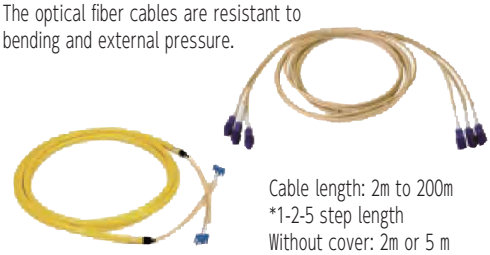
DM-553 Li-ion battery (built-in)

The battery can be inserted or removed from the front of the isolation unit. It uses three batteries to enable the unit to continuously operate for 20hours.
The battery can be charged with the use of the main unit.

The DM-900/L and DM-910/L are supplied with three batteries.

DM-002 to DM-010 optical fiber cables

The optical fiber cables are resistant to bending and external pressure.



Cable length: 2m to 200m
*1-2-5 step length
Without cover: 2m or 5 m
With cover: 5m to 200m

DM-105/DM-106 acquisition cables

Interface cables especially designed for the acquisition unit. These cables are connected to the unit and transceiver by electrical signals from the DM-400/L.

Cable length: 2 or 5m

The DM-9xxL long memory isolation unit enables detailed analysis during a basic inverter duty cycle.

The DM-900L and DM-910L long memory isolation units enable detailed analysis of individual carrier signals while capturing a base duty cycle.

A fundamental duty cycle (16ms on the sample screen) can be captured at a rate of 1GS/s.

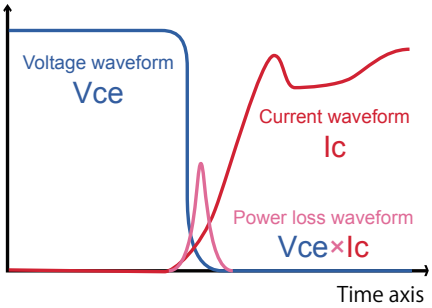
Gate driving waveform of the U, V, and W phases on the high side of a 3-phase inverter.

View with zoom display.

Up to 24 CH at a high voltage and wide bandwidth can be simultaneously measured.

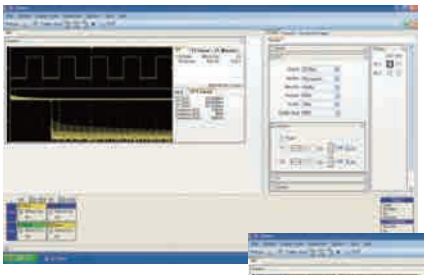
Waveform monitoring and other system operations are remotely performed using the standard IS Viewer (software). The IS Viewer can be used off-line as well, and is therefore useful for data organization at locations remote from the measurement site.

The many operation functions provided by the IS Viewer facilitate power loss and other measurement.

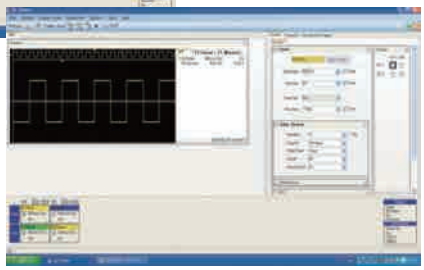


The Vce, Ic, output voltage and current waveforms of the upper and lower arms of an inverter can be simultaneously measured. dv/dt, di/dt, and other parameters, such as power loss, can be easily calculated from the measurement waveforms.

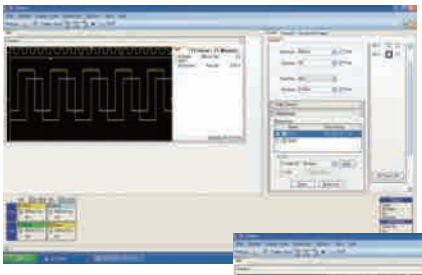
Functions of the IS viewer (DM-800)



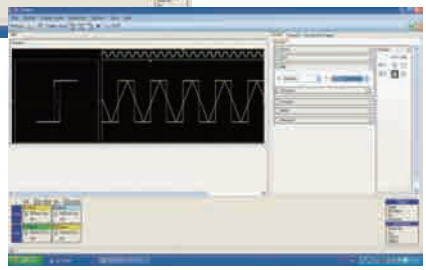
FFT function
This function is used for the frequency analysis of measured waveforms.



Edge search function
This function is used to automatically detect the edge of a monitored waveform and display selected edges.

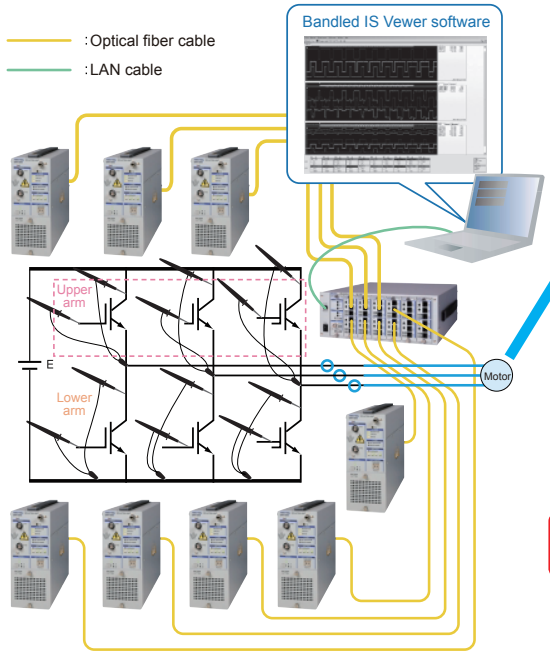


Reference display function
This function is used to compare waveforms.

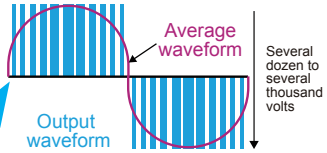


X-Y display function
This function is used to evaluate the SOA (safe operation area) and other items.

Multi-channel floating measurements (simultaneous measurement example of the upper and lower arms of a 3-phase inverter)

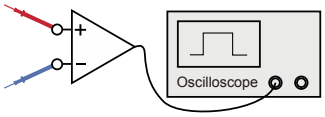


The waveform of voltage output from the 3-phase inverter that drives a motor or other device (shown in the left-hand figure) is a pulse voltage waveform, as shown in the figure below.

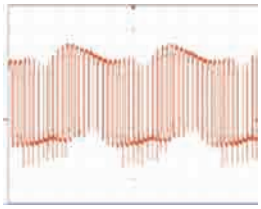


Differential probes were used for this type of measurement in the past, but this resulted in the waveform sometimes being distorted, and it was sometimes difficult to ensure sufficient measurement bandwidth due to constraints of the common mode rejection ratio or withstand common mode voltage. With optical fiber isolation, this isolation system can accurately monitor signals without being affected by these constraints.

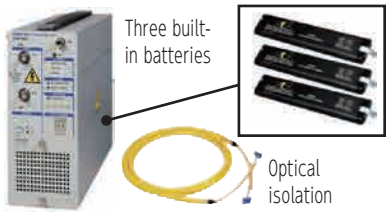
Measuring Vge of the upper arm with differemtial input

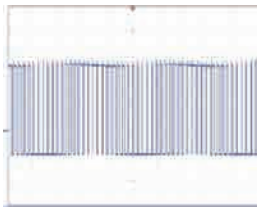


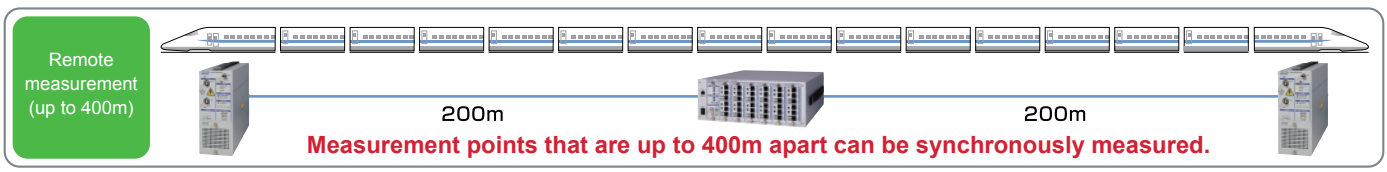
The common mode noise prevents accurate measurement.



Measuring Vge of the upper arm with isolation input



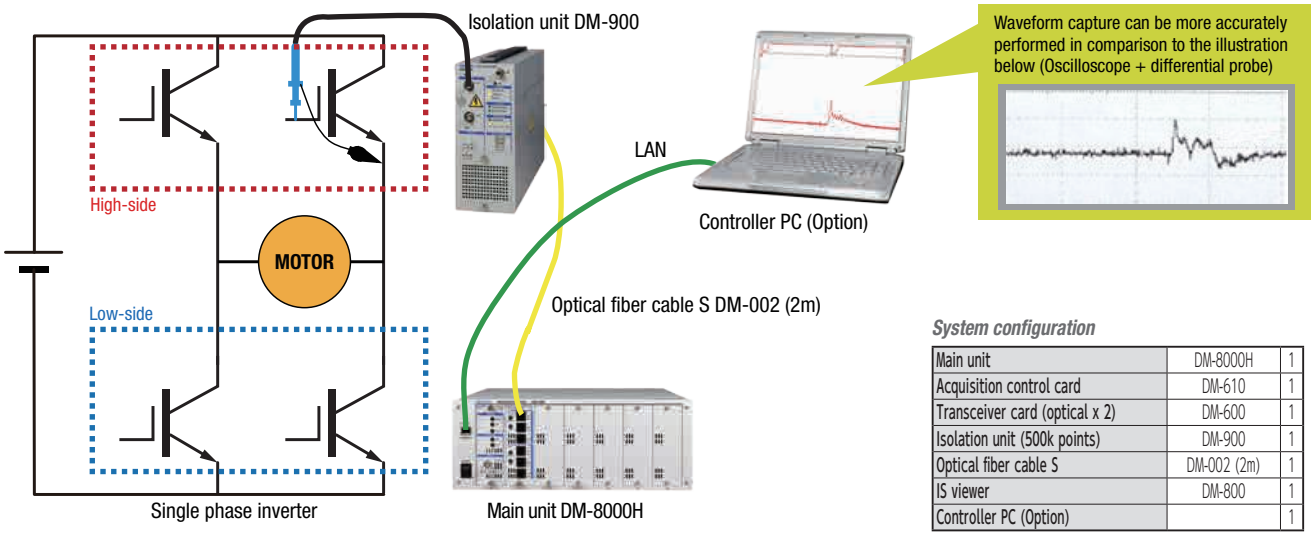




Measurement points that are up to 400m apart can be synchronously measured.

System configuration

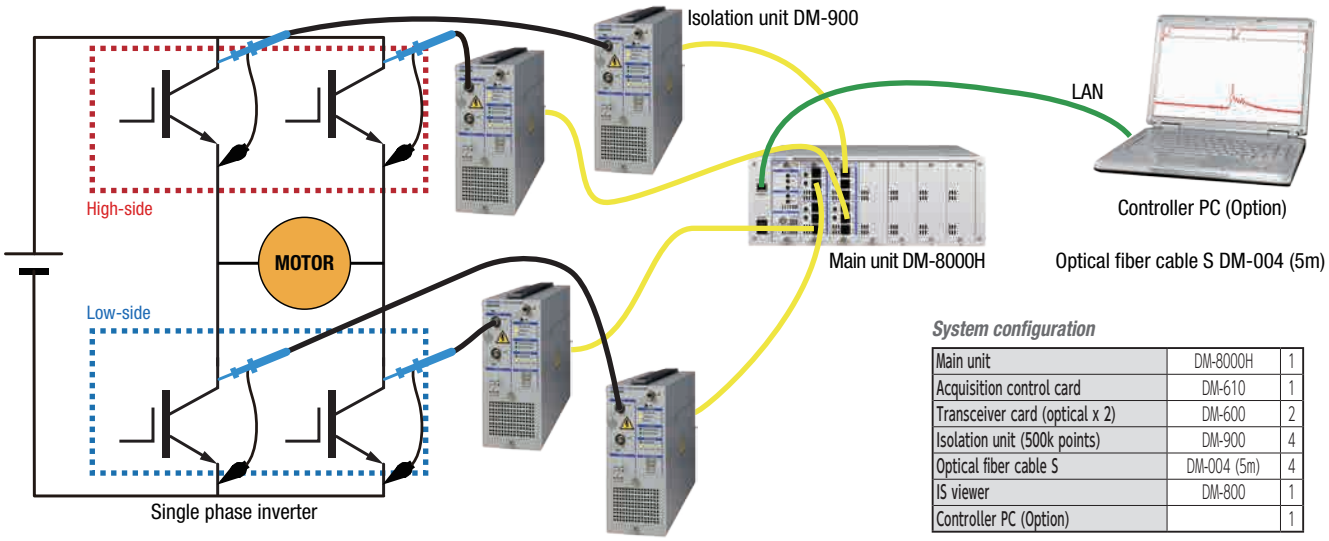
IGBT Gate voltage measurements in the high-side switch of a single phase inverter (one unit)



System configuration

Main unit	DM-8000H	1
Acquisition control card	DM-610	1
Transceiver card (optical x 2)	DM-600	1
Isolation unit (500k points)	DM-900	1
Optical fiber cable S	DM-002 (2m)	1
IS viewer	DM-800	1
Controller PC (Option)		1

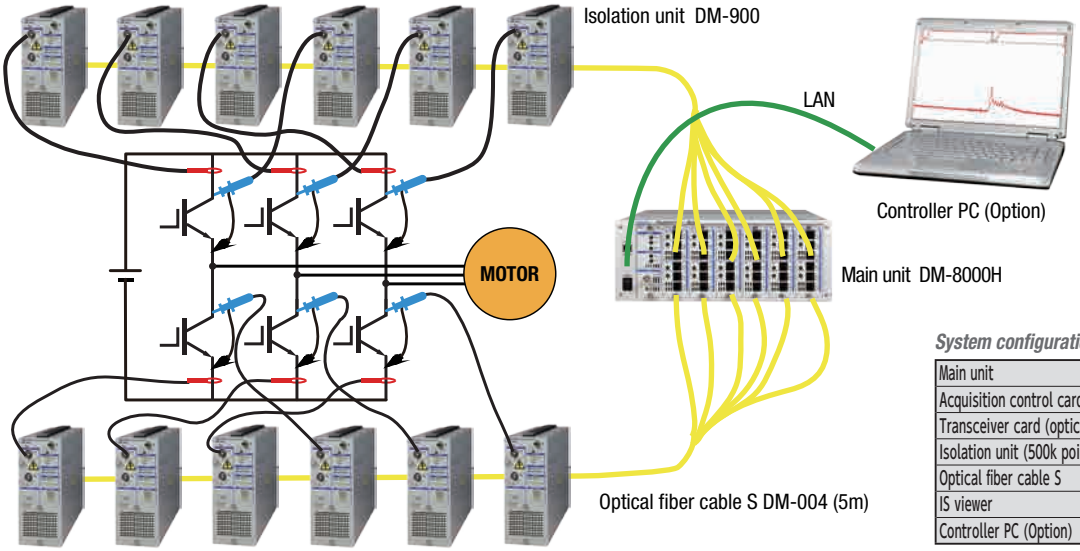
IGBT Vce voltage measurements in the high-side switch of single phase inverters (four units)



System configuration

Main unit	DM-8000H	1
Acquisition control card	DM-610	1
Transceiver card (optical x 2)	DM-600	2
Isolation unit (500k points)	DM-900	4
Optical fiber cable S	DM-004 (5m)	4
IS viewer	DM-800	1
Controller PC (Option)		1

IGBT Vce voltage & Ic current measurements of 3-phase, 2-level inverters (twelve units)



System configuration

Main unit	DM-8000H	1
Acquisition control card	DM-610	1
Transceiver card (optical x 2)	DM-600	6
Isolation unit (500k points)	DM-900	12
Optical fiber cable S	DM-004 (5m)	12
IS viewer	DM-800	1
Controller PC (Option)		1

Isolation System DM-8000H Specifications

DM-900L/DM-910L Isolation Unit and DM-400/L Acquisition Unit

Model	DM-900	DM-900L	DM-910	DM-910L	DM-400	DM-400L
Signal input unit						
Frequency Bandwidth (-3 dB)	500MHz					
Bandwidth limiter	20MHz / 100MHz					
Input impedance	1M Ω // 16pF				1M Ω // 16pF or 50 Ω	
Maximum input voltage	400V max (DC+peakAC<=5kHz) CAT I					
Number of channels	2 (between channels are not isolated)		1		2 (Not isolated)	
Input coupling	GND, DC1M Ω , AC1M Ω		GND, DC1M Ω		GND, DC1M Ω , AC1M Ω , DC50 Ω	
Input sensitivity	2mV/div~10V/div, 1-2-5 steps		CH1-MAIN: 50mV/div~5V/div, 1-2-5 steps CH2-ZOOM: 2mV/div~1V/div, 1-2-5 steps		2mV/div~10V/div, 1-2-5 steps	
Offset range	2mV/div~50mV/div, ± 1V *1 100mV/div~500mV/div, ± 10V *2 1V/div~10V/div, ± 100V *3		CH1-MAIN: 50mV/div~500mV/div, ± 10V *2 1V/div~5V/div, ± 100V *3 CH2-ZOOM: 2mV/div~20mV/div, ± 2V *1 50mV/div~1V/div, ± 20V *2		2mV/div~50mV/div, ± 1V *1 100mV/div~500mV/div, ± 10V *2 1V/div~10V/div, ± 100V *3	
Offset accuracy	± (1.0% + 0.5% of full-scale + X) X:*1 1mV, *2 10mV, *3 100mV					
DC gain accuracy	± (1.5% + 0.5% of full-scale)					
Probe sensitivity	10:1, 100:1, 1000:1 (Auto detection/manual settings)					
Sample rate	1GS/s (2GS/s during interleave)					
Vertical axis resolution	8bits					
Maximum memory length	500k points/ch	16M points/ch	500k points/ch	16M points/ch	500k points/ch	16M points/ch
Trigger system unit						
Trigger sources	CH1, CH2		CH-1-MAIN		CH1, CH2	
Trigger slope	Positive / Negative					
Coupling	AC, DC, HFREJ, LFREJ					
Level range	125% of full-scale					
Interface						
Interface	1 set of 3 optical interfaces (optical fiber cable: 2m to 200m)				1 set of electrical interfaces (wire cable:2 or 5m)	
Power supply and battery unit						
Internal battery	3 battery packs (unit can operate on one battery)				–	
Battery charging	Can be charged by the main unit				–	
Power consumption	120VAmax (when using AC power)				40VAmax	
Battery operation time	Approx. 12 hours of continuous operation (when using 3 batteries)				–	
Battery charging time	Approx. 6 hours				–	
AC power supply	AC100 to 240 (50/60Hz)					
Calibration signal						
Calibration signal	0.6V / 6V (selectable)					
Mechanical unit						
Dimensions (mm)	122.4 (H) X 258.4 (W) X 544 (D)				96.4 (H) X 171.6 (W) X 322.6 (D)	
Weight	Approx. 7kg (excluding battery packs and accessories) Battery pack weight: Approx. 660g per pack				2.6kg	
Operating temperature	0˚C to +40˚C					
Performance guaranteed temperature	+10˚C to +35˚C					
Accessories						
Battery pack	3				–	
Power supply cable	1					

DM-8000H Main Unit

* When the DM-610 acquisition control card is installed

Transceiver card connection	
Number of slots	6 (Max. 12 isolation units and/or acquisition units can be connected.)
Time axis	
Sweep range	1ns/div to 20s/div
Clock accuracy	10ppm
Acquisition mode	Normal, peak
Trigger system	
Mode	Auto,Normal,Single,Stop
Source	Up to 24 CH
Type	Edge,Pulse width
Trigger delay	Available
Interface	
Ethernet port	1000BASE-T x 3
Power supply unit	
AC power supply	100V to 240V (50/60Hz)
Power consumption	130VA max
Mechanical unit	
Dimensions (mm) and weight	132(H) x 351(W) x 420(D), Available. 6.9kg
Operating temperature	0˚C to +40˚C
Performance guaranteed temperature	+10˚C to +35˚C
Accessories	
LAN cable	1
Power supply cable	1
Operation manual	CD-R(1)
Control software	IS Viewer DM-800 CD-R (1)

Note #1: Intel and Pentium are registered trademarks or trademarks of Intel Corporation and its subsidiary companies in the United States of America and other countries.

Note #2: Windows is a registered trademark or trademark of Microsoft Corporation in the United States of America and other countries.

DM-600/DM-620/DM-630 Transceiver Card

Number of isolation / acquisition units connected	DM-600: 2 (DM-900/L, DM-910/L)
	DM-620: 1 (DM-900/L, DM-910/L) +1 (DM-400/L)
	DM-630: 2 (DM-400/L)
Operation indicator	Status display via LED
Mechanism	Card inserted in main unit (DM-8000H)
Operating temperature	0˚C to +40˚C
Performance guaranteed temperature	+10˚C to +35˚C

IS Viewer DM-800

(supplied with the DM-8000H main unit)

** IS Viewer is installed in the controlling computer (option) and is used to operate the isolation system and to monitor waveforms.*

Main function	
Operations	+, -, x , ÷ , | x |, | ÷ |, ∫ , dy/dx
Parameter measurements	Max, Min, p-p, Top, Base, Top-Base, RMS, Cycle RMS, Mean, Cycle Mean, +/-Overshoot, Transition Time, dv/dt, Freq, Period, +/-Pulse Count, +/-Pulse Width, Duty, Integral, Integral (abs), Integral (pos), Integral (neg), Skew (%), Skew (Level)
Other functions	XY display, FFT, Cursor, smoothing, channel de-skew, re-scale, off-line viewer
Waveform storage	CSV
Saving images	BMP,PNG,Clipboard
Saving setups	with / without waveforms
Controlling computer	
CPU	Intel® Pentium®4 Processor or later Note #1
RAM	2GB or larger
OS	Windows® XP Professional SP3 Note #2
	Windows® Vista Business SP2 Note #2
Display	At least WXGA (1,280 x 768 pixels) recommended (SXGA (1,280 x 1,024 pixels) is required for full display.)

ISOLATION PROBE

ISOLATION AMP (Receiving side) **ISOLATION UNIT (Sending side)**

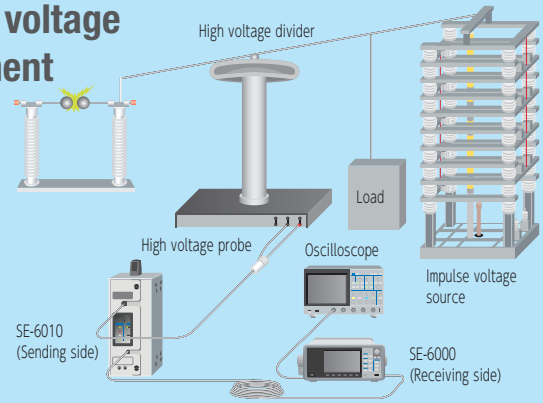
SE-6000 SE-6010

Performs waveform measurements with high resolutions and in safe manner under high voltage environment in systems that isolate output terminals through optical insulation

- Contributes to the safety for the high voltage environment tests
- Increases measurement quality with differential probes
- Measures noise resistance very effectively
- Supports wide range of objects such as lightning surge and charging tests and etc.
- Measures Distant points (Switches, Transportation equipment and etc.)
- Analyzes failure factors when multiple abnormal operations happened at the distant places (The Isolation unit can be set at each place, up to 4 sets in total)

Ultra-high voltage measurement

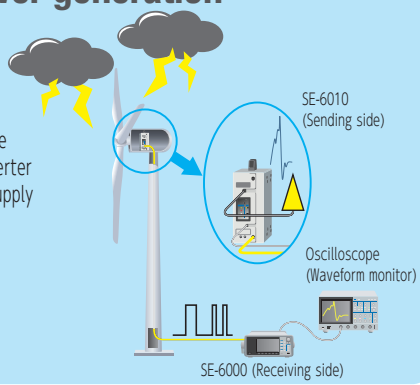
Performs ultra-high voltage measurement in safe manner



Wind-power generation

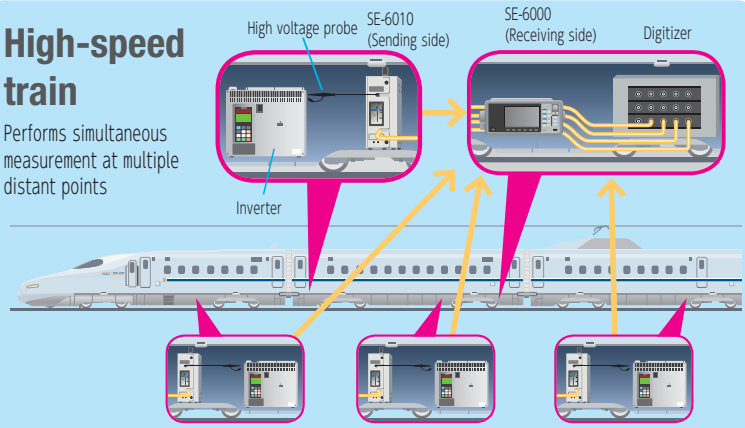
Isolation unit can be set at a distant place

Useful for a long time monitoring of an inverter and an UPS power supply



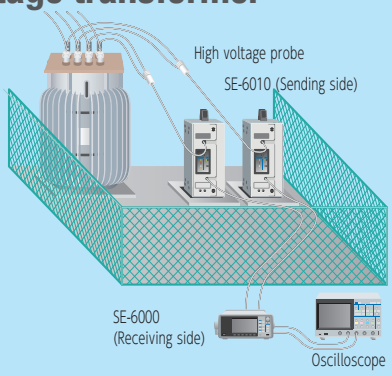
High-speed train

Performs simultaneous measurement at multiple distant points

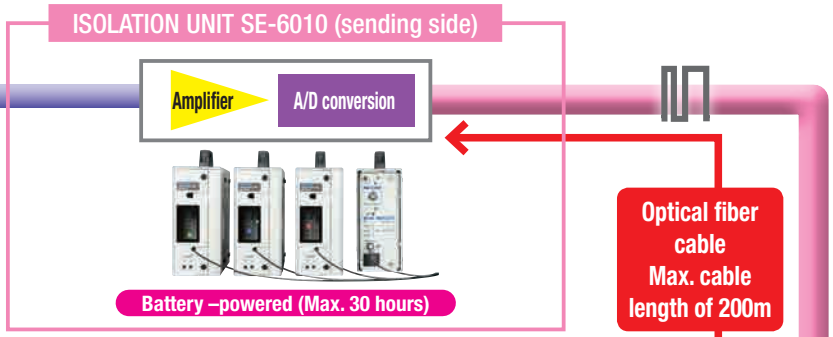


High-voltage transformer

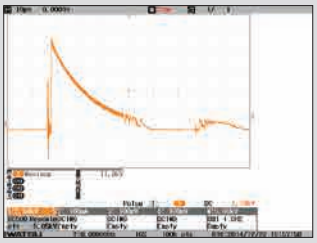
Performs ultra-high voltage measurement in safe manner



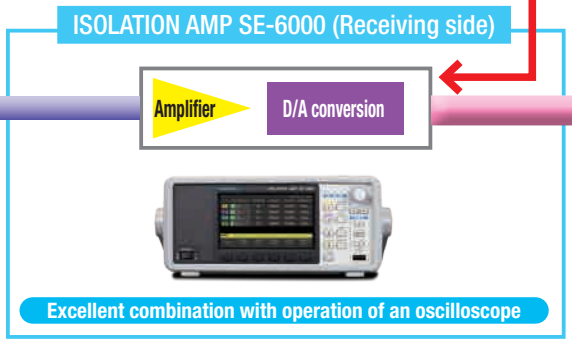
Various types of probes can be used, such as High voltage probes, current probes and passive proves



Example of High Voltage Pulse Waveform



- Oscilloscope
- Digitizer
- Others



- SE-6010 ISOLATION UNIT (sending side) is high resolution equipment for waveform measurement in high voltage environment, using voltage/current probes and etc.
- As the Unit works with batteries, measurement of low distortion can be done with reduced Common Mode noise.
- Measured waveforms are immediately transferred to the AMPLIFIER UNIT (receiving side) through optical fiber.
- Since the ISOLATION Unit and the AMPLIFIER Unit are insulated electrically and completely by optical fiber, safe measurement in high voltage / high current environment can be achieved.
- Max. 4 sets of Isolation Units can be connected to one Amplifier, and the 4 channels' analog waveforms output from the Amplifier can be used for various kinds of analysis besides waveform observation with oscilloscopes.

ISOLATION UNIT

SE-6010 *(Sending side)*

Specifications

Number of channels		1
Frequency range (-3dB)		30MHz (Input to Unit ~ Output from AMP)
Input impedance		1M Ω //20pF
Input coupling		DC, AC, GND
Input range (Full scale)		± 50mV, ± 100mV, ± 200mV, ± 500mV, ± 1V, ± 2V, ± 5V, ± 10V, ± 20V, ± 50V In DSO mode: ± 40mV, ± 80mV, ± 200mV, ± 400mV, ± 800mV, ± 2V, ± 4V, ± 8V, ± 20V, ± 40V
Input filter		OFF, 10MHz, 1MHz, 100kHz
Probe System		Auto detection, Manual setting
Max. Input voltage		400Vpeak
Offset voltage		± 50mV to ± 200mV : ± 1V ± 500mV to ± 2V : ± 10V ± 5V to ± 50V : ± 100V
ADC		14bit 100MS/s
Automatic calibration		Available per channel
Input connector		BNC (the metal parts are covered by the insulation cases.)
LED display	Indicator	Power status: at the side of operating battery ON/OFF. Battery status: Change flashing speed by remaining power level.
Power supply	Battery	Li-ion battery (Max. 2pcs)
Operation time (When ordinary temperature)		Battery 1pc: 12 hours Battery 2pcs: 24 hours *1 pce equipped as standard
Output(Optical I/F connector)		Twin LC connector × 1
External dimensions(mm)		Approx. 95W × 205H × 315D

ISOLATION AMP

SE-6000 *(Receiving side)*

Specifications

Number of channels	4
DAC	14bit 100MS/s
Output voltage (Impedance)	± 1V(50 Ω loading), ± 2V(1M Ω loading) In DSO mode: ± 800mV(50 Ω loading), ± 1.6V(1M Ω loading)
Monitor display	4.3" Color LCD back light : Select High / Low
Auto range	Range, Offset auto detection
Input (Optical I/F Connector)	Twin LC connector × 4
Output	BNC × 4
External interface	USB (for Save and Recall) LAN (for Remote recall)
External dimensions (mm)	Approx. 226W × 100H × 366D

Options

Optical fiber	3m, 10m, 50m(Outdoor specifications), 200m (Custom order)
Battery	Li-ion battery(1pc equipped as standard)
Battery charger	2- bay type

Constitution

Product Name		Model Number
ISOLATION AMP (Receiver side)		SE-6000
ISOLATION UNIT (Sending side)		SE-6010
Battery charger (2-bay type)		SE-603
Battery		SE-601
Optical fiber cable	3m	SE-605
	10m	SE-606
	50m(Outdoor spec)	SE-607
	200m	Custom order

High Voltage Differential Probe

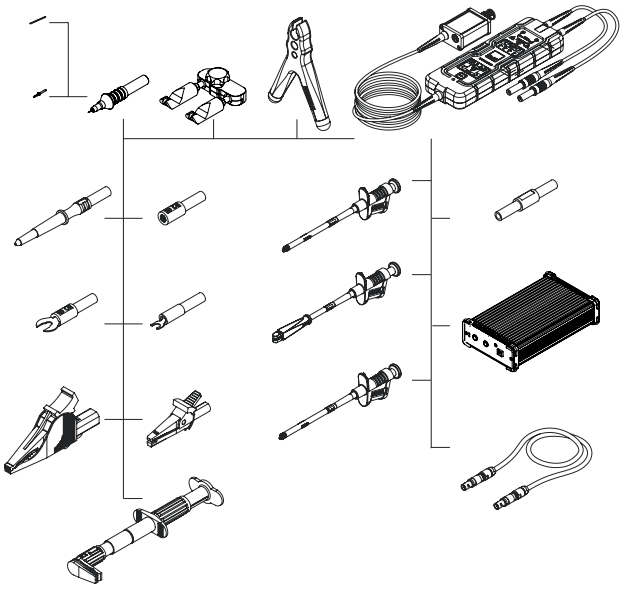
BumbleBee®

Wide bandwidth 400MHz

Attenuation Ratio(switchable)	Input voltage	50:1	100:1	250:1	500:1
Bandwidth(-3dB) Rise time(10%-90%)	50V	300MHz 1.2ns	300MHz 1.2ns	400MHz 0.875ns	400MHz 0.875ns
	500V	–	–	300MHz 1.2ns	300MHz 1.2ns
	1,000V	–	–	–	300MHz 1.2ns
RMS Noise level (Broadband noise at 30MHz bandwidth)		55mV	55mV	75mV	75mV
Typical Propagation Delay		10ns			
Max. Common Mode Voltage		± 2,000V pk(± 1,400V rms)			
Max. Input Voltage Measurement category (IEC61010-031)	Category I	2,000V eff. 6,000V transient Overvoltage			
	Category III	1,000V CATIII			
Max. Input Voltage		± 200V DC	± 400V DC	± 1,000V DC	± 2,000V DC
Common Mode Voltage		± 1,400Vpk(± 1,000Vrms)			
DC Gain accuracy		± 0.7%	± 0.7%	± 0.35%	± 0.35%
Offset Range 1)		± 4V			
Offset Resolution 1)		15 Bits / Minimum Step<125 μ V			
Offset Drift 1)		150 μ V/℃	150 μ V/℃	40 μ V/℃	40 μ V/℃
Input impedance at each input to GND		5M Ω //4pF			
Input impedance at differential inputs		10M Ω //2pF			
Input coupling of the measuring instrument		50 Ω			
Commonmode rejection ratio (typ. CMRR)	DC	>80dB			
	100kHz	>70dB			
	1MHz	>62dB			
	3.2MHz	>50dB			
Weight	370g				
Cable length	2m				
Input Leads Length	25cm				
Input Leads Connectors	2mm x 4mm(male)				
Output Connectors	BNC(male)				
Operating temperature range	0 ℃ to 50℃				
Temperature range for probe input leads	-40℃ to 85℃				
Power supply units(Optional)	PS-02(2CH), PS-03(4CH)				

1) Referred to Output

Bumble Bee® is registered trademark in Germany of PMK GmbH.



Holding probe tips with probe tip adaptor soldering on PCB directly enables to eliminate affection byProbing and keep signal integrity.

Holding with 2-Footer

Holding twin holder and 3D positioner

Common mode voltage	± 2,000V pk (± 1,400V rms)
Max. input voltage (measurement category)	(I) : 2,000V rms (6,000V transient overvoltage)
	(Ⅲ) : 1,000V rms CAT Ⅲ
Offset range	± 4V (Resolution 15Bit/minimum Step<125 μ V)
Input impedance	5M Ω // 4pF(GND), 10M Ω // 2pF(Differential)
Input coupling of instruments	50 Ω
Typical CMRR	>80dB(DC), >70dB(100kHz), >62dB(1MHz), >50dB(3.2MHz)
Cable length	2m(Output), 25cm(Input leads)
Weight (Probe only)	370g
Operating temperature range	0℃ ~ 50℃ (Probe), -40℃ ~ 85℃ (Input leads)
Probe power supply	PS-02(2CH), PS-03(4CH)
	Probe power supplies provides PC remote control on Bumble Bee via USB or Ethernet(Optional) with PC-software "PMK Probe Control(64bit-Win7 or above version)" with USB memory.

BumbleBee® is manufactured by PMK Mess- und Kommunikationstechnik GmbH - Germany

SS-320

100MHz, 1.4kV

Freq. BW	DC to 100MHz
Maximum differential input voltage (DC+AC peak)	± 140V(50:1)/ ± 1.4kV(500:1)
CMRR(70dB)	500V DC
CMRR(80dB)	50/60Hz
CMRR(50dB)	1MHz
Input impedance	1M Ω
Input impedance at each input to GND	4M Ω //7.0pF
Input impedance at differential input	8M Ω //3.5pF
Cable length	1.5m
Power supply unit (optional)	PS-25(External) / DS-579

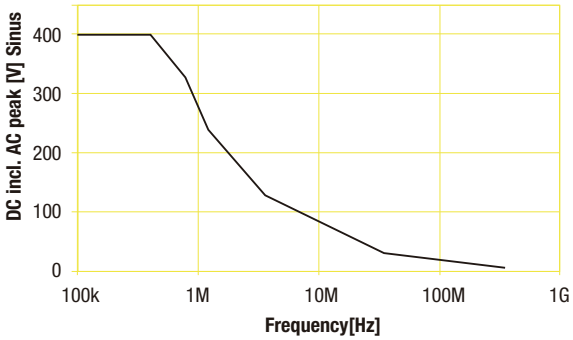
Voltage probe

Usable temperature range: -55℃~155℃

PHT312-RO

Suitable for wide temperature range probing

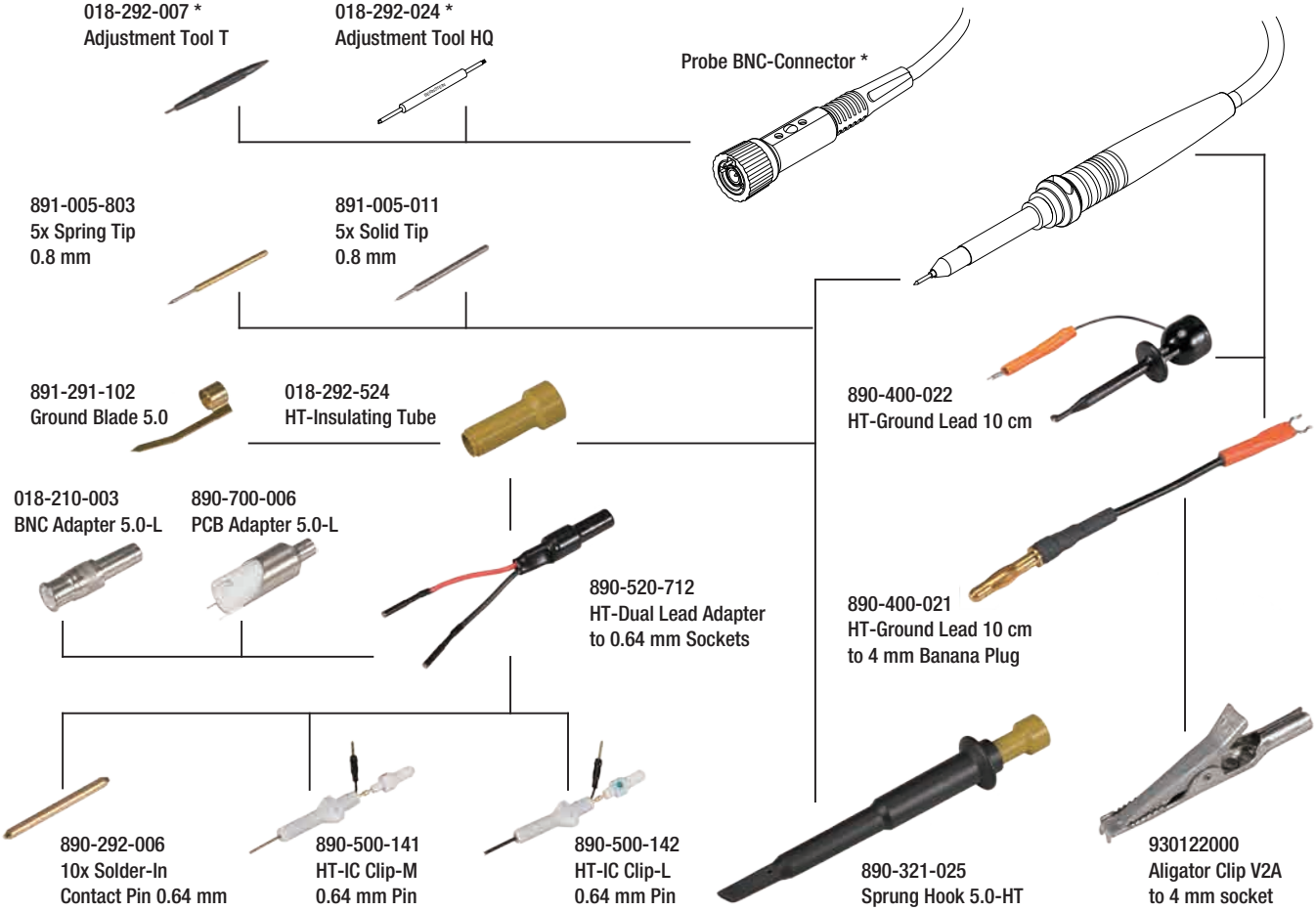
Typical Voltage Derating of PHT312



Specifications

Attenuation Ratio	10:1 ± 2% at DC
System Bandwidth	350MHz(-3dB)
System Risetime	1ns(10%-90%)
Maximum Rated Input Voltage	400Vrms(1,250V transient overvoltage) 300Vrms CAT II
Input Resistance	4.4M
Input Capacitance	<20pF
Compensation Range	10pF-25pF
Cable Length	2m
Temperature Range(operating)	BNC Connector and(*) marked parts: 0°C ~ 50°C Probe Head and Cable Assembly only: -55°C ~ 155°C
Maximum Relative Humidity	80% RH for temperature upto 31˚C decreasing linearly to 40% at 50˚c

Accessories *Standard accessories



Coming Soon

Ultra wide temperature probe

Usable temperature range: -55℃~205℃

Current Probes

CLAMP TYPE CURRENT PROBE

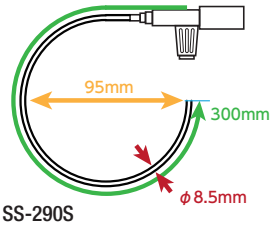
SS-270

Model	Maximum input current		Frequency bandwidth	Measurable wire diameter(max.)
SS-240A	30Arms	50Apk	DC-50MHz	5mm
SS-250	30Arms	50Apk	DC-100MHz	5mm
SS-260	150Arms	300Apk	DC-10MHz	20mm
SS-270	500Arms	700Apk	DC-2MHz	20mm

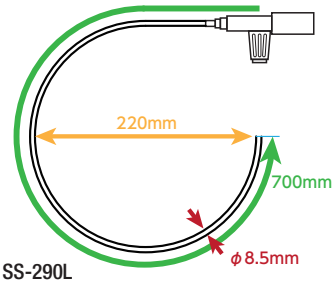
ROGOWSKI COIL CURRENT PROBE Lineup

- High current 12kApk, Withstanding voltage 12kV max.
- Zero adjust function

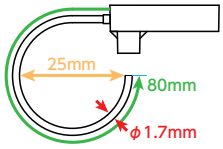
SS-290 series



SS-290S



SS-290L



SS-280A series

SS-280A Series Specifications

Model		Frequency Bandwidth	Sensor part temperature range	Sensitivity [mV/A]	Peak Current[A]	Peak di/dt [kA/s]	Cut-off frequency fL[Hz]	Noise [mV rms]	Absolute Maximum di/dt	
									Peak[kA/s]	RMS[kA/s]
Sensitivity and peak current	SS-281A	fL to 30MHz[-3dB] fL: lower cut-off frequency	-40°C to 125°C	200	30	2	110	3.5	80	1
	SS-282A			100	60	4	65	2.5		
	SS-283A			50	120	8	32	2		1.5
	SS-284A			20	300	20	9	1.8		
	SS-285A			10	600	40	6			
	SS-286A			5	1,200	80	3			2
	SS-287A			2	3,000		2	1.4		
	SS-288A			1	6,000					
	SS-289A			0.5	12,000					

SS-290 Series Specifications

Model		Frequency Bandwidth	Sensor part temperature range	Sensitivity [mV/A]	Peak Current[A]	Peak di/dt [kA/s]	Cut-off frequency fL[Hz]	Noise [mV rms]	Absolute Maximum di/dt	
									Peak[kA/s]	RMS[kA/s]
Sensitivity and peak current	SS-293S	SS-290S : fL to 20MHz[-3dB] SS-290L : fL to 10MHz[-3dB] fL:v lower cut-off frequency	-40°C to 125°C	5	1.2	60	1	3.5	80	3.0
	SS-293L					32				
	SS-294S/L			2	3	80	0.8	2.0		
	SS-295S/L			1	6		0.6	1.4		
	SS-296S/L			0.5	12		0.4	1.2		

Common Specifications

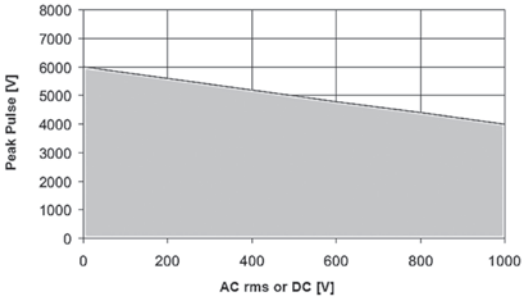
			SS-280ASeries	SS-290Series
Basic Specifications	Accuracy		±2%(-10°C to 70°C add ±250ppm/°C when out of the range in the left)	±2%(-10°C to 60°C add ±300ppm/°C when out of the range in the left)
	Output	Connector	Connector: BNC	
		Maximum voltage	±6 V (load 100 k) * Output becomes ±2V and sensitivity becomes about the half for 50 load.	±6V (load 100 k)
	Typical Linearity		±0.05% of full-scale	
	Zero Point Adjustment Ranges		±300mV or more	
Coil (Sensor Part)	Coil Length		80mm±5mm	SS-29xS: 300mm±10mm / SS-29xL: 700mm±10mm
	Coil Thickness / Peak Voltage Isolation / Cable Length		Max.1.7mm /1.2kVpeak / 1.5m ±50mm	Max. 8.5mm / 10kVpeak / 3.0m ±100mm
	Temperature Range		-40°C to 125°C(Including sensor and cable)	
Mainframe (Amplifier)	Dimensions		Approx. 80(W) x 165(H) x 35(D) mm (Without the external projection portion)	
	Weight		0.37kg	SS-29xS: Approx. 0.48kg / SS-29xL: Approx. 0.5kg
	Power Supply		Use AA batteries four pieces or AC adapter (optional)	
			Four AA dry batteries, Approx. 18 hours with alkaline batteries	Four AA dry batteries, Approx. 30 hours with alkaline batteries
	Accessories		BNC Cable (1), Instruction Manual(1), Screw Driver(1), Hand Case(1),AA dry batteries : (4)	
Environmental conditions	Operating temperature and humidity ranges		0°C to 40°C, 80%RH or less(Except for the sensor)	

High Voltage Passive Probes

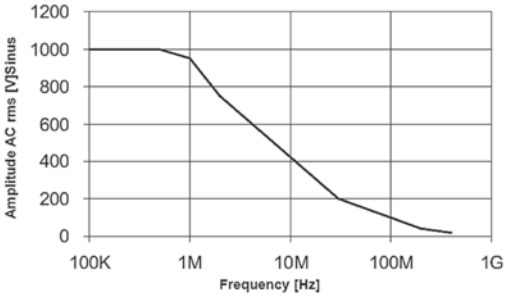
PHV1000
PHVS1000

Model	Attenuation	Iinput RC		BW(-3dB)	Measurement Category I		Cable length
		R(M Ω)	C(pF)		rms(kV)	peak(kV)	
PHV1000-RO	100:1	50	7.5	400MHz	1	4	2m
PHV1000-3-RO				250MHz			3m
PHVS1000-RO	1000:1	50	7.5	400MHz	1	4	2m
PHVS1000-3-RO				250MHz			3m

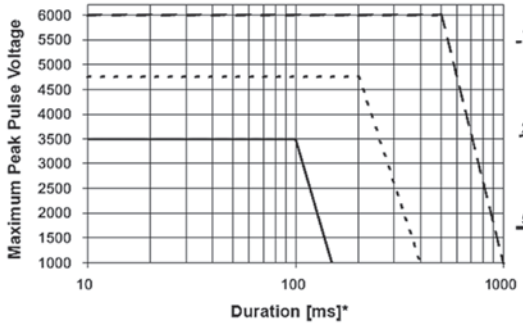
RMS vs. Peak Pulse Voltage PHV 1000-RO



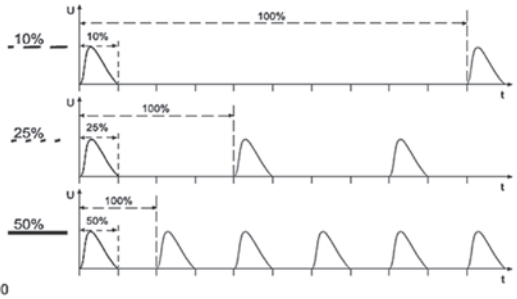
Typical Voltage Derating PHV 1000-RO



Maximum Pulse Derating PHV 1000-RO



Duty Cycle



PHV6xx
PHVS6xx

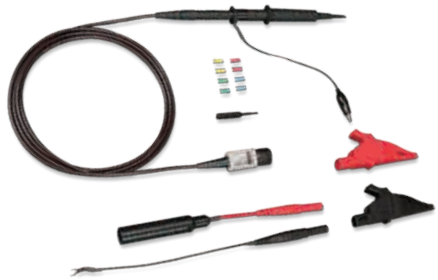
PHV4002

Model	Attenuation	Iinput RC		BW(MHz at -3dB)	Max. Input Voltage(kV)			Comp. Range [pF]	Cable length
		R [MΩ]	C [pF]		CAT II AC rms	VDC Incl. pk AC	Impulse Peak		
PHV641-LRO	100:1	50	<6	380	2	3	4	10 - 50	1.2m
PHV642-LRO			<6.5	300					2.0m
PHV643-LRO			<7	150				15 - 55	3.0m
PHV661-LRO	100:1	50	<6	380	2.8	4	6	10 - 50	1.2m
PHV662-LRO			<6.5	300					2.0m
PHV663-LRO			<7	150				15 - 55	3.0m
PHVS662-LRO	1000:1	50	<6.5	400	2.8	4	6	10 - 50	2.0m
PHVS663-LRO			<7	250				15 - 55	3.0m
PHV4002-3-RO	1000:1	100	<2.5	100	14	20	40	10 - 50	3.0m
PHV4002-5-RO				100					
PHV4002-8-RO				50					
PHV4002-10-RO				10					

Passive Probes

Model	Attenuation	Input Impedance	System bandwidth(-3dB)	scope input capacity
SS-101R	10 : 1	10M Ω /12pF	500MHz	13 to 23pF
SS-0130R	10 : 1	10M Ω /12.5pF	200MHz	18 to 35pF
SS-0122	10 : 1	10M Ω /14pF	100MHz	10 to 32pF
	1 : 1	1M Ω /<150pF	6MHz	
SS-0112	10 : 1	10M Ω /22pF	60MHz	10 to 45pF
	1 : 1	1M Ω /<200pF	6MHz	
SS-0004	1 : 1	44pF ± 6pF	30MHz	

SS-0170R/ SS-0171R



HV-P30A

HV-P60A

Model	Attenuation	Input RC		System Bandwidth [MHz](-3dB)	Cable Length [m]	Comp. Range [pF]	Max. Input Voltage [kV]	
		R [MΩ]	C [pF]				CAT Ⅱ DC+ACpeak	CAT Ⅰ DC+ACpeak
SS-0171R	100 : 1	66.7	<4	400	2.0	6 – 18	1.0	4.0
SS-0170R	100 : 1	66.7	<4	400	2.0	6 – 18	1.0	6.0
HV-P30A	1000:1	100	<7	50	3.0	15 – 50	30	
HV-P60A	2000:1	1,000	<7	50	4.0	20 – 50	60	

Pair Probes

PMK

Model	Attenuation	Input RC		BW [MHz] (-3dB)	Cable Length [m]	Capacitance Range [pF]	Max. Input Voltage [kV]		
		R [MΩ]	C [pF]				CAT Ⅱ AC rms	VDC Incl.pkA	Impulse Peak
PDD4161-L	100 : 1	50	<6	380	1.2	10 – 50	2.8	4.0	6.0
PDD4162-L	100 : 1	50	<6.5	300	2.0	10 – 50	2.8	4.0	6.0
PDD4163-L	100 : 1	50	<7	150	3.0	15 – 55	2.8	4.0	6.0
PDDS4962-L	1000 : 1	50	<6	400	2.0	10 – 50	2.0	3.0	4.0
PDDS4963-L	1000 : 1	50	<6.5	250	3.0	10 – 50	2.0	3.0	4.0
PDD4002-3	1000 : 1	100	<2.5	100	3.0	10 – 50	14	20	40

Pair passive probes are paired of their performance for dynamic tests.

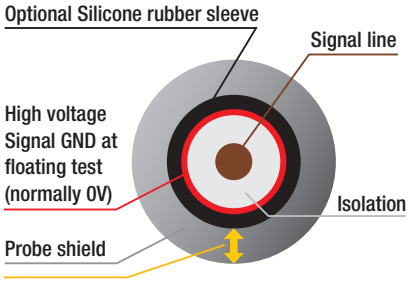
Options for High voltage passive probes

PMK

Silicon rubber sleeved option

Option HV-S* for withstanding voltage at 49kV(DC, typical) for standard probes

* Option HV-S is factory option at ordering point



Ex. PHV1000-RO with Option HV-S

2-foot positioner

High voltage PCB adaptor

BNC adaptor

Flexible adaptor (4mm safety Banana plug)

Safety alligatorclip

GND leads

15cm/22cm/30cm/ HF compensated 22cm

22cm 2mm Banana plug

22cm 4mm Banana plug

Voltage Probe Calibrators

KHT1000C (DC, Pulse)
100V/200V/500V/1000V, 50Hz

TK100C (DC, Pulse)
100V, 100Hz

Carrent Probe Calibrators

KSZ10B 0.1A/0.2A/0.5A/1A/2A/10A, 1Hz
KSZ100B 20A/50A/100A, 0.5Hz

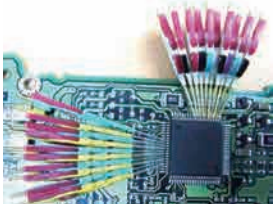
Interlock casing for disabling output when opening cover (factory option at ordering point)
※Contact our sales representative

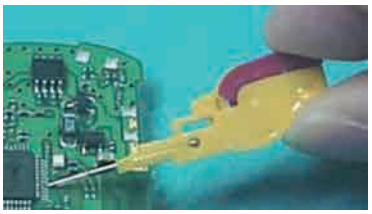
Model	Output	DC accuracy	Tr	Over- shoot	Repetition Period	Pulse width	Trigger output
TK100C	100V	± 0.5%	<6ns	<3%	100Hz		
KHT1000C	± 100/200/500/1kV switchable (Continuous variable 100–1000V*)	± 1%/0.5% /0.25%	<14ns	<2%	50Hz (Continuous variable 1–100Hz*)	5ms (Continuous variable 1–100ms)	10V,1 μ S
KHT6000C	1k ~ 6kV	± 0.5%	<40ns	<2%	1Hz	1ms	15V,10 μ S
KSZ10B	0.1/0.2/0.5/1/2/5/10A	–	16 34ns	<2%	1Hz	1ms	10V
KSZ100B	20/50/100A	–	40 120ns	<2%	0.5Hz	1ms	10V

*Continuous variable available at remote control mode

Probing tools for Flat package (Ultra-mini clips)

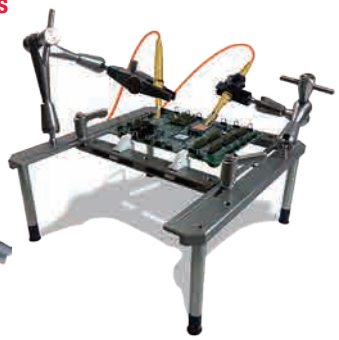
*Distribution of PMK probes and Rogowski coil current probes are limited in Japan and Asian markets.





PCBA Frame and 3D positioners

3D Positioners



SKID -PCBA Frame

PMK 3D Scope-Probe Positioners

Type	Description	incl. Holder
MSA100 Probe	Positioner with steel base, span width 200mm	HAL512
MSB40 Probe	Positioner with table clamp, span width 200mm	HAL512
MSC85 Probe	Positioner with vacuum clamp, span width 200mm	HAL512
MSM130 Probe	Positioner with magnet foot, span width 130mm	HAL512
MSM200 Probe	Positioner with magnet foot, span width 200mm	HAL512
MSU1500 Probe	Positioner with steel base, span width 200mm	UNIHOLD

Accessories and Spares for 3D Probe Positioners

Type	Description
STS100	1200g heavy steel base, Φ 100mm, Positioner collet M6
TIK40	Table clamp with a clamping range of up to 40mm for table edges and pipes, 2 collets M6
VAS85	Vacuum cupM8 incl. 1x adapter to M6, Φ 85mm
TM170	Magnet foot 170N, M6 Φ 30mm
TM300	Magnet foot 300N, M8 incl. 1x adapter to M6, Φ 30mm
STV130	Probe - Positioner span width 130mm, both sided M6
STV200	Probe - Positioner span width 200mm, both sided M6
HAL512	Probe - Holder for PMK probes and other probing devices with Φ 5 - 12mm,M6
GAD M86	Screw adapter M8/M6 SW 13mm
UNIHOLD	PMK universal Probe Holder "Uniholder" for PMK probes and other readings recorders with Φ 1.5 - 17mm,M6

PMK 3D Scope-Probe Positioners

Type	Dimensions	Clamping width
SKID-S	255 x 255 x 100mm	160 x 160mm
SKID-M	305 x 225 x 100mm	240 x 160mm
SKID-L	405 x 365 x 190mm	340 x 300mm

6½ Digits Digital Multimeter
VOAC7602

5½ Digits Digital Multimeter
New VOAC7502

VOAC7602

Enables instantaneous copies of the screen to be taken

VOAC7502

Display

Easy-to-see Large Screen

Equipped with a high-resolution, wide color LCD display. The display is bright and provides a wider field of view, which becomes apparent the more it is used. The font used for the digits can be selected from normal (gothic) type and seven segment type. It is also possible to choose the background color from two colors (white and black).

4.3-inch high-resolution LCD monitor 109mm

Black background mode :
* The font for the numerical display is selected with NORMAL(gothic) on DISPLAY.

User-friendly Operability

This key illuminates when necessary.

Inputting numerals and characters, and list selection can be done quickly and directly. Simply rotate the knob and then press the knob to set parameters.

Arrow keys

These keys are used to move the cursor for numerical and character input. They can also be used for switching between the primary display of numerals, trend charts and histogram charts, etc., and the secondary displays of statistics and analog meters, etc.

New displays that make even better use of the judgment function

A larger screen for enhanced legibility

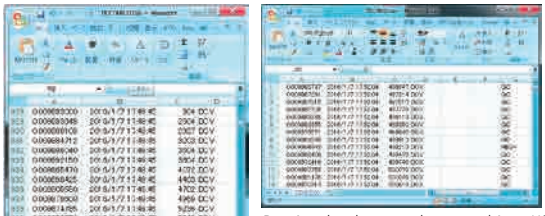
It is now possible to see the screen from a distance. Highly-acclaimed for enabling adjustment work to be carried out more easily and speedily.

Unique needle meters. Pseudo analog-like fluctuations are displayed digitally

In addition to the convenience of making estimated judgments, it is now possible to use combinations of the judgment function in a wide range of ways.
The color of the needle changes when the reading exceeds the judgment standards.

NEW FUNCTIONS

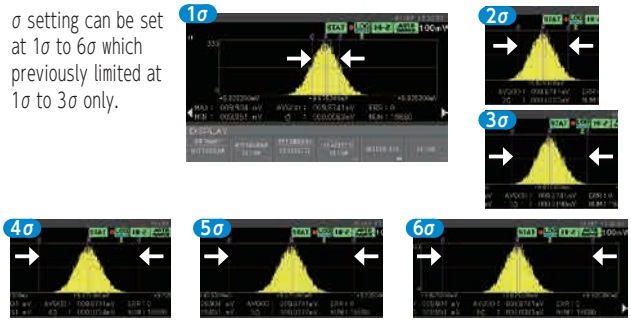
[Continuous data logging into USB memory] Longtime logging function



Previously, data can be stored into USB memory manually. Now it can be done automatically during measurements into USB memory.

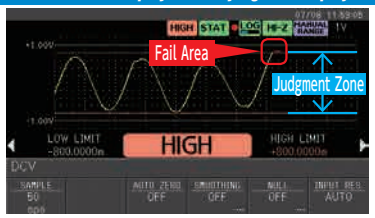
Extended calculations for secondary statistical calculation

σ setting can be set at 1σ to 6σ which previously limited at 1σ to 3σ only.

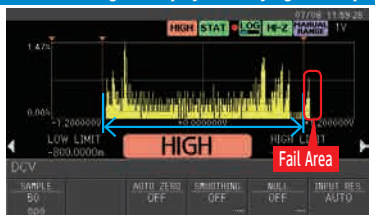


A myriad of analyses can now be carried out without the use of a PC. Performance and functionality levels without selecting fields enhance work quality. The VOAC7602 is equipped with a wide range of new functions, including trend chart and histogram chart displays and enhanced analysis accuracy through 30k sampling/s, which exceeds expectations for normal DMMs.

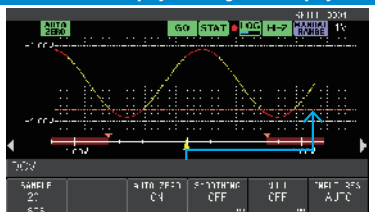
Real Time • Trend display + LIMIT judgment display



Real Time • Histogram display + LIMIT judgment display

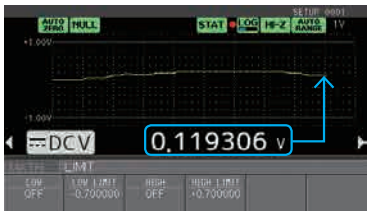


Real Time • Trend display + Analog meter display



Real Time • Numerical display + LIMIT judgment display

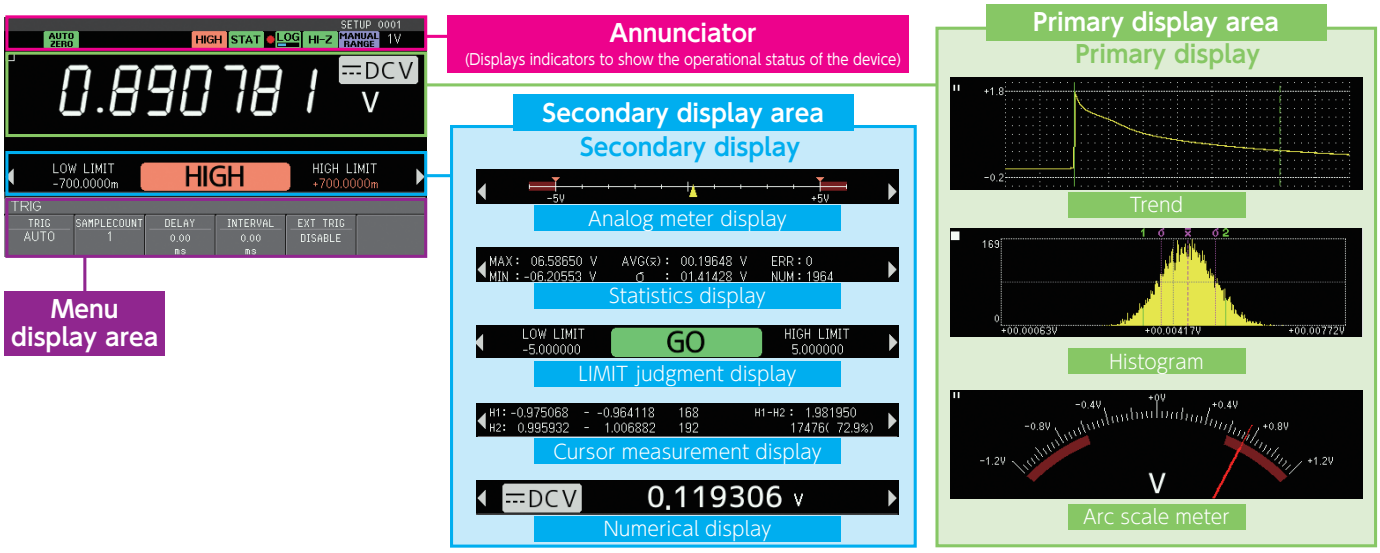
Real Time • Trend display + Data Numerical display



Arc scale meter display + Data Numerical display

A myriad of analyses display combinations are now possible without the use of a PC

The primary display consists of several displays, including the numerical display, the trend charts, the histogram charts and the arc scale meter, and a secondary display to provide a wealth of information related to each of the primary displays is also available. A wide range of screen combinations can therefore be selected in alignment with measurement requirements.



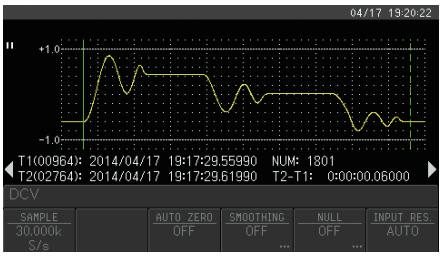
Accurate Sampling Rates Now Possible with the Bulk Mode. This contributes greatly to improved analysis accuracy

A dedicated acquisition mode was added to enable 30k sampling/s. (DCV, DCI, 2W Ω and 4W Ω with 5½ digit displays) This has greatly improved the time resolution to load data, and is useful for transferring data across to other new DMM applications.

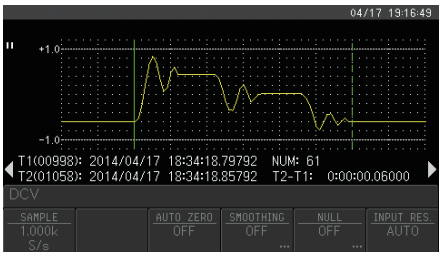
Sampling Rate Comparison

A comparison of data acquired with 1k sampling/s and 30k sampling/s using the same signals in the bulk mode.

Trend



30k sampling/s



1k sampling/s

Bulk mode

The bulk mode is a mode that concentrates only on acquiring measurement data.
Accurate sampling rates up to a maximum of 30k sampling/s are guaranteed when the display of measurement data on the screen is switched off during data acquisition. The measurement data is stored in bulk in the log memory, and can be used for displaying trends and histograms with the use of the offline browser function. Data can also be saved onto USB memories.

Logging is Possible for Long Periods of Time with Long Memory

Equipped with a data size equivalent to 100k points of data to supports extended logging periods.
Example: Logging exceeding one full day is possible at a sampling speed of one per second.

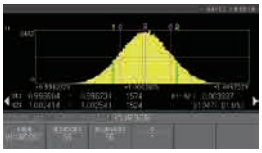
Sampling Rate (Sampling/s)	1	4	20	100	500	1k	2k	7.5k	15k	30k
Loading Time (HH:MM:SS)	27:46:40	6:56:40	1:23:20	0:16:40	0:03:20	0:01:40	0:00:50	0:00:13	0:00:07	0:00:03

Using this in combination with the trigger function's interval setting will enable parameters that are longer than the sampling cycle to be set (0 to 3,600 seconds), and even longer logging times can be obtained by setting the interval at one second or longer.

Offline Browser Function Equipped with a Powerful Cursor

Offline Histogram Chart Display Useful for Measurement Yields

The data loaded into the log memory is displayed in a histogram so that the yields can be easily measured with the cursor.
This function is conventionally carried out through PC analyses, but allowing judgment to be performed where the work is being carried out drastically improves work efficiency.



Off-line Trend Charts for Displaying the Time-Based Fluctuations in Measurements

In addition to an oscilloscope-like display, it is possible to recalculate the statistics within the range of the cursor to acquire statistical data within required ranges. It is also possible to perform this while copying the screens into the USB memory, which is very useful for improving work efficiency even further.

Vastly Upgraded Judgment Function

The VOAC7602 is capable of performing high-grade analyses based on the results of LIMIT judgment. The main feature here is the simple operations. The unit answers the questions that trouble operators, such as the number of defects occurring and the Date & Time of Occurrence.

"Occurrence Rate" Solution Screen

VOAC7502 Specifications

Performance levels hereinafter depend on the following conditions and definitions.
Warm-up time: One hour, Temperature/Humidity: 23℃±5℃/80%RH or less, Accuracy for one year, Response Time: Time to the accurate measurement at each range

1. Sampling rate and Resolution

1-1. DC Range (DCV, DCI, 2W Ω , 4W Ω)

Sampling Rate (S/s) ＊1		Display Digits	Remarks
Power Supply Frequncy:50Hz	Power Supply Frequncy:60Hz		
2.5(1) ~ 50(20)	2.5(1) ~ 60(20)	5½ digits	The Sampling rate shown in ( ) is at AUTOZERO or at 4WΩ.
100 ~ 30k	100 ~ 30k	4½ digits	The Sampling rate shown can not be selected at 4WΩ.

＊1 The Sampling rate is guaranteed only when loading data with the logging function MODE is set at the BULK mode.

1-2. AC Range (ACV, ACI)

AC Filter	Sampling Rate (S/s)		Display Digits	Response Time ＊1
	Power Supply Frequncy:50Hz	Power Supply Frequncy:60Hz		
MID	2.5	2.5	5½ digits	Within 3 seconds
HIGH	2.5 ~ 50	2.5 ~ 60	5½ digits	Within 2 seconds

＊1 Time to the accurate measurement at each range

2. Direct Current Voltage Measurement (DCV)

2-1. Accuracy and Resolution

Unit: ±(% of reading + % of range)

Range	Full Scale when 5½ Digits in Use	Resolution	Accuracy	Temperature Coefficient /℃	Input Impedance
100mV	119.999	1μV	0.018 + 0.003	0.0015 + 0.0004	1GΩ or more, or 10MΩ±1%
1V	1.19999	10μV	0.015 + 0.003	0.0015 + 0.0001	
10V	11.9999	100μV	0.012 + 0.001	0.0015 + 0.0001	
100V	119.999	1mV	0.015 + 0.003	0.0020 + 0.0001	10MΩ±1%
1000V	1100.00	10mV	0.015 + 0.003	0.0020 + 0.0001	

・Sampling Rate: 1S/s ・Response Time: within 1 second
・Maximum Permissible Voltage: 100mV ~ 100V Range: 800Vpeak (continual), 1100Vpeak (for 1 minute)
1000V Range: ±1100Vpeak (continual)

2-2. Noise Reduction

(50Hz/60Hz±0.1%)

PLC	NMRR	CMRR Unbalance Resistance 1k Ω
Integral Multiple for 1 PLC	55dB	120dB
Other than the above	0dB	-

3. Alternating Current Voltage Measurement (ACV)

3-1. Resolution and Measurement Range

Actual Effective Value Detection Crest Factor :<3

Range	Full Scale	Resolution	Measurement Range		Input Impedance
			MD	HIGH	
100mV	119.999	1μV	20Hz ~ 100kHz	200Hz ~ 100kHz	Approx.1MΩ// 100pF or less
1V	1.19999	10μV			
10V	11.9999	100μV			
100V	119.999	1mV			
750V	750.00	10mV			

3-2. Accuracy

Unit: ±(% of reading + % of range)

Range	Frequency	Accuracy	Temperature Coefficient
100.000mV ~ 750.000V	20Hz ~ 45Hz	0.70 + 0.04	0.070 + 0.004
	45Hz ~ 100Hz	0.20 + 0.04	0.020 + 0.004
	100Hz ~ 20kHz	0.10 + 0.04	0.010 + 0.004
	20kHz ~ 50kHz	0.20 + 0.05	0.020 + 0.005
	50kHz ~ 100kHz	0.60 + 0.08	0.060 + 0.008

・The above shows Accuracy at sine wave.
・The maximum permissible voltage is 750Vrms or 1100Vpeak, but the DC component is ±500V or less.
・The 750V range is restricted to 100kHz or 8 x 107[V・Hz).
・The Crest Factor (CF) is guaranteed to upto either 3 or the maximum input voltage during full scale input, whichever is smaller.

4. Direct Current Measurement (DCI)

4-1. Accuracy and Resolution

Unit: ± (% of reading + % of range)

Range	Full Scale when 5½ Digits in Use	Resolution	Accuracy	Temperature Coefficient	Shunt Resistance
1mA	1.19999	10nA	0.050 + 0.002	0.003 + 0.0005	90Ω
10mA	11.9999	100nA	0.050 + 0.002	0.003 + 0.0005	5Ω
100mA	119.999	1μA	0.050 + 0.002	0.005 + 0.0005	5Ω
1A	1.19999	10μA	0.050 + 0.002	0.003 + 0.0005	0.1Ω
3A	3.0000	100μA	0.150 + 0.002	0.005 + 0.0005	0.1Ω

・The above is applied to the situation of Resolution 5½ digits. ・The Maximum Permissible Current: 3ADC or 3Arms (continual) (Guaranteed with 3A fuse)

5. Alternating Current Measurement (ACI)

5-1. Resolution and Measurement Range

Actual Effective Value Detection Crest Factor:<3

Range	Full Scale	Resolution	Measurement Range		Shunt Resistance
			MD	HIGH	
1A	1.19999	10μA	20Hz ~ 5kHz	200Hz ~ 5kHz	0.1Ω
3A	3.0000	100μA			

5-2. Accuracy

Unit:± (% of reading + % of range)

Range	Frequency	Accuracy	Temperature Coefficient
1A/3A	20Hz ~ 45Hz	0.70 + 0.1	0.100 + 0.01
	45Hz ~ 100Hz	0.35 + 0.1	0.035 + 0.01
	100Hz ~ 5kHz	0.50 + 0.1	0.050 + 0.01

・The above shows Accuracy at sine wave. ・The Maximum Permissible Current: 3Arms (continual) (Guaranteed with 3A fuse)

6.2 Terminal Resistance Measurement (2W Ω) /4 terminal resistance Measurement (4W Ω

6-1. Resolution, Accuracy and Measurement Current

Unit: ±(% of reading+ % of range)

Range	Full Scale	Resolution	Accuracy	Temperature Coefficient	Measurement Current
100Ω	119.999	1mΩ	0.020 + 0.003	0.002 + 0.0004	Approx.1mA
1kΩ	1.19999	10mΩ	0.018 + 0.003	0.002 + 0.0001	Approx.1mA
10kΩ	11.9999	0.1Ω	0.018 + 0.003	0.002 + 0.0001	Approx.100μA
Range	Full Scale	Resolution	Accuracy	Temperature Coefficient	Measurement Current
100kΩ	119.999	1Ω	0.018 + 0.003	0.002 + 0.0001	Approx.10μA
1MΩ	1.19999	10Ω	0.018 + 0.003	0.002 + 0.0002	Approx. 5μA
10MΩ	11.9999	100Ω	0.250 + 0.005	0.250 + 0.0005	Approx. 500nA
100MΩ	119.999	1kΩ	1.500 + 0.005	1.500 + 0.0010	Approx. 500nA //10MΩ

・The accuracy of the above shows 4 terminals resistance measurement or 2 terminals resistance measurement after zero compensation with the NULL operation using 5½ digits resolution. A margin of error equalling 0.2Ω is added to the 2 terminals resistance measurement if the NULL operation is not used.
・The Maximum Permissible Voltage
Between Ω and COM Terminals: 800Vpeak (continual),1100Vpeak (for 1 minute)
Between Sense Hi and Lo: 200 Vpeak
・Terminal Open-Circuit Voltage <17 V

7. Continuity Tests (CONT ▪ıı|) , Diodes (→▶|-)

Unit: ±(% of reading + % of range)

	Measurement Current	Accuracy	Temperature Coefficient	Remarks
Continuity Test	Approx.1mA	0.020+ 0.020	0.002+ 0.002	Threshold:1Ω~ 1000Ω
Diode	Approx. 1mA	0.020+ 0.020	0.002+ 0.002	Measurment Range: 0.1mV ~ 1.1999V

・The Maximum Permissible Voltage: 800Vpeak (continual), 1100Vpeak (for 1 minute)

8. Frequency Measurement (FREQ)

8-1. Accuracy and Display Digit Count,

AC Coupling, Reciprocal System, Crest Factor<3

Gate Time	Display Digit Count and Measurement Range	Accuracy (%)	Accuracy (%)	Accuracy (%)	Accuracy (%)
		3 ~ 5Hz	5 ~ 10Hz	10 ~ 40Hz	40 ~ 300kHz
100ms	6 digits: 3.00000Hz ~ 300.000kHz	0.1	0.05	0.03	0.01
10ms	5 digits: 3.0000Hz ~ 300.00kHz	0.1	0.05	0.03	0.01
1ms	4 digits: 3.000Hz ~ 300.0kHz	0.1	0.05	0.03	0.01

・The Maxium Permissible Voltage: 750Vrms or 1100Vpeak, but the DC component is ±500V or less (continual).
・It is possible to switch the input range between automatic and manual for a range between ACV 100mV and 750V.
・Input Range: 100mVrms to 750Vrms between 3Hz and 100kHz, however, Maximum of 2.2 x 107 [V・HZ] between 100kHz and 300KHz.
・Maximum 100kHz is guaranteed for input of 200Vrms or more.
・Input values that are less than 3Hz or more than 300kHz may be measured and displayed, but Accuracy is not guaranteed.

9. Trigger Functions

Trigger Mode	AUTO, SINGLE	Trigger Delay	0.00ms ~ 3,600 s (Resolution 10μs)
Trigger Sampling Count	1 ~ 100,000	Trigger Intervals	0.00ms ~ 3,600 s (Resolution 10μs)

10. Operation Functions

Moving average, NULL, Scaling, Decibel, Statistic and Limit Operations

11. Logging Functions

NORMAL Mode	Measurement data is stored in the memory while monitoring it. The sampling rate is not guaranteed.
BULK Mode	Masurement data cannot be monitored in the real-time, but for which the sampling rate is guaranteed.
Data Size	NORMAL Mode: 100k, BULK Mode:1k, 2k, 5k, 10k, 20k, 50k, 100k Readings
STOP EVENT(BULK Mode only)	The following four ways can be selected; 1. NONE: No setting , 2. EXT TRIG: External TRIG input, 3. LEVEL: When the measurement value exceeds the threshold, 4. LIMIT; The four GO/NO GO (HIGH or LOW)/HIGH/LOW settings can be selected from the LIMIT judgment result.
Post Trigger Count (BULK Mode only)	The acquiring data after STOP EVENT can be counted at 0 to100%. (The setting resolution is 1%)

12. Primary Display

Value Display	Font: Can be selected from 7 segments and NORMAL(gothic), Size: Can be selected from NORMAL and LARGE It is possible to display ACV/Frequency and NULL/Measured Value, and etc. at the same time when NORMAL has been set.
Trend Chart Display	Horizontal Axis: Can be selected from AUTO, FULLSCALE and MANUAL Offline Browsing Mode: Scrolling and expanding waveforms , Cursor display and Search function
Histogram Chart Display	BIN count: 2 ~ 400, Statistics Cursor and H1/H2 cursors functions are available. Offline Browsing Mode: The histogram can be generated by changing the number of bin, etc.
Arc Scale Meter Display	Scale: Can be selected from AUTO, FULLSCALE, MANUAL and LOG
Limit Display	Improves visual recognition of the judgment result (GO, HIGH, LOW) on the primary display, the display should be greatly larger than that of the secondary display.

13. Secondary Display

NUMERIC display, ANALOG METER display, STATISTIC display, or LIMIT calculation result display can be selected. Trend Chart display, Histogram Chart display, Each Chart Information display,or Each Cursor Measurement display also can be selected.

14. General Specifications

Interfaces	USB2.0 (Standard), GPIB (Option), LAN & RS-232 (Option), DIO Interface (Option) *USB Interface is available for remote usage only. USB memory, etc. can not be used.
REMOTE Command	SCPI or IWATSU VOAC752x series
Rear Input/Output terminals	TRIG input, COMPLETE output
Setup Memory	Internal 10
LCD	4.3-inch color LCD, 480 × 272dots, TFT active matrix, LED back light
Warm-up time	One hour after power switched on
Operation Guaranteed Temperature and Humidity	0℃~ 50℃ (less than 80% or equivalent moisture at 40℃ . No Condensation)
Storage Temperature and Humidity	− 20℃~ +60℃ (less than 90% or equivalent moisture at 40℃ . No Condensation)
Power Supply	AC100V/110V/220V/240V ± 10 % , 50Hz/60Hz All supplies with the exception of AC100V are optional (factory option)
Power Consumption	14VA or less (including options)
Withstand Voltage	DC ± 500V(between input terminals for all front panel measurements and the earth.)
Installation (Over-Voltage) Category	Cattegory II (Local level, Electrical appliances, Portable appliances)
Contamination Level	Contamination level 2 *Must not be used in envirnments containing conductive contamination.
External Dimensions	Approx. 225Wx100Hx366D mm (excluding the legs, handle, knobs and other protruding components)
Weight	Approx. 3.0kg (including the protectors and options)
Accessories	Test leads, Power cable, User's guide, Instruction manual(CD) ,Fuses(2pcs)

15. Configuration

Main body	VOAC7502	Digital Multimeter Main body
Option	SC-361	LAN & RS-232 Interface
	SC-362	DIO Interface
	SC-363	GPIB Interface

VOAC7602 Specifications

Performance levels hereinafter depend on the following conditions and definitions.
Warm-up time: One hour, Temperature/Humidity: 23℃±5℃/80%RH or less, Accuracy for one year, Response Time: Time to the accurate measurement at each range

1. Sampling rate and Resolution

1-1. DC Range (DCV, DCI, 2W Ω , 4W Ω)

Sampling Rate(S /s) ＊1		Display Digits	Remarks
Power Supply Frequency: 50Hz	Power Supply Frequency: 60Hz		
2.5(1) ~ 50(20)	2.5(1) ~ 60(20)	6½ digits	The Sampling rate shown in ( ) is at AUTOZERO or at 4WΩ.
100 ~ 30k	100 ~ 30k	5½ digits	The Sampling rate shown can not be selected at 4WΩ.

*1. The sampling rate is only guaranteed when loading data with the logging function MODE is set at the BULK mode.

1-2. AC Range (ACV, ACI)

AC Filter	Sampling Rate(S /s)		Display Digits	Response Time ＊1
	50Hz	60Hz		
MID	2.5	2.5	6½ digits	Within 3 seconds
HIGH	2.5 ~ 50	2.5 ~ 60	6½ digits	Within 2 seconds

＊1 Time to accurate measurement at each range

2. Direct Current Voltage Measurements (DCV)

2-1. Accuracy and Resolution

Unit: ±(% of reading + % of range)

Range	Full Scale when 6½ Digits in Use	Resolution	Accuracy	Temperature Coefficient /℃	Input Impedance
100mV	119.9999	0.1μV	0.0050+0.0035	0.0005+0.0005	1GΩ or more, or 10MΩ±1%
1V	1.199999	1μV	0.0040+0.0007	0.0005+0.0001	
10V	11.99999	10μV	0.0035+0.0005		
100V	119.9999	0.1mV	0.0045+0.0006		10MΩ±1%
1000V	1100.000	1mV	0.0045+0.0010		

・Sampling Rate: 1S/s ・Response Time: within 1 second
・Maximum Permissible Voltage: 100mV ~ 100V Range: 800Vpeak (continual), 1100Vpeak (for 1 minute)
1000V Range: ±1100Vpeak (continual)

2-2. Noise Reduction

(50Hz/60Hz±0.1%)

PLC	NMRR	CMRR Unbalance Resistance1k Ω
Integral Multiple for 1 PLC	55dB	120dB
Other than the above	0dB	-

3. Alternating Current Voltage Measurements (ACV)

3-1. Resolution and Measurement Range

Actual Effective Value Detection Crest Factor :<5

Range	Full Scale	Resolution	Measurement Range		Input Impedance
			MD	HIGH	
100mV	119.9999	0.1μV	20Hz ~ 300kHz	200Hz ~ 300kHz	Approx.1MΩ// 100pF or less
1V	1.199999	1μV			
10V	11.99999	10μV			
100V	119.9999	0.1mV			
750V	750.000	1mV	20Hz ~ 100kHz	200Hz ~ 100kHz	

3-2. Accuracy

Unit: ±(% of reading + % of range)

Range	Frequency	Accuracy	Temperature Coefficient
100.0000mV	20Hz ~ 45Hz	0.70 + 0.04	0.070 + 0.004
	45Hz ~ 100Hz	0.20 + 0.04	0.020 + 0.004
	100Hz ~ 20kHz	0.06 + 0.04	0.005 + 0.004
	20kHz ~ 50kHz	0.12 + 0.05	0.011 + 0.005
	50kHz ~ 100kHz	0.60 + 0.08	0.060 + 0.008
	100kHz ~ 300kHz	4.00 + 0.50	0.200 + 0.020
1.000000V ~ 750.000V	20Hz ~ 45Hz	0.70 + 0.03	0.070 + 0.003
	45Hz ~ 100Hz	0.20 + 0.03	0.020 + 0.003
	100Hz ~ 20kHz	0.06 + 0.03	0.005 + 0.003
	20kHz ~ 50kHz	0.11 + 0.05	0.011 + 0.005
	50kHz ~ 100kHz	0.60 + 0.08	0.060 + 0.008
	100kHz ~ 300kHz	4.0 + 0.50	0.200 + 0.020

・The above shows Accuracy at sine wave.
・The maximum permissible voltage 750Vrms or 1100Vpeak, but the DC components is ±500V or less.
・The 750V range is restricted to 100kHz or 8 x107 (V・Hz)
・The Crest Factor (CF) is guaranteed to upto either 3 or the maximum input voltage during full scale input, whichever is smaller.

4. Direct Current Measurement (DCI)

4-1. Accuracy and Resolution

Unit:±(% of reading + % of range)

Range	Full Scale when 5½ Digits in use	Resolution	Accuracy	Temperature Coefficient/℃	Shunt Resistance
1mA	1.199999	1nA	0.050 + 0.006	0.0020 + 0.0050	90Ω
10mA	11.99999	10nA	0.050 + 0.020	0.0020 + 0.0020	5Ω
100mA	119.9999	100nA	0.050 + 0.005	0.0020 + 0.0005	5Ω
1A	1.199999	1μA	0.100 + 0.010	0.0050 + 0.0010	0.1Ω
3A	3.00000	10μA	0.120 + 0.020	0.0050 + 0.0020	0.1Ω

・The above is applied to the condition of Resolution 6½ digits. ・The Maximum Permissible Current: All Ranges;3ADC or 3Arms (continual) (Guaranteed with 3A fuse)

5. Alternating Current Measurement (ACI)

5-1. Resolution and Measurement Range

Actual Effective Value Detection Crest Factor: <5

Range	Full Scale	Resolution	Measurement Range		Shunt Resistance
			MD	HIGH	
1A	1.199999	1μA	20Hz ~ 5kHz	200Hz ~ 5kHz	0.1Ω
3A	3.00000	10μA			

5-2. Accuracy

Unit:±(% of reading + % of range)

Range	Frequency	Accuracy	Temperature Coefficient
1A	20Hz ~ 45Hz	0.70 + 0.04	0.100 + 0.006
	45Hz ~ 100Hz	0.30 + 0.04	0.035 + 0.006
	100Hz ~ 5kHz	0.10 + 0.04	0.015 + 0.006
3A	20Hz ~ 45Hz	0.70 + 0.06	0.100 + 0.006
	45Hz ~ 100Hz	0.35 + 0.06	0.035 + 0.006
	100Hz ~ 5kHz	0.15 + 0.06	0.015 + 0.006

・The above shows Accuracy at Sine Wave. ・Maxium Permissible Current: 3Arms (continual) (Guaranteed with 3A fuse)

6. 2 Terminals resistance measurement (2W Ω)/4 Terminals resistance measurements (4W Ω)

6-1. Resolution, Accuracy and Measurement Current

Unit: ±(% of reading+% of range)

Range	Full Scale	Resolution	Accuracy	Temperature Coefficient	Measurement Current
100Ω	119.9999	0.1mΩ	0.010 + 0.004	0.0006 + 0.0005	Approx. 1mA
1kΩ	1.199999	1mΩ	0.010 + 0.001	0.0006 + 0.0001	Approx. 1mA
10kΩ	11.99999	10mΩ	0.010 + 0.001	0.0006 + 0.0001	Approx. 100μA
100kΩ	119.9999	0.1Ω	0.010 + 0.001	0.0006 + 0.0001	Approx. 10μA
1MΩ	1.199999	1Ω	0.010 + 0.001	0.0010 + 0.0002	Approx. 5μA
10MΩ	11.99999	10Ω	0.040 + 0.001	0.0030 + 0.0004	Approx. 500nA
100MΩ	119.9999	100Ω	0.800 + 0.010	0.1500 + 0.0002	Approx. 500nA //10MΩ

・The accuracy of the above shows 4 terminals resistance measurement or 2 terminals resistance measurement after zero compensation with the NULL operation using 6½ digits resolution. A margin of error equaliing 0.2Ω is added to the 2 terminals resistance measurement if the NULL operation is not used.
・Maximum Permissible Voltage
Between the Ω and COM Terminals: 800Vpeak (continual),1100Vpeak(for 1 minute)
Between Sense Hi-Lo: 200 Vpeak
・Terminal Open-Circuit Voltage <17 V

7. Continuity Tests(CONT •ıı|) , Diodes(▶|-)

Unit:±(% of reading+ % of range)

	Measurement Current	Accuracy	Temperature Coefficient	Remarks
Continuity Test	Approx.1mA	0.010+ 0.020	0.001+ 0.002	Threshold: 1Ω~ 1000Ω
Diode	Approx.1mA	0.010+ 0.020	0.001+ 0.002	M't Range: 0.1mV ~ 1.1999V

・Maxium Permissible Voltage: 800Vpeak (continual), 1100Vpeak (for 1 minute)

8. Temperature Measurement (TEMP, TC: Thermocouple)

8-1. Accuracy and Resolution

Unit:±(% of reading+Digits)

Thermocouple	Measurement Range (℃)	Accuracy	Resolution	Max. allowable voltage
R	-50 ~ 0	0.02+70	0.01℃	800 Vpeak (Continual) 1100 Vpeak (1 minute)
	0 ~ +100	0.02+50		
	+100 ~ +1765	0.02+30		
K(CA)	-200 ~ -100	0.15+50		
	-100 ~ 0	0.15+35		
	0 ~ +1370	0.15+20		
T(CC)	-200 ~ -100	0.15+50		
	-100 ~ 0	0.15+35		
	0 ~ +400	0.15+20		
J(IC)	-200 ~ -100	0.15+50		
	-100 ~ 0	0.15+35		
	0 ~ +1200	0.15+20		
E(CRC)	-200 ~ -100	0.15+50		
	-100 ~ 0	0.15+35		
	0 ~ +1000	0.15+20		

・The above does not include thermocouple accuracy.
・The cold junction temperature is input by the TEMP/SENSOR menu, and the margin of error is not included.
・±0.1℃ /℃ (total thermocouple) is added to the guaranteed operating temperature between 0℃ to18℃ and 28℃ to 50℃ .
・-200℃ or less tempareture may be measured and displayed, but Accuracy is not guaranteed.
・The standard thermoelectromotive force is aquired with piecewise linear approximation calculations in accordance with JIS C 1602-1995.

9. Temperature Range (TEMP, RTD: Resistance temperature detector)

9-1. Measurement Range, Accuracy and Resolution

Unit:±(% of reading+Digits)

RTD	Measurement Range (℃)	Accuracy	Temperature Coefficient	Resolution
Pt100	-200 ~ +850	0.06℃	0.003℃	0.01℃
JPt100	-200 ~ +510			

・Pt100: Conforms to JIS C1604.JIS-1997 standards.
・JPt100:Conforms JIS C1604 -1989 standards.
・The 4 conductance cable equation does not include measurement cable (or probe) accuracy.
・Maximum Permissible Voltage: 800Vpeak (continual), 1100Vpeak (for 1 minute)

10. Frequency Measurement (FREQ)

10-1. Accuracy, Display Digit Count

AC Coupling, Reciprical System, Crest factor<5

Gate Time	Display Digit Count, Measurement Range	Accuracy(%)			
		3 ~ 5Hz	5 ~ 10Hz	10 ~ 40Hz	40 ~ 300kHz
1s	7 digits: 3.000000Hz ~ 300.0000kHz	0.1	0.05	0.03	0.01
100ms	6 digits: 3.00000Hz ~ 300.000kHz	0.1	0.05	0.03	0.01
10ms	5 digits: 1.0000Hz ~ 300.00kHz	0.1	0.05	0.03	0.01
1ms	4 digits: 3.000Hz ~ 300.0kHz	0.1	0.05	0.03	0.01

・Maxium Permissible Voltage: 750Vrms or 1100Vpeak, but the DC component is ±500V or less (continual).
・Input Range: 100mVrms to 750Vrms between 3Hz and 100kHz
*However, up to a maximum of 2.2 x 107 [V/HZ] between 100kHz and 300KHz
・Maximum 100kHz is guaranteed for input of 200Vrms or more.

11. Trigger Functions

Trigger Mode	AUTO, SINGLE	Trigger Delay	0.00ms ~ 3,600 s (Resolution 10μs)
Trigger Sampling Count	1 ~ 100,000	Intervals	0.00ms ~ 3,600 s (Resolution 10μs)

12. Operation Functions

Moving average, NULL, Scaling, Decibel, Statistic and Limit Operations

13. Logging Function

NORMAL Mode	Measurement data is stored in the memory while monitoring it. The sampling rate is not guaranteed.
BULK Mode	Masurement data cannot be monitored in the real-time, but for which the sampling rate is guaranteed.
Data Size	NORMAL Mode: 100k, Reading fixed BULK Mode: 1k, 2k, 5k, 10k, 20k, 50k, 100k Readings
STOP EVENT(BULK Mode only)	he following four ways can be selected; 1. NONE: No setting , 2. EXT TRIG: External TRIG input, 3. LEVEL: When the measurement value exceeds the threshold, 4. LIMIT; The four GO/NO GO (HIGH or LOW)/HIGH/LOW settings can be selected from the LIMIT judgment result.
Post Trigger Count (BULK Mode only)	The acquiring data after STOP EVENT can be counted at 0 to100%. (The setting resolution is 1%)

14. Primary Display

Value Display	Font: Can be selected from 7 segments and NORMAL(gothic), Size: Can be selected from NORMAL and LARGE It is possible to display ACV/Frequency and NULL/Measured Value, and etc. at the same time when NORMAL has been set.
Trend Chart Display	Horizontal Axis: Can be selected from AUTO, FULLSCALE and MANUAL Offline Browsing Mode: Scrolling and expanding waveforms , Cursor display and Search function
Histogram Chart Display	BIN count: 2 ~ 400, Statistics Cursor and H1/H2 cursors functions are available. Offline Browsing Mode: The histogram can be generated by changing the number of bin, etc.
Arc Scale Meter Display	Scale: Can be selected from AUTO, FULLSCALE, MANUAL and LOG
Limit Display	Improves visual recognition of the judgment result (GO, HIGH, LOW) on the primary display, the display should be greatly larger than that of the secondary display.

15. Secondary Display

NUMERIC display, ANALOG METER display, STATISTIC display, or LIMIT calculation result display can be selected. Trend Chart display, Histogram Chart display, Each Chart Information display,or Each Cursor Measurement display also can be selected.

16. General Specifications

Interfaces	USB2.0 (Standard), GPIB (Option), LAN & RS-232 (Option), DIO Interface (Option) *USB Interface is available for remote usage only. USB memory, etc. can be used.
REMOTE Command	SCPI or IWATSU VOAC752x series
Rear Input/Output terminals	TRIG input, COMPLETE output
Setup Memory	Internal 10
LCD	4.3-inch color LCD, 480 x 272dots, TFT active matrix, LED back light
Warm-up time	One hour after power switched on
Operation Guaranteed Temperature and Humidity	0℃~ 50℃ (less than 80% or equivalent moisture at 40℃ . No Condensation)
Storage Temperature and Humidity	– 20℃~ +60℃ (less than 90% or equivalent moisture at 40℃ . No Condensation)
Power Supply	AC100V/110V/220V/240V ± 10 % , 50Hz/60Hz All supplies with the exception of AC100V are optional (factory option)
Power Consumption	21VA or less (including options)
Withstand Voltage	DC ± 500V(between input terminals for all front panel measurements and the earth.)
Installation (Over-Voltage) Category	Cattegory II (Local level, Electrical appliances, Portable appliances)
Contamination Level	Contamination level 2 *Must not be used in envirnments containing conductive contamination.
External Dimensions	Approx. 225Wx100Hx366D mm (excluding the legs, handle, knobs and other protruding components)
Weight	Approx. 3.0kg (including the protectors and options)
Accessories	Test leads, Power cable, User's guide, Instruction manual(CD) ,Fuses(2pcs)

17. Configuration

Main body	VOAC7602	Digital Multimeter Main body
Option	SC-361	LAN & RS-232 Interface
	SC-362	DIO Interface
	SC-363	GPIB Interface

Standard Functions List

Main body	VOAC7602	VOAC7502	Remarks
Direct-Current Voltage measurement(DCV)	○	○	100 mV ~ 1000 V
Alternating-Current Voltage measurement(ACV)	○	○	100 mV ~ 750 V
Direct-Current Current measurement(DCI)	○	○	1 mA ~ 3 A
Alternating-Current Current measurement(ACI)	○	○	1 A ~ 3 A
2-wire lelvin test(2WΩ)	○	○	100 Ω~ 100 MΩ
4-wire kelvin test(4WΩ)	○	○	100 Ω~ 100 MΩ
Continuity test	○	○	
Diode test	○	○	
Frequency test(FREQ)	○	○	3 Hz ~ 300 kHz
Temperature test(TEMP)	○	×	Thermocouple(Type-R、K、T、J、E) Resistance temperature detectrr (Pt100、JPt100)
NULL operation	○	○	
SMOOTHING	○	○	
Statistic operation	○	○	MAX/MIN/AVG/Standard Deviation
Scaling operation	○	○	(X-a)*b/c、d/x
Decibel operation	○	○	dB、dBm、dBV
Limit operation	○	○	Hi/Go/Lo
Logging function(Off line browsing function)	○	○	Modes: NORMAL/BULK
Interval test	○	○	
Trend Chart display(On line/Off line)	○	○	
Histogram Chart display(On line/Off line)	○	○	
USB host port function(USB memory is used.)	○	×	Screen/Data Out put of LOG memory , Save/Recall, Firmwafre Updates
Remote Interface(USB)	○	○	
Panel Setting memory	○	○	Internal memory:10
Remote Interface(LAN & RS-232)	△	△	LAN&RS-232 Interface SC-361 is required.
DIO output	△	△	SC-362 is required.
Remote Interface(GPIB)	△	△	GP-IB Interface SC-363 is required.

note) ○ : Equipped as standard
△ : Factory option
X : Not available

VOAC7602 / 7502 Optional Accessories

LAN&RS-232 Interface
SC-361

* Factory option
* Can not be munted at the same time as the SC-363(GPIB Interface).

DIO Interface
SC-362

* Factory option

GPIB Interface
SC-363

* Factory option
* Can not be mounted at the same time as SC-361(LAN&RS-232 Interface).

USB-RS Converter
SC-525

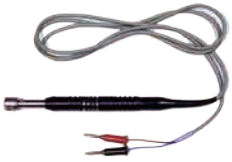
USB-RS-232 conversion cable

Sheath-type thermocouple (Type-K)
SC-0107

* Cold-junction-temperature Input is required.
* This product can not be used for VOAC7502.

Sheath-type thermocouple (Type-K)
SC-0116

* Cold-junction-temperature Input is required.
* This product can not be used for VOAC7502.



Clamp-on current probe
SC-028

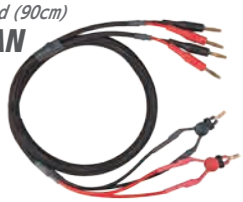
DC180A, AC130A

High-resistance test lead
SC-004

Shielded cable for high-value resistance less than100MΩ

4-Wire Kelvin test lead (90cm)
TKL 90cm BAN

* Manufactured by PMK GmbH



Test leads
SC-020

Standard accessories
Red 1pc, Black 1pc

Alligator clip H
SC-023

For SC-020 only
Strength voltage:
600V / 10A, CE compliance

Arrow clip
SC-026

For SC-020 AC30V/DC60V 3A

4-wire Kelvin test clips (Mechatronics products)
KELVIN : L
KELVIN : M
KELVIN : S

Digital Multimeter (portable type)

VOAC7500H Series

GPIB

Isolate 2-channel input dual function
0.1μV, 509999, 5½ digits

VOAC7523H

Isolate 2-channel input dual function
1μV, 509999, 5½ digits

VOAC7520H

GPIB

4-terminal resistance measurement
dual function 0.1μV, 509999, 5½ digits

VOAC7522H

4-terminal resistance measurement
dual function 1μV, 509999, 5½ digits

VOAC7521H

Digital Multimeters VOAC7523H/7522H/7520H/7521H Specifications

* Accuracy (±X% of reading +Y digits) indicated by X+Y
The measuring accuracy indicated below can be obtained for a year following the calibration of the instrument.

1. Typical Sample Rate and Resolution

Sample Rate	Resolution	Reading Rate	Hum Rejection
SLOW	5.5-digit	approx. 4 times/sec	Yes
MID	5.5-digit	approx. 20 times/sec	Yes
FAST	4.5-digit	approx. 100 times/sec	N/A

2. DC Volt (DCV) 50mV range is for the VOAC7523H / 7522H only.

Range	Resolution		Input Resistance	Accuracy*	
	5.5-digit	4.5-digit		SLOW/MID	FAST
50mV	0.1μV	1μV	100MΩ or more	0.025+10	0.025+15
500mV	1μV	10μV	1000MΩ or more	0.012+5	0.012+10
5V	10μV	100μV	0.012+2	0.012+7	
50V	100μV	1mV	approx. 10MΩ	0.016+5	0.016+10
500V	1mV	10mV		0.016+2	0.016+7
1000V	10mV	100mV			

The accuracy in the 50mV and 500mV ranges is specified after zero compensation through the REL operation.
Sample rate in the 50mV range
SLOW/MID: Approx. 0.5 times/sec, FAST: Approx. 50 times/sec
Max. input voltage: 50mV to 5V range ± 800V (continuous) 50V to 1000V range ± 1100V (continuous)

Resolution and noise rejection

Resolution	Sample Rate	NMRR	CMRR
5.5-digit	SLOW	55dB or more	120dB or more
5.5-digit	MID	55dB or more	120dB or more
4.5-digit	FAST	0dB	55dB or more

3. CH-B DC Volt (DCV) VOAC7523H / 7520H only

Range	Resolution	Input Resistance	Accuracy*	
	4.5-digit		SLOW/MID	FAST
5V	100μV	CH-B:H to CH-B:L 10MΩ ± 3%	0.025+2	0.025+30
50V	1mV	CH-B:H to CH-A:L 5MΩ ± 3%		0.025+8
300V	10mV	CH-B:L to CH-A:L 5MΩ ± 3%		0.025+5

Max. input voltage: ± 300V, between CH-A L and CH-B ± 300V

Resolution and noise rejection

Resolution	Sample Rate	NMRR	CMRR	Isolation between CH-A and CH-B
4.5-digit	SLOW/MID	55dB or more	120dB or more	56dB or more
4.5-digit	FAST	0dB	55dB or more	

4. AC Volt (ACV, DC+ACV) detection of True RMS
Up to 100kHz for VOAC7521H / 7520H

Range	Resolution	Measurement Range		Input Resistance
	5.5-digit	SLOW	MID/FAST	
500mV	1μV	15Hz to 300kHz	200Hz to 300kHz	less than approx. 1MΩ // 100pF
5V	10μV			
50V	100μV			
500V	1mV	45Hz to 100kHz	200Hz to 100kHz	
750V	10mV	45Hz to 20kHz	200Hz to 20kHz	

Accuracy: SLOW Sample (Sine wave Amplitude at 5% to 100% of fullscale of range)

Frequency	Accuracy*
15Hz to 45Hz	0.5+150
45Hz to 100Hz	0.25+150
100Hz to 30kHz	0.2+150
30kHz to 100kHz	0.5+300
100kHz to 300kHz	2.5+1000

Coefficient to input other than sine wave

Crest Factor	Crest Factor		
	1 to 1.5	1.5 to 2	2 to 3
15Hz to 30kHz	0.05%	0.15%	0.30%
30kHz to 300kHz	0.20%	-	-

Resnponse time

Sample Rate	Resolution	Reading Rate	Response Time
SLOW	5.5-digit	4 times/sec	less than 3 sec
MID/FAST	5.5-digit	20 times/sec	less than 2 sec

Max. input voltage: 780Vrms, ± 1100V DC (continuous)
In the case of DC+ACV, 500 (less than 45Hz) or 300 (45Hz or higher) must be added to the value of Accuracy digit in above.
Sample rate of FAST becomes the same values as MID (approx. 20 times/sec).

5. DC Current (DCA)

Range	Resolution		Accuracy*		Input Resistance
	5.5-digit	4.5-digit	SLOW/MID	FAST	
5mA	10nA	100nA	0.05+7	0.05+17	150Ω or less
50mA	100nA	1μA			15W or less
500mA	1μA	10μA			2W or less
10A	100μA	1mA	0.2+7	0.2+17	0.1Ω or less

Auto range is not available between 5mA to 500mA range and 10A range because of using different input terminals.
Max. input current: 500mA at 5mA to 500mA ranges (FUSE 0.5A/250V)
10A at 10A range (FUSE 15A/250V)

6. AC Current (ACA, DC+ACA)

Range	Resolution	Measurement Range		Input Resistance
	5.5-digit	SLOW/MID	FAST	
5mA	10nA	15Hz to 5kHz	200Hz to 5kHz	150Ω or less
50mA	100nA			15W or less
500mA	1μA	45Hz to 5kHz		2W or less
10A	100μA			0.1W or less

Accuracy: SLOW Sample (Sine wave) amplitude at 5% to 100% of fullscale (10% to 100% for10A range)

Frequency	Accuracy*	Crest Factor		
		1 to 1.5	1.5 to 2	2 to 3
15Hz to 45Hz	1+200	0.05%	0.15%	0.30%
45Hz to 1kHz	0.4+200			
1kHz to 5kHz	5.0+200			

Response time

Sample Rate	Resolution	Reading Range	Response time
SLOW	5.5-digit	4 times/sec	less than 3 sec
MID/FAST	5.5-digit	20 times/sec	less than 2 sec

Max. input current: 500mA for 5mA to 500mA ranges (FUSE 0.5A)
10A for 10A range (FUSE 15A)
DC Component on input current must be included in the Max. input current.
In the case of 10A range at 45Hz to 1kHz, 0.3 must be added to %.
In the case of DC+ACA, 500 (less than 45Hz) or 300 (45Hz or higher) must be added to the value of Accuracy in above.
Sample rate of FAST becomes the same value as MID (approx. 20 times/sec).

7. Resistance (2 Wire Ω /4 Wire Ω) 4 Wire Ω : VOAC7522H / 7521H only

Range	Resolution		Accuracy*		Test Current
	SLOW/MID	FAST	SLOW/MID	FAST	
50Ω	0.1mΩ	1mΩ	0.025+10	0.025+15	approx. 10mA
500Ω	1mΩ	10mΩ	0.014+3	0.014+8	approx. 10mA
5kΩ	10mΩ	0.1Ω			approx. 1mA
50kΩ	0.1Ω	1Ω			approx. 100μA
500kΩ	1Ω	10Ω	0.015+3	0.015+33	approx. 10μA
5MΩ	10Ω	10Ω	0.033+30	0.033+30	approx. 1μA
50MΩ	100Ω	100Ω	0.25+30	0.25+30	approx. 100nA
500MΩ	1kΩ	1kΩ	1.5+50	1.5+50	approx. 10nA

Max. input voltage: ± 500V peak Open circuit test voltage: 12V or less
The accuracy at 50Ω to 5kΩ range are specified after zero compensation through the REL operation.
Sample rate of FAST at 5MΩ to 500MΩ range becomes the same value as MID (approx. 20 times/sec).

8. Low-Power Resistance (2 Wire Ω)

Range	Resolution	Accuracy*		Test Current
	SLOW/MID/FAST	SLOW/MID	FAST	
500Ω	10mΩ	0.1+5	0.1+15	approx. 1mA
5kΩ	0.1Ω			approx. 100μA
50kΩ	1Ω			approx. 10μA
500kΩ	10Ω	0.2+30	0.2+40	approx. 1μA
5MΩ	100Ω		0.2+30	approx. 100nA
50MΩ	1kΩ	1.5+30	1.5+30	approx. 10nA

Max. input voltage: ± 500V peak Open circuit test voltage: 12V or less
The accuracy at 500Ω to 5kΩ range are specified after zero compensation through the REL operation.
Sample rate of FAST at 5MΩ to 500MΩ range becomes the same value as MID (approx. 20 times/sec).
Indications are in 4.5 digits for SLOW, MID, and FAST.

9. Diode

Test Current	Measurement Range	Accuracy*	Open Circuit Test Voltave	Max. Input Voltave
approx. 1mA or 10mA	0.1mV to 5.0999V	0.014+13	12V or less	± 500V peak

10. Temperature

Thermocouple	Temperature Range to be Measured	Accuracy*	Resolution	Max. Input Voltave
R	-50˚C to 0˚C	0.2+70	0.1˚C	± 500V peak
	0˚C to +100˚C	0.2+50		
	+100˚C to +1768˚C	0.2+30		
K(CA)	-200˚C to -100˚C	0.15+50		
	-100˚C to 0˚C	0.15+35		
	0˚C to +1372˚C	0.15+20		
T(CC)	-200˚C to -100˚C	0.15+50		
	-100˚C to 0˚C	0.15+35		
	0˚C to +400˚C	0.15+20		
J(IC)	-200˚C to -100˚C	0.15+50		
	-100˚C to 0˚C	0.15+35		
	0˚C to +1200˚C	0.15+20		
E(CRC)	-200˚C to -100˚C	0.15+50		
	-100˚C to 0˚C	0.15+35		
	0˚C to +1000˚C	0.15+20		

11. Frequency (AC couple, Crest Factor: less than 3)

Sample Rate	Reading Rate(Gate time)	Display Digits and Measurement Range		Accuracy*
SLOW	approx. 0.5 times/sec (1s)	6-digit	15.0000Hz to 1.00000MHz	0.02+2
MID	approx. 4 times/sec (100ms)	5-digit	15.000Hz to 1.0000MHz	
FAST	approx. 10 times/sec (10ms)	4-digit	150.00Hz to 1.000MHz	

12. Chart for combination of Dual Function

	DCV	CH-B DCV (*1)	ACV	DC+ACV	DCA	ACA	DC+ACA	2 WireW	4 WireW(*2)	Hz	˚C
DCV	×	○	△	△	△	△	△	×	×	△	△
CH-BDCV (*1)	○	×	○	○	○	○	○	○	-	○	○
ACV	△	○	×	○	○	△	△	×	×	○	×
DC+ACV	△	○	○	×	○	△	△	×	×	○	×
DCA	△	○	○	○	×	△	△	△	△	○	×
ACA	△	○	△	△	△	×	○	△	△	△	×
DC+ACA	△	○	△	△	△	○	×	△	△	△	×
2 WireW	×	○	×	×	△	△	△	×	△	×	×
4 WireW(*2)	×	-	×	×	△	△	△	△	×	×	×
Hz	△	○	○	○	○	△	△	×	×	×	×
˚C	△	○	×	×	×	×	×	×	×	×	×

○: Available △: have a limitation ×: N/A - : not provided
(*1) CH-B DCV: VOAC7523H / 7520H only (*2) 4 WireΩ: VOAC7522H / 7521H only

13. General

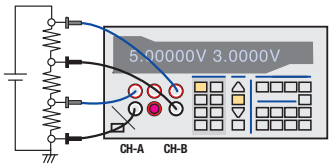
MATH		Moving Average, Scale, Decibel (dBm, dBμ), Difference, Statistics (MAX, MIN, X, s), Comparison (COMP), Arithmetic Calculation between Dual Function
Memory	DATA	Max. 3000 data with 10 msec resolution time mark (Elapsed time)
	SET UP	10
Interfaces (Full Remote)	Standard	RS-232
	Option	LAN, GPIB
Power Supply	Voltage	AC100V, 110V, 220V, 240V
	Frequency	50Hz, 60Hz
	Power Consumption	21 VA (includes options) or less

Operation Temperature and Humidity		0˚C to +50˚C (less than 80%RH) no condensation, 70%RH or less at +40˚C to +50˚C
Storage Temperature and Humidity		-20˚C to +60˚C (70%RH or less) no condensation, includes operation temperature
Size	Dimensions (mm)	210(W) x 99(H) x 353(D) (Options are built into the main unit)
	Weight	3.5kg (includes options) or less
Standard Accessories		Fuse, Test Leads, Alignment Screwdriver, Operation Manual(CD-ROM), Power cable

Isolate 2-channel input

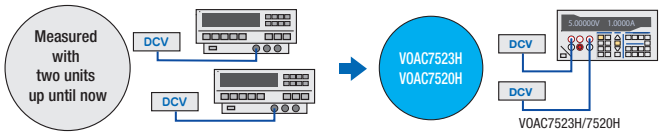
(VOAC7523H/7520H)

- If the CH-A and CH-B input is from an insulated VOAC7523H or 7520H, the electrical potential for different circuits can be measured simultaneously.

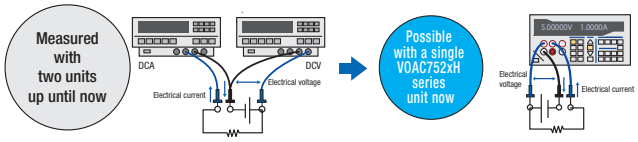


Dual Channels

- Measurements that conventionally require two oscilloscopes can now be performed simultaneously with a single unit to greatly improve efficiency.
  A connection example is shown below. Simultaneous display and simultaneous measurements are being performed here



Dual Display / Dual Function



Accurate Root-Mean-Square (RMS)

- Accurate root-mean-square values for AC voltage and AC current can be measured. Root-mean-square values for direct current can also be measured (DC+AC) V, (DC+AC) A

Abundant Interfaces

- *LAN Interface: SC-351*

10BASE-T (cannot be connected at the same time as the GPIB)

- *GPIB Interface: SC-353*

To create a familiar system

- *DIO Interface: SC-352*

Useful for judging acceptable and non-acceptable waveforms. Open collector output.

- *D/A Output: SC-354*

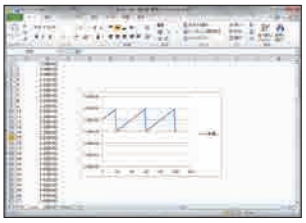
Output can be selected from three patterns of 10V, 1V and 0.1V.
Cannot be connected at the same time as the DIO.
See the following website for further details.
www.iti.iwatsu.co.jp/jp/products/voac/voac752xh_opt.html

- *RS USB Converter: SC-525*

USB can be used when connected with a RS-232 connector.

Trend Graphs Using the Interface

Data can be loaded into Excel and other spreadsheet software when connected to a PC with the interface. This enables trend graphs, etc., to be easily made.



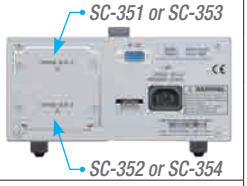
Programming not required!

Download the software from the following.

Click here for the sample software

URL http://www.iti.iwatsu.co.jp/ → Support

Options

Product Name	Part Number	Image of Product
LAN interface *1	SC-351	
DIO interface *2	SC-352	
GPIB interface *1	SC-353	
D/A Converter interface *2	SC-354	
RS232-USB Converter (WindowsXP,Vista,7)	SC-525	
4-wire kelvin test clips	KELVIN M Type	
Clamp-on current probe DC ± 180A MAX AC130A rms MAX (40Hz to 1kHz)	SC-028	
Sheath-type thermocouple (Type K) -200˚C to +800˚C	SC-0107	
Surface thermocouple (Type K) 0˚C to +500˚C	SC-0116	
Banana plug (Can be used to connect a thermocouple)	POMONA1286	

Product Name	Part Number	Image of Product
High-resistance test lead	SC-004	
Test leads	SC-020	
Arrow clip For SC-020 (AC30V/DC60V/DC3A)	SC-026	
Alligator clip H For SC-020 (600Vrms, CAT II/10A)	SC-023	

*1 The LAN interface SC-351 and GPIB interface SC-353 cannot be installed at the same time.
*2 The DIO interface SC-352 and D/A Converter interface SC-354 cannot be installed at the same time.

Digital Multimeter (Handy type)

1μV, 50000, 4½ digits

VOAC22

Universal Counter

SC-7217
SC-7215

GPIB
[Option]

A Maximum of 3GHz, and the Digit Display Greatly Increased to Accommodate a Maximum of 12Digits/sec

- USB, LAN, RS-232 (option) and full remote control with GPIB (option)
- Comparate output with digital I/O
- Full lineup of options to provide greater expandability
  - Data stored on USB storage memories.
  - High-stability clock oscillator option.

SC-7217 / SC-7215 Specifications

				SC-7217	SC-7215
CH-A、CH-B	Input impedance			50Ω ±1.5% / 1MΩ± 1.5% //16pF ±3pF	
	Input withstand pressure	50Ω/ 1MΩ		7Vrms / 200Vpk	
	Frequency band	DC / AC		DC to 450MHz / 10Hz to 450MHz	
	Input voltage range	ATT OFF / ON		±2.5V / ±50V	
	Trigger level accuracy	ATT OFF / ON		±2%±25mV / ±2.5%±500mV	
	Slope switching			+/−	
	Band limitter			10kHz	
	Noise rejection			OFF/ON	
EXT-B	Input signal range	Pulse width / frequency		500ns min / 1MHz max	
CH-C	Input impedance / SWR / Maximum input electrical power			50Ω, AC coupling / 2.0 or less / +30dBm	—
	Frequency band			100MHz to 3GHz	—
	AGC			ON/OFF	—
	Burst detection			ON/OFF	—
		Detection sensitivity		Up until 1.2GHz: -20dBm, up until 3GHz: -10dBm	—
		Burst detection delay time		10μs	—
Measurement Functions	FREQ A、FREQ B			Max. 13-digit, 12-digit/sec (at 1second gate)	
		Measurement range		Single: 6mHz to 250MHz, time / EXT-B gate: 12mHz to 450MHz	
		Gate selection		Single / EXT-B / Time (set at 10μs to 10s 10^n) (n: integer)	
	FREQ C			Max. 13-digit, 12-digit/sec (at 1second gate)	—
		Measurement range		100MHz to 3GHz, 1/16 pre-scaler	—
		Gate selection		EXT-B / Time (set at 10μs to 10s 10^n) (n: integer)	—
	FREQ LINE	Measurement range / Gate selection		45Hz to 440Hz / 0.1s/1s/10s	
	PERIOD A	Measurement range		Single: 4ns to 166s	
				Time / EXT-B gate: 2.2ns to 83s	
		Gate selection		Single / EXT-B / Time (set at 10μs to 10s 10^n) (n: integer)	
	DUTY A	Input signal range	Pulse width / Frequency	6ns min / 80MHz max	
		Measurement range	Single / Time	0.01μ to 99.999,999,99% / 0.2μ to 99.999,999,8%	
		Gate selection		Single / Time (set at 10μs to 10s 10^n) (n: integer)	
	PULSE WIDTH A	Input signal range	Pulse width / Frequency	6ns min / 80MHz max	
		Measurement range	Single / Time	6ns to 171s / 6ns to approximately ½ gate time	
		Gate selection		Single / Time (set at 10μs to 10s 10^n) (n: integer)	
	TIME INTERVAL A→B	Input signal range	Pulse width / Frequency	6ns min / 80MHz max	
		Measurement range	Single / Time	6ns to 10.995s / 6ns to approximately ½ gate time	
		Gate selection		Single / Time (set at 10μs to 10s 10^n) (n: integer)	
	FREQ A/B	Input signal range, Frequency		250MHz max	
		Measurement range / Gate Selection		1 E-9 to 1 E+9 / Time (set at 10μs to 10s 10^n) (n: integer)	
	PHAS A→B	Input signal range	Pulse width / Frequency	6ns min / 80MHz max	
		Measurement range	Single / Time	0.1μ to 359.999,999,9°/ 1μ to 359.999,999° (However, it is necessary or this to be less than half of the gate for non-measurable signal cycles)	
		Gate selection		Single / Time (set at 10μs to 10s 10^n) (n: integer)	
	TOT A	Input signal range	Pulse width / Frequency	2ns min / 250MHz max	
		Gate selection		MANUAL / EXT-B / Time (set at 10μs to 10s 10^n) (n: integer)	
		Measurement range		0 to 4,294,967,295 count	
	Peak voltage measurement	Measurement frequency / Measurement speed		150Hz to 150MHz / 2 seconds or less	
		Measurement voltage range	ATT OFF / ATT ON	±2.5V / ±50V	
Measurement operations				Repeat / Single / HOLD	
Calculation				Smoothing (moving average), scaling, comparate, statistics (MAX, MIN, σ, average)	
Pulse setup				Internal memory (10) or USB memory	
DATA save memory				MAX. 500,000kinds (volatile memory)	
Internal standard clock	Temperature characteristics			+/- 1ppm (range of 0 to +40°C with +25°C as the standard)	
	Temporal change / Short-term stability			±0.1ppm/month、±1ppm/year / ±1ppb/s	
Interface	USB / LAN / DIO			USB2.0 HS / 100base-TX / Output: HI/LO/GO/BUSY	
10MHz STD IN	Input impedance / Input frequency / Input sensitivity			Approximately 850 Ωs (at 10MHz), AC coupling / 10MHz +/- 50Hz / 100mVrms	
Marker / STD output				STD / Marker selected and output with the setting	
	Output impedance / Marker output / STD output			50Ωs +/- 10% / +1Vo-p (0V output during measurement) / 10 MHz sine wave 1Vp-p or more (with 50Ωs at the terminal)	
Options (OP when shipped)	OCXO	Medium stability	Temperature characteristics	+/- 20ppb (range of 0 to +40°C with +25°C as the standard)	
			Temporal change	+/- 10ppb/day (fluctuations in one day's frequencies with the standard frequency being that measured after 48 hours. At +25°C)	
				+/- 100ppb/year (fluctuations in one year's frequencies with the standard frequency being that measured 10 days after the power has been switched on. At +25°C)	
		High stability	Temperature characteristics	+/- 5ppb (range of 0 to +40°C with +25°C as the standard)	
			Temporal change	+/- 0.5ppb/day (fluctuations in one day's frequencies with the standard frequency being that measured 30 days after the power has been switched on. At +25°C)	
				+/- 50ppb/year (fluctuations in one year's frequencies with the standard frequency being that measured 30 days after the power has been switched on. At +25 °C)	
	Interface			GPIB (conforming to IEEE488-1 with full remote functions,) RS-232C, host for connecting the USB memory (for storage only)	
Electric power	Voltage / Frequency			AC 100V to AC 240V ±10% / 50 to 60Hz±5%(100V to 240V) / 400Hz±10%(100V to 120V)	
	Power consumption			70VA(35W) max	
External dimensions (mm)				(210±2)W ×(99±2)H×(353±2)D	
Accessories				Product users'guide x 1, instructions (CD) x 1, power cable x 1.	
Environment				0°C to +40°C with 80%RH or less and no condensation	

Universal Counter
SC-7200H Series

A new lineup of high-performance counters that transcend their class!

GPIB

3GHz x 1ch &
230MHz x 2ch
Universal Counter
SC-7207H

GPIB

2GHz x 1ch &
230MHz x 1ch
Universal Counter
SC-7206H

GPIB
[Option]

230MHz x 2ch
Universal Counter
SC-7205H

Useful functions based on the need for a maximum of 3GHz and easy use.

- Enables frequency measurements for two independent channels (SC-7207H, SC-7205H.)
- Pulse width measurements and time interval measurements greatly broaden the scope of single-gate measurement.
- Easy operations with single key strokes for each action.
- Easy-to-see fluorescent display area. Detailed information displayed with 5 x 7 dot resolution.

* A full-spelling guide provides powerful support for operations.

- Auto-trigger function that eradicates the need for setting the trigger level. Manual setup is, of course, also possible.
- Making line inspection tasks more efficient is a simple chore with the comparison and statistic calculation functions.
- The scaling calculation function enables single unit conversion (revolutions, speed, etc.)
- Input signal peak voltage measurements make it easy to confirm the waveform amplitude.
- The save/recall function for panel setup makes predetermined inspection tasks more efficient.
- The GPIB (optional for the SC-7205H: SC-701) and RS-232 interfaces provide full remote control.

* Transmission is performed in the real-time at a high speed of a maximum 200 items of data/second, which contributes to improved line throughput.

- Full lineup of options to provide greater expandability
- Comparator output (open collector) with digital I/O (SC-702.) External trigger input.

* 150mA can be used for line monitoring equipment without modification to provide a margin of 50V.

- The high-stability standard oscilloscope (SC-703A) provides highly accurate measurements.

Specifications and Performance

Output Interfaces	RS-232: Fitted as standard. GPIB Fitted as standard (optional for the SC-7205H: SC-701) Digital I/O: Optional (SC-702)
Dimensions (mm) and Weight	Approximately 210(W) x 99(H) x 353(D) (excluding options and protrusions) 4.0kg or less (when mounted with the SC-701, 702 and 703 options)
High-stability Standard Oscillator (manufactured on request)	Two types of options available (only one type may be mounted) Temperature Characteristics: +/-0.05ppm, Oscillation Frequency: 10MHz

Universal Counter Option

GPIB Interface

SC-701

For use with the SC-7205H

- Mounting the SC-701 onto the SC-7207H, 7206H and 7205H Universal Counters (fitted as standard to the SC-7207H and 7206H) enables measurements taken with external GPIB controllers to be reset, the remote setup of measurement functions, time base functions and calculations, etc., and the results of measurements to be transmitted as data to external sources.

* This is a factory option and needs to be ordered at the same time as the main unit. Ordering factory installation at a later date will be chargeable.

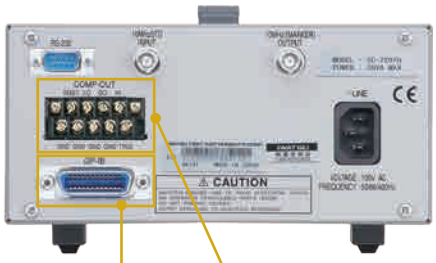
Digital I/O

SC-702

For use with the SC-7207H, SC-7206H and SC-7205H

- Installing the SC-702 onto the SC-7207H, SC-7206H and SC-7205H Universal Counters will enable control over the start of measurement and the output of comparison calculation results. (open collector) Connecting an external lamp also allows parts to be selected and inspection results to be easily browsed.

* This is a factory option and needs to be ordered at the same time as the main unit. Ordering factory installation at a later date will be chargeable.



SC-702
Digital I/O (Factry optiion)

SC-701
GPIB Interface (Equipped as standard on SC-7207H and SC-7205H. Factory option only for SC-7205H)

Main Performance

Maximum Output Terminal Rating	Withstand voltage	DC50V
	Withstand current	DC150mA
	Frequency response	DC to 1kHz
Maximum Input Terminal Rating	Withstand voltage	DC5V
	Frequency response	DC to 1kHz

RS-USB Converter

SC-525

For use with the SC-7207H, SC-7206H and SC-7205H

- The cable for connecting the RS-232 measurement unit to a personal computer's USB port.
- Overall length approximately 85cm.

* Can also be used with the VOAC 7500H series, the SG-4115 and the SG-4105.

High-stability Standard Oscilloscope

SC-703A Custom Order

	New Crystal (SC-703A)
Oscillation Frequency	10MHz
Temperature Characteristics	+/-0.05ppm Range of 0 ˚C to 40 ˚C with +25 ˚C as the standard.
Rising Time	+/-0.05ppm 10 minutes for power switch-on with the frequency 1 hour after power switch-on as the standard
Time Fluctuations (per day)	+/-0.02ppm Value at 72 hours after power switch-on with 48 hours after power switch-on as the standard
Time Fluctuations (per year)	+/-0.02ppm Value at one year after power switch-on with 10 days after power switch-on as the standard

Universal Counters SC-7207H / SC-7206H / SC-7205H Specifications

Frequency A (FREQ-A)

•Measuring range and resolution * SC-7206H is not equipped with EXT-B gate

		SC-7207H		SC-7206H, SC-7205H	
Reference time (reference frequency)		10ns (100MHz)		100ns (10MHz)	
Range	DC	6mHz to 230MHz		0.6mHz to 230MHz	
	AC	10Hz to 230MHz			
Resolution and count method	Frequency	Below 100MHz	100MHz or more	Below 10MHz	10MHz or more
	Count method	Reciprocal count	Direct count	Reciprocal count	Direct count
	1ms gate	5 digits	1kHz	4 digits	1kHz
	10ms gate	6 digits	100Hz	5 digits	100Hz
	0.1s gate	7 digits	10Hz	6 digits	10Hz
	1s gate	8 digits	1Hz	7 digits	1Hz
	10s gate	9 digits	0.1Hz	8 digits	0.1Hz
	EXT-B gate *	Reciprocal count method: The number of digits is determined by external gate time			
	SGL gate	Reciprocal count method: The number of digits is determined by measured signal			

AC Line Frequency (FREQ-LINE) (for SC-7207H and SC-7205H only)

•Measuring range and resolution

		SC-7207H	SC-7205H
Reference time		10ns	100ns
Range		45Hz to 440Hz	
Resolution	0.1s gate	7 digits	6 digits
	1s gate	8 digits	7 digits
	10s gate	9 digits	8 digits

Frequency C (FREQ-C) (for SC-7207H and SC-7206H only)

•Measuring range and resolution

		SC-7207H		SC-7206H	
Reference time(reference frequency)		10ns (100MHz)		100ns (10MHz)	
Range(for AC coupling only)		100MHz to 3GHz 1/16 prescaler		100MHz to 2GHz 1/16 prescaler	
Resolution and count method	Measured signal	Below 1.6GHz	1.6GHz or more	Below 160MHz	160MHz or more
	Count method	Reciprocal count	Direct count	Reciprocal count	Direct count
	1ms gate	5 digits	10kHz	4 digits	10kHz
	10ms gate	6 digits	1kHz	5 digits	1kHz
	0.1s gate	7 digits	100Hz	6 digits	100Hz
	1s gate	8 digits	10Hz	7 digits	10Hz
	10s gate	9 digits	1Hz	8 digits	1Hz
	EXT-B gate	Reciprocal count method: The number of digits is determined by external gate time		Not equipped with EXT-B	

Period A (PERI-A)

•Measuring range and resolution *SC-7206H is not equipped with EXT-B gate

		SC-7207H	SC-7206H, SC-7205H
Reference time		10ns	100ns
Range	DC couple	5ns to 171s	5ns to 1,717s
	AC couple	5ns to 0.1s	
Resolution	1ms gate	5 digits	4 digits
	10ms gate	6 digits	5 digits
	0.1s gate	7 digits	6 digits
	1s gate	8 digits	7 digits
	10s gate	9 digits	8 digits
	EXT-B gate *	The number of digits is determined by external gate time	
	SGL gate	The number of digits is determined by measured signal	

Duty ratio A (DUTY-A)

•Measuring range and resolution

			SC-7207H	SC-7206H, SC-7205H
Input signal frequency range			Same as FREQ-A	
Measuring range		SGL gate	0.01μ to 99.999,999,99 [%]	
		Internal gate	0.2μ to 99.999,999,8 [%]	2μ to 99.999,998 [%]
Measuring resolution	Average count of internal gate	SGL gate	10ns/input period x 100 [%]	100ns/input period x 100 [%]
		1 to 24	10ns/average input period x 100 [%]	100ns/average input period x 100 [%]
		25 to 2,499	1ns/average input period x 100 [%]	10ns/average input period x 100 [%]
		2,500 to 249,999	100ps/average input period x 100 [%]	1ns/average input period x 100 [%]
		250,000 to 24,999,999	10ps/average input period x 100 [%]	100ps/average input period x 100 [%]
		25,000,000 or more	1ps/average input period x 100 [%]	10ps/average input period x 100 [%]

Pulse width A (P.W-A)

•Minimum pulse width: 6ns •Maximum repetitive frequency: 80MHz •Measuring range and resolution

			SC-7207H	SC-7206H, SC-7205H
Reference time			10ns	100ns
Measuring range		SGL gate	10ns to 171s	100ns to 1,717s
		Internal gate (1ms to 10s)	10ns to approx. 1/2 gate time	100ns to approx. 1/2 gate time
Measuring resolution	Average count of internal gate	SGL gate	10ns to 100ns	100ns to 1ms
		1 to 24	10ns	100ns
		25 to 2,499	1ns	10ns
		2,500 to 249,999	100ps	1ns
		250,000 to 24,999,999	10ps	100ps
		25,000,000 or more	1ps	10ps

Time interval A --> B (T.INT A --> B) (for SC-7207H and SC-7205H only)

•Minimum time interval: 6ns •Maximum repetitive frequency: 80MHz •Measuring range and resolution

			SC-7207H	SC-7205H
Reference time			10ns	100ns
Measuring range		SGL gate	10ns to 10,955s	100ns to 109,951s
		Internal gate (1ms to 10s)	10ns to approx. 1/2 gate time	100ns to approx. 1/2 gate time
Measuring resolution	Average count of internal gate	SGL gate	10ns to 10μs	100ns to 100μs
		1 to 24	10ns	100ns
		25 to 2,499	1ns	10ns
		2,500 to 249,999	100ps	1ns
		250,000 to 24,999,999	10ps	100ps
		25,000,000 or more	1ps	10ps

Frequency ratio A/B (FREQ A/B) (for SC-7207H and SC-7205H only)

•Measuring range and resolution

		SC-7207H	SC-7205H
Input signal frequency range		Both CH-A and CH-B are the same as that for FREQ-A	
Measuring range	Internal gate (1ms to 10s)	1E-9 to 1E+9	
Measuring resolution	Internal gate (1ms to 10s)	1+LOG (CH-A input frequency x gate time) digits	

Phase measuring A --> B (PHAS A --> B) (for SC-7207H and SC-7205H only)

•Minimum time interval: 6ns •Maximum repetitive frequency: 80MHz •Measuring range and resolution

			SC-7207H	SC-7205H
Reference time			10ns	100ns
Measuring range		SGL gate	0.1μ to 359.999,999,9 [*]	
		Internal gate	1μ to 359.999,999 [*]	10μ to 359.999,99 [*]
Measuring resolution	Average count of internal gate	SGL gate	0ns/input period x 360 [*]	100ns/input period x 360 [*]
		1 to 24	10ns/average input period x 360 [*]	100ns/average input period x 360 [*]
		25 to 2,499	1ns/average input period x 360 [*]	10ns/average input period x 360 [*]
		2,500 to 249,999	100ps/average input period x 360 [*]	1ns/average input period x 360 [*]
		250,000 to 24,999,999	10ps/average input period x 360 [*]	100ps/average input period x 360 [*]
		25,000,000 or more	1ps/average input period x 360 [*]	10ps/average input period x 360 [*]

Peak voltage measuring (SC-7206H is not equipped with CH-B)

Measures and displays in real-time the voltage amplitude of the measured signal at CH-A or CH-B.

Frequency range	150Hz ≦ input frequency ≦ 50MHz
Response time	2 seconds or less
Voltage range	±2.50V (ATT off, resolution: 10mV), ±50.0V (ATT on, resolution: 100mV)
Measuring error	ATT off: 10% of indication ±50mV ATT on: not specified

CH-A, CH-B input terminal (SC-7206H is not equipped with CH-B)

Input RC			Approx. 1MΩ//20pF or less
Coupling			AC or DC
Low pass filter			Off, 10kHz
Attenuator			Off, 26dB (1/20)
Trigger level	Measuring Range	ATT off	-2.50V to +2.50V (resolution: 10mV)
		ATT on	-50.0V to +50.0V (resolution: 100mV)
	accuracy (0˚C to +40˚C)	ATT off	10% ±30mV of the set value (±3% when +2V to -2 V)
		ATT on	10% ±300mV of the set value (±3% when +40V to -40 V)
Operating input voltage range		ATT off	±2.5V
		ATT on	±50V
Input sensitivity	Manual trigger	ATT off	30mVrms (DC to 230MHz)
		ATT on	0.6Vrms (DC to 230MHz)
	Auto trigger	ATT off	200mVrms (10kHz to 230MHz, sine wave)
		ATT on	4Vrms (10kHz to 230MHz, sine wave)

CH-C input terminal (for SC-7207H and SC-7206H only)

Maximum input power			+30dBm (approx. 7Vrms when 1mΩ/50Ω = 0dBm as a reference)	
Impedance			Approx. 50Ω	
Coupling			AC	
VSWR			2.0 or less (SC-7207H: 100MHz to 3GHz, SC-7206H: 100MHz to 2GHz)	
Input sensitivity			(Sine wave: up to 2 GHz for SC-7206H)	
AGC off/on		-20dBm	(100MHz ≦ input frequency ≦ 300MHz)	
		-25dBm	(300MHz < input frequency ≦ 1.5GHz)	
		-20dBm	(1.5GHz < input frequency ≦ 3.0GHz)	
Burst detection	Detection frequency range		SC-7207H	SC-7206H
			100MHz to 3GHz	100MHz to 2GHz
	Input sensitivity		(Sine wave: up to 2GHz for SC-7206H)	
	AGC off	-20dBm	(100MHz ≦ input frequency ≦ 1.2GHz)	
		-10dBm	(1.2GHz < input frequency ≦ 3.0GHz)	
	Detection delay time		500μs (Burst period ≧ set gate + 500μs)	

10MHz STD IN

BNC terminal for more stable input of the external reference frequency

Frequency	10MHz±50Hz (±5ppm)
Amplitude	1Vrms to 5Vrms, threshold = 0V
Input resistance	Approx. 6.4kΩ
Input coupling	AC

10MHz STD OUT/(MARKER OUT)

BNC terminal for output of internal reference oscillator or marker signal.
Marker signal is a signal that presupposes the brightness modulation (Z axis) of the analog oscilloscope for example. It is enabled at the SGL gate when the function is in between the time interval (T.INT A --> B) and phase (PHAS A --> B). Output is "Lo level" from the start of CH-A measuring to the start of CH-B measuring.

Output	CMOS level
Reference frequency output	10MHz: Stability is the same as that for the internal reference oscillator.
Marker output	In the 5MHz band, L-state is output during actual measuring. (for SC-7207H and SC-7205H only.)

Output interface

•RS-232 is equipped as standard •GPIB is equipped as standard (option SC-701 for SC-7205H)
•Digital I/O option can be installed (SC-702)

Environmental conditions

•Warm-up time: 60 minutes or more •Operating temperature/humidity: 0˚C to +40˚C/85%R.H or less (no condensation) •Storage temperature/humidity: -20˚C to +60˚C/90%R.H or less (no condensation)

Reference oscillator

Equipped with SC-7207H, SC-7206H and SC-7205H as standard
Output is possible to the 10MHz OUT BNC terminal on the rear panel of the main unit.
•Oscillation frequency: 10MHz •Temperature characteristics: ± 2.5ppm/unit environmental temperature: 0˚C to +40˚C •Aging rate: ± 1.0ppm/year

Power supply conditions and power supply voltage changes (factory option)

•Voltage: AC100V / 110V to 120V / 220V to 240V •Frequency: 50Hz, 60Hz, 400Hz
•Power consumption: At AC100V with optional SC-701 and SC-702 are installed.

	SC-7207H	SC-7206H	SC-7205H
Power Consumption	36VA MAX	33VA MAX	31VA MAX

Dimensions (mm)	(210 ± 2)W x (99 ± 2)H x (353 ± 2)D (excluding options and protruded parts)
Weight	4.0kg or less (including optional SC-701 and SC-702)
Accessory	Power cable (1), operation manual CD-ROM (1)

30MHz FUNCTION GENERATOR

SG-4300 Series

Various types of output waveforms

30MHz 2ch
SG-4322 CE

30MHz 1ch
SG-4321 CE

Various Oscillation Modes

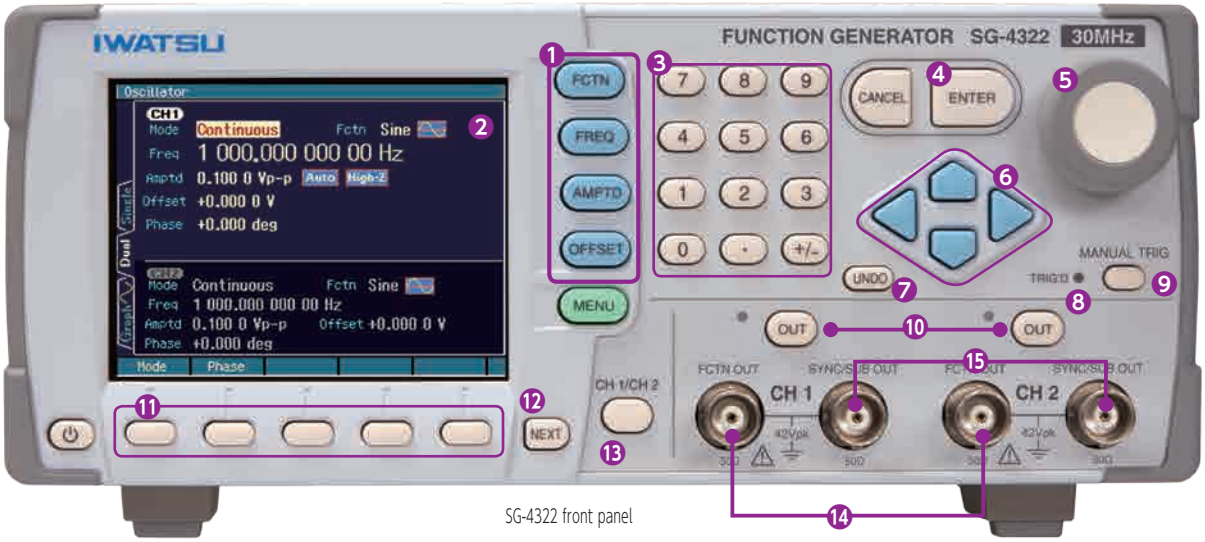
•Sine •Square •Pulse •Ramp •Parameter-variable •Arbitrary

Standerd waveforms, Large capacity arbitrary,Standerd parameter variable waveforms(25 waveforms)

Versatile Functions

•Sweep •Modulation •Burst •Trigger •Gate •Sequence •Synchronus operation •Variable duty •Variable rise •Variablr fall

Equipped with program operation, parameter-variable waveforms etc,.



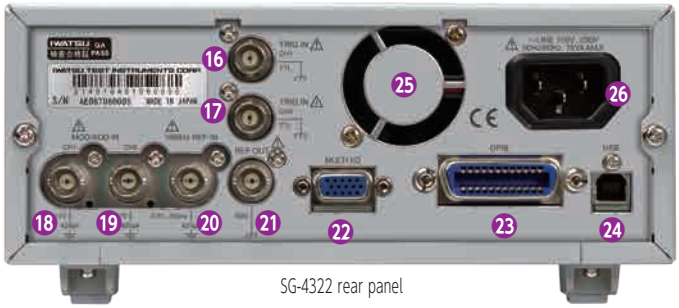
SG-4322 front panel

❶ Basic Parameters / Shortcut keys
❷ 3.5# QVGA TFT Color LCD display
❸ Ten-key for direct input
❹ Enter key : Execute each setting
❺ Function knob for selecting items and values
❻ Arrow keys
❼ UNDO key for undo
❽ Triggered indication light
❾ Manual Triggering key
❿ OUT : Output on/off key
⓫ Soft keys for setting selectable functions
⓬ NEXT key for selecting from multiple setting pages
⓭ CH1/CH2 key for switching CH1 or CH2

⓮ CH1 and CH2 signal outputs Isolated by each channel
- Independent setting by each channel
- Phase shift control between 2 channels
- Synchronized output in different phase
- Frequency variable between 2 channels
- Different frequency output between 2 channels
- Differential output

⓯ CH1 and CH2 synchronized signal outputs
Reference phase synchronization
- Synchronized signal with internal frequency modification
- Burst synchronization signal
- Sweep synchronization signal
- Sequence step synchronization signal
- Synchronized signal with internal modification signal
- Sweep X driving signal for X axes of oscilloscope/recorder

⓰ CH1 Trigger input BNC
⓱ CH2 Trigger input BNC
⓲ CH1 Output modification/Adder input BNC
⓳ CH2 Output modification/Adder input BNC
⓴ Outer 10MHz reference frequency signal input BNC
㉑ Frequency reference signal output BNC
㉒ Multiple I/O connector for sweep, sequence control and synchronization code output



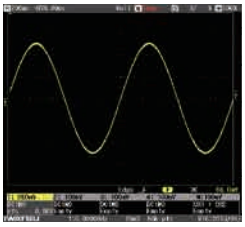
SG-4322 rear panel

㉓ GPIB interface connector
㉔ USB interface connector
㉕ Fan motor
㉖ AC inlet(AC90V to AC250V)

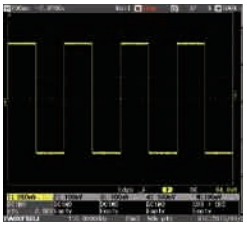
Sequence control function

Programmable each signal waveform pattern

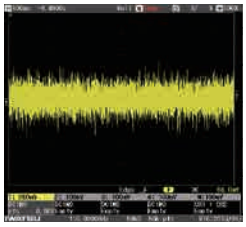
Sequence oscillation is used to program combination of multiple pattern outputs such and Waveform type, frequency, amplitude, duty cycle and offset. It can be used together with parameter variable function at complicated and long timeframe waveform patterns for sudden frequency/sweep variable.



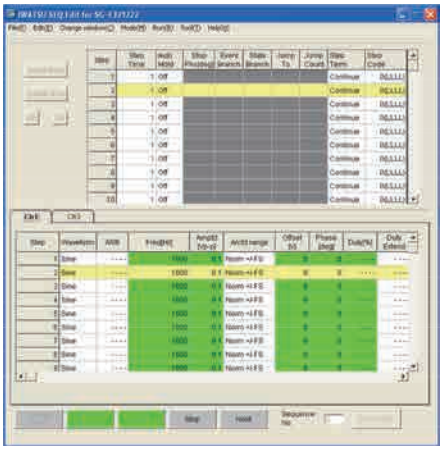
Waveforms 1

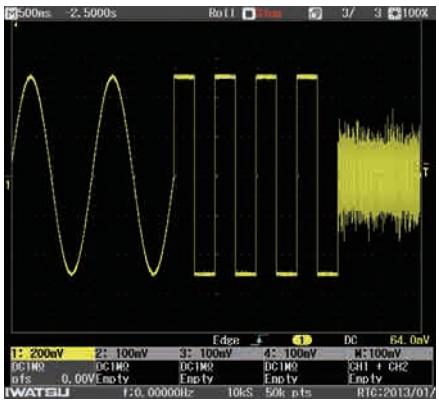


Waveforms 2



Waveforms 3





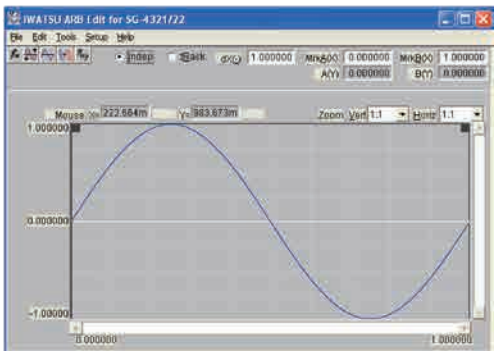
Waveform 1+2+3 at long memory

Arbitrary signal waveform with free-download software

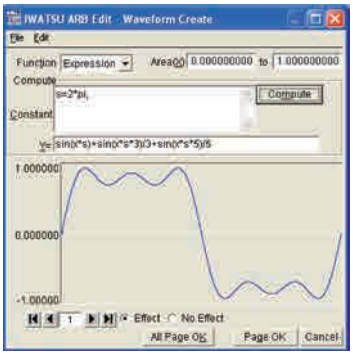
4M-word waveform memory for 512k-word/waveform, max.

Maximum 512k-word/waveform outputs are available with arbitrary waveform generating software for example;

- Copy and paste of pre-set waveform shapes for complex signal waveforms.
- Waveform generation from waveform formula
- Expansion and compression of signal waveforms
- Computation between waveforms



Arbitrary waveform generating software ARB Edit



Waveform formula setting and waveform

Computation between waveforms

Specifications

		SG-4322	SG-4321
Product name		Function Generator	
Oscillation frequency		0.01 μHz to 30MHz	
Number of channels		2 ch	1 ch
Vertical resolution for waveform		14bit	
Waveform and frequency range	∿	0.01 μHz to 30MHz	
	⊓ (duty fixed)	0.01 μHz to 15MHz	
	⊓ (duty variable)	0.01 μHz to 15MHz	
	⊓	0.01 μHz to 15MHz	
	∿ (symmetry variable)	0.01 μHz to 5MHz	
	Parameter-variable waveforms (25 types)	0.01 μHz to 5MHz	
	Arbitrary waveform	0.01 μHz to 5MHz	
	Noise	Bandwidth 26MHz	
Frequency setting resolution		0.01 μHz	
Rising/falling variable		Pulse 15.0ns to 58.8Ms	
Arbitrary waveform data length/number of waves		512K words / 128 waves, 4Mwords	
Maximum output voltage/resolution		20 Vp-p/open, 10 Vp-p/50 Ω , Resolution: 0.1 mVp-p or 1 mVp-p (depending on conditions)	
User-defined unit		○	○
Input/output floating		○	○
Isolation between channels		○	—

		SG-4322	SG-4321
Oscillation mode	Continuous oscillation	○	○
	Burst/trigger/gate/ triggered gate	○	○
	Sweep	Frequency, phase, amplitude, DC offset, duty ratio	
	Internal modulation External modulation	FM, FSK, PM, PSK, AM,DC offset and PWM	
	Sequence	○	○
	Two channel mode	○	—
Synchronous operation		○	○
External addition		○	○
Setting storage		○	○
GPIB interface		○	○
USB interface		○	○
Color LCD display		○	○
Arbitrary Waveform Editor		○	○
Sequence Editor		○	○
Power supply		AC90V to 250V	
Power consumption		75VA以下	50VA以下
External dimensions (mm) *2		216 (W) × 88 (H) × 332 (D)	
Weight		approx. 2.1 kg	approx. 2.1 kg
Application Software		Sequence Editing Software	
Option		SG-510 Multi Cable for input and output	

Function Generator

SG-4100 Series

10mHz - 15MHz 1ch

SG-4105

10mHz - 5MHz 1ch

SG-4104

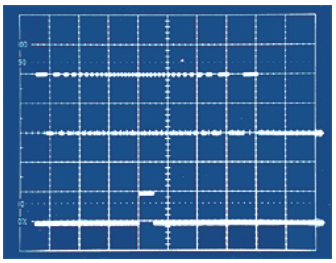
- Wide oscillation bandwidth from 10mHz to 15MHz (SG-4105)
- High accuracy (50ppm: SG-4105, SG-4104) and high stability waveform output by employing DDS (Direct Digital Synthesizer) system
- Max 20Vp-p (Output terminal open)
- 0.0% to 100.0% duty control/ Up to 65,536 Burst waveforms
- Offset control +10V to -10V (output terminal open)
- Waveform outputs are connected continuously when vary the frequency
- Linear / Log sweep function
- Simultaneous display of the frequency and output voltage
- Easy operation (set performance can be checked at a glance)
- PMC option (SG-506: SG-4105) best suited for evaluating pulse motor control
- Provides Small-amplitude on Large-offset

PMC function*(Factory option)
Pulse motor control function SG-506 (SG-4105)

Pulse motor control function

PMC option function controls pulse motor. Pulse motor acceleration or braking controls need to be reviewed not only by position control, but also under loaded condition. The PMC option simplifies the evaluation.
Pulse outputs in open collector (50V) are output from rear panel with PMC option.
Common motor driver circuit connected with PMC.

*PMC (Pulse Motor Control) is coined word by IWATSU TEST INSTRUMENT CORPORATION.
(Order any factory options when ordering the main unit. Additional orders after the delivery of the main unit require a separate fee.)



Upper waveform shows drive pulse for pulse motor, lower waveform shows sensor input waveform. After reaching maximum frequency while specified accelerating period, starts braking by sensor input signal. Then stops at specified pulse counts.

Boost Amp

SG-300

A useful drive amp that boosts signal generator output at 1MHz full power band.
The SG-300 is an amplifier for converting function generator output.
This amplifire can be used for a wide range of purposes, including the development of inverters and other mechatronic equipment.
The amplifire has a low impedance (Lo Ω) output, which enables it to be used with low power loss even driving low impedance loads.
It also supports amplitude modulation only at the positive side or only at the negative side, which enables zero level adjustment.

SG-300 Specifications

Maximum Voltage	24Vp-p (with 50 Ω load) / 48Vp-p (without load)
Maximum Current	DC or Peak 240mA (with 50 Ω load) / Continuous DC or Peak 300mA (with Lo Ω output)
Full Power Band width	1MHz (with a 50 Ω load and 24Vp-p output)

RS-USB Converter

SC-525

For use with the SG-4105

- The cable for connecting the RS-232 measurement unit to a personal computer's USB port.
- Overall length approximately 85cm.

* Can also be used with the VOAC7602, VOAC7502, VOAC7500H series, SC-7200H series.

Delay Pattern Generator (6 channel pulse generator)

DG-8000

GPIB

CE

*input/output on the front

TRIG IN	SYNC OUT	CH1 (U)	CH2 (V)	CH3 (W)	CH4 (X)	CH5 (Y)	CH6 (Z)

Rear panel configuration of a standard model

Seamless change

The frequency, pulse width, and other settings can be seamlessly changed during oscillation.

Tracking function

Parameters can be changed simultaneously for each channel.

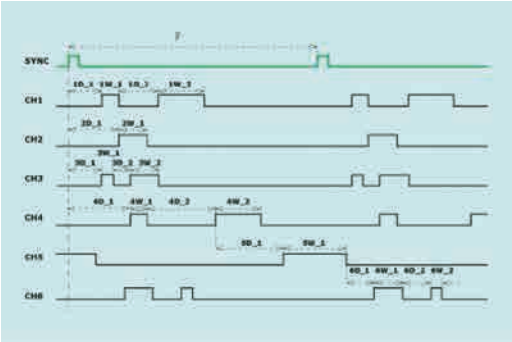
Operation pattern control (DG-802)

The operation pattern option enables continuous operation testing.

Synchronization of multiple generators (DG-602)

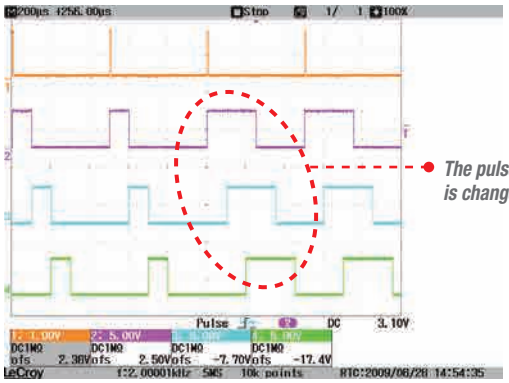
The quick synchronization option enables three generators (18 channels) to synchronously output data.

Setting parameters and output examples of 6 channel independent pulse output



BASIC mode

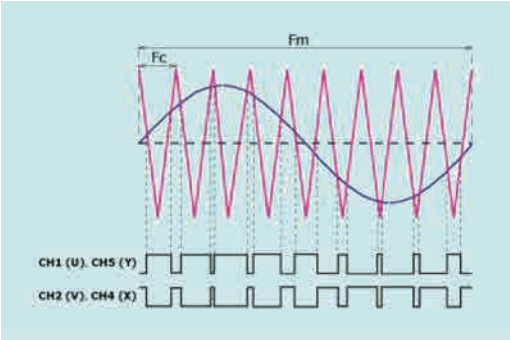
Pulses can be easily generated by specifying any dependency, delay value, and width value for each of 6CH. The output level can also be individually specified for each CH.



Tracking function

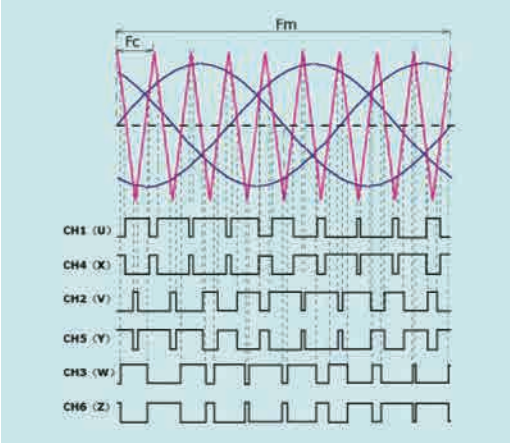
The pulse width, delay time, and other settings can be changed simultaneously for any combination of CH. Output example when the pulse width of channels 1 to 3 is changed simultaneously.

Signal generation method and output examples of the inverter option



Single-phase bipolar output in the INVERTER mode

Pulses can be easily generated by specifying the carrier frequency (Fc), modulation signal frequency (Fm), and modulation depth (that is, the rate of the modulation signal amplitude to the carrier amplitude).



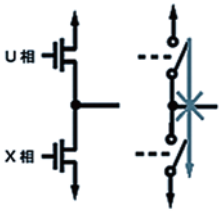
3-phase 2-level in the INVERTER mode

Pulses can be easily generated by specifying the carrier frequency (Fc), modulation signal frequency (Fm), and modulation period (that is, the rate of the modulation signal amplitude to the carrier amplitude).

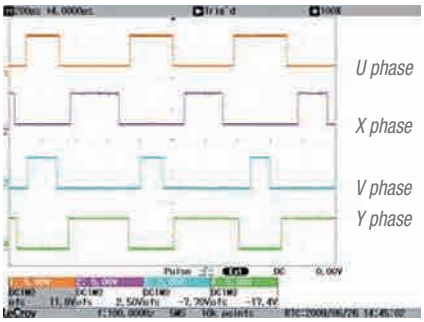
Lineup

Items	Product name	Model number	Incorporated function
Main unit	Delay pattern generator	DG-8000	–
Software option	Inverter and PPG option	DG-801	INVERTER mode
			PPG mode
	Test adapter	DG-802	Operation pattern function
Hardware option	External modulation option	DG-601	External modulation function
	Quick synchronization option	DG-602	Quick synchronization function

Gap control to prevent the high and low side switches of devices from being turned on simultaneously



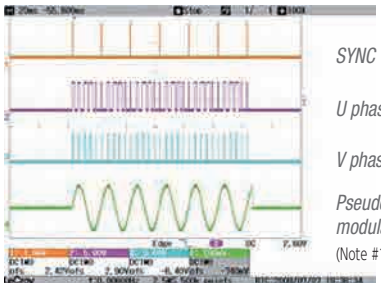
Short circuits are dangerous



If the phase U and X devices in the above illustration are turned on at the same time, they short-circuit, causing danger and damage.
The DG-8000 gap time control function automatically generates the specified dead time as shown in the illustration. Even if the frequency or cycle changes, the dead time remains constant. The gap time can be changed even during oscillation. It is also possible to turn devices on at the same time by specifying a negative value.

Easy generation of PWM signals

The inverter and PPG option (DG-801) enables you to output control signals for the buck chopper, single-phase uni-polar, single-phase bi-polar, and 3-phase 2-level. The modulation frequency and modulation depth can be changed even during oscillation. This is convenient for testing inverters because it is possible to obtain output to which pulse width modulation created from the inner sine wave and triangle wave is applied.

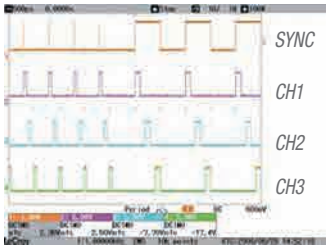


Note #1:
The modulation signal is shown only for explanatory purposes. This signal is not output from the DG-8000.

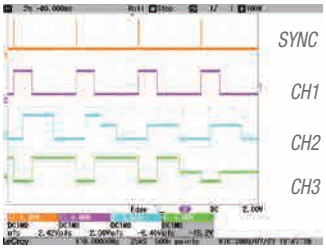
When using the PPG function, this generator functions as a signal generator for complicated logic modulation waves on 6 channels using predetermined pulse patterns. Waveform patterns can be created using the waveform creation application (which is available free of charge.)

Configuration example
DG-8000 main unit: 1
DG-801 inverter and PPG option: 1

Independent control of the time axis and vertical axis



Changing the frequency



Changing the output level

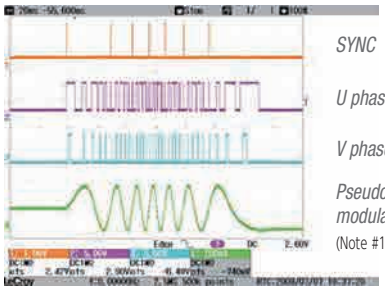
The parameters related to the time axis and those related to the vertical axis are separately controlled. These parameters can be changed manually or by using remote commands.

Support of ORed output on channel 1

Channel 1 has an ORed output function, which logically adds up to 6 sets of double pulses, making twelve pulses of specified channels, and outputs the result.

Variable control of the PWM signal frequency

The operation pattern option (DG-802) is convenient for continuous operation testing because it enables variable control of the frequency and modulation depth (in the inverter mode only). The patterns for such control are controlled using predetermined arbitrary waveforms. These waveforms can be created using the waveform creation application (which is available free of charge.)



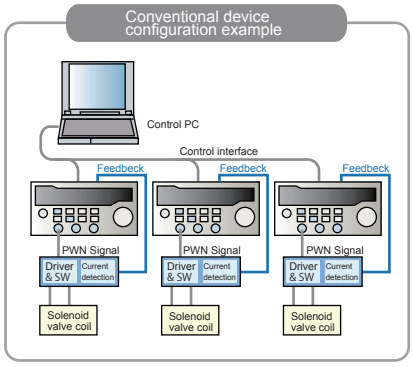
The illustration on the left shows an example of when a trapezoid waveform signal is used to apply frequency modulation.

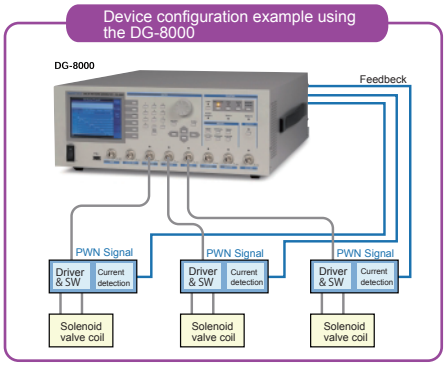
Note #1:
The modulation signal is shown only for explanatory purposes. This signal is not output from the DG-8000.

Configuration example
DG-8000 main unit: 1
DG-801 inverter and PPG option: 1
DG-802 operation pattern option: 1

In the inverter mode, faulty patterns during the gap time can be inserted intentionally at regular intervals by using the error insertion function.

Application example: Continuous operation test of solenoid and other elements that control electromagnetic valves

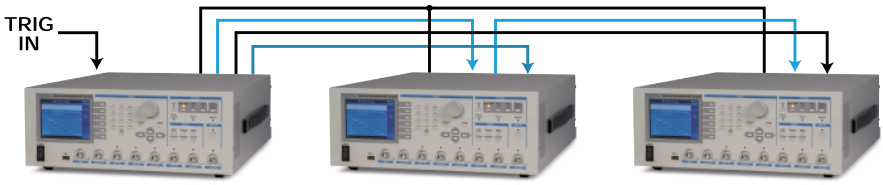




The external modulation option (DG-601) enables external control of the following functions:
- Modulation of the pulse width and delay in the basic mode
- Control of the modulation depth in the inverter mode
- Control of the frequency and modulation depth for operation patterns

Configuration example
DG-8000 main unit: 1
DG-802 operation pattern option: 1
DG-601 external modulation options

Parallel operation of three generators to support output from 18 channels



6 channels + 6 channels + 6 channels = 18 channels

The quick synchronization option (DG-602) quickly enables up to 3 generators to synchronously operate by connecting BNC cables to the rear panel. If one of the generators goes down, the remaining two generators also shut down their output as a failsafe when this function is used.

Configuration example
DG-8000 main unit: 1
DG-602 quick synchronization options: 3

Delay Pattern Generator DG-8000 Specifications

Common specifications

Pulse output terminal

Number of channels	6CH
Output level	± 10V (open) / ± 5V (50 Ω)
Output range	2 ranges (large/small)
Output logic	Positive/negative
Output impedance	50 Ω
ORed output	Effective channels among channels 1 to 6 are ORed and the result is output (from channel 1)

Other output terminals

SYNC OUT output	BNC terminal (1)
IRREGULAR output	BNC terminal (1)
ALARM output	BNC terminal (1)
10 MHz REF output	BNC terminal (1)
REAR TRIG output	Quick synchronization operation option (DG-602), BNC terminal (1)

Input terminals

TRIG	BNC terminal (1), input: ± 5V,max., threshold: ± 1/2 of input level, variable
TRIG INH/RDY	BNC terminal (1), TTL level
Emergency stop input	BNC terminal (1), TTL level
10 MHz REF input	BNC terminal (1), 1V P-P ± 100ppm or less required
Frequency control input	For the external modulation option (DG-601) and operation pattern option (DG-802), BNC terminal (1)
External modulation (PWM)	For the external modulation option (DG-601), BNC terminal (3)
REAR TRIG input	For the quick synchronization operation option (DG-602), BNC terminal (1)
ALARM SENSE input	For the quick synchronization operation option (DG-602), BNC terminal (1)

Output control

Oscillation start/stop	The button to turn all channels on or off immediately
Individual setting	To turn all channels on or off immediately
When oscillation stops	Select relay OFF or set the output level to 0.

LED indicators

TRIG'd	Indicates when TRIG is applied.
OUTPUT, channels 1 to 6	Indicates when output is enabled and on.
REMOTE	Indicates up in the REMOTE status.
INHIBIT/READY	Indicates up when oscillation is READY.

Pulse generation

Oscillation mode	CONT, TRIG'd CONT, TRIG, GATE
Gap control	Supported. *Gap control is a function that ensures non-overlapping time when phases V and X, phases U and Y, and phases W and Z overlap each other by specifying a delay or pulse width. This function can be also used to intentionally make these phases overlapped.

Interface

TRIG'd	USB1.1 storage function only (Waveform file and Setup file)
Remote (LAN)	100BASE-TX, 10BASE-T
Remote (GPIB)	Supported as standard

Screen display

LCD	4.7-inch color LCD
Resolution	320 x 240 pixcels

Others

SETUP save/recall	Supported (10 internal memories)
Power-saving mode	Supported
Beep function	Supported
Status display	Supported

Power supply unit

AC power supply	AC 100V to AC 240V (50/60 Hz)
Power consumption	190VA,max

Mechanical section

External dimensions (mm)	Approx. 400 (W) x 150 (H) x 497 (D) (without external projections)
Weight	Approx. 8kg

Environment

Operating temperature	0˚C to +40˚C (without condensation)
Operating humidity	85% R.H. or less at +40˚C
Storage temperature	-20˚C to +60˚C

Accessories

Power cable	1
Operation manual	CD-ROM (1)

The following modulations can be applied by using the DG-601 external modulation option when the main unit function is in the Basic mode:

PWM modulation
The pulse width can be changed by an external input signal. The modulation depth can be individually specified for each external input channel (U/V/W) and freely allocated to output channels.

Delay modulation
The delay value can be changed by an external input signal. The modulation depth can be individually specified for each external input channel (U/V/W) and freely allocated to output channels.

Other specifications

BASIC mode	
Mode	Independent control of 6CH, 3-phase pattern A/B

6 independent channels

Number of pulses	SINGLE pulse/ DOUBLE pulse
Frequency/cycle	1mHz to 10MHz (1mHz or 9-digit resolution) 100ns to 1,000s (10ns or 9-digit resolution)
Frequency/cycle accuracy	± 50ppm
Standard channel	Select SYNC or both edges of the smallest channel
Delay	0ns, 10ns to 1,000s (10ns or 9-digit resolution)
Pulse width	0ns, 50ns to 1,000s (10ns or 9-digit resolution)
PHASE	0˚ to 360˚ (minimum resolution: 0.01˚, frequency-dependent) 0% to 100% (minimum resolution: 0.001%, frequency-dependent)
DUTY	0˚ to 360˚ (minimum resolution: 0.01˚, frequency-dependent) 0% to 100% (minimum resolution: 0.001%, frequency-dependent)
Gap time setting	0 to ± 1 cycle or 1s, max.
Gap resolution	Frequency specifying : Gap in 20 ns or 6 digits Cycle specifying : Gap in 10 ns or 6 digits
Frequency dividing function	Supported
Frequency dividing setting range	1 to 65,535
Tracking	Multiple parameters can be changed simultaneously.
Internal modulation	PWM modulation and delay modulation

3-phase pattern A

Oscillation mode	CONT, TRIG'd CONT, GATE
Cycle (Tc)	Determined by setting Tw1 and Tw2. Tc = (Tw1+Tw2) x 3
Tw1 and Tw2 setting range	0ns, 100ns to 100s
Tw3 setting range	0ns, 100ns or more (Fc minus- Tw1)
Pulse width setting resolution	100ns or 9digits
Gap control	By setting Tw3.
Operation change during oscillation	Parameters can be seamlessly changed.

3-phase pattern B

Oscillation mode	CONT, TRIG'd CONT, GATE
Cycle (Tc)	Determined by setting Tw and Tw3. Tc = Tw2+Tw3
Tw1 setting range	0ns, 100ns to 100s
Tw2 setting range	0ns, 100ns or up to more (Fc-2 x Tw1)
Tw3 setting range	100ns to 100s
Pulse width setting resolution	100ns or 9digits
Gap control	Realized by setting Tw2.
Operation change during oscillation	Parameters can be seamlessly changed.

Inverter mode (with the DG-801 inverter and PPG option mounted)	
Mode	Buck chopper, single-phase uni-polar, single-phase bi-polar 3-phase 2-level

Common setting parameters

Carrier frequency	100mHz to 1MHz
Modulation frequency	1mHz to 10kHz
Other parameters	Modulation depth, modulation steps, gap time, and others

PPG mode (with the DG-801 inverter and PPG option mounted)	

Frequency specifying mode

Frequency	1mHz to 10MHz (1mHz or 6-digit resolution)
Memory length	10kW or 100kW

Clock specifying mode

CK frequency	100Hz to 100MHz (resolution: 1mHz or 6digits)
Memory length	10kW or 100kW

Operation pattern (with the DG-802 operation pattern option mounted)	
Frequency control	The frequency (cycle) can be controlled using any waveform or external input.
Frequency control input	BNC terminal (1)
Modulation control	INVERTER mode only. The modulation can be controlled using any waveform or external input.
Faulty pattern insertion	Supported

External modulation (with the DG-601 external modulation option mounted)	
External modulation input	BNC terminal (3)
Frequency control input	BNC terminal (1)
Input range	2 ranges (-2 to +2V or 0 to +2V)
Input impedance	Approx. 1M Ω
Resolution	12 bits
Frequency characteristics	100kHz, amplitude of 90% or more (1kHz standard)

External modulation (with the DG-601 external modulation option mounted)	
REAR TRIG output	BNC terminal (2)
REAR TRIG input	BNC terminal (1)
ALARM SENSE input	BNC terminal (1)

B-H Analyzer
SY-8210 Series

SY-8218 10Hz - 10MHz
SY-8219 10Hz - 1MHz

Best suited for measuring magnetic properties of soft magnetic materials such as Silicon-steel plates, ferrites, and amorphous materials

GPIB [Option]

SY-8218

CE

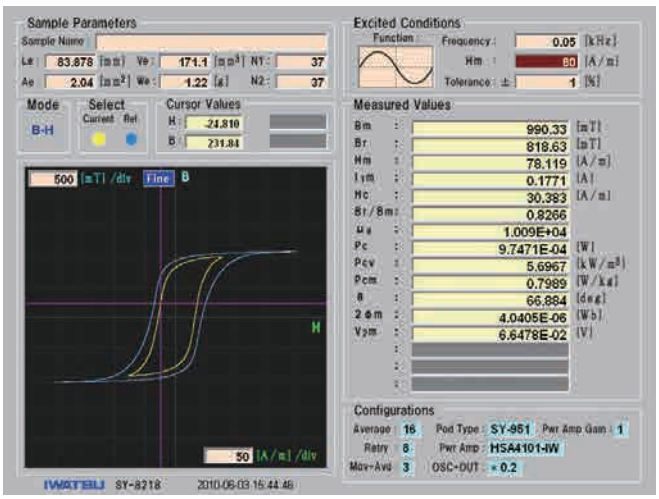
GPIB [Option]

SY-8219

CE

Main features

- Wide measurement frequency for materials analysis which used in high frequencies
  SY-8218: SINE from 10Hz to 10MHz, Pulse at Duty 50:50 from 10Hz to 1MHz
  SY-8219: SINE from 10Hz to 1MHz, Pulse at Duty 50:50 from 10Hz to 1MHz
- 16times of acquisition data(comparing with former Iwatsu models)
  Acquisition data at 8,192points/cycle perform precise measurement on parameters such as Hc(Coersive force), Br(Residual flux density), and other parameters.
- Pulse excitation function
  Both SINE(Sinusoidal) and Pulse(at Duty 50:50, 1MHz,max.) excitation are available as a standard function
- Temperature characteristic test with Scanner Chamber System



Optional Items

• Power Amplifiers •DC bias power supply •Single sheet measurement tester •High-current POD*

*under development

Precise automatic core loss measurement in higher frequency

Precise and accurate core loss measurement

Iwatsu's B-H analyzers which hiring CROSS-POWER method (IEC62044-3) enable precise and highly accurate measurement embedded minimized phase error integration on frequency spectrum with current detecting resisters and compensation on detecting circuit with full compensation on amplitude and phase characteristics. Third generation models from year 1984 are available now to contribute leading-edge development on future power management.

SY-810 Remote control software

IE-1125B Power amplifier

SY-8218 B-H analyzer

SY-320A Temperature scanner system

Feature

- Wide band frequency range from 10Hz to 10MHz (SY-8218)
- 41pcs., max. specimen for temperature range of -30℃ to 150℃ automatic scanner system (SY-321A)
- Voltage : ± 140V, max. / Current : ± 5.2A, max. DC to 3MHz High power amplifier (IE-1125B)
- 36mm(L),min. 35mm(W),max. single sheet test (SY-956)
- DC30A, max. DC-bias superposing test (SY-960/961/962)

B-H analyzer
SY-8218/SY-8219

Single sheet test system
SY-956

Temperature scanner system
SY-320A

Power amplifiers

HSA4101-IW

HSA4014-IW

IE-1125B

DC-bias test system
SY-960

Various types of soft magnetic material property test

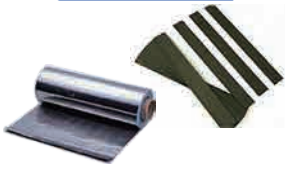
Soft magnetic materials	Types of shape
Ferrite	Toroid
Permalloy	EE core
Amorphous	EI core
Silicon steel sheet	Sheet
Dust core	Powder

Toroidal

Powder

EE core

Sheet

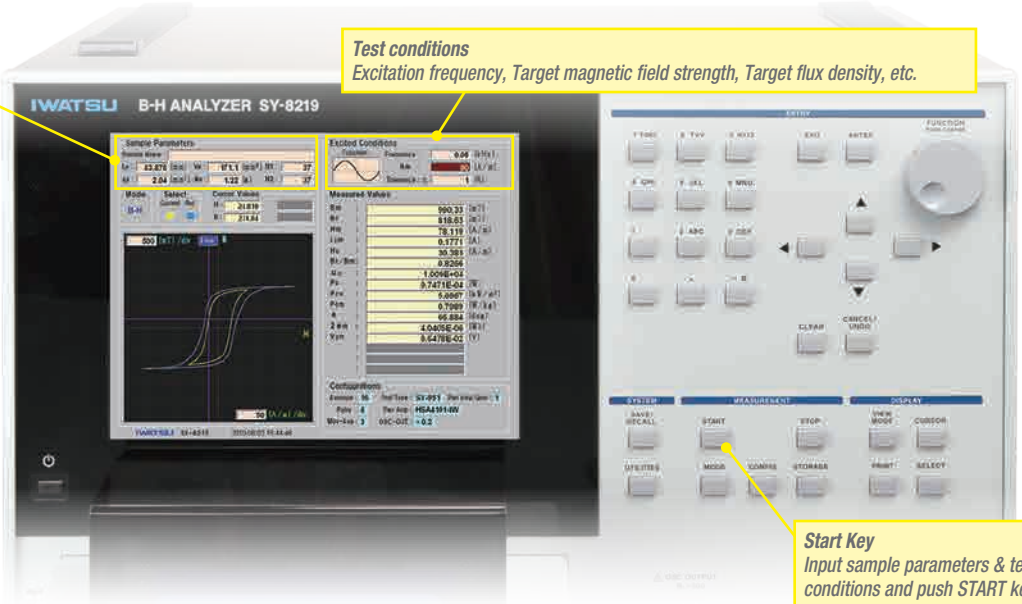


Full automatic test

Sample parameters (Effective magnetic length, Effective cross section, number of turns of windings, etc.) and test conditions(Frequency, Maximum field strength: Hm, Maximum flux density: Bm, Maximum induced voltage: V2m, Maximum exciting current: I1m) inputs enable obtaining BH hysteresis curve and magnetic properties in value automatically.

Sample name
Le: Effective mangetic length
Ae: Effective cross section
Ve: Effective volume
We: Mass
N1: Number of turns of primary winding
N2: Number of turns of secondary winding

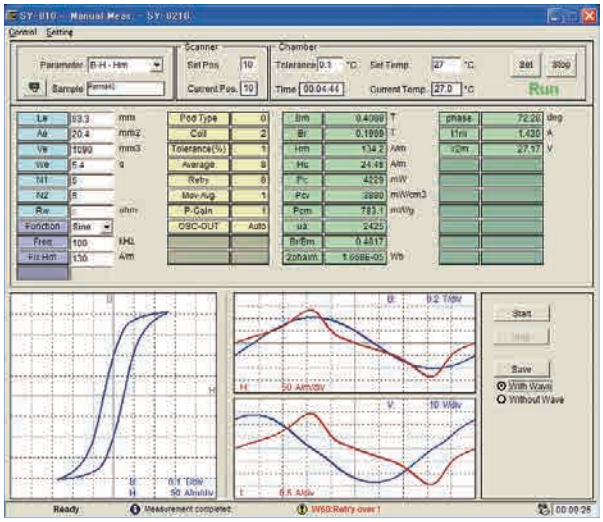
Test conditions
Excitation frequency, Target magnetic field strength, Target flux density, etc.

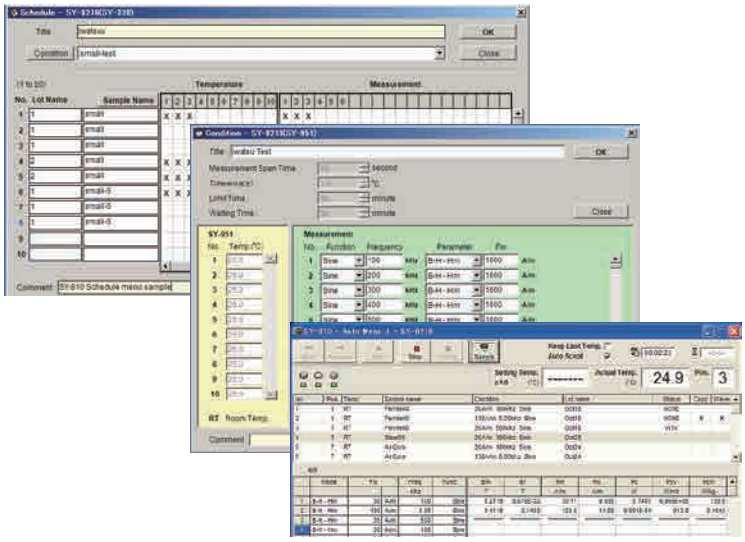


Start Key
Input sample parameters & test conditions and push START key to measure

Full automatic test with options

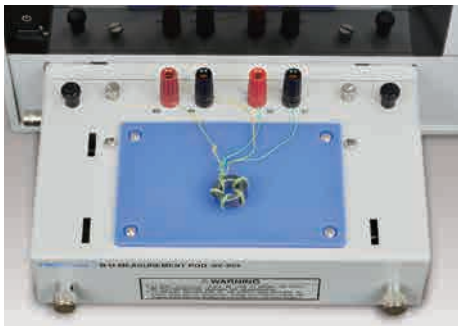
Temperature scanner system, Single sheet test system and DC biasing system are able to be controlled with the SY-810 Remote control software.





Precise test in higher frequency

SY-8218 BH analyzer mainframe



Measurement POD image without POD cover

- Test freq. : 10Hz to 10MHz (SY-8218) / 10Hz to 1MHz(SY-8219)
- Appling signal waveform : Sinusoidal or Pulse (10Hz to 1MHz)
- Input current : ± 6A, maximum
- Input voltage : ± 200V, maximum
- Excitation method : Automatic excitation (at fixed Hm, Bm, I1m or V2m)
  Residual flux can be eliminated by degaussing with applying AC magnetic field

SY-8200 Series Specifications

Model		SY-8218	SY-8219
Measurement method		CROSS-POWER method (conformance to IEC62044-3)	
Measurement item(Symbol)		Max. Magnetic flux density(Bm), Residual magnetic flux density(Br), Max.Magnetic field strength(Hm), Coersive force(Hc), Rectangular ratio(Br/Bm), Relative amplitude permeability(μa), Core loss(Pc,Pcv,Pcm), Primary excitation current(I1m), Secondary induced voltage(V2m), Phase(θ), Total magnetic flux linkage(2φm), Apparent power(VA), Impedance permeability(μz), Complex permeability(μ', μ"), Loss coefficient(tan δ), Inductance(L), Resistance(R), Impedance(|Z|), Quality factor(Q), Total harmonic distortion(THD)	
Waveform display		B-H curve,Excitation current, Induced voltage, Magnetic field, Magnetic flux density	
Testfrequency	Sinusoidal	10Hz to 10MHz	10Hz to 1MHz
	Square	10Hz to 1MHz (Duty50)	
Magnetic field signal detection		Voltage drop at Non-inductive resister, Maximum current at ± 6A	
Magnetic fluxdensity signal detection		Voltage detection at induced voltage detection coil, Maximum signal detection voltage at ± 200V	
Digitizer		16 bits (8,192 points/cycle)	
Sample connection method		2 or 1 coil (winding) method selectable	
Display		8.4" TFT-LCD SVGA 800 x 600pixels	
Power		AC100V to AC240V,50/60Hz, Approx. 130VA (MAX.)	
Weight and dimensions (mm)		Main unit: Approx. 12.5kg, 420 (W) x 266 (H) x 480 (D) ± 2 (without the projection section)	
External memory		USB port for data storage	
Accessories		Reference sample, POD cover, AC coupler module SY-504, Power amplifier cable(BNC-BNC), OSC cable (SMA-BNC), Power cable, Operation manual(CD-ROM), Users guide	

Power amplifier
Wide band and High power

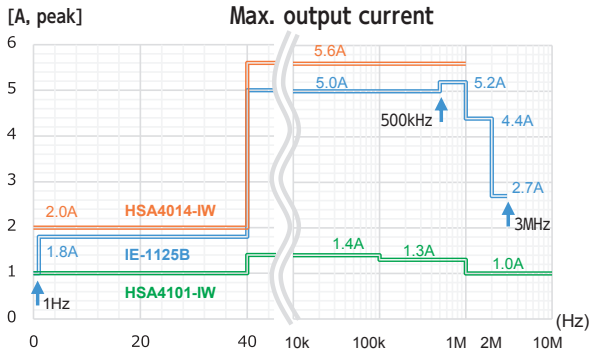
Best fit with B-H analyzer

HSA4101-IW 10MHz, 1A, 71V
HSA4014-IW 1MHz, 5.6A, 75V
IE-1125B 3MHz, 5.2A, 140V

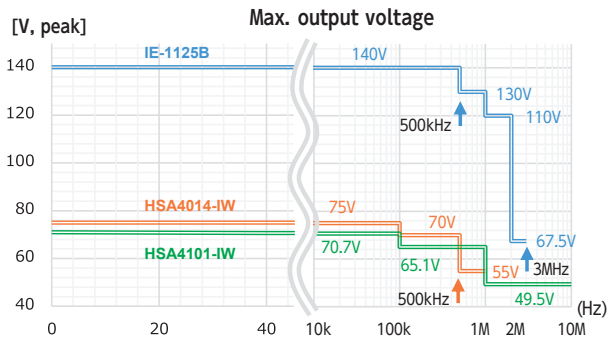
HSA4101-IW

HSA4014-IW

IE-1125B



		HSA4101-IW	HSA4014-IW	IE-1125B
Frequency		DC ~ 10MHz	DC ~ 1MHz	DC ~ 3MHz
Outputcurrent (peak)		±1A, max.	±5.6A, max.	±5.2A, max.
Outputvoltage (peak)		±71V, max.	±75V, max.	±140V, max.
Outputpower		50VA	200VA	350VA
Inputpower				
	Frequency	50/60Hz	50/60Hz	50/60Hz
	Voltage Range	AC100V to 115V AC200V to 230V	AC90V to 110V factory option: 120V/200V/220V/240V	AC90V to 250V
Powerconsumption		700VA, max. (400W)	900VA, max.(700W)	2kVA, max.
Weight & Dimensions		Approx.7.8kg 220W×177H×450D(mm)	Approx.18kg 290W×177H×450D(mm)	Approx.29kg 440W×238H×600D(mm)



※SY-911 connection cable option has to be required for IE-1125B.

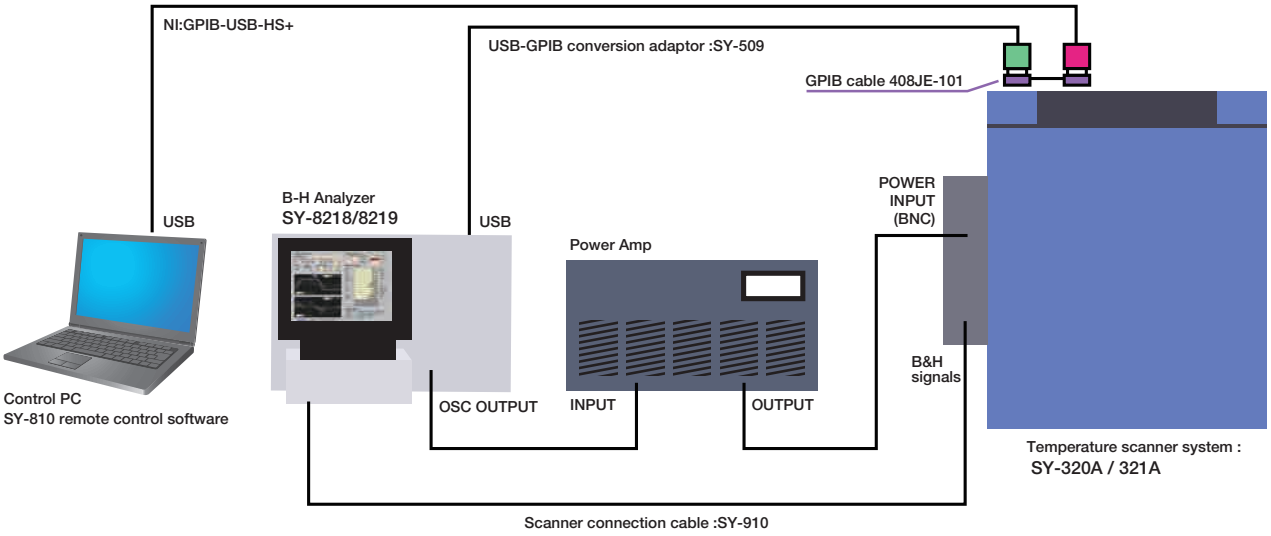
Temperature range : -30˚C to 150˚C, Sample 41pcs, max.

Temperature scanner system

SY-320A sample 20pcs., max.
SY-321A sample 41pcs., max.

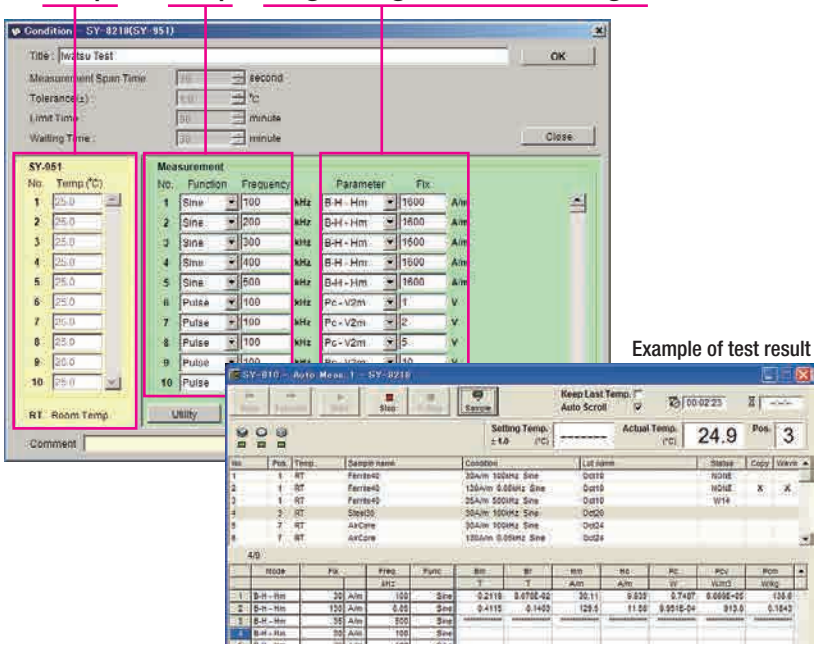
- Test freq. : 10Hz ~ 5MHz (with SY-8218 mainframe)
  : 10Hz ~ 1MHz (with SY-8219 mainframe)
- Input current : ± 6A, max.
- Input Voltage : ± 200V, max.
- Temp. range : − 30℃ to 150℃

Remote control system configurations



REMOTE CONTROL SOFTWARE : SY-810

Temp. Freq. Target magnetic field strength

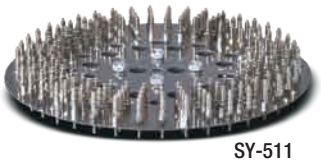


Spare parts for temperature scanner system

Turntable

for setting samples on scanner mechanism

SY-510 for SY-320A
SY-511 for SY-321A



SY-511
for 41 samples

Spare connection pin set

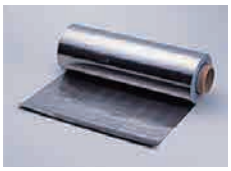
SY-512 for SY-320A/321A

SY-521(1set)

Full automatic accurate test for single sheet shape samples such as Silicon-steel sheets, etc.

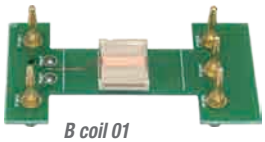
Mini Single Sheet Tester (SST)

SY-956

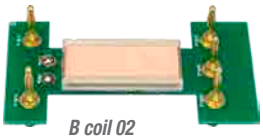


- Test frequency:10Hz to 20kHz
- Applicable magnetic field strength : 10,000A/m, max.
- Sample dimensions : Single sheet samples at ; 36mm(L), min. / 35mm(W), max. and 3mm(t), max.
- Introducing vertical single yoke current excitation type single sheet magnetic property characteristics test method
- Yoke compensation function cancelling loss and other affection in Yoke (patent pending)
- Constant pressing force on specimen (selectable from 16 kinds of force settings)

B coils (as standard)



B coil 01
Sample size
Thickness : 1mm, max.
Width : 10mm, max.
Number of turns : 35



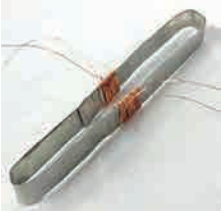
B coil 02
Sample size
Thickness : 1mm, max.
Width : 30mm, max.
Number of turns : 100

SY-956 Series Specifications

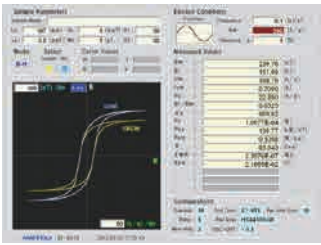
Items	Specifications
Measurement Method	Vertical single yoke current excitation type single sheet magnetic property characteristics test method (IEC 60404-3 compatible)(Yoke compensation : available)
Applicabl emagnetic field strength	Approx.10,000A/m (Max.) with excitation level at 5A
Measurement frequency range	Sine : 10Hz to 20kHz
Sample dimension	35mm(W),max., 36mm(L), min. 3mm(thickness),max.
Detection current	± 6A, max.
Detection voltage	± 200V, max.
Power	AC100V to AC240V, 50Hz/60Hz, Approx. 27VA(Max.)
Performance guarantee temperature	18℃ to 28℃
Dimension Weight	330W × 200H × 320D(mm) Approx. 8.5kg
Accessories	Single sheet test system connection cable SY-957, B coil (2kinds), Connection terminal screw, Pincer, Blowing blush, Accessory case, Power cable, Operation manual

Hint

Steel sheet will show different magnetic properties between the different shapes even exactly the same material. It is important to test magnetic property as a single sheet prior to machining.



Example of Permalloy
Hc : Round=Oval
Br : Round<Oval
Bm : Round<Oval
Core loss : Round<Oval



LF AC coupler SY-514

AC coupler at fLc=300Hz(-3dB) to use in lower frequency than AC coupler SY-504 which provided as a standard accessory with BH analyzer mainframe.

Accessory BNC cable(0.6m)

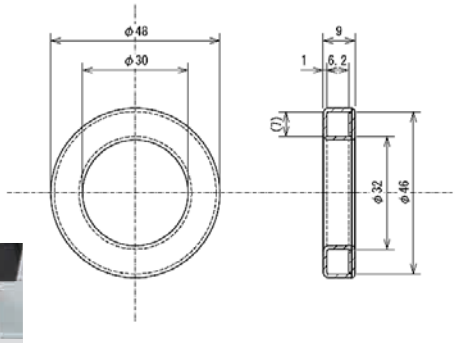
fLc(cut-off freq.)	Approx. 300Hz
Input voltage	± 200V,max.
Input current	± 6A,max.
Connection cable	BNC cable(0.6m)

10kHz AC coupler SY-504

(standard accessory for B-H Analyzers)

Blank toroidal core SY-513

Blank toroidal shape casing for powder material or layered thin material donuts shape, etc.



Automatic test on power inductor properties with DC biasing

DC-bias test system

SY-960/961/962

DC-bias current source SY-961

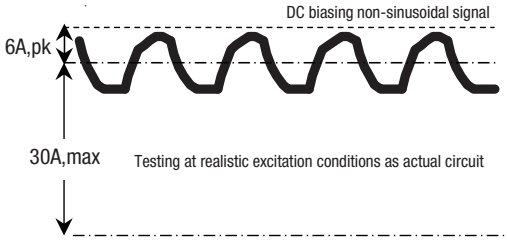
DC bias tester SY-960

SMD Power inductor

Toroidal coil inductor

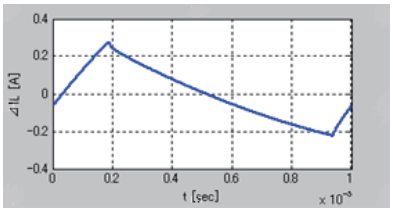
▮DC bias current	30A, max
▮AC Ripple current	± 6A, max
▮Test frequency(Sinusoidal)	10kHz to 3MHz
▮Test frequency(Pulse)	10kHz to 1MHz (Duty10%-90%)

DC biasing non-sinusoidal signal

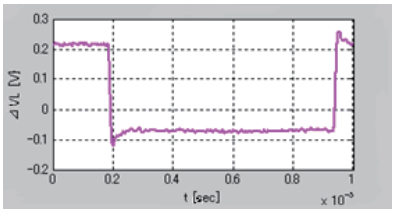


Pulse(Triangular signal waveform in current at specimen, called QUASI-CHOPPER), or Sinusoidal test with DC biasing

Test example on chip inductor (Chopper excitation)



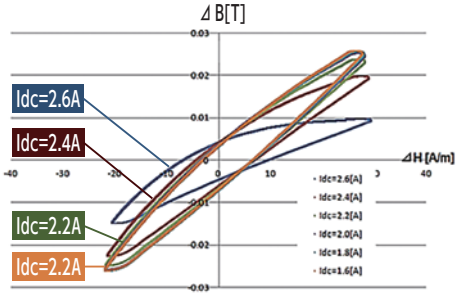
Current signal



Voltage signal

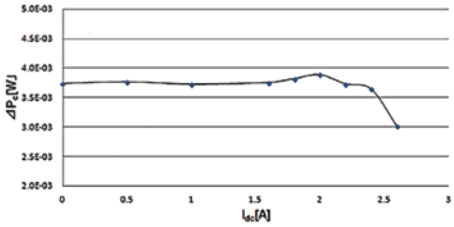
Different DC biasing conditions at constant ⊿H

DC Bias ⊿B-⊿H Curve (100kHz, Pulse, Duty25%, ⊿I_L=0.5[A])



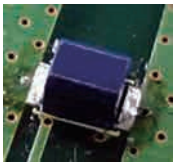
DC bias vs ⊿Pc

DC Bias Coreloss ⊿P_C(100kHz, Pulse, Duty25%, ⊿I_L=0.5[A])



Hint

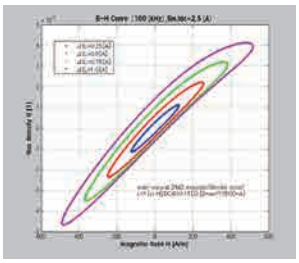
In actual operation, both AC magnetic field and DC magnetic field may be applied at the same time usually.
Magnetic property test with changing DC biasing level is considered important.

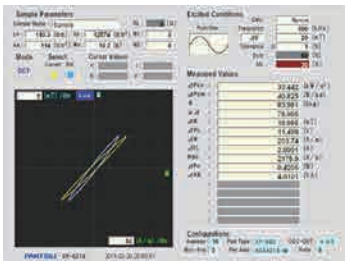


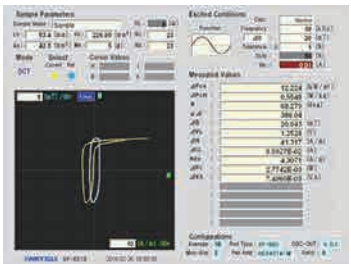
Ferrite(SMA)
L=1.0μH

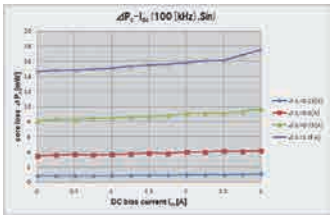
Fe-Based amorphous core
L=311μH

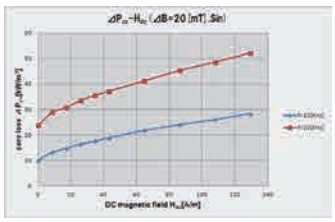
Iron powder core
L=8.4μH

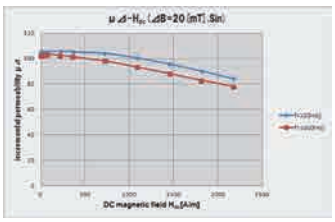












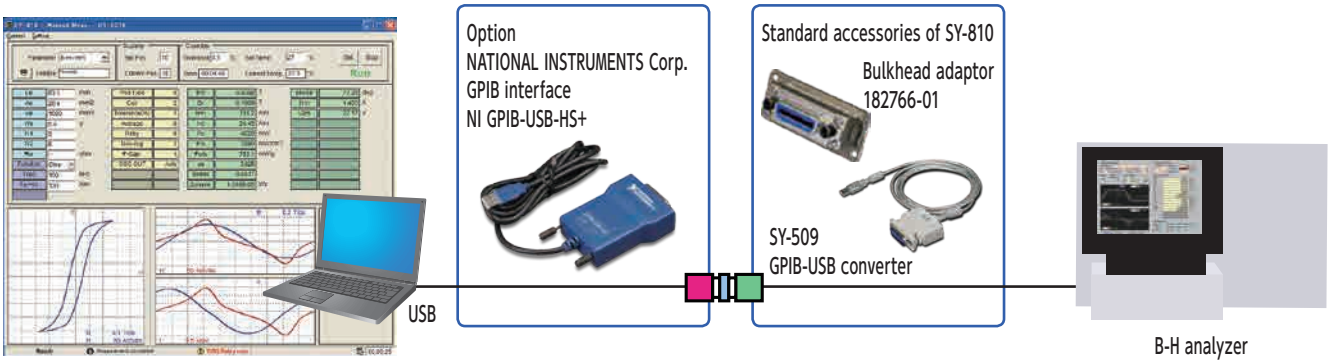
DC-bias test system is uniquely used as an option for SY-8218 or SY-8219 and not be used with other equipment. Adjustment and inspection as a system with BH analyzer is required.
BH analyzers(SY-8218/SY-8219) at the customer end will be returned to our factory for adjustment and inspection when DC-bias test system can be configured as a system.

Automatic test can be performed such as property test vs frequency, etc.

Remote control software

SY-810

- Temperature conditions up to 20kinds, Excitation conditions upto 40kinds for each DUT(device under test) are available. This means 20x40(=800)kinds of conditions can be programmed for each sample of DUT.
- Pulse excitation can be controlled with BH analyzer
- Hard copy of displayed results (JPEG, PNG) and signal waveform data at xxx.csv basis can be extracted to PC memory.



Display example of remote control software SY-810

Power amplifier

Contents of SY-810 : CD (software and operation manual at PDF), GP-IB converter SY-509, Bulkhead adaptor 182766-01 and software license agreement

PC operation environment

OS: Windows Vista SP2, Windows7 32bit/64bit, Windows8 32bit/64bit

.NET Framework(packed), CPU Pentium133M or above, Memory at 64Mbyte or more, Display resolution at1024x768 or above, USB port x1

※Contact our sales for the most recommended system configurations.

※NI GPIB-USB-HS+ (NATIONAL INSTRUMENTS Corp.) is required for PC interface with SY-8218/SY-8219. PC is not included with this system and supplied by customer

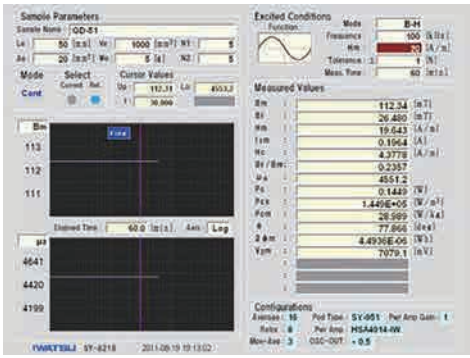
Continuous test function SY-811

Time-tendency property test can be performed at continuous excitation.

- Temperature conditions up to 20kinds, Excitation conditions upto 40kinds for each DUT(device under test) are available. This means 20x40(=800)kinds of conditions can be programmed for each sample of DUT.
- Pulse excitation can be controlled with BH analyzer
- Hard copy of displayed results (JPEG, PNG) and signal waveform data at xxx. csv basis can be extracted to PC memory.

※Option for BH analyzer

※Implementation of SY-811 on BH analyzers(SY-8218/SY-8219) at the customer end will be returned to our factory for installation and inspection.



Equipment wagon

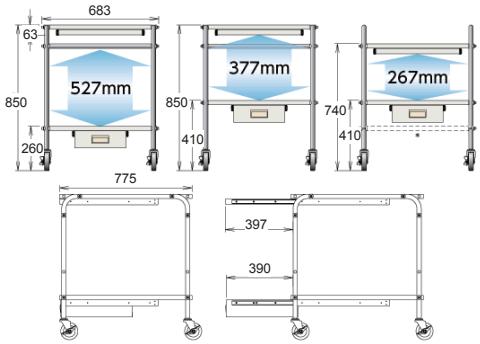
Equipment wagon

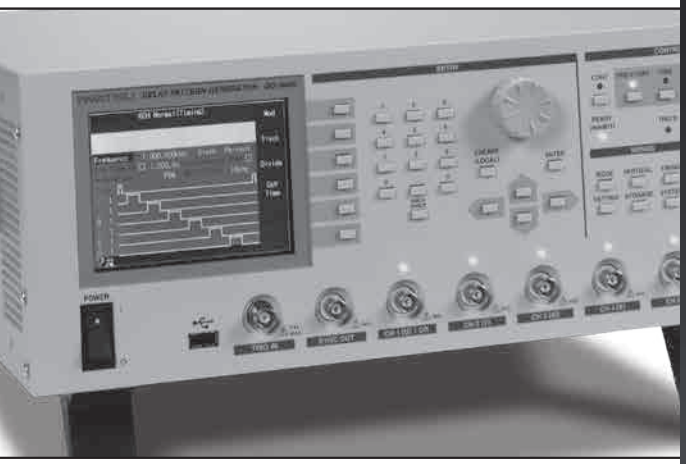
MT-600L

Table can be modified of it's height.

Major items :
Slide pull-out table
Pull out for accessories
4 wheel casters with lock function
Equipment tighten belt
Mountable weight : 100kg, max.
Height : Approx. 850mm
Table : 590W x 775D(mm) fixed
Weight : Approx. 36kg

※Supplied as each piece and assembled by customer





IWATSU http://www.iti.iwatsu.co.jp/

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